U.S. Fish & Wildlife Service

Environmental Assessment for the Draft Refuge Comprehensive Conservation Plan

Turnbull National Wildlife Refuge

June 2005

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CHAPTER 1

Introduction and Background

Great Blue Heron. Photograph by Nancy J. Curry

1.1 INTRODUCTION

Turnbull National Wildlife Refuge is located on the eastern edge of the Columbia Basin in the Channeled Scablands region of Spokane County in eastern Washington (Map 1). The City of Spokane, a major metropolitan area of nearly 200,000 people, is located 20 miles northeast of the Refuge. The Refuge is located next to the town of Cheney.

In enacting the National Wildlife Refuge System Improvement Act (NWRSIA, also known as Public Law 105-57, 1997), Congress mandated that Comprehensive Conservation Plans be developed for each of the more than 500 refuges in the National Wildlife Refuge System. Pursuant to the National Environmental Policy Act of 1969 (NEPA), this Environmental Assessment (EA) explores different options (alternatives) for the Refuge Comprehensive Conservation Plan (CCP or Plan) and discloses anticipated effects for each alternative.

The CCP will be used as a tool by the Refuge staff and other partners in Refuge management. It will guide management decisions over the next fifteen years and identify strategies for achieving Refuge goals and objectives. A range of alternatives was considered for the CCP. These alternatives are presented in Chapter 2 and analyzed in Chapter 4. Appendices provide supporting information.

1.2 PURPOSE AND NEED

The purpose of the CCP is to provide a coherent, integrated set of management actions to help attain the Refuge vision, goals, and objectives. It identifies the Refuge's role in support of the mission of the National Wildlife Refuge System, provides information on the Service's management actions, and provides a basis for Refuge budget requests.

The CCP is needed for a variety of reasons. Most urgently, Refuge purposes could be threatened without action to protect sources of Refuge water. Groundwater is especially critical to migratory waterbirds breeding in Refuge wetlands. Both shallow and deep aquifers underlying the Refuge are, however, being increasingly tapped for residential and urban development. In addition, widespread land conversion to agricultural and residential uses in the surrounding area has threatened the connectivity of the Refuge to other native habitats, undermining biological integrity.

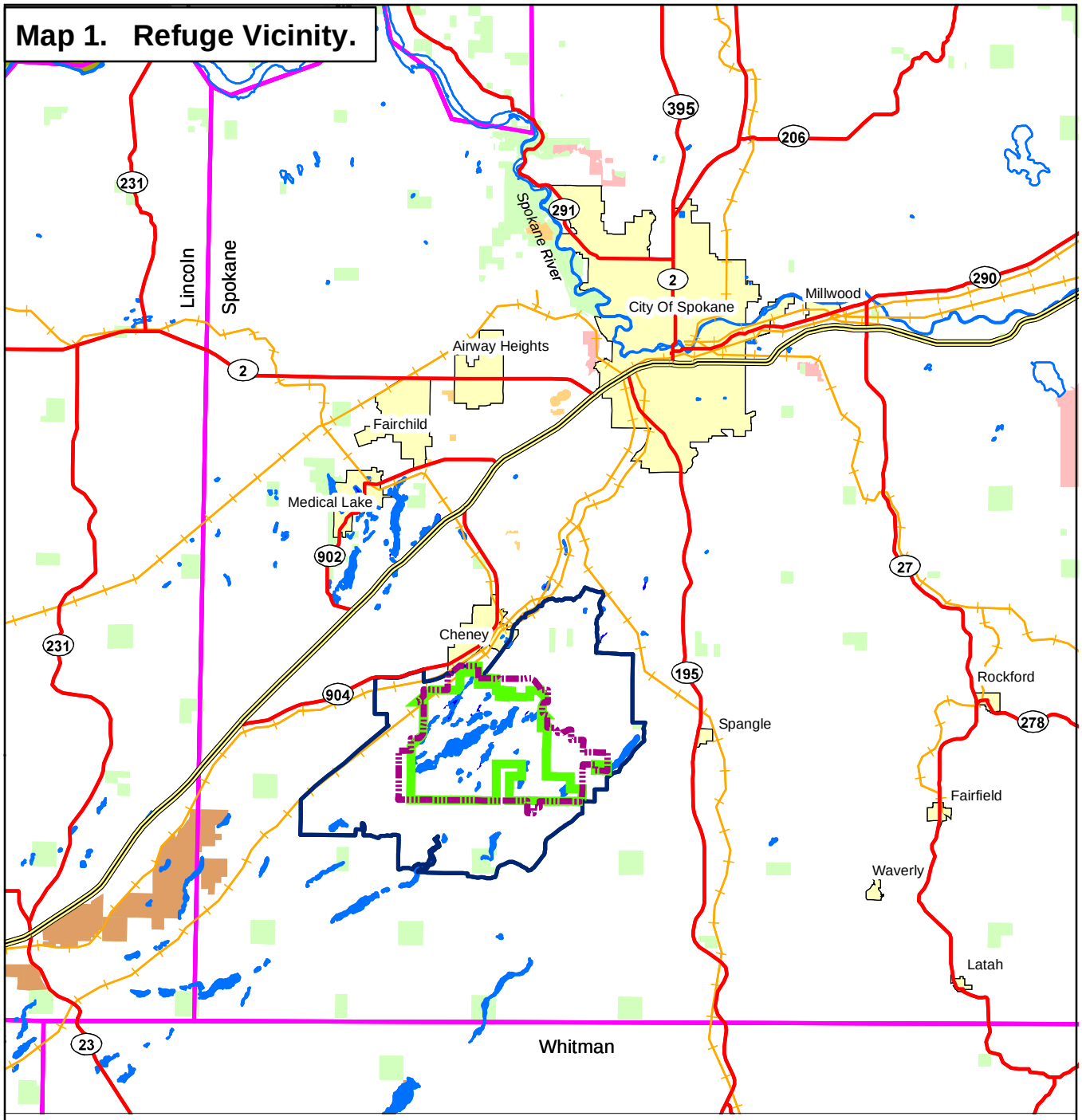
The Channeled Scablands, of which the Refuge is a piece, is an area of regional and national conservation importance. Crossing several counties in eastern and central Washington state, the Scablands contain densities of wetland basins rivaling the Prairie Pothole region, and at intact sites, waterfowl production exceeds that of the Potholes region. Yet most of the larger wetland basins have been drained and very little of the original Channeled Scablands area is under any kind of public ownership or protected in any other fashion.

Numerous plans attest to the biological significance of the area: it is identified as an important site in the Partners in Flight Columbia Plateau Plan (Altman and Holmes 2000), the Nature Conservancy's Columbia Plateau Ecoregion Plan (Soper 1999), the Draft Intermountain West Waterbird Conservation Plan (Ivey and Herziger 2003), and the Draft Recovery Plan for Water Howellia (Shelley and Gamon 1996).

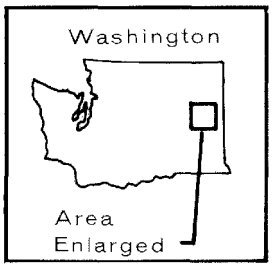
In addition, the Refuge is currently designated as an Important Bird Area by the Audubon Society. The Channeled Scablands also host the majority of the last remnants of the Palouse steppe vegetation community which is recognized both nationally and at the state level as a critically endangered ecosystem.

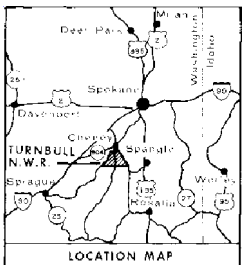
The CCP is also needed to address the problem of aspen browsing by an increasing elk population. Aspen clones are not successfully regenerating in many places on the Refuge, in part because of heavy browsing by elk.

Map 1. Refuge Vicinity.



TURNBULL NATIONAL
WILDLIFE REFUGE
DRAFT COMPREHENSIVE
CONSERVATION PLAN
2005





LEGEND

- Refuge Fee Title Ownership
- Existing Approved Refuge Boundary*
- Study Area
- County Boundaries
- Lakes or rivers
- Railways

* Area within which the U.S. Fish and Wildlife Service is currently authorized to acquire from willing sellers and/or manage through various agreements.

Land Ownership

- Dept of Defense
- County owned
- State owned
- Tribal Land
- Bureau of Land Management
- State Parks

N

1:400,000

0 3.5 7 Miles

Map produced by: U.S. Fish and Wildlife Service, 16507 SW Roy Rogers Rd., Sherwood, OR 97140 (503) 590-6596

Finally, the CCP is also needed to evaluate and manage Refuge visitor uses and needs in light of regional recreation trends and demands and in compliance with the National Wildlife Refuge System Improvement Act (NWRSIA). The NWRSIA requires refuges to facilitate compatible wildlife-dependent recreation for six Refuge System priority public uses, namely hunting, fishing, wildlife observation and photography, environmental education and interpretation.

1.3 PROPOSED ACTION

The proposed action is to implement Alternative 3 as described in this EA. This alternative encompasses the following key actions:

(1) The Service would strive, with partners, to protect water resources that support Refuge wetlands and wildlife, and to protect and restore additional wetlands, rare Palouse steppe habitat, aspen / riparian habitats, and pine forests within the Channeled Scablands. To do this, the Service would implement a Land Protection Plan (found in Appendix A). Key elements of this plan include the following:

- Establishing a Stewardship Area surrounding the Refuge, which would encompass 44,536 acres. This area includes the 5,171 acres within the current Approved Refuge Boundary not acquired in fee. The Stewardship Area would function as an informally designated conservation zone surrounding the Refuge. Within the Stewardship Area, the Service would actively work with partners and neighbors for voluntary, cooperative activities that protect habitat and water resources. Key tools include but are not limited to: conservation easements, enrollment in the Wetlands Reserve Program, and technical assistance programs. Key partners include but are not limited to: Inland Northwest Joint Venture, Spokane County, State of Washington, Inland Northwest Land Trust, Ducks Unlimited and The Nature Conservancy.
- In addition, the Service would seek to protect, as part of the National Wildlife Refuge System, up to 12,000 acres of priority lands from willing sellers within the Stewardship Area, through fee, easement or agreement. Priority lands are described in Appendix A.

Land conservation is proposed to address the key threats to Refuge purposes and integrity, in particular threats to surface water and groundwater resources, and the lack of connectivity with surrounding habitats. In addition, land conservation would provide opportunities for protection and restoration of Palouse steppe, wetland, aspen/riparian, and ponderosa pine forest habitats and would provide additional opportunities for wildlife-dependent recreation. These habitats also support several threatened species.

(2) To address habitat damage caused by elk browse, and to provide a recreational opportunity, the Service would approve an annual elk hunting program at the Refuge. The number of permits, length of the seasons, and number of seasons offered would vary depending upon the amount of aspen damage observed each year. The Service would also offer a youth waterfowl hunt each year on the weekend designated by the State for this season each year.

(3) The Service would increase the Environmental Education program, both on and off-Refuge, increase viewpoint and interpretive opportunities on the Refuge, add a small interpretive exhibit area (co-located with new office space), provide more trail miles, and link the Public Use Area to the cross-State Columbia Plateau Trail with a bike trail. If the Refuge were to acquire contiguous additional lands, up to 10 additional trail miles could be added as well as several thousand more acres for elk or waterfowl hunting.

These actions best achieve the Refuge purpose, vision, and goals, and contribute to the Refuge System mission. These actions address the

significant issues, are consistent with principles of sound fish and wildlife management, and fulfill necessary mandates under NWRSIA and other applicable laws.

1.4 CONTENT AND SCOPE OF THE CCP

This CCP provides management guidance for maintenance, restoration, and use of Refuge resources during the next 15 years. Specifically, the CCP for Turnbull Refuge will:

- Set a long term vision, goals, and objectives for the Refuge;
- Implement a Land Protection Plan, including an informally designated Stewardship Area surrounding the Refuge, and describe objectives and conceptual management strategies for areas that may be acquired through fee, easement, or lease;
- Establish public use management goals, objectives, and strategies and evaluate existing and proposed activities for compatibility with the purposes of the Refuge;
- Integrate the Habitat Management Plan goals and objectives that were outlined in 1999; and
- Outline projects, staff, and facilities necessary to support the goals and objectives.

The CCP provides a framework for future Refuge management. The environmental analysis of this plan is addressed at the broader area planning level. It is not a detailed site plan and does not have precise locations for facilities or detailed descriptions of programs.

In this and other chapters of the EA, references are made at times to the Study Area. In order to study the areas within and adjacent to the Refuge that were most critical in terms of hydrologic influence and habitat connectivity, the planning team designated a Study Area encompassing 60,000 acres. For this EA, the planning team specifically analyzed aspects of hydrology, habitat quality, recreation, and land use within the entire Study Area. The Study Area is shown on nearly all maps in the document.

Other sections of text refer to the "Refuge vicinity." This is an area that was not specifically outlined, but generally extends outside the Refuge for approximately 5 to 7 miles in each direction.

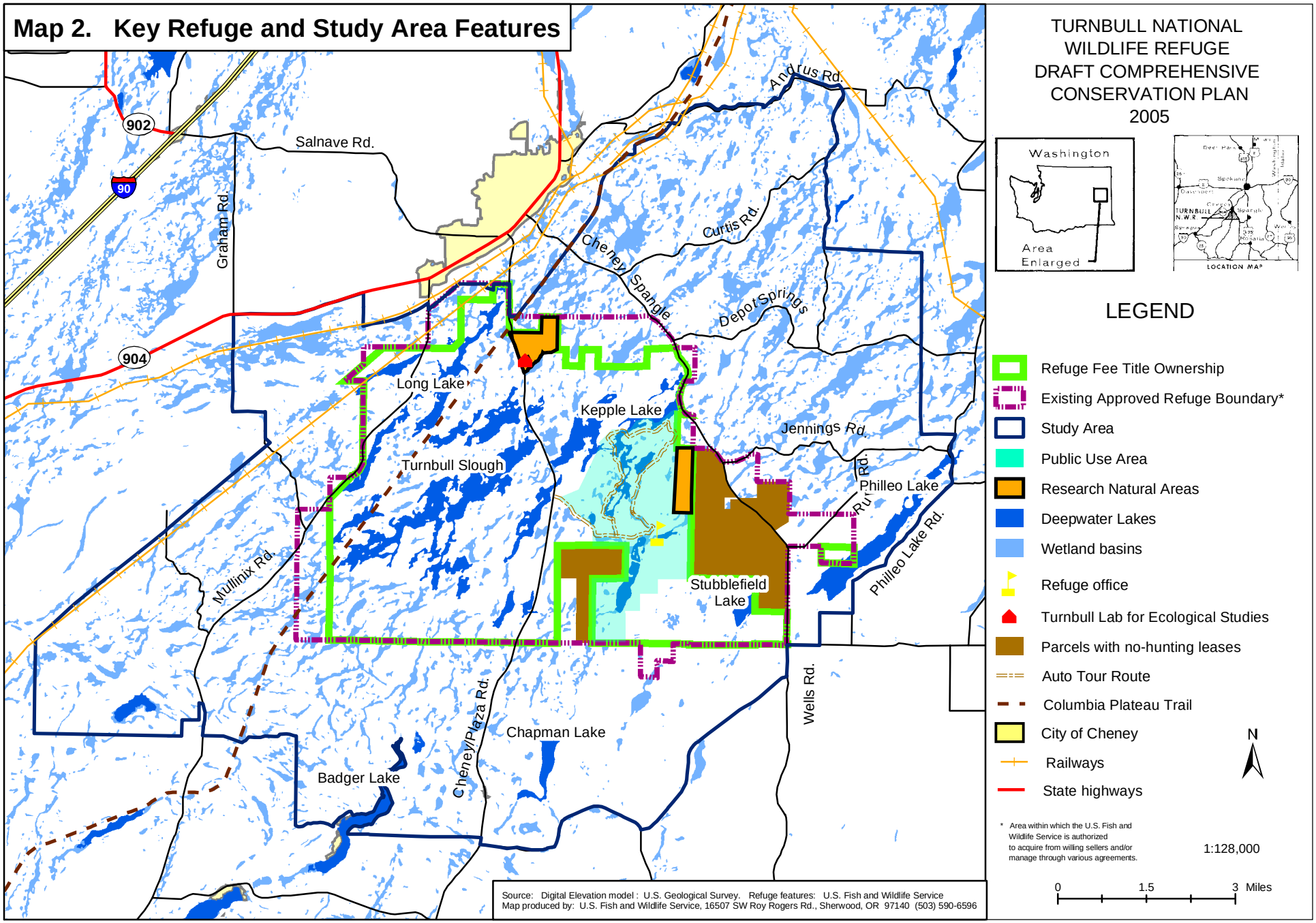
The CCP guides Refuge management activities only. In some cases, the CCP makes recommendations that the manager and staff work with private landowners or other management agencies for greater conservation benefit on private lands. In no cases would any project be undertaken on private land without the consent of the landowner.

This Environmental Assessment does not include a detailed analysis of habitat management actions to be taken upon currently owned Refuge lands. That analysis was completed with the Habitat Management Plan (USDI 1999) and Fire Management Plan (USDI 2001).

1.5 BRIEF DESCRIPTION AND HISTORY OF THE REFUGE AND STUDY AREA

The Refuge and Study Area are located within a globally unique geological area known as the Channeled Scablands, created by massive scouring from Ice Age floods 15,000 years ago (Map 2). An extensive complex of deep permanent sloughs, semi-permanent potholes and seasonal wetlands formed in the depressions left in the scoured landscape, while soils only centimeters thick on upland sites, support primarily ponderosa pine intermixed with

Map 2. Key Refuge and Study Area Features



grasslands (steppe) and exposed basalt cliffs. Aspen is scattered throughout the area. The juxtaposition of all these contrasting habitats in such close proximity is unique to the Channeled Scablands and creates conditions of exceptional wildlife and plant diversity.

Prior to settlement, ducks, geese, and other waterbirds nested in the area in large numbers. Many waterfowl also used the productive marshes and lakes during the spring and fall migrations.

Because of its unique resources, this area was also important to local indigenous cultures. The Northern Plateau peoples frequented this vicinity in spring to dig the roots of camas, bitterroot, wild onion and numerous species of lomatium, and to gather waterfowl eggs.

Pioneers arrived in the late 1800s and rapidly began altering the landscape. Many of the marshes were drained to expand crop areas for hay. By the late 1920s few wetlands remained; instead a network of drainage ditches became the more common feature of the landscape. In addition, as in most developing communities, timber was harvested, native plant communities were grazed by livestock, exotic plants were introduced, and fire, a natural part of the ecosystem, was suppressed. The wildlife values of the area would have been seriously compromised if it had not been for the failure of the drained lakebeds to produce crops.

The Refuge was established by President Franklin D. Roosevelt in 1937, through Executive Order 7681, as a refuge and breeding ground for migratory birds and other wildlife. Local activists, sportsmen, and naturalists were instrumental in obtaining the area's designation as a National Wildlife Refuge. The Refuge was named after early settler Cyrus Turnbull, who built a cabin on the north end of Turnbull Slough and lived there with his wife and children from 1880 to 1886.

1.5.1 Habitat Management

Since Refuge establishment, the primary focus of habitat management was waterfowl, and in recent years it was directed more specifically at production of redheads. Early management focused on restoring Refuge wetlands that had been drained, and producing grain crops for migratory waterfowl. In later years, management moved from restoration to enhancement, the goal always being to improve habitat conditions to increase or maintain waterfowl populations. Enhancement involved creating additional semi-permanent wetland habitat for breeding diving ducks, especially redheads, and the creation of numerous nesting islands for upland nesting ducks.

Habitat manipulation for redheads involved deepening seasonal and temporary marshes and increasing the interspersion of open water to emergent vegetation with heavy equipment. In the early decades the Refuge also allowed economic uses including timber harvest, grazing, and trapping. Trapping and timber harvest were suspended in 1975 and grazing was discontinued in 1993. The Refuge continues to use prescribed burning, has begun small scale non-commercial thinning, and reinstated commercial thinning to reduce fuel accumulations and promote forest health. With completion of the Habitat Management Plan (HMP) in 1999, the Refuge adopted a mission statement based on the Refuge's purposes and the outstanding wildlife and habitat needs of the area. The Refuge's mission now includes restoring and maintaining the native ecosystem processes of the Channeled Scablands. Under management goals and objectives adopted under the HMP, Refuge habitats are managed to sustain the diversity of the flora and fauna native to the Channeled Scablands.

1.5.2 Public Uses

For many years, the Refuge has maintained a 2,200-acre area open to the public (Public Use Area). Approximately 30,000 visits are made

each year to the Refuge. Wildlife observation is the major activity, and an Auto Tour Route leads visitors to the key observation points. Visitors also hike, take nature photographs, ride bicycles, jog, or cross-country ski. Hunting and fishing have never occurred at the Refuge. Outside the Public Use Area, the Refuge has historically been closed to general visitor use. At times, opportunities are offered within this area for special interpretive tours or community service projects.

The Refuge has had some form of environmental education (EE) for most of its existence. Early in its development, EE was very informal and only a handful of local schools and civic groups visited the Refuge annually. These early groups were provided a talk or nature walk by the Refuge staff member who was free on the day of their visit.

As the local population grew, the Refuge recognized the need for a more formal approach. A self-conducted program was initiated, with the development of an EE classroom and teacher workshops offered in spring and fall. This program, with some enhancement was in operation until 1995 with nearly 2,500 students visiting the Refuge annually.

In 1996, a Refuge Friends group was formed and over $80,000 in grants was received via Friend's fund-raising activities. The influx of funds were used to hire a contractor to coordinate activities and develop a new curriculum. The EE program reached nearly 15,000 students over the next two years.

In the years since, the Refuge has tried to continue to meet this demand by offering a year-round, multi-faceted program facilitated primarily by Americorps members, Student Conservation Association (SCA) volunteers, student interns, and community volunteers. Because of the lack of a stable funding base, and the time commitment involved in training new EE staff yearly, the challenge is to maintain a consistent, high quality program from one year to the next.

1.5.3 Land Status

Like most other refuges, Turnbull Refuge was acquired incrementally over time after its original establishment. The process of adding to the Refuge System is ongoing and will likely continue in a similar incremental pattern. For every refuge, the Approved Refuge Boundary identifies the area within which the Service may acquire lands or interest in land from willing sellers. The Approved Refuge Boundary may contain roads, right-of-ways, or other portions of property that a Refuge would not be interested in acquiring. An Approved Refuge Boundary can be modified by executive order, legislation, congressional legislation, or administrative procedures of the Service.

Currently, the Turnbull Approved Refuge Boundary totals 20,827 acres (acreage figure based on the Service's Geographic Information Systems calculations). Table 1-1 shows the current acres and percent of this area in fee title ownership, lease, and agreement.

Table 1-1. Turnbull NWR Land Status

Land Status	Current Acres*	Percent of Approved Refuge Boundary
Fee title ownership	15,656	75%
Lease (no hunting)	2,018	10%
Agreements	138	<1%
Subtotal managed under NWRS	**17,812**	**86%**
Inholdings within Approved Acquisition Boundary	3,015	14%
Total Acreage within Approved Refuge Boundary	20,827	100%

* Rounded to nearest acre. Source: RPMIS, January 2003.

Of the 15,656 acres under Refuge ownership, approximately 13,650 acres (66 percent) were purchased with Migratory Bird Conservation Commission funds (Duck Stamp monies).

1.6 IMPLEMENTATION AND RELATIONSHIP TO PREVIOUS AND FUTURE REFUGE PLANS

1.6.1 IMPLEMENTATION

Implementation of the objectives and strategies in the preferred alternative will be dependent upon the Refuge receiving adequate funds. Funding will not be immediately available to implement the CCP in full. Project implementation will be guided partly through priorities as outlined in Appendix F - Implementation. If funding for any particular project is not received through appropriations, or obtained through partnerships or private sources, the Service will normally default to the corresponding no action strategy for any particular item.

1.6.2 PREVIOUS PLANS AND DECISIONS

The CCP has evolved from previous planning efforts and/or decisions, including:

- Determination that grazing is incompatible with the purposes of Turnbull Refuge (1990). This determination resulted in a decision to phase grazing out over five years. However, a subsequent court case brought by Defenders of Wildlife and Audubon resulted in a ruling that incompatible uses had to end immediately.
- Operational review completed by the Service in 1990.
- Management Plan by Don White, Parts 1 and 2, 1986.
- Environmental Assessment covering Operation, Maintenance, and Development, 1973.
- Master Plan, 1966.

While the life-span of the CCP is 15 years, periodic reviews will occur. The CCP may be amended as necessary at any time under the principles of adaptive management.

1.6.3 STEP-DOWN PLANS

Under Service planning policy, the CCP is meant to serve as broad guidance to all Refuge management programs. Specifics needed for implementation are generally developed in "step-down management plans" for individual program areas. All step-down plans require appropriate NEPA compliance. Project-specific plans, with appropriate NEPA compliance, may be prepared outside of these step-down plans.

Two important step-down plans–the Habitat Management Plan (HMP) and the Fire Management Plan (FMP)–were completed, together with NEPA compliance, in advance of the CCP (see USDI 1999, and USDI 2001). Those plans are integrated in the CCP with the following important caveats:

- The CCP shall act as the umbrella planning document for the Refuge. The CCP's final overall goals for the Refuge supercede those listed in the HMP and FMP.

- The HMP's habitat objectives, strategies and guidelines prevail over any habitat objectives or guidelines listed in the FMP, in case of conflict.

- The FMP should be regarded primarily as an operational plan. "Goals" "objectives" and "strategies" listed in that plan pertain primarily to fire management actions and should not be taken out of that context.

The status of other step-down plans are listed in Table 1-2.

Table 1-2. Step Down Management Plans Status

Completed Plans (Date Completed)	**Plans Needed Subsequent to CCP**
Habitat Management Plan (1999)	Public Use Management Plan
Fire Management Plan (2001)	Hunt Plan
Emergency Action Plan for Lower Pine Lake (2002) Reviewed annually.	Law Enforcement Plan
Continuation of Operations Plan (2002)	Integrated Pest Management Plan
Safety Plan (2000)	Cultural Resources Management Plan
Sign Plan (1993) Needs to be updated.	Biological Research Plan
Wildlife Inventory Plan (1990) Needs to be updated.	Annual Water Management Plan

1.7 FEDERAL MANDATES AND REFUGE PURPOSES

Refuges are guided by various federal laws and executive orders, Service policies, and international treaties. Fundamental to refuge management are the mission and goals of the National Wildlife Refuge System (NWRS or Refuge System) and the designated purpose of the refuge unit as described in establishing legislation, executive orders, or other documents establishing, authorizing, or expanding a Refuge.

Key concepts and guidance of the Refuge System are covered in the National Wildlife Refuge System Administration Act of 1966, the Refuge Recreation Act of 1962, Title 50 of the Code of Federal Regulations, the Fish and Wildlife Service Manual, and, most recently, the National Wildlife Refuge System Improvement Act of 1997.

1.7.1 NATIONAL WILDLIFE REFUGE SYSTEM IMPROVEMENT ACT

Of all the laws governing activities on National Wildlife Refuges, the National Wildlife Refuge System Improvement Act (NWRSIA or Act) undoubtedly exerts the greatest influence. The NWRSIA amended the Refuge System Administration Act of 1966 by including a unifying mission and goals for all National Wildlife Refuges as a System, a new process for determining compatible refuge uses, and a requirement that each refuge be managed under a CCP, developed in an open public process.

The NWRSIA states that the Secretary shall provide for the conservation of fish, wildlife and plants, and their habitats within the System as well as ensure that the biological integrity, diversity, and environmental health of the System is maintained.

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

Additionally, the Act identifies six priority wildlife-dependent recreational uses. These uses are hunting, fishing, wildlife observation and photography, environmental education and interpretation. As priority public uses of the Refuge system, these uses are to receive enhanced consideration over other uses in planning and management.

When preparing a CCP, Refuge managers must reevaluate compatibility of all general public, recreational, and economic uses (even those

occurring to further habitat management goals) proposed or occurring on a Refuge, including priority public uses. No Refuge use may be allowed or continued unless it is determined to be compatible. A compatible use is a use that, in the sound professional judgement of the Refuge manager, will not materially interfere with or detract from the fulfillment of the mission of the Refuge System or the purposes of the Refuge. Updated compatibility determinations for existing and proposed uses for Turnbull Refuge are in Appendix E.

Section 5 of the Act also states "In administering the System, the Secretary shall ...(F) assist in the maintenance of adequate water quantity and water quality to fulfill the mission of the System and the purposes of each refuge; (G) acquire, under State law, water rights that are needed for refuge purposes..."

The NWRSIA also requires that, in addition to formally established guidance, the CCP must be developed with the participation of the public. Issues and concerns articulated by the public play a key role in guiding alternatives considered during the development of the CCP, and together with the formal guidance, can play a role in selection of the preferred alternative.

1.7.2 Other Laws, Policies, and Orders

Many other federal authorities, including laws, treaties, executive orders, interstate compacts and memoranda of agreement govern Service and Refuge System lands. A list and brief description of each can be found at http://laws.fws.gov.

Over the last couple of years, the Service has developed or revised numerous policies and Director's Orders to reflect the mandates and intent of the NWRSIA. Some of these key policies include the Biological Diversity, Health, and Environmental Health Policy; the Compatibility Policy; the Refuge Planning Policy; the Director's Order on Responsibility of Federal Agencies to Protect Migratory Birds in Accordance with Executive Order 13186; and the Director's Order regarding Coordination and Cooperative Work with State Fish and Wildlife Agency Representatives on Management of the National Wildlife Refuge System. Text of these policies and orders as well as others in draft or under development can be found at: http://refuges.fws.gov/policymakers/nwrpolicies.html.

In developing a CCP, Refuges must consider these broader laws and policies as well as Refuge System and ecosystem goals and visions. The CCP must be consistent with these and also with the Refuge purpose. Figure 1 illustrates the hierarchy of planning guidance in the Fish and Wildlife Service.

1.7.3 National Wildlife Refuge System Mission and Goals

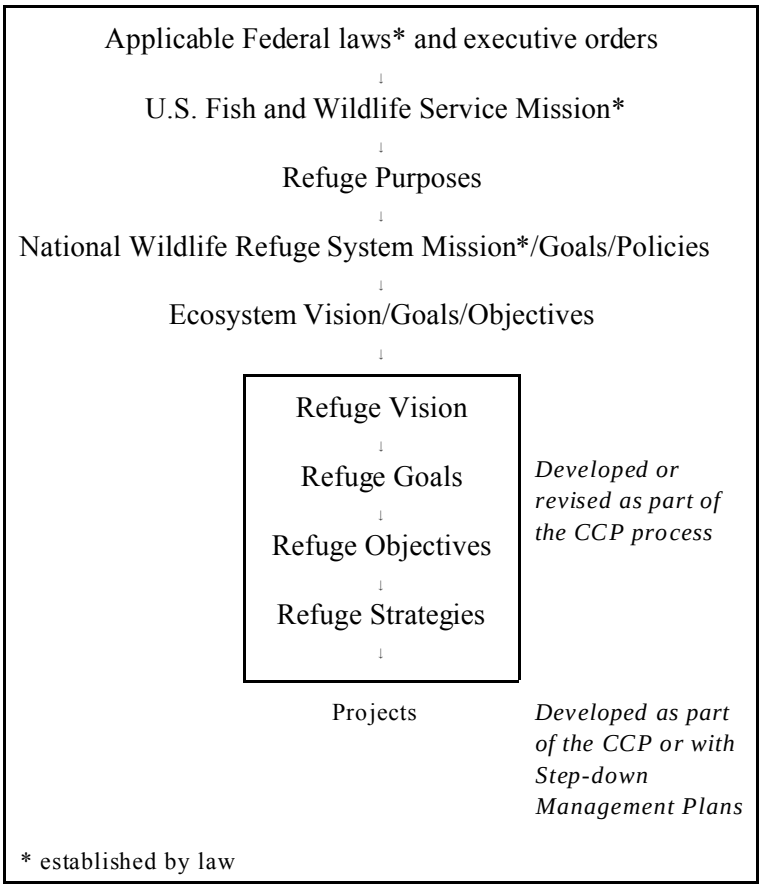
The mission of the National Wildlife Refuge System is:

"*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 Improvement Act of 1997.)

The goals of the National Wildlife Refuge System are: (published in draft in the Federal Register, Jan 16, 2001)

- To fulfill our statutory duty to achieve refuge purpose(s) and further the System mission.
- To conserve, restore where appropriate, and enhance all species of fish, wildlife, and plants that are endangered or threatened with becoming endangered.
- To perpetuate migratory bird, interjurisdictional fish, and marine mammal populations.

Figure 1. Hierarchy of Guidance within the National Wildlife Refuge System



- To conserve a diversity of fish, wildlife, and plants.
- To conserve and restore where appropriate representative ecosystems of the United States, including the ecological processes characteristic of those ecosystems.
- To foster understanding and instill appreciation of native fish, wildlife, and plants, and their conservation, by providing the public with safe, high-quality, and compatible wildlife-dependent public use. Such use includes hunting, fishing, wildlife observation and photography, and environmental education and interpretation.

1.7.4 Significance of the Refuge Purpose

The purpose for which a refuge was established or acquired is of key importance in refuge planning. Purposes must form the foundation for management decisions. By law, refuges are to be managed to achieve their purposes. When a conflict exists between the Refuge System mission and the purpose of an individual refuge, the refuge purpose may supercede the Refuge System mission (Improvement Act, Section 5(a)(3)(D)).

The Service defines the purposes of national wildlife Refuges when a Refuge is established or when new land is added to an existing Refuge. Service realty files document purposes used to acquire lands or to receive transferred lands. At times, purpose statements define

specific uses allowable on the Refuge. Purpose statements often identify the wildlife species or groups of species that receive management emphasis on any particular Refuge.

1.7.5 Purposes for Turnbull National Wildlife Refuge

As explained previously, the following purposes form the foundation for management decisions at Turnbull Refuge, including the development of goals, objectives, and strategies.

- "...as a refuge and breeding ground for migratory birds and other wildlife..." (Executive Order 7681, dated July 30, 1937)
- "...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. 715d Migratory Bird Conservation Act)
- "...suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." (16 U.S.C. 460k-1) and "...the Secretary...may accept and use...real... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors..." (16 U.S.C. 460k-2 and Refuge Recreation Act 16 U.S.C. 460k-460k-4, as amended).
- "...for the development, advancement, management, conservation, and protection of fish and wildlife resources..." (16 U.S.C. 742f(a)(4)) "...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude..." (16 U.S.C. 742f(b)(1) Fish and Wildlife Act of 1956).

1.7.6 Meaning of Terms in Purpose

Migratory Birds. Migratory birds are those defined as such by the following treaties. The birds are listed at 50 CFR § 10.13.

- The treaty between the United States and Great Britain for the protection of migratory birds concluded August 16, 1916 (39 Stat. 1702).
- The treaty between the United States and the United Mexican States for the protection of migratory birds and game mammals concluded February 7, 1936 (50 Stat. 1311).
- The Convention between the Government of the United States and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction, and their Environment concluded March 4, 1972.
- The Convention between the United States and Union of Soviet Socialist Republics for the Conservation of Migratory Birds and their Environment concluded November 19, 1976 (16 USC 715j).

Inviolate Sanctuary. The original intent of the term "inviolate sanctuary" is found in the Migratory Bird Conservation Act (first passed in 1918 as the Migratory Bird Treaty Act and amended in 1934 and 1938). This Act originally required that all refuges be inviolate sanctuaries and deemed that refuges' primary purposes were as breeding ground and habitat for migratory birds. Migratory bird hunting was prohibited on migratory waterfowl areas by the Act but most other human uses were not addressed. The 1938 amendment to the Act gave refuge managers authority to decide if, when, and how bird hunting would be allowed. After World War II, public demand for opening refuges to recreation increased. The 1949 Duck Stamp Act allowed waterfowl hunting on all refuges, but restricted the percentage of each refuge open to hunting.

Current policy states that portions of a refuge are considered "inviolate sanctuaries" if they were (a) acquired with the approval of the Migratory Bird Conservation Commission (MBCC) for the purpose of an inviolate sanctuary; (b) acquired with the approval of the MBCC or Land and Water Conservation Fund to protect a threatened or endangered species; or (c) established by an instrument or document which states that we intend to manage the area as an "inviolate sanctuary for migratory birds"

or to fulfill the purpose of the Migratory Bird Conservation Act. Policy further allows hunting of migratory game birds on no more than 40 percent of the total area considered an inviolate sanctuary, if compatible with the Refuge purposes and mission. Inviolate sanctuary classification imposes no limits on hunting non-migratory birds, fur bearers, or other game species.

On Turnbull NWR, 13,650 acres were purchased with MBCC funds and fall within the "inviolate sanctuary" provision. Since its inception, the Refuge has been closed to hunting of all kinds. Key advocates for the establishment of the Refuge in the 1930s included the Spokane Sportsman's Association, who believed that the local area should include a sanctuary where hunting would not be permitted.

Incidental Fish and Wildlife-Oriented Recreational Development. The Refuge Recreation Act does not specifically define these terms (although the term "secondary" is also used together with "incidental" in several places), but this Act does emphasize the following points:

- "...any present or future recreational use will be compatible with, and will not prevent accomplishment of, the primary purposes for which the said conservation areas were acquired or established..."
- "...such public recreation use shall be permitted only to the extent that is practicable and not inconsistent with other previously authorized Federal operations or with the primary objectives for which each particular area is established..."

Development, Advancement, Management, Conservation, and Protection. These terms were not defined in the Fish and Wildlife Act (as amended). However, the NWRSIA does define some of these terms as follows:

> "Conserving" "conservation" "manage" "managing" and "management" mean to sustain, and where appropriate, restore and enhance healthy populations of fish, wildlife, and plants utilizing, in accordance with applicable Federal and State laws, methods and procedures associated with modern scientific resource programs. Such methods and procedures include, consistent with the provisions of the Act, protection, research, census, law enforcement, habitat management, propagation, live trapping and transplantation, and regulated taking.

1.8 RELATIONSHIP TO REGIONAL CONSERVATION GOALS

The Refuge System, when and where possible, also tries to assist in meeting conservation goals established by other divisions of the Service, and by other legitimate and credible organizations. Some of these organizations are other federal agencies or interagency groups. Others are state agencies or coalitions of government and nongovernment partners, such as Partners in Flight. Listed below are brief statements of ecosystem goals and objectives that apply within the Refuge vicinity.

1.8.1 INTERMOUNTAIN WEST JOINT VENTURE

The 1998 Intermountain West Joint Venture *Channeled Scablands Focus Area Implementation Plan* (Intermountain West Joint Venture 1998) includes two goals relevant to the Refuge CCP: increasing the quantity and quality of Channeled Scabland wetland, upland, and riparian habitats for breeding, migrating, and wintering waterfowl, as well as other species of management concern; and restoring degraded wetland and upland habitat for waterfowl and other species.

Two federal North American Wetland Conservation Act (NAWCA) grants were awarded recently in the amount of nearly two million dollars for protection and restoration of wetland and riparian habitats in Spokane, Lincoln, and Adams Counties. These first two

grants fund Phases 1 and 2 of a five phase project plan for the Intermountain West Joint Venture Channeled Scablands Focus Area (CSFA), to which the Refuge is a partner.

Fourteen public and private organizations provided matching and in-kind funds in the amount of $3.2 million (Phase II) and $6.2 million (Phase I). Numerous private landowners are also partners in the project. The goals of Phase I and Phase II of the project are to acquire, restore and enhance over 15,000 acres of wetland, riparian, and adjacent upland habitat within the area covered by the CSFA Implementation Plan.

The Refuge is a partner to an ongoing effort by 14 organizations to protect and restore wetlands and riparian areas within the Channeled Scablands. Two million dollars in federal grants were recently awarded to this project. Partners have put up nearly ten million dollars in matching and in-kind funds.

1.8.2 Partners in Flight, Columbia Plateau Plan

The primary goal of the recently published *Conservation Strategy for Landbirds in the Columbia Plateau of Eastern Oregon and Washington* (Altman and Holmes 2000) is to ensure long-term maintenance of healthy populations of native landbirds in shrub-steppe and riparian habitats. The Partners in Flight Conservation Strategy includes an objective to "Initiate actions to increase the size and connectivity of existing riparian and steppe patches through restoration and acquisition efforts."

1.8.3 Birds of Conservation Concern 2002

Based on the efforts and assessment scores of three major bird conservation efforts (Partners In Flight, the U.S. Shorebird Conservation Plan, and the North American Waterbird Conservation Plan), this report identifies, by Service region and by Bird Conservation Region (BCR), the bird species most in need of conservation attention (the list does not include threatened or endangered species or hunted species). Turnbull Refuge straddles BCRs 9 and 10. BCR 9 contains 29 species listed in this report and BCR 10 contains 28 species (USFWS 2002).

1.8.4 GAP Analysis Program Report, Washington State

The 1997 report *Role of Washington State's National Wildlife Refuges in Conserving the State's Biodiversity* (Cassidy et al. 1997b) recommended acquisition priorities for specific zones in the State of Washington. For the east side forest zones and the steppe zones of Washington, the Gap Analysis Program (GAP) authors recommended acquiring areas with the following characteristics: "Oak and ponderosa pine forest, especially where these types are combined with wetlands, and not isolated from upper forest and lower steppe zones, and where maintenance of a natural fire regime is feasible." Within the steppe zones, the GAP authors recommended acquiring: "Upland steppe on deep soil; the palouse zone adjacent to Turnbull Refuge has the highest priority, but deep soil sites in any steppe zone are a high acquisition priority. Wetlands in steppe, especially where wetland protection can be combined with protection of adjacent uplands."

1.8.5 Water Howellia Draft RecoveryPlan

The goal of this recovery plan is "to provide an adequate level of conservation for the species and its habitat so that there will be self-sustaining populations distributed throughout its extant range" (Shelley and Gamon, 1996). According to the draft plan, recovery efforts should "focus on development and implementation of habitat management plans for occurrences on public lands; promotion of voluntary protection on private lands;

conducting biological and habitat management research; monitoring and surveys of known occurrences and potential habitat; dissemination of educational information; promotion of state-level legal protection; and evaluation of the appropriateness and feasibility of reintroducing water howellia into portions of its historic range."

1.8.6 The Nature Conservancy Conservation Strategy, Columbia Plateau Ecoregion

The Nature Conservancy (TNC) conducted a strategic analysis of the Columbia Plateau Ecoregion to identify sites that could conceivably maintain all viable native species and communities within the Ecoregion (Soper 1999). They concluded that protection of approximately 139 sites would achieve their goals. They further prioritized this list, identifying 27 sites to work on over the next five years. Several of the priority sites are within the Palouse steppe area, as well as within the Channeled Scablands ecosystem.

1.8.7 The Service's Columbia RiverBasin Ecoregion

The Service's Columbia River Basin Ecoregion Goal #1 reads as follows: "Prevent species decline, expedite recovery of candidate, threatened, and endangered species, and preclude future species listings by conserving and restoring a diversity of native fish, wildlife, and plant species and their habitats in the Columbia River Basin" .

1.8.8 Interior Columbia Basin Ecosystem Management Plan

This project was an ambitious effort covering the majority of the Inland Northwest (an area the size of France) and is a good source of broadscale ecosystem analysis for the region. The scientific assessment which underlies the plan identified numerous threats to the ecological integrity of the basin (Quigley et al. 1996). Within the vicinity of Turnbull Refuge, report authors listed the primary opportunities to address the risks to ecological integrity as: "maintenance or restoration of riparian conditions; restoration of productive aquatic areas; and conservation of fish strongholds and unique aquatic areas."

1.8.9 Spokane County Comprehensive Plan

Spokane County recently completed an update of its Comprehensive Plan (Spokane County 2002). The Plan calls for minimization of habitat fragmentation. Furthermore, the County's Critical Areas Ordinance requires the protection of a variety of priority habitats, including wildlife corridors and landscape linkages. A University of Washington Department of Urban Design and Planning class analyzed the County's biodiversity and habitat to assess which lands, if protected, would conserve all the biodiversity of the County under the most efficient design possible. The students ultimately recommended a map of reserves, wildlife corridors and landscape linkages that would meet this objective (see http://depts.washington.edu/-rsal/GAP/spokane_brochure/index.html; also Stevenson 1998; University of Washington 1998). Much of the area surrounding Turnbull Refuge is encompassed in the area the students recommended be maintained as a reserve and wildlife corridor. The County has incorporated the recommendation by designating many of these areas as "open space" in its plan and zoning others under a low density "Rural Conservation" category.

1.9 REFUGE VISION

Turnbull National Wildlife Refuge will be key to preserving the unique Channeled Scablands habitat of Eastern Washington, with its broad diversity of plants and animals. The area will serve as an important link in migrations for at least 139 species of birds, but its best function will be as a production area for at least 100 bird species. Habitat diversity will provide a stable, productive and flexible resource to ensure that

the native faunal diversity of the Refuge is maintained. The Refuge will restore and maintain ecosystem processes that provide for a natural diversity of flora and fauna native to the wetland, aspen/riparian, steppe, and ponderosa pine communties of Eastern Washington. Maintenance of biodiversity will be further supported by the conservation of threatened and endangered species. Partnerships with neighbors, non-profit organizations, and other government agencies will ensure the maintenance of biologically effective landscape linkages and corridors between the Refuge and other intact areas of vegetation zones representative of this ecoregion. Efforts will be made to conserve and restore additional Channeled Scabland habitats and wetlands.

Wetland habitats will have a legally secure water supply based on annual precipitation and runoff. The quality of water entering the Refuge will be monitored and maintained at a standard suitable for ensuring ecological integrity. Water management facilities make for more efficient use of water, bypassing high flows, maintaining desired food and cover plants, and providing optimum diversity.

Grassland steppe habitats will be healthy and diverse, sustaining a variety of both migratory and resident birds as well as other indigenous plants and wildlife. Healthy forested uplands managed by the reintroduction of fire will provide a natural distribution and diversity of structural and successional stages to benefit forest dependent wildlife.

Research and environmental education opportunities will be provided. Visitor and education facilities will assist with interpreting the values of wildlands and wildlife to the public. Visitors will experience the quiet solitude that only nature can provide. Opportunities for outstanding aesthetics, wildlife observation, and other compatible uses will be provided.

Volunteers will support Refuge public use programs, Refuge monitoring and research, and habitat restoration. Partnerships with Friends of Turnbull Refuge, the Spokane chapter of the Audubon Society, the Inland Northwest Land Trust, the Inland Northwest Wildlife Council and other non-profit organizations, neighbors, and other federal, state and county agencies will enhance opportunities to realize Refuge goals and objectives.

1.10 REFUGE GOALS

Goal 1: Contribute to protection of local watersheds so as to maintain adequate water quality and quantity for native Refuge wetland species.

Goal 2: Provide habitat conditions essential to the conservation of birds and other wildlife within a variety of wetland complexes**.**

Goal 3: Restore Refuge aspen and ponderosa forest to a natural distribution of stand structural and successional stages to benefit forest-dependent wildlife.

Goal 4: Protect and restore the natural distribution and diversity of grassland and shrub steppe habitats to benefit wildlife.

Goal 5: Support the conservation of threatened and endangered species in their natural ecosystems.

Goal 6: Support the maintenance of biologically effective landscape linkages and corridors between the Refuge and other intact areas of vegetation zones representative of this ecoregion.

Goal 7: Foster appreciation of and support for the Refuge and the Channeled Scablands ecosystem through quality environmental education, interpretation, wildlife-dependent recreation, and outreach compatible with the Refuge purposes and mission .

Goal 8: Encourage and support research that substantially contributes to our understanding of the Channeled Scablands ecosystem.

1.11 PUBLIC INVOLVEMENT IN THE DEVELOPMENT OF THE CCP

Public involvement was sought throughout the development of the CCP, starting in the summer of 1999. Public involvement strategies emphasized face-to-face meetings with key agencies, tribes with ancient links to the area, elected officials, and Refuge neighbors. The Refuge also held open houses, conducted a planning workshop, sent newsletters, conducted surveys, and gave presentations at community organizations to inform the public, invite discussion and solicit feedback.

A mailing list of approximately 900 persons and organizations is maintained at the Refuge and was used to distribute planning updates and public meeting announcements. Appendix K contains a brief summary of the events, meetings, and outreach tools that were used in our public involvement efforts.

1.12 ISSUES

Under the National Environmental Policy Act (NEPA), federal agencies may identify numerous issues after scoping is completed. However, only major issues drive the formulation of alternatives. Based on the scoping efforts undertaken, the following major issues were identified for the Turnbull Refuge.

Issue 1. Elk Management and Hunting

Archeological evidence suggest that elk may have once been fairly widespread in eastern Washington and were hunted by native Americans residing in the area. However, elk appear to have been eliminated by the time of Euro-American settlement. Elk reintroductions in the early 1900s resulted in expanding herds throughout much of the forested portions of eastern Washington. From these reintroductions and subsequent transplants, elk populations increased dramatically in the mid-twentieth century. Elk were first observed on the Refuge in the late 1950s. Although increasing numbers were observed on the Refuge and in most of southern Spokane County since their first appearance, dramatic increases did not occur until the early 1980s. The herd that inhabits the Refuge and local vicinity (Hangman Creek subherd) was estimated at 115 to 219 animals in 1997 (95 percent confidence interval, population estimate from Meyers 1998). In November 2004, 354 elk were counted in the herd, with 100 off-Refuge and the rest on the Refuge.

Research underway by the State and Eastern Washington University indicates that the Refuge is disproportionately important to the local elk population as security cover. As a result, there has been heavy browsing of young aspen and other deciduous shrubs and trees on the Refuge. In addition, several neighbors have complained of elk damage to their hay, other agricultural crops, fences, and ornamental shrubs since the early 1990s and feel that the Refuge should take a more active role in limiting elk numbers. Since 1992, two claims have been paid by the State for elk damage to agricultural crops. Complaints have declined since 1999 as a result of several local landowners leasing their lands for hunting.

On Refuge hunting of big game and/or waterfowl has been proposed at various times in the past (1959, 1966, and 1987) but never was widely supported by the community and has never been permitted on the Refuge for any species.

Surveys conducted in 1999 indicate 82 percent of the public surveyed (485 respondents) believe that the Refuge should remain closed to hunting. Half of the 88 respondents who felt that the Refuge should be opened to hunting, also felt that all types of hunting should be allowed. Eighteen respondents felt that only big game hunting should be allowed (EDAW 1999). Respondents to other surveys distributed at the public scoping meetings in the spring of 2000, indicated that 29 percent of the participants identified the prohibition of hunting as an

important Refuge issue. However, nearly 13 percent felt that the most important issue was allowing hunting as a management tool.

Washington Department of Fish and Wildlife and others advocate hunting or other management tools to bring the elk population numbers down to a level considered "socially acceptable" (i.e. a level which does not trigger many depredation complaints).

Issue Summary: What kinds of elk management tools, if any, should be utilized at the Refuge to address habitat damage and depredation problems?

Issue 2. Recreational Development and Opportunities, Allowable Uses, and Visitor Access

For many years, the Refuge has maintained a 2,200-acre area open to public driving, wildlife viewing and photography, hiking, and environmental education. The remainder of the Refuge is closed to public use. Interpretive opportunities are fairly limited and trail lengths are short.

An opportunity to inquire into what the public values at Turnbull Refuge occurred during public scoping at the outset of the CCP. As part of this process, the Service distributed a short survey to its mailing list and to attendees of the public scoping meetings in February and March, 2000. Eighty-six participants completed the survey. The majority of the respondents to the survey indicated that wildlife is what makes Turnbull special to them. Nature, interpretation and environmental education were also important reasons for visiting the Refuge. Ninety-three percent of the individuals surveyed agreed that Refuge facilities were adequate. A segment of the public is interested in seeing a higher level of interpretive and trail facilities for public enjoyment and use.

The environmental education program (EE) has been underway for more than thirty years. The EE program provides students from the Spokane area an opportunity for field-based science learning and supports teachers in meeting state educational requirements. However, the program has no permanent funding, and many requests go unmet because of limited staff and facilities. To date, the EE program has been supported by volunteers, an active partnership program, and fluctuating Refuge funds supplemented by grants. Many members of the public have expressed interest in expanding the EE program.

In May of 2000, the Washington State Parks and Recreation Commission (WSPRC) opened the 130-mile long Columbia Plateau Trail on an abandoned railroad right-of-way in Eastern Washington. The new trail lies adjacent to some of the Refuge's most productive waterfowl lakes, Long Lake and Ballinger Lake. The trail, when fully developed, will run from Pasco to Fish Lake, and traverse five miles of the Refuge, through the heart of the Refuge's closed area. Projections of use for this section of trail are 30,000 people annually. State Parks and some users have asked the Refuge to create side trails off of the Columbia Plateau trail so that they can loop through the area. Concerns remain, however, about potential disturbance to waterfowl, disturbance to big-game populations in this area, and potential for trespass from the Columbia Plateau Trail into the closed area of the Refuge.

Public participation in nature activities, including wildlife observation and photography and visiting interpretive centers, is projected to grow by approximately 30 percent over the next 15 years in the state of Washington (IAC, 2002a). An assessment completed by IAC (IAC 1995) identified trails and environmental education as the two highest outdoor recreation needs in the State.

Hunting is one of the six priority public uses identified in the Refuge Improvement Act of 1997. Hunting participation in the State is expected to decrease, however, over the next fifteen years (IAC, 2002a). All priority public

uses must be considered when developing public use alternatives in the CCP.

Issue Summary: What kind of public recreational opportunities should the Refuge seek to provide over the next 15 years, and how should the Refuge manage these uses to maintain compatibility with its purposes?

Issue 3. Protection of Habitats, Water Quality and Quantity Off-Refuge

Refuge wildlife and their habitats are connected to and depend upon the surrounding landscape. The Refuge Improvement Act of 1997 requires maintenance of the Refuge System's biological integrity, diversity and environmental health. The Act also directs the Secretary to maintain adequate water quality and quantity to fulfill the purposes of each Refuge and acquire, under State law, water rights that are needed for Refuge purposes.

In consideration of these mandates, the planning team has considered whether Turnbull Refuge encompasses sufficient habitat to maintain the wildlife it was established to protect. The team also considered whether water supplies that feed Refuge wetlands are adequate for the future, and whether they are free of pollutants.

For most of the Refuge's existence, surrounding land use has mostly complemented the Refuge by maintaining open space, providing a larger habitat base, and serving as critical linkages to other undisturbed habitats. The situation around the Refuge is, however, changing. Spokane County's population has increased by 30 percent over the past 20 years. Accelerated home construction, business developments, and the transportation infrastructure to service this growing population have begun to isolate the Refuge from surrounding habitats. This development increases the potential for threats to wildlife and their habitats, such as contamination of air and water, altered or depleted supplies of surface and ground water, loss of connectivity to other suitable or complimentary habitats, and the invasion of exotic plant and animal species that erode the integrity of the Refuge. It is likely that the biological integrity, diversity and environmental health of the Refuge will be at risk over the long term if the Refuge is managed as an isolated island of habitat without attention to maintaining water supplies and connectivity to adjacent habitats.

Several scientific assessments in the area (Cassidy et al. 1997a, Wisdom 2000, Soper 1999) indicate that much of Eastern Washington's wildlife and habitats remain unprotected.

Mechanisms for land protection could include: cooperative agreements, conservation easements, fee title acquisition, leases, donations, transfers, and exchanges. Only willing participants would be considered for any of these approaches.

Issue Summary: How can the Refuge best ensure protection of water supplies and healthy wildlife habitats within the Refuge vicinity, to provide long term benefits for its species and habitats?

CHAPTER 2

Alternatives, Goals, Objectives and Strategies

Elk cow and calf. Photograph by Nancy J. Curry

2.1 ALTERNATIVES

2.1.1 CONSIDERATIONS IN THE DESIGN OF ALTERNATIVES

In drafting the alternatives for this long term conservation plan, the Service reviewed and considered a variety of resource, social, economic, and political aspects important for managing the Refuge. These background conditions are described more fully in Chapter 3. As is appropriate for a National Wildlife Refuge, resource considerations were fundamental in designing alternatives. Aquatic species at Turnbull depend on water, so careful consideration was allotted to hydrology, especially the delineations of watersheds providing surface water to the Refuge. After planning began and several members of the public mentioned water quality as an issue, the Service commissioned a water quality study to provide information on current stream water quality parameters. In addition, the team consulted groundwater specialists, to estimate groundwater movements, and the team identified a groundwater "area of influence" - i.e. an area within which groundwater withdrawals, recharges, and/or contamination would be most likely to affect Refuge wetlands.

The planning team utilized aerial photo interpretation to map and rate the quality of all of the terrestrial habitat within the Study Area. The team utilized National Wetlands Inventory data to locate all Study Area wetlands and identified each wetland as drained or undrained. The team considered the potential for wetland restoration especially with regard to wetlands crossing multiple property ownerships. The team considered habitat connectivity and areas inhabited by threatened and endangered species. The team also consulted with Washington Department of Fish and Wildlife to get the latest information on elk herd sizes and locations frequented by elk within the area. The team reviewed scientific reports and studies to better understand ecosystem trends and the latest scientific recommendations for species and habitats.

The team reviewed State reports on outdoor recreation trends and catalogued nearby recreation opportunities. The team used surveys, meeting questionnaires, and comments to try to determine the kinds of experiences desired by Refuge visitors.

The Service met with local, State, and federal agency staffs and elected officials to ascertain priorities and problems as perceived by others. Refuge staff met with neighbors, Refuge users, non-profit groups, and community organizations to ensure that their comments and ideas were considered during CCP development.

Finally, the planning team held a workshop attended by approximately three dozen local citizens to review our preliminary alternatives. Based on the input received at that workshop and further internal review, the Service refined the CCP alternatives to the four presented below.

2.1.2 ALTERNATIVES CONSIDERED BUT NOT DEVELOPED

The planning team considered the possibility of creating a Wetlands Management District within the full extent of the Channeled Scablands. Such districts occur in other regions similarly rich in wetlands, such as the Prairie Potholes region in the northern prairie states or the Central Valley in California. However, the team felt that establishing a Wetlands Management District in the Channeled Scablands region is outside the scope of the Turnbull NWR CCP. The team recommends, however, that the Service consider this idea in some depth at a regional level in the future.

The planning team considered the possibility of offering a white-tailed deer hunt. Deer are present on the Refuge and in the surrounding area. White-tailed deer populations are

periodically reduced by a virus which causes Epizootic Hemorrhagic Disease (EHD), also known as blue-tongue. The disease is transmitted by biting gnats and usually occurs in the driest part of the year when animals are congregated at watering holes. The disease does not appear to be density-dependent, meaning that major outbreaks can occur, sharply reducing the deer population regardless of the number of the deer in any particular area. All ages appear to be affected. The result is generally an unpredictable supply of deer and low numbers in most years. For these reasons, the planning team did not include a white-tailed deer hunt in any alternatives.

2.1.3 ALTERNATIVE DESCRIPTIONS

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*

Actions will be implemented over a period of 15 years as funding becomes available. Implementation priorities are designated in Appendix F.

Under each alternative, actions will be implemented over a period of 15 years as funding becomes available. Project priorities are designated in Appendix F, Implementation.

- *On-Refuge Habitat and Fire Management*

Habitat management actions will continue to be guided by the direction set forth in the Refuge Habitat Management Plan (USDI 1999). This plan was analyzed and publicly reviewed under an Environmental Assessment released in 1999. Fire management was similarly analyzed and a Fire Management Plan was finalized in 2001.

- *Inholdings*

The Fish and Wildlife Service will continue to seek ways for acquiring interest in private lands within the existing Approved Refuge Boundary, from willing landowners. This interest could be secured through management, easements, exchange or purchase of the approximately 5,171 acres of inholdings (this includes lease and agreement lands) within the boundary. Outside the Approved Refuge Boundary, small acquisitions from willing sellers may be completed consistent with national policy.

- *Leases*

The Refuge will continue to maintain mutually agreed upon leases on 2,018 acres of lands within the Approved Refuge Boundary. Under these leases, two adjacent landowners agree to prevent hunting from occurring on their property. Another area is managed under a year to year agreement for the same purpose. The leased properties are fenced and carry Refuge signs. These leases were set up to protect waterfowl and to minimize public safety concerns adjacent to the Refuge's Public Use Area. The leases do not incur a cost to the U.S. government.

- *Easements*

The Service manages two conservation easements: Wildrose in northern Spokane County, and RD Smith in Whitman County. Both areas contain riparian habitat that is managed to exclude livestock.

- *Maintenance of Existing Research Natural Areas (RNA)*

Two existing Service designated Research Natural Areas (RNAs) on the Refuge will be maintained and restored for the values for which they were established in 1966. In practice, this means that they will be managed similarly to other Refuge habitats as described in the Refuge Habitat Management Plan. Research activities may occur within the RNAs, but will not be confined to these areas.

Active management within both RNAs will continue with the objective of returning both RNAs to a more natural stand condition. After an initial thinning, Pine Creek RNA will be maintained with regular underburning. Turnbull Pines will be managed as a control area until the completion of all other uplands habitat management units, and then it may be restored in the same manner as other forested areas of the Refuge.

- *Tribal Coordination*

Increased regular communication with Native American Tribes who have an interest in the Refuge will be common to all alternatives. The Spokane Tribe, Coeur d'Alene Tribe, Kalispel Tribe, and the Confederated Tribes of the Colville Reservation are four local Tribal groups the Service will work with regarding issues of shared interest. Currently, the Service allows Tribal members to gather roots and tubers in appropriate locations on the Refuge and seeks their assistance in interpreting traditional Native American lifeways as part of the Refuge's environmental education program.

- *State Coordination*

Similarly, under all alternatives, the Service will continue to maintain regular discussions with the Washington Department of Fish and Wildlife. Key topics of discussion will be coordination on elk management strategies and law enforcement.

- *Volunteer Opportunities and Partnerships*

Volunteer opportunities and partnerships occur in all alternatives. These are recognized as key components of the successful management of public lands and vital to implementation of Refuge programs, plans, and projects.

- *Refuge Revenue Sharing Payment*

Annual payments to Spokane County will continue according to the established formula and subject to payments authorized by Congress. The total payment made to Spokane County in 2002 was $53,185. If lands are acquired and added to the Refuge, the Service's annual payment will increase accordingly.

- *Firewood Cutting by Permit*

The firewood cutting permit system remains the same under all alternatives**.** The number of permits issued, cords allowed, and locations will vary from year to year based on slash produced by forest management practices.

- *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 and to support staff and management needs.

- *Protection and Management of Cultural Resources*

The Service will continue to uphold federal laws protecting cultural resources, including the National Historic Preservation Act (NHPA), Archeological Resources Protection Act, and

Native American Graves Protection and Repatriation Act. These laws also require consultation with Native American tribes, the State Historic Preservation Office, and other preservation partners. The NHPA requires all projects that use federal funding, permitting, or licensing to be reviewed by a cultural resource professional to determine if there is the potential to affect cultural resources. If needed, an inventory must be conducted and appropriate actions to mitigate effects must be identified, prior to implementation of the project. A site specific determination is needed for all of the HMP, FMP and CCP projects including:
- new or expanded Refuge management and public use facilities and activities
- elk management actions
- federal easements, cooperative agreements, and other stewardship projects off the Refuge.

- *Management of Minor Recreational Uses*

Minor recreational activities are occasionally pursued on the Refuge. Other recreational activities not specifically addressed in this document may be allowed on Refuge lands if the Refuge Manager finds they do not conflict with wildlife or habitat objectives.

Alternative 1 - No Action Alternative

This alternative, required by the National Environmental Policy Act, is the no action alternative, and provides a baseline for which to compare the action alternatives (Alternatives 2, 3, and 4). This alternative would continue Refuge management practices already underway or funded. No significant changes would be initiated by the Service. A detailed description of current Refuge management programs is found in the Affected Environment section of this EA (Chapter 3). In brief, a low to moderate level of recreational services and activities would be provided. An active Environmental Education program would continue, but could fluctuate without a stable staff base. Most casual Refuge users would find short trails with little or no interpretive material. No visitor contact center would be built. Hunting programs would not be initiated

Habitat and fire management practices on the Refuge would continue as described under the Habitat Management Plan and the Fire Management Plan.

The Service would actively encourage stewardship practices of adjacent Refuge neighbors within a 21,396-acre Stewardship Area as outlined in the Habitat Management Plan. The intent of the Stewardship Area would be to encourage voluntary conservation and restoration of habitats with the goal of providing mutual benefit to local aquatic resources and upland habitats. However, no additional staff for stewardship or outreach would be added. The Approved Refuge Boundary would remain the same.

Other than routine maintenance, no further work is anticipated for public access roads. However, should there be an unanticipated change in visitation or other reason for reconfiguring road designs, a future Refuge road project may be programmed to address the situation.

Alternative 2 - Moderate Recreation Increase

This alternative focuses on the non-consumptive, wildlife dependent recreational uses that have traditionally occurred at Turnbull NWR. The Environmental Education program would be moderately expanded, and additional opportunities for wildlife observation, photography, and interpretation would be available. An additional four miles of trail would be made available to the public and most viewpoints would be supported with interpretive signs. A small visitor contact point would be added to the current office space. The EE program facilities would be enlarged at their current location.

The Refuge would offer elk hunting annually, contingent upon approval of a Hunting Plan and publishing rules in the Federal Register. Hunting season length, number of permits, and/or seasons offered would vary according to the level of aspen damage by elk observed on the Refuge each year. The elk hunt would be managed as a high quality, limited entry opportunity, in cooperation with the State. Other tools to reduce elk population numbers or damage would be considered, including: relocation, biobullets (implant of reproduction suppression chemicals), facilitation of State technical assistance, and other methods. The Refuge would continue to coordinate with the State on all elk management tools and elk population information.

For the future, turkey population trends would be monitored and a turkey hunt program could be initiated if their populations reached excessive levels.

The Service would actively encourage conservation within a Stewardship Area of approximately 44,536 acres surrounding the Refuge. This area includes the 5,171 acres within the current Approved Refuge Boundary not acquired in fee. The Stewardship Area would function as an informally designated conservation zone surrounding the Refuge. The intent of the Stewardship Area would be to encourage voluntary conservation and restoration of habitats with the goal of providing mutual benefits to local aquatic resources and upland wildlife habitats. In keeping with this stewardship emphasis, the Refuge would provide frequent outreach activities and information sharing about conservation practices, technical and financial assistance programs offered by various agencies, and contact lists for conservation easements and other land status commitments. No additional regulatory burden would fall on landowners within this informally designated area.

The Stewardship Area would function as an informally designated conservation zone surrounding the Refuge. Within the Stewardship Area, the Service would encourage voluntary conservation and restoration of habitats, to benefit wetlands, water, and wildlife habitats. No additional regulatory burden would fall on landowners within this informally designated area.

No changes would be made to the Approved Refuge Boundary, and the Refuge would not acquire properties outside the existing Approved Refuge Boundary.

Habitat and fire management practices on the Refuge would continue as described under the Habitat Management Plan and the Fire Management Plan.

Some additional staff would be added to manage the habitat, facilities, and public use improvements described above.

Other than routine maintenance and completion of paving of the entrance road, no further work is anticipated for public access roads. However, should there be an unanticipated change in visitation or other reason for reconfiguring road designs, a future Refuge road project may be programmed to address the situation.

Alternative 3. Recreation with Aquatic and Biodiversity Stewardship (The Service's Preferred Alternative.)

This alternative creates new opportunities for the non-consumptive, wildlife dependent recreational programs and uses that have traditionally occurred at Turnbull NWR. It also incorporates a more strategic plan for the stewardship and protection of the lands and waters surrounding the Refuge.

The Environmental Education program would be expanded, with greater numbers of students both on and off Refuge offered the opportunity to learn about the wildlife and ecology of the Channeled Scablands and Turnbull NWR. Additional classroom space would be added, allowing the Refuge to accommodate two classes at the same time. The trail network would be expanded by approximately four miles and six additional viewpoints would be added. Existing and new viewpoints would be supported with interpretive signs. A small visitor contact point and interpretive area would be established inside new office space. A designated bike trail would be established along Cheney-Plaza Road to link the Columbia Plateau Trail with the Public Use Area, using the old highway roadbed along most of its route.

Elk hunting and other elk management would be offered as described under Alternative 2.

A pilot youth waterfowl hunt would be added, after preparation of a Hunting Plan and publication of rules in the Federal Register. The hunt would occur during the State special season for youths, now occurring in mid-September. The new waterfowl hunting program would emphasize education, possibly requiring a waterfowl identification or natural history class for youths participating in the hunt. The Refuge would consider expanding the waterfowl hunt in the future once more fall waterfowl habitat has been restored in the vicinity of the Refuge.

For the future, turkey population trends would be monitored and a turkey hunt program could be initiated if their populations exceeded acceptable levels.

The Service would actively encourage conservation within a Stewardship Area, as described under Alternative 2. No additional regulatory burden would fall on landowners within this informally designated area.

In addition, the Service would seek to protect, as part of the National Wildlife Refuge System, up to 12,000 acres by fee, easement, or agreement from willing sellers on priority lands within the Stewardship Area.

As described in Appendix A (Land Protection Plan), priority lands include those adjoining lands that are most critical for protection of Refuge water quality and quantity; have the highest quality steppe, pine, and wetland habitat; and provide the best opportunities for wetlands restoration.

Habitat and fire management practices on the Refuge would continue as described under the Habitat Management Plan and the Fire Management Plan.

Additional staff would be added to support the programs that form the core of this alternative.

Other than routine maintenance, completion of paving of the entrance road, pulloffs associated with viewpoints, and bike lane work, no further work is anticipated for public access roads. However, should there be an unanticipated change in visitation or other reason for reconfiguring road designs, a future Refuge road project may be programmed to address the situation.

Alternative 4. High Conservation and High Recreation Opportunities

This alternative is similar to Alternative 3 for the opportunities created in the non-consumptive, wildlife dependent recreational programs and for elk management tools and hunting. Alternative 4 includes the most comprehensive plan of the four alternatives for protection of the lands and waters surrounding the Refuge. This Alternative would also incorporate a 3-day per week recreational waterfowl hunt during the State's general duck season.

The Environmental Education program would be expanded, with greater numbers of students both on and off Refuge offered the opportunity to learn about the wildlife and ecology of the Channeled Scablands and Turnbull NWR. The trail network would be expanded by approximately four miles and six additional viewpoints would be added. Existing and new viewpoints would be supported with interpretive signs. A new moderately-sized visitor center and interpretive center would be built or leased, and designed in concert with a new expanded environmental education facility. A designated loop bike trail would be established through the Refuge to link the Columbia Plateau Trail with the Public Use Area, using the old highway roadbed along Cheney-Plaza Road for the western link, and using a bike lane along Cheney-Spangle Road for its eastern link. This bike trail would be established in cooperation with partners.

Elk hunting would be offered as described under Alternative 2, and other elk management tools would be explored as described under Alternative 2. Waterfowl hunting would be offered on Upper Turnbull Slough and West Tritt Lake during the State's general duck season.

Under Alternative 4, the Refuge would also consider the possibility of turkey hunting during the next 15 years, depending on turkey population trends.

The Service would actively encourage conservation within a Stewardship Area of approximately 44,536 acres surrounding the Refuge, as described under Alternative 2. No additional regulatory burden would fall on landowners within this informally designated area.

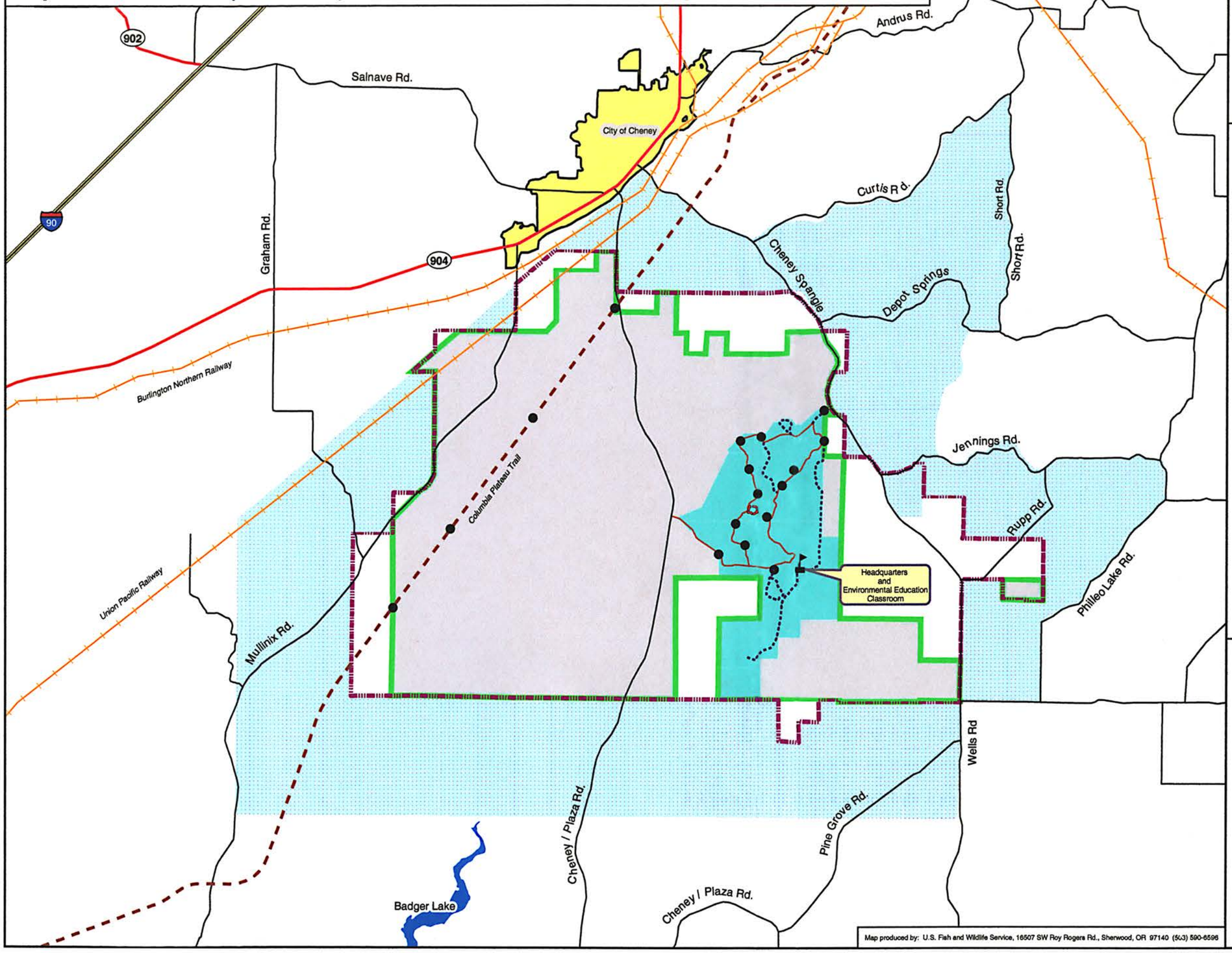
In addition, the Service would seek protection of up to 25,000 acres within the National Wildlife Refuge System by fee, easement, or agreement from willing sellers on priority lands within the Stewardship Area. Priority lands include those adjoining lands that are most critical for protection of Refuge water quality and quantity, have the highest quality steppe, pine, aspen, and wetland habitat, and provide the best opportunities for wetlands restoration.

Habitat and fire management practices on the Refuge would continue as described under the Habitat Management Plan and the Fire Management Plan.

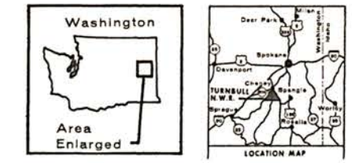
Additional staff would be added to support the programs that form the core of this alternative.

Other than routine maintenance, completion of paving of the entrance road, pulloffs associated with viewpoints, and bike lane work, no further work is anticipated for public access roads. However, should there be an unanticipated change in visitation or other reason for reconfiguring road designs, a future Refuge road project may be programmed to address the situation.

Map 3. Alternative 1 (No Action). Turnbull National Wildlife Refuge Draft CCP / EA, 2005



Map produced by: U.S. Fish and Wildlife Service, 16507 SW Roy Rogers Rd., Sherwood, OR 97140 (503) 590-6596



LEGEND

Existing Land Conservation Features

- Stewardship Area ***

*** Stewardship Area: An informally designated conservation zone surrounding the Refuge. Within this area, the Service actively works with partners and neighbors for voluntary, cooperative activities that protect habitat and water resources. Key tools include but are not limited to: conservation easements, use of conservation grants and/or enrollment in various habitat reserve programs, well capping, and technical assistance programs.

No acquisition outside the Approved Refuge Boundary occurs under this Alternative.

Other Existing Features

- Public Use Area
- Interpretive trails
- Existing viewpoints
- Existing hiking trails
- Columbia Plateau Trail
- Auto tour route
- Railways
- Refuge Fee Title Ownership
- Existing Approved Refuge Boundary*

* Area within which the U.S. Fish and Wildlife Service is currently authorized to acquire additional lands from willing sellers.

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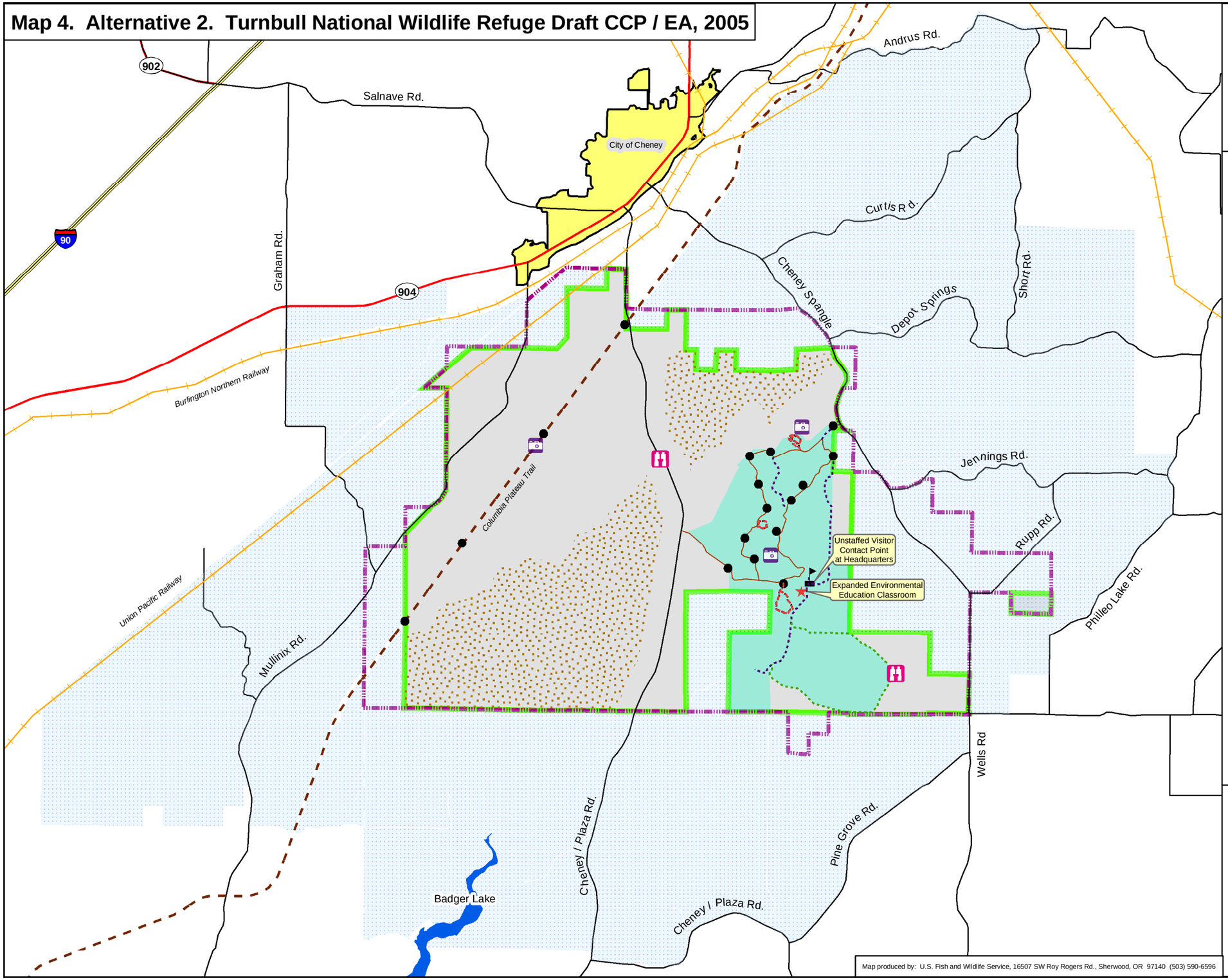
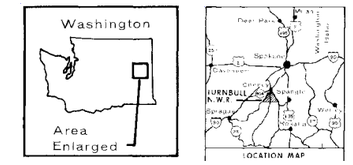
Map 4. Alternative 2. Turnbull National Wildlife Refuge Draft CCP / EA, 2005





LEGEND

Proposed Land Conservation Features

Stewardship Area ***

*** Stewardship Area: An informally designated conservation zone surrounding the Refuge. Within this area, the Service would actively work with partners and neighbors for voluntary, cooperative activities that protect habitat and water resources. Key tools include but are not limited to: conservation easements, use of conservation grants and/or enrollment in various habitat reserve programs, well capping, and technical assistance programs.

No acquisition outside the Approved Refuge Boundary occurs under this Alternative.

Proposed New Public Use Features

- New viewpoints
- New photoblinds
- New hiking trails
- Interpretive trails
- Elk hunting area
- Expanded Public Use Area

Existing Features

- Existing viewpoints
- Existing hiking trails
- Columbia Plateau Trail
- Auto tour route
- Railways
- Refuge Fee Title Ownership
- Existing Approved Refuge Boundary*

* Area within which the U.S. Fish and Wildlife Service is currently authorized to acquire additional lands from willing sellers.

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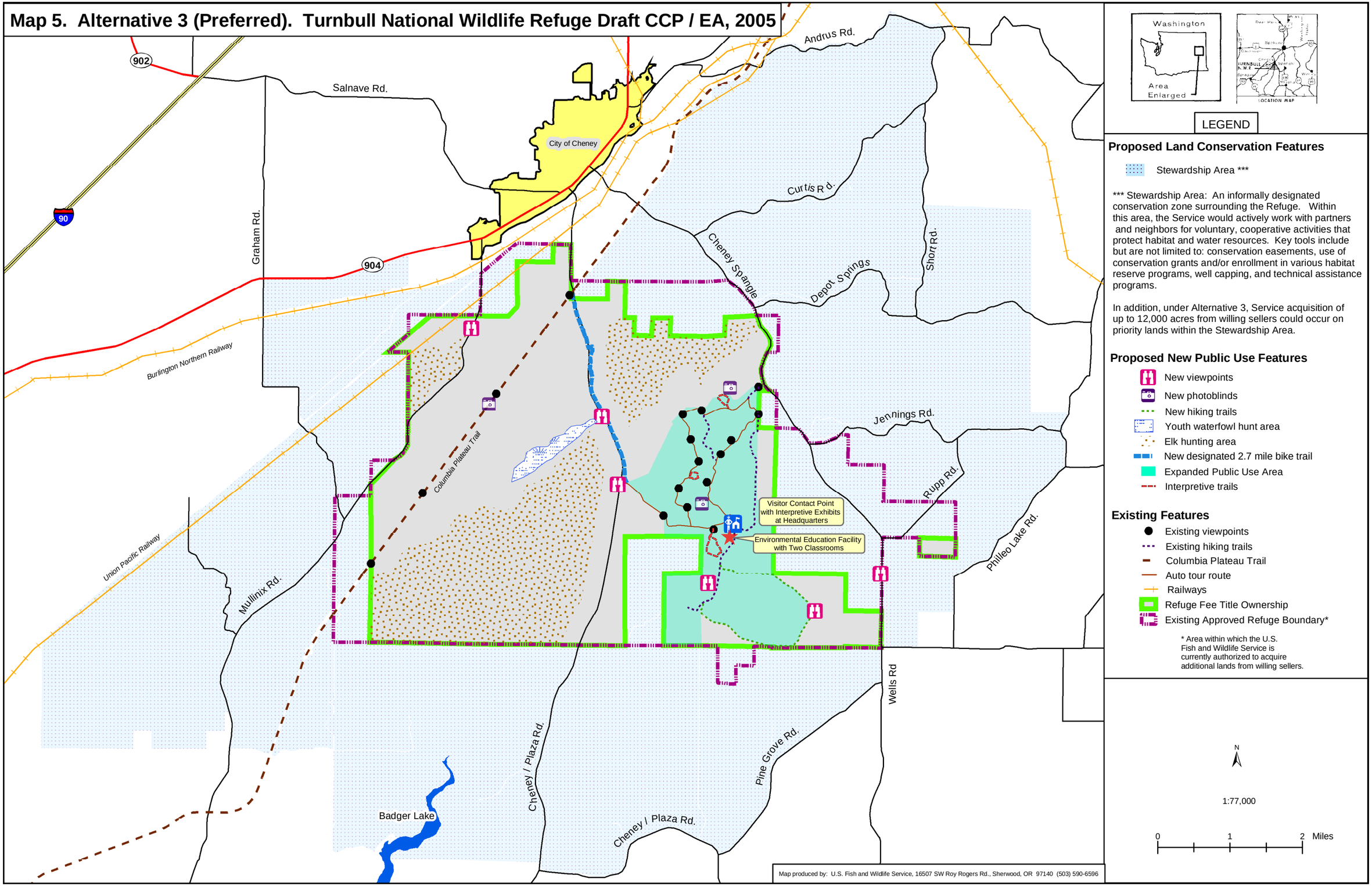
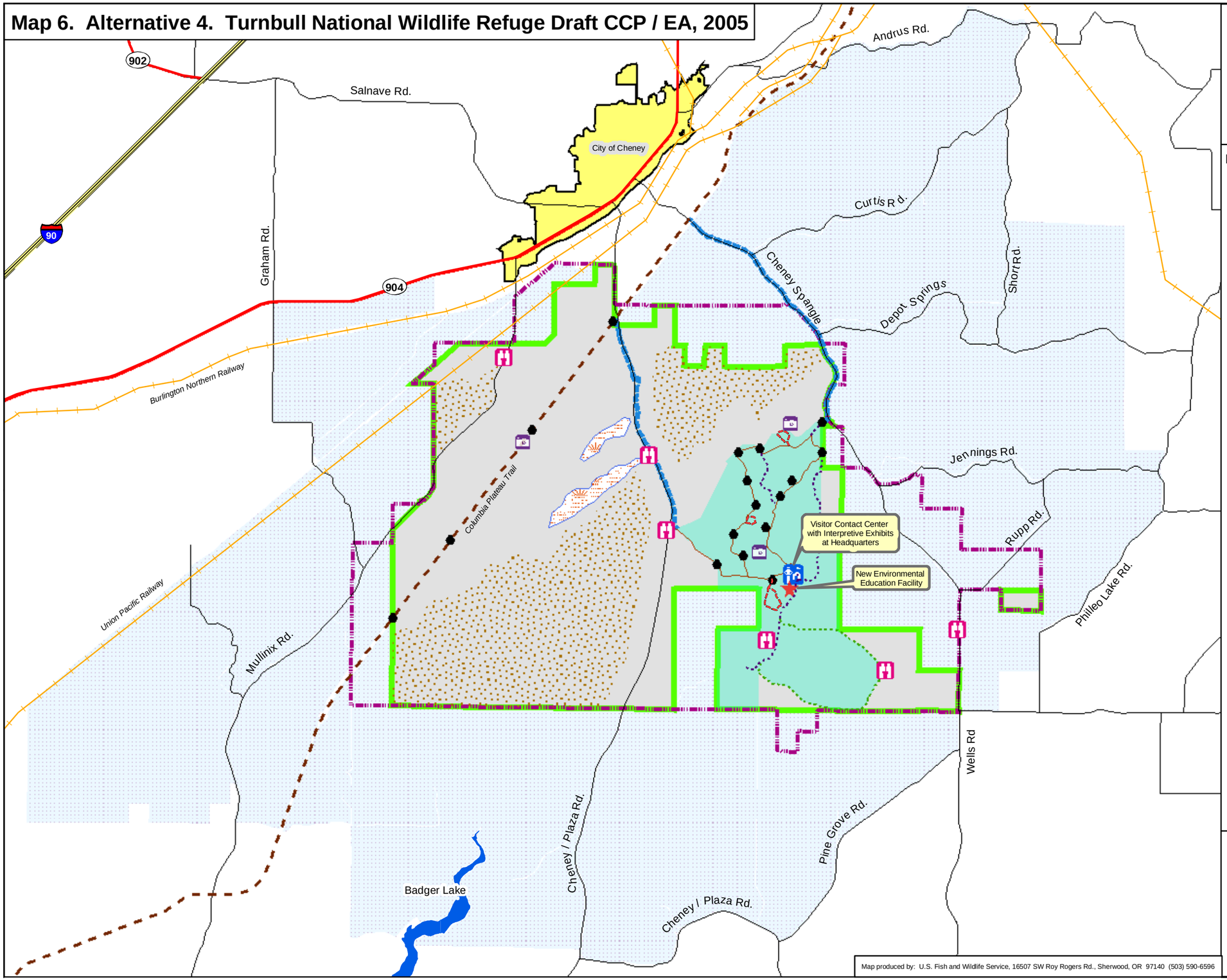
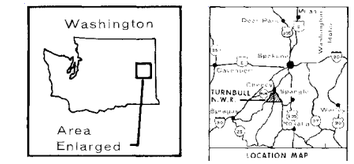
Map 5. Alternative 3 (Preferred). Turnbull National Wildlife Refuge Draft CCP / EA, 2005



Map 6. Alternative 4. Turnbull National Wildlife Refuge Draft CCP / EA, 2005



Map produced by: U.S. Fish and Wildlife Service, 16507 SW Roy Rogers Rd., Sherwood, OR 97140 (503) 590-6596



LEGEND

Proposed Land Conservation Features

Stewardship Area ***

*** Stewardship Area: An informally designated conservation zone surrounding the Refuge. Within this area, the Service would actively work with partners and neighbors for voluntary, cooperative activities that protect habitat and water resources. Key tools include but are not limited to: conservation easements, use of conservation grants and/or enrollment in various habitat reserve programs, well capping, and technical assistance programs.

In addition, under Alternative 4, Service acquisition of up to 25,000 acres from willing sellers could occur on priority lands within the Stewardship Area.

Proposed New Public Use Features

- New viewpoints
- New photoblinds
- New hiking trails
- 3 day/week waterfowl hunting area
- Elk hunting area
- New designated 6.2 mile bike loop
- Expanded Public Use Area
- Interpretive trails

Existing Features

- Existing viewpoints
- Existing hiking trails
- Columbia Plateau Trail
- Auto tour route
- Railways
- Refuge Fee Title Ownership
- Existing Approved Refuge Boundary*

* Area within which the U.S. Fish and Wildlife Service is currently authorized to acquire additional lands from willing sellers.

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Table 2-1. Comparison of Alternatives

THEMES	Alternative 1 *NO-ACTION*	Alternative 2 *MODERATE RECREATION INCREASE*	Alternative 3 (Preferred alt.) *RECREATION WITH AQUATIC & HABITAT STEWARDSHIP*	Alternative 4 *HIGH RECREATION AND HIGH CONSERVATION*
ON- REFUGE HABITAT MANAGEMENT				
Management of Refuge Pine Forests, Wetlands, Aspen, and Steppe Habitats	Continue implementation of Habitat Management Plan (1999) and Fire Management Plan (2001) . See Appendix B for HMP summary and objectives; see Appendix C for Fire Managment Summary.			
ELK MANAGEMENT				
State Coordination	Continue discussions with State to share information on elk, including herd population estimates, reports of off-Refuge damage, viable methods for reducing elk numbers, etc. Conduct annual elk population survey together with State.			
Elk Hunting	No	Allowed, after preparation of a Hunting Plan and publication of Federal Register notice. Length of season, number of permits issued and/or seasons offered would vary based upon the level of aspen damage observed on the Refuge each year. Hunt would be managed as a high quality, limited entry opportunity, in cooperation with State.		
Use of Other Tools to Reduce Elk Numbers	No	Other tools to reduce elk population numbers or damage will be considered together with State. Potential tools to consider include: Relocation, biobullets (implant of reproduction suppression chemicals), facilitation of State technical assistance, and other methods.		
WATERFOWL AND GAMEBIRD HUNTING				
Waterfowl Hunting	No	No	Youth hunt one weekend each year, in conjunction with educational program. Additional areas could be designated if Refuge were to acquire additional lands.	High quality hunt, opening day till freeze-up; 3 days/week during State duck season. Hunt blinds at South side of West Tritt Lake and Upper Turnbull Slough. New areas could be designated if theRefuge were to acquire additional lands.
Other species	No	Maintain possibility of permitted turkey hunt depending on turkey population trends. Encourage research to investigate turkey ecology on Refuge.		

THEMES	Alternative 1 *NO-ACTION*	Alternative 2 *MODERATE RECREATION*	Alternative 3 *RECREATION AND STEWARDSHIP*	Alternative 4 *HIGH*
OFF- REFUGE LAND CONSERVATION FOCUS AND TOOLS				
Land Conservation Goals	Mainly, to ensure greater protection of the Refuge's water quality and quantity by protection of surface and ground watersheds.	- To ensure greater protection of the Refuge's water quality and quantity by protection of surface and ground watersheds. - To ensure greater protection and conservation of the critically endangered Palouse steppe habitat - To enhance and restore the outstanding wetland resources of the Channeled Scablands - To provide greater connectivity to other ponderosa pine habitats and to ensure greater protection for aspen habitats.		
LAND CONSERVATION TOOLS				
Stewardship Area / Partnerships	The Stewardship Area is an informally designated conservation zone surrounding the Refuge. Within this area, the Service would actively work with partners and neighbors for voluntary, cooperative activities that protect habitat and water resources. Key tools include but are not limited to conservation easements, enrollment in the Wetlands Reserve Program, well casing, and technical assistance programs. Key partners include but are not limited to: Inland Northwest Joint Venture, Ducks Unlimited, Spokane County Parks and Recreation Dept, Spokane County Conservation District, Washington Dept. of Fish and Wildlife, U.S. Bureau of Land Management, U.S. Natural Resources Conservation Service, Avista Corporation, U.S. Farm Services Agency, Inland Northwest Wildlife Council, Inland Northwest Land Trust, Friends of Turnbull National Wildlife Refuge, Spokane Audubon Society, and The Nature Conservancy.			
Stewardship Area Size	21,396 acres	44,536 acres		
Protection Under the National Wildlife Refuge System	No additional acres outside the existing Approved Refuge Boundary		Protection of up to 12,000 acres by fee, easement, or agreement from willing sellers on priority lands within the Stewardship Area	Protection of up to 25,000 acres by fee, easement, or agreement from willing sellers on priority lands within the Stewardship Area

THEMES	Alternative 1 *NO-ACTION*	Alternative 2 *MODERATE RECREATION*	Alternative 3 *RECREATION AND STEWARDSHIP*	Alternative 4 *HIGH*
PUBLIC USE AREA				
Size and Location	2200 acres	3190 acres (hunting would occur annually on an additional 5,000 plus acres outside the Public Use Area)		
Accessibility Times and Areas	Open year round. Off trail foot use permissible.	Open year-round. Off trail use not permissible.		
WILDLIFE OBSERVATION / WILDLIFE PHOTOGRAPHY				
Location of Viewpoints and Pulloffs	Public use area ; Columbia Plateau Trail		Public use area; Columbia Plateau Trail; Cheney-Plaza Road; Cheney-Spangle Road; Mullinix Road	
Designated Viewpoints **(Viewpoint defined as a point designed expressly for observation: usually supported by an auto pulloff or parking area, sometimes a short access trail to scenic overlooks, photo blinds and areas with single interpretive panels. Does not include short - medium interpretive trails with multiple viewpoints.)**	19 designated viewpoints - only some with interpretive signs. Most supported with pulloff or parking area *Along Auto Tour route:* 30 acre lake 30 acre lake north Pine restoration area Camas meadow N. Blackhorse lake East Blackhorse lake Swan Pond Structure Aspen Grove Wheeler Memorial North Bluebird Trailhead Kepple Overlook Kepple Peninsula Kepple Structure Headquarters / Pine Creek Riparian EE Winslow Pool *Along Columbia Plateau Trail:* Long Lake, Ballinger Lake, North end Col. Plateau Trail, South end Col. Plateau Trail	21 viewpoints (19 existing viewpoints plus 2 new sites). Most/all viewpoints to include interpetive sign. New sites developed in the following areas. *From Cheney-Plaza Road:* Upper Turnbull Slough (elevated platform) *Other locations:* Stubblefield Lake (elevated viewpoint)	25 viewpoints (19 existing plus 6 new sites). Most/all viewpoints to include interpetive sign. New sites developed in the following areas. *Within existing P.U. area:* Cheever Lake *From Cheney-Plaza Road:* Upper Turnbull Slough (elevated platform) McDowell Lake (elevated platform) *Other locations:* Helms Marsh from Mullinix Road Stubblefield Lake (elevated platform), Pulloff on Cheney-Spangle Road where there is view of Stubblefield Lake and steppe.	

THEMES	Alternative 1 *NO-ACTION*	Alternative 2 *MODERATE RECREATION*	Alternative 3 *RECREATION AND STEWARDSHIP*	Alternative 4 *HIGH*
Photo Opportunity Blinds	Pine Lake (not accessible to persons with disabilities)	Pine Lake (not accessible to persons with disabilities), Kepple Peninsula (accessible), East side of Blackhorse (accessible), Long Lake, but only in conjuction w/ Long Lake bypass (accessible).		
Visitor Welcome Areas	Reception area in office.	Interpretive panels overlooking Winslow Pool (4 panels) Small information center; volunteer staffed as needed. Add on to existing office space and have joint reception area.	Interpretive panels overlooking Winslow Pool (4 panels) Staffed visitor contact point together with small interpretive exhibit area, included in new office space.	Interpretive panels overlooking Winslow Pool (4 panels) Staffed visitor center together with larger interpretive exhibit area. Design new facility in concert with design of new office space.
ENVIRONMENTAL EDUCATION PROGRAM ON REFUGE				
Degree of Facilitation	Sometimes facilitated, depending on funding. Non facilitated classes are guided by teachers and scheduled in advance.	All visiting classes and groups facilitated by volunteers, with limited facilitation by Refuge staff.	All visiting classes and groups facilitated by Refuge staff, teachers, volunteers, or other partners.	
Teacher Support	Two or fewer teacher workshops annually	Two or fewer teacher workshops annually	Two to four teacher workshops annually	Four or more teacher workshops annually
Number of Students Served Annually	3,000-8,000	4,000-8,000	8,000-10,000	8,000-12,000
Coordinator Status	Seasonal/ temporary or volunteer coordinator (sometimes student interns) coordinate all EE activities.	Seasonal Environmental Education Specialist	Year round Environmental Education Specialist	
Target Audience Emphasis	Local students from schools up to 50 miles away	Local students from schools up to 50 miles away	All ages, (students and non-students) diverse backgrounds and affiliations, inner city kids, at risk kids and seniors. From schools and other groups up to 150 miles away.	
Field EE Sites	Four sites - one in rest at all times. Each site used 4 days per week or less.	Four hardened sites- one in rest at all times. Each site used 4 days per week or less. Piers established into wetlands to facilitate aquatic studies and diminish shoreline impact. Add fifth site if needed.		

THEMES	Alternative 1 *NO-ACTION*	Alternative 2 *MODERATE RECREATION*	Alternative 3 *RECREATION AND STEWARDSHIP*	Alternative 4 *HIGH*
ENVIRONMENTAL EDUCATION PROGRAM OFF REFUGE				
Materials	EE supplies, videos and displays loaned out as needed.			
Number of individuals served	500 - 1,500 (20-60 classes/year)	1,200 - 1800 (48-72 classes/year)	3,000 - 4,500 (120-180 classes or groups/year)	4,000 - 7,000 (160-280 classes or groups/year)
Percent facilitated	0	10	25	25
Links to Other EE Programs	none	to others in Greater Spokane Area	member of (State-wide?) consortium	
Depth of programs	seasonal more local Refuge orientation	year-round more local Refuge orientation	year round Eastern Washington ecosystems emphasis	year round Eastern Washington ecosystems emphasis
Target Audience Emphasis	Local students	Local students	All ages, diverse backgrounds and affiliations, inner city kids, at risk kids and seniors	All ages, diverse backgrounds and affiliations, inner city kids, at risk kids and seniors
ENVIRONMENTAL EDUCATION FACILITY				
EE Facility	Existing - no additions or expansions	Expand existing classroom Could also consider having a presence (as a participant, not a lead) at a regional center if one is ever established.	Add second classroom to existing facility. Role of center is to serve as a regional environmental education center.	New constructed or leased facility. Role of center is to serve as a regional environmental center, one of the state visitor center "destinations"
Number of Persons that the EE Classroom Facility Accommodates	35 people - existing classroom at Headquarters.	50 people - existing classroom at Headquarters expanded.	Add on to existing classroom at Headquarters. Facility will have 2 adjoining classrooms accommodating 50 people each; can be combined to create multipurpose presentation room seating 100.	2 adjoining classrooms accommodating 50 people each; can be combined to create multipurpose presentation room seating 100. New facility at Headquarters, designed in concert with visitor contact center and interpretive exhibits.

THEMES	Alternative 1 *NO-ACTION*	Alternative 2 *MODERATE RECREATION*	Alternative 3 *RECREATION AND STEWARDSHIP*	Alternative 4 *HIGH*
TRAILS				
Trail mileage and location	Total 11.5 miles: (6.75 miles in Public Use Area 4.75 miles on Columbia Plateau Trail)	15.25 miles (4.75 miles CPT, 10.5 miles in public use area, including new Stubblefield loop)	15.25 miles. Additional trail miles may be added in the future if opportunities arise through acquisition of properties contiguous to Public Use Area. Stubblefield trail will terminate in elevated viewing platform. No off trail use. .	
Surface Type and Accessibility	Most dirt surfaces. One wheelchair accessible boardwalk. Bark on EE site short trails. Two trails (Kepple Peninsula Trail and Pine Lake Loop Trail) with accessible surfaces, 48" widths, appropriate grades for accessibility, and accessible trailheads. These trails will traverse each major habitat type.			
Boardwalk	Fix or replace	Replace to meet standards of updated accessibility guidelines		
Trail Lengths	same as current; no trail > 2 miles in length except for Columbia Plateau Trail.	Stubblefield trail added with length of 3.7 miles.	Stubblefield trail added with length of 3.7 miles. In future, should additional trails be added on newly acquired properties, trails could be longer.	
Loop trails	Auto Tour Route (pedestrians share w/ autos - 5 miles) Pine Lakes Loop (1 mile)	Loop trail of up to 5.3 miles (Pine lakes / Headquarters / Stubblefield loop), pedestrians only.	Loop trail of up to 9.6 miles (Pine lakes / Headquarters / Stubblefield loop / bike loop).	Loop trail of up to 12.1 miles (Pine lakes / Headquarters / Stubblefield loop / bike loop).
Bike Trails	No designated bike trail		A designated 2.7 mile bike trail connecting Public Use Area to one point on the State Columbia Plateau Trail. Bike Trail would follow the old Cheney Plaza Highway roadbed inside the Refuge (adjacent to CheneyPlaza Rd.) Consider packed gravel to cut the dust.	A designated 6.2 mile bike loop trail that loops with links from the Columbia Plateau Trail to the Public Use Area along both Cheney-Spangle Hwy and Cheney Plaza Road, along old highway bed. Work with County for bike lanes on the highways.

THEMES	Alternative 1 *NO-ACTION*	Alternative 2 *MODERATE RECREATION*	Alternative 3 *RECREATION AND STEWARDSHIP*	Alternative 4 *HIGH*
COLUMBIA PLATEAU TRAIL				
Interpretive signs and facilities	Four interpretive sites 1 vault toilet north of Ballinger Lake 4 benches		Existing signs and facilities, plus: Sign-in book at Refuge entry points? More benches Support State Parks initiative to develop public facilities in the vicinity of the Refuge for the Columbia Plateau Trail.	
Monitoring	Ad hoc monthly monitoring. Experimental manipulations with EWU class Monitoring of visitation frequency	Ad hoc monthly monitoring. Experimental manipulations with EWU class Monitoring of visitation frequency	Systematic monitoring of recreational use, including: visitor numbers, trespass occurrences, and wildlife disturbance utilizing pre-established scientific protocol. Experimental manipulations with EWU class plus study of real-time actual use and disturbance correlations over 1-2 nesting seasons. Monitoring of visitation frequency	
Minimize Disturbance to Long Lake and Other Sensitive Areas	None	Consider planting hawthorne to prevent trespass and minimize disturbance near Long Lake Consider possibility of developing a bypass trail to reduce disturbance along sensitive parts of the CPT. Consider education, concentrating use, or seasonal closures as other tools		

THEMES	Alternative 1 *NO-ACTION*	Alternative 2 *MODERATE RECREATION*	Alternative 3 *RECREATION AND STEWARDSHIP*	Alternative 4 *HIGH*
INTERPRETATION				
Interpretive Trails (Generally short trails designed especially for the educational benefit of casual or new visitors; trails have multiple interpretive signs or markers supported with brochure)	Boardwalk (5 signs) Kepple Peninsula Trail (project underway - trail features markers with interpretive brochure)	Boardwalk (5 signs) Pine Lake Loop Trail (4 signs) Kepple Peninsula Trail (markers with interpretive brochure)	Boardwalk (7 signs) Pine Lake Loop Trail (4 signs) Kepple Peninsula Trail (markers with interpretive brochure)	
Interpretive Services (naturalist)	None	Occasional, volunteer	Day, evening, and weekend programs.	
Number of Wheelchair Accessible Points / Trails	Boardwalk Trail Kepple Peninsula Trail Pine Lake Loop Trail		Boardwalk Trail, Kepple Peninsula Trail, Pine Lake Loop Trail, and Turnbull Slough. Most interpretive signs would follow ADA guidelines.	
Space for Non-Profit Gift Store	Provide space in EE classroom for Friends of Turnbull NWR store		Provide space in Visitor Center for Friends of Turnbull NWR store	
CULTURAL RESOURCE EDUCATION AND INTERPRETATION				
Education materials	Earth and Sky Curriculum	artifact replica kit, additional hands-on activities and curriculum		
Interpretive materials	None	pamphlets, signs, exhibits		
Number of individuals served and Target Audience	Fall EE Classes targeted at local students.	proportional to on and off Refuge EE programs. Target audience would be Refuge visitors as well as local students.		
CULTURAL RESOURCE MANAGEMENT AND PROTECTION				
Data management	Use existing maps		Develop GIS layer with appropriate locks for sensitive information	
Partnerships	**n/a**	Develop partnership with the Tribes for cultural resources inventory, evaluation, and monitoring		
		n/a	Work with educational institutions, historical societies, and other preservation partners for inventory, evaluation and monitoring	

2.2 GOALS, OBJECTIVES AND STRATEGIES

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

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

In the development of a CCP, the Service prepares an Environmental Assessment, which evaluates alternative sets of management actions. Alternatives are different sets of objectives and strategies.

The goals for the Turnbull Refuge over the next fifteen years under the CCP are presented below. 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.

Readers, please note the following:

✓ The objective statement as written is the objective statement that applies to the preferred alternative, Alternative 3.
✓ Italicized text in the objective statement indicates specific items 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 italicized item or items.
✓ If an objective is not included in a particular alternative, a long dash, marked as follows — is used to indicate that this objective is absent from that alternative.

Finally, below each objective statement are the strategies that could be employed in order to accomplish the objectives. Again, 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 that strategy will not be used in that alternative.

Only new objectives and strategies that were developed during the CCP planning process are listed here. Objectives developed for the Refuge Habitat Management Plan are listed here, but not explained, partly because the NEPA document analyzing those objectives was completed in 1999 and partly because these objectives are part of the current Refuge management direction regardless of which CCP alternative is chosen. The complete text of the HMP objectives, strategies, and guild management guidelines can be found in Appendix B. The FMP objectives and strategies were not restated here nor in Appendix B as that plan is primarily an operational plan dealing with wildfire suppression, fire prevention, and prescribed fire. The goals, objectives and strategies listed in that plan should be treated within that context only. The FMP objectives prevail over all other Refuge objectives for fire suppression, firefighter safety, life and property protection in case of wildfire. When not dealing with fire suppression situations, HMP or CCP objectives supercede FMP objectives when there is any conflict in habitat type objectives.

GOAL 1: Contribute to protection of local watersheds to maintain adequate water quality and quantity for native Refuge wetland species.

Objectives 1A through 1D were developed as part of the HMP. They can be found in greater detail in Appendix B.

OBJECTIVE 1A. WATER RIGHTS REVIEW
OBJECTIVE 1B. WETLANDS WATER LEVEL MONITORING
OBJECTIVE 1C. WATER YIELD OF REFUGE WATERSHEDS
OBJECTIVE 1D. WATERSHED QUALITY COORDINATION

OBJECTIVE 1E. WATER AND LAND CONSERVATION: In partnership with private landowners, other federal agencies, local and state governments, and private organizations, the Service will work *to protect the water resources supporting Refuge wetlands and wildlife, and will protect, conserve, and restore wetland, steppe, and forest habitats in the Refuge vicinity.*

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
protection of water resources mainly	as above (strategies vary below)	as above (strategies vary below)	as above (strategies vary below)

Strategies	*Alternative*			
	1	2	3	4
• Designate informal Stewardship Area of approximately *44,536 acres* surrounding Refuge-owned lands. The intent of the Stewardship Area is to encourage voluntary and cooperative protection and restoration of high and medium quality habitats, and to protect water quality and quantity within the surface and ground watersheds affecting the Refuge. Work with neighboring landowners and partners utilizing tools such as conservation easements, enrollment in the Wetlands Reserve Program, well capping, and technical assistance to achieve Stewardship aims.	21,396	✓	✓	✓
• Via Director approval, implement Land Protection Plan (Appendix A) and establish new Approved Refuge Boundary to the extent of the Stewardship Area.			✓	✓
• Within new Approved Refuge Boundary, the Service shall seek to protect, as part of the National Wildlife Refuge System, up to *12,000* additional acres of 1st and 2nd order priority lands, as identified in the Land Protection Plan, from willing sellers, through fee, easement, or agreement.			12,000	25,000
• Hire staff person to conduct intensive outreach to achieve habitat conservation objectives by voluntary and cooperative means within Stewardship area. Partner with Ecological Services as needed.		✓	✓	✓
• Encourage the State of Washington to address habitat protection needs of the Channeled Scablands as part of the State Comprehensive Wildlife Conservation Plan (required to be completed by October 2005 to maintain eligibility for State Wildlife Grants).	✓	✓	✓	✓

Rationale for preferred objective and strategies:

Refuge wildlife are connected to and depend upon the larger landscape. The Turnbull NWR comprises one of the only protected areas within the Channeled Scablands. Most of the original habitats of the Scablands have been highly altered, as detailed in Chapter 3. Yet the potential of the Scablands to support biodiversity is quite high; as one example, wetland basin density rivals that of the Prairie Pothole region and at intact sites, waterfowl production exceeds that of the Potholes (see Chapter 3 of this document, Sections 3.2 and 3.1, and the Refuge Habitat Management Plan [USDI 1999] for more detail). The intermingling of four different habitat types in such close proximity creates conditions of unique habitat diversity.

Some attendees at the public alternatives workshop in June, 2002 were interested in developing the voluntary stewardship idea. A Stewardship Area helps to raise public awareness of the unique conservation value of these lands and the roles that can be played by both public and private sector entities in conservation. This awareness in turn could potentially lead to decisions by multiple private landowners, the State, and other conservation partners (i.e. The Nature Conservancy, Inland Northwest Land Trust, and others) to recognize this area as a priority area for the protection and enhancement of habitats; conservation and management of water, and restoration of drained wetlands. Thus, conservation benefits could potentially be realized in a very efficient manner. The proposed Stewardship Area extends to the boundary of the Study Area used in the EA. It encompasses lands in varying conditions. The distribution and quality of wetland, aspen / riparian, ponderosa pine, and Palouse steppe habitats within this area is mapped and discussed in Chapter 3, and analyzed further in Chapter 4 of this Draft CCP/EA.

Protection under the Refuge System of up to 12,000 acres of land within the proposed new Approved Refuge Boundary will assist in sustaining the values of the highest quality lands within the Study Area, including the lands most important for surface and ground water quality and quantity protection; the lands with superior pine, aspen and/or steppe habitats; and the lands most feasible for restoration of wetlands.

Protection and restoration, using the variety of tools proposed under Alternative 3, and in partnership with neighbors and interested conservation partners, will greatly contribute to the long term maintenance of environmental health and biodiversity in this area of Washington. See Land Protection Plan in Appendix A for further details.

OBJECTIVE 1F. IMPROVE WATER QUALITY AND QUANTITY: Work to ensure current or improved levels of the quality and quantity of water entering the Refuge from the four major drainages (Company, Kaegle, Phillips, and Philleo) so as to manage existing Refuge wetlands at objective levels identified in the Habitat Management Plan.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
as above	as above	as above	as above

Strategies	*Alternative*			
	1	2	3	4
• Complete water quality study in progress. Conduct similar study at five year intervals to determine if water quality entering Refuge is improving.	✓	✓	✓	✓
• Partner with landowners, County, Natural Resources Conservation Service and Department of Ecology outside Refuge ownership boundaries, but with particular focus within Stewardship Area, to implement measures that could conserve water quality and quantity. Such measures may include: distribution of information about best management practices, enrollment in the Wetlands Reserve Program, and other conservation practices; provision of technical assistance or matching funds for conservation and restoration work, etc.	✓	✓	✓	✓
• Within new Approved Refuge Boundary, acquire lands from willing sellers as funds become available.			✓	✓
• Encourage land trusts such as The Nature Conservancy, Trust for Public Lands, and Inland Northwest Land Trust to work actively within the Channeled Scablands and especially within the Stewardship Area to conserve lands.		✓	✓	✓
• Together with partners, monitor groundwater resources through the placement of monitoring wells and use of the piezometer well identified in the HMP.		✓	✓	✓
• Consider a study on groundwater resources, to investigate the hypothesis that there has been a drop in well levels from historic to current times.		✓	✓	✓

Rationale for preferred objective and strategies:

Maintaining adequate water quantity flowing into the Refuge is essential for wetlands to function as primary breeding and foraging habitats for all species that may potentially use these habitats. Because of the regional nature of the drainage system, Turnbull NWR is dependent on inflow of water to supply and manage its wetlands.

The proximity and growth of Spokane, Cheney, and other communities in the Spokane metropolitan area has the potential to affect the quality of both groundwater and surface run-off waters. Septic systems continue to be the primary method of domestic waste disposal in the area. Increased septic system loading increases the potential for non-point source pollution of groundwater that ultimately feeds Refuge wetlands.

Water quality has been a concern for the Refuge for some time. During the last 11 years, two studies of water quality around and on the Refuge were completed. The 2002 study found the highest nutrient concentrations in the subwatersheds with the greatest area in dairy and/or dryland farming (see Chapter 3, Section 3.1). Left unresolved, water quality problems will degrade Refuge wetland habitats and other habitats downstream.

GOAL 2: Provide habitat conditions essential to the conservation of migratory birds and other wildlife within a variety of wetland complexes.

Objectives 2A through 2F were developed as part of the HMP. They can be found in greater detail in Appendix B.

OBJECTIVE 2A. OPEN WATER ACREAGE
OBJECTIVE 2B. EMERGENT PLANT STRATA PERCENT
OBJECTIVE 2C. WATER DEPTHS IN EMERGENT PLANT ZONE
OBJECTIVE 2D. RESTORATION OF NATURAL HYDROLOGY
OBJECTIVE 2E. RESTORATION OF NATURAL BASINS TOPOGRAPHY
OBJECTIVE 2F. REED CANARYGRASS CONTROL

OBJECTIVE 2G. RESTORE WETLANDS: Strive to maintain existing and restore additional wetland habitat to benefit key wetland indicator species.

- Within the Stewardship Area, protect or restore *up to 7,110 acres* of wetlands through voluntary partnerships and stewardship activities.
- Within new Approved Refuge Boundary, protect, as part of the National Wildlife Refuge System, *up to 2,156 acres* of wetland habitat from willing sellers only.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
Stewardship Area - up to 393 acres Protection by NWRS - 0 acres	Stewardship Area - up to 7,110 acres Protection by NWRS - 0 acres	Stewardship Area - up to 7,110 acres Protection by NWRS - up to 2,156 acres	Stewardship Area - up to 7,110 acres Protection by NWRS - up to 4,491 acres

Strategies	*Alternative*			
	1	2	3	4
• Throughout Stewardship Area, work with landowners to encourage wetlands restoration activities. Provide education on the values of wetlands through outreach programs; provide technical assistance as feasible; and provide information to landowners on technical and financial assistance programs available through federal, state, or local agencies and private organizations.	✓	✓	✓	✓
• With partners, prepare interpretive brochure describing wetlands restoration desired outcomes and techniques. Use brochure for field trips, outreach activities, etc.	✓	✓	✓	✓
• Within new Approved Refuge Boundary, acquire lands from willing sellers as funds become available.			✓	✓

Rationale for preferred objective and strategies:

Approximately 7,110 wetland acres are found within the Study Area outside of the Refuge ownership, of which 5, 006 acres are drained. The potential of the Channeled Scablands vicinity to support wetland habitats and species is very high. Analysis shows that the Channeled Scablands rival or exceed the Prairie Pothole Region for wetland depth, size, and abundance in almost every wetland type category (see further discussion, Chapter 3). Additionally, the Channeled Scablands have a greater proportion of the total area in wetlands. In areas such as the Refuge where the wetland complex is still intact, duck breeding pair densities of several species is actually greater than in the Prairie Pothole region, which is globally known for its waterfowl production.

Positive conservation action is needed, however, to realize these habitat benefits. As the situation currently stands, most of these wetland acres have been drained and now provide only ephemeral habitat for wetland dependent species.

Key wetland indicator species are listed in the Refuge Habitat Management Plan (USDI 1999).

See Land Protection Plan in Appendix A for further details.

OBJECTIVE 2H. IDENTIFY AND PROTECT VERNAL POOLS: Identify locations of high quality and intact rare vernal pool habitat within Stewardship Area and strive to further protect these areas.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
as above	as above	as above	as above

Strategies	*Alternative*			
	1	2	3	4
• In cooperation with landowners, inventory grassland areas within the Stewardship Area to ascertain vernal pool presence.	✓	✓	✓	✓
• Throughout Stewardship Area, work with landowners to encourage vernal pool protection. Provide information on the values of vernal pools through outreach programs; provide technical assistance as feasible; and provide information to landowners on technical and financial assistance programs available through federal, state, or local agencies and private organizations.	✓	✓	✓	✓
• Within new Approved Refuge Boundary, acquire lands from willing sellers as funds become available.			✓	✓

Rationale for preferred objective and strategies:

Vernal pools, typically located in the biscuit and swale steppe habitat of the Channeled Scablands region, warrant special consideration. These vernal pools occur in shallow depressions with a perched water table. Standing water is usually present for less than two months in most years. Because of the relatively short lived nature of these wetlands they are host to a unique plant and animal community.

Because of their small size and ephemeral nature, most vernal pools are not readily detectable with remote sensing imagery and have been largely overlooked by the National Wetlands Inventory. Because of this, their actual locations in the Study Area are generally unknown.

GOAL 3: Restore Refuge aspen and ponderosa pine forests to a natural distribution of stand structural and successional stages to benefit forest dependent wildlife.

Objectives 3A through 3D were developed as part of the HMP. They can be found in greater detail in Appendix B.

OBJECTIVE 3A. RESTORATION OF PONDEROSA PINE
OBJECTIVE 3B. SNAG RECRUITMENT
OBJECTIVE 3C. ASPEN / RIPARIAN RESTORATION WITHIN CLIMAX PINE STANDS
OBJECTIVE 3D. COARSE WOODY DEBRIS

OBJECTIVE 3E. REDUCE ELK DAMAGE: In cooperation with the State, undertake actions to reduce elk damage to Refuge habitats. In particular, ensure that damage to Refuge aspen groves does not exceed levels above which aspen stands cannot be regenerated or sustained.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
as above	as above	as above	as above

Strategies	*Alternative*			
	1	2	3	4
• Continue work to identify a sound indicator for measuring the damage to aspen habitats. Investigate use of percent of current annual growth (CAG) browsed or percent of twigs browsed. Utilize Albrecht (2003) study.	✓	✓	✓	✓
• Continue discussions with Washington Department of Fish and Wildlife to share elk information, including herd population estimates, reports of on-refuge and off-refuge damage, and viable methods for reducing elk numbers.	✓	✓	✓	✓
• Consider a variety of tools to reduce elk population numbers or damage, including relocation, implant of reproduction inhibiting chemicals, working with private landowners, and other methods as feasible. (Hunting would be employed as a tool under Alts. 2, 3, and 4 - see Objective 7M).		✓	✓	✓
• Monitor aspen habitats annually using established indicator.	✓	✓	✓	✓
• Monitor and track seasonal shifts in elk populations and distribution on Refuge.	✓	✓	✓	✓
• Encourage Washington State University continuation of Master's level theses dealing with elk / aspen interactions.		✓	✓	✓

Rationale for preferred objective and strategies:

Research underway by the State and Eastern Washington University indicates that the Refuge is important to the local elk population as security cover. As a result, there has been heavy browsing of young aspen and other deciduous shrubs and trees on the Refuge. In addition, several neighbors have complained of elk damage to their hay, other agricultural crops, fences, and ornamental shrubs since the early 1990s and feel that the Refuge should take a more active role in limiting elk numbers. Since 1992, two claims have been paid by the State for elk damage to agricultural crops. Complaints have declined since 1999 after several local landowners began leasing their lands for hunting.

Aspen stands typically regenerate themselves after disturbance by producing new shoots, also called suckers. A high level of elk browse on an aspen stand can ultimately impede the stand's capacity to regenerate and grow into a mature stand. Current literature was reviewed to investigate the issue of how much elk use on aspen is sustainable or in other words, does not impede a stand's regeneration and capacity to grow into a mature stand. A set of management recommendations for regenerating aspen stands, published by Bates et. al. (2002) indicates that 4000-5000 well-spaced suckers per acre at age two is adequate for regenerating the stand, though a higher number of suckers per acre is desirable for unexpected losses from disease or injury. Other authors, including Debyle (1985) and Campbell et. al. (2001) have recommended retaining at least 500 stems per acre at year 6 or when the aspen close is approximately 2.5 meters tall.

The Refuge maintains twelve study plots in aspen habitat. Albrecht (2003) investigated aspen regeneration under variable elk use on the Refuge and discovered that aspen in areas where elk concentrate are much more intensively browsed. Specifically, he discovered that in areas categorized as "low-use" by elk, less than 20% of the stems under 2.5 meters tall received moderate to high intensity browsing. This appeared to be an acceptable level in that these stands were showing recruitment of an adequate number of stems per acre.

Management that reduces elk densities in an area during the winter by either removal or redistribution can decrease browsing intensity enough to allow aspen escapement and height growth beyond the reach of elk. Hunting can be an effective elk population management strategy. Because of the high proportion of leased private land and current no hunting areas such as the Refuge and several private tracts, limited elk hunting opportunities exist in the Refuge vicinity.

See also Objective 7M, Initiate a High-Quality Elk Hunting Pilot Program.

OBJECTIVE 3F. PROTECT ASPEN HABITAT: Strive to protect and restore additional aspen and deciduous shrub habitat to benefit key aspen indicator species.

- Within the Stewardship Area, protect and restore *up to 380 acres* of aspen through voluntary partnerships and stewardship activities.
- Within new Approved Refuge Boundary, protect, as part of the National Wildlife Refuge System, *up to 115 acres* of aspen habitat from willing sellers only.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
Stewardship Area - up to 243 acres Protection by NWRS - 0 acres	Stewardship Area - up to 380 acres Protection by NWRS - 0 acres	Stewardship Area - up to 380 acres Protection by NWRS - up to 115 acres	Stewardship Area - up to 380 acres Protection by NWRS - up to 240 acres

Strategies	Alternative 1	2	3	4
• Throughout Stewardship Area, work with landowners to encourage stewardship and restoration of aspen groves and deciduous shrub riparian habitats. Provide education on the wildlife values of aspen habitat through outreach programs, provide technical assistance as feasible, and provide information to landowners on technical and financial assistance programs available through federal, state, or local agencies and private organizations. Integrate outreach and assistance programs with the Wildland Urban Interface program (WUI) and funds as per the National Fire Plan.		✓	✓	✓
• With partners, prepare interpretive brochure describing aspen restoration desired outcomes and techniques. Use brochure for field trips, outreach activities, etc.		✓	✓	✓
• Within new Approved Refuge Boundary, acquire lands from willing sellers as funds become available.			✓	✓

Rationale for preferred objective and strategies:

Although aspen occurs in small amounts relative to other habitats within the Study Area, it is important to a large portion of the local wildlife, particularly neotropical migratory songbirds. Almost 75% of the aspen stands within the Study Area are considered high quality (deduced from aerial photo interpretation). Cover type mapping completed by the Refuge in 1992 indicated that the area occupied by aspen and deciduous shrub riparian habitats had been reduced by approximately 65 percent from previously. Causes for this decline included competition by encroaching ponderosa pine, clearing for pasture improvement, and finally by livestock and elk browsing which suppresses aspen and shrub regeneration. Simplification of habitat structure in aspen (loss or suppression of understory shrubs, grasses, forbs, and regenerating trees, as well as loss of snags) reduces the suitability of this habitat for shrub and tree cavity nesters and cavity using wildlife species. Human development nearby also encourages competitive or predatory wildlife such as starlings, house sparrows, racoons, and cats.

Key aspen indicator species are listed in the Refuge Habitat Management Plan (USDI 1999).

See Land Protection Plan in Appendix A for further details.

OBJECTIVE 3G. PROTECT PONDEROSA PINE HABITAT: Protect and restore additional ponderosa pine forest habitat to benefit key pine indicator species.

- Within the Stewardship Area, protect and restore *up to 20,090 acres* of ponderosa pine habitat through voluntary partnerships and stewardship activities.
- Within new Approved Refuge Boundary, protect, as part of the National Wildlife Refuge System, *up to 6,092 acres* of ponderosa pine habitat, from willing sellers only.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
Stewardship Area - up to 10,176 acres Protection by NWRS - 0 acres	Stewardship Area - up to 20,090 acres Protection by NWRS - 0 acres	Stewardship Area - up to 20,090 acres Protection by NWRS - up to 6,092 acres	Stewardship Area - up to 20,090 acres Protection by NWRS - up to 12,691 acres

Strategies	Alternative			
	1	2	3	4
• Within Stewardship Area, work with landowners to encourage conservation and restoration activities for ponderosa pine forests. Provide information on the values of pine forests through outreach programs; provide technical assistance for restoration as feasible; and provide information to landowners on technical and financial assistance programs available through federal, state, or local agencies and private organizations. Integrate outreach and assistance programs with the Wildland Urban Interface program (WUI) and funds as per the National Fire Plan.		✓	✓	✓
• With partners, prepare interpretive brochure describing pine forest restoration desired outcomes and techniques. Use brochure for field trips, outreach activities, etc.	✓	✓	✓	✓
• Within new Approved Refuge Boundary, acquire lands from willing sellers as funds become available.			✓	✓

Rationale for preferred objective and strategies:

The Study Area contains approximately 20,090 acres of ponderosa pine forest. Nearly all large diameter open stands of ponderosa pine forest have been harvested from large regions of Oregon, Washington, and Idaho. Ponderosa pine provides valuable wildlife habitat in its large-diameter late-seral stage. Timber harvest has severely affected these habitat types because of the high value of the trees and the fact that, located at lower elevations, these habitats have been more accessible than higher elevation types. Fire exclusion has also played a role in the loss of this habitat, resulting in a gradual shift in stand composition from shade-intolerant tree species such as ponderosa pine to shade-tolerant species such as Douglas-fir and grand fir. See further discussion in Chapter 3, Section 3.2.

The late-seral ponderosa pine cover type has declined throughout its range in the Columbia Basin but portions of the Basin show declines that are particularly severe. In the Northern Glaciated Mountains Ecological Reporting Unit (ERU) which measures 17.6 million acres and includes part of the northeast section of the Study Area, late-seral, single layer ponderosa pine has declined from historic levels by over 99 percent. In the Columbia Plateau ERU (24.3 million acres), where the rest of the Study Area is located, late-seral, single layer ponderosa pine has declined from historic levels by over 93 percent (Hann et al. 1997).

Conservation and restoration of large diameter pine forests is necessary in order to protect and restore habitats for the unique suite of species reliant on such forests.

Key ponderosa pine indicator species are listed in the Refuge Habitat Management Plan (USDI 1999).

See Land Protection Plan in Appendix A for further details.

GOAL 4: Protect and restore the natural distribution and diversity of grassland and shrub steppe habitats to benefit wildlife.

Objectives 4A through 4D were developed as part of the HMP. They can be found in greater detail in Appendix B.

OBJECTIVE 4A. LITTER COVER PERCENT
OBJECTIVE 4B. ENCROACHING PINES REMOVAL
OBJECTIVE 4C. EXOTIC PLANT SPECIES CONTROL
OBJECTIVE 4D. IDENTIFICATION OF INTACT GRASSLAND AND STEPPE

OBJECTIVE 4E. PROTECT PALOUSE STEPPE HABITAT: Strive to protect and restore additional Palouse steppe habitat to benefit key steppe indicator species.

- Within the Stewardship Area, protect and restore *up to 11,955* of Palouse steppe habitat through voluntary partnerships and stewardship activities.
- Within new Approved Refuge Boundary, protect, as part of the National Wildlife Refuge System, *up to 3,637 acres* of Palouse steppe habitat from willing sellers only.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
Stewardship Area - up to 7,141 acres Protection by NWRS - 0 acres	Stewardship Area - up to 11,955 acres Protection by NWRS - 0 acres	Stewardship Area - up to 11,955 acres Protection by NWRS - up to 3,637 acres	Stewardship Area - up to 11,955 acres Protection by NWRS - up to 7,577 acres

Strategies	*Alternative*			
	1	2	3	4
• Within Stewardship Area, work with landowners to encourage Palouse steppe protection and restoration activities. Provide information on the values of steppe through outreach programs; provide technical assistance as feasible; and provide information to landowners on technical and financial assistance programs available through federal, state, or local agencies and private organizations.		✓	✓	✓
• Within new Approved Refuge Boundary, acquire lands from willing sellers as funds become available.			✓	✓

Rationale for preferred objective and strategies:

Nearly 90 percent of the original Palouse Prairie steppe habitat has been converted to dryland farming (Cassidy et al. 1997a). The extent of this loss places this ecosystem on the list of critically endangered ecosystems in the United States (Noss et al. 1995) and the Washington GAP Analysis authors rated Palouse steppe as the highest conservation priority in the State.

Key steppe indicator species are listed in the Refuge Habitat Management Plan (USDI 1999).

GOAL 5: Support the conservation of threatened and endangered species in their natural ecosystems.

Objectives 5A through 5E were developed as part of the HMP. They can be found in greater detail in Appendix B.

OBJECTIVE 5A. HOWELLIA RESEARCH AND MONITORING
OBJECTIVE 5B. HOWELLIA PRECAUTION
OBJECTIVE 5C. REDUCTION OF REED CANARYGRASS COMPETITION
OBJECTIVE 5D. HOWELLIA EDUCATION
OBJECTIVE 5E. HOWELLIA HABITAT PROTECTION

OBJECTIVE 5F. CONSERVE WATER HOWELLIA HABITAT: Protect *up to 885 acres* of potential water howellia habitat within the Stewardship Area and/or *up to 511 acres* within new Approved Refuge Boundary to support recovery efforts identified in the Draft Water Howellia Recovery Plan (Shelly and Gamon 1996).

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
Stewardship Area - up to 454 acres Protection by NWRS - 0 acres	Stewardship Area - up to 885 acres Protection by NWRS - 0 acres	Stewardship Area - up to 885 acres Protection by NWRS - up to 268 acres	Stewardship Area - up to 885 acres Protection by NWRS - up to 559 acres

Strategies	*Alternative*			
	1	2	3	4
• Within Stewardship Area, work with landowners to encourage conservation of water howellia. Provide information on identification of the plant in outreach programs; provide technical assistance as feasible; and provide information to landowners on technical and financial assistance programs available through Natural Resources Conservation Service, private partners, or the Service's Private Lands Program.		✓	✓	✓
• Within new Approved Refuge Boundary, acquire lands from willing sellers as funds become available.			✓	✓

Rationale for preferred objective and strategies:

Small, semi-permanent wetlands on the the Refuge and within the near vicinity support one of the largest known metapopulations of water Howellia within its range (Shelly and Gamon 1996). Although very little of its potential habitat has been surveyed in the Refuge vicinity, there are numerous wetlands within that have the same habitat attributes as the known occurrences on the Refuge. Expanding the number of protected sub-populations would further conserve this meta-population.

OBJECTIVE 5G. PROTECT SPALDING'S SILENE HABITAT: Endeavor to protect *up to 6,502* acres of potential Spalding's Silene habitat within the Stewardship Area and/or *up to 1,971 acres* within the new Approved Refuge Boundary in support of recovery for this species.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
Stewardship Area - up to 4,256 acres Protection by NWRS - 0 acres	Stewardship Area - up to 6,502 acres Protection by NWRS - 0 acres	Stewardship Area - up to 6,502 acres Protection by NWRS - up to 1,971 acres	Stewardship Area - up to 6,502 acres Protection by NWRS - up to 4,107 acres

Strategies	*Alternative*			
	1	2	3	4
• Implement all recovery actions that are appropriate and can be undertaken at Turnbull NWR.		✓	✓	✓
• Actively promote conservation of Palouse steppe habitat through outreach and education programs.		✓	✓	✓
• Protect potential Spalding's silene habitat through acquisition from willing sellers as funds become available.			✓	✓

Rationale for preferred objective and strategies:

Spalding's silene,also known as Spalding's catchfly, was recently listed as a threatened species under the Endangered Species Act. The species has been documented on the Refuge and 28 populations have been identified in eastern Washington (Spokane, Lincoln, Whitman, and Asotin counties). This species is primarily restricted to Palouse steppe habitat. Actions undertaken by the Refuge to promote conservation of Palouse steppe habitat could also aid in the long term recovery of this species.

GOAL 6:	Support the maintenance of biologically effective landscape linkages and corridors between the refuge and other intact areas of vegetation zones representative of this ecoregion.

Objectives 6A through 6B were developed as part of the HMP. They can be found in greater detail in Appendix B.

OBJECTIVE 6A. PARTICIPATION IN COUNTY AND MUNICIPAL PLANNING
OBJECTIVE 6B. MAINTENANCE OF NATIVE LAND COVER

GOAL 7: Foster appreciation and support of the Refuge and the Channeled Scablands ecosystem through quality environmental education, interpretation, wildlife-dependent recreation, and outreach compatible with the Refuge purposes and mission.

OBJECTIVE 7A. PROVIDE QUALITY ENVIRONMENTAL EDUCATION PROGRAM ON-REFUGE: Provide a quality, on-site environmental education program for *8,000 - 10,000* students and citizens annually. This program shall emphasize the wildlife and habitat of the Channeled Scablands as well as the role and importance of national wildlife refuges. The on-Refuge environmental education program shall:

- focus on community groups and schools within *150 mile*s;
- tier to (or achieve) Washington state educational objectives;
- incorporate specific learning objectives and utilizes audience-appropriate curricula;
- feature class *facilitation balanced between Refuge staff, teachers, volunteers, and partners*; and
- be coordinated by a *permanent full time Environmental Education Specialist*.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
3,000 - 8,000 50 miles sometimes facilitated volunteer coordinators from Americorps	4,000 - 8,000 50 miles volunteer facilitated seasonal Environmental Education Specialist	8,000 - 10,000 150 miles facilitation balanced between staff, teacher, volunteer and partners permanent full-time Environmental Education Specialist	8,000 - 12,000 150 miles facilitation balanced between staff, teacher, volunteer and partners permanent full-time Environmental Education Specialist

Strategies	*Alternative*			
	1	2	3	4
• Every two years, review EE curricula with focus group of educators at primary, secondary, and university levels. Update curricula and materials as necessary to ensure specific, age-appropriate learning objectives are articulated and that proper emphasis is placed on Refuge System, current ecosystem science of Channeled Scablands, current management issues, and adherence to current State environmental education standards.			✓	✓
• Design all instructional materials to encourage development of a environmental ethic and commitment to land stewardship in addition to conveying scientific knowlege.	✓	✓	✓	✓
• Consider membership in a statewide environmental education consortium, with the Refuge program emphasis on Channeled Scablands and Eastern Washington ecosystems.			✓	✓
• Establish permanent, full time Environmental Education Specialist position.			✓	✓
• Establish a permanent seasonal Environmental Educational Specialist position.		✓	✓	✓
• Establish temporary park rangers for EE program.			✓	✓
• Hold *2 to 4* teacher workshops per year to train educators and facilitators.	0-2	0-2	2-4	4+

Rationale for preferred objective and strategies:

The Refuge EE program has been active for over 30 years. Based on feedback conducted through CCP scoping, the Service recognizes that of all the public services the Refuge provides, the EE program is probably the most highly valued by the public. Many people support an expanded EE program. We feel it is imperative to ensure that this program receive the staff and funding emphasis that will ensure quality environmental educational opportunities for a diversity of students and community groups for the next 15 years.

OBJECTIVE 7B. EXPAND ENVIRONMENTAL EDUCATION FACILITIES: Within seven years, expand the existing EE facility to allow use by *two groups* at a time. Provide *two adjoining classrooms*, accommodating *50 people each*, which can be combined to create a multipurpose room for 100.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
One group one classroom 35 people	One group one classroom 50 people	Two groups two classrooms 50 people each	Two groups two classrooms 50 people each new facility

Strategies	*Alternative*			
	1	2	3	4
• Explore funding opportunities such as a capital campaign, etc.		✓	✓	✓
• Maintain a vault toilet at each EE site, and maintain parking areas to accommodate buses.	✓	✓	✓	✓
• Establish a permanent shelter at each EE site.		✓	✓	✓
• Maintain four field EE sites, with one in rest /rotation at all time.	✓	✓	✓	✓
• Add a fifth field EE site if necessary.			✓	✓
• Ensure all EE facilities and field sites are accessible to individuals with disabilities.	✓	✓	✓	✓
• Build new facility				✓

Rationale for preferred objective and strategies:

Existing environmental education facilities have worked well in the past, but they limit the potential of the program. There is a need to be able to schedule two classes at a time. Expanded classroom facilities will provide an opportunity for presentations and educational activities for larger audiences. The public is very supportive of the environmental education program and would like to see more activity in this area.

OBJECTIVE 7C. PROVIDE ENVIRONMENTAL EDUCATION PROGRAM OFF-REFUGE: Provide an off-Refuge environmental education program to community groups and schools that fosters understanding, appreciation and support for Refuges, and the habitat and wildlife of the Channeled Scablands ecosystem, The off-Refuge environmental education program shall:

- be coordinated by a *staff Environmental Education Specialist*.
- complement on-Refuge environmental education opportunities;
- reach audiences not reached by on-Refuge programs;
- focus on groups and schools within an hour's drive;
- reach *3,000 to 4,500 individuals (120-180 classes)* annually, at least 20 percent of these from non-traditional audiences;
- include at least *25 percent facilitated* educational opportunities;
- incorporate Washington state educational objectives; and
- incorporate specific learning objectives and utilize audience-appropriate curricula.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
volunteer coordinator 500-1,500 individuals (20-60 groups) not facilitated	volunteer coordinator 1,200-1,800 individuals (48-72 groups) 10% facilitated	staff EE specialist 3,000- 4,500 individuals (120-180 groups) 25% facilitated	staff EE specialist 4,000-7,000 individuals (160-280 groups) 25% facilitated

Strategies	*Alternative*			
	1	2	3	4
• Maintain lending library of EE materials (videos, skins, curriculum guidelines, etc.).	✓	✓	✓	✓
• Recruit retired teachers and other volunteers for off refuge facilitated opportunities.	✓	✓	✓	✓
• Coordinate this program closely with the on-refuge EE program. In general, implementing the on-refuge program will benefit the off-Refuge program as well.		✓	✓	✓
• Post curricula and other learning materials on the Refuge web site.			✓	✓
• Actively advertise off-refuge environmental education program to teachers, schools, and other groups.			✓	✓

Rationale for preferred objective and strategies:

Off-refuge educational programs can greatly expand the level of awareness and knowledge of the Refuge and the Channeled Scablands ecosystem. The Refuge can accommodate only 125 students per day on site, but many more students per day could potentially learn about the wildlife and aquatic ecology of the Channeled Scablands through off-site programs, especially those provided through a lending library. Even with these programs, however, the Refuge would aim to have at least 25 percent of the off-refuge programs facilitated, as staff has found that facilitated programs are generally more effective at achieving the learning objectives.

OBJECTIVE 7D. DEVELOP CULTURAL RESOURCES INTERPRETIVE AND EDUCATION PROGRAM:

In partnership with the Spokane, Coeur d'Alene, Colville, and Kalispel Tribes, historical societies, and other preservation partners, develop a program for the education and interpretation of cultural resources of the Refuge that:

- instills an ethic for the conservation of our cultural heritage;
- promotes an appreciation for the Native American culture and perspective on cultural resources;
- translates the results of cultural research into media that can be understood and appreciated by a variety of people; and
- relates the connection between cultural resources and natural resources and the role of humans in the environment.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
---	as above	as above	as above

Strategies	*Alternative*			
	1	2	3	4
• Consult with the Tribes, historical societies, and other preservation partners to identify the types of cultural resource information appropriate for public interpretation.		✓	✓	✓
• Prepare interpretive media (e.g., pamphlets, signs, exhibits) that depict Native American and Euroamerican cultural resources on the Refuge.			✓	✓
• Develop lending library of education materials for use in local schools and museums concerning cultural resources, the discipline of archaeology, the perspective of Native Americans, Euroamerican settlement history, and conservation of cultural resources. These materials could include an artifact replica kit with hands-on activities and curriculum prepared in consultation with the local school district, historical societies, and the Tribes.			✓	✓
• Develop an outreach program and materials so that the cultural resource messages become part of cultural events in the area, including: Washington Archaeology Month, National Wildlife Refuge Week, and appropriate local festivals.			✓	✓
• Create storage and use plans for museum property to facilitate appropriate uses as part of the education program.		✓	✓	✓
• Train an EE Specialist in cultural resource education and interpretation. Training could be provided by the Service's cultural resource team members.			✓	✓

Rationale for preferred objective and strategies:

The Refuge has several known prehistoric sites, at least 38 farmsteads, and two rural schoolhouse sites. More sites will likely be discovered in coming years. Most cultural resources are not renewable. The education and interpretation of cultural resources can instill a conservation ethic among the public and others who encounter or manage them.

OBJECTIVE 7E. INCREASE COMMUNITY SUPPORT: With partners, increase community support and appreciation for the Refuge, its purpose and management programs, focusing particularly on adjacent landowners, Cheney community groups and leaders, and Spokane County community groups and leaders, to accomplish the following:

- Outreach themes shall focus on wildlife, habitat and conservation needs of Channeled Scablands ecosystem.
- Outreach efforts shall incorporate practical conservation advice and tips and information at every opportunity. Examples: how to conserve water at home or build a nest box for bluebirds may be an appropriate outreach topic for a general audience, while how to enroll in the Wetlands Reserve Program may be an appropriate topic for landowner audience.
- The Refuge shall hold at least *six face-to-face outreach events* to focus audiences annually.
- The Refuge shall hold a booth at a minimum of *three community fairs* or festivals annually.
- The Refuge shall hold at least *four community work days* per year.
- Outreach efforts shall persuade landowners and partners to undertake at least *two conservation projects* annually within the Stewardship Area.
- The Refuge shall establish and maintain a diversity of partnerships within the private sector, with non-governmental organizations, educational institutions, and other government agencies.
- Partners should assist the Refuge in fundraising and providing matching funds where appropriate.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
2 outreach events 2 fairs 4 workdays one conservation project	2 outreach events 2 fairs 4 workdays one conservation project	6 outreach events 3 fairs 4 workdays two conservation projects	8 outreach events 3 fairs 6 workdays three conservation projects

Strategies	*Alternative*			
	1	2	3	4
• Hire part-time outreach specialist.			✓	✓
• Designate focus audiences, including at minimum: landowners in the Stewardship Area, community political, economic and social leaders.		✓	✓	✓
• Create portable, lendable outreach presentation tool kit.		✓	✓	✓
• Work with the Friends of Turnbull to create a volunteer speaker's bureau who would speak to groups on behalf of the Refuge.		✓	✓	✓
• Continue recruiting, training, and utilizing volunteers for support of Refuge programs and activities.		✓	✓	✓
• With partners, incorporate evening and weekend programs into the schedule of activities.		✓	✓	✓
• Update and maintain Refuge web page.		✓	✓	✓

Rationale for preferred objective and strategies:

Outreach differs from off-refuge environmental education in one key attribute - outreach has no specific learning objectives while environmental education does. Outreach is also not simply coordination with existing or potential partner agencies or groups. Outreach is complementary to these by targeting

audiences who may not have an expressed interest in the Refuge, but nonetheless may influence the Refuge by their actions or proximity. Outreach efforts have the potential to build understanding, curiosity, and support, especially when geared towards groups that might not have the inclination to actually visit the Refuge. Ultimately, outreach is aimed at building new partnerships and spurring conservation action in the community. We feel communication efforts are an important aspect of conservation and an important component of Refuge management.

OBJECTIVE 7F. PROVIDE VISITOR CONTACT CENTER AND INTERPRETIVE EXHIBIT AREA:

With partners, provide visitor contact and information facilities in conjunction with an interpretive exhibit area within seven years as follows:

- *Staffed visitor contact facilities* provide orientation and a jumping-off point for Refuge wildlife-dependent recreational activities.
- Visitor contact point includes a *small exhibit area* containing quality non-static interpretive materials that increase awareness of the Channeled Scablands ecosystem, the Refuge System, and Turnbull Refuge management practices. Interpretive materials instill a sense of stewardship and environmental ethic.
- Visitor contact center is designed to accommodate persons of all abilities.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
reception area in office	small info point, volunteer staffed as needed.	as above	staffed visitor contact center larger exhibit area new facilities

Strategies	*Alternative*			
	1	2	3	4
• Update interpretive prospectus to include Refuge management interpretive themes. Utilize interpretive prospectus to guide exhibit themes.		✓	✓	✓
• Explore diverse funding opportunities for capital improvements.		✓	✓	✓
• Consider new facility or add on to existing facility as funding allows.			✓	✓
• Build new facility.				✓

Rationale for preferred objective and strategies:

At the present time, the Refuge does not have any central interpretive area for the public. This limits the use of the Refuge by those who are constrained by time or physical ability from exploring the trails and viewpoints directly. A staffed central interpretive area will be a strong focus for visitor contacts and will directly advance public understanding of the Refuge and the surrounding ecosystem.

OBJECTIVE 7G. PROVIDE DIVERSITY OF WILDLIFE OBSERVATION VIEWPOINTS, WITH INTERPRETIVE MATERIALS: Within five years, provide a diversity of permanent wildlife viewing points to the public as follows:

- *Most* viewpoints shall contain high quality interpretive signs or materials that follow Americans with Disabilities Act guidelines. Focused messages on interpretive media should evoke emotion, raise awareness of local ecology, and promote understanding of refuge management practices.
- Include *15* viewpoints inside the Public Use Area and *4* viewpoints along the Columbia Plateau Trail (CPT).
- Include *one* viewpoint inside Refuge at Stubblefield Lake.
- Include *five* viewpoints along local County roads and highways to increase knowledge and enjoyment of casual drive-through visitors and in support of the Watchable Wildife site and Audubon Important Birding Area designations.
- Design viewpoints to maximize wildlife viewing experiences while minimizing disturbance or impacts to wildlife.
- Establish viewpoints in a diversity of habitats so that visitors can gain greater understanding of the different wildlife and plants inhabiting the Refuge's pine forests, aspen forests, grasslands, and wetlands.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
Interpretive signs only on Boardwalk and CPT viewpoints. Public Use Area - 15 CPT - 4 County Roads - 0 Stubblefield - 0	Most viewpoints have interpretive signs. Public Use Area - 15 CPT - 4 County Roads - 1 Stubblefield - 1	Most viewpoints have interpretive signs. Public Use Area - 16 CPT - 4 County Roads - 4 Stubblefield - 1	Most viewpoints have interpretive signs. Public Use Area - 16 CPT - 4 County Roads - 4 Stubblefield - 1

Strategies	*Alternative*			
	1	2	3	4
• Establish interpretive signs at the following locations in the Public Use Area: Swan Pond, Kiosk at Winslow Pool, Kepple Overlook, Blackhorse Lake control structure, Photo Blind at Pine Lake, Wheeler Memorial, Restored Pine area, Kepple Peninsula, North Bluebird Trailhead and Camas Meadow.		✓	✓	✓
• Establish interpretive signs and develop pulloff and short accessible trail to new viewpoint at Upper Turnbull Slough, visible from Cheney-Plaza Road.		✓	✓	✓
• Establish interpretive signs and design an elevated platform at Stubblefield Lake in conjunction with the new loop trail.		✓	✓	✓
• Establish interpretive signs and develop pulloffs on County roads as needed at the following viewpoints visible from County roads: McDowell Lake, Stubblefield view from Cheney-Spangle, and Helm Marsh from Mullinix Road.			✓	✓
• Establish interpretive signs at Cheever Lake (in Public Use Area).			✓	✓
• Maintain the four existing interpretive signs at north end of the Columbia Plateau Trail, south end of the Columbia Plateau Trail, Ballinger Lake, and Long Lake.	✓	✓	✓	✓
• Provide information to visitors about the best techniques for minimizing disturbance to wildlife while observing or photographing wildlife.	✓	✓	✓	✓
• Display photographers ethics guidelines.		✓	✓	✓

• With the help of volunteers, ensure development of three accessible photo blinds at Kepple Peninsula, the East side of Blackhorse Lake, and Long Lake. Retrofit Pine Lake photo blind for accessibility.		✓	✓	✓
• Update and implement interpretive prospectus with the strategies above.		✓	✓	✓
• Consider adding additional viewpoints with interpretive signs if the Refuge acquires additional land.			✓	✓
• Consider adding bolted down aids such as spotting scopes or telescopes to enhance wildlife viewing from certain viewpoints .			✓	✓
• Seek alternative funding sources to support the objective.		✓	✓	✓
• Design new interpretive signs to be easily read from a vehicle.	✓	✓	✓	✓
• Establish vegetative screening at viewpoints where necessary.		✓	✓	✓
• Link interpretive materials to EE and all management programs.		✓	✓	✓

Rationale for preferred objective and strategies:

Part of the Refuge vision is to support visitor education. The Refuge staff sees a prime opportunity to support education of the solitary or casual visitor through the use of interpretive media at the Refuge's outstanding viewpoints. Such interpretive material can greatly enhance visitor ecological understanding, ultimately contributing to their enjoyment of the Refuge and its wildlife.

OBJECTIVE 7H. IMPROVE PUBLIC FACILITIES: Improve visitor infrastructure so as to enhance safety, sanitation, comfort, and access for the visiting public, including citizens with disabilities.

Strategies	*Alternative*			
	1	2	3	4
• Improve Refuge signs, vehicle access routes, pullouts and parking in the Public Use Area, using Tranportation Equity Act -21 or other available funds.	✓	✓	✓	✓
• Move gate and fee station closer to Cheney Plaza Road.	✓	✓	✓	✓

(Also see strategies under Objectives 7B, 7F, 7G, 7J, and 7I for more information about facilities and access).

Rationale for preferred objective and strategies:

Improvement of Refuge facilities provides an opportunity to enhance the visitor experience and improve visitor compliance with rules. The Refuge also needs to implement current Americans with Disabilities Act (ADA) standards and guidelines and provide a greater diversity of facilities to individuals with disabilities.

OBJECTIVE 7I. EXPAND PEDESTRIAN-ONLY TRAIL NETWORK: Within 10 years, expand and enhance the Refuge pedestrian trail network as follows:

- Designate at least *two* trails for universal access (accessible to current ADA standards).
- Locate all trailheads within the Public Use Area.
- Provide *15.25 miles* of pedestrian only trails with some trail routes of 2 miles or more; provide potential for trail links and more loop trails.
- Provide improved interpretation on some trails and leave other trails as natural as possible.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
two 11.5 miles	two 15.25 miles	two 15.25 miles	two 15.25 miles

Strategies	*Alternative*			
	1	2	3	4
• Replace Boardwalk Trail at West Blackhorse Lake with another boardwalk type trail meeting current ADA standards.		✓	✓	✓
• Establish trail to Stubblefield Lake and ensure users do not adversely affect unique qualities of this area by going off trail.		✓	✓	✓
• To minimize disturbance to waterfowl on the lake during peak waterfowl use periods, consider a bypass near Long Lake on the Columbia Plateau Trail, or establish natural screening.		✓	✓	✓
• Monitor number of visitors and visitor use patterns in the Public Use Area, using established sampling techniques.		✓	✓	✓
• Develop four interpretive panels at Winslow Pool		✓	✓	✓
• Prohibit bicycle use on pedestrian trails except possibly Bluebird Trail and Stubblefield Lake Trail.		✓	✓	✓
• Consider adding additional trails if Refuge acquires additional land.			✓	✓

Rationale for preferred objective and strategies:

Many people have expressed a desire for a greater variety of trails and more loop trails. The Service sees an opportunity to provide this at the Refuge. However, trail establishment outside the Public Use Area is not justified at this time, partly because additional trails will be made available within the Public Use Area, and partly because of the need to separate trail users from hunting, which will occur outside the Public Use Area. If the Refuge were to acquire additional lands, more trails could be considered.

OBJECTIVE 7J. SUPPORT COMPATIBLE COLUMBIA PLATEAU TRAIL USE: Support hiking, biking, and equestrian use on the portion of the Columbia Plateau Trail that crosses Refuge land and ensure that trail use remains compatible with Refuge purposes.

Strategies	Alternative 1	2	3	4
• Continue to co-manage the 4.75 mile section of the Columbia Plateau Trail that runs through Refuge land together with the Washington State Parks and Recreation Commission under the parameters of the existing cooperative agreement.	✓	✓	✓	✓
• Every five years, review and update the cooperative agreement for the Columbia Plateau Trail.		✓	✓	✓
• Encourage State to lead effort to plan and develop additional public facilities at the Cheney Plaza intersections with the Columbia Plateau Trail.	✓	✓	✓	✓
• Establish a vault toilet north of Ballinger Lake.	✓	✓	✓	✓
• Place benches at strategic viewpoints and place a sign-in book at the north and south points where the trail enters the Refuge.			✓	✓
• Partner with the State to establish regular and accepted visitor counting techniques so that the Refuge has reliable visitor estimates on this trail.		✓	✓	✓
• Conduct systematic monitoring of trail use to determine patterns of use, degrees of disturbance, and consequences to wildlife, if any.			✓	✓
• In cooperation with the State , consider a variety of tools to prevent trespass and disturbance to key wildlife areas, including vegetative plantings, public education efforts, concentrating use at key facility points (i.e. benches), establishing of bypass trail at Long Lake, or using seasonal closures.		✓	✓	✓

Rationale for preferred objective and strategies:

The Columbia Plateau Trail, built on an abandoned railroad track through the Rails to Trails program, is a new recreational asset for Eastern Washington. When fully complete, it will traverse 130 miles of the state, extending from Ice Harbor Dam on the Columbia River to Fish Lake near Cheney. Because it crosses an area of the Refuge that has been closed to the public for 60 to70 years, there is no real knowledge of how wildlife using the area will respond. The Service supports the trail and also wants to ensure that trail use remains compatible with Refuge purposes. Continued cooperative management with State Parks and Recreation and ongoing monitoring are the best strategies for achieving this objective.

OBJECTIVE 7K. ESTABLISH A DESIGNATED AND SIGNED BIKE TRAIL LINK: Establish a designated, signed, trail link for biking and hiking between the Columbia Plateau Trail and the Public Use Area via the old Cheney Plaza Highway roadbed within five years.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
---	---	Bike trail connects the Columbia Plateau Trail and the Public Use Area	Bike trail also loops through Public Use Area to Cheney Spangle Road and incorporates bike lanes on Cheney Spangle Road.

Strategies	Alternative 1	2	3	4
• Plan trail in cooperation with Washington Department of Transportation, State Parks and Recreation, and Spokane County.			✓	✓
• Seek joint funding for trail construction.			✓	✓
• Consider paving trail to minimize dust.			✓	✓

Rationale for preferred objective and strategies:

There is value in direct and safe non-motorized access to the Refuge Public Use Area for users coming from Spokane or Cheney. Currently, the most direct and safest route is by way of the Columbia Plateau Trail (CPT); however, there is no clear designated link from the CPT to the Public Use Area on the Refuge. Establishing such a link would enable non-motorized users to leave the CPT near Overpass Pond and travel on a safe route to the Public Use Area. The abandoned Cheney Plaza Highway roadbed is located inside the Refuge to the east of the current Cheney Plaza Highway. Converting this roadbed to a designated bike trail would make bike access to the Refuge much safer as bikes would no longer have to share the actual highway.

OBJECTIVE 7L. PROVIDE A HIGH-QUALITY WATERFOWL HUNT FOR YOUTHS: Initiate a safe, high quality, low-impact *youth waterfowl hunt on the annual State youth hunt weekend.* Emphasize education, possibly requiring a waterfowl identification or natural history class for youths participating in the hunt.

- Safety means: no injuries or safety incidents; 98 percent of all hunters report feeling safe.
- High quality means: uncrowded conditions (hunters spaced at 300 yards or more) and minimal conflicts with other priority public uses.
- Low-impact means: limited vehicle access; designated stationary hunting areas *on the north side of Upper Turnbull Slough*; no boats; and walk- in/walk-out access.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
---	---	as above	general hunt on three days per week waterfowl hunt during State general duck season; north side of Upper Turnbull Slough and south side of West Tritt Lake.

Strategies	Alternative 1	2	3	4
• Publish Hunting Plan and Federal Register Notice before first hunt season.			✓	✓
• Manage hunt in cooperation with State.			✓	✓
• Ensure that one full-time or two collateral duty law enforcement officers are monitoring the hunt on each hunting day.			✓	✓
• Enforce maximum of 25 shells per hunter, non-toxic shot only			✓	✓
• Thoroughly evaluate youth waterfowl hunting program after five years			✓	✓
• Consider adding additional hunting areas if Refuge acquires additional land.			✓	✓
• Ensure reasonable accommodation is provided for disabled hunters.			✓	✓

Rationale for preferred objective and strategies:

Some people have expressed interest in the Refuge hosting a waterfowl hunt and the National Wildlife Refuge System Improvement Act requires consideration of all priority public uses during the CCP process. Opportunities for waterfowl hunting at Turnbull NWR are quite limited for several reasons, including loss of habitat and the shift in the waterfowl migration to the west.

Within the upper reaches of the Channeled Scablands where the Refuge is located, fall waterfowl habitat is very limited as a result of extensive drainage of the large, historically permanent wetland sloughs in the early 1900s. Over 70 percent of the wetlands in this area have been drained. The remaining fall habitat occurs on the Refuge and on several deepwater lakes in the vicinity of the Refuge. These off-Refuge lakes receive intense pressure from recreationists, primarily anglers, but also from a few waterfowl hunters where hunting is allowed.

As a result of the extensive drainage of fall migration habitat in the Refuge vicinity and extensive development of irrigation wasteways and agriculture in the central Columbia Basin, much of the fall waterfowl migration has shifted west of the Refuge. Increases in waterfowl use of the Refuge in the fall during above average precipitation years, however, indicate that restoration of fall migration habitat would likely increase waterfowl populations in this area.

Although nineteen percent of the Refuge is wetlands, many of these wetlands are dry by fall, because of their naturally shallow profiles. Those 800 acres that do still contain water at the onset of waterfowl hunting season are usually open less than one month before freezing. Opening the Refuge to a waterfowl hunt for the one month period before freeze-up would result in decreased use of this habitat by waterfowl. The Service believes, however, that a limited youth hunt, to occur on one weekend (usually in September) per year, can be accommodated and would help the Refuge facilitate hunting as a priority use, as required under the NWRSIA. The Refuge proposes land conservation as a key element of the Preferred Alternative 3. These land conservation actions (see Appendix A) should result in a significant amount of additional wetland habitat protected and restored. If the Refuge can acquire or protect additional fall wetland habitat outside the current boundaries, opening additional acres to waterfowl hunting could be considered as indicated under Alternatives 3 and 4.

OBJECTIVE 7M. INITIATE A HIGH-QUALITY ELK HUNTING PROGRAM: Initiate an annual, safe, high quality, walk-in, limited-entry elk hunting program as follows:

- High quality means: uncrowded conditions, with less than 2 people per square mile, and < 10 percent of hunters report feeling crowded. In addition, at least 80 percent report satisfaction with their hunting experience.
- Walk-in means: vehicles are left in designated parking areas; there is walk- in/walk-out access only; and no motorized or equestrian retrieval is permitted.
- Safe means: no firearm related injuries or safety incidents and 98 percent of all hunters report feeling safe.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
---	as above	as above	as above

Strategies	Alternative			
	1	2	3	4
• Manage annual hunt in cooperation with State. Publish Sport Hunting Plan and Federal Register Notice before first hunt season. Length of season, number of permits issued, and/or seasons offered would vary annually. Season recommendations would be based on an annual assessment of elk damage to Refuge aspen groves and would be developed each year together with Washington Department of Fish and Wildlife. All classes of hunter would be initially considered and the hunt could be targeted at one or more classes if implemented. Potential hunt areas would be separated from areas used by other recreational Refuge users. Special needs for hunters with disabilities would be considered and accommodated as reasonable. Ensure that law enforcement officers are monitoring the hunt on each hunting day.		✓	✓	✓
• Thoroughly evaluate elk hunting program after five years		✓	✓	✓
• Consider adding additional hunting areas if Refuge acquires additional land.			✓	✓

Rationale for preferred objective and strategies:

Some people have expressed interest in the Refuge hosting an elk hunt and the National Wildlife Refuge System Improvement Act requires consideration of all Refuge System priority public uses during the CCP process. For these reasons, as well as because elk browsing is causing damage to aspen habitats, we are proposing to open the Refuge to high-quality elk hunting under the action alternatives. The benefits of an annual, limited-entry hunt for elk would include providing recreation, some population management of the elk sub-herd that uses the refuge, and reduced impacts by elk on aspen and associated shrubs. All of these benefits are consistent with the Refuge Vision and Goals. In addition, an annual limited entry hunt would contribute to the Washington Department of Fish and Wildlife goal for the Hangman sub-herd of the Selkirk elk population, i.e. "Maintain elk numbers that are compatible with local agriculture and suburban expansion." The hunt level would be tied to aspen damage rather than population levels for four reasons: a) the relationship between aspen damage and elk use on Turnbull NWR has been documented by a recent study by Albrecht (2003); b) a specific population objective for the Hangman sub-herd has not been defined; c) the Refuge land area that could accommodate hunting is too small to make a major impact on the sub-herd populations through hunting alone (other tools for managing population tools can be used and are explored more fully in Objective 3E); and d) elk move off and on the Refuge easily and population counts are inherently subject to more variation and potentially inaccurate conclusions.

Hunting, along with other priority public uses of the Refuge System, will also be considered on any newly acquired lands. See also Objective 3E, which addresses other methods of limiting elk damage to aspen habitats.

OBJECTIVE 7N. EXPLORE TURKEY MANAGEMENT / HUNTING OPPORTUNITY: Consider possibility of permitted turkey hunt depending on turkey population trends.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
---	---	as above	as above

Strategies	*Alternative*			
	1	2	3	4
• Encourage research to investigate turkey ecology on Refuge.		✓	✓	✓
• Initiate study to explore impact of turkey populations on non-natives.		✓	✓	✓

Rationale for preferred objective and strategies:

Anecdotal evidence suggests that the local turkey population is on the rise. Depending on the population trends and results of studies, the Refuge may be able to support a turkey hunt at some point in the future. Such a hunt would be designed primarily for population management of turkeys to prevent turkey populations from impacting other ground foragers such as sparrows, towhees, bluebirds, or solitaires.

OBJECTIVE 7O. PROTECT WILDLIFE AND HABITAT FROM INCOMPATIBLE PUBLIC USE: Limit human disturbance and habitat degradation as much as possible. Keep off-trail use restricted.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
--	as above	as above	as above

Strategies	*Alternative*			
	1	2	3	4
• Monitor use levels by activity and evaluate impacts of increased human uses on the Refuge. Using established visitor counting techniques, prepare seasonal activity estimates for visitors by type of use and location.			✓	✓
• Ensure public is aware that the Refuge is day use only and that dogs must be kept on a leash at all times.		✓	✓	✓
• Prohibit the following non-wildlife dependent uses: snowmobiling, dogsledding, off-road vehicle use, concerts, camping, military training activities, orienteering, boating, animal/dog training or trials, swimming, collecting, ice-skating, team sports, sport training, pet abandonment or unauthorized introductions of wildlife. In addition, prohibit fishing (a wildlife-dependent use) as no suitable fishery exists on the Refuge.		✓	✓	✓
• Discourage the following non-wildlife dependent uses: weddings, ash dispersal, and large public events not oriented towards wildlife education.		✓	✓	✓

• Further investigate disturbance effects with on-site studies. Develop a protocol for monitoring impacts to habitats at EE sites.			✓	✓

Rationale for preferred objective and strategies:

Laws and policy encourage wildlife-dependent recreation on National Wildlife Refuges, as long as the activities remain compatible with the Refuge purposes. There is a clear need to monitor both the degree and type of human activity on the Refuge as well as any effects this may currently or in the future have on wildlife. This data will be critical in the design of adaptive management strategies, if needed, to refine programs and minimize wildlife disturbances.

GOAL 8:	Encourage and support research and monitoring that substantially contributes to our understanding of the natural and cultural resources of the Channeled Scablands ecosystem.

OBJECTIVE 8A. ENCOURAGE APPLIED RESEARCH: Ensure ongoing, high quality, applied research on the Refuge that contributes to questions of particular refuge management interest as follows:

- Encourage the initiation of at least one graduate or senior-thesis level research project from the Refuge research needs list each year.
- Refuge staff shall review each proposal to ensure that permitted research projects minimize potential for cumulative impacts with other studies and activities; are compatible with refuge purposes; and have undergone peer review.
- Limit research activities outside the Turnbull Laboratory for Ecological Studies site to no more than six per year.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
--	as above	as above	as above

Strategies	*Alternative*			
	1	2	3	4
• Collaborate annually with Eastern Washington University and other institutions.	✓	✓	✓	✓
• Prepare a summary of the Refuge proposal review process and distribute to key institutions and departments.		✓	✓	✓
• Ensure that any research activity with the potential to impact listed species receives a Section 7 review under the Endangered Species Act.				
• Seek additional funding from internal or external sources to support at least one quality, in-depth study per year.		✓	✓	✓
• Update and share the Refuge research needs list annually.	✓	✓	✓	✓

Rationale for preferred objective and strategies:

Through the years, Turnbull NWR and Eastern Washington University have enjoyed mutual benefit from a close association. The Refuge gains serious research which expands the biological knowledge base at the Refuge and enhances the professionalism of the biological program. The University gains a field site and a place for their laboratory. The Service wishes to continue this close association, under guidelines that will ensure research remains compatible and helps fill Refuge management data gaps.

OBJECTIVE 8B. MONITOR WILDLIFE AND HABITATS: Continue monitoring of wildlife habitats and populations to validate and evaluate population responses to Refuge habitat management.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
as above	as above	as above	as above

Strategies	*Alternative*			
	1	2	3	4
• Continue to implement the Refuge Habitat Management Plan biological monitoring plan. Develop and implement an objective driven habitat monitoring program capable of evaluating the effectiveness of management strategies in achieving habitat objectives. Develop habitat monitoring procedures that measure conditions and variables identified in habitat objectives (see HMP Table 10).	✓	✓	✓	✓
• Develop and implement wildlife monitoring procedures to document population trends of key indicator species in order to evaluate the effectiveness of management strategies and the validity of habitat objectives.	✓	✓	✓	✓
• Continue participation in national monitoring programs for neotropical migratory landbirds, amphibians, marshbirds, and waterfowl.	✓	✓	✓	✓
• Hire additional permanent full time biologist			✓	✓
• Hire *two* additional biological technicians to aid in monitoring work.	1	1	2	3

Rationale for preferred objective / strategies:

Monitoring data and information provides critical support to Refuge resource management and contributes to the Service's ability to modify management practices as needed. This is the cornerstone of adaptive management.

OBJECTIVE 8C. IMPLEMENT A PROACTIVE CULTURAL RESOURCES PROGRAM: Implement a proactive cultural resource management program that focuses on meeting the requirements of the National Historic Preservation Act, including consultation, identification, inventory, evaluation, protection, and monitoring of cultural resources.

Alt 1	Alt 2	Alt 3 (preferred)	Alt 4
as above	as above	as above	as above

Strategies	*Alternative*			
	1	2	3	4
• Identify archaeological sites that coincide with existing and planned roads, facilities, public use areas, and habitat projects. Evaluate threatened and impacted sites for eligibility to the National Register of Historic Places. Prepare and implement activities to mitigate impacts to sites as necessary.	✓	✓	✓	✓

•	Develop a GIS layer for cultural resources that can be used with other GIS layers for the Refuge, yet contains appropriate locks to protect sensitive information.		✓	✓	✓
•	Develop partnership with the Tribes for cultural resources inventory, evaluation, and project monitoring, consistent with cultural resource regulations.		✓	✓	✓
•	Develop relationships with educational institutions, historical societies, and other preservation partners for the inventory, evaluation, and monitoring of cultural resources at the Refuge.	✓	✓	✓	✓

Rationale for preferred objective and strategies:

Various federal historic preservation laws and regulations require the Service to implement the kind of program described under this objective. Inattention to these responsibilities may obstruct the Refuge in its other land, habitat, and wildlife management efforts.

CHAPTER 3

Affected Environment

Downingia spp. Photograph by Bob Griffith.

3.1 PHYSICAL ENVIRONMENT

3.1.1 CLIMATE

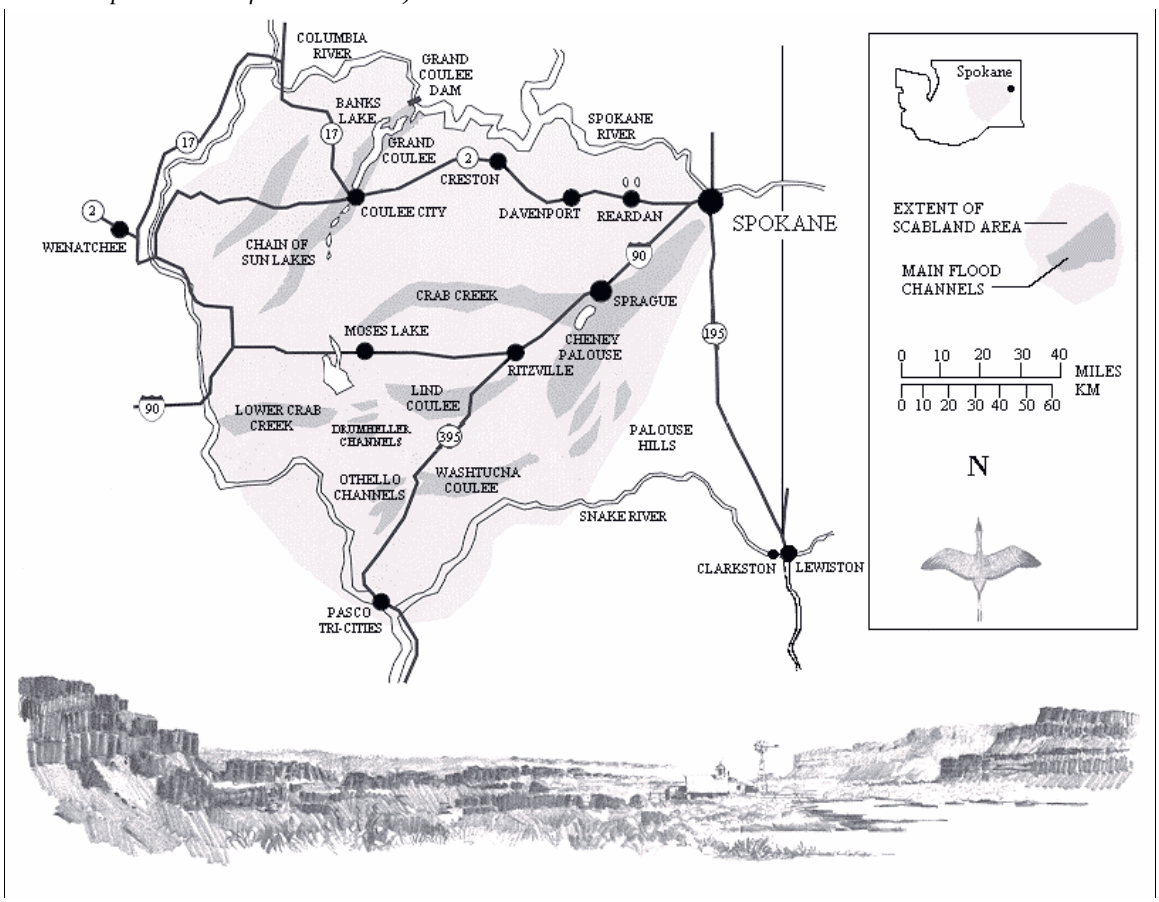
The climate at Turnbull Refuge is semi-arid with an average annual precipitation of 16.5 inches. The majority of precipitation falls as snow from November to February with a yearly average of 50 inches. Above average snow-years occur three out of every ten years. Drought periods are common. Summers are warm and dry with average daily highs above 80 degrees Fahrenheit. Winter months are cool with mean daily temperatures between 25 and 30 degrees Fahrenheit.

3.1.2 GEOLOGY AND SOILS

The Refuge is part of a much larger landform, called the Columbia Plateau. The Columbia Plateau is the result of numerous lava flows that spread over the area and hardened between 16 and 6 million years ago. These flows, originating as far east as Idaho, flowed down the broad valleys of the Columbia River Basin all the way to the coast. Over 200 flows piled up layer upon layer of lava to a total thickness measured in thousands of feet and covering an area of around 80,000 square miles (Baker 1978). The immense weight of the covering of basalt resulted in settling and tilting of the plateau from the northeast to the southwest.

During the two million years of the last ice age, periodic extensions and retreats of the continental ice sheet left exposed glacial outwash sediments on the plateau that were picked up by strong winds blowing off the expansive ice sheets. These dust-like particles were redeposited on the eastern side of the Columbia Plateau, covering the basalts to depths

Figure 2. Location of Channeled Scablands formations in Eastern Washington State *(figure used with permission of Maurice Vial)*



of up to 150 feet thick. This thick covering of loess became the rolling grass covered hills referred to as the Palouse Formation.

The Channeled Scablands formation extends over approximately 2,000 square miles on the Columbia Plateau (See Figure 2). The Scablands were formed in a series of dramatic events approximately 15,000 years ago at the end of the last great ice age. At that time, a lobe of the continental ice sheet dammed the Columbia River and drainage of the Clark Fork River creating three glacial lakes, two on the Columbia River and the other comprising ancient Lake Missoula on the Clark Fork which covered 2,900-square-miles of northwestern Montana (Allen et al. 1986). As the rising water of the lake lifted the ice dam terminus of Lake Missoula, the lake emptied resulting in catastrophic floods that scoured away the wind deposited soils of the Palouse Formation in large tracts exposing the underlying basalt. Numerous channels and depressions were eroded in the basalt. Subsequent deposition of glacial outwash sediments and ash from the eruption of the volcanoes of the Cascade Range resulted in the formation of a diverse complex of lakes, sloughs and ponds in the flood tracts. In contrast to the deep and more uniform soils of the Palouse Formation, the uplands of the flood tracts of the Channeled Scablands are a mosaic of exposed, fractured basalt, small mounds of deeper soils and swales comprised of shallow lithosols. This unique patterned ground is often referred to as biscuit and swale topography (Daubenmire 1970).

The soils of the Scabland uplands are primarily of the Hesseltine complex with the major portion mapped as Hesseltine very rocky complex, with 0 percent to 30 percent slopes (Donaldson and Giese 1968). This soil mapping unit includes from 25 percent to 50 percent basalt rock outcrops and unnamed very stony, very shallow soils in the swales. The mounds or biscuits are primarily Hesseltine silt loam with topsoil 16 inches deep underlain by coarse gravel and stones to a depth of 60 inches over basalt bedrock. Hesseltine soils are either covered by steppe grassland vegetation or forested.

Soils in the meadows and around potholes are of the Cocolallala silty clay loam series. These soils range up to 60 inches deep and are formed in volcanic ash deposits mixed with silty alluvium. Highly organic Semiahmoo muck soils are found in the deepest portions of the potholes. These peat soils average 4 feet deep but can be as deep as 12 feet.

3.1.3 HYDROLOGY (WATER QUANTITY, DISTRIBUTION, USE, RIGHTS, AND QUALITY)

Surface Watersheds/Drainage

The Refuge encompasses the upper portions of three watersheds: Hangman Creek, Rock Creek, and Cow Creek. The Hangman Creek watershed drains toward the northeast and the Spokane River. Both the Cow Creek and Rock Creek watersheds drain to the south and southeast into the Palouse River. Few natural drainages occur on the Refuge as a result of low relief and the complex topography created by the Ice Age floods. Pine Creek, which originates on the eastside of the Refuge and flows into Rock Creek, is the only natural perennial stream course on the Refuge.

The diverse complex of lakes, sloughs and ponds, so prominent in the Channeled Scablands, were not uniformly valued by early settlers. The lakes and marshes were drained in an attempt to create or find land suitable for agricultural development, after the dry, rocky uplands proved too difficult to farm. Early settlers formed a drainage district, constructing numerous ditches which connected the previously separate lakes and wetlands. Between 1910 and 1912, all of the lakes in the area now encompassed by the Refuge (except Stubblefield Lake) were drained. Most of the large lakes and wetlands located within the Study Area were also drained at the time. These drains and ditches form four separate drainage networks which traverse the Refuge

vicinity. The four main networks, or subwatersheds, are Company, Philleo, Kaegle, and Phillips. Company contributes to the Cow Creek watershed; Philleo terminates at Philleo Lake and at Stubblefield Lake on the Refuge. Both Kaegle and Phillips drain into the Rock Creek watershed. Map 7 shows the location of ditches and the outlines of the four main drainage "sub-watersheds" or networks that extend from the surrounding private lands into the Refuge. Surface water recharge for 1,952 acres of Refuge wetlands now comes from local run-off within these subwatersheds (Table 3-1).

Wetlands

Alteration and Restoration: Pre-settlement, most surface waters in the Channeled Scablands were isolated in individual wetland basins. Some wetlands were briefly connected in spring during years of above average rainfall. Wetland depths were dictated by the depth of the basin or the topographic low separating wetland basins from each other or one of the natural drainages of the region.

As previously discussed, many of the wetland basins in the Channeled Scablands area were connected to a manmade drainage system to provide additional acreage for farming. As a consequence, wetlands throughout the Channeled Scablands formation were drained.

In 1937, the Turnbull Refuge was established and restoration of the natural wetland habitats began. This was accomplished by plugging the drainage ditches in smaller wetlands and building dikes and water control structures at the outlets of larger sloughs and lakes. There are now 17 low dikes varying from 40 feet to 800 feet in width across the Refuge. There are also 22 water control structures used to manage water distribution and depth amongst the now connected wetlands and lakes.

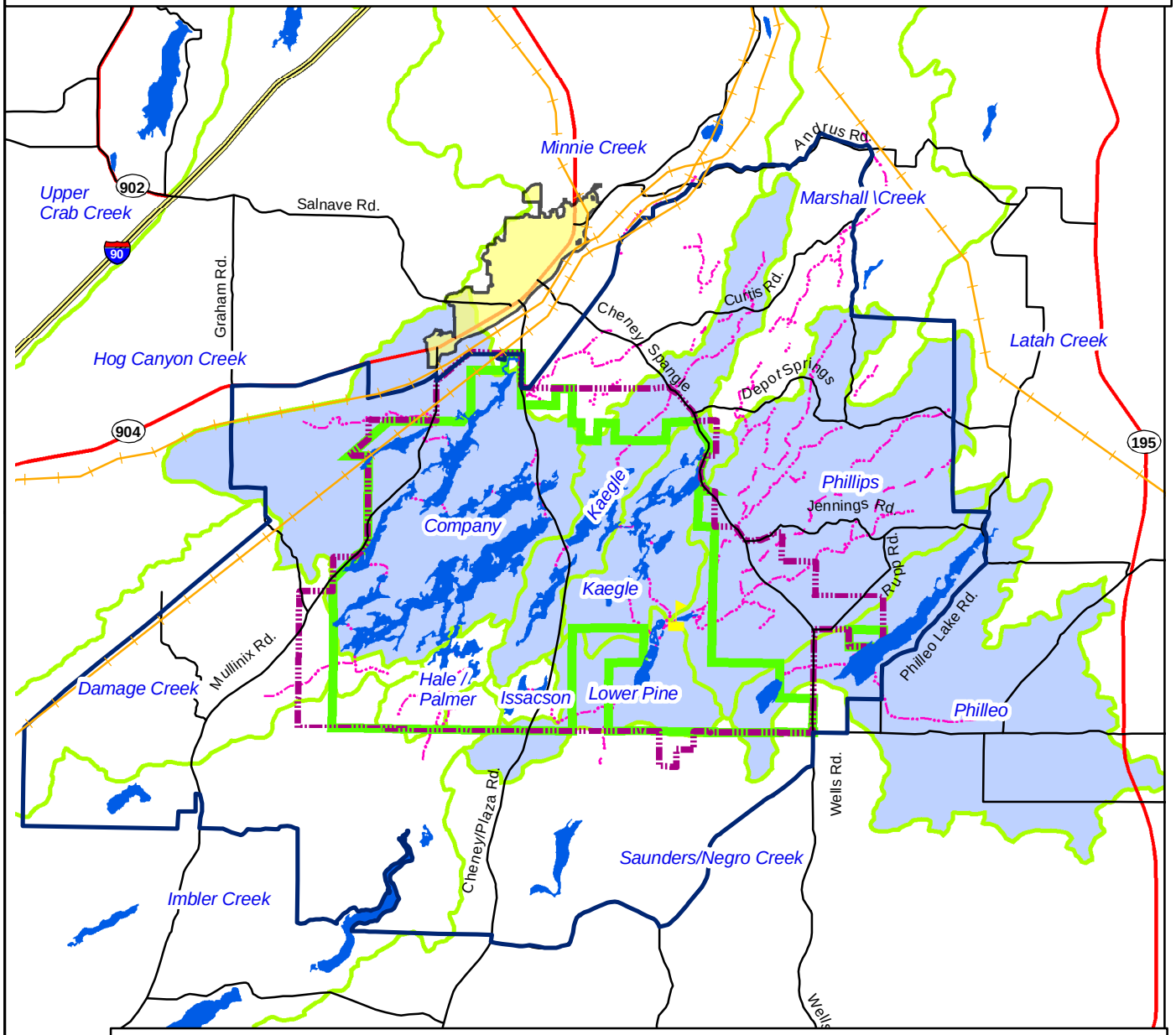
There are few known water control structures within the Study Area. Sixty percent of the wetlands within the Study Area continue to be drained annually through the ditch network providing pasture for cattle. Historically, these wetlands represented the larger, more permanent wetland basins such as those on the Refuge. Map 8 shows the distribution of drained and undrained wetlands within the vicinity of the Refuge.

Wetland Recharge: Because of the regional nature of the drainage system, surface water from several drained wetland basins on private land flow through a chain of Refuge wetlands to the south through the Rock Creek and Cow Creek drainages to the Palouse River. As a result, some Refuge wetlands receive supplemental water from these off-Refuge sources, and control structures allow limited management of water levels. Other wetlands that were drained occur at the "head" of a drainage system and do not receive supplemental water from other wetlands. The wetlands of the Refuge and the surrounding area

Table 3-1. *Regional Subwatersheds Affecting Refuge Wetlands*

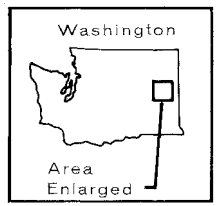
Drainage	Sub-Watershed Size Off-Refuge (acres)	Land Uses	Refuge Wetland Acres Affected
Company	4,397	Dairy, farming, livestock grazing, domestic	1,282
Kaegle	1,708	Livestock grazing, domestic, forestry	501
Phillips	6,973	Livestock grazing, domestic, forestry	120
Philleo	9,403	Dryland farming, livestock grazing	49

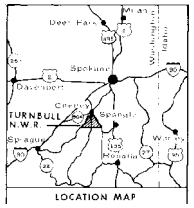
Map 7. Surface Watersheds and Drainage Features with Influence on Refuge



Source: Surface watersheds - Aerial photo interpretation from U.S. Geological Survey 1:24,000 quad maps by Mike Rule, USFWS. Drainage ditches: derived from USGS quad maps and USGS orthophotos.
Map produced by: U.S. Fish and Wildlife Service, 16507 SW Roy Rogers Rd., Sherwood, OR 97140 (503) 590-6596

TURNBULL NATIONAL WILDLIFE REFUGE DRAFT COMPREHENSIVE CONSERVATION PLAN 2005





LEGEND

- Subwatersheds draining into Refuge wetlands
- Other subwatershed boundaries
- Drainage ditches
- Deeper lakes
- Refuge Fee Title Ownership
- Existing Approved Refuge Boundary*
- Study Area
- City of Cheney
- Refuge headquarters
- County roads
- Railways

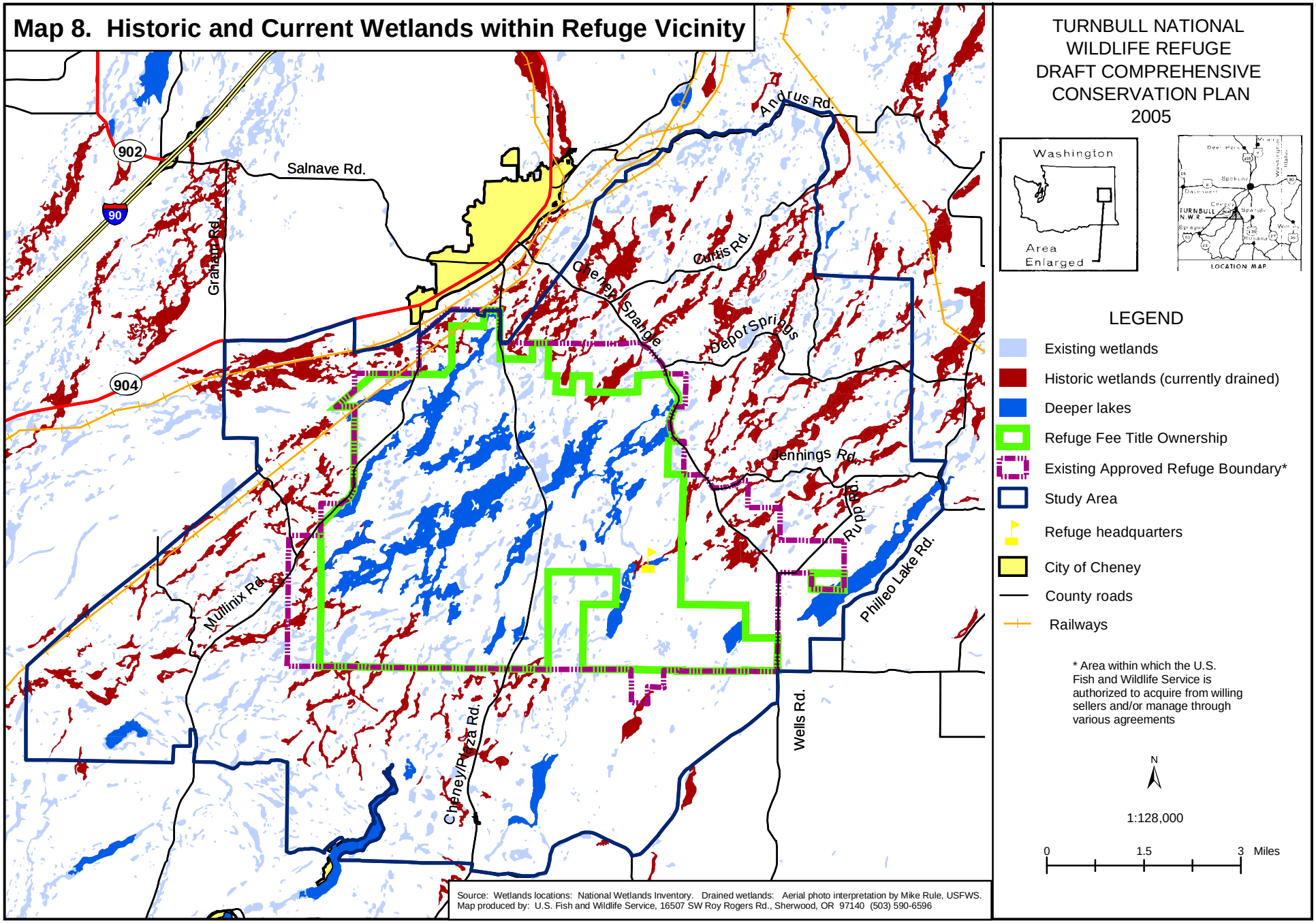
* Area within which the U.S. Fish and Wildlife Service is authorized to acquire from willing sellers and/or manage through various agreements

N

1:150,000

0 2 4 Miles

Map 8. Historic and Current Wetlands within Refuge Vicinity



receive water primarily from spring rains and snowmelt. Surface runoff is intermittent, localized, and generally ceases by late April. Wetlands not recharged by perennial surface water or groundwater sources begin to drawdown as a result of groundwater seepage and evapotranspiration beginning in May.

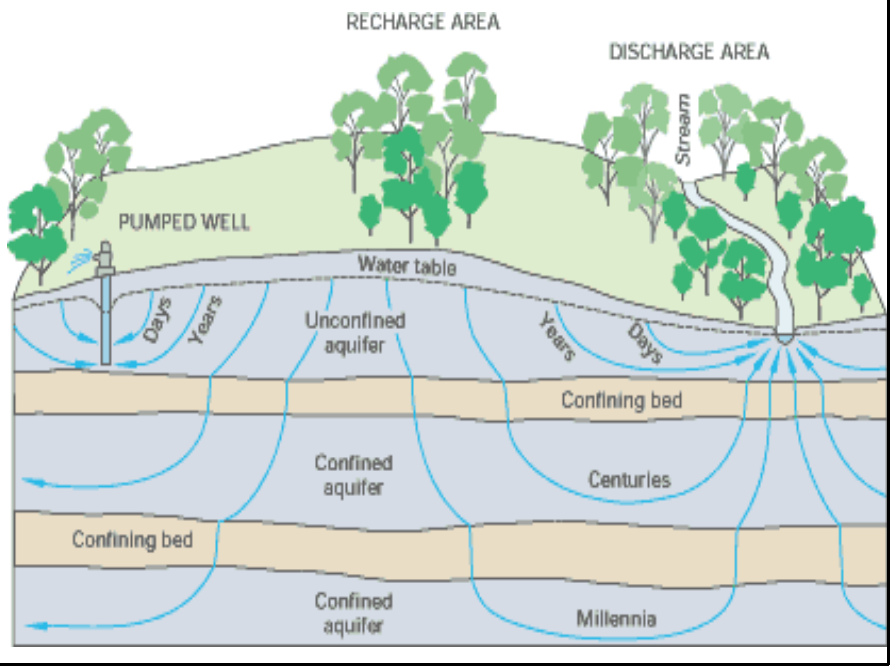
Within the Study Area, wetlands range in size from vernal pools less than 0.1 acres to large permanent wetlands over 400 acres in size. The average wetland density is 10 per square mile with nearly 16 percent of the landscape consisting of wetlands.

Groundwater

The groundwater system underlying scabland wetlands consists of three major formations in Miocene Basalts: a deep, confined aquifer (Grande Ronde Basalts), a shallow, unconfined aquifer (Wanapum Basalts), and a confining bed (Wanapum-Grande Ronde Interbed) comprised of fine sediments and clays that impede water movement between the shallow and deep aquifer (Vaccaro 1999). Both the Wanapum and Grande Round Basalts consist of numerous lava flows. The major water conductance and storage portions of these aquifers are at the contact zone of individual flows, which consists of rubbly basalt, cinders, and ash (Luzier and Burt 1974). The centers of individual flows are very dense and relatively impervious to water movement except along vertical fracture lines. The result is numerous water bearing layers of rock that are increasingly confined with depth. Since the Wanapum Basalts occur near the surface and the upper layers are relatively unconfined, water levels in this aquifer in general constitute the local water table. The major areas of recharge for these aquifers are along the northern and eastern edge of the Plateau including the Refuge area where outcrops of Wanapum basalts occur. Vertical recharge to the system is on the order of one to two inches per year (Vaccaro 1999).

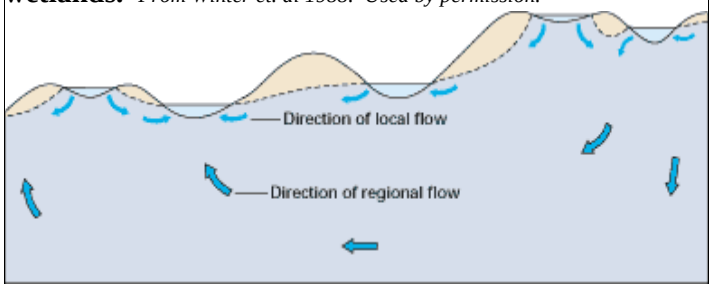
In the Refuge area, the basalt formations are relatively thin and highly variable as they pinch out near the edge of the plateau and amid ridges and humps of pre-Miocene granite. The Wanapum Basalts in this area range from less than one foot to 400 feet in thickness and the Grand Ronde Basalts range between 10 feet and 400 feet in thickness. The granite humps create a groundwater divide approximately two miles northeast of the Refuge (Luzier and Burt 1974). Southwest of the divide, groundwater flows slowly toward the Refuge and further southwest. Northeast of the divide, groundwater flows toward Hangman Creek and the Spokane River. The result of these conditions is a much lower

Figure 3. Graphical depiction of water flows between underground aquifers, recharge and discharge areas. *From Winter et. al. 1988. Used by permission.*



groundwater storage capacity and a smaller area of potential recharge which makes this area vulnerable to groundwater depletion from overuse.

Figure 4. Relationship of groundwater flows to wetlands. *From Winter et. al 1988. Used by permission.*



Most wetlands in the Channeled Scablands are directly influenced by groundwater as they are a surface expression of water levels in the underlying shallow, unconfined aquifer. The relationship of wetlands to groundwater depends on their topographic position. When wetlands occur near topographic highs, such as on ridges or the tops of buttes or plateaus, they tend to lose water to the shallow, unconfined aquifer and are often referred to as recharge wetlands. Wetlands or streams situated in regional lows generally receive inputs from groundwater and are called discharge wetlands. When wetlands are located at intermediate elevations, they can be both recharge and discharge wetlands (Winter et al. 1998).

When water levels decrease in the unconfined, shallow aquifer as a result of drought or pumping, the water table declines (Heath 1998). Groundwater recharge from wetlands will then increase and discharges to wetlands will decrease (Winter et al. 1998). The result is shallower, temporary wetlands more prone to drought. Marsh edge species, including introduced species such as reed canary grass, then encroach into the basin. This negatively affects the production of waterfowl and other waterbirds by decreasing the number of acres of open water and brood rearing habitat in summer.

Recent monitoring of the groundwater and wetland water levels on the Refuge has clearly demonstrated that wetland water levels are supported through the summer months by inflow from the shallow water table (Roland 2000). Based on the general direction of groundwater flow, the area that influences the Refuge's groundwater supply extends off the Refuge approximately one mile north and east, and one half mile south and west (Map 9).

This means that groundwater pumping within this zone has the potential to directly affect wetland levels on the Refuge.

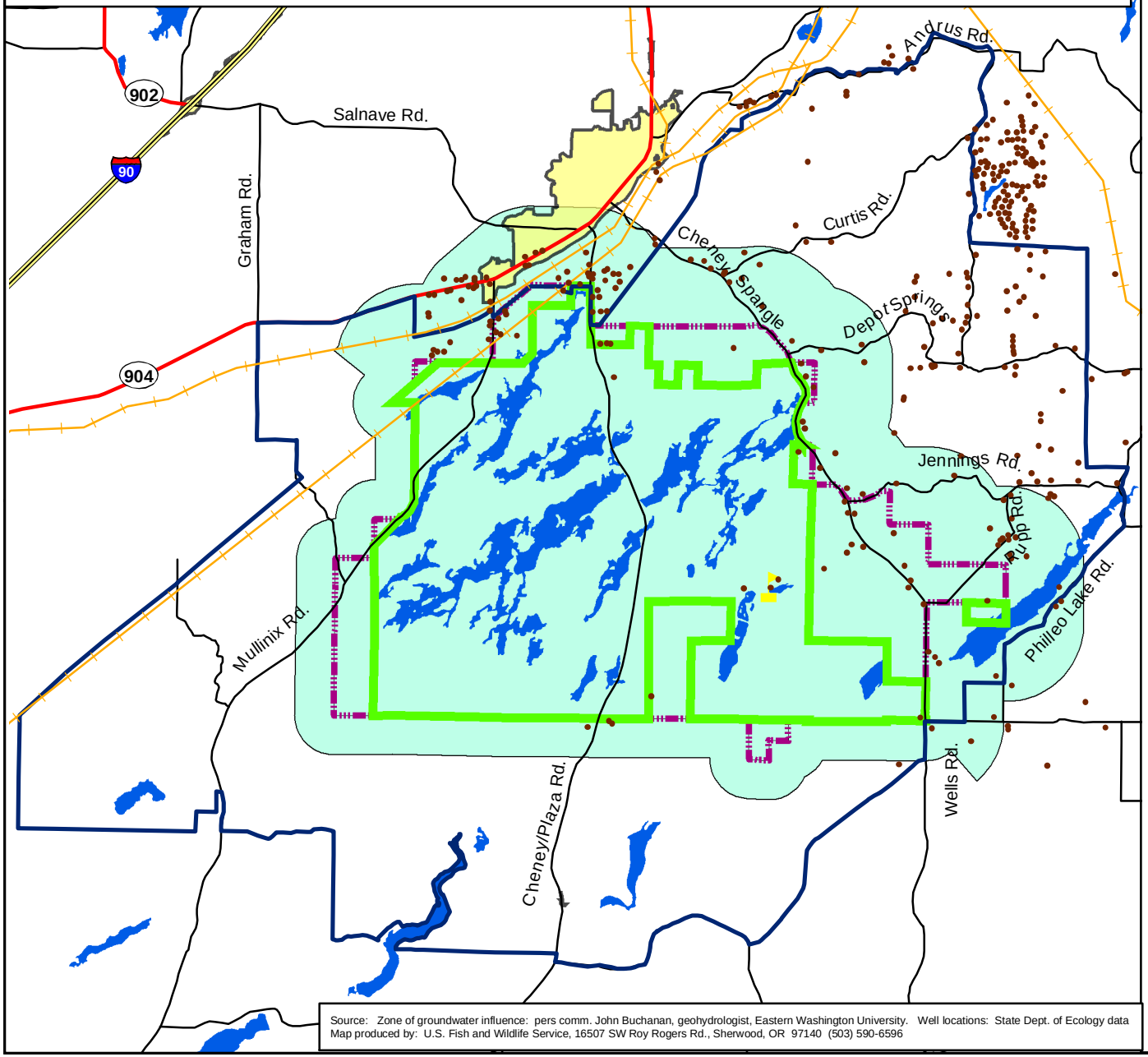
Water Use and Water Rights

Groundwater: There are at least 200 wells located within one mile of the Refuge boundary (Map 9). Most of these are located northeast of the Refuge and are small domestic systems that do not trigger a permitting and review process for drilling or annual use. Most of these wells are removing water from the shallow Wanapum Basalts aquifer.

Groundwater pumping within one mile of the Refuge boundary has the potential to directly affect Refuge wetlands.

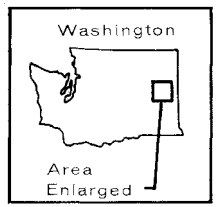
In addition to these numerous small domestic wells, the city of Cheney has recently added additional deep municipal wells that penetrate into the lower aquifer (Grande Ronde Basalts). Although this aquifer is confined primarily by the Wanapum -Grande Ronde Interbed, "vertical conductivity" (or passage of water between aquifer layers) does occur in the shallower Wanapum Basalts. To clarify, when drill holes penetrate the shallow aquifer to reach the deeper aquifer, water cascades from the shallow aquifer down to the lower aquifer. Major declines in the shallow Wanapum aquifer could have long-term impacts on the local water table. "Casing" the well can prevent water from cascading down the drill hole.

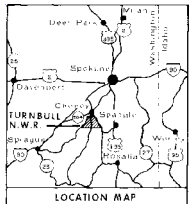
Map 9. Groundwater Zone and Features with Influence on Refuge Wetlands



Source: Zone of groundwater influence: pers comm. John Buchanan, geohydrologist, Eastern Washington University. Well locations: State Dept. of Ecology data
Map produced by: U.S. Fish and Wildlife Service, 16507 SW Roy Rogers Rd., Sherwood, OR 97140 (503) 590-6596

TURNBULL NATIONAL WILDLIFE REFUGE DRAFT COMPREHENSIVE CONSERVATION PLAN 2005





LEGEND

- Zone of groundwater influence on Refuge
- Wells **
- Deeper lakes
- Refuge Fee Title Ownership
- Existing Approved Refuge Boundary*
- Study Area
- Refuge headquarters
- City of Cheney
- County roads
- Railways

* Area within which the U.S. Fish and Wildlife Service is authorized to acquire from willing sellers and/or manage through various agreements

** Wells are not mapped completely here. There are additional existing wells not shown.

N

1:128,000

0 1.5 3 Miles

Most of the current and future domestic and industrial development in the area is reliant on groundwater withdrawals from the local shallow aquifer. The number of new wells and the lack of regulations to curb groundwater "mining" pose a threat to the shallow aquifers in the area. Using the aquifer's water faster than its recharge rate will result in lowering the water table.

Surface water: The Service has claims on all major drainages flowing onto the Refuge but only five water rights have been adjudicated. Hence, the majority of the Refuge's water rights are still unadjudicated claims. The State of Washington has no immediate plans to complete the adjudication of claims in this area. It will likely be many decades before the Refuge has a final determination of its water rights. Although the Refuge's claims are valid water rights, which allow for the diversion and use of water in the Refuge wetlands, the State's water rights process does not provide protection for unadjudicated water rights. Therefore, the existing surface water supply is neither protected nor reliable. This, coupled with an increasing population and the fact that most scientists agree that the global warming trend will continue and could cause a drying effect in this area, causes concern about maintaining and protecting the local surface water supply.

Landowners to the east of the Refuge have stated that they are unwilling to continue to maintain levees on Rock Creek. Disintegration of the levee system will cause Rock Creek to flood out of its banks and greatly reduce the water flow to Stubblefield Lake (a unique playa lake) on the Refuge. In addition, the Philleo Duck Club has a water right claim on Rock Creek. If adjudicated, this right could result in a water diversion to Philleo Lake and less water for Stubblefield Lake. The loss of an adequate water supply to Stubblefield Lake would lead to a significant loss of waterfowl and waterbird maintenance and production habitat.

Water Quality

Until recently, little water quality information was available specific to the Refuge's watersheds. Over the past 30 years, bodies of water in the Pine Creek Drainage of the Refuge have consistently supported extensive mats of algae. Refuge records note several accounts of fish kills frequently attributed to oxygen depletion from large standing crops of respiring and decaying algae. The most recent die off occurred in 1987, caused by low dissolved oxygen concentrations coupled with high ammonia nitrogen, a toxic combination.

Negative effects from excessive algal production and associated changes in water quality are not limited to lethal effects on fish. Dense algal mats compete with submerged aquatic plant species for light and space resulting in decreased biomass and seed production. The roots, seeds and foliage of submerged aquatic plant species are important food resources for many waterfowl species and other wetland dependent wildlife. These plants are also an important substrate for aquatic invertebrate species that are the most important source of protein and fat for prefledging waterfowl. These dense mats of algae also prevent young waterfowl from physically accessing important foraging areas.

In response to this problem, a study was initiated in 1991, under contract with Eastern Washington University. The major goal of this study was to determine if nutrient loading from off-Refuge sources was significantly impacting Refuge waters, and if the enrichment was substantial enough to support excessive algal growth. The study looked specifically at two major drainages that enter the Refuge through private lands, the Kaegle System and the Phillips System, both of which contribute to the Pine Creek System. The study found that nutrient concentrations were higher in the Pine Creek drainage on the Refuge than off the Refuge, and that nutrient loads tended to increase as the flow proceeded through the Pine Creek wetlands. Nutrients were possibly

contributed by other surface inflow, groundwater inflow, and/or sediment release from past nutrient inputs to wetlands. Conclusions on source were limited by the sampling scheme and the low run-off conditions that year. In the Kaegle Ditch System, nutrient levels were found to be higher just inside the Refuge boundary than in the upper part of the drainage. Livestock grazing practices and cattle feedlots off-Refuge appear to be responsible for these elevated levels.

In 2002, a more extensive nutrient study was undertaken to determine if nutrient loads have changed significantly since 1991, evaluate the effectiveness of remediation actions taken in the Pine Creek System, and monitor other surface water inflows not studied in 1991. Preliminary results indicate that water entering the Refuge from both Company Ditch to the northwest and Philleo Ditch to the southeast are carrying total phosphorus and nitrogen concentrations several orders of magnitude higher than the mean concentrations in either the Phillips and Kaegle System or in Refuge wetlands with no inputs from private land. Company Ditch originates below a dairy and the Philleo Ditch redirects Rock Creek whose watershed is dominated by dryland agriculture. Water entering the Refuge from the other two drainage systems flow through a series of drained wetlands that are used for hay and pasture.

The proximity and growth of Spokane, Cheney, and other communities in the Spokane metropolitan area has the potential to affect the quality of both groundwater and surface run-off waters. Septic systems continue to be the primary method of domestic waste disposal in the area. Increased septic system loading increases the potential for non-point source pollution of groundwater that ultimately feeds Refuge wetlands.

3.1.4 Air Quality

Air quality is a particularly sensitive issue within the region surrounding the Refuge. Portions of Spokane County have been designated as non-attainment areas for PM_{10} (particulate matter 10 microns or less in size) under the provisions of the Clean Air Act (Public Law 95-95). The Clean Air Act established "National Ambient Air Quality Standards" and allows the states primary jurisdiction in air quality management. Under the act, states are required to identify areas which have air pollutant levels not meeting national standards (non-attainment areas) and develop regulations and a state implementation plan to bring these areas into compliance. Significant sources of particulate matter in the region are silvicultural and agricultural field burning, dust from gravel and dirt roads, automobile emissions, windblown dust from tilled agricultural fields, smoke from wood burning stoves and fireplaces, and burning of yard waste.

3.1.5 Contaminants

There are no known sources of contaminants within the current Approved Refuge Boundary. Four sites have been identified in proximity to the Refuge that are potential sources of contamination. These include an auto-wrecking yard, a dairy, a heavy equipment training school, and an old crop-duster airstrip. Specifics are not known at this time. Contaminants associated with agricultural lands, old homesteads, and confined animal operations are likely present on some properties.

3.2 REFUGE AND STUDY AREA HABITATS

The Study Area straddles the Northeast and Columbia Basin Ecoregions of Washington state, as defined by the Washington State Gap Analysis (Cassidy et al. 1997a). The Northeastern Corner Ecoregion is characterized by extensive areas of coniferous forests. The Columbia Basin Ecoregion consists primarily of steppe communities, large portions of which have been converted into agricultural fields.

3.2.1 HABITAT TYPES

Wetlands

As discussed in more detail above in the Hydrology section, approximately 7,110 acres of wetland habitat are located in the Study Area. They range from tiny vernal pools to large permanent wetlands over 400 acres in size. There is a great diversity of plant species found in these wetlands, dictated by water depth and the length of time a portion of a wetland basin is flooded.

The Study Area includes numerous historically permanent and semi-permanent wetlands that were drained in the 1920s and have subsequently been used for ranching. Since peat soils and a cold growing season create unfavorable conditions for farming, most of these former wetlands were farmed for only a few years and then converted to pasture. The larger basins have low spots where remnant wetland plant communities persist. Restoration could be easily and inexpensively accomplished by plugging the drainage ditches and allowing the natural basins to flood.

The potential of the Channeled Scablands vicinity to support wetland habitats and species is potentially very high. Figure 5 compares a 7.5 minute quadrangle (area = 32,345 acres) within the local vicinity of the Channeled Scablands with a 7.5 minute quadrangle (same area) within the Prairie Pothole region in the north-central United States and Canada, an area renowned for its waterfowl. The analysis shows that the Channeled Scablands rival or exceed the Prairie Pothole Region for wetland depth, size, and abundance in almost every category. Additionally, the Channeled Scablands had a greater proportion of the land in wetland area. In areas such as the Refuge where the Refuge complex is still intact, duck breeding pair densities of several species is actually greater than in the Prairie Pothole region, which is globally known for its waterfowl production.

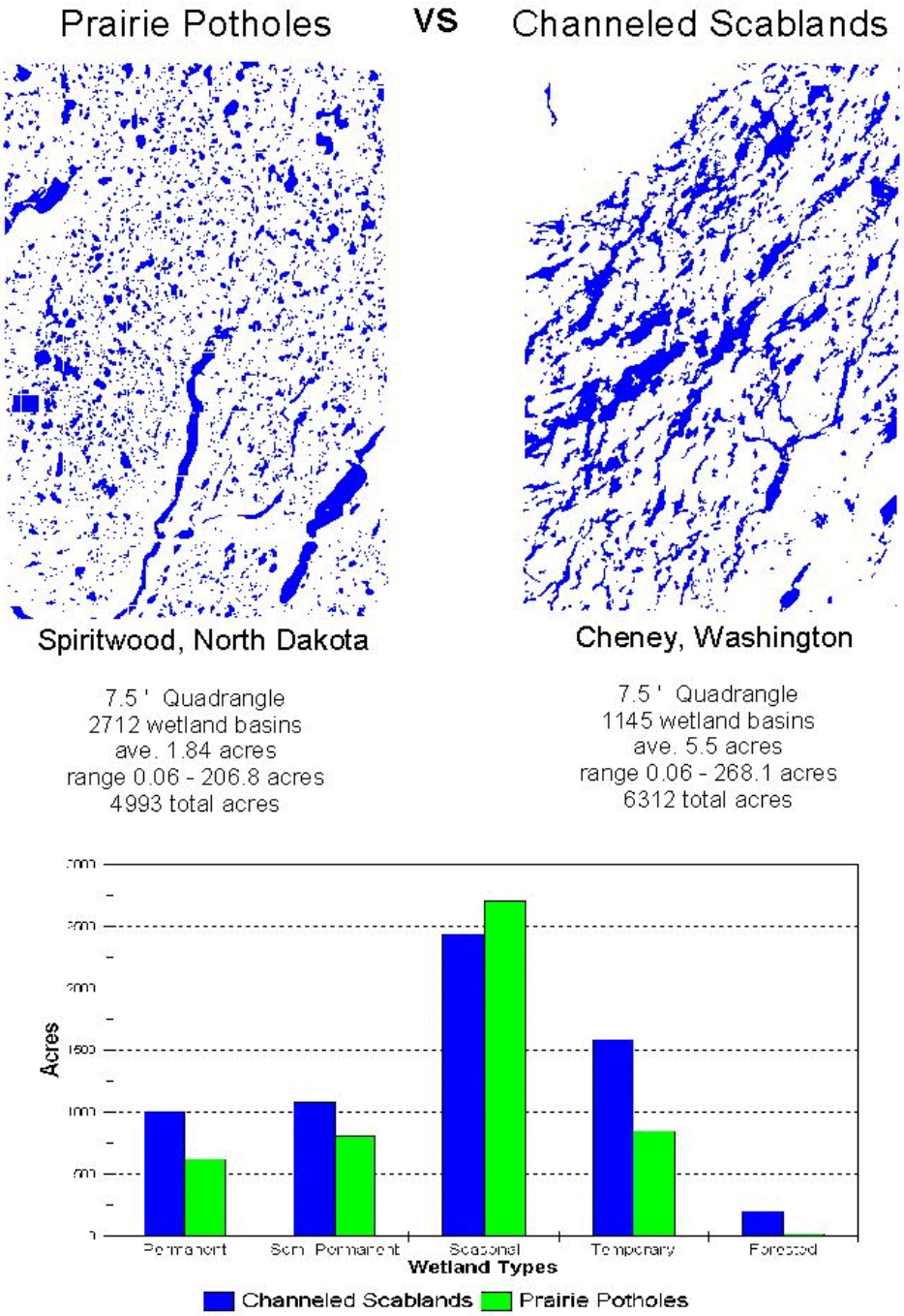
Vernal pools are a unique ephemeral wetland type located in the Palouse steppe portions of the Study Area that warrant special consideration. Vernal pools occur in shallow depressions with a perched water table. Standing water is usually present for less than two months in most years. Because of the relatively short lived nature of these wetlands they are host to a unique plant (Bjork 1997) and animal community (Rabe 1997).

The small, semi- permanent wetlands of the Channeled Scablands also support the threatened plant species, water howellia (*Howellia aquatilis*). The Refuge and vicinity support one of the largest known metapopulations of this species within its range (Shelly and Gamon 1996). Although very little of its potential habitat has been surveyed in the Refuge vicinity, there are numerous wetlands that have the same attributes of the known occurrences within the Study Area. Expanding the number of protected sub-populations would further conserve this meta-population.

The Refuge also falls within the suspected range of Ute ladies'-tresses (*Spiranthes diluvialis*), an orchid species federally listed as threatened. This species was discovered in Washington State for the first time in 1997. It is found in wetland and riparian areas generally below the lower margin of montane forest in transition , open shrub and grasslands zones. The species is found in early and mid-seral communities, usually in relatively open vegetation with sparse canopy in full sun to partial shade.

Ute ladies'-tresses has not been documented on the Refuge. Several plant surveys have been conducted on the Refuge since 1984 without documenting its presence. Hooded ladies'-tresses *(Spiranthes romanzoffiana*), a similar species, has been found on the Refuge. Suitable habitat may occur here, but is generally dominated by reed canarygrass. This invasive grass species forms a dense thatch layer that can prevent the germination and growth of herbaceous plant species such as Ute ladies'-tresses which appears to require early

Figure 5. Comparison of Channeled Scablands Wetlands Density, Size, and Type with Prairie Potholes Region.



successional habitats. It is unlikely that it occurs on the Refuge.

Aspen/Deciduous shrub Riparian Forests

Approximately 380 acres of aspen forests occur within the Study Area. Map 10 shows the distribution of aspen habitat within the Refuge vicinity.

Aspen communities, including waterbirch, alder, and hawthorn, occur mostly as narrow bands along the edge of meadows and large sloughs, and around the margins of pothole wetlands. Aspen dominated stands are a critical resource for wildlife species requiring both cavities and deciduous foliage in tree and shrub canopies for breeding and foraging.

This habitat has been significantly reduced in the Refuge vicinity by competition from encroaching ponderosa pine and the suppression of aspen and shrub regeneration by grazing livestock. In recent years, a growing Rocky Mountain elk population may have been contributing to this problem (see further discussion in Section 3.4). Many of the existing stands are dominated by overmature trees with little regeneration. In the past, periodic fire removed encroaching pines and encouraged regeneration of aspen and understory shrubs.

Grasslands (Steppe)

Approximately 11,955 acres of open grasslands (or areas that can be restored to open grasslands) occur within the Study Area. Map 11 shows the location of current steppe habitat and former (historic) steppe habitat in the Refuge vicinity.

The open grassland habitats of the Study Area fall into a broad category of plant associations referred to as Palouse steppe (also known as "meadow steppe"). Meadow steppe plant associations form a chain around the periphery of the Columbia Basin Ecoregion between areas of extensive forests to the north and east and the drier shrub-steppe areas of the lower Columbia Basin. These plant associations occur on two distinct landforms, the rolling Palouse Prairie hills, and the unique "biscuit and swale" patterned ground of the Channeled Scablands. The Idaho fescue/common snowberry *(Festuca idahoensis and Symphiocarpos albus* respectively*)* association is common to both landforms, and together with other plant associations found in the grasslands, can support a diverse community of native plant species including some that are endemic to the northern Columbia Basin. One of these species, Spalding's silene, is a federally listed threatened species. Several populations have been located on the Refuge and the surrounding area on remnants of high quality steppe.

Nearly 90 percent of the original Palouse Prairie steppe habitat has been converted to dryland farming (Cassidy et.al. 1997a). The extent of this loss places this ecosystem on the list of critically endangered ecosystems in the United States (Noss et.al. 1995). Most of the remnant Palouse Steppe is found in small fragments on north slopes too steep for plowing or within the "biscuit and swale" land form of the Channeled Scablands. The Study Area includes approximately 1,000 acres of land with the potential to restore from farmed agricultural use back to functioning steppe habitat.

Although 54 percent of the remaining steppe habitat within the Study Area is in good ecological condition, many acres have been impacted through partial conversion to agriculture, rural development, introduction of exotic species and heavy grazing. Reductions in livestock grazing, control of exotic species, restoration of farmed areas and minimizing further subdivision would greatly improve habitats for these species as well as protect rare vernal wetland habitat and the habitat of Spalding's silene.

Washington State completed its first GAP analysis in 1997. GAP analysis seeks to identify habitat types and species not adequately represented in the network of areas managed for biodiversity. Vegetation is used as the primary filter in GAP analysis, because vegetation

patterns are determinants of overall biodiversity patterns (Levin, 1981; Noss 1990, Franklin 1993). Gap analysis assumes that most plant and animal species will be adequately represented if all vegetation types are adequately represented in biodiversity management areas.

According to the Washington Gap Analysis (Cassidy et al. 1997), "the most glaring gap in the protection of biodiversity in Washington is in the steppe zone." The Gap Analysis delineated each vegetation type in the state, determined the percentage of each vegetation zone under different land protection management and compiled the information into an overall Conservation Priority Index (CPI) to sift out the vegetation zones most lacking in protection. The Palouse Steppe rated highest of all vegetation types in Washington on the CPI index. The Gap Analysis authors stated:

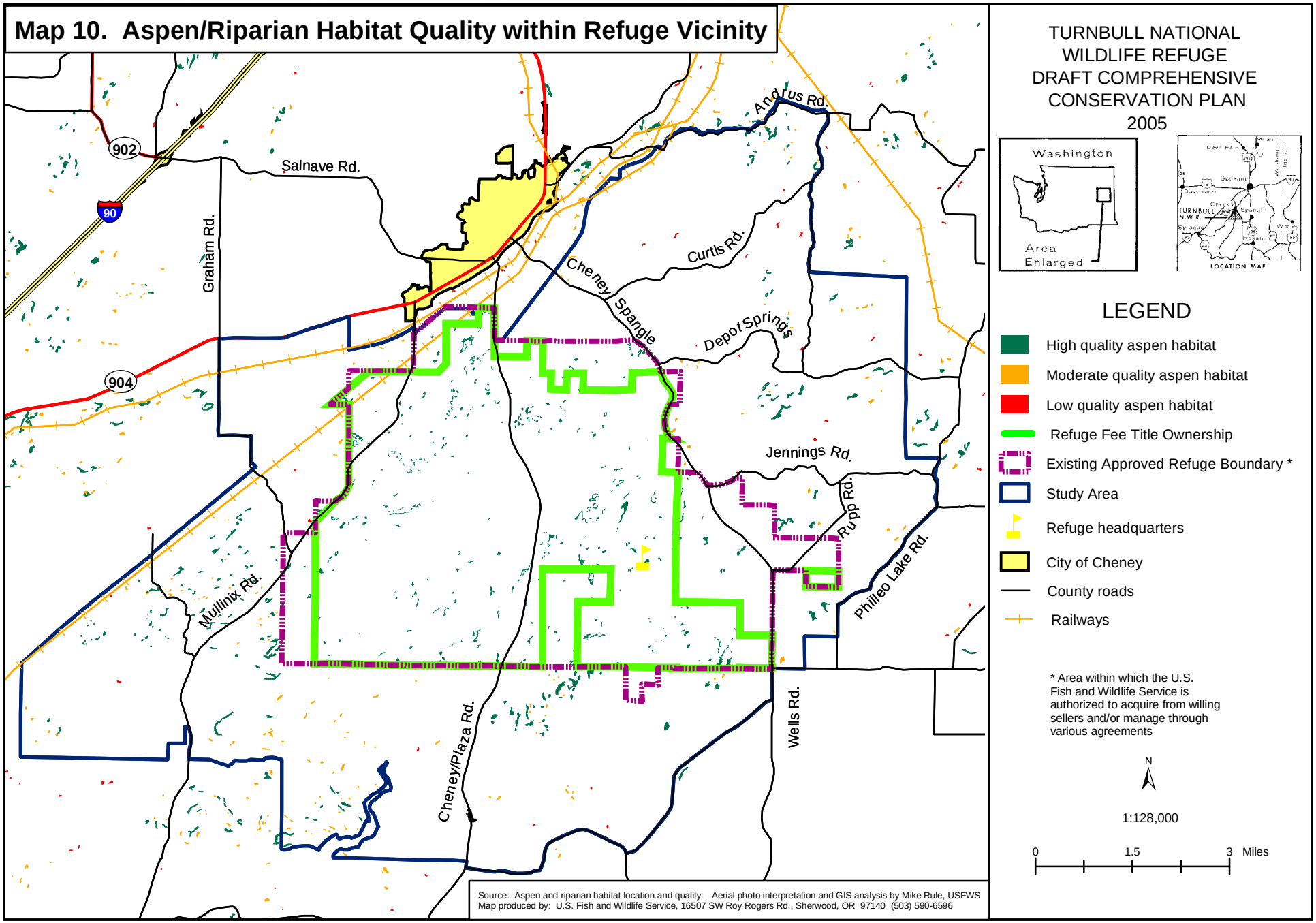
> *With this CPI, the Palouse is ranked, by far, as the zone with the highest conservation priority because of the small percentage of its area on protected land, its near total conversion to agriculture, and its moderately large size. (Volume 5, p. 78)*
>
> *Because of the high CPI of the Palouse, lands in the Palouse zone should also be an acquisition priority. Since there are virtually no Palouse grasslands left to acquire, acquisition would have to be accomplished by restoration. The restoration of Palouse lands, if attempted, would be an excellent joint project between the Refuge and researchers interested in restoration.*

Ponderosa Pine Forests

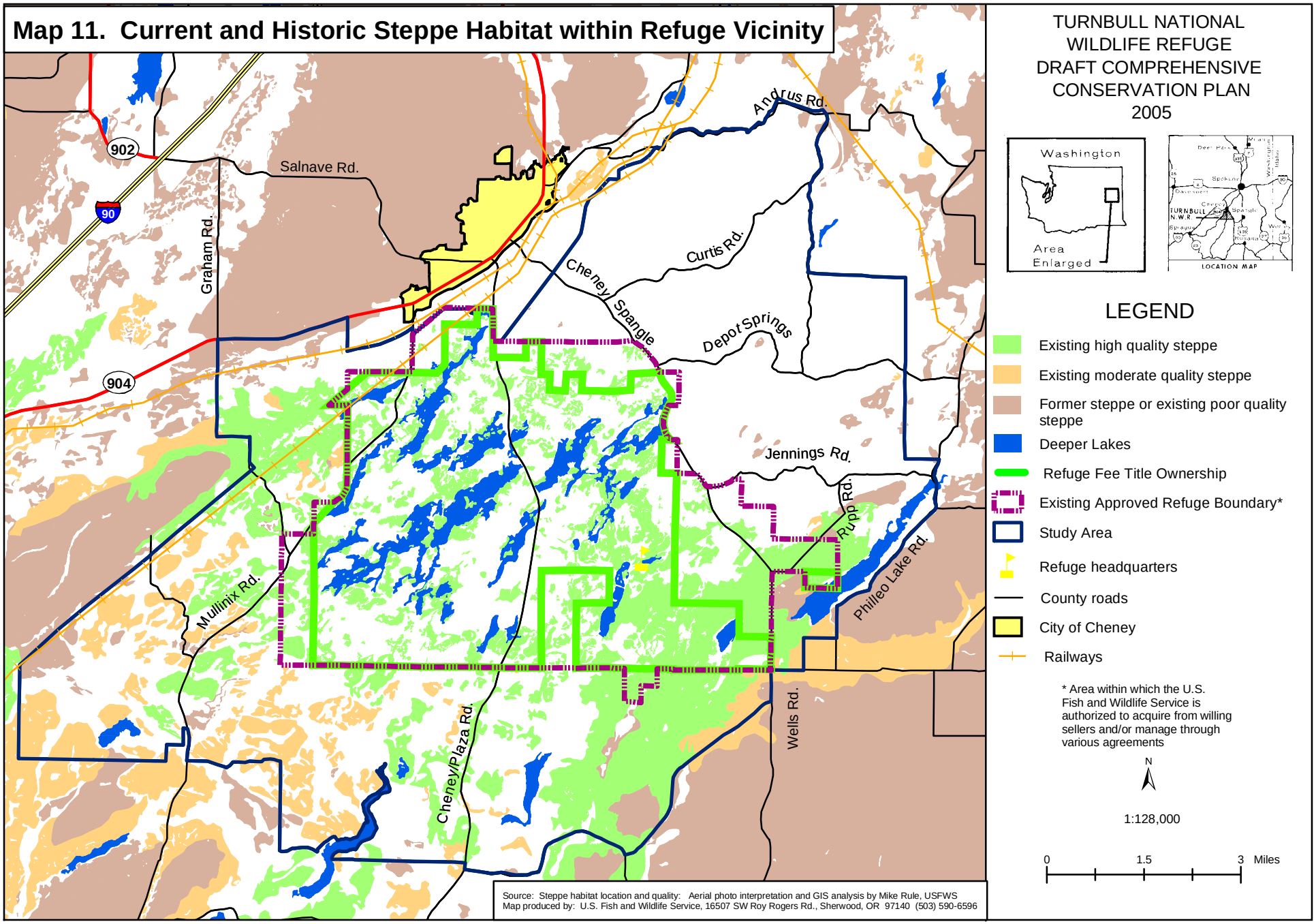
Approximately 20,090 acres of ponderosa pine forests occur within the Study Area (Map 12). The shallow rocky soils of the flood channels provide an avenue for a narrow extension of the Ponderosa Pine Zone of the Northeast Corner Ecoregion into the steppe habitats of the Columbia Basin.

The two pine associations found in the Study Area are ponderosa pine (*Pinus ponderosa*) /Idaho fescue and ponderosa pine/snowberry (Daubenmire 1952 and Franklin and Dyrness 1973). The distribution of these associations is influenced primarily by soil moisture regime. The ponderosa pine/fescue occurs on drier sites with shallow rocky soils. These stands are often found on flat to gently sloping terrain and the low ridges between wetland drainages. The understory is comprised of an abundance of other perennial grasses and perennial forbs including bluebunch wheatgrass, Sandberg's bluegrass, prairie junegrass *(Koeleria cristata),* arrowleaf balsamroot, grass widow *(Sisyrinchium inflatum),* deer vetch *(Lotus nevadensis),* and fringecup. Canopy cover is typically less than 50 percent. The ponderosa pine/snowberry association is found mostly in shallow depressions, at the bottom of slopes near wetlands, and on the north aspects of basalt bluffs. Soils are deeper, less well drained and consist primarily of silt loams of the Hesseltine complex. The understory of this association can consist of a dense growth of common snowberry, Wood's rose, bearberry *(Arctostaphylous uva-ursi*), and Oregon grape *(Berberis repens)* with a suppressed herbaceous layer consisting of bluebunch wheatgrass, several *Poa* species, pinegrass (*Calamagrostis rubescens*) and starry Solomon-plume (*Smilacina stellata*). In wetter sites, pinegrass can assume dominance of the herbaceous layer. Associated herbaceous species may include rhizomatous bluebunch wheatgrass, starry Solomon-plume, cinquefoil *(Potentilla gracilis)*, and strawberry *(Fragaria vesca*). At the edge of wetlands and in deeper depressions, a tall deciduous shrub layer may occur, comprised of such species as *Spiraea sp.,* serviceberry *(Amelanchier alnifolia),* chokecherry *(Prunus virgiana),* golden currant *(Ribes cereum),* and Wood's rose. Quaking aspen, mountain alder (*Alnus incana),* and water birch *(Betula occidentalis)* may also be represented in the understory. Trees on these sites grow quickly and tend to be more densely stocked due to the uniform nature of the soil and higher moisture

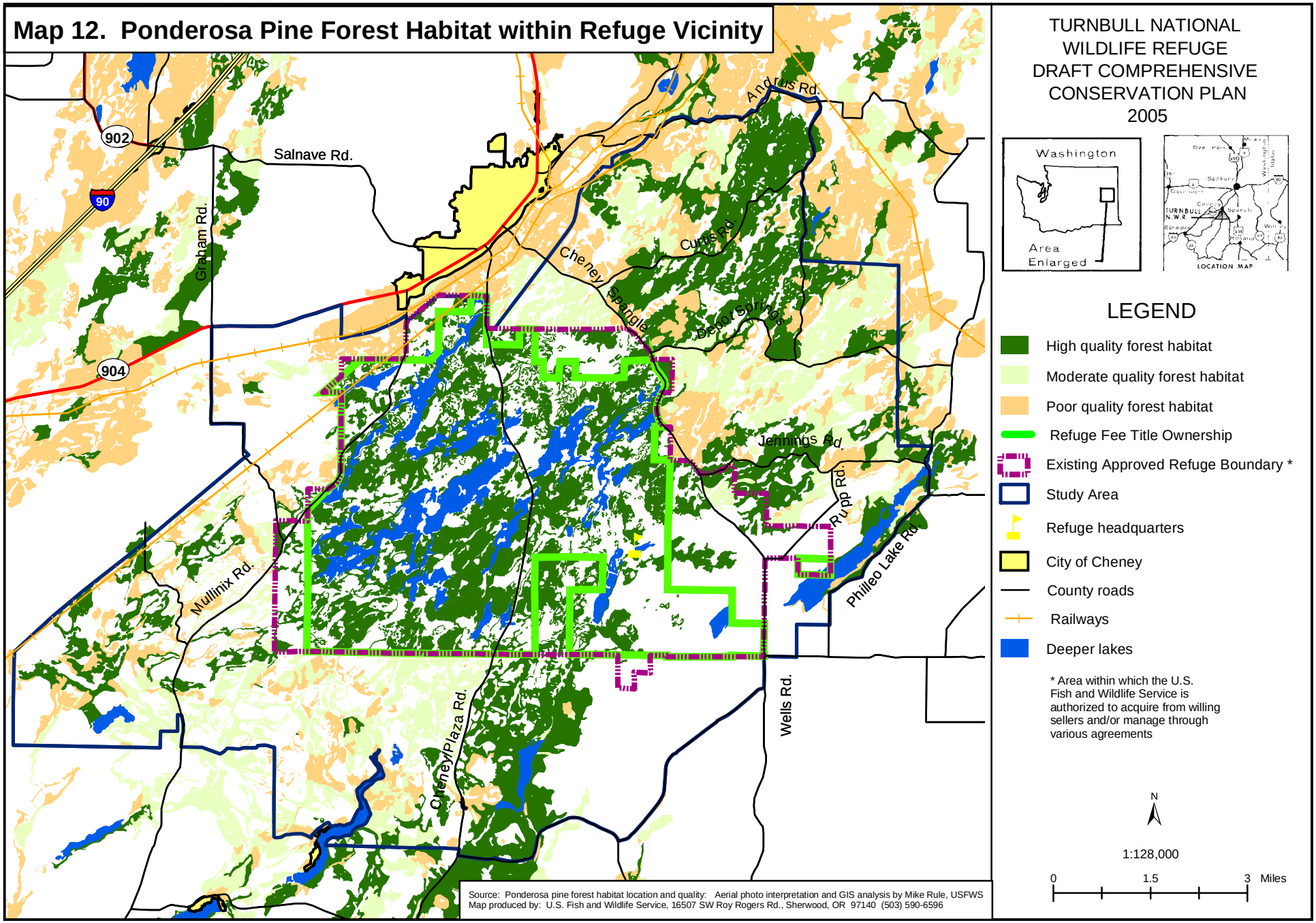
Map 10. Aspen/Riparian Habitat Quality within Refuge Vicinity



Map 11. Current and Historic Steppe Habitat within Refuge Vicinity



Map 12. Ponderosa Pine Forest Habitat within Refuge Vicinity



conditions that reduces fire frequency. Canopy cover on these sites often exceeds 50 percent. Within the Study Area these associations are intermixed on uplands with both steppe and edaphic climax plant associations.

Although ponderosa pine is a widespread ecosystem, most large-diameter, late-seral ponderosa pine trees are now gone from their former range throughout the Western states, lost to timber harvest and the changes in fire regimes. Timber harvest has severely affected these habitat types because of the high value of the trees and the fact that, located at lower elevations, these habitats have been more accessible than higher elevation types. Fire exclusion has also played a role in the loss of this habitat, as fire exclusion has resulted in a gradual shift in stand composition from shade-intolerant tree species such as ponderosa pine to shade-tolerant species such as Douglas-fir and grand fir.

Less than 4 percent of the ponderosa pine habitat within Washington State is included in lands where conservation of biodiversity is the primary objective (Cassidy et al. 1997). Species such as white-headed woodpecker, white-breasted nuthatch, pygmy nuthatch, and Lewis' woodpecker are strongly associated with large diameter ponderosa pine trees. Within the entire Interior Columbia River basin (an area covering most of the states of Oregon, Washington, and Idaho as well as a good quarter of Montana and portions of Nevada and Utah), "source habitats" (habitats in good enough condition to provide for successful breeding) for these species have declined about 50 percent for the first three species and 85 percent for the Lewis' woodpecker (Wisdom et.al. 2000). Within the basin, late-seral, large-diameter ponderosa pine habitats have declined 81 percent decline from historic levels (Hann et al, 1997; Wisdom et al, 2000). The magnitude of decline in historical vegetation structure and composition has been greater for this forest habitat type than for any other forest habitat types in the Interior Columbia Basin. As a consequence, the suite of species dependent on this cover and structural type is among those considered at highest risk within the Basin (Wisdom et al, 2000).

For more site-specific analysis, the authors of the Interior Columbia Basin Asssessment divided the 145-million acre basins into smaller areas known as Ecological Reporting Units (ERUs). The Turnbull NWR and its Study Area straddle two ERUs, each of which show declines even greater than that seen basin-wide for the late-seral ponderosa pine cover type. In the Northern Glaciated Mountains ERU (17.6 million acres), which includes part of the northeast section of the Study Area, late-seral, single layer ponderosa pine has declined from historic levels by 99.3 percent. In the Columbia Plateau ERU (24.3 million acres), where the rest of the Study Area is located, late-seral, single layer ponderosa pine has declined from historic levels by 93.9 percent. (Data from Hann, et al. 1997).

Within the Study Area, only 40 percent of the ponderosa pine forest stands are considered high quality wildlife habitat. These high quality stands have a mature tree component, and they are contiguous with existing Refuge stands and relatively unfragmented. The remaining pine forests in the Study Area have been degraded through logging and the suppression of fire. The results are overstocked stands of suppressed second growth that is at risk for loss by wildfire, insects and disease and that provides only marginal habitat for wildlife . Many of these lower quality stands have been fragmented by rural development, clearing for agriculture and road and fence construction.

3.2.2 Major Wildlife Values

Based on the distribution of habitats within the Study Area, Refuge information, and modeling performed by Washington State Gap Analysis (Grue et. al. 1995), 7 amphibian species, 10 reptile, 45 mammal and 203 bird species are predicted to occur within the Study Area. Among these species are several with special conservation status including federally listed, proposed and candidate species, as well as many

State listed species and others of management concern (Table 3-2).

Wetland Wildlife

Located within the Pacific Flyway, the large, historically permanent wetland basins within the study area are shallow flooded in the spring providing migration habitat for peak waterfowl populations of over 100,000 birds, principally mallards, northern pintail and American widgeon. In addition, as many as 2,000 tundra swans utilize the same wetlands in the spring. These concentrations of birds also attract bald eagles in moderate numbers. Numerous undrained wetlands currently provide breeding habitat for 17 waterfowl species, numerous marshbirds including sora, Virginia rails, American bittern, and black terns, yellow-headed black birds and Columbia spotted frogs.

As these same wetlands naturally drawdown in late summer they also provide important shallow foraging habitat along their shorelines for up to 25 species of migrating shorebirds such as the western, least and Baird's sandpiper, greater and lesser yellow-legs, and long-billed dowitchers.

The few existing undrained large permanent wetlands found in the Study Area provide important fall migration and wintering habitat for waterfowl and bald eagles until freeze up in late November. At the current time, fall waterfowl habitat within the Study Area is very limited as a result of extensive drainage of the large, historically permanent wetland sloughs in the early 1900s. Over 70 percent of the wetlands in this area have been drained. The remaining fall habitat occurs on the Refuge and on Refuge and on several deepwater lakes in the vicinity of the Refuge. As a result of the extensive drainage of fall migration habitat in the Refuge vicinity and extensive development of irrigation wasteways and agriculture in the central Columbia Basin, much of the fall waterfowl migration has shifted west of the Refuge. Increases in waterfowl use of the Refuge in the fall during above average precipitation years, however, indicate that restoration of fall migration habitat would likely increase waterfowl populations in this area.

Restoration of the large, drained wetland basins in the Study Area would increase breeding habitat for all of the above-mentioned species especially redheads, lesser scaup, and black terns. These restored wetlands would significantly increase the amount of fall migratory waterfowl and shorebird and wintering bald eagle habitat that is currently limited in the area surrounding the Refuge.

Steppe Wildlife

The Palouse steppe habitat in the Study Area has the potential to support substantial populations of several ground nesting passerines including the grasshopper, savannah and vesper sparrows. Many of these species are experiencing declining population trends regionally and have been identified as species of concern (Table 3.2).

These habitats also support large small mammal populations including the Columbia ground squirrel, Great Basin pocket mouse, vagrant shrew and northern pocket mouse. This abundant prey base supports a diverse community of predators consisting of several raptor species, coyotes, and badgers.

Aspen/Riparian Wildlife

Aspen and riparian habitats support the highest diversity of wildlife species of all habitats within the Study Area. Sixty-five of the 124 breeding birds in this area frequent the aspen and deciduous shrub riparian plant communities for either reproduction or foraging. The aspen community type is the primary foraging and breeding habitat for ten of these species, including the willow flycatcher, yellow warbler and red-naped sapsucker (all neotropical migrants).

Table 3-2. *Special Status Species that Likely Occur within the Study Area (Including Plants)*

SPECIES	STUDY AREA USE
Federally Threatened ---- Total of 4 species	
• Bald eagle	transitory winter visitor
• Water howellia (*Howellia aquatilis*)	small vernal wetlands
• Ute's lady's tresses (*Spiranthes diluvialis)*	wet meadow
• Spaulding's silene *(Silene spauldingii*)	Palouse steppe endemic
Washington State Endangered ---- Total of 3 species	
• Sandhill crane	Rare spring migrant
• American white pelican	Summer visitor on area lakes with fish
• Upland sandpiper	Previously nested Stubblefield Lake area
Washington State Threatened ---- Total of 1 species	
• Ferruginous hawk	Rare summer visitor
Washington State Candidate ---- Total of 6 species	
• Columbia sharp-tailed grouse	Extirpated
• Townsend's big-eared bat	Rare resident requiring caves or crevices
• Northern goshawk	Migrant and rare breeder
• Lewis Woodpecker	Migrant and past breeder
• Loggerhead shrike	Rare fall visitor
• Golden eagle	Summer visitor
North American Waterfowl Conservation Act Priority Waterfowl ---- Total of 7 spp.	
• Mallard	Common breeder - marshes
• Pintail	Common breeder - marshes
• Lesser scaup	Uncommon breeder - marshes
• Redhead	Common breeder - marshes
• Wood duck	Breeder - marshes
• Canvasback	Breeder - marshes
• Ring-necked duck	Breeder - marshes
Partners in Flight Priority Species * ---- Total of 30 species	
(Only five described here for brevity's sake)	
• Yellow-headed black bird (12)	Common breeder- marshes
• Grasshopper sparrow (11)	Uncommon breeder -steppe
• Yellow warbler (11)	Uncommon breeder - riparian
• Eastern kingbird (9)	Common breeder- upland shrub
• Chipping sparrow (9)	Common breeder- open young forest
Region 1 Species of Management Concern ** ---- Total of 10 species	
• American bittern	Common breeder
• Black tern	Common breeder
• Bewick's wren	Uncommon breeder -riparian
• Lark sparrow	Uncommon breeder -steppe
• Grasshopper sparrow	Uncommon breeder -steppe
• Lewis woodpecker	Migrant and past breeder
• Short-eared owl	Winter visitor
• Loggerhead shrike	Rare fall visitor
• Olive-sided flycatcher	Uncommon spring migrant/potential breeder
• Ferruginous hawk	Rare summer visitor

* PIF Priority Index from Andleman and Stock (1994); only species with ratings of 9 or higher shown here.
** R-1 list established in 1995.

The substantial insect populations associated with the high structural diversity and vegetation density in these habitats also makes them a focal point for many insectivorous species such as bats and neotropical migratory landbirds. Several species of bats, including the big brown bat, hoary bat, and silver-haired bat, utilize either aspen foliage or cavities in aspen trees and snags for roost.

The dense cover of aspen / riparian habitats also provides critical fawn rearing habitat for white-tailed deer and important winter browse for Rocky mountain elk and white-tailed deer.

Ponderosa Pine-dependent Wildlife

There are twenty eight species of wildlife that utilize the ponderosa pine forest in the Refuge vicinity as breeding and foraging habitat. Although most of the Study Area's ponderosa pine forest stands have been heavily logged and now consist of dense unhealthy stands of small diameter trees, habitat exists for several tree canopy nesting birds such as the chipping sparrow and cavity using wildlife species, including several bat species of concern. The potential exists to restore these forest to more natural stand conditions supporting large diameter trees and snags that will provide improved habitat for such species as the western bluebird and the Lewis' woodpecker, a state candidate species.

3.3 LAND STEWARDSHIP OVERVIEW

The Refuge (15,656 acres or 24.5 square miles) comprises one of the only protected areas within the Channeled Scablands. The vicinity map (Map 1) in Chapter 1 shows the locations of publicly owned lands within Spokane County. Turnbull NWR, managed by the U.S. Fish and Wildlife Service, is the only major land management agency in the area geared towards wildlife habitat protection.

3.3.1 CURRENT LAND USE WITHIN STUDY AREA

Most parcels within the Study Area are in private ownership, and as shown in Table 3-1 earlier in this chapter, are used for livestock grazing, dairy, farming, domestic, or forestry.

The Refuge comprises one of the few protected areas within the Channeled Scablands.

The majority of tax lots within the Study Area measure over 80 acres in size, although some subdivided parcels are as small as six acres. There are about forty landowners owning 250 or more acres within the Study Area; six landowners have holdings of one thousand or more acres. Many of the property owners are aging or retired and there could be significant ownership turnover and subdividing in the near future.

Although the current land uses are predominantly rural, over the last ten years a number of tracts have been subdivided into parcels intended for residential use. To date, only some of these have actually been sold and houses constructed.

There are nine State land parcels within the Study Area, totaling about 875 acres (management by Washington Department of Natural Resources - DNR)-. Other than these scattered parcels, there are few public lands in the area. Public lands including Palouse Prairie steppe habitat are especially rare. Bureau of Land Management is the only other federal land manager within forty miles of the Refuge. Their six tracts to the southwest average about 3,500 acres each. The Idaho Panhandle National Forest is located nearly fifty miles east from the Refuge at its nearest point. Little Pend Oreille NWR is located 90 miles to the north.

Riverside and Mount Spokane State Parks are located twenty-five and fifty miles away, respectively. These parks, though sizeable, are geared primarily towards providing recreational

opportunities to the local population, not at providing wildlife and habitat protection.

3.3.2 County Zoning within Study Area

Spokane County recently completed its Comprehensive Plan (Spokane County, 2002). The plan maps important County resources, updates County zoning, establishes goals and policies for future County growth, and establishes patterns of acceptable land uses.

Turnbull National Wildlife Refuge and most of the surrounding Study Area are located within the newly designated Rural Conservation zone, a zone that was developed from Spokane County's Critical Areas program and from the University of Washington study *Wildlife Corridors and Landscape Linkages: An Approach to Biodiversity Planning for Spokane County* (University of Washington, 1998). This category encourages low-impact uses, and has a maximum density of 1 dwelling unit per 20 acres. Bonus densities are allowable when clustering is employed. Clustering is a new technique aimed at minimizing population density and retaining rural character. Rural clustering encourages the grouping of home sites on areas of the site best suited for development, while retaining the remainder of the site for open space. Clustering is thought to result in a number of environmental benefits, including (for the same amount of housing constructed) fewer road miles, ability to use a community well, and greater security against wildfire.

Spokane County is predominantly rural, but the average population density of 237 persons per square mile far exceeds the state average of 88 persons per square mile.

The Spokane County Division of Long Range Planning projects an increase of 68,114 people in the unincorporated areas of the County, for a total of 265,158 people by the year 2020 (Spokane County, 2002 [Ch. 9]). This represents a projected increase of 35 percent over current population.

County Designated Open Space

Most of the Study Area is mapped as part of the County system of Open Space Corridors. The County establishes several goals around open space in its recent update of the Comprehensive Plan. One applicable here is:

PO.5a *Preserve and protect existing and designated open space areas and corridors throughout Spokane County.*

County Designated Critical Natural Resources

The Study Area encompasses most of the wetlands-rich areas in the County. The Study Area is also largely mapped as moderately susceptible to contamination of aquifers. Most of the Study Area is mapped as a Fish and Wildlife Conservation Area. More specifically, these conservation areas include those areas mapped by WDFW as Priority Habitats / Species areas and also includes all naturally occurring ponds under 20 acres. The County established several goals related to wetlands protection, groundwater protection, and fish and wildlife critical areas. One is reiterated here:

NE.24: *Protect, maintain, and improve critical fish and wildlife habitat conservation areas and habitats of local importance through a variety of methods including public ownership of the most critical areas and incentives for privately owned lands.*

3.3.3 Land Protection Activities within Refuge Vicinity

Ecosystem Management Initiatives and Goals

A number of entities have expressed support for additional protection of biodiversity within Eastern Washington and specifically within the habitats specified in this CCP. A portion of Chapter 1 (section 1.8 - Relationship to Regional Conservation Goals) outlines some of the more pertinent plans, initiatives, and policies important to consider for this area.

Governmental Programs for Land Protection

The federal and State governments maintain numerous programs managed through a variety different agencies to promote land and water conservation, habitat protection, and improvement of environmental quality. Some programs are directed at private landowners, while others are directed at municipalities, tribes, agencies, conservation districts, non-governmental organizations, or others. The various programs usually utilize some kind of grant or payment; technical assistance program; or cooperative agreement to accomplish program goals. Program objectives may be directed at management, restoration, acquisition, planning, or other aspect of natural resource management. These programs are too numerous to list and describe here, but as a start, information may be obtained from agencies like U.S. National Resource Conservation Service (http://www.nrcs.usda.gov/programs/) and the U.S. Fish and Wildlife Private Stewardship Grants program (http://endangered.fws.gov/grants/private_stewardship).

In addition to the federal and state programs, Spokane County has developed a Conservation Futures program. This program provides a means for counties to acquire lands and habitats important to the preservation of wildlife or lands having significant recreational, social, scenic, or aesthetic values. The Legislature granted counties the local option of a tax up to 6.25 cents per $1,000 of assessed valuation to acquire open space.

3.3.4 Private and Partnership Land Protection Initiatives

A number of private organizations, many working in partnership with federal, state, and local agencies, are active within the local area to protect and restore habitats and open space for the future (in particular, see North American Wetland Conservation Act section below).

A variety of land protections tools are utilized in partnership efforts and also independently by land trusts. Some common mechanisms for protecting land include: outright acquisition, conservation easements, outright land donation, bargain sale of land, donation of undivided partial interests, donations of land by will, donation of remainder interest in land with reserved life estate, and restrictive covenant. Most of the tools result in income and estate tax reductions to the landowner. A number of these mechanisms allow a landowner to continue to occupy and use the land, and to gain the benefit of income tax reductions while still occupying the land.

A conservation easement is a legal agreement between a private landowner and an organization. It allows landowners to pledge their land for conservation values, scenery, or open space while retaining title. The conservation easement specifies which activities can take place upon the land, as well as which activities are restricted. Allowed activities typically include farming, forestry, recreation, and limited construction. Restricted activities usually include development, subdivision, surface mining, dredging, and other actions that would damage the conservation values of the property.

Each conservation easement is tailored to meet the specific needs and conservation purposes of the signatory parties. The easement stays with the property no matter who owns it, much like a road or utility easement. Future owners of the property are bound by the easement's terms. Landowners may receive cash for the value of the foregone development rights and/or tax credits.

North American Wetland Conservation Act (NAWCA)

Two NAWCA grants were awarded recently in the amount of nearly two million dollars for protection and restoration of wetland and riparian habitats in Spokane, Lincoln, and Adams Counties. These first two grants fund

Phases 1 and 2 of a five phase project plan for the Intermountain West Joint Venture Channeled Scablands Focus Area (CSFA).

The Refuge is a partner to an ongoing effort by 14 organizations to protect and restore wetlands and riparian areas within the Channeled Scablands. Two million dollars in federal grants were recently awarded to this project, and partners have put up a total of nearly ten million dollars in matching and in-kind funds.

Fourteen public and private organizations provided matching and in-kind funds in the amount of $3.2 million (Phase II) and $6.2 million (Phase I). The organizations include: Ducks Unlimited, Spokane County Parks and Recreation Department, Spokane County Conservation District, U.S. Bureau of Land Management, U.S. Natural Resources Conservation Service, U.S. Fish and Wildlife Service, The Nature Conservancy, Avista Corporation, U.S. Farm Services Agency, Washington Department of Fish and Wildlife, Inland Northwest Wildlife Council, Inland Northwest Land Trust, Friends of Turnbull NWR, and Spokane Audubon Society. Numerous private landowners are also partners in the project. The goals of Phase I and Phase II of the project are to acquire, restore and enhance over 15,000 acres of wetland, riparian, and adjacent upland habitat within the area covered by the CSFA Implementation Plan.

Inland Northwest Land Trust (INLT)

INLT is a local, non-profit, non-political organization with 300 members. According to this organization, 10,000 acres of open space are being lost each year in Spokane County. Primarily through donated conservation easements, the INLT has preserved over 4,000 acres of wetlands, shorelines, farmlands, and forests in eastern Washington and northern Idaho since 1994. The INLT ensures compliance with the terms of conservation easements by committing to regular monitoring and annual visits to the property.

The Nature Conservancy

The Nature Conservancy's mission is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. Through a strategic, science-based planning process called Conservation by Design, TNC identifies the highest-priority places that, if conserved, promise to ensure biodiversity over the long term. TNC identified approximately 139 sites of conservation interest within their Columbia Plateau Ecoregional Assessment, including Turnbull NWR and the surrounding area (Soper 1999).

TNC works with all of the land protection tools mentioned above. Its acquisition program often works with the goal to transfer properties over to other land management agencies, rather than keeping all acquired properties under TNC ownership in perpetuity. Within the local area, TNC recently acquired two properties on the eastern boundary of the Refuge, that the Service later purchased.

Trust for Public Land

Trust for Public Land is another national land conservancy but with a slightly broader mission than TNC. TPL is the only national nonprofit working exclusively to protect land for human enjoyment and well-being. TPL helps conserve land for recreation and spiritual nourishment and to improve the health and quality of life of American communities. Though most of its Washington activities have centered in the Western portions of the state, TPL has recently expressed interest in broadening its programs within the Spokane Area.

In the Northwest, TPL works with individual landowners through the Northwest Working Landscapes Program. Working landscapes

include agriculture lands such as farms, ranches and orchards; forestlands and woodlots that are the sources of wood products; and estuaries, tidelands, lakes and rivers that support commercial fishing. These lands are valuable not only because of their economic impact and commodity production, but also for their benefits as undeveloped land for wildlife habitat, scenic open space, protecting water quality and acting as buffers to existing preserved land. By offering a variety of conservation solutions for critical farmland, forests and fish-bearing watersheds, TPL can give private landowners alternatives to development while protecting natural resources.

3.4 ELK MANAGEMENT

3.4.1 History of Rocky Mountain Elk in Refuge Vicinity

Although archaeological evidence suggest that elk may have once been fairly widespread in eastern Washington and were hunted by native Americans residing in the area, the earliest written records of Rocky Mountain elk in eastern Washington exist from the late 1800's for only the Okanogan, Blue Mountains, and Yakima areas. Elk, if historically present in the Refuge area and the forested portions of northeastern Washington, appear to have been eliminated by the time of settlement.

Reintroductions in the early 1900's, however, resulted in expanding herds throughout much of the forested portions of eastern Washington. From these reintroductions and subsequent transplants, elk populations increased dramatically in the 40's, 50's and 60's. Rocky Mountain elk were first observed on the Refuge in the late 1950's. Although increasing numbers were observed on the Refuge and in most of southern Spokane County since their first appearance, dramatic increases did not occur until the early 1980's.

By the late 1980's, the elk population in the Refuge vicinity was estimated at between 60 to 80 animals, based primarily on incidental observations. As the elk population grew in size so did interest in its management. In 1993, the elk of southern Spokane County were designated the Hangman Creek sub-herd by the Washington Department of Fish and Wildlife and managed as part of the Selkirk Herd of northeastern Washington.

3.4.2 Recent Population Estimates

The first aerial survey of this population was completed during the spring of 1993. The estimated population size was between 271-384 (95 percent confidence interval) with 60 elk observed on the Refuge. Additional aerial surveys were conducted in 1994 and 1995. These surveys indicated a growing population with high productivity. During an aerial survey conducted by the State in 1997, 93 elk were observed on the Refuge and the estimated population for the sub-herd was between 115 and 219 animals (95 percent confidence interval). This population decrease for the entire sub-herd is likely the result of the any-bull strategy and offering either-sex and anterless hunts with extended seasons for muzzle loaders and Advanced Hunter Education graduates. The most current survey data from 2004 found 254 elk on the Refuge, with an additional 100 elk in the vicinity, for a total estimated herd size of 354.

3.4.3 Elk Issues

Since this population has become well established, three primary issues concerning this population of elk have developed, including impacts to aspen-dominated habitats, damage to private lands and recreational hunting opportunities.

Although aspen habitats occur in small amounts relative to other habitats on the Refuge, they are particularly important to a large portion of the wildlife on the Refuge, as previously discussed. Elk use and preference for aspen and other deciduous browse is well documented. Under high populations and limited habitat, elk

browsing can have a significant negative impact on the regeneration of aspen. In areas of suburban development or intense hunting pressure, elk use of such places like Turnbull NWR - that provide both security cover and forage - increases. Increasing use of this security cover is evidenced by the increase in elk numbers observed on the Refuge from 1993 to 1997 (62 to 94) when the sub-herd population decreased.

Currently research is being conducted by the State and Eastern Washington University to determine the extent that the Refuge acts as security cover for this sub-herd. Preliminary results indicate that radio-collared elk are utilizing the Refuge disproportionately to other areas. Over 90 percent of the relocations made during the day have been recorded on the Refuge. During the hunting season radio-collared elk seldom leave the Refuge during daylight hours.

This high elk use has resulted in heavy browsing of young aspen and other deciduous shrubs and trees on the Refuge, especially in recently burned areas. Whether this use is sustainable has yet to be determined. Research has been initiated to quantify the impact of elk on this habitat. The possibility exists that current elk use of Refuge aspen is having a significant negative impact on the structure and sustainability of this important habitat.

Although the Refuge is receiving the greatest proportion of elk use in this area, the Washington Department of Fish and Wildlife has received numerous complaints of elk damage to hay, other crops, fences, and ornamental shrubs within the Hangman Creek sub-herd's range since the early 1990's. Since 1992, two claims have been paid by the State for elk damage to agricultural crops. Claims have declined since 1999 as a result of several landowners in the area leasing their lands for hunting.

Hunting and trapping were once popular activities in the area with settlers before the Refuge was established. In the 1930s when the Refuge was established the prevailing public view was that there should be no hunting at the Refuge. The original advocates for Refuge establishment included the Spokane Sportsman's Association, who wanted a sanctuary where hunting would not be permitted. They hoped to create a place where wildlife could flourish and act as a source for adjacent hunted lands. Hunting was not then and has never since been permitted at the Refuge.

Some hunting advocates have expressed the desire to see the Refuge opened to elk hunting, primarily as a way to mitigate for some of the depredation that occurs occasionally on adjacent lands.

The Washington Department of Fish and Wildlife has openly advocated an elk hunt on the Refuge over the past 10 years primarily to help alleviate problems with elk depredation on private lands around the Refuge. In the Washington State Selkirk Elk Herd Plan (Zender and Hickman 2001), one of the the objectives for the Hangman Creek PMU which includes the Refuge is to "stabilize elk numbers at levels tolerable with landowners and suburban expansion." One of the strategies proposed to achieve this objective besides extended seasons and liberal either-sex recreational hunts in the area is to "encourage the Turnbull National Wildlife Refuge to consider a limited entry season for anterless elk to address the increasing number of elk using the Refuge during hunting seasons."

Staff from the State and the Refuge have met on several occasions during this time period to discuss the elk issue and options for population control. The Service position has been that a hunt on the Refuge could not be offered as an alternative without a better understanding of the ecology of this population and the impacts the herd is having on Refuge habitats. The State and the Refuge have cooperated on research to answer these questions. The State's desire for a Refuge hunt has not been as strong lately as a

result of decreasing damage claims. Several landowners in the area have responded to elk damage by leasing their land for hunting to reduce damage and provide income.

3.5 REFUGE INFRASTRUCTURE AND ADMINISTRATIVE FACILITIES

3.5.1 ENTRANCES AND ROADS

There is one public entrance to the Refuge at Smith Road, off Cheney Plaza Highway, which accesses the Public Use Area. Other roads access the Refuge but none are public entrances.

The Refuge includes a network of paved, gravel and dirt roads totaling approximately 69 miles. Only the paved roads and the gravel-covered Auto Tour Route are open to the public and these roads are open year round, while the native surface roads are often closed during winter.

The interior road network serves as the backbone of fire breaks, as well as providing quick and efficient access for fire suppression activities. At one time, the Refuge maintained a peripheral fire break surrounding the Refuge, but this has not been maintained in fifteen years. The road network within the Study Area also serves as the main fire break there.

Paved Roads

There are a total of 5.8 miles of paved roads within the Approved Refuge Boundary, however, all are maintained by the county. Cheney-Spangle Road runs northwest-southeast on the Refuge's eastern border; and Mullinix Road, runs north-south along the western border. Cheney-Plaza Road, running north-south, bisects the Refuge interior.

Primary Roads

The 5 ½ mile auto tour route as well as the entrance road (Smith Road) are surfaced with gravel or a combination of gravel and native materials and are maintained by the Refuge. Two miles of entrance road and 5 1/2 miles of auto tour route were improved in October 2003. The gravel surface of both roads was brought up several inches, the auto tour route was widened and several pullouts installed along it for observation (and possible future interpretation sites). A small portion of the entrance road was paved. Culverts were replaced as well.

There are a total of 7 miles of gravel roads within the Public Use Area and these are also considered primary roads.

Dirt Roads

Single lane roads with mostly a native surface road bed comprise the remainder of the Refuge road inventory and are maintained by the Service. These roads access the more remote areas of the Refuge, and are closed except for administrative purposes. This category also includes fire roads and non-maintained roads that are impassable to vehicles. A total of 56 miles of dirt roads are located within the Approved Refuge Boundary.

3.5.2 ADMINISTRATIVE FACILITIES

On the Refuge, existing administrative facilities have been developed over a long period beginning in the early 1940s. The Refuge headquarters covers approximately 30 acres adjacent to Pine Creek. Buildings at headquarters include one residence, two offices, a shop-service building, two equipment and supply storage pole barns, two vehicle storage buildings, a hazardous storage building, and two well houses. The headquarters also includes a rest station and environmental education building that includes a classroom and Friends of Turnbull book store, both built and maintained for the public.

Other buildings on the Refuge include a residence on the former Helm tract (property purchased by the Refuge in 1987) and a house,

garage, barn and equipment shed located on the former Goodwin tract. The Helm's farmhouse (originally the Cosselman house) is currently being used as a bunk house for Refuge volunteers and seasonal employees. The house, shop, and garage on the Goodwin Tract is currently occupied or being used under a life-time use arrangement with the former owners. The other existing structures on the Goodwin Tract are vacant.

Drainage Network, Dikes, and Water Control Structures

Seventeen low dikes, varying from 40-800 feet in width, are located at lake and wetland outlets across the Refuge. There are also 22 water control structures used to manage water depth and distribution amongst the now connected wetlands and lakes.

Drains and ditches form 4 separate drainage networks that traverse the study area. Map 7 shows the location of ditches and the outlines of the four main drainage "watersheds" or networks that extend from the surrounding area into the Refuge.

Five lakes in the Pine Creek Drainage (Windmill Pond, Headquarters Pond, Winslow Lake, Pine Lake and Cheever Lake) are not natural but were created through construction of a series of dams and dikes.

Turnbull Laboratory for Ecological Studies

In 1973, a laboratory owned and maintained by Eastern Washington University was constructed on Refuge lands. The Refuge co-manages the lab, known as the Turnbull Laboratory for Ecological Studies (TLES). The TLES facility is located on the northwest shore of Findley Lake in the northern part of the Refuge, approximately two miles south of Cheney on the Cheney Plaza Road. The lab is operated by the biology department at Eastern Washington University (EWU), and provides opportunities to EWU students for study and research in ecology and natural history. The facility is furnished with an analytical lab, dry lab, general to special purpose area, library conference room, and offices. The building also houses a display area for public education. The laboratory measures approximately 3,800 square feet.

3.6 PUBLIC USE FACILITIES, ACTIVITIES AND PROGRAMS

3.6.1 OVERVIEW

Currently, an estimated 30,000 visitors come to the Refuge to participate in the environmental education program, observe wildlife, hike or bike, enjoy nature, photograph wildlife in a natural setting, and cross-country ski.

Visitation was also estimated at approximately 30,000 visitors in the mid-1970s. Total visitation estimates rose to as high as 50,000 in the early to mid 1980s. Some of the increase may have been due to a variety of non wildlife-dependent uses that were encouraged during those years. The fee station that was constructed in 1987 established an entry fee of $2.00 per vehicle (increased to $3.00/vehicle in the late 1990s) and Refuge staff believe that visitation dropped slightly as a result of the new fee.

3.6.2 VISITOR USE PATTERNS

Visitor Origin

In 1999, the Friends of Turnbull National Wildlife Refuge (Friends) & Refuge staff conducted a visitor survey to identify visitor use patterns, preferences, and needs related to the Refuge. A total of 531 visitor surveys were administered at nine different locations in Spokane County. The results of the surveys were analyzed by EDAW, Inc., a private consulting firm.

According to the survey results, 95 percent of the non-school group visitors to the Refuge were

from Spokane County. This high percentage emphasizes the importance of the Refuge as a recreation and education resource for residents of the greater Spokane area and county.

As a validation, visitor use data was analyzed from eight months of entrance fee envelopes, March, 1995 through October, 2000 (n=13,383 fee envelopes). School groups do not fill out these envelopes, so this analysis helped to deduce visitor origin for the non-EE activities available at Turnbull. The data showed that an average of 46 percent of visitors using the Refuge came from the city of Spokane, while 16 percent came from the nearby city of Cheney.

Seventy percent of the visitors were from Spokane County, and an additional 10 percent of all visitors came from other parts of eastern Washington. Seven percent came from western Washington, and 13 percent came from outside the state of Washington. In summary, this data shows that the majority of non-school group visitors are local and a small but significant percentage comes from outside the local area to enjoy Turnbull's amenities.

3.6.3 Public Facilities

Amenities available to visitors include approximately nineteen scenic overlooks (viewpoints) supported by vehicle pulloffs or parking areas (some of these constructed during 2003), four environmental education sites and an environmental education classroom, several short hiking trails, a disabled-accessible boardwalk, and one long cross-state trail (Columbia Plateau Trail) that passes through the Refuge. Four interpretive sites and four benches are located on the Refuge portion of the Columbia Plateau Trail.

Viewpoint - any area that has been designed specifically for the wildlife viewer in mind and includes areas with pulloffs, panels, blinds or "short" access trails (less than 1/10 mile).

Five interpretive panels are installed on the Blackhorse Boardwalk. A photo/observation blind is located on Pine Lake. A 5.5 mile long self-guided Auto Tour Route winds through pine forest, past lakes and basalt rock outcrops and is open year-round.

Except for the Columbia Plateau Trail, all visitor facilities are located within the Public Use Area, a 2,200-acre area in the southeastern portion of the Refuge. The public is not allowed access to the other areas of the Refuge except by special permit. The Public Use Area comprises approximately 14 percent of the total 15,656 Refuge owned acres. See Map 13 for details of facilities within the Public Use Area.

The Refuge Environmental Education Classroom is maintained for hosting onsite activities for schools and organized groups of all ages. The classroom contains numerous animal mounts and skins, live specimens, track casts, preserved aquatic invertebrates, pressed plants, a landscape mural, and other natural history specimens. Through the assistance of over 100 volunteers and a fiscal year 2000 challenge grant, the building's interior was completely renovated during the winter of 2000-2001. In this remodeling, a corner of the building was designated for the Refuge's Friends group who opened a small store specializing in nature books, T-shirts and sweatshirts, and other articles. Profits from this store, which is staffed entirely with volunteers, go directly toward the Refuge's Environmental Education Program.

An accessible public restroom (located a quarter mile west of the headquarters) and four vault toilets are located within the Public Use Area and maintained for the visiting public. Another vault toilet is located along the Columbia Plateau Trail, near Ballinger Lakes.

Funds are being sought for design and construction of an information kiosk that will be placed near the public restrooms at the start of the Auto Tour Route.

Map 13. Existing Recreational Facilities within the Public Use Area

The Refuge maintains a fee station near the public entrance on Smith Road. Visitors pay $3 per car per day.

Trails

Table 3-3 displays the current trails located on the Refuge, together with the kind of surface, use, and length, in miles, of each trail.

Native Surface Trails: The Refuge Public Use Area has an estimated 7.7 miles of trail, some of which originated as maintenance roads. Most are short trails that terminate at a wetland. The Pine Lake Trail follows segments of shoreline along Winslow Pool and Pine Lake, meandering through ponderosa pine forest before looping back to wetlands again. This old service road has been converted to an asphalt surfaced accessible trail. The Bluebird Trail follows an old road along the eastern boundary of the Public Use Area and intersects the auto tour route near Kepple Lake.

The Headquarters Trail begins at Refuge Headquarters and follows the chain of Pine Creek wetlands south to Cheever Lake, ending at a riparian area below the lake. The Bluebird Trail and the Headquarters Trail both double as service roads and need to be graded annually.

In addition, each of the EE sites on the auto tour route have a short loop trail (½ to 3/4 mile) winding through wetland, grassland, forest and riparian habitat. Volunteer groups are recruited to replace the bark on the EE trails every two years on a rotational basis. This ensures that the trails remain in good condition.

Disabled persons access trail at Blackhorse Lake: The Blackhorse Lake boardwalk (0.2 miles) was built in 1989 and was designed to provide access to persons in wheelchairs. The structure is in need of major reworking to comply with new Americans with Disabilities Act (ADA) guidelines.

Columbia Plateau Trail: In May, 2000, a new trail was opened for public use in the western portion of the Refuge. The Columbia Plateau Trail (CPT) encompasses 130 miles of an abandoned railroad right-of-way extending from East Pasco to Fish Lake near Cheney, and passes through the Refuge. Currently, 23 miles of trail between Lincoln County and Cheney are developed and open to the public. A future connection to the city of Spokane is under development.

Table 3-3 *Existing Trails*

TRAIL NAME	Surface	Open to:	Length (miles)
Columbia Plateau Trail	gravel	pedestrians, bikers, equestrian	4.75
Kepple Overlook	native	pedestrian	0.23
Kepple Peninsula (interpretive)	gravel/native	pedestrian	0.45
30-Acre Cutoff Trail	native	pedestrian	0.75
East Blackhorse EE Trail	native	pedestrian	0.45
Blackhorse Lake Boardwalk (interpretive)	wooden boardwalk	pedestrian	0.20
West Blackhorse EE Trail	native	pedestrian	0.29
Pine Lake Loop (interpretive)	asphalt	pedestrian	0.90
Headquarters	native	pedestrian	1.55
Bluebird	native	pedestrian	1.96
Total Length			**11.53**

Trail lengths calculated from GIS coverage (trailsarc)

A Cooperative Agreement was signed on January 25, 1995 between the Washington State Parks and Recreation Commission (WSPRC) and the U. S. Fish and Wildlife Service. This agreement addresses the 4.75 mile section of the abandoned railroad bed that intersects the western portion of the Refuge. Under the agreement, the Service will co-manage the trail through the Refuge portion in the same manner as it manages its Public Use Area, complying with existing rules and regulations pertaining to access and use. A notable exception to the Refuge regulations is that horseback riding is allowed on the section of the Columbia Plateau Trail traversing the Refuge. In addition to authorizing the Service to co-manage the public use section of trail and provide fire management presuppression and suppression activities, the WSPRC will assist the Service with law enforcement, noxious weed control, and maintaining the boundary fence on either side of the trail. The Refuge monitors use on the trail segment that crosses the Refuge.

Visitors may enter the Refuge portion of the trail from Cheney Spangle Road to the north or from Amber Lake to the south; these access points are not on the Refuge. The trail is developed for hiking, riding bicycles, or horses. Visitors using the trail are not required to pay a fee when crossing the Refuge, however, they pay a $5.00 parking fee at the State managed parking lot.

This new trail creates opportunities for new recreation and environmental education, as well as concerns about potential trail user impacts on adjoining wildlife and habitat. The Columbia Plateau Trail crosses a segment of the Refuge that was closed to public use for over 60 years. A portion of the trail parallels Long Lake, a noted waterfowl production area. Disturbance of nesting waterfowl and other species is a concern. There are four Service roads maintained for management access that cross the trail. Trespass has been noted at these sites.

It is expected that the new trail will eventually become a popular destination for as many as 500,000 visitors each year over its entire length (pers. comm., Fraser, 1999), and the WSPRC expects approximately 20,000 visitors/year to pass through the Refuge portion each year. The trail has been open for approximately five years now. In 2003, the Refuge installed a traffic counter to provide usage estimates. During a five month period (March 23-August 30), 3,575 passages past the traffic counter were recorded. At least some of these included return visits.

Expected increased publicity about the trail will expose many more visitors to the Refuge in the future. To take advantage of this recreation and education opportunity, and to better manage potential user impacts, the USFWS and WSPRC have installed interpretation and education signs along the trail segment through the Refuge. This interpretation will help increase public awareness of this sensitive area and its fragile resources. Trail linkages between the CPT and the auto tour route may also be a consideration to further enhance the visitor experience.

Americans with Disabilities Act (ADA) Compliance

The 2000 U.S. Census found that 19 percent of Americans have disabilities. Approximately half of this number have physical mobility issues (http://www.census.gov/Press-Release/www/2002/cb02ff11.html This number is expected to increase in the future with the aging of the U.S. population.

The Access Board, a federal agency that provides specific accessibility guidelines for buildings, facilities, recreation sites, and transportation devices that comply with the Americans with Disabilities Act can be found at http://www.access-board.gov/.

Facilities currently compliant with the ADA are the upstairs portion of the Refuge office, the environmental education building, maintenance building, public rest rooms, four vault toilets, and the Boardwalk.

Two Small Visitor Facility Construction grants were received by the Refuge in 2004 for developing an accessible surface on the Kepple Lake Peninsula Trail and the Pine Lake Loop Trail. Work began on these two projects in 2004 and will be completed in 2005. Kepple Peninsula Trail will have a 1/4 mile packed gravel surface and an accessible observation/photography blind. Two benches will be placed along the trail. The 1.25 mile Pine Lake Loop Trail will have a combination of packed gravel surface and 4 foot wide asphalt surface. Four benches will be placed along the trail edge. The Friends of Turnbull NWR were successfully awarded a grant that purchased two SeaCoast binoculars for placement on an overlook over Winslow Pool adjacent the new accessible Pine Lake Loop Trail.

Facilities in need of upgrades are the Fire Management Office, Helm's bunkhouse, and the photo blind.

3.6.4 Recreation Program and Activities at the Refuge

Visitor Preferences

As mentioned previously, in 1999 the Friends of Turnbull National Wildlife Refuge (Friends) conducted a visitor survey to identify visitor use patterns, preferences, and needs related to the Refuge. A total of 531 visitor surveys were administered at nine different locations in Spokane County.

Results of the Friends survey showed that visitors to the Refuge participate in a number of recreational activities (see Table 3.4) with "enjoying nature" being the most popular activity among visitors.

The Refuge keeps its own data and estimates of visitation, including estimates of how many visitors participate in activities of interest. Estimates are entered yearly into a database called the Refuge Management Information System (RMIS). Table 3-5 provides recent data on visitor estimates reported in RMIS. Annual discrepancies from year to year are a result of a) natural variability in visitation; b) staff member changes and consequent different methods of counting visits; and c) program variability (i.e. funding for EE program can vary substantially from year to year).

Table 3-4. *Most Common Visitor Activities at Turnbull NWR*

Activity	Percent
Enjoying nature	64
Birding	51
Hiking	45
Photography	23
Bicycling	12
Walking a dog	6
Running	4

Source: Friends survey, analyzed by EDAW (1999)

The most accurate numbers from RMIS are the EE program numbers. Because of uncertainty and annual fluctations, Table 3-5 also includes a "Manager's baseline figure" that is the Refuge Manager's best baseline estimate of *current average* annual visitation by use type. Note that because many visitors participate in more than one activity, the total number of visits is smaller than the sum of visits in individual categories.

Wildlife Viewing and Photography

The focus of current Refuge observation and photography activity is the 200+ species of birds, 45 species of mammals, and 7 amphibian and 10 reptile species that can be observed on the Refuge. Visitors coming to the Refuge utilize the Public Use Area, drive or ride bikes on the auto tour route, and hike trails to see and photograph the variety of birds and mammals inhabiting this relatively undisturbed area of the Channeled Scablands. Often visitors use their cars as blinds. Notably, the Refuge has been identified in the Washington Watchable Wildlife Viewing Guide.

Table 3-5. *Estimates of Visitation Reported in RMIS, Years 2000-2002, by Activity*

	Visit Category	Manager's Baseline Estimate	FY 2002	2002: percent of total visits	FY 2001	2001 percent of total visits	FY 2000	2000 percent of total visits
I.	Total Number of Visits[a]	30,000	23,970	100%	28,184	100%	28,000	100%
II.	Interpretation and Nature Observation (not sum of below)	20,000	20,357	85%	24,590	87%	26,450	94%
	a. Staff / volunteer conducted	1,600	1,678	7%	441	2%	440	2%
	b. Visitor center	6,000	6,176	26%	5,500	20%	7,050	25%
	c. Admin office	8,000	4,404	18%	7,974	28%	9,105	33%
	d. Kiosks[b]	0	10,403	43%	9,581	34%	0	0%
	e. Nature Trails	20,000	16,745	70%	20,996	74%	24,900	89%
	(foot)	12,000	11,677	49%	5,128	18%	24,900	89%
	(auto)	18,000	10,136	42%	18,432	65%	21,700	78%
	f. Towers/platforms/blinds	50	28	0%	28	0%	7,350	26%
	g. Other Wildlife Observation	6,500	6,500	27%	6,500	23%	800	3%
III.	Environmental Education (sum of below)	9,000	9,489	40%	11,149	40%	8,050	29%
	a. Staff / volunteer conducted	5,500	5,237		8,353		2,500	
	b. Non-staff conducted	3,500	4,252		2,796		5,550	
IV.	Recreation[c]	5,000	4,447	19%	5,327	19%	5,700	20%

[a] Total number of visits is not equal to the sum of any of the particular categories, since many visitors participate in more than one activity.

[b] Fee station visits were counted as kiosk visits in FY 2002 and 2001but not in FY 2000.

[c] "Recreation" category IV includes other non-wildlife dependent recreation such as biking, cross-country skiing, etc.

Interpretation

The Service is revising a 1986 Interpretive Prospectus. This document outlines the media and messages for each interpretive site.

Interpretive trails are generally short trails designed especially for the educational benefit of the casual or new Refuge visitor. Interpretive trails allow people to receive self-guided educational information through multiple signs or other media as they pass along a trail. Currently the Refuge has one interpretive trail at the Boardwalk (West Blackhorse Lake) with five signs. Another interpretive trail is being designed at Kepple Peninsula, with posts sunk into the ground at key points. Visitors will be able to pick up a brochure which describes the habitats and wildlife that can be seen at each post. The Columbia Plateau Trail also has multiple interpretive signs, but is not short nor likely to be frequented by the casual visitor, thus it is not considered an interpretive trail like the other two mentioned above.

Environmental Education

An important component of recreation on the Refuge is the extensive Environmental Education (EE) program. Although the Refuge has had some form of environmental education for most of its existence, the program has

greatly expanded in the past ten years. Currently 3,500 to 9,500 students are reached annually through Turnbull's EE and outreach programs (dependent on grants, donations, and annual discretionary funding).

The highest use period for EE on the Refuge is late March to mid-June. Over 85 school groups (K-12) from Spokane County and surrounding areas have participated in the Program. Moreover, numerous civic groups, from preschool children to senior citizens, are provided field trips, night hikes, tours, in-classroom activities, and guided nature walks on the Refuge throughout the year.

An EE classroom with capacity for 50 students and four designated outdoor study sites on the Refuge are the key facilities used and maintained for the EE Program. Each study site is designed to provide nature walks, studies in aquatic ecology, and a seating area for instruction and activities. The outdoor classrooms are used on a rotational basis to minimize disturbance. Classroom sessions preceding or following the outdoor field work have been found to be very helpful in reinforcing the learning objectives.

The From Earth and Sky Fall Field Trip

Grades 3 & up learn about the seasonal rounds of Northern Plateau peoples. Students are guided through hands-on activities such as building tule-mat shelters (Summer), hunting (Fall), listening to traditional stories in Salish and English (Winter), and learning about native plants and root-gathering tools (Spring). Throughout, students discover the role that native species play in tribal living and habitat stewardship.

An example learning objective for this project: 80 percent of participating students will understand the term semi-nomadic and the importance of seasonal cycles to the Northern Plateau culture.

EE program focus and learning objectives: The goal of the program is to instill a sense of environmental awareness and responsibility within individuals and communities. The program is designed to motivate participants to make wise decisions concerning the use and conservation of natural resources. Following are the overall EE program objectives:

1. Involve participants in all areas of the Refuge ecosystem by providing an activity-based curriculum.
2. Inform, involve, and motivate people to be aware of and active in the operation and health of their ecosystems by providing environmental education materials and activities.
3. Build a responsible environmental ethic in our constituency by developing programs and activities for visitors.
4. Increase conservation background knowledge by providing ongoing training for regional teachers, college interns, and volunteers in ecosystem ecology and interpretation.
5. Involve students and educators, interested citizens and U.S. Fish & Wildlife personnel in evaluating the program to better meet the changing needs of the community.
6. Cultivate the program and its partnerships to become a model for regional, state, and national environmental education efforts.

Activities for students of all ages centers on four programs: Turnbull Spring Field Trip, Summer Interpretive Project, From Earth and Sky-The Natural World Fall Field Trip Project, and Discover Wildlife Outreach Project winter activities. Each EE program is designed with a curriculum and specific learning objectives tailored to the different grade levels.

The EE program is overseen by one permanent full-time staff (GS-9 Supervisory Park Ranger). The program is almost completely facilitated

with the help of AmeriCorps volunteers, Student Conservation Association volunteers, other local volunteers (e.g., university students, retired educators). Staff focuses effort on training teachers; workshops are offered annually for teachers leading self-conducted classes. Trained volunteer facilitators donate approximately 5,000 hours/year to the EE program. These EE facilitators provide spring field trips, conduct classroom and outdoor activities on the Refuge and provide environmental education and outreach to the public through fairs, expos, and in-classroom presentations to local schools.

The important regional role of the Refuge's EE Program is reflected in the fact that the program typically has far higher demand than it can meet and that school groups have occasionally come from as far away as Yakima to participate in the program. The services offered by the Refuge are a significant component of the environmental education program in these schools, and provide valuable training to educators as well. The popularity of the EE Program is a reflection of the growing importance of environmental education as a component of classroom learning (Everett and Dedrick 2000).

The EE program has operated with a limited amount of annual operational funding from the Fish and Wildlife Service. Much of the necessary funding to support volunteer stipends and contract employees has been obtained through grants and fund raising efforts by the Friends of Turnbull NWR. A secure source of annual funding is necessary to enable this program to expand as future demand increases.

Hunting

Hunting and trapping were once popular activities in the area with settlers before the Refuge was established. Limited information suggests that deer, antelope, or elk hunting could have occurred near or within the Refuge (Holstine et al 1992). In the 1930s when the Refuge was established the prevailing public view was that there should be no hunting at the Refuge. The original advocates for Refuge establishment included the Spokane Sportsman's Association, who wanted a sanctuary where hunting would not be permitted. They hoped to create a place where wildlife could flourish and act as a source for adjacent hunted lands. Hunting was not then and has never since been permitted at the Refuge.

In 1959, the Washington State Department of Game (WSDG) conducted an informal survey to explore opening a portion of the Refuge to public waterfowl hunting. The WSDG contacted individuals, including the Regional Director of the National Wildlife Federation for the states of Oregon, Washington and Alaska.

A general consensus of those contacted was that the Refuge should remain closed to hunting, at least until fully developed.

The 1966 Refuge Master Plan (USDI 1966) also explored hunting big game, including deer and elk, on the Refuge. After thorough evaluation, the Service determined not to open the Refuge to hunting at that time. The rationale was based on the fact that at that time, there was no biological reason to reduce the big game population on the Refuge. Conflicts that could occur between a big game hunting season and migratory waterfowl hunting season as well as cattle grazing were also noted.

In May, 1987, the State and Service re-visited the issue of opening up the Refuge to white-tailed deer hunting. In response to this hunting proposal, the Refuge received over 1000 responses, with a 7-1 ratio against the idea of allowing hunting inside the Refuge (Cheney Free Press 1987). Because of the overwhelming opposition, the Service decided not to move forward with the proposal.

Some hunting advocates have expressed the desire to see the Refuge opened to elk hunting, primarily as a way to mitigate for some depredation that occurs occasionally on adjacent lands.

Elk: See the Elk Management section above (Section 3.4) for more detail on elk hunting.

Waterfowl: Waterfowl hunting on the Refuge has seldom been an issue with the hunting public. During recent public meetings, participants were nearly unanimous in their opposition to the opening of waterfowl hunting on the Refuge. Although the local officials of the Washington Department of Fish and Wildlife have not approached the Refuge concerning a waterfowl hunt, some interest was expressed for a hunt at the State Office level.

Interest in waterfowl hunting may also be tempered by the relatively low use of the Refuge vicinity by waterfowl in the fall. Fall waterfowl populations on the Refuge are fairly irregular as a result of periodic drought and early freeze up that limits the availability of open water. Waterfowl numbers are considerably lower than occurred in this area historically as a result of the drainage of many of the permanent and semi-permanent wetlands and the development of irrigated agriculture in the arid steppe of Columbia Basin to the west (made possible by the Coulee Dam Project). These changes have shifted the fall migration to the farm fields, reservoirs and wasteways of the lower Basin.

When wetland and weather conditions result in good fall migration habitat, a portion of the southern migration still utilizes the restored wetlands of the Refuge and undrained deeper water habitats of the Study Area. Refuge waterfowl counts indicate that numbers peak in mid-October in most years. In these good years, peak counts of mallards range from 10,000 to 25,000 birds in late October and represent 75 percent of the fall waterfowl populations. Other duck species peak earlier in October. By mid to late November Refuge wetlands freeze up in most years resulting in a forced emigration of most waterfowl with the exception of smaller populations of goldeneyes, Canada geese and a few hardy mallards. This relatively narrow window of available habitat limits waterfowl hunting opportunities in this area.

Turkeys: Only one native upland game bird - ruffed grouse - is found in the area. Other upland game birds inhabiting the area are non-native and have spread from releases.

Information on population size and population growth is lacking with the exception of incidental observations. Observations in other areas where the Rio Grande sub-species has been introduced indicate that populations can build quickly without hunting to remove some of the annual growth. The potential impact this growing population of a non-native gamebird may have on native wildlife is largely unknown. After an extensive literature review Refuge staff found no work done on this subject with regards to wild turkeys.

Fishing

Historically, all Refuge wetlands with the exception of Pine Creek were fishless. This condition resulted in an aquatic ecosystem based on the absence of a significant vertebrate predator. In 1954, the State planted five to six inch rainbow trout in three of the Pine Creek wetlands. A second planting occurred in 1955. In 1956, the State began taking eggs, up to 90,000 total. However, the State subsequently decided to abandon the project for several reasons, including the tendency of spawners to go downstream, a conflict between spawning season and high spring run-off, and a summer die-off due to high water temperatures and low oxygen content (USDI 1966). As a result, the Refuge has never provided notable opportunities for fishing. A few exotic game fish do continue to survive in these lakes. The Refuge has no intention to plant non-native fish again, since maintaining the biodiversity and proper function of Turnbull wetlands requires that they remain fishless as they were historically.

According to a recent study of the area's regional recreational supply and demand, fishing opportunities appear to be sufficiently available in the Refuge vicinity at the many surrounding lakes and rivers (Everett and Dedrick 2000). See more in Section 3.7.

Other Recreation

Some visitors hike or ride bicycles on the Refuge in addition to or as support for wildlife observation activities. Hiking and observation trails were described above. Bicycling is allowed on the entrance road, auto- tour route, and the Columbia Plateau Trail (CPT). Unauthorized bicycle use has occurred on foot trails in the Public Use Area and on service roads in the closed section of the Refuge by obtaining access from the auto tour route, Cheney Plaza Road and the CPT.

A few visitors jog or cross-country ski in the Public Use Area. Additionally, the public may participate in a variety of community service projects, such as trail maintenance, riparian planting, or weed control. Special events are sometimes hosted for the public, including bird walks, volksmarches, and various tours.

Activities Currently Prohibited on the Refuge

Activities that are not currently permitted on the Refuge include hunting, fishing, boating, off-road vehicle use, horseback riding (except on the Columbia Plateau Trail), camping, and on-ice activities. Typical law enforcement matters deal with unauthorized uses such as trespass into the closed areas, illegal taking of Refuge plants and wildlife, dogs off leash, mock military exercises, artifact collecting, illegal hunting, and overnight camping

3.7 REGIONAL RECREATION PERSPECTIVE

As part of preparation of this CCP, the Service contracted with EDAW consulting firm to understand the current and potential future role of the Refuge related to recreation. This report (Everett and Dedrick 2000) characterized the existing regional supply of compatible recreation relative to the Refuge and also presented state data for future trends in recreation needs. This data is useful in planning for the types of recreation activities and facilities provided at the Refuge over the next 15 years and beyond. The following text in Section 3.7.1 summarizes data from that report.

3.7.1 NEARBY RECREATIONAL OPPORTUNITIES

Within a 2-3 hour drive from Turnbull, there are numerous outdoor recreation opportunities that are managed by a variety of federal, state, local, and private entities. These resources include lakes, rivers, other Refuges, a ski area, interpretive facilities, wildlife management areas, Forest Service and BLM lands, and developed parks. Of the six Refuge-system priority uses, opportunities for viewing wildlife are probably most plentiful in the vicinity, while opportunities for environmental education and hunting are the least plentiful.

A small state agency known as the Interagency Committee for Outdoor Recreation (IAC) advises the State of Washington on matters of outdoor recreation. The IAC conducts inventory of outdoor recreation sites and opportunities, conducts studies of recreational participation and preferences, and periodically releases documents related to overall State Comprehensive Outdoor Recreation Planning (SCORP). The IAC divides the state into 13 regions to present information on regional recreation supply. Turnbull NWR is in Planning District 12, which includes Spokane and Whitman counties. As of 1995, there were a total of 362 local, state, federal, and private recreation sites in this region (6 percent of the state total) totaling 49,753 developed acres (4 percent of the state total). Local entities manage almost 80 percent of the sites, while the State of Washington has the greatest quantity of developed acreage (21,833 acres).

Fishing/aquatic recreation opportunities

The Channeled Scablands provide a unique setting for abundant small-lake fishing, boating, wildlife observation/photography, and camping opportunities. Within 2 to 15 miles from the Refuge, 13 recreational lakes (Chapman,

Philleo, Williams, Amber, Badger, Fish, Fishtrap, Hog, Silver, Clear, West Medical, Medical, and Rock Lakes) provide a diversity of water-oriented public recreational activities including fishing, boating, swimming, and camping.

Closest to the Refuge, Chapman Lake (146 acres) is located 2 miles south of the Refuge and is one of the deepest lakes in northeast Washington. This lake abounds with game fish, including silvers (kokanee), perch, crappies and trout. As such it is popular with anglers and offers a small private resort called Chapman Lake Resort. The State DNR owns the water and some adjacent land, however fishing access is private and not public. The lake is bordered by various landowners but seems to be managed in common to facilitate fishing. Maximum boat speed allowed is 5 mph. A resort located on the lakeshore has camping, cabins, store, and hookups.

Hunting

Many local residents utilize private lands in the area for hunting, negotiating access with friends or neighbors. The nearest community hunting area within the vicinity is located at Philleo Lake, on the eastern boundary of the Refuge. The upper end of Philleo Lake is owned by two private duck clubs who offer hunting and fishing opportunities to approximately six club members.

State and federal lands, some nearby and some located at some distance, provide various hunting opportunities. Bureau of Land Management provides hunting at Fishtrap and Hog Lakes about 10 miles southwest of the Refuge. The US Fish and Wildlife Service offers a range of hunting opportunities at Little Pend Oreille National Wildlife Refuge (90 miles north of Turnbull) and Columbia National Wildlife Refuge (100 miles southwest of Turnbull). Washington Department of Fish and Wildlife provides hunting at Swanson Lakes Wildlife Area (60 miles northwest of Turnbull). Hunting opportunities are plentiful in other areas of northeast Washington and nearby in the Idaho Panhandle, specifically on the numerous National Forests, Wilderness Areas, and other lakes and rivers in the region.

Environmental Education / Interpretive Centers

Riverside State Park, located 25 miles north of the Refuge in Spokane, offers an interpretive center and wildlife viewing opportunities. Liberty Lake County Park, located about 30 miles northeast of the Refuge, offers interpretive facilities and an accessible boardwalk. This park is also used for EE programs by a local school district. Similar opportunities are available at Heyburn State Park at the south end of Lake Coeur d'Alene in Idaho, about 50 miles east of the Refuge. This State Park features developed wildlife viewing areas, including an interpretive center.

Hiking

All of the nearby larger state and county parks also offer a variety of recreational opportunities including hiking, biking, skiing, wildlife observation/photography, camping, boating, fishing, and swimming. These include Mt. Spokane State Park, Riverside State Park, Liberty Lake County Park, and Heyburn State Park in Idaho. Planning District 12 showed a significantly lower portion of trail mileage than other planning districts delineated by IAC (1 percent of the state total); however, the trail total predated opening of the Columbia Plateau Trail (IAC 1990; IAC 1995).

Wildlife or Nature Observation

Turnbull NWR is the primary location within Planning District 12 focusing on wildlife observation, however incidental wildlife and nature observation are provided in all or most of the other natural areas described above. Spokane County also owns 4,609 acres of open space, which offers some recreational /open space opportunities to area residents (Spokane

County 2002). The County's goal is to manage these areas in a way that preserves and creates natural habitats while enhancing the quality of life for the residents of Spokane County. Whenever possible, efforts are made to coordinate these objectives with other resource management agencies such as the USFWS, WSPRC, and WDFW.

3.7.2 Recreational Activity Specific to the Study Area

Very few developed recreational sites occur within the Study Area designated for this CCP. However, Refuge staff is aware of the following uses:

- Chapman Lake has fishing, boating, and swimming and is described above.
- Hunting occurs by landowner permission, since there are few public lands available for hunting within the Study Area (DNR owns about 875 acres). The kinds of hunting that occur are upland birds, big game, and some limited waterfowl hunting.
- Philleo Lake has waterfowl hunting opportunities as described above.
- The Columbia Plateau Trail traverses the southwest corner of the Study Area. The trail is open for hiking, biking, and equestrian use.
- There is frequent bicycling that occurs on the County roads within the Study Area, including bike meets.
- Waterskiing and jetboat use is infrequent, but may be increasing.
- Swimming occurs in the lakes.
- The Eastern Washington University cross-country track team runs throughout the Study Area.
- There is casual wildlife observation here and there (Philleo Lake has pelicans).
- There is a privately owned horseback riding stable where people board horses. There aren't however, any trails that they maintain for people to use. Except for the Columbia Plateau Trail, there are no other equestrian trails known.
- Hiking and walking may occur in small quantities around the lakes
- There is one balloonist who frequents the area.

3.7.3 Statewide and Regional Participation Rates and Trends

Current Participation Rates

The most recently released SCORP Assessment (IAC 2002a) identified 14 major categories of outdoor recreation, subdivided into 170 activities. Of these 14 major categories, walking / hiking and nature activities figure as the two most popular, with 53 percent and 43 percent of Washington state residents participating in these activities, respectively. The IAC also indicated that observing / photographing nature and wildlife have participation rates of 42 percent, and visiting interpretation centers has a participation rate of 7.5 percent.

IAC's 1990 and 1995 reports also provided participation rates, subdividing by Region. Region 4 (Eastern Washington) is a destination for fewer visitors compared to the other three SCORP planning regions in the state. One reason for this is the region's distance from the Puget Sound, where most of the state's residents live.

Compared to other regions in the state, Region 4 attracts the highest statewide percentage of hunters, with about 18 percent of all hunting trips in the state occurring in this region (IAC

1990). Most (94 percent) of all hunting in the state is done by Washington residents.

Forecast of Future Regional Recreation Demand and Key Recreation Needs Identified by IAC

Overall, outdoor recreation activity in most activities continues to increase at high growth rates. In a recent technical report (IAC 2002b), IAC projected future participation in 13 of 14 major outdoor recreation use categories over periods of 10 and 20 years. Nine of these activities will experience double digit growth (see Table 3-6).

These most recent estimates of recreation trends were based on the National Survey on Recreation and the Environment Projections for the Pacific Region (NSRE), which includes Washington State. IAC adjusted the NRSE projections as necessary based on age group participation, estimates of resource and facility availability, user group organization and representation, land use and land designations; and "other factors" including the economy and social factors. Table 3-6 shows the percent change expected for Washington State by activity as reported by IAC.

The 1995 assessment identified trails and environmental education as the two highest outdoor recreation needs in the state. As depicted in Table 3-6, the kinds of uses that are compatible at Turnbull NWR are expected to show increases of 20 percent to 40 percent over the next 20 years. The exception is hunting, in which participation is expected to fall at about that same rate.

If estimates from the 1987-2000 projections (IAC 1990) hold true for this next 10-20 year period, growth in activities will be somewhat lower in Eastern Washington compared to the state as a whole. This smaller percentage increase is due in part to the relatively smaller population growth (in terms of the actual number of people) in this part of the state as compared to the more populous and rapidly growing Puget Sound area. The population growth in the Puget Sound area and elsewhere in the state fuels much of the growth in outdoor recreation activity participation (see discussion in Section 3.11 Demographics / Social Setting for an understanding of population growth within the vicinity and within Washington State as a whole).

Table 3-6. *Projected Future Increase in Participation for Selected Outdoor Recreation Activities*

Activity	Estimated Change Next 10 Years (2002-2012)	Estimated Change, Next 20 Years (2002-2022)
Walking	23%	34%
Hiking	10%	20%
Nature Activities (includes outdoor photography, observing wildlife and fish, gathering and collecting, gardening, and visiting nature interpretive centers)	23%	37%
Sightseeing (includes driving for pleasure)	10%	20%
Bicycle Riding	19%	29%
Cross Country Skiing	23%	No estimate
Hunting / Shooting	-15%	-21%

Source: IAC (2002b).

3.8 RESEARCH

3.8.1 BACKGROUND

Since the first lands were purchased establishing the Refuge, research projects (ranging from undergraduate class projects to post-doctoral studies) have been completed on the Refuge. In the past decade, the Refuge has hosted between 3 and 6 research projects annually. Research topics covered have included; parasitology of reptiles, wildlife habitat relationships, limnology, nesting ecology of waterfowl and cavity nesting birds, roosting ecology of bats, predator/prey interactions, effects of management actions on wildlife populations and habitats, evolution of predator defenses in zooplankton, insect/plant co-evolution, fire effects on the ecology of individual plant species, plant communities, animal/plant relationships, and impact of herbivory on plant growth and development.

Although researchers from as far away as University of Illinois, the University of Alberta, Canada and the University of California at Santa Cruz have conducted studies on the Refuge, the large majority of researchers have come from local colleges and universities including Eastern Washington University, Washington State University, Gonzaga University, University of Idaho, and the University of Washington. Eastern Washington University, which is just a few miles north of the Refuge in the City of Cheney, has been the most active.

The Refuge has worked with several of these universities to complete research directed at filling information gaps that hinder the development of management strategies to achieve wildlife and habitat objectives. This type of research is given priority in the approval process. The Refuge maintains a research needs list that is shared with potential researchers.

All potential researchers are required to submit a research proposal for review and recommendation by the Refuge Biologist and approval by the Refuge Manager. The Refuge has limited on-going research projects to six per year. Proposals are reviewed for their potential benefit to the Refuge, Ecoregion and Region, their compatibility with the Refuge purposes, and the possibility of conflicts with on-going studies, Refuge monitoring efforts and management activities. Once a project is approved, a Special Use Permit is issued that may stipulate certain special conditions to minimize impacts to Refuge resources and conflicts.

3.8.2 TURNBULL LABORATORY FOR ECOLOGICAL STUDIES (TLES)

Eastern Washington University has operated a research facility on the Refuge under a cooperative agreement with the Service since 1973. This is the only facility of this type in the National Wildlife Refuge System. Its presence on the Refuge has resulted in a strong research relationship with the University which has resulted in a number of important studies beneficial to the understanding and management of Refuge habitats and wildlife.

The original cooperative agreement signed in 1973 allowed the University to construct and operate a facility within the boundaries of the Refuge for the purposes of conducting classes and environmental and biotic studies that would assist the Service in accomplishing Refuge objectives. The architectural design, plans, exterior colors, specifications, construction and location of the laboratory were all subject to Service approval. The University was required to comply with all Federal and State laws applicable to Turnbull NWR as well as with federal and state water quality standards for release of effluent from the operation. All research and study projects undertaken by the University that involve the use of the Refuge are to be approved in advance by the Service. The Service has the right to restrict the University from engaging in any projects when the Service determines that it is in its best interest to do so. Use of the lands upon which the laboratory is located and all use of the premises outside the building are coordinated with and subject to the approval of the Refuge Manager and will be

compatible with Refuge objectives and operations. The Service may terminate this agreement for failure of the University to comply with any or all of the terms or conditions. This agreement was in effect for a period of 15 years. It was renegotiated in 1988 and was reauthorized in 2004. The University has expressed a desire to expand the facilities which will have to be addressed during the renegotiations.

In order to assure that the University is in compliance with the terms of the agreement, the Refuge meets quarterly with the laboratory directors and the facility is regularly inspected. At the quarterly meetings, the Refuge receives an updates on activities at the laboratory and the Refuge addresses issues associated with reporting on research projects, compliance with Special Use Permits and operational concerns.

3.9 SPECIAL STATUS LANDS

Two Research Natural Areas (RNAs) are found within the Refuge: Turnbull Pines and Pine Creek RNAs. Research Natural Areas are part of a Federal system of such tracts established for research and educational purposes. Each RNA constitutes a site where some natural features are preserved for scientific purposes and natural processes are allowed to dominate. Their main purposes are to provide:

1) baseline areas against which effects of human activities can be measured;
2) sites for study of natural processes in undisturbed ecosystems; and
3) gene pool preserves for all organisms, especially rare and endangered types.

It is important to note that research on the Refuge is not limited to the RNAs. Research activity occurs in all areas of the Refuge. The RNAs do not contain enough habitat diversity nor are they large enough to function as complete representations of the Refuge, thus there has never been a compelling scientific reason to confine research to the RNAs.

According to the Standards and Policy Guidelines issued for Research Natural Areas (Dec., 1976 revision):

> *an RNA is a physical...unit in which current natural conditions are maintained, insofar as possible. These conditions are ordinarily achieved by allowing natural physical and biological processes to prevail without human intervention. However, under unusual circumstances, deliberate manipulation may be utilized to maintain the unique feature that the Research Natural Area was established to protect...Restoration should be initiated on an Area that is no longer valued for its established purpose...Manipulation may be required to restore an Area...*

Another guideline states:

> *Intense recreational use is not compatible with the objectives of Research Natural Areas. There may be some Areas where observational recreation can be conducted without prejudicing Area values. Other recreational activities such as rock collecting, berry picking, hunting, and fishing should not be encouraged , and should be prohibited if they are incompatible with Area objectives.*

3.9.1 TURNBULL PINES RNA

Turnbull Pine RNA was established in 1966 to exemplify "nearly pristine ponderosa pine savanna at the transition from forest to grassland and a series of freewater potholes characteristic of the Channeled Scablands" (Franklin et.al. 1972). Measuring a total of 197 acres, it is located along Cheney Plaza Road, surrounding the Turnbull Laboratory for Ecological Studies. The tract is mostly ponderosa pine forest with a few scattered groves of quaking aspen and wetlands.

Turnbull Pines gets more research use due to its greater proximity to the TLES. University class projects are frequently sited there.

While the first round of forest habitat management projects is underway, Turnbull Pines will be managed as a control area (until completion of all other uplands habitat management units - i.e. no tree removal or fire management over the next twenty years). There are a few other control areas on the Refuge, including Kepple Butte and the area north of Turnbull Slough. Once the forest thinning projects prescribed by the Habitat Management Plan have been completed in the rest of the Refuge, the Turnbull Pines RNA may also receive thinning and fuels treatment. In 2002, 40 acres were manually thinned just inside its northern boundary as part of a Wildfire Urban Interface (WUI) project.

3.7.2 Pine Creek RNA

Located near the eastern boundary of the Public Use Area, the Pine Creek RNA was also established in 1966 to exemplify "relatively undisturbed savanna of ponderosa pine and bunchgrasses found in the forest-grassland transition at the northeastern edge of eastern Washington's steppes" (Franklin et. al. 1972). This RNA measures 160 acres. Cheatgrass was noted in the southern half of the RNA by authors of the 1972 handbook (Franklin et.al. 1972) and the handbook notes that "the area must be considered disturbed by livestock grazing."

In 1989, the Washington Natural Heritage Program surveyed the RNA and adjacent Refuge land. The survey report (Gamon 1990) recommended that the existing RNA should be expanded. The rationale stated involved incorporating a greater expanse of ponderosa pine forest, two populations of yellow lady slippers (*Cypropidia parviflora,* state threatened), a vernal pool with tufted hairgrass, a geologic feature of note known as stonenet scabland, and the complete watershed of one of the larger wetlands. The expansion would have doubled the size of the RNA. Although the Refuge Manager applied to expand the RNA boundaries in 1990, no expansion was authorized.

There is some concern that opening of the stands in forest habitat management may have a negative effect on *C. parviflora.* Under current Refuge management practices, there is an 82-foot zone around the wetlands in which mechanical equipment is not allowed (exceptions are made for particular wetland restoration activities).
C. parviflora populations are usually found within this 82-foot zone and will be protected by this management practice in numerous locations outside the RNA. Thus the expansion of the RNA is not seen as critical for protection of this species.

As part of the HMP planning process, the Refuge examined the features for which Pine Creek RNA was designated. After doing so, the Refuge deemed that certain active management activities were necessary. In particular, overstocked stands of ponderosa pine threatened the long term sustainability of this RNA. As a result, the Refuge obtained permission to thin this RNA in 2001. RNA policy guidelines (Dec. 1976) normally prohibit commercial operation in RNAs, but fire management (without logging to prepare stands) has always been permitted in RNAs. After this thin, the Refuge intends to maintain the RNA stand condition with fire.

3.10 CULTURAL RESOURCES

3.10.1 Native American Overview

Comparisons of point forms and related archeological findings at Turnbull NWR with radiocarbon dated collections from surrounding areas indicates that human presence in the Channeled Scablands of eastern Washington dates back at least 8000 years. At the time of historic contact the area encompassing the Turnbull NWR was within the territory of the Upper Spokan Indians. Their territory included areas around the upper mainstem and tributaries of the Spokane River. They were bordered on the west by the Middle Spokan Indians which occupied the middle portion of the Spokane River and to the east by Coeur d'Alene Indians

which occupied the areas surrounding Coeur d'Alene Lake, Coeur d'Alene River and the upper most portion of the Spokane River. To the south their neighbors were the Palus Indians. The Spokan Indians and their neighbors are considered part of the Plateau Culture whose major characteristics included a heavy reliance on salmon and other aquatic foods; highly developed fishing techniques; joint occupation of resource areas; expansion of kinship ties through intermarriage; development of extensive trade networks; and a simple political organization formed at the village level (Holstine et al. 1992).

The Spokan and other Columbia Plateau people were semi-nomadic, carrying out subsistence hunting, gathering and fishing by making frequent, calculated moves to identified resource areas during different seasons (i.e., seasonal subsistence rounds). This semi-nomadic strategy allowed them to collect food sources for nine months of the year, then live on stored foods for the hardest months of the winter. Semi-permanent winter villages of the Spokan people were often situated adjacent to principal salmon fishing areas while temporary camps were set up at root digging grounds, berry collecting areas, and hunting locations. Salmon resources were not present at Turnbull NWR, and therefore the closest winter villages were located near fishing stations likely at Hangman Creek (Latah Creek) 10 miles east of the Refuge, and along the Spokane River about 15 miles to the north (Holstine et al.1992). While the Refuge lacks anadromous fish resources, it and adjacent areas had several other major traditional Native American food resources, especially bulbs and roots, waterfowl, waterfowl eggs, turtles, and marmots (Holstine et al. 1992, Bernard 1947). Deer, elk, and possibly antelope were also found here and may have been hunted, although the principal locations for hunting large game as well as for berry collecting were in the highlands north of the Spokane River. The only documented seasonal settlement in proximity to the Refuge was identified at the site of present-day Cheney, Washington. Accounts of local settlers say it was a gathering place during June or July for camas digging and for other activities including horse racing, gambling, and trading. Most likely many other campsites were also scattered about the landscape (Holstine et al. 1992).

Based on both their abundance and variety, bulbs and roots were probably the most significant resources found at the Refuge. Historically, Indian people from at least two separate groups are known to have harvested plant resources on the Refuge. The Spokan and Coeur d'Alene people came here in the spring to dig the roots of camas, kous, bitteroot, and wild onion (Holstine et al. 1992, Bernard 1947). Land use practices of the early Euro-American settlers, especially draining, tilling, and grazing, reduced the quantity and distribution of camas and other native plant foods both on and off the Refuge (Bernard 1947), however several large stands of camas remain viable today (Holstine et al. 1992). After the creation of the Refuge, Native Americans were allowed to use some of the camas fields until the 1940s when this use was stopped due to concerns of impacting spring nesting of waterfowl (Holstine et al. 1992). More recently permits for root collecting have been granted almost yearly to various Spokans. Today's Native American collecting activities on the Refuge are primarily focused on teaching the younger generation traditional gathering methods.

3.10.2 Euro-American Overview

In the early 1800s, most fur traders avoided the present day Refuge area when they traveled the Channeled Scablands from northeast Washington to the Snake River. All of the major travel routes in eastern Washington bypassed this area because travel through wetlands was always difficult. From 1859-1862 however, the U.S. Army constructed a 624 mile long road between Fort Walla Walla and Fort Benton on the Upper Missouri River in Montana. Named the Mullan Road after Lt. John Mullan who directed its construction, it crossed the southeast corner of the present Refuge. While the Mullan road was infamous for being washed out and rough going, the

portion crossing the open grasslands of the Refuge was probably one of the better stretches and was maintained as a principal route of localized travel for people who later settled along the road (Holstine et al. 1992).

Settlement on the Refuge lands occurred later than other areas of the Pacific Northwest because of the obstacle posed by the wetlands. Daniel Percival became the first settler to own land there when he purchased 120 acres in 1877. Most wetland settlers combined stock raising with grain and hay production to make a living. Many of the early residents hunted or hauled freight to supplement their income. In 1880, a road was built that crossed the northern edge of the Refuge with bridges across the low marshy areas. This new improved road gave the few wetland settlers connections to nearby outposts of civilization, and a stage coach service between Cheney and Spangle began. By 1881 the Northern Pacific Railway Co. had laid track from Portland to Spokane. With it came new economic opportunities for local residents including providing timber for railroad ties and selling oats and hay (Holstine et al. 1992).

Cyrus Turnbull and his wife Mary Jane Williams built a cabin at the north end of Turnbull Slough and lived there with their children from 1880 - 1886 before moving to Idaho Territory. While Cyrus listed his occupation as farmer in the 1885 Auditor's census of Spokane County, family accounts indicate that hunting commanded the greatest share of his energy and interest while he lived on the Refuge (Holstine 1992). His oldest son Oliver distinctly remembered his father's tamed wild geese which were used as decoys (Bernard 1947). It is not known whether Cyrus Turnbull settled in the wetlands for the purpose of making a living from hunting, but in those days skillful hunters could earn a living providing wild meat to the newly established and rapidly growing town of Cheney (Holstine 1992). Cyrus Turnbull was not the first settler of the wetlands, never owned land there, and stayed only six years, yet his contemporaries named the area after him. Perhaps his success as a hunter may have inspired his neighbors to name his primary hunting grounds after him (Holstine et al. 1992). The foundation of Turnbull's cabin was still visible in 1946 (Bernard 1947), however the site has not been found in recent years.

When the nearby transcontinental railroad line was completed in 1883, settlement accelerated to a flood as emigrants from the Midwest and East Coast arrived to claim or purchase vacant lands for farming and speculation. Settlement decreased during the Depression of 1893 and increased again in the early 1900s. Most of the residents on Refuge lands became subsistence farmers who dug ditches to drain their land. Cooperative drainage districts were later formed to drain more water over a larger area. Most of the drained land was unfit for long-term crop growing (Holstine et al. 1992).

In 1906 the Spokane, Portland, and Seattle Railway (SP&S) started construction on a regional railroad to provide more direct access to Portland for Spokane area produce and passengers. The line went through what is now the western portion of the Refuge. Construction required extensive blasting through basalt rock, which old-timers claimed was responsible for lowering the water table in the wetlands. Sometime during the railroad construction, crews of Italian laborers built rock ovens within the present Refuge. The workers baked bread in the ovens. Another strikingly similar oven is located in the Refuge but not near the railroad. This oven was possibly built by a settler who may have copied the technique used by the Italian laborers or it could have been constructed in association with ditch construction laborers. Dairying made modest profits for Turnbull settlers until the Washington Water Power electric railroad, which shipped milk to creameries in Spokane, was shut down in 1922. The replacement of the horse with the automobile in the 1920s caused a decline in the price of hay which hurt the local economy. As the thin peat soils lost their fertility, profits declined, and the Great Depression approached, many Turnbull area farmers were forced to abandon their lands

(Holstine et al. 1992). The establishment of the Turnbull National Wildlife Refuge was in part made possible because of the failing farm economy (Valentine 2000).

Despite their close proximity to a transcontinental railroad and later a regional railroad, settlers of Turnbull Lakes lived a relatively isolated existence. The roads were unpaved, poorly maintained and frequently impassable. Not a single farm ever received electricity or telephone service. When the government acquired the lands in the 1930s, the hardy descendants of the pioneers who first settled the area were still living out the final phase of the frontier era (Holstine et al. 1992).

3.10.3 Current knowledge of local cultural resources

Refuge Cultural Resource Surveys

Cultural resource investigations on Turnbull NWR started in the early 1970s when Refuge personnel made informal efforts to identify a few sites within Refuge boundaries. Beginning in the 1980s formal cultural resource surveys were conducted in association with proposed ground disturbing management projects including pond alterations, fenceline construction, and a new entrance road. A comprehensive survey of the Refuge (Holstine et al. 1992) was conducted by professionals from Eastern Washington University's Archaeological and Historical Services under a grant from the Service. This survey covered an estimated 1500 acres of the Refuge and included a historical records search. The Refuge land holdings total 15,656 acres, of which 2,606 acres (or 17 percent) have been systematically surveyed to date for cultural resources.

A limitation of all surveys on the Refuge is poor ground surface visibility, especially in forested areas and areas where Mt. St. Helen's ash was deposited in 1980 (Holstine et al. 1992). That, combined with different survey techniques and purposes, can result in undiscovered sites even on previously surveyed areas. It is highly probable that over the coming years additional archeological and historical sites will be exposed by human actions or natural causes. Forested uplands are more likely to contain as yet undiscovered prehistoric lithic debris sites. Wetlands and agricultural fields are less likely to contain intact prehistoric sites due to intensity of disturbance during historic and recent times.

Refuge Cultural Resource Sites

Turnbull NWR has some truly unique, interesting prehistoric and historic properties. Refuge surveys have resulted in several recorded prehistoric sites. There are three rockshelters, naturally formed by flood-eroded basalt faces, on the Refuge. These are large enough to provide human shelter but their most important use was probably food storage. At least nine rock pits in four different locations have been found on the Refuge. These pits probably held caches of either dried meat or plant foods, particularly roots. This storage method reduced the quantity of food lost to burrowing animals and the air circulation within the rocks helped reduce spoilage. Caches of this type were intended to blend into the surrounding rock to prevent raiding by other families or groups. Foods were commonly stored near collection areas and extracted in late winter/early spring when food supplies were low. These storage pits were probably used within the last 200 years since these types of structures are destroyed over time due to rock creep/movement (Holstine et al. 1992). Evidence of a roasting oven probably used for camas and dating back as much as 1,000 years has been found on the Refuge (Lyons 1993). Small lithic debris scatters that are estimated to be between 2,000 and 3,000 years old have been found. These are presumed to have been in locations of temporary food gathering camps. These sites, combined with information collected in other areas of eastern Washington, support the theory that during prehistoric times Refuge lands were used primarily on a seasonal basis for hunting and gathering (Holstine et al. 1992).

There are many historic sites on the Refuge including 38 farmsteads which have been recorded and several others known but not located. House foundations, fence jacks, and domestic detritus from the first quarter of the twentieth century including milk and tobacco cans, glass bottles, canning jars, and various metal objects remain to tell their story. More of these types of physical remains of historic sites are likely to be discovered throughout the Refuge. Two rural schoolhouse sites also occur on Refuge lands. It is not known when the schools were first built but they were probably in use during the late 1800s and continued until 1923 when students in the Turnbull Lakes area began attending school in Cheney. Just over one mile of the Mullan Road, one of the Pacific Northwest's most significant historic travel routes crosses the southeast corner of the Refuge. Another historic road that may have been an alternate route during wet seasons crosses the Refuge about a half mile east of the Mullan Road. The SP&S railroad grade still exists, and evidence from its 1906 construction, like the rock ovens built by Italian laborers, can be found along its length. Many water control structures in the form of dikes, ditches, and a tunnel under the SP&S railroad bed were constructed by early settlers, drainage district crews, and WPA workers in their efforts to improve agricultural production by draining the wetlands. After the Refuge was established in 1937, some of the original ditches were modified and other water control structures added for the opposite purpose of retaining water in the wetlands to enhance waterfowl habitat.

Cultural Resource Surveys and Sites within the Study Area

A record search conducted in January 2000 found that only four systematic cultural resource surveys have been conducted in or near the study area outside of Refuge lands. There are no recorded prehistoric sites, however, four historic sites have been formally recorded in this area. The four sites are as follows: 1) Mullan Military Road Marker monument - constructed in 1926 - indicating that remnants of this road are in the study area as well as on the Refuge; 2) Campsite of General William T. Sherman during a 1877 tour. Sherman was visiting to site new military posts so as to quell Indian unrest of the times. 3) Dybdall Grist Mill, a custom wheat mill which operated from 1897 until 1955, and is listed on the National Register of Historic Places; and 4) Company Ditch - a portion of this canal is also within the Refuge and is currently used to move water into the wetlands that it was originally constructed to drain.

The higher density of recorded historic and pre-historic sites located in Turnbull NWR is due to federal ownership and the mandates to survey federal lands. The density of sites within the Study Area may be similar, but fewer surveys have been done (Valentine 2000).

3.11 REFUGE BUDGET AND REVENUE SHARING

3.11.1 ANNUAL FUNDING

In FY 2002 Turnbull Refuge was allocated $455,100 in 1261funds, $260,850 in 1262 funds, $1,500 in 1231 funds, $12,000 in 6860 funds, $5,000 in 1121 funds and $735,700 in fire program accounts. The large fire program at the Refuge receives 50 % of the total allocated funds, and these are used for Pre-suppression, Hazardous Fuel Reduction and Wildland Urban Interface (funds used to reduce the wildfire hazard on private lands and along the boundary of the Refuge).

3.11.2 REVENUE SHARING

When private lands are acquired by the USFWS they are removed from the tax rolls. This is because the United States Government, like city, township, county, and state governments, is exempt from taxation. However, under provisions of the Revenue Sharing Act, the county receives an annual revenue sharing payment which often equals or exceeds the amount that would have been collected from taxes in private ownership. The revenue sharing

fund consists of net income from the sale of products or privileges. Some examples are timber sales, grazing fees, permit fees, oil and gas royalties, etc. If there is not enough money in the fund to cover the annual payments, Congress is authorized to appropriate money to make up the deficit. Should Congress fail to appropriate such funds, payments to the county are reduced accordingly.

The Refuge Revenue Sharing Act provides for a payment of the greater of 25 percent of net receipts, or 3/4 of 1 percent of the adjusted purchase price for purchased land, or $0.75 per acre. Payments can not be less than $0.75 per acre for all purchased and donated land. All lands administrated solely or primarily by the USFWS qualify for revenue sharing. USFWS lands are reappraised by the Service at least once every 5 years. Payments to counties can be used for any governmental purpose. Spokane County has traditionally used the payment for the support of roads, schools and fire suppression.

3.11.3 Entrance Fee Program

The Refuge currently has a seasonal entrance fee program. Visitors pay a daily fee of $3/car to enter the Refuge between March 1 and October 31. Visitors can also use the Federal Passport System's Golden Eagle, Golden Access, or Golden Age Passports which are annual passes to all open federal lands. The Federal Duck Stamp at $15/year allows entrance to all National Wildlife Refuges that charge an entrance fee, or visitors can use an annual $12 Refuge Annual Pass specifically for Turnbull NWR. Entrance fees currently generate about $6,000/year at Turnbull NWR. With a 30% increase in visitation expected over the next decade, the Service expects this amount to rise to at least $8,000/year. Consideration could be given toward requiring an entrance fee year around instead of seasonally. These funds are used to purchase additional Refuge brochures, signs, and pay for other public use supplies and activities.

3.11.3 Volunteers

Volunteers provided 16,000 hours of service to the Refuge in FY 2002 at a value of $236,000. This is the equivalent of 7.7 full time employees. The hours provided were categorized as follows: 4,108 hours in habitat and wildlife monitoring support, 1,756 hours in habitat management, 722 hours in fish and wildlife management, 2,455 hours in resource protection, 6,359 hours in public use and recreation , 55 hours in planning and 2,883 in maintenance.

3.12 LOCAL SOCIAL AND ECONOMIC SETTING

The Refuge is situated entirely within Spokane County, in Northeast Washington. The nearest town, Cheney, sits just north of the Refuge's northern boundary. The City of Spokane, Washington's second largest city, is approximately 20 miles to the northeast.

3.12.1 Population, housing and income

County-wide data

Population and social statistic data for Spokane County, and comparisons with the State of Washington as a whole, are shown in Table 3-7.

Spokane County has grown rapidly in recent years with a 15.7 percent increase in population since 1990, making it the third fastest growing county in the state during the 1990s.

Census figures of Spokane residents from the year 2000 show that 91.4 percent identify themselves as White. Persons of Latino or Hispanic origin represent the largest other racial category, with 2.8 percent reporting themselves in this category. An additional 2.8 percent identify themselves as of two or more races.

Slightly over 11 percent of the entire population of Spokane County identify themselves as college graduates, compared with 12 percent in the State as a whole.

Median household income is lower in Spokane County than in the State as a whole. Correspondingly, the poverty rate is slightly higher in Spokane County than in the State of Washington as a whole.

Rural Areas

The Refuge and the Study Area are both located within Census Tracts 142 and 143. The City of Cheney is located within Census Tract 140.

Within Spokane County, several subareas were designated for the purposes of calculating population. Rural subareas encompass more than one Census Tract. The Refuge is situated within County Subarea "South Rural" and is just adjacent to the County subarea "West Rural." Table 3.8 shows population and housing data for these areas.

Urban Areas

Population data, and changes since 1990, are presented for several local towns in Table 3-9.

The current population of the City of Spokane, located 20 miles (32 km) northeast of the Refuge,
is 195,629 people, making it the second largest city in Washington State (U.S. Census 2000) (Table 3.9). This represents a 10 percent increase since 1990, a faster growth rate than either Seattle or Tacoma. The population of Cheney, just adjacent to the Refuge, has also increased at a rapid rate since 1990 (Table 3-9).

Table 3-7 *Population and Associated Social Statistics, Spokane County and Washington*

	Spokane County	Washington
Population, 2000	417,939	5,894,121
Population, percent change, 1990 to 2000	15.7%	21.1%
Persons under 18 years old, percent, 2000	25.7%	25.7%
Persons 65 years old and over, percent, 2000	12.4%	11.2%
High school graduates, persons 25 years and over, 1990	192,761	2,620,607
College graduates, persons 25 years and over, 1990	47,096	716,969
Housing units, 2000	175,005	2,451,075
Homeownership rate, 2000	65.5%	64.6%
Households, 2000	163,611	2,271,398
Persons per household, 2000	2.46	2.53
Households with persons under 18, percent, 2000	34.7%	35.2%
Median household money income, 1997 model-based estimate	$35,691	$41,715
Persons below poverty, percent, 1997 model-based estimate	12.2%	10.2%
Children below poverty, percent, 1997 model-based estim.	17.1%	15.2%

Source: U.S. Census, 2000 (http://quickfacts.census.gov/qfd/states/53/53063.html)

Table 3-8. *Summary of Population and Housing by County Subarea*

Subarea	Census Tracts included	2000 Population	2000 Housing
West Rural (includes City of Cheney),	104, 140, 139, 141	32,046	10,799
South Rural	133, 135, 142, 143	11,897	4,953 estimated

Source: Spokane County (http://www.spokanecounty.org/BP/Census/2000/2000cntysum.asp)

Table 3-9. *Recent Population Growth in Selected Cities near Turnbull NWR (1990-1999).*

Location	Population (1990)	Population (2000)	Percent Change (1990-2000)
Spokane	177,196	195,629	10.0
Cheney (adjacent to Turnbull NWR)	7,723	8,832	14.3
Medical Lake	3,664	3,758	2.5
Spangle	229	240	4.8

Source: US Census Bureau (*http://factfinder.census.gov/servlet/GCTTable?_bm=y&-geo_id=04000US53&-_box_head_nbr=GCT-PH1&-ds_name=DEC_2000_SF1_U&-format=ST-7*)

Table 3-10. *Estimated Population (2015) and Population Change (1999-2015) in Selected Locations.*

Location	Estimated Population (2015)	Percent Change (1999-2015)
Spokane	242,744	28.3
Cheney	11,235	31.4
Spokane County	510,971	23.3
Washington State	7,142,144	24.1

Source: OFM (1999)

Future Trends

The population increases observed over the last 10 years are forecasted to continue beyond 2015. By 2015, the population of Spokane County is expected to increase 23.3 percent to 510,971 while the population of Washington State will increase 24.1 percent to 7,142,144 (OFM 1999) (see Table 3-10). These increases in population are expected to be mirrored by similar growth in many of the communities surrounding the Refuge.

3.12.2 Employment and Business

Table 3-11 shows some basic business and employment data for Spokane County, with comparison to Washington State as a whole.

3.12.3 Environmental Justice

In February 1994, the President of the United States issued Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations. This Executive Order requires all

federal agencies to seek to achieve environmental justice by identifying and addressing disproportionately high and adverse human health or environmental effect of its programs, policies, and activities on minority and low-income populations.

Activities related to Refuges usually do not have a high risk of adversely affecting human health and the environment. In reviewing the demographics of Spokane County, less than 10 percent of the county identified themselves as a minority and just over 12 percent of the population is estimated to be living below the poverty level.

Table 3-11 *Employment and Business Data*

Business Facts	Spokane County	Washington
Private nonfarm establishments, 1999	11,717	162,932
Private nonfarm employment, 1999	162,962	2,209,129
Private nonfarm employment, percent change 1990-1999	29.1%	25.4%
Nonemployer establishments, 1998	20,937	315,472
Manufacturers shipments, 1997 ($1000)	3,994,582	78,852,486
Retail sales, 1997 ($1000)	4,122,561	52,472,866
Retail sales per capita, 1997	$10,165	$9,363
Minority-owned firms, percent of total, 1997	5.1%	9.6%
Women-owned firms, percent of total, 1997	22.9%	27.5%
Housing units authorized by building permits, 2000	2,094	39,021
Federal funds and grants, 2000 ($1000)	2,132,792	33,896,997
Local government employment - full-time equivalent, 1997	11,717	185,152

Source: U.S. Census, 2000 (http://quickfacts.census.gov/qfd/states/53/53063.html)

CHAPTER 4

Environmental Consequences

Trumpeter Swans. Photograph by Nancy J. Curry

This chapter analyzes and compares the effects anticipated under each alternative, assuming each alternative would be implemented as described in Chapter 2. In general, the spatial framework for analysis is the Study Area, and the time period considered is the next fifteen years. Effects are considered in four main topic areas: species and habitats, social, economic, and cultural. Within each topic area we have chosen the key indicators of concern for evaluation. These indicators highlight the key resource values under the topic of consideration. Each indicator is assessed for the effects that would occur to it by implementation of the land protection actions, public use actions, and elk management actions proposed under the different alternatives. For analysis purposes, elk hunting programs are assessed under the public use actions sections.

A summary of the overall chapter and analysis is found in Table 4-1. The effects are summarized using words or phrases (minimal, decrease, increase, stable, declining) to characterize the effect on the indicator. A short narrative is also provided to further explain the effect. Where possible numeric quantities from tables within the chapter are provided to ease comparisons of the alternatives.

4.1 EFFECTS TO SPECIES AND HABITATS

4.1.1 INDICATOR 1-EFFECTS TO WATER QUALITY AND QUANTITY

Effects from land protection actions

Land protection actions can have a very large impact on Refuge water quality and quantity, because the proximity and growth of the Spokane metropolitan area is probably the greatest threat to water quality and quantity within the Turnbull NWR. The principal land protection differences between alternatives are the sizes of the Stewardship Area and the acres of habitat potentially acquired for inclusion in the National Wildlife Refuge System. Under all alternatives a Stewardship Area would be designated, and within this area the Refuge would focus outreach and education programs to increase landowner participation in voluntary conservation programs protecting water quantity and quality, and protecting and restoring additional habitat. The Stewardship Area measures a total of 21,396 acres in Alternative 1 and 44,536 acres in Alternatives 2, 3, and 4. The Stewardship Area by itself under Alternatives 1 and 2 would not constitute an expansion of the current Approved Refuge Boundary. In Alternatives 3 and 4, an expanded Approved Refuge Boundary is proposed. Within this boundary, the Service would seek to purchase land or an interest in land from willing sellers (contingent on funding) to increase the size of the Refuge and further conservation efforts.

Both the conservation programs of the Stewardship Areas and the land acquisition potential of an expanded Refuge boundary rely on voluntary and willing participants. Since their numbers are largely unknown, it is difficult to estimate the effectiveness of each of the alternatives in protecting and restoring water quality and quantity. However, the larger the land base, the more opportunities there will be to protect and restore water quality and quantity. It is assumed that land acquisition within an expanded Refuge boundary would be more effective in fully protecting and restoring water quality and quantity than the Stewardship Area conservation programs, because the acquisition would remove any constraints imposed by the economic and personal needs of the private landowner. Land acquisition by the U.S. Fish and Wildlife Service may be the best remaining opportunity to protect habitat and Refuge water quality and quantity from adverse land use changes.

The Stewardship Area for Alternative 1, identified in the Refuge's Habitat Management Plan, was defined to protect watersheds northeast of the Refuge that were felt to be at the highest risk from development. The Stewardship Area also included a one-mile wide buffer zone around the Refuge where excessive

Table 4.1 *Summary of effects of alternatives on biological, social, economic, and cultural resource indicators.* [1]

Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Effects to Water Quality and Water Quantity				
Input of phosphorus and nitrogen into refuge wetlands	**Increased N and P inputs:** An estimated 1,342 acres (3% of the Study Area) would be protected over the next 15 years, resulting in little change in existing trends of agricultural run-off or the number of additional septic systems projected to be installed within the Refuge surface watershed over the next 15 years.	**Increased N and P inputs:** An estimated 2,683 acres (6% of the Study Area) would be protected over the next 15 years, resulting in slight improvements that would not substantially offset nutrient input from new hobby farms and additional septic systems.	**Stabilized N and P inputs:** This alternative would potentially result in 600 fewer new septic systems installed within the Refuge surface watershed, and would also result in partially reduced agricultural inputs to Refuge watersheds. These improvements would, however, only offset increased inputs from septic systems and hobby livestock, thus resulting in similar levels of nutrient inputs to Refuge wetlands as presently.	**Decreased N and P inputs:** This alternative would potentially result up to 1,200 fewer new septic systems and would also result in reduced livestock grazing within wetland basins that drain onto the refuge thereby decreasing the total input of phosphorus and nitrogen and substantially improving water quality.
Inflow to refuge wetlands from surface drainages and groundwater	**Declining Water Tables:** Up to 2,000 additional wells could be drilled for domestic use as the area is sub-divided over the next 15 years, further reducing groundwater resources .	**Declining Water Tables** Fewer wells would be developed in the 1-mile groundwater buffer area, but some declines in water levels in the shallow aquifer would still be expected in the long-term.	**Stable Water Tables** The number of new wells expected would be one third less than under Alternative 1, resulting in stabilizing water levels in the shallow aquifers.	**Increased Water Tables** The potential number of new wells would be reduced by 1,200. In conjunction with increased wetland restoration activities, aquifer recharge should raise the water table reducing surface water losses to groundwater recharge.

[1] Alternatives are distinguished based on actions in three main areas: land protection, public use, and elk management. For a detailed description of alternative actions in these areas, see Chapter 2. To summarize land protection actions briefly here, Alternative 1 includes land protection actions that rely on landowner participation in voluntary conservation programs and partnership activities within a small designated Stewardship Area. Alternative 2 also relies on voluntary conservation but includes some funding for outreach and designates a larger Stewardship Area. Alternative 3 includes voluntary measures and also provides for protection, under the National Wildlife Refuge System, of up to 12,000 acres, by fee, easement, or cooperative agreement within the Stewardship Area. Alternative 4 is similar to Alternative 3 but provides for protection of up to 25,000 acres by fee, easement, or cooperative agreement.

Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Effects to Wetland Habitats and Populations of Wetland-Associated Species				
Cumulative Effects on Area and Effectiveness of Wetland Habitat	**Declining Faster** This alternative could result in the protection and restoration of 261 acres of altered wetlands (5% of the Study Area), but most wetland habitat in the area would still be expected to decline in quality due to trends in water quality and quantity.	**Declining Slower** This alternative could result in 522 acres of wetlands protected and restored, but most wetland habitat in the Study Area would still be declining in quality due to trends in water quality and quantity.	**Stable to Increasing** Alt. 2 could result in 2,102 acres of altered wetlands restored, which equates to approximately 40% of the altered wetland acreage of the Study Area. This would offset continued wetland losses on other unprotected lands in the Study Area.	**Increasing** Alt. 4 could result in 3,627 acres of altered wetlands restored (72% of the altered wetland acreage in the Study Area). This level of conservation effort would more than offset any losses on the remaining unprotected acres in the Study Area.
Percent of refuge wetland habitat impacted by public uses: Spring/Summer Fall	18% 18%	10% 10%	12% 30% (18% of the fall wetland habitat would be affected only on 2 days/yr during the youth waterfowl hunt)	12% 35%
Waterfowl Breeding pairs • Number of pairs (% increase over current) • Fall use days (% increase)	480 (11%) 80,218 (13%)	961 (23%) 161,121(27%)	4,114 (88%) 622,755(103%)	7,501 (159%) 1,123,054 (186%)
Waterbird and shorebird populations: percent increase over current levels	13%	27%	103%	186%
Overall effects on populations of wetland associated wildlife	**Decreasing Populations** Small increases in the wetland area protected and restored within the Study Area would not offset declines in remaining altered and unprotected wetlands. Human disturbance of 18% of the existing refuge wetlands would contribute to declines in populations of wetland species.	**Decreasing Populations** Moderate increases in the wetland area protected and restored would not offset declines in remaining altered and unprotected wetlands.	**Stable to increasing populations** Significant restoration of altered wetland habitat and protection of existing intact wetlands would result in population increases that would offset expected losses on the remaining altered and unprotected wetlands.	**Increasing populations** Restoration and protection of an estimated 72% of the wetlands in the Study Area would result in substantial increases in populations of wetland associated wildlife during the breeding season and fall migration period.

Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Effects to Steppe Habitats and Populations of Steppe-Associated Species				
• Acres of high and medium quality steppe within Stewardship Zone • Acres potentially protected and restored	6,380 370	10,278 740	10,278 4,340	10,278 8,240
Percent of refuge steppe habitat negatively affected by public uses	20%	11.7%	13.5%	13.5%
Cumulative effects on area and effectiveness of steppe habitat from all proposed actions	**Declining Faster** An overall decline in the integrity of steppe habitats from increased fragmentation, invasive species, and development is expected in the Study Area.	**Declining Slower** A net decline in the biological integrity of steppe habitat is expected in the Study Area.	**Stable to Increasing** Additional opportunity to fully protect and restore larger tracts of high quality steppe habitat in the Study Area would offset losses resulting from sub-division and development.	**Improving** Additional opportunity to protect and restore most of the high quality steppe habitat in the Study Area would result in an overall improvement in the condition of steppe habitats within the vicinity of the refuge.
Cumulative effects on steppe associated wildlife (eg. grasshopper, vesper, lark, and savannah sparrows)	**Declining Faster** Nesting populations of steppe associated birds in the Study Area would be expected to decline as a result of the net loss of the biological integrity of steppe habitat and increased disturbance in the refuge Public Use Area.	**Declining Slower** Nesting populations of steppe associated species in the Study Area would be expected to decline as a result of the loss of the biological integrity of the remaining unprotected steppe habitat.	**Stable to Increasing** Restoration and protection efforts under this alternative would offset losses from development and land conversion, stabilizing or slightly increasing populations of steppe associated species.	**Increasing** Net increases in the area and biological integrity of steppe habitats within the Study Area would increase nesting populations and productivity of associated wildlife species.
Effects to Ponderosa Pine Habitats and Populations of Ponderosa Pine-Associated Species				
Acres of high and medium quality pine habitat in the Stewardship Area	7,582	14,778	14,778	14,778
Acres potentially protected and restored	629	1,258	7,378	14,008

Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Percent of Refuge ponderosa pine habitat affected by public uses	11%	2%	2.6%	2.6%
Cumulative effects to ponderosa pine habitat	**Declining Faster** Many large landholdings in the Study Area would continue to be sub-divided and developed resulting in an overall decline in the integrity of pine habitats in the Study Area.	**Declining Slower** Habitat losses, degradation and fragmentation would continue to occur, but at a slower rate than in Alt. 1.	**Stable to Improving** Additional opportunity to fully protect and restore larger tracts of ponderosa pine habitat in the Study Area would offset losses from sub-division and development.	**Improving** The opportunity exists to protect and restore the vast majority of high quality pine habitat in the Study Area, improving the overall availability and condition of pine habitats in the Study Area.
Effects to associated wildlife	**Declining Faster** Species requiring large blocks of mature pine forest would decline in the area as property is sub-divided and cleared for homes. Cavity-using wildlife species requiring large diameter trees would be the most impacted.	**Declining Slower** Species requiring large blocks of mature pine forest would decline in the area, but at a slower rate than in Alt. 1. Cavity-using wildlife species requiring large diameter trees would be the most impacted.	**Stable to Increasing** Protection and restoration of substantial areas of ponderosa pine forest would stabilize populations of species requiring large blocks of mature pine forest. Cavity-using wildlife species requiring large diameter trees would be the most benefited.	**Increasing** Species requiring large blocks of mature pine forest would increase in the area as protection and restoration take place on 72% of the pine habitat in the Study Area. Cavity-using wildlife species requiring large diameter trees would be the most benefited.
Cumulative Effects to Forest Connectivity	Continued sub-division of larger forested tracts north of the refuge would result in fragmentation and erosion of forest connectivity.	Forest connectivity would still slowly decline over time.	This alternative would help maintain minimally effective linkages to other forested zones.	This alternative would create fully effective linkages to other forested zones.
Effects to Aspen / Riparian Habitats and Populations of Aspen / Riparian Associated Species				
Acres of high and medium quality aspen /riparian habitat within the Stewardship Area	233	363	363	363
Estimated acres protected and or restored	12	24	144	274
Percent of Refuge habitat affected by publicuses	19%	3%	4%	4%

Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Cumulative Effects on the area and effectiveness of aspen / riparian habitat from all proposed actions.	**Declining Faster** Little impact of Refuge programs on land use trends, thus, many large landholdings would continue to be sub-divided and developed resulting in an overall decline in the integrity of aspen habitats in the Study Area.	**Declining Slower** Some impact of Refuge programs on land use trends, however, land clearing and fragmentation would continue, resulting in an overall decline.	**Stable to Increasing** Larger impact of Refuge programs on land use trends, thus would provide additional opportunity to fully protect and restore larger stands and aggregations of aspen habitat in the Study Area, offsetting losses and declining quality in remaining unprotected areas.	**Increasing** The opportunity exists to protect and restore the vast majority of aspen habitat within the Study Area.
Cumulative Effects to aspen / riparian associated wildlife (especially deciduous forest dependent species, such as red-naped sapsucker, willow flycatcher, and yellow warbler)	**Declining Populations** Decline expected in populations of most deciduous forest dependent species within the Study Area. Increasing visitation and the lack of adequate controls within the Public Use Area would result in declines in these species on the refuge.	**Declining Populations** Decrease in most deciduous forest dependent species.	**Stable to Increasing** Stable populations of deciduous forest dependent species would be expected.	**Increasing** Increased populations of deciduous forest dependent species would be expected.
Effects to threatened and endangered species				
Acres of potential Spalding's silene habitat in Stewardship Area	4,256	6,502	6,502	6,502
Estimated acres protected and restored	358	605	2,575	4,700
Spalding's silene - Cumulative Effects	**Declining Faster** Little impact of Refuge programs on land use trends, thus expected degradation and loss of existing Silene habitat and populations under this alternative.	**Declining Slower** Losses due to sub-division and development would continue to occur on the remaining unprotected areas, at a rate slower than Alt. 1.	**Stable to Increasing** Additional opportunity to fully protect and restore larger tracts of high quality steppe habitat in the Study Area would be available, thereby offsetting losses of Silene habitat on the remaining unprotected lands.	**Improving** Opportunity would exist to protect and restore the vast majority of remaining high to medium quality steppe habitat in the Study Area, thus protecting nearly all available Silene habitat within the Study Area..

Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Number of *Howellia* wetlands in Stewardship Area	200	400	400	400
Total acreage of potential *Howellia* wetlands	454	885	885	885
Estimated acres protected and restored	38	82	350	640
Water Howellia - Cumulative Effects	**Declining Faster** Expected losses in *Howellia* habitat resulting primarily from declines in water quantity resulting from excessive groundwater withdrawals.	**Declining Slower** Expected losses in *Howellia* habitat resulting from declines in water quantity resulting from excessive groundwater withdrawals.	**Stable to Increasing** Additional opportunity to fully protect and restore potential *Howellia* habitat in the Study Area thereby offsetting losses on the remaining unprotected lands.	**Increasing** Protection and restoration of the vast majority of *Howellia* habitat in the Study Area. would be expected.
Fall and winter bald eagle habitat - Cumulative effects	**Declining Faster** Increasing development around existing permanent water sources and potential declines in water quantity would result in an overall decline in fall /winter bald eagle habitat.	**Declining Slower** Increasing development around unprotected permanent water sources and potential declines in water quantity would result in an overall decline in fall /winter bald eagle habitat.	**Stable to Increasing** The potential exists to double the area of protected bald eagle habitat within the Study Area, offsetting any losses on the remaining unprotected and altered habitat in the Study Area.	**Increasing** Expected protection and restoration within the Study Area would more than offset any losses on the remaining unprotected and altered habitat resulting in an increase in fall/winter bald eagle use.
Acres within Stewardship Areas	118	351	351	351
Estimated acres protected and restored	104	208	890	1,624
Percent of existing refuge bald eagle habitat potentially affected by public use actions	18%	22%	40%* *(14% of the Refuge habitat would only be impacted 2 days/yr during youth waterfowl hunt)	54%

Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Social Effects				
Opportunities for compatible nature/wildlife observation and birdwatching	**Declining** Reduced viewing opportunities would be expected due to declining populations of local wildlife and increased human disturbance associated with higher expected visitation, no trail restrictions and lack of screened viewing areas.	**Declining** Additional viewpoints and trails would improve access to viewing areas. Human disturbance would be reduced by restricting visitors to trails and viewpoints, but expected declines in wildlife populations around the refuge due to development would reduce viewing opportunities.	**Increasing** Expansion of the Public Use Area as well as additional trails and viewpoints would provide greater access and opportunity to view wildlife. Land protection actions would result in increased wildlife populations increasing the probability of observing wildlife, and would also result in the potential to provide more viewing areas in the future.	**Substantially Increasing** Expansion of the Public Use Area, as well as additional trails and viewpoints would provide greater access and opportunity to view wildlife. Land protection actions would result in increased wildlife populations and the potential to to provide more viewing areas.
Opportunities for compatible non–motorized trail activities and longer trail loop options	**No Change** No loop trails and no trail longer than 1.5 mile.	**Minimal Increase** Stubblefield Lake Loop added.	**Moderate Increase** Trail loops include Stubblefield Lake Trail and Public Use Area / Columbia Plateau Trail Connector. Potential trails on new additions.	**Moderate Increase** Trail loops include Stubblefield Lake Trail and Public Use Area / Columbia Plateau Trail Connector. Potential trails on new additions.
Miles of Trails	11.25	15.25	15.25	15.25
Opportunities for increasing numbers of destination visitors	**No Change**	**Moderate** An additional trail, viewpoints, expanded interpretation and environmental education programs, and an elk hunt would increase the number of destination visitors.	**Moderate** Additional trails, viewpoints, greatly expanded interpretation and environmental education programs, elk hunting, and a youth waterfowl hunt would all make Turnbull NWR more attractive to destination visitors.	**High** Additional trails, viewpoints, a new visitor center, greatly expanded interpretation and environmental education programs, elk and waterfowl hunts would all make the Refuge much more attractive to destination visitors.
Opportunities for quality hunting	**None**	**Minimal Increase** Only an elk hunt would be offered, with the objective of reducing impacts to aspen communities. Without an acquisition program no additional hunting areas would come available.	**Moderate Increase** An annual elk and youth waterfowl hunt on the existing Refuge area and the potential for additional hunting opportunities on up to 12,000 acres of new acquisitions would increase opportunities for a quality hunt.	**Substantial Increase** An annual elk and fall waterfowl hunt on the existing Refuge area and the potential for additional hunting opportunities on up to 25,000 acres of new acquisitions would substantially increase opportunities for a quality hunt.

Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Opportunities for a compatible and sustainable Environmental Education program both on-Refuge and off-Refuge	**Minimal and Variable** Reliance on volunteers and soft money results in inconsistent service to the community and stalled program development Program would continue to serve from 3,000 to 8,000 students with high annual variability. Most activities would be self-facilitated. Off-Refuge EE would not be facilitated.	**Moderate and Stable** Addition of seasonal staff would allow for a more stable service and improved program development but facilities and year-round support would continue to limit the capacity of the program to between 4,000 and 8,000 students depending on volunteer recruitment. Ten percent of the off-Refuge program would be facilitated.	**High** Addition of year-round staff and a second classroom would greatly expand the quality and capacity of the program allowing the Refuge to serve up to 10,000 students annually on-Refuge and about 4,500 students off-Refuge. About 25% of the off-Refuge program would be facilitated.	**Very High** Construction of a new environmental education center and year-round staff would result in the program becoming a regional role model providing teacher in-service training, and hosting up to 12,000 students throughout the year and conducting off-Refuge program for up to 10,000 students .
Environmental justice	**Neutral** Proposed programs have a low risk of adversely affecting human health, or the social environment as most anticipated effects are positive. Minority and low-income populations do not appear to be at risk for disproportionately adverse effects from the proposed alternative.			
Contribution of Refuge Operations to the Regional Economy				
Effects from expenditures on operations and maintenance: • Total employment • Annual income	39 $ 882,000	39 $ 890,000	57 $ 1,321,000	63 $ 1,483,000
Effects from one-time expenditures (special projects): • Total employment • Annual income	52 $ 936,000	62 $ 1,032,000	90 $ 1,403,000	100 $ 1,677,000
Contribution of Refuge Recreation to the Regional Economy				
Effects from visitor expenditures on non-consumptive recreation at Refuge: • Total employment • Annual income	80 $ 1,251,000	86 $1, 348,000	99 $ 1,570,000	110 $ 1,741,000

Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Effects from visitor expenditures on hunting at Refuge: • Total employment • Annual income	0 0	<1 $3,600	<1 $3,600	2 $ 22,700
Effects from Land Conservation on the Regional Economy				
Effects from reduction in agricultural production on acquired lands • Lost employment • Lost annual income	-6 - $ 41,550	-6 - $ 41,550	-22 - $ 141,300	-27 - $ 186,900
Effects of Refuge Land Acquisition on Local Tax Revenues				
Estimated loss of property taxes and timber excise taxes on acquired lands	- $ 8,559	- $8,559	- $29,091	- $38,515
Estimated federal in-lieu of property tax payments on Refuge lands	$ 35,806	$ 35,806	$ 45,541	$ 50,002
Consumer Surplus Value of Refuge				
Estimated annual recreation benefits at Refuge (consumer surplus)	$ 1, 643,750	$ 1, 777, 330	$ 2,068,580	$ 2,325,630

Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Effects to Refuge Cultural Resources				
Risk of damage to or loss of archaeological and historical sites	Minimal construction activity would reduce risk to cultural resources. Increasing visitation might increase risk for vandalism.	Additional trails, viewpoints and facilities would increase damage risk to cultural resources as would resulting increases in visitation.	Expanded public use facilities and projected increases in public use create a high risk of damage and vandalism on Refuge. Risk to cultural resources within the Study Area could be somewhat lower than at present.	With the most facility construction and highest projected visitor use, this alternative has the greatest potential for damage to cultural resources on Refuge. Risk to cultural resources within the Study Area would be somewhat lower than at present.
Opportunities for cultural resource education	Moderate opportunity with variable resources to administer program.	Moderate opportunity with stable resources to administer program.	High opportunity, with stable resources to administer program.	Very high opportunity, with stable resources to administer program.

groundwater removal could negatively impact Refuge wetlands. Thirty-two percent of the Refuge surface watersheds fall within this Stewardship Area (Table 4-2). It is expected that Alternative 1 would have negligible impact on water quality and quantity, because it relies strictly on private land conservation programs, and the Stewardship Area includes only 28 percent of the Company Ditch which supports the greatest proportion of Refuge wetlands. Projected participation in voluntary landowner incentive programs and partnership activities will protect only 3 percent (1,342 acres) of the Stewardship Area in the next 15 years. This effort will not significantly reduce current levels of agricultural run-off or the number of new wells and septic systems, resulting in increased inputs of nitrogen and phosphorus to wetlands, and groundwater withdrawals exceeding recharge.

The Stewardship Area for Alternatives 2, 3, and 4 is nearly double the size of the Alternative 1 Stewardship Area. Fifty-six percent of the Refuge surface watersheds are included, as well as all of the one-mile wide, groundwater protection zone. Ninety-five percent and 62 percent of the Kaegle and Company Ditch drainages, respectively, are included in the proposed Stewardship Area for these alternatives (see Table 4-2). These subwatersheds provide input to over 80 percent of the Refuge's managed wetlands. Because of the larger Stewardship Area and the addition of outreach staff, the proposed actions under Alternative 2 are expected to protect about 2,683 acres (about six percent of the Stewardship Area) from development that could result in increased nutrient inputs or overuse of groundwater resources. These improvements, however, will not offset nutrient input from new hobby farms and additional septic systems and excessive groundwater withdrawals for new wells on the remaining unprotected areas of the Stewardship Area.

Alternatives 3 and 4 expand the current Approved Refuge Boundary to the extent of the Stewardship Area, but place a cap on the maximum number of acres the Service would acquire an interest in over the next 15 years. Under Alternative 3, purchase of easements or fee title acquisition of up to 12,000 acres in addition to landowner participation in voluntary conservation programs and partnership activities will reduce the potential number of new septic systems and wells by up to 600. Agricultural activities within wetland basins that drain onto Refuge will likely be reduced as restorations are completed. These improvements will off-set increased nutrients inputs from septic systems,

Table 4-2. *Acreage[a] and Percent of each Refuge Surface Subwatershed Contained within Stewardship Areas and Estimated Area Protected or Restored*

	Alt 1	Alt 2	Alt 3	Alt 4
Stewardship Area				
Company	1,217 (28%)	2,736 (62%)	2,736 (62%)	2,736 (62%)
Kaegle	830 (49%)	1,628 (95%)	1,628 (95%)	1,628 (95%)
Phillips	1,781 (26%)	6,460 (93%)	6,460 (93%)	6,460 (93%)
Philleo	3,421 (36%)	1,690 (18%)	1,690 (18%)	1,690 (18%)
Total	*7,249 (32%)*	*12,514 (56%)*	*12,514 (56%)*	*12,514 (56%)*
Area protected or restored				
Acres	1,342	2,683	14,683	27,683
Percent of Stewardship Area	3%	6%	33%	62%

[a] Assumptions on acreage are as follows: Alt 1 acres is equivalent to the number of acres protected or restored over the past ten years within the Study Area, extrapolated over the next 15 years. Alt 2 acres is twice the effort in Alt 1. Alt3 acres is 12,000 acres acquisition cap plus the private land effort equivalent to Alternative 2. Alt 4 acres is 25,000 acres acquisition cap plus the Alt 2 Private Land effort.

hobby livestock, and groundwater withdrawals on the remaining unprotected area. Actions likely under this alternative will have the effect of maintaining or slightly decreasing existing levels of nutrient inputs to Refuge wetland and stabilizing or slightly increasing current water quantities.

Purchase of easements or fee title on up to 25,000 acres under Alternative 4 in addition to projected landowner participation in voluntary conservation programs and partnership activities will reduce both the potential number of new septic systems and wells by up to 1,200, as well as agricultural activities within wetland basins that drain onto the Refuge. This level of protection would decrease the total input of phosphorus and nitrogen substantially improving water quality. In conjunction with limitations on groundwater withdrawals, wetland restoration activities should increase aquifer recharge and raise the water table thereby reducing surface water losses to groundwater recharge.

Effects from elk management actions (Not including hunting)

There are no anticipated impacts to water quality and quantity from any of the elk management actions.

Effects from Public Use Actions

There are no anticipated impacts to water quality and quantity from any of the Public Use actions.

4.1.2 INDICATOR 2 - EFFECTS TO THE WETLANDS HABITAT BASE AND ASSOCIATED WILDLIFE SPECIES

Effects from land protection actions

With over 70 percent of the wetland basins in the vicinity of the Refuge already altered from drainage and agricultural use, numerous opportunities exist to protect and restore additional wetland habitat through implementation of land protection actions.

Table 4-3 compares the wetland habitat area included within the alternative Stewardship Areas and the estimated acres protected and restored given the alternative land protection actions. Table 4-4 and 4-5 compare the estimated response of breeding and migratory waterfowl to the different land protection alternatives.

The effectiveness of the alternatives in protecting and restoring the historic composition of wetlands in the Refuge vicinity increases from Alternative 1 through 4. This increase results from enlarging the size of the Stewardship Area, increasing outreach efforts for voluntary conservation programs, and adding land acquisition as a land protection strategy.

Alternative 1 includes approximately 3,900 acres of historic wetlands in its Stewardship Area. Over 7,000 historic wetland acres are included in the Stewardship Area of Alternatives 2, 3, and 4. The Stewardship Area of Alternatives 2, 3, and 4 also includes almost twice the area of historically semi-permanent and permanent wetlands than Alternative 1. These wetland types were the most impacted by past drainage activities and are critical to the breeding success of most wetland-dependent wildlife, as well as providing important fall use to waterfowl and fall/winter use to bald eagles.

Both Alternative 1 and 2 rely strictly on partnership activities and voluntary private land conservation programs to restore and protect wetlands. Projected participation in voluntary land conservation programs within the Stewardship Area of Alternative 1, in combination with conservation partner activities, will result in the protection and restoration of approximately 9 percent of the altered wetlands. Increased outreach efforts under Alternative 2 with additional staff and a larger Stewardship Area will result in a doubling of the area of wetlands protected and restored through voluntary conservation programs. These efforts, however, will not offset continuing wetland loss and degradation on the remaining unprotected lands, resulting in a decreasing wetland base and a decline in wetland associated wildlife.

Many landowners in the Stewardship Areas are economically dependent on drained wetlands to produce hay or pasture for their livestock. This dependence is one of the reasons few of the large landowners have participated in conservation programs to restore altered wetlands. Both Alternative 3 and 4 include land acquisition as a land protection strategy which could provide an alternative compensation mechanism for landowners. The potential to acquire 2,819 acres of wetlands in Alternative 3, and 5,139 acres in Alternative 4, would allow restoration of 2,012 acres and 3,627 acres under Alternative 3 and 4, respectively.

Table 4-3. *Current and Historic Acreage of each Wetland Type within Altered Basins of theAlternative Stewardship Areas and Estimated Area of each Wetland Type Potentially Protected or Restored.*

	Alt 1	Alt 2	Alt 3	Alt 4
Current Wetland Composition [a]				
Permanent	165	464	464	464
Semi-permanent	397	773	773	773
Seasonal	2,029	4,089	4,089	4,089
Temporary	1,974	1,378	1,378	1,378
Total	3,645	6,704	6,704	6,704
Historic Wetland Composition [b]				
Permanent	1,223	2,247	2,247	2,247
Semi-permanent	925	1,685	1,685	1,685
Seasonal	894	1,628	1,628	1,628
Temporary	851	1,550	1,550	1,550
Total	3,903	7,110	7,110	7,110
Estimated Acres of Current Wetland Type Potentially Protected [c]				
Permanent	15	45	194	354
Semi-permanent	36	76	324	591
Seasonal	183	401	1,719	2,134
Temporary	95	135	581	1,058
Total	330	659	2,819	5,139
Estimated Acres of each Wetland Type Restored [d]				
Permanent	98	197	760	1,370
Semi-permanent	66	132	513	924
Seasonal	48	97	374	674
Temporary	47	94	364	656
Total	261	522	2,012	3,627

[a] Derived from National Wetland Inventory Maps
[b] Product of the percent composition of a wetland type on Turnbull NWR, a fully restored sample, and the number of potential wetland acres in the Stewardship Area of the Channeled Scablands
[c] Product of the current percent composition of each wetland type within the Stewardship Area and the estimated wetland acres protected under an alternative.
[d] The difference between the acres of each current wetland type and the historic acres of each wetland type in the protected area.

Table 4-4. *Estimated Duck Breeding Pairs Expected on Restored and Protected Wetlands within the Alternative Stewardship Areas.*

Species	Alt 1	Alt 2	Alt 3	Alt 4
MALLARD	73	146	623	1136
GADWALL	26	53	225	410
WIGEON	4	8	34	62
G.W. TEAL	15	30	128	234
B.W. TEAL	18	36	154	281
C. TEAL	47	94	402	733
SHOVELER	13	26	110	200
PINTAIL	3	7	29	52
WOOD DUCK	3	6	27	48
TOTAL DABBLERS	202	404	225	3156
REDHEAD	111	222	949	1730
CANVASBACK	6	12	51	94
L. SCAUP	15	30	128	234
RING-NECK	26	52	224	408
BUFFLEHEAD	18	37	157	287
RUDDY DUCK	105	209	896	1634
TOTAL DIVERS	281	562	2406	4387
TOTAL DUCKS	**480**	**961**	**4114**	**7502**

*The product of breeding pair densities (pairs/wetland acre) on the Refuge (a fully restored landscape) and the estimated wetland acres protected and restored

The result of this substantial addition of semi-permanent and permanent wetland habitat will offset losses on unprotected lands resulting in stable to increasing populations of wetland associated wildlife especially waterfowl, marshbirds and shorebirds.

Effects from Elk Management Actions (Not including hunting)

No impacts anticipated.

Effects from Public Use Actions

The principal impact of public use programs on wetland habitats and wildlife are associated with visitors on foot engaged in bird watching, wildlife observation, photography, hunting, and environmental education activities. Numerous studies have confirmed that people on foot can cause a variety of disturbance reactions in wildlife, including flushing or displacement (Erwin 1989, Fraser et al. 1985, Freddy 1986), heart rate increases (MacArthur et al. 1982), altered foraging patterns (Burger and Gochfeld 1991), and even, in some cases, diminished reproductive success (Boyle and Samson 1985). 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. 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). The area of wetlands within 328 feet of public activity centers and hunting areas

Table 4-5. *Estimated Fall Duck use Days Expected on Restored and Protected Wetlands within the Alternative Stewardship Areas**

Species	Alt 1	Alt 2	Alt 3	Alt 4
MALLARD	59,768	119,470	511,772	933,071
GADWALL	7,923	15,838	67,843	123,693
WIGEON	7,201	14,395	61,663	112,424
G.W. TEAL	2,132	4,261	18,254	33,282
B.W. TEAL	1,179	2,358	10,099	18,413
C. TEAL	316	632	2,709	4,940
SHOVELER	449	898	3,845	7,010
PINTAIL	4,860	9,714	41,612	75,867
TOTAL DABBLERS	83,829	167,566	717,797	1,308,700
REDHEAD	455	910	3,899	7,108
CANVASBACK	520	1,040	4,456	8,124
L. SCAUP	1,746	3,490	14,949	27,254
RING-NECK	1,158	2,315	9,918	18,082
BUFFLEHEAD	327	654	2,803	5,110
RUDDY DUCK	1,041	2,080	8,912	16,248
TOTAL DIVERS	5,248	10,490	44,964	81,927
TOTAL DUCKS	89,077	178,056	762,733	1,390,627

*The product of the duck use days per acre of permanent wetland on the Refuge (a fully restored landscape) and the estimated acres of permanent wetland protected and restored under each alternative

therefore provides an indicator to evaluate the effects of the alternatives on wetland wildlife (Table 4-6). It is important to note that these areas also include the portions of wetlands that are not visible from trails or other public use facilities. There is also some overlap in the buffer areas associated with different facilities types.

Trails: Based on the analysis displayed in Table 4-6, trails have the highest potential of any public facility type to result in disturbance to wetland wildlife, with the exception of hunting areas. Although Alternative 1 has the least amount of wetland acres within 328 feet (100 meters) of public use facilities, including trails (see Table 4-6), it has the greatest potential to impact wetland wildlife because visitors are currently free to roam off-trail year-round within the entire Public Use Area. Continuation of this unrestricted use policy, with probable increases in future visitor numbers, would likely result in significant disturbance to wetland wildlife and less wildlife in the Public Use Area. The 2,200-acre Public Use Area has 546 acres of wetlands representing 18.2 percent of the total Refuge wetland base.

Alternatives 2, 3, and 4 would implement regulations restricting foot travel to trails-only during the nesting season to minimize wildlife disturbance which could result in reduced foraging time, abandonment of nest and young, increased predation of nests and young, and trampling of habitat.

The Stubblefield Lake Loop is a new 3.7-mile trail proposed in Alternatives 2, 3, and 4. With use restricted to the trail year round, hikers would not be allowed to approach any wetland area close enough to disturb waterfowl or other water birds. If individuals do not comply with regulations prohibiting off-trail use, the potential does exist for disturbance to waterfowl and waterbirds using this wetland. Law enforcement efforts are expected to keep this type of violation to a minimum. Outside the Public Use Area, the Columbia Plateau Trail (CPT) crosses 4.75 miles of the Refuge where individuals on foot, bicycle and horseback pass within 100 feet and in full

Table 4-6. *Area of Wetlands (acres) within 328 feet of Public Areas[a] and the Percentage of the Refuge Wetland Base Potentially Impacted by Public Use of Each Area.*

Public Use Facility	Alt 1	Alt 2	Alt 3	Alt 4
Trails Acres percent of Refuge wetlands	 202 6.7%	 227 7.6%	 266 8.9%	 266 8.9%
EE sites Acres percent of Refuge wetlands	 10 0.3%	 10 0.3%	 10+[b] 0.3%	 10+[b] 0.3%
Viewpoints Acres percent of Refuge wetlands	 37 1.2%	 60 2.0%	 65 2.2%	 65 2.2%
Waterfowl Hunting Area Acres percent of Refuge wetlands	 0	 0	 140+[c] 4.6%	 282+[c] 9.4%
Off trail area	546 18.2%	0	0	0

Note: Acres and percentages are not additive since there is overlap between facility types.

[a] trails, EE sites, viewpoints, and waterfowl hunting areas

[b] An additional site is proposed but a location has not yet been determined.

[C] As lands are acquired new hunting areas may be opened after review

view of 56 acres of several important wetlands (Overpass and Railroad Ponds, Wetland 90, Long Lake, and Ballinger Lakes). If use of the trail increases as expected, birds will flush and move away from the trail, reducing their use of important breeding and foraging habitat. Several areas adjacent to the trail provide important waterfowl migration habitat in the spring and fall. Flocks of birds are more susceptible to disturbance because of their tendency to react as a group. Individuals that flush in response to human activities within 328 feet can illicit behavioral responses from individuals in the flock at much greater distances (Fox and Madsen 1997). Alternatives 2, 3, and 4 propose utilizing vegetation plantings to screen trail users, putting them out of view of the southern end of Long Lake. If screening does not work, an optional 0.7-mile bypass trail which would allow trail users to use a parallel route out of view of Long Lake could be established. The bypass could alleviate most of the disturbance problems associated with foot traffic on this very exposed portion of the Columbia Plateau Trail. Placement of a viewing blind that would allow observers to approach Long Lake undetected would also increase opportunities to view wildlife while minimizing disturbance.

Alternatives 3 and 4 propose an additional 4-mile connecting trail from the CPT to the Public Use Area. Its course along the old Cheney-Plaza Highway would put individuals on foot and bicycle near several wetlands including the Overpass Pond, East Tritt Lake and Reeves Lake. Depending on the level of use and compliance to regulations restricting off-trail use, some impact to wildlife using these wetlands would be expected. In Alternative 4, the potential exists to add additional trails if land adjacent to the existing Public Use Area is acquired from a willing seller. Although placement of new trails would be made to minimize disturbance to wetland wildlife, some increased negative effects to wetlands and associated wildlife would be expected.

Viewpoints: Ten new viewpoints/pullouts were constructed in 2003 along the Pine Creek Auto-Tour Route, bringing the Refuge total to 19. Although five of these sites are in view of wetlands, only two are close enough to cause disturbance if individuals exit their vehicles. At these sites, appropriate signing will inform the public of the importance of staying in the vehicle. Any interpretative panels will be designed to be easily read from a vehicle. Under Alternatives 2, 3, and 4, two elevated viewing platforms (Upper Turnbull Slough and Stubblefield Lake) are proposed. Although both viewpoints would be within 328 feet of wetlands, the elevated platforms would focus the activities of wildlife observers and minimize disturbance to wetland wildlife. An elevated platform is also proposed at McDowell Lake under Alternatives 3 and 4.

Under Alternatives 3 and 4, the total number of viewpoints would rise from 19 to 25. Only the elevated platforms mentioned above and the viewpoint proposed for Cheever Lake would be placed within 328 feet of a wetland. The Cheever Lake location is elevated above the lake resulting in little expected human disturbance to wetland wildlife.

Photo Blinds: With only one blind in place and no restrictions on off-trail use under Alternative 1, disturbance from photographers attempting close approaches would likely increase as visitation increases. Public education that informs photographers of ethical and least intrusive methods is proposed under all alternatives and could reduce some impacts. Three new photo blinds are proposed in Alternatives 2, 3, and 4. All of the blinds would be accessible to persons with disabilities. The purpose of these photo blinds is to provide sites where photographers can get close-up photographs without disturbing wildlife. Placement of these additional blinds would likely reduce disturbance from wildlife photographers.

Environmental Education Sites: Although the infrastructure planned at the Environmental Education (EE) sites (parking and vault toilets at each site for all alternatives; shelters at each site for Alternatives 2, 3, and 4) are within 328 feet of wetlands, they would be located out-of-sight of adjacent wetlands to minimize disturbance to wildlife or direct impacts to wetland habitat. The aquatic study component of the spring and summer programs, however, places students at the wetland edge where they dip net for aquatic invertebrates. This concentrated use results in trampled vegetation along approximately 66 feet of shoreline as well as disturbance to waterfowl. An unpublished study (Jose 1997) examined the effect of EE site activities on the Turnbull NWR at Blackhorse Lake. The study results indicated that significantly fewer waterfowl were present in the study area when EE classes were on-site as compared to the control times. The study also found significantly more short flights undertaken by birds when EE classes were on-site. All alternatives include having one of the EE sites in rest/rotation at all times, resulting in a given site being used on only four days per week to minimize impacts to waterfowl and other wildlife. Under Alternatives 2, 3, and 4, hardening of the aquatic study sites and construction of a pier would focus use and minimize impacts to wetland habitat. If needed, under these alternatives, an additional EE site would be constructed. Although the location of the site has not been determined, it would have a similar configuration as the other sites. The presence of an additional aquatic study site would potentially increase the disturbance to wetland wildlife.

Office and Visitor Contact Point: No impacts would be expected from the Refuge Office/Visitor Contact Point or the EE classroom addition proposed under Alternative 2 since both are currently sited well away from wetlands. Under Alternatives 3 and 4, a new Refuge office and Visitor Contact Point may be constructed or leased. Siting of these facilities has yet to be determined. If the existing Headquarters area is used, then little impact to the effectiveness of wetland habitat for wildlife would be expected. Any new site selected would place facilities so that human activity is not regularly visible to wildlife on wetlands within 328 feet of the facility.

Elk Hunting: Elk hunting under Alternatives 2, 3, and 4 would cause some disturbance to waterfowl and other birds, associated with hunters walking in close proximity to wetlands and gunfire, which generally results in a behavioral response by birds. Elk hunting by its nature involves free roaming on foot throughout a hunting unit. Any portion of the Refuge that may be open to hunting will include wetlands. Waterfowl use, however, occurs only on the permanent and semi-permanent wetlands of the Refuge through mid-November, when freeze up usually occurs and waterfowl move to rivers and larger, deeper lakes off-Refuge. With a limited-entry permit hunt and generally a two-week period of overlap between the elk hunting season and the time period waterfowl numbers are normally present on the Refuge, impacts would be minimal. Potential expansion of the elk hunting areas into new acquisitions could occur under Alternatives 3 and 4 and could increase the level of disturbance relative to the other alternatives. The small number of hunters and infrequent gunfire would still result in only minimal impacts to waterfowl and other wetland dependent wildlife.

Waterfowl Hunting: Only Alternative 3 and 4 would have effects to wetlands and associated wildlife from waterfowl hunting since no waterfowl hunting is proposed under Alternatives 1 and 2. There are 140 acres of wetlands representing 17.5 percent of the Refuge's total fall wetland base included in the proposed hunting area (Upper Turnbull Slough) under Alternative 3. Approximately 35 percent of the fall wetland base would be open to waterfowl hunting under Alternative 4.

Waterfowl hunting results in direct mortality and crippling, and displaces waterfowl from foraging habitat during the fall migration period (Delong 2002). Bélanger and Bédard (1995) conclude that disturbance caused by waterfowl hunting can: a) modify the distribution and use of various habitats by birds (Owens 1977, White-Robinson 1982, Madsen 1985); b) affect their activity budget and reduce their foraging time and consequently their ability to store fat reserves necessary both for migration and breeding (Raveling 1979; Thomas 1983); and c) disrupt pair and family bonds and contribute to increased hunting mortality. Minimizing the number of days of the week the Refuge is open to hunting as well as the number of permits available to hunters, and using spaced blinds would restrict impacts to the defined hunt areas. Potential expansion of waterfowl hunting onto new additions would increase disturbance to waterfowl if this activity is currently not allowed.

Cumulative Public Use Impacts: Cumulatively, the public use program of Alternative 4 would have the greatest impact on the effectiveness of wetland habitat for wildlife. Although off-trail use within the Public Use Area would be seasonally restricted, proposed annual, season-long waterfowl hunting would increase disturbance as would the trails, viewpoints, and EE site additions and the potential expansion of the public use facilities onto new acquisitions. Alternative 3 would have less impacts than Alternative 4 because only a two day youth waterfowl hunt is proposed on approximately half the area identified in Alternative 4. The additional public use facilities, including trails, viewpoints, and EE sites, would be the same as in Alternative 4 and would contribute to disturbance of wetland habitat and wildlife. Alternative 2 would have less negative impacts than Alternative 3 because fewer trail, viewpoint, and EE site additions are proposed and the Refuge would remain closed to waterfowl hunting. Although Alternative 2 would have two new viewpoints, it would also have less negative impacts than Alternative 1, as a result of restrictions placed on off-trail use, creation of a bypass trail for the Long Lake portion of The Columbia Plateau Trail, and the construction of three additional photo blinds.

4.1.3 INDICATOR 3 - EFFECTS TO STEPPE HABITATS AND ASSOCIATED WILDLIFE

Effects from land protection actions

The quality index (see Table 4-7) or value of a given tract of steppe habitat to wildlife and to maintaining biodiversity is dependent on the size

of the tract, the presence or absence of exotic plant and animal competitors, and adequate native grass cover. Most of the steppe associated bird species, including the grasshopper, savannah and vesper sparrows, require both grass and litter cover for nesting. Spalding's silene, a threatened plant species, is found in areas of intact steppe habitat with high native plant diversity.

Compared to other habitats such as wetlands, conversion of steppe areas to other land uses including agricultural, residential and commercial is relatively easy, both from a logistical and regulatory standpoint. There is a general lack of knowledge concerning steppe habitat and its value in its native state, consequently, steppe under private ownership has few protections. Steppe protection on private land under all alternatives, but especially Alternatives 1 and 2, will require a well designed outreach and education program to increase awareness of the value of this habitat and its endangered status, as well as informing landowners of the incentive and conservation programs that can be applied in these areas. The potential to influence land use on 4,350 acres and 8,250 acres of high and medium quality steppe habitat within the Stewardship Areas of Alternatives 1 and 2, respectively, may increase protection of this habitat. However, it is expected that properties will continue to be subdivided and developed to the maximum density allowed by county zoning and restrictions imposed by critical area ordinances. Alternative 2 is expected to be more successful than Alternative 1, because the addition of outreach staff and the greater acreage of high and medium quality steppe habitat increases the probability of finding willing landowners to participate in conservation programs. Both alternatives, however, are not expected to result in a net gain in protected steppe habitat because losses will continue on the remaining large unprotected areas. The addition of an acquisition program in Alternatives 3 and 4 would increase the effectiveness of restoration and protection efforts on 4,340 acres and 8,240 acres respectively, of high and medium quality steppe.

Acquisition would likely be the most important tool where steppe is in danger of being sub-divided and developed.

The land protection actions of Alternative 3 would stabilize or moderately increase the quantity of high quality steppe habitat at current levels and the associated wildlife populations by off-setting continued losses on the remaining 7,600 acres of unprotected steppe within the Stewardship Area. Alternative 4, with its 25,000 acre cap on acquisition, would provide greater

Table 4-7. *Acres of Steppe Habitat by Quality Index Contained within Alternative Stewardship Areas and Estimated Acres Potentially Protected or Restored*

	Alt 1	Alt 2	Alt 3	Alt 4
Stewardship Area				
High	4,256	6,502	6,502	6,502
Medium	2,124	3,776	3,776	3,776
Low	761	1,677	1,677	1,677
Total	*7,141*	*11,955*	*11,955*	*11,955*
Potential acres of steppe protected or restored*	370	740	4,340	8,240

* Product of the estimated total area protected or restored under each alternative (from Table 4.2) and the percent composition of steppe habitat in the Stewardship Area.

opportunity to protect steppe, resulting in an increase in the restored and protected habitat base. This substantially expanded base of high-quality steppe habitat will result in net increases in populations of native wildlife species as native grass and litter cover increases and native plant diversity is restored.

Effects from Elk Management Actions (Not including hunting)

No impacts would be expected.

Effects from public use actions

The threat to steppe habitat and steppe associated species imposed by public use activities results from either the alteration of habitat, or disturbance of wildlife associated with development and improvement of facilities and both on and off-trail foot travel. Numerous studies have found that bird abundance, species composition, and nest success are affected by the presence of people on foot. In the mixed-grass prairie ecosystem in Colorado, Miller et al. (1998) found that specialist species (western meadowlark, vesper sparrow, and grasshopper sparrows) were less common near heavily used recreational trails. Generalist species such as the American robin, brown-headed cowbird ,and black-billed magpie were less affected by trail use. They also found that birds were less likely to nest near trails within the grassland ecosystem and that nest predation was greater near trails. For the majority of species, they found impact was greatest within a 246-foot (75 meter) zone of influence.

Decreasing abundance of birds adjacent to trails may be related to effects on territorial establishment. Gutzwiller et al. (1994) reported that even a single pedestrian moving through a bird's territory was sufficient to reduce the occurrence and consistency of primary song. Reijnen and Foppen (1994) found that in areas where primary song was affected by disturbance, birds there appeared reluctant to establish nesting territories. Reluctance to establish territories could result in lower densities of breeding birds. Zande et al. (1984) reported a negative relationship between the intensity of recreation occurring on trails and breeding bird densities in 8 of 13 bird species. In order to compare the alternatives, the acreage of steppe habitat open to foot travel and within 246 feet of public facilities (trails, viewpoints, pullouts, and EE sites) was chosen to indicate the potential threat of public use activities to steppe wildlife (Table 4-8).

Under Alternative 1, off-trail use would continue to be allowed within the entire Public Use Area which includes 1,200 acres of steppe habitat. As a result, Alternative 1 would have the greatest potential impacts of all the alternatives to steppe habitat and associated wildlife. Alternatives 2, 3, and 4 prohibit off-trail foot travel which would restrict the direct impacts of public use activities on habitat to the foot print of the facilities and a small area around them, rather than the entire Public Use Area. Because of this prohibition on off-trail foot travel, Alternative 2 would be expected to have the fewest negative impacts to steppe despite the loss of small amounts of steppe used for pullouts, trails, and viewing platforms, and increasing disturbance to steppe wildlife on nearly 200 additional acres associated with use at these new facilities.

Overall, Alternatives 3 and 4 would have greater negative effects on steppe habitat and wildlife than Alternative 2, due to an additional trail, location of an additional EE site, four new viewpoints, and additions to the EE classroom. Direct losses from actual facility construction would be restricted to less than 0.1 percent of the Refuge's existing steppe habitat base. Potential public use developments on new acquisitions could impact additional steppe habitat. The impacts to steppe habitat would be similar for Alternatives 3 and 4 with the exception of a larger waterfowl hunting program in Alternative 4 that could result in impacts to steppe vegetation by foot travel within the hunting units. These impacts would be expected to be minimal because the use occurs during plant dormancy and hunter numbers would be small.

Table 4-8. *Acres of Steppe Habitat within 246 feet of Public Facilities[a] and the Percentage of the Refuge Steppe Habitat Base Potentially Impacted by Public Use*

Public Use Facility	Alt 1	Alt 2	Alt 3	Alt 4
Off -trail foot travel				
Acres of steppe habitat	1,200	0	0	0
Percent of Refuge steppe habitat	20%	0%	0%	0%
Trails				
Acres	454	653	757	757[b]
Percent of Refuge steppe habitat	7.5%	10.8%	12.5%	12.5%
EE sites				
Acres	18	18	18[c]	18[c]
Percent of Refuge steppe habitat	0.3%	0.3%	0.3%	0.3%
Viewpoints				
Acres	27	39	42	42[d]
Percent of Refuge steppe habitat	0.4%	0.6%	0.7%	0.7%

[a] Trails, EE sites, viewpoints, and off trail use areas

[b] New trails may be added if land is acquired adjacent to existing Public Use Area

[c] An additional site is proposed but a location has not yet been determined.

[d] New viewpoints may be established if good vistas become available on new acquisitions.

4.1.4 INDICATOR 4 - EFFECTS TO PONDEROSA PINE FOREST AND ASSOCIATED WILDLIFE

Effects from land protection actions

The principle threats to forested habitat around the Refuge are fragmentation as a result of sub-division and home development, and private forest management. Subdivision development tends to cut holes in or eliminate the ponderosa pine forest leaving a few isolated trees for landscaping. Most private forest owners emphasize removal of the largest trees for economic returns, leaving dense stands of young, pole-sized trees. They also tend to remove a greater proportion of the dead trees thereby reducing the number of large diameter snags that are recruited and retained in the landscape. Such stands do not provide the large-diameter snags favored by cavity-using wildlife, nor the more open forest conditions required by snag roosting bats, western bluebirds, flycatchers, and ground foraging bird species. A comparison of the opportunity to protect additional forested habits afforded by the alternatives and the estimated area restored and protected is provided in Table 4-9.

The tendency for forests in private ownership to be over-managed from the viewpoint of wildlife habitat can be altered, to a point, through outreach, education and financial and technical assistance programs as proposed in all the alternatives. The action alternatives 2, 3, and 4 would provide more opportunities than Alternative 1 to find landowners willing to practice voluntary protection and restoration, due to the inclusion of nearly twice the acreage of ponderosa pine forest in the Stewardship Area of the action alternatives (Table 4-9). Projected participation in these voluntary conservation programs is not expected to offset continued fragmentation of larger pine stands and loss of stands of mature pine on the remaining unprotected areas. Populations of forested dependent wildlife that require mature trees and snags, coarse woody debris and diverse native

understories are expected to decline under programs that emphasize voluntary conservation efforts only.

Full protection and restoration of a forest stand would be more likely to occur when landowners have an opportunity to willingly sell their economic interests to an organization managing for wildlife and biodiversity. The expanded Refuge boundary proposed in Alternatives 3 and 4 would provide the opportunity to acquire forested property from willing sellers. with Alternative 4 providing substantially more opportunities than Alternative 3 (see Table 4.9).

The estimated area restored and protected under Alternative 3 would not substantially increase the habitat base of high quality ponderosa pine forest since over 50 percent of the high and medium quality forest habitat will still be unprotected and will likely decline in habitat quality. Land protection actions under Alternative 4 are expected to increase the base of high quality ponderosa pine habitat by potentially restoring and protecting an area equal to all the high and medium pine stands in the Stewardship Area. These actions would more than off set any losses on the remaining unprotected land resulting in increasing populations of forest dependent wildlife especially those associated with open mature stands of pine.

Effects from elk management actions (Not including hunting)

Elk populations do not in general impact ponderosa pine communities because of their low preference for pine and the ability of most grasses and forbs to withstand grazing pressure. Under very high densities, elk damage can, however, occur. Overgrazing and trampling can result in loss of preferred forage species and soil damage resulting in increased erosion and the spread of less palatable exotic species on disturbed areas. The only impacts to pine forest observed on the Refuge to date have been in the tall shrub phase of the Ponderosa pine/snowberry association. In these areas, high use of blue elderberry, serviceberry, chokecherry, and spiraea has occurred, impacting growth form and reproduction.

Some form of elk management is proposed under alternatives 2, 3, and 4. Elk management actions that reduce populations or redistribute animals will affect the density of elk in a given area. Successfully reducing elk densities in these areas will minimize impacts to the pine understory. It is important to note that redistributing elk from areas of high density to areas providing relatively greater security without reductions in population size will only transfer impacts.

Table 4-9. *Acres of Ponderosa Pine Habitat Contained within Alternative Stewardship Areas, by Quality Index, and Estimated Acres Potentially Protected or Restored.*

	Alt 1	Alt 2	Alt 3	Alt 4
Acres in Stewardship Area				
High quality habitat	3,942	8,109	8,109	8,109
Medium quality habitat	3,640	6,669	6,669	6,669
Low quality habitat	2,594	5,312	5,312	5,312
Total	*10,176*	*20,090*	*20,090*	*20,090*
Acres of pine habitat potentially protected or restored*	629	1,258	7,378	14,008

*Product of the estimated total area protected or restored under each alternative (Table 4.2) and the percent composition of ponderosa pine habitat in the Stewardship Area.

Effects from public use activities

The open nature of ponderosa pine forest and the lack of a well developed shrub layer in most stands places most tree and snag breeding and foraging species well above public use activities on the ground. These species, using higher habitat strata, are less susceptible to direct loss of habitat or damage to nests or individuals. Most, however, are still susceptible to human disturbance. Larger bird species that nest in pine stands, including red-tailed hawks, great-horned owls, and osprey, are especially intolerant of individuals on foot within their nesting territories. Zande and Vos (1984) found that 10 of the 12 passerine breeding bird species studied in woodlots in the Netherlands exhibited lower numbers in groves where recreation use was more common. Recreation intensity values ranging between 0.4 to 15 visitors per acre resulted in decreased breeding bird densities (Zande and Vos 1984). Research by Cooke (1980) on several passerine species in wooded habitat indicated there is a mean distance at which human activity is tolerated. Disturbances taking place at less than a species' mean tolerance distance resulted in movement away from the disturbance. Eighty-two feet (25 meters) represents an average tolerance distance of several species in their study. Based on this work, the area of ponderosa habitat open to foot travel, and within 82 feet of either trails, EE sites, viewpoints, or pullouts, are used here as indicators to compare the potential affect of public uses on the suitability of forested habitat for breeding wildlife (Table 4-10).

Ponderosa pine forests also support wildlife species that dwell near or on the ground. These species could be affected by direct vegetation impacts associated with off-trail foot travel and construction of public use facilities that reduce litter, grass and low shrub cover required for nesting and security. The same 82-foot zone is used to indicate the potential for effects on this group as well.

A lack of seasonal restrictions on off-trail foot travel within the public use area, which includes 691 acres of ponderosa pine habitat, would result in Alternative 1 having the greatest potential impact to breeding wildlife within ponderosa pine habitat. This alternative, however, has the least amount of forested habitat near public use facilities where disturbance would be more intense. Although Alternatives 2, 3, and 4 have more acres of pine forest intersected by new trails, seasonal restrictions on off-trail use would greatly reduce overall effects of the public use program. Under all alternatives, off-trail use associated with proposed hunting programs would have minimal to no impact on ponderosa pine habitat or associated wildlife because the hunting programs would involve a small number of individuals and take place outside the breeding season. Public use developments on new acquisitions under Alternatives 3 and 4 could negatively impact additional pine habitat. The extent of this future development is unknown, but impacts would likely be offset by improvements in habitat and greater control on human activities.

4.1.5 INDICATOR 5 - EFFECTS TO FOREST CONNECTIVITY

Effects from land protection actions

There are two primary forested corridors that serve to link the Refuge to the more contiguous forest zones of northeastern Washington and northern Idaho. These corridors follow the ancient Ice Age flood tracts north to the Spokane River drainage. The northeast corridor roughly follows the Minnie and Marshall Creek drainages to Hangman Creek and the northwest corridor extends north on the west side of Cheney through the Medical Lake area to the Deep Creek Drainage. The principal threats to the integrity of these linkages are fragmentation of forested habitat within the corridors associated with subdivision development and the creation of barriers by roads and fences. Although recent zoning changes will reduce the potential development density in important landscape linkages, development of parcels subdivided prior to adoption of new zoning laws would still significantly reduce the effectiveness of these linkages.

Table 4-10. *Acres of Ponderosa Pine Habitat within 82 feet of Public Areas and the Percentage of the Refuge Pine Habitat Base Potentially Impacted by Public Use.*

Public Use Facility	Alt 1	Alt 2	Alt 3	Alt 4
Area open to off-trail foot travel (breeding season) Acres Percent of Refuge pine habitat	 691 11%	 0	 0	 0
Trails Acres Percent of Refuge pine habitat	 110 1.8%	 127 2.0%	 159 2.6%	 159+[a] 2.6%+
EE sites Acres Percent of Refuge pine habitat	 0.4 <0.1%	 0.4 <0.1%	 0.4+[b] <0.1%	 0.4+[b] <0.1%
Viewpoints Acres Percent of Refuge pine habitat	 2 <0.1%	 2.7 <0.1%	 3.1 <0.1%	 3.1+[c] <0.1%+

[a] New trails maybe added if land is acquired adjacent to existing Public Use Area

[b] An additional site is proposed but a location has yet to be determined.

[c] New viewpoints maybe established if good vistas become available on new acquisitions.

The proposed Stewardship Area for Alternative 1 encompasses a substantial portion of an important landscape linkage northeast of the Refuge which extends to Hangman Creek. Projected participation in voluntary conservation programs on private lands will not, however, significantly slow development. Continued sub-division of larger forested tracts north of the Refuge will result in fragmentation and erosion of forest connectivity. A greater portion of the northeast linkage and the linkages west and northwest of the Refuge are included in the Stewardship Areas for Alternatives 2, 3, and 4. Increased outreach and education efforts proposed under these three alternatives will slow the rate of sub-division by increasing participation in private land conservation programs, but forested corridors will still slowly decline over time. Using land acquisition as a protection tool in conjunction with private land initiatives, as proposed in Alternatives 3 and 4, will be more effective in protecting forest connectivity beyond private land conservation programs. Alternative 3 would allow maintenance of minimally effective linkages while the fee-title acquisition or purchase of conservation easements on up to 25,000 acres of strategically located forested parcels and improved management of these parcels under Alternative 4 would create fully effective linkages to other forested zones.

Effects from elk management actions (Not including hunting)

There are no anticipated impacts to forest connectivity from any of the elk management actions.

Effects from Public Use Actions

There are no anticipated impacts to forest connectivity from any of the public use actions.

4.1.6 INDICATOR 6 - EFFECTS TO ASPEN RIPARIAN HABITAT AND ASSOCIATED WILDLIFE

Effects from land protection actions

The area of aspen lost from historic times within the Study Area (Table 4-11) is likely equivalent

to the loss on the Refuge - 65 percent - or possibly more. This loss is the result of encroaching ponderosa pine, overbrowsing by livestock, and clearing to improve pasture. Pine encroachment is the result of past and current fire suppression efforts. Without forest management to thin pine and regenerate aspen near wetlands, pine will continue to dominate seral aspen communities. Where aspen clones have severely declined, planting may be needed to reestablish aspen stands. Simplification of habitat structure in aspen as a result of grazing, pruning, understory clearing, and firewood cutting is commonly seen, especially on small parcels where the entire property is treated as a yard or the stocking of hobby livestock is high. Loss of habitat structure through removal of understory shrubs, grasses, forbs, and snags reduces the suitability of this habitat for shrub and tree canopy nesters and cavity-using wildlife species. Reversing this trend requires protection of aspen from grazing and outreach and education efforts focusing on the values of unmanaged aspen stands.

In addition to the direct impacts to aspen habitat described above, human development in close proximity to aspen stands can reduce the effectiveness of habitat through direct impacts to wildlife species. Non-native competitors that utilize cavities for nesting, such as starlings and European house sparrows, are often attracted to farms and suburban yards. The brown-headed cowbird (which parasitizes the nests of songbirds) increases in population where livestock are present. Pets, especially cats, can have significant effects on native wildlife through direct mortality and harassment. Native predators such as skunks and raccoons are often attracted to human developments because of supplemental food supplies associated with pet food and refuse. Human activity alone can affect the behavior of wildlife. Whether changes in behavior are detrimental to individual wildlife species depends on the intensity of the disturbance and its duration. Reducing these threats requires minimizing development near aspen communities. Some of these impacts can be offset by increasing the area and density of aspen through protection and restoration efforts that improve habitat structure.

Alternatives 1 and 2 provide the opportunity to protect and improve 243 acres and 380 acres, respectively, of aspen-dominated habitat and to benefit associated wildlife through outreach and education strategies to promote participation in conservation programs. The proposed Stewardship Area of Alternative 1, however, fails to include several aggregations of aspen stands, hence limits Service involvement in their conservation. Landowner participation in voluntary conservation programs and partnership activities will have some impact on land conversion, but many large land holdings

Table 4-11. *Acres of Aspen Riparian Habitat within Alternative Stewardship Areas, by Quality Index and Estimated Acres Protected and Restored.*

	Alt 1	Alt 2	Alt 3	Alt 4
Stewardship Area				
High quality habitat	182	271	271	271
Medium quality habitat	51	92	92	92
Low quality habitat	10	17	17	17
Total Aspen Riparian Habitat acres	243	380	380	380
Estimated Acres Protected and Restored*	12	24	144	274

*Product of the estimated total area protected and restored under each alternative (Table 4.2) and the percent composition of aspen riparian habitat in the Stewardship Area.

will continue to be sub-divided and developed resulting in an overall decline in the biological integrity of aspen habitats in the Refuge vicinity. Under Alternative 2, improved outreach and a larger Stewardship Area, which includes the highest quality aspen habitat in the Refuge vicinity, will reduce losses from sub-division and development, but land clearing and fragmentation will continue to occur on the remaining unprotected areas resulting in an overall decline. An expanded Refuge boundary in Alternatives 3 and 4 would increase the probability that additional aspen riparian habitat would be protected and managed for associated wildlife species over Alternatives 1 and 2 (Table 4-11). With the largest proposed acquisition encompassing 274 acres of aspen riparian habitat, Alternative 4 would afford the greatest opportunity to protect and restore additional riparian habitat thereby increasing the area and quality of aspen habitat and the populations of associated wildlife that breed and forage within the deciduous tree and shrub canopies (e.g. red-naped sapsucker, willow flycatcher, yellow warbler, and ruffed grouse).

Effects from elk management actions (Not including hunting)

Elk use and preference for aspen and other deciduous browse is well documented (Debyle 1985). Under high elk densities and limited habitat, elk browsing can have a significant negative impact on the regeneration of aspen and other deciduous trees and shrubs. Elk browse the tips of new shoots below about eight feet and also eat the bark of mature aspen. When browsing intensity is high enough to remove the majority of the current years growth, aspen will develop a shrub form or the new sprout will be killed. Without recruitment of an adequate density of well formed aspen stems, mature trees that die will not be replaced and the stand will decline. Without browsing, aspen sprouts can generally reach a height of eight feet within eight years putting them out of the reach of elk. Elk management that either reduces elk densities in an area during the winter by removal or redistribution can decrease browsing intensity enough to allow escapement and height growth putting them beyond the reach of elk .

The opportunity to employ elk management techniques to reduce elk densities under all alternatives will likely decrease impacts to aspen stands within the previous high elk use areas on the Refuge.

Effects from public use activities

Potential impacts of public uses on aspen habitat and associated wildlife include: changes to the habitat structure through construction of public use facilities; increased disturbance to wildlife from activities occurring in close proximity to riparian areas; and potential redistribution of elk and their browse impacts by hunting. None of the alternatives contain plans for the construction or improvement of public use facilities that would directly impact a significant area of aspen habitat. Proposed facilities would, however, place visitors in close proximity to aspen, resulting in disturbance to wildlife.

Songbirds and woodpeckers are the primary species groups potentially affected by public use activities in aspen riparian zones. Disturbance to birds by visitors, particularly those on foot, can result in behavioral responses and habitat impacts as previously described for wetland, steppe, and pine forests. Table 4-12 provides a comparison of the area of aspen within 82 feet (25 meters) of trails and EE sites and the percentage this area represents of the total Refuge aspen habitat. Eighty-two feet was chosen because it represents an average tolerance distance of thirteen passerines species in woodland habitat (Cooke 1980). Trails were chosen as a focal area, because individuals on foot have been shown to have the greatest potential to disturb wildlife. EE sites were also chosen as a focal point of disturbance because of the large number of students at these sites at one time and the duration of the activity. Alternative 1 would potentially have the greatest impact on aspen riparian habitat as a result of unrestricted off-trail foot travel in the public use area. Aspen stands are highly desirable locations for bird watchers and photographers because of the abundance and diversity of wildlife typically

Table 4-12. *Acres of Aspen Habitat within 82 feet of Trails and EE Sites and the Percentage of the Refuge Aspen Habitat Base Potentially Impacted*

Public Use Activity	Alt 1	Alt 2	Alt 3	Alt 4
Off-trail foot travel				
Acres	152	0	0	0
Percent of Refuge aspen	19%	0	0	0
Trails				
Acres	25	27	29	29
Percent of Refuge aspen	3%	3%	4%	4%
EE sites				
Acres	1	1	1+[a]	1+[a]
Percent of Refuge aspen	0.1%	0.1%	0.1%	0.1%

found there. There are approximately 152 acres of aspen/riparian habitat within the Public Use Area that could be affected under Alternative 1, representing 19 percent of the Refuge aspen habitat base.

The predicted increase in visitor use on the Refuge could have a significant impact on aspen-dependent wildlife. Public use activities under Alternative 2 would have the least amount of impact on aspen habitat and wildlife, primarily as a result of restrictions on off-trail foot travel and the moderate increases in trails and facilities. Impacts to aspen habitat and wildlife under Alternatives 3 and 4 would be similar and slightly higher than Alternative 2 as a result of additional trails and viewpoints. If public use is extended on to any new acquisitions (which could occur under Alternatives 3 and 4) some additional impacts may result. These effects may be mitigated by habitat protection and restoration efforts and proper placement of trails and new facilities that maintain adequate buffers.

Annual hunting, if allowed in the same area each year, may cause elk to begin using the remaining no-shooting zones, especially the Public Use Area, to a greater degree. This portion of the Refuge has historically received low elk use due to the relatively greater level of human disturbance. Aspen in this area has shown little impact from elk and regeneration typically reaches a height of eight feet within seven to eight years.

Since disturbance associated with hunting has a greater influence on elk behavior than other public uses (Skovlin 1982), elk will likely begin to habituate to the level of non-hunting related human disturbance in the no-shooting areas (Ward 1973). Increased density of elk in these no-shooting areas may occur under any of the alternatives including an elk hunt (Alternatives 2, 3, and 4) and may increase the intensity of aspen browsing in the no-shooting areas, off-setting gains made in the hunting zones. The potential to acquire additional lands under Alternatives 3 and 4 increases the opportunities to vary hunt units both temporally and spatially, to minimize problems with elk overuse of no shooting zones.

4.1.7 INDICATOR 7 - EFFECTS TO THREATENED SPECIES

Effects from land protection actions

Water Howellia: Identified threats to water howellia include: competition from exotic species, changes in the water regime of wetlands through draining or flooding, grazing, increased sedimentation from erosion, and ground disturbing activity within wetlands that could

disrupt the seed bed. With 33 occurrences, the Refuge supports one of the larger metapopulations of this species within its range. This metapopulation, however, extends beyond the Refuge boundary. Hundreds of wetlands around the Refuge have the potential to provide habitat for water howellia (Table 4-13). If these wetlands do support populations of water howellia, then the Stewardship Area private land conservation programs may help minimize threats. Securing their future existence would conserve the metapopulation of the species and reduce the risk of extinction.

Protection of water howellia populations on private land would require minimizing the threats enumerated above. Minimizing land development for either domestic or commercial use would have the greatest benefit for this species and its habitat.

Spalding's Silene: Spalding's silene is a perennial plant species found in areas of high quality intact steppe of eastern Washington and Oregon. Six occurrences have been located on the mounded soils of the Refuge. Potential threats to this species are the same as those impacting steppe. The difference between alternatives is primarily based on the amount of high quality steppe habitat that would potentially be protected (Table 4-13). The effectiveness of the alternative protection strategies is the same as those described for steppe habitat.

Bald Eagle: Bald eagle fall and winter use is limited in the Refuge vicinity primarily by the shortage of large, permanent wetlands that host concentrations of waterfowl, their principal winter food. The relatively high level of disturbance associated with human activity around existing eagle habitat off-Refuge may also contribute to low use in this area.

Although opportunities to protect existing fall and winter habitat exist within the protection areas identified in the alternatives (Table 4-13), the greatest positive impact to eagles would be

Table 4-13. *Habitat Area for Threatened and Endangered Species Affected*

	Alt 1	Alt 2	Alt 3	Alt 4
Water howellia habitat				
Stewardship Area				
Number of wetlands	200	400	400	400
Acres of howellia habitat	454	885	885	885
Estimated Acres Protected and Restored [a]	38	82	350	640
Spalding's silene habitat				
Acres of habitat in Stewardship Area	4,256	6,502	6,502	6,502
Estimated Acres Protected and Restored [b]	358	605	2,575	4,700
Fall/winter bald eagle habitat				
Acres of habitat in Stewardship Area	118	351	351	351
Estimated Acres Protected and Restored [c]	104	208	890	1,624

[a] Product of the percent composition of howellia habitat in the alternative Stewardship Area and the estimated area protected and restored under each alternative

[b] Estimated area of high quality steppe protected under each alternative (Table 4.7)

[c] Estimated acres of permanent wetlands protected and restored under each alternative (Table 4.3).

the restoration of additional permanent wetlands and minimizing development and its associated human disturbance in these areas. Comparison of the alternatives in this regard is also provided in Section 4.1.2.

Effects from elk management actions (Not including hunting)

Water howellia: No impacts would be expected from non-hunting elk management activities. This work would not take place within wetlands.

Spalding's silene: No impacts would be expected as the area of steppe habitat impacted by any elk management activity would be very small and all known populations would be avoided.

Bald Eagle: There could be short term disturbance to bald eagles associated with capture activities if relocation is utilized. This activity would occur in a localized area and for a short period of time resulting in only minimal impact.

Effects from public use actions

Water howellia: No adverse impacts to populations of water howellia would be expected from public use activities proposed in any of the alternatives. No public use facilities are planned within or adjacent to wetlands with known occurrences of water howellia.

Spalding's silene: Potential threats to Spalding's silene include direct impact to populations and habitat associated with facilities expansion, trampling of vegetation by foot travel, and potential introduction of exotic species. Over the course of the next 15 years, visitation at the Refuge is expected to increase. There are six known populations of Spalding's silene within the Public Use Area. A lack of restrictions on off-trail use in the Public Use Area under Alternative 1 may result in some impact to Spalding's silene as well as the possible introduction of exotic plant competitors. None of the alternatives, however, have proposed facilities near any known populations of this plant species on the Refuge. The minimal impact that alternative facilities development would have on steppe habitat makes any impact to this plant species unlikely.

Bald Eagle: Bald eagles could potentially be affected by disturbance associated with Refuge visitors engaged in wildlife observation, bird watching, photography, and environmental education under each of the four alternatives. Wintering populations of bald eagles have shown susceptibility to disturbance resulting in disrupted foraging behavior and changes in social dynamics between other species in the avian scavenger guild (Skagen et al. 1991) and avoidance of areas with high disturbance (Stalmaster and Newman 1978). Stalmaster and Newman (1978) also found that recreational activities occurring within 820 feet (250 meters) of roosting and foraging areas resulted in changes in distribution patterns by displacement to areas of lower human activity. Under all alternatives, trails and public use facilities would occur within 820 feet of bald eagle foraging habitat within the Public Use Area as well as along the Columbia Plateau Trail (Table 4-14). Under all the alternatives visitation to the Refuge is expected to increase. The lack of adequate controls on public use activity under Alternative 1 would likely result in significant impacts to bald eagles in the Public Use Area and adjacent to the Columbia Plateau Trail. The three action alternatives have greater restrictions on public use activities, but increase the number of facilities and access into areas that are currently closed. In general, adverse effects to eagles would likely increase from Alternative 2 to 4, as additional trails and facilities are developed. The impact this increase will have on bald eagles depends on the extent the design of public use facilities takes into account wildlife and habitat needs.

The potential for a limited-entry elk hunt in Alternatives 2 through 4 could result in short-term impacts to eagle use within the hunt units. Hunt units would incorporate portions of the large permanent wetlands utilized by eagles, and hunters would occasionally be walking within 820 feet of this habitat. Stalmaster and Newman

Table 4-14. *Acres of Bald Eagle Fall/Winter Habitat Potentially Affected by Off-Trail Foot Travel, within 820 feet of Public Areas* and the Percentage of the Refuge Bald Eagle Habitat Base Potentially Impacted by Public Use Activities.*

Public Use Facility	Alt 1	Alt 2	Alt 3	Alt 4
Off trail foot travel - acres Percent of Refuge eagle habitat	170 17%	0	0	0
Trails Acres Percent of Refuge eagle habitat	 177 18%	 198 20%	 222+[a] 22%+	 222+[a] 22%+
Viewpoints Acres Percent of Refuge eagle habitat	 81 8%	 107 11%	 134+[b] 13.8%+	 134+[b] 13.8%
Waterfowl Hunting Percent of Refuge habitat			140+[c] 14%+	282+[c] 28%+
Total Acres Potentially affected Percent of Refuge habitat	180 18%	219 22%	383+ 40%	525+ 54%

* Trails, viewpoints and waterfowl hunting areas

[a] New trails maybe added if land is acquired adjacent to existing Public Use Area

[b] New viewpoints maybe established if good vistas become available on new acquisitions.

[C] Additional waterfowl hunting areas may be established on new acquisitions following a review

(1978) found that gunshots were the only noises that elicited overt escape behavior by bald eagles in their study. Edwards (1969) also found that gunshots could be used to flush eagles from their roost (cited in Stalmaster and Newman 1978). The small number of elk hunting permits issued and the short period of time hunters would be present near bald eagle habitat would result in only minor impacts to eagles under all alternatives. Varying hunt units spatially and temporally may reduce some of these impacts.

Annual waterfowl hunting as proposed under Alternative 3 and 4 would increase the amount of disturbance to bald eagles within hunt units resulting in avoidance of these areas. The two - day youth waterfowl hunt as proposed in Alternative 3 would, however, have negligible impacts on bald eagles. The larger season-long waterfowl hunt proposed in Alternative 4 would impact a significant portion of the available bald eagle habitat on the Refuge.

Waterfowl hunting may, however, increase the food base as a result of wounding and crippling of waterfowl. Under Alternative 4, limiting the number of days per week open to hunting and restricting shooting hours could potentially increase eagle use of the hunting units.

All of the existing and restorable fall /winter bald eagle habitat off-Refuge receives human use that could potentially be affecting roosting and foraging bald eagles. If some of this habitat is acquired as proposed under Alternatives 3 and 4, some public use may be allowed. The impact this use will have on bald eagles depends on the extent to which bald eagle needs are considered in the design of public use facilities. Control of human access may actually reduce disturbance and increase bald eagle use.

4.2 SOCIAL EFFECTS

4.2.1 OVERVIEW /GENERAL

As an overview to assessing the social effects of Alternatives 1 through 4, it is important to understand the broader context of Turnbull NWR within the region and how recreational demand and public use is expected to change over time.

A growing visitor presence in the Refuge area can be expected in the future, based on IAC estimates provided in Chapter 3. Many of the public use opportunities currently provided at the Refuge – hiking, outdoor photography, sightseeing and exploring, nature study, and wildlife observation – are very popular within the State and are forecasted to attract increasing amounts of participants in the coming years. The newly developed Columbia Plateau Trail will also play a role in increasing Refuge visitation. Since a large proportion of current visitors to the Refuge are from Spokane County, it is also important to consider the significant amount of population growth forecast for the county. Based on these factors, non-school related public use at the Refuge, particularly the auto tour route area, will increase in the future. This will occur no matter which alternative is selected.

Table 4-15 shows Refuge visitation (number of Refuge visits, annually) estimates for several categories, both currently and expected under the different alternatives. The following background information may be useful in interpreting this table. Current visitation refers to the Refuge's best estimate of annual visitation in year 2003. It is based on Refuge Management Information System (RMIS) data from the three to five years preceding 2003, as presented in Chapter 3, but is not always an exact average of these numbers.

The numbers shown for Alternatives 1, 2, 3, and 4 represent the Refuge's best estimate of the number of visits in each category *during the final year of the 15-year CCP time frame* (i.e.

Table 4-15. *Annual Refuge Visitation, Projected in 15 years, by Alternative**

Recreation Category	Current Visitation	Alt 1	Alt 2	Alt 3	Alt 4
Wildlife observation[a]	20,000	26,500	29,500	32,500	35,500
Wildlife / nature photography[b]	4,000	5,000	6,000	6,500	7,000
Hiking / Foot Trail use	12,000	14,000	14,500	17,000	20,000
Bicycling[c]	1,000	1,250	1,250	3,750	5,000
Visitor Center	6,000	7,500	10,000	15,000	21,000
Environmental Education[d]	5,000	5,000	6,000	9,000	10,000
Waterfowl hunting	0	0	0	15	450
Elk hunting	0	0	80	80	80

* Refuge visits are not totaled since visitors may engage in more than one activity per visit.
[a] Not counting EE program
[b] Hobby photographers account for a majority of this category
[c] Not including bicycle use on Columbia Plateau Trail
[d] On-Refuge environmental education only

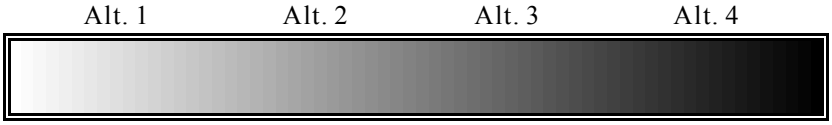
during year 2020 if the Refuge signs its CCP in 2005). The future visit numbers are estimates based partly on the projections provided by IAC (2002b) for changing visits in different outdoor recreation categories over the next two decades. Facilities and programs that would be part of each alternative also figured into the estimate.

Note that although significant quantities of land could be added to the Refuge under Alternatives 3 and 4, with consequent increases in the area available for recreation, this potential increase was not factored into the numbers presented for these alternatives. The reason for this is that the exact location and timing of land acquisition cannot be predicted. Therefore, the numbers for Table 4-15 simply represent the visits expected within the current Refuge fee title ownership, by alternative.

Refuge services provided to support recreational visitors would differ along a continuum, depending on the alternative, with Alternative 1 providing existing, relatively low levels of staff, facilities, and programs. These increase by alternative, with Alternative 4 providing the highest level of staff, facilities, and programs.

Currently, the Refuge is an important public area, used mainly by county residents. Public use and recreational activities currently supported at the Refuge include watching and photographing wildlife, environmental education, hiking, and bicycling. These activities would continue under all alternatives, but Alternatives 3 and 4 would be better able to accommodate increasing demand for these activities because of enhanced public use facilities and programs. In addition, under Alternatives 3 and 4, the Refuge's attraction to other potential visitor groups would be expanded as a result of enhanced or new public use facilities and expanded trail opportunities.

Staff / Facilities / Programs



Less *More*

The Public Use Area remains the same under Alternative 1, but is enlarged under Alternatives 2, 3, and 4 to accommodate additional trails. Public use at the Refuge would continue to be day use only in all alternatives. Under Alternative 1, off trail use would be permissible, but off trail use would not be allowed under Alternatives 2, 3, or 4. Certain non-wildlife dependent uses would continue to be prohibited.

Greater accessibility to persons of all abilities would be available at increasing levels from Alternative 1 through Alternative 4. All alternatives would fix or replace the existing wheelchair-accessible Boardwalk while Alternatives 2, 3, and 4 also include the wheelchair-accessible Kepple Peninsula and Pine Lake Loop trails. All alternative actions provide ADA-accessible opportunities.

Fishing opportunities are available in the county and in the Refuge vicinity at the many surrounding lakes and rivers. Fishing is not a viable activity at Refuge lakes due to the lack of a stable fishery and other fishery and wildlife habitat constraints. As a result, fishing was not an activity that was considered during the CCP planning process.

4.2.2 INDICATOR 1 - OPPORTUNITIES FOR COMPATIBLE NATURE/WILDLIFE OBSERVATION AND BIRD WATCHING

Effects from Land Protection Actions

Alternatives 2, 3, and 4 include a large 44,356-acre Stewardship area around the Refuge (in Alternative 1, the Stewardship Area would be the priority areas designated in the approved HMP - approximately 21, 396 acres). Within the Stewardship Area, the Refuge would encourage greater conservation practices and restoration from interested private landowners. If these conservation and restoration activities were to be undertaken, there could be an indirect effect of increasing the quality of wildlife observation and bird watching on the Refuge and within the Refuge vicinity.

Alternatives 1 and 2 keep the Approved Refuge Boundary the same and under these alternatives there are no significant opportunities for the Refuge to expand designated wildlife observation areas outside the Refuge. Alternatives 3 and 4 expand the Approved Refuge Boundary, and contingent upon the availability of willing sellers, provide opportunities for protection of up to 12,000 acres (Alt 3) or 25,000 acres (Alt 4) under the National Wildlife Refuge System. Under these alternatives, lands could be acquired from willing sellers within this expanded area and there is the potential that additional designated wildlife observation areas could be added in the future.

Effects from Elk Management Actions (Not including hunting)

Elk management actions would be similar across all alternatives. Overall, all of the elk management actions are aimed at reducing the elk population. Elk management actions could result in a decrease in elk sightings over time. Non-hunting methods should not affect sightings of any other animals.

Effects from Public Use Actions

Wildlife observation and wildlife photography would be supported in all alternatives, with Alternative 1 being the least intensive and Alternative 4 being the most intensive. In all four alternatives, this activity would occur in the Public Use Area and along the Columbia Plateau Trail. All alternative actions would continue to provide opportunities for nature/wildlife observation; however, Alternatives 3 and 4 would enhance opportunities for this activity the most by providing additional designated viewpoint areas, additional photo blinds, and more facilities.

Designated viewpoints (auto pull-off areas with possibly a short trail to a photo blind, scenic overlook or interpretive panel) are provided in all alternatives but vary in scope. Alternative 1 would provide 19 viewpoints while Alternative 2 would have two additional viewpoints and would provide more improvements (interpretive signs) at most sites. Alternatives 3 and 4 would provide 25 viewpoints each, and interpretive signs would be placed at most.

Photo opportunity blinds would be provided in all alternatives, but would vary by alternative. In Alternative 1, one blind would be provided (not accessible). In Alternatives 2 through 4, four photo blinds would be provided with three of them designed to be accessible.

Hunting could have a positive effect on wildlife observation quality. All hunt areas would be located outside the boundaries of the Public Use Area and buffered from the Columbia Plateau Trail and county roadways. No safety conflicts would be expected between hunters and non-hunters. Although it's difficult to predict with certainty, wildlife observation opportunities could be increased as a variety of animals move away from the hunted zones toward sanctuary areas, including the Public Use Area. The ultimate outcome for the visitor is that higher numbers of animals may be visible, but the aesthetic value of the experience may be diminished somewhat by the occasional sound of shots.

Alternatives 1 through 4 provide a varying level of facilities with Alternative 1 providing the least and Alternative 4 providing the most. Some of these facilities (i.e., interpretive exhibits at a visitor contact facility, additional hiking trails, interpretive signs, bike trail, and improvements along the Columbia Plateau Trail) may indirectly contribute to the quality of wildlife viewing available by helping visitors to better understand and enjoy what they see.

Alternatives 3 and 4 include a provision to cooperate with WSPRC, should they choose to add additional facilities along the Columbia Plateau Trail at the north border of the Refuge. These actions would encourage additional nature/wildlife observation along the Columbia Plateau Trail, particularly Alternatives 3 and 4.

Along the Columbia Plateau Trail, Alternatives 2, 3, and 4 would provide vegetative buffering (planting of hawthorne), additional visitor education, and potential seasonal closures along Long Lake. Ultimately these actions are aimed at protecting the wildlife habitat present at Long Lake and will contribute, over the long-term, to the quality of wildlife observation along the whole Refuge section of the Columbia Plateau Trail.

4.2.3 INDICATOR 2 - OPPORTUNITIES FOR COMPATIBLE NON-MOTORIZED TRAIL ACTIVITIES AND LONGER TRAIL LOOP OPTIONS

Effects from Land Protection Actions

No effects to trail opportunites are expected under Alternatives 1 and 2. Under Alternatives 3 and 4, the Refuge approved boundary would be expanded and, contingent upon the availability of willing sellers, additional lands would be added to the Refuge. If large, contiguous blocks are added, there may be a possibility to add additional Refuge trails in the future.

Effects from Elk Management Actions (Not including hunting)

No effect to trails from any of the non-hunting elk management actions is foreseen under any alternative.

Effects from Public Use Actions

All alternatives would provide non-motorized, multi-use trails; however, they would increase in number and length by alternative. Alternative 1 includes 11.5 miles of trails with 6.75 miles in the Public Use Area and 4.75 miles along the Columbia Plateau Trail with no trail longer than 1.5 mile. Alternative 2 would include 15.25 miles of trail with a new longer Stubblefield Trail loop. Alternatives 3 and 4 would also include 15.25 miles of trail, but additional trails may be added if lands are acquired in the future, including longer trail loops.

Under Alternative 1, the longest pedestrian only loop trail available to visitors is one mile. Alternatives 2, 3, and 4 would provide visitors with a pedestrian only loop trail of 5.3 miles. Were a visitor to start on a bicycle, the loop possibilities would be many miles longer under Alternative 3 and even longer with more diversity of scenery under Alternative 4.

Thus, all alternative actions would provide opportunities for trail use; however, Alternatives 2, 3 and 4 would further enhance this activity. All trailheads would be located in the Public Use Area (with the exception of trailheads for the Columbia Plateau Trail) and trail surfaces would vary by location.

Visitors using trails may have a more pleasing experience when encountering viewpoints, blinds, and/or interpretive material along the way. In general, these opportunities increase with each alternative, with Alternative 4 providing the highest number of viewpoints, blinds, and interpretive sites.

The Boardwalk and Kepple Peninsula Trail would be redeveloped as interpretive trails (multiple interpretive signs or markers) under all

alternatives. In Alternatives 2, 3, and 4, the Pine Lake Loop Trail with multiple interpretive signs would also be added.

Opportunities for ADA-accessible trail and access opportunities would vary by alternative. Each of the interpretive trails would be designed to be ADA-accessible. The existing Boardwalk would be fixed or replaced under all alternatives. Alternatives 2, 3, and 4 would also include accessible trail opportunities at the Kepple Peninsula and Pine Lake Loop trails.

In Alternative 3, a designated bike trail that connects the Columbia Plateau Trail with the Public Use Area would be provided. It would generally follow the old highway roadbed inside the Refuge. Alternative 4 would include this bike route and loop it through the Public Use Area, out Gate 19, and up Cheney-Spangle Highway to Cheney. The Refuge would partner with Spokane County Roads Department and other entities to seek funds and design assistance for the development of paved bike lanes and safe, marked access points where needed on the county highways.

Along the Columbia Plateau Trail, Alternatives 1 and 2 would provide a vault toilet and benches. Alternatives 3 and 4 would also provide sign-in books, additional benches, and cooperation with WSPRC, should they choose to provide additional parking, kiosk, and/or restroom facilities at another nearby trail location. Through these measures, Alternatives 3 and 4 would encourage additional trail use along the Columbia Plateau Trail.

At Long Lake, a new 0.7- mile bypass trail along the Columbia Plateau Trail could possibly be provided in Alternatives 2, 3 and 4. If constructed, this action would allow trail users to detour off the Columbia Plateau Trail and follow a 1-mile long trail through a natural environment within the Refuge. In addition, Alternatives 2 through 4 would help minimize disturbance from trail users in the Long Lake area or other sensitive locations. This would be accomplished through the use of vegetative buffer plantings (hawthorne), increased visitor education, and potential seasonal closures or trail re-routes inside the Refuge. Alternatives 2, 3, and 4 with tall thorny vegetative screening and the potential for seasonal trail closures may negatively effect wildlife observation opportunities in the Long Lake area.

Hunt programs established under Alternatives 2, 3, and 4 would not have any significant impact on trail opportunities. Hunt areas would be located well away from trails and there should be no safety conflicts.

4.2.4 INDICATOR 3 - OPPORTUNITIES FOR INCREASING NUMBERS OF "DESTINATION" VISITORS

Small or moderately sized natural areas without overnight use can find it hard to attract "destination" visitors. Destination visitors are typically residents from other areas, and as such, would rely more heavily on local restaurants, hotels and other tourist support businesses than visitors who reside within the local area. As such, destination-oriented visitors can be positive for the local economy. Being known as a destination stop also helps put a Refuge "on the map" with regard to internal agency recognition and support, with likely increases in funding to support Refuge programs.

Effects from Land Protection Actions

Alternatives 1 and 2 keep the Approved Refuge Boundary the same. Under Alternatives 3 and 4, the Refuge's approved boundary would be expanded, and contingent upon the availability of willing sellers, additional lands would be added to the Refuge. The potential for a larger Refuge under Alternatives 3 and 4 may eventually result in an increase in the number or length of trails or viewpoints available to visitors. Such an increase would increase the complexity of recreational opportunities available at the Refuge, making the Refuge more likely to be a destination stop for visitors from outside the local area.

All alternatives also include a Stewardship Area, which would rely on partnerships and voluntary

means to improve wildlife habitat. Enhanced wildlife habitat could result from Stewardship Area activities, which could improve viewing opportunities all around the Refuge, possibly increasing the areas's reputation as a "destination" spot.

Effects from Elk Management Actions (Not including hunting)

Non-hunting elk management actions would be similar across all alternatives. Overall, all of the elk management actions are aimed at reducing the elk population. The employment of non-hunting elk management actions would be more likely under Alternatives 1 than the other alternatives, and could decrease the chance of attracting more destination visitors to the Refuge.

Effects from Public Use Actions

There are several factors that could increase Turnbull's visibility as a destination stop for visitors. One would be the availability of blinds and viewpoints that increase a visitor's chances of seeing rare birds or birds engaging in interesting behavior (i.e. a colonial nesting site). Another would be longer, loop trails and trails meandering through a diversity of habitats. A third would be a well-built and designed EE and interpretive center. An opportunity for uncrowded, high quality hunting would be a fourth factor for attracting destination visitors. Outreach and signs posted in key places, such as along Interstate 90, could also be instrumental in increasing destination tourism, independent of wildlife and habitat conditions. There are other factors that attract destination visitors that cannot be controlled (such as a posting of a Rare Bird Alert).

Based on factors that can be controlled, Alternative 4 would most likely provide the conditions that would attract destination visitors and Alternative 1 would be the least likely to provide these conditions. Alternatives 2 and 3 would be intermediate.

4.2.5 INDICATOR 4 - OPPORTUNITIES FOR QUALITY HUNTING

Effects from Land Protection Actions

Hunting does not occur on Refuge currently but does occur on neighboring private lands. All alternatives promote voluntary conservation within a Stewardship Area around the Refuge. To the extent that conservation actions may expand habitat or sanctuary for game animals, there could be an increase in the quality of hunting available off-Refuge under all Alternatives, with the greatest quality potentially available under Alternative 4 and the least under Alternative 1. Similarly, conservation actions can affect the quality of public hunting that will be available on-Refuge under Alternatives 2, 3, and 4. Quality public hunting on Refuge would be expected to be highest under Alternative 4, intermediate under Alternative 3, and low under Alternative 1.

Effects from Elk Management Actions (Not including hunting)

Non-hunting elk management actions would be similar across all alternatives. Overall, all of the elk management actions are aimed at reducing the elk population. As such, if these were used in conjunction with an elk hunt in any particular alternative, the hunt quality could go down as there could be fewer elk at which to shoot.

Effects from Public Use Actions

Future demand for hunting is expected to decrease slightly in the coming years. However, as the overall county and the Cheney area continues to grow in population, some existing private hunting areas will no doubt be lost to new development over time. Under Alternatives 2, 3 and 4, elk hunting would occur annually on approximately 5,230 acres that are not open to other public uses. The number of permits and seasons opened would vary depending on the level of habitat damage (mainly to aspen). Alternative 3 provides for an annual youth waterfowl hunt on Upper Turnbull Slough. Alternative 4 also provides for fall

waterfowl hunting at Turnbull Slough and West Tritt Lake. In Alternatives 2, 3, and 4, the Refuge would potentially provide a turkey hunt depending upon turkey population trends.

All hunts that could occur would be designed as quality hunts, as defined in Chapter 2, Objectives 7L and 7M.

In sum, of the four alternatives, Alternative 4 provides the most opportunities for hunting on the Refuge. It is unknown if elk hunting quality would change over time under Alternatives 2, 3, or 4.

4.2.6 INDICATOR 5 - OPPORTUNITIES FOR A COMPATIBLE AND SUSTAINABLE ENVIRONMENTAL EDUCATION PROGRAM, BOTH ON-REFUGE AND OFF-REFUGE

Effects from Land Protection Actions

Within the Stewardship Area designated under all alternatives, the Refuge would encourage greater conservation practices and restoration from interested landowners. These activities could possibly form the basis of off-Refuge Environmental Education activities cosponsored by the Refuge and private landowners.

Under all alternatives, EE sites and facilities will be centered within the Public Use Area and would not be established on any additional lands added to the Refuge. .

Effects from Elk Management Actions (Not including hunting)

No effect to the EE program from non-hunting elk management activities was identified.

Effects from Public Use Actions

The Refuge continues to attract many school groups annually, who participate in the Refuge's EE program. This is a well established and successful program seeing increased demand as school districts continue to expand their EE curriculum while simultaneously accommodating more students due to population growth. Very few other nearby locations offer this same program or site opportunities (EDAW 1999). It appears that the Refuge could schedule as many school trips as it could reasonably accommodate, given sufficient funding. There is no shortage of demand for EE activities at the Refuge now, nor is demand expected to soften in the future.

All alternatives would provide for an on-Refuge EE program; however, the EE program would vary by alternative with Alternative 1 providing a lower level of EE services and facilities and Alternative 4 providing the highest level of EE services and facilities.

Similarly, all alternatives provide for an EE program off of the Refuge. The effect varies by alternative with Alternative 1 providing a lower level of off-Refuge EE programs and support and Alternative 4 providing the highest level of off-Refuge EE programs and support.

Refuge staff and facilities would vary under the alternatives in line with the level of service provided. Alternative 1 would provide the same staff and facilities as now. Existing base staff and facilities cannot adequately support the current demand for EE programs, hence there is a lot of fluctuation annually depending upon what kind of grant money has recently been obtained. Alternatives 2, 3, and 4 would all attempt to remedy this instability by providing higher annual base funding to support staff. In addition, Alternatives 3 and 4 would double the size of the EE facilities (a brand new facility would be built under Alternative 4). The actions to upgrade and expand staff and facilities in Alternatives 3 and 4 would most enhance the on-Refuge and off-Refuge EE programs and provide the greatest opportunity for the local and regional public to enjoy the benefits of environmental education.

Alternatives 2, 3, and 4 all accommodate some level of hunting on Refuge lands. New areas could be designated if additional lands were acquired. Under any alternative, if hunting were to be employed, safe hunting areas would be

designated away from the Public Use Area, county roads, and the Columbia Plateau Trail. No safety issues would be expected between hunters and non-hunters. There could be some disturbance which may cause animals to move around the Refuge and into the public use area or other non-hunted sanctuary areas on or off the Refuge. This would not have any significant impact on EE program activities.

4.2.6 INDICATOR 6 - OPPORTUNITIES FOR COMPATIBLE INTERPRETATION, BOTH SELF-GUIDED AND STAFF-LED

Effects from Land Protection Actions

No effects to interpretation opportunities are expected under any alternative.

Effects from Elk Management Actions (Not including hunting)

Elk management activities, which would be a new activity at the Refuge, would require their own interpretation emphasis. This would be most facilitated under the alternatives that provide a greater exhibit area and naturalist services (i.e., Alternatives 3 and 4).

No other direct effect to the interpretation program from elk management activities was identified. No safety issues would be expected under any alternative.

Effects from Public Use Actions

All alternative actions provide opportunities for interpretation; however, Alternatives 2, 3 and 4 would further enhance this activity by providing additional interpretive trails and signs, exhibits, and naturalist services.

Currently, the Refuge does not have any central interpretive area or staffed visitor contact / welcome facility that is linked to the auto tour route and could serve as a jumping-off point for Refuge visitors. This condition limits the use of the Refuge by those who are constrained by time or physical ability from exploring interpretive materials, nearby trails, and viewpoints directly.

Visitor welcome areas would vary by alternative. In Alternative 1, no new facility would be provided. In Alternatives 2, 3, and 4, four interpetive panels overlooking Winslow Pool would be provided. In Alternative 2, a small volunteer-staffed information point would help meet this need for visitor welcome as well as orientation to the Refuge environment. In Alternatives 3 and 4, additional staffed new or expanded facilities would be provided to help meet this growing need and to provide an enhanced experience for Refuge visitors, including new interpretive and orientation exhibits. Alternatives 2, 3, and 4 would provide a new gate and fee station closer to Cheney-Plaza Highway. This action would enhance visitor management and help avoid confusion for visitors.

Designated viewpoints (auto pull-off areas with possibly a short trail to a photo blind, scenic overlook or interpretive panel) would be provided in all alternatives but would vary in scope. Alternative 1 would have 19 viewpoints while Alternative 2 would have 21 viewpoints, most with more improvements, especially interpretive signs. Alternatives 3 and 4 would have the same 21 viewpoints, plus 4 more along county roadways (Upper Turnbull Slough, McDowell Lake, Helm Marsh, and Stubblefield/steppe habitat).

Interpretive trails with signs would be provided in all alternatives. These would include the Boardwalk (with signs) and Kepple Peninsula Trail (with trail markers and interpretive brochure). Under Alternatives 2, 3, and 4, the Pine Lake Loop Trail, with signs, would be added.

Provision of the services of an interpretive naturalist would vary by alternative. No naturalist would be provided in Alternative 1. Alternative 2 would include an occasional, volunteer naturalist. Alternatives 3 and 4 would offer a naturalist with scheduled programs.

Hunting would not occur under Alternative 1. Annual hunting would occur under Alternative 2, 3, and 4 for elk and possibly turkey.

Alternative 3 would provide a 2-day youth waterfowl hunt on Upper Turnbull Slough and Alternative 4 would provide for fall waterfowl hunting for the State general waterfowl season at Turnbull Slough and West Tritt Lake, subject to shooting hours limitations and daily closures. New areas could be designated if additional lands were acquired under both Alternative 3 and 4. Under any alternative, if hunting were to be employed, safe hunting areas would be designated away from the Public Use Area, county roads, and the Columbia Plateau Trail. No safety issues would be expected between hunters and non-hunters. There could be some disturbance which may cause animals to move around the Refuge and into the public use area or other non-hunted sanctuary areas on or off the Refuge. This would not have any significant impact on interpretive program activities.

4.2.7 INDICATOR 7 - ENVIRONMENTAL JUSTICE

Proposed public use, elk management, and land protection actions all have a low risk of adversely affecting human health, economics, or the social environment as most anticipated effects are positive. Minority and low-income populations are not prevalent in the proposed Refuge expansion areas nor in the county as a whole. Minority and low-income populations do not appear to be at risk for disproportionately adverse effects from any of the proposed alternatives for Turnbull NWR CCP.

4.3 ECONOMIC EFFECTS

4.3.1 OVERVIEW OF ECONOMIC ANALYSIS

Turnbull NWR has direct economic impacts on the local economy. Turnbull NWR has an annual budget that supports employee salaries, operations and maintenance costs and various programs. The Refuge is sometimes allocated funding for capital improvements such as building roads or facilities. All of these activities require spending by the U.S. Fish and Wildlife Service, which results in effects on the local economy.

Turnbull NWR also has an indirect economic impact on the local economy through the many recreational activities that it supports. These activities currently include wildlife viewing, photography, hiking, environmental education, bicycling, and cross-country skiing. The action alternatives also would provide opportunities for hunting. Individuals that visit the Refuge and participate in these activities buy goods and services in local towns and cities (e.g., food, lodging, fuel, equipment), and thus contribute to the health of the regional economy.

The Service requested a contractor, Jones and Stokes, Inc., to prepare the analysis of economic effects stemming from the various actions associated with the Draft CCP/EA alternatives. These effects were considered under five indicators. Each indicator addresses a different aspect of economic effects. Indicators one through three assess the direct, indirect and induced effects of the CCP alternatives on jobs and personal income within the county. Indicator one focuses only on those effects stemming from Refuge expenditures. Indicator two focuses on the effects stemming from recreational expenditures associated with the Refuge. Indicator three focuses on the effects stemming from changed land use in the county as the Refuge expands. The results from indicators one through three can be summed to deduce an overall economic effect on jobs and personal income in the county.

Indicator four addresses the tax revenue changes that would be expected under the different alternatives and indicator five focuses on the consumer surplus values (“willingness to pay”) associated with each alternative.

The area of economic influence was established as Spokane County, Washington. The assessment of the economic effects was narrowed to Spokane County because Turnbull NWR is located entirely within this county; Refuge operation and maintenance expenditures would occur primarily within this county; and most visitors to the Refuge live within Spokane County and are assumed to make most of their purchases inside the county. Additionally, if the

Refuge were to acquire additional lands, these lands would also be located within the Spokane County boundary. For the purposes of this analysis, it was assumed (unless stated otherwise in each indicator analysis) that any effects attributable to the presence of the Refuge would occur only in Spokane County.

Overview of the IMPLAN Model

The economic effect of different alternatives was analyzed with the use of MicroIMPLAN (Impact Analysis for Planning), designed by the U.S. Forest Service. The IMPLAN model is owned and maintained by the Minnesota IMPLAN Group, Inc. IMPLAN is used by many state and federal planning agencies to evaluate the economic impact of policy choices. IMPLAN is based on a model known as input/output analysis. Input/output analysis uses business purchase information to discover the linkages among industries in the economy. By tracing a matrix of transactions it is possible to follow of the effects of a purchase as they flow through the economy. A purchase of seed, for example, flows back to wholesalers, truckers, seed farmers, and agricultural chemical manufacturers. This model of county-level economic interactions is used to estimate total regional economic activity based on changes in expenditures.

The IMPLAN input/output matrix incorporates data from a number of federal and state entities, including the Bureau of Economic Analysis and the Bureau of Labor Statistics. To group the industries for purposes of developing the input-output matrix and multipliers, IMPLAN uses the categories developed in the U.S. Office of Management and Budget's Standard Industrial Classification (SIC) code. The analysis was performed using the 1999 data package.

IMPLAN produces an estimate of the amount of employment (number of jobs) and the amount of personal income (dollars) that would be expected annually from the expenditure of dollars in any particular sector. Both the amount of employment and the amount of personal income are categorized as direct, indirct, or induced. These categories are defined as follows:

- *Direct effects* are the changes in production in industries producing items for which demand has changed, or which have suffered a supply shock. These are the changes specified initially by the modeler.

- *Indirect effects* are changes in production in industries linked with the directly affected industries. For example, a decrease in demand for the output of one of the directly affected industries will lead that industry to decrease demand for inputs, thereby affecting industries that supply those inputs.

- *Induced effects* are changes in household consumption resulting from changes in employment brought about by the direct and indirect effects. For example, reductions in household consumption of medical and legal services may occur as a result of decreased regional employment.

The model then sums these effects across all industries, estimating the change in regional output, employment and other indicators that would result from the initial change in output.

One weakness of input/output analysis is that it is a static model. Industries in the model do not change their production methods in response to changes in the business environment. This results in an oversimplification of how businesses and individuals respond in the real world; because of this inability of the model to account for human adaptation, economists believe input/output results represent more dramatic long-term impacts than will actually occur (Laughland and Caudill 1999).

4.3.2 INDICATOR 1 - EFFECTS FROM REFUGE OPERATIONS ON REGIONAL ECONOMY

This indicator seeks to answer the question, for each alternative: What contribution do expenditures made on behalf of Refuge operations and maintenance make to the regional economy?

Operational and Maintenance Expenditures

Since Refuge operational expenditures would vary by alternative based on the staffing levels and programs associated with each alternative (see Appendix F), each alternative would result in a different degree of economic effect. Table 4-16 shows the regional economic effect from Refuge annual operations and maintenance in the local economy. Projected average annual level of Refuge expenditures on operations and maintenance over the life of the CCP is included in the notes section of the table. It was also assumed that all operations and maintenance expenditures made by Turnbull NWR would occur in Spokane County and that all Turnbull NWR employees would reside in Spokane County.

The analysis shows that there is an enhanced economic effect on jobs and personal income from the increase in operations and maintenance expenditures under Alternative 1 to Alternative 4. Alternative 4 would produce about 50 percent more jobs and personal income as Alternative 1. The effects of Alternatives 2 and 3 are intermediate between Alternatives 1 and 4.

One-Time Expenditures

In addition to normal operations, the Refuge proposes a variety of special projects, which would generally be funded through special allocations rather than regular operations or maintenance funds. As such, they are classed as "one-time" expenditures. The projects that would be undertaken vary by alternative. Table 4-17 displays the regional economic effects from these one-time expenditures. Only high-priority projects listed in the Implementation Appendix (Appendix F) were counted towards the analysis. Assumptions that the analysis was based upon, including the average annual level of Refuge expenditures on these one-time expenditures over the life of the CCP, is included in the notes section of the table.

Note that the output of direct jobs from the IMPLAN model does not correspond exactly to the staffing levels projected by the Refuge under each alternative. IMPLAN projects the number of jobs based on an average salary of a non-military federal worker in the county of interest. This average salary over the county does not necessarily match the salaries that would be offered in the positions needed at the Refuge.

Revenues that the Refuge receives from firewood collecting, timber harvesting, and occasional other commercial uses were not included in the analysis. These revenues are small and are returned to the U.S. treasury and not the Refuge directly. In addition, it was

Table 4-16. *Estimated Employment and Annual Income Resulting from Total Refuge Annual Expenditures on Maintenance and Operations*

	Employment				Personal Income ($)			
Alternative	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
1	24	6	9	39	531,000	139,000	212,000	882,000
2	24	6	9	39	536,000	140,000	214,000	890,000
3	34	9	14	57	791,000	214,000	316,000	1,321,000
4	36	11	16	63	888,000	240,000	355,000	1,483,000

Notes: Personal income estimates have been rounded to the nearest thousand. Annual expenditures used to estimate employment and income are:

Alternative 1: $1,369,000
Alternative 2: $1,383,000
Alternative 3: $2,062,000
Alternative 4: $2,311,000

Table 4-17. *Employment and Income Resulting from Refuge One Time Expenditures on Buildings, Facilities, and Environmental Restoration Projects*

	Employment				Personal Income ($)			
Alternative	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
1	39	3	10	52	602,000	94,000	240,000	936,000
2	47	4	11	62	682,000	99,000	251,000	1,032,000
3	68	6	16	90	993,000	180,000	230,000	1,403,000
4	76	6	18	100	1,108,000	161,000	408,000	1,677,000

Notes: Personal income estimates have been rounded to the nearest thousand. Average annual level of one time expenditures used to estimate employment and income are:

Alternative 1: $1,594,000
Alternative 2: $1,668,000
Alternative 3: $2,428,000
Alternative 4: $2,710,000

assumed that these commercial uses would occur on suitable lands at comparable levels even if the Refuge was not designated.

The analysis shows that there is an enhanced economic effect on jobs and personal income from the increase in one-time expenditures under Alternative 1 to Alternative 4. Alternative 4 would produce almost double the jobs of Alternative 1. The effects of Alternatives 2 and 3 are intermediate between Alternatives 1 and 4.

4.3.3 INDICATOR 2 - EFFECTS FROM REFUGE RECREATION ON REGIONAL ECONOMY

This indicator seeks to answer the question, for each alternative: What economic value is contributed to the regional economy from the existence of the Refuge recreational facilities and programs?

Refuge recreational programs and facilities would vary by alternative. The types and quantities of visitor facilities and programs are expected to influence the number of visitors. Finally, visitation is expected to be affected by demographic changes that are expected to occur over the next fifteen year as Spokane County continues to grow. Estimates of visitation to the Refuge under each alternative and for different recreational categories are presented in Table 4-15. As evident from that table, visitation is estimated to increase under each alternative but increases in more dramatically for Alternative 4 than for the other alternatives, because of the greater emphasis in this alternative for recreational facilities and programs. As a result, Alternative 4 would result in the highest number of jobs and have the highest degree of economic effect. The net effect of recreational spending by Refuge visitors engaged in non-consumptive activities (including wildlife observation, interpretation, hiking, bicycling, and environmental education) on area employment and personal income is displayed in Tables 4-18. The net effect of recreational spending by Refuge hunting visitors (including elk and waterfowl hunting) on area employment and personal income is displayed in Table 4-19.

Two aspects of the recreational activity analysis deserve explanation. First, the analysis includes the visitors to the Refuge who reside in the local area. Section 3.6.2 of the Draft CCP/EA shows that 70-95% of visitors to the Refuge are from Spokane county. If Turnbull NWR did not exist, local residents would possibly take advantage of similar recreational opportunities nearby, such as at Riverside State Park or Mt Spokane State Park. As a result, the expenditures made by these visitors represent spending that may have taken place inside the county regardless of the existence of the Refuge, and thus do not constitute an infusion of funds into the local the economy. Hence, the analysis may overestimate somewhat the contribution of the Refuge to the

Table 4-18. *Estimated Employment and Income Resulting from Non-Consumptive Recreation at Refuge*

	Employment				Personal Income ($)			
Alternative	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
1	54	12	14	80	659,000	304,000	288,000	1,251,000
2	58	13	15	86	710,000	328,000	310,000	1,348,000
3	67	15	17	99	827,000	382,000	361,000	1,570,000
4	75	16	19	110	917,000	423,000	401,000	1,741,000

Notes: Annual non-consumptive recreation expenditures used to estimate employment and personal income are calculated by multiplying annual visitation in non-consumptive categories times a per day expeditures of $87.04. This figure was derived from Tables 25 and 33 in USFWS (2003). Total annual expenditures by non-consumptive visitors were estimated as follows:

Alternative 1: $2,861000
Alternative 2: $3,083,000
Alternative 3: $3,590,000
Alternative 4: $3,980,000

Table 4-19. *Estimated Employment and Income Resulting from Hunting at Refuge*

	Employment				Personal Income ($)			
Alternative	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
1	0	0	0	0	0	0	0	0
2	<1	<1	<1	<1	1,900	900	800	3,600
3	<1	<1	<1	<1	1,900	900	800	3,600
4	1	<1	<1	2	11,900	5,500	5,300	22,700

Notes: 1. Annual hunting expenditures used to estimate employment and personal income were calculated by multiplying annual elk and waterfowl hunting visitation times per day expeditures of $95.02 for elk hunting and $88.06 for waterfowl hunting, respectively. These figures were derived from Tables 12 and 18 in USFWS (2003). Total annual expenditures by hunting visitors were estimated as follows:

Alternative 1: 0
Alternative 2: $7,634
Alternative 3: $7,634
Alternative 4: $47,261

2. The decision to add a youth waterfowl hunt to Alternative 3 was made after the economic analysis was already completed by the contractor. The youth waterfowl hunt was not factored into the analysis. However, we estimate the economic effect of the youth hunt would be relatively minor and the overall impact on jobs and income under Alternative 3 would be somewhat intermediate between Alternative 2 and Alternative 4.

local economy. However, the recreation areas nearby provide a slightly different mix of facilities and programs than the Refuge, and habitat values are not necessarily identical. To the extent that residents would seek a recreational experience very similar to that provided by Turnbull NWR, they may travel outside the county to find it. In this case, the analysis would correctly treat expenditures associated with the Refuge as an infusion of funds because, in the absence of the Refuge, residents would go elsewhere.

The analysis assumes that all visitor purchases associated with the Refuge's recreation programs occur inside Spokane County. This may overestimate the amount of recreational spending attributable to the Refuge, as some visitors may in fact purchase some goods and supplies outside the county. For example, some Refuge visitors live out of state and may purchase items such as binoculars near their homes.

The results show that:

- Under all of the alternatives, non-consumptive recreation has a much greater effect on the county economy than hunting, and can even exceed the results from spending on Refuge operations and maintenance. This activity would account for between $1.25 million and $1.74 million of personal income and between 80 and 110 jobs, from Alternative 1 through Alternative 4. Although persons engaged in nonconsumptive recreational activities spend fewer dollars per visitor day than do hunters, the significantly higher number of visitor days spent on non-consumptive recreation compared to hunting make it a greater contributor to the regional economy. As noted in Section 4.2.1 of the Draft CCP/EA, the estimate of the annual number of non-consumptive recreation days projected for each alternative is somewhat speculative. As a result, the estimates of the regional economic impact of wildlife viewing from Turnbull NWR should be interpreted with this uncertainty in mind.
- Hunting has a very low effect on the economy ; it is projected to account for the addition of no more than two jobs and $22,700 of personal income under Alternative 4, and less than one job and only $3,600 in personal income under Alternative 2. Alternative 3 would have an intermediate effect, and there would be zero effect under Alternative 1. Unlike non-consumptive recreation, the estimates of the annual number of hunting days relatively easy to estimate; thus, the calculations of the regional economic impact of hunting at Turnbull NWR are probably fairly on the mark (see Table 4-19). By its nature, hunting (especially free-roam big game hunting) requires space. Only six to ten elk hunters can likely be accommodated safely on the Refuge at one time. Thus the actual numbers of persons who may hunt the Refuge is quite small compared to the estimates of non-consumptive visitors.

4.3.4 INDICATOR 3 - EFFECTS FROM LAND CONSERVATION ON REGIONAL ECONOMY

This indicator seeks to answer the question, for each alternative: What is the loss of jobs and income from commercial activities on private lands that might occur as the Refuge implements land conservation actions?

Land conservation or protection tools include, under all alternatives, voluntary measures taken by landowners and partners to protect and restore habitats within the Stewardship Area. This analysis does not take into account any economic changes stemming from any of the voluntary actions that might be undertaken. Alternatives 3 and 4 also include the option of protection, under the NWRS, of up to 12,000 acres, or 25,000 acres, respectively. Lands acquired by the Service could result in changed land use and thus a potential loss of commercial value. This analysis considers the economic effect from that.

The analysis assumes that all lands purchased by the Service would be either agricultural or

forest lands. Agricultural production on lands adjacent to and within the vicinity of Turnbull NWR include livestock production, hay production, and grain crops. Approximately 98% of the agricultural land within the Study Area is used for livestock grazing and the remaining 2% is planted to grain crops. Of the total agricultural lands, approximately 12% are also used for hay production. Table 4-20 show the estimated economic changes in employment and personal income resulting from transfer of a portion of these lands into public ownership and the subsequent cessation of these agricultural activities.

Alternatives 1 and 2 do not include provisions for changing the Approved Refuge Boundary but the analysis still includes the economic effect of Refuge acquisition of approximately 2,000 acres of inholdings for both alternatives over the life of the CCP. Alternatives 3 and 4 are based on an assumption that 6,800 and 9,000 acres, respectively, would be acquired by the Refuge over the next fifteen years. The analysis further assumes that all land that the Refuge acquires would have stayed in the same land uses as they are currently in and would not have been in alternative land uses (i.e. would not have been developed for housing).

Lands with timber harvest currently occurring (typically second-growth thinnings) may be acquired, however, the effects from change in land ownership into the public sector would be likely negligible. The reason is that the Refuge will continue to thin forests on Refuge-owned lands to meet the objectives of the Habitat Management Plan. In the event forest lands were to be purchased by the Service, timber production from these lands would likely continue at current levels, over the life of the CCP. Thus, no change in forest-product related employment or personal income is expected under any of the alternatives.

4.3.5 INDICATOR 4 - EFFECTS FROM LAND CONSERVATION ON LOCAL TAX REVENUE

This indicator seeks to answer the question, for each alternative: What changes in local tax revenue would be expected as a result of land transfers from private ownership into the Refuge system?

In the event that the Refuge acquires additional lands now under private ownership, property taxes would no longer be assessed to those lands. The Refuge would instead pay an annual payment known as "in-lieu-of taxes" payment, or Refuge Revenue Sharing. The net effect to the County tax base can be analyzed by comparing the two effects.

Table 4-20. *Estimated Change in Total Employment and Income Over Next Fifteen Years Resulting from a Reduction in Agricultural Production on Acquired Lands*

	Employment				Personal Income ($)			
Alternative	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
1	-5	-1	0	-6	-20,500	-11,200	-9,850	-41,550
2	-5	-1	0	-6	-20,500	-11,200	-9,850	-41,550
3	-18	-2	-2	-22	-69,800	-38,000	-33,500	-141,300
4	-23	-2	-2	-27	-92,300	-50,300	-44,300	-186,900

Notes: The reduction in agricultural production values used to estimate changes in employment and personal income are:

Alternative 1: $159,700
Alternative 2: $159,700
Alternative 3: $543,100
Alternative 4: $718,800

Potential Loss in Tax Revenue

Table 4-21 shows the expected changes in County property tax revenues and timber excise taxes expected under each of the alternatives.

Refuge Revenue Sharing

The Refuge Revenue Sharing Act of 1935, as amended, provides that the Service make annual Refuge Revenue Sharing payment (RRS - also known as Federal In-Lieu of Property Tax Payments) to counties or the lowest unit of government that collects and distributes property taxes. Payments are based on whichever of the following calculations results in the largest amount:

- $0.75 per Refuge acre;
- 25 percent of the net receipts collected from Refuge lands in the county; or
- Three-quarters of one percent of the appraised property value of the Refuge.

Table 4-22 shows the estimated annual RRS payment under each method, by alternative. The third method yields the highest RRS payment. However, historically the Service has paid only a portion of the annual total RRS payment, generally between 66 and 94 percent of the estimated total.

4.3.6 INDICATOR 5 - CONSUMER SURPLUS EFFECTS

The final indicator used to assess the economic impact of the different alternatives focuses on a concept known as "consumer surplus." Consumer surplus represents the amount an individual would be willing to pay for a good or service over and above the asking price. Individuals are often able to enjoy recreational activities at a price that is less than the amount they would be willing to pay. Thus, the consumer surplus measure captures the added benefit consumers gain beyond that reflected in the dollar value of goods and services purchased in the process of participating in these activities. Economists have developed a variety of methodologies to estimate surplus values associated with various recreational activities as well as environmental services.

The non-consumptive recreation daily value was derived from the USFWS National Survey (September 2003) Table 7. "Wildlife Watching Net Economic Values Per Day: 2001" for Washington. The value applied to estimate consumer surplus is $50/day. The wildlife

Table 4-21. *Estimated Change in Property Taxes and Timber Excise Tax Revenues*

Alternative	Land Acquired over 15 years (acres)	Change in County Tax Revenue ($)	Change in Timber Excise Tax ($)	Total ($)
1	2000	(8,400)	-159	(8,559)
2	2000	(8,400)	-159	(8,559)
3	6800	(28,560)	-531	(29,091)
4	9000	(37,800)	-715	(38,515)

Sources: Timber excise tax: Washington Department of Revene 2003.
Average per acre property tax revenue: Wentz pers. Comm.

Assumptions:
1. Assessment of loss of property tax revenues assumed only agricultural land would be purchased to expand Turnbull NWR.
2. Annual per acre property tax revenue is $4.20. Change in property tax revenue was calculated assuming that all lands were acquired simultaneously instead of over the duration of the plan.

Table 4-22. *Estimated Federal In-Lieu of Property Tax Payments*

	Method 1: $.75/Refuge Acre		Method 2: 25% of Receipts Collected from TNWR Lands		Method 3: $.0075 of Appraised Value		
Alternative	Total Acres	Total payment ($)	Annual Receipts ($)	Total payment ($)	Total Acres	Estimated Appraised Value ($)	Estimated Payment ($)
1	17,656	13,242	1,563	391	17,656	4,774,182	35,806
2	17,656	13,242	1,663	416	17,656	4,774,182	35,806
3	22,456	16,842	3,435	859	22,456	6,072,102	45,541
4	24,656	18,492	4,619	1,155	24,656	6,666,982	50,002

Notes Estimated assessed property value within the TNWR study area is $270.4/acre.

watching economic value was used as a proxy for all non-consumptive recreation because all non-consumptive recreation was treated as the same type of activity (in terms of trip expenditures) in Indicator 2 of the analysis. In addition, the USFWS did not report an estimated value for other types of non-consumptive recreation in the National Survey.

The elk hunting daily value was derived from the USFWS National Survey (September 2003) Table 2. "Elk Hunting Economic Values Per Day: 2001". The value applied to estimate consumer surplus is $76/day. Although Table 2 does not report a value for Washington, it does report a value for Oregon. The Oregon value was used as a proxy for Washington. The daily value was applied to annual elk hunting days to calculate the annual elk hunting consumer surplus for each alternative.

The waterfowl hunting daily value was based on values reported by Cooper and Loomis (1991). The value applied to estimate consumer surplus is $74/day. (Surprisingly, the National Survey did not report a value for waterfowl hunting.) The daily value was applied to annual waterfowl hunting days to calculate the annual waterfowl hunting consumer surplus for each alternative. (Note: Alternative 3 was changed after this analysis was done and does not fully reflect this value.)

Consumer surplus values for the many environmental services provided by Turnbull NWR, such as bald eagle habitat or water filtering (to take two examples), are not explicitly considered in this analysis.

The estimates of per-day expenditures used in Indicator 2 are not directly comparable to the dollar figures used to estimate the surplus value of Turnbull NWR recreation under Indicator 5. Whereas surplus value is a measure of a consumer's willingness to pay for an activity over and above current expenditures on that activity, the estimates used in Indicator 2 reflect the actual expenditures made by recreators. The two analyses serve different purposes. Whereas the analysis of the surplus value reflects the net societal value of the recreational experience itself, the regional economic model estimates the contribution of recreation to the regional economy.

Table 4-23 displays the consumer surplus value for each alternative.

4.3.7 SUMMARY COMPARISON

Table 4-24 summarizes the economic effects that would result from implementation of the alternatives. This table includes the losses in jobs and personal income as a result of the loss in agricultural production, offset by the expected increases in jobs and personal income

associated with increased refuge expenditures and increased visitation to the Refuge. It integrates the analysis under Indicators 1, 2, and 3.

Under all alternatives, there would be a net positive effect to the economy of Spokane County. The largest number of jobs and largest increase in personal income would be realized through implementation of Alternative 4, and the smallest number of jobs and personal income from Alternative 1. Alternatives 2 and 3 would have intermediate effects.

Approximately 324,000 persons were employed in Spokane County in 2000 (US CENSUS). Although each alternative would result in a net increase in the number of jobs in the county, this increase would not be significant for the county economy as a whole, with less than a 1% increase in jobs for any of the alternatives considered.

The total personal income in Spokane County in 2000 was approximately $10.7 billion. Similarly to the net increase in jobs, each alternative would result in a net increase in personal income to the County. Again, this increase represents less than a 1% increase under any alternative and thus is not significant to the county economy as a whole.

Table 4-23. *Estimated Annual Recreation Benefits (Consumer Surplus) at Refuge*

	Non-Consumptive Recreation			Elk Hunting			Waterfowl Hunting			
Alternative	Visitor Days	$/Day	Total	Visitor Days	$/Day	Total	Visitor Days	$/Day	Total	**Total**
1	32,875	50	1,643,750	0	76	-	0		-	1,643,750
2	35,425	50	1,771,250	80	76	6,080	0		-	1,777,330
3	41,250	50	2,062,500	80	76	6,080	0		-	2,068,580
4	45,725	50	2,286,250	80	76	6,080	450	74	33,300	2,325,630

Sources:

Non-consumptive recreation value/day: USFWS 2003
Elk hunting value/day: USFWS 2003
Waterfowl hunting value/day: Cooper and Loomis 1991

Table 4.24. *Summary of Effects to Employment and Personal Income, by CCP Alternative.*

	Employment				**Personal Income ($)**			
Alternative	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
1	112	20	33	165	1,771,500	525,800	730,150	3,027,450
2	125	23	36	182	1,909,400	556,700	765,950	3,232,050
3	152	29	46	225	2,543,100	738,900	874,300	4,156,300
4	165	32	52	248	2,832,600	779,200	1,125,000	4,736,800

4.4 EFFECTS TO CULTURAL RESOURCES

4.4.1 INDICATOR 1 - EFFECTS TO ARCHAEOLOGICAL AND HISTORICAL SITES

Effects from land protection actions

Acquisition of land by a Federal agency is not considered an undertaking with the potential to affect historic properties under the National Historic Preservation Act (NHPA), therefore acquiring additional lands within the current Refuge boundary and expanding the Refuge boundary are not considered effects to cultural resources. Off Refuge stewardship projects that use federal funding, permitting, or licensing are covered by NHPA. These projects are required to have a cultural resource professional determine the project's potential to affect cultural resources, and if needed, appropriate actions to mitigate effects. Alternatives 2, 3, and 4 would have a greater potential to affect cultural resources off the Refuge due to the larger size of the Stewardship Area for these alternatives compared to Alternative 1. Whether these impacts are positive or negative depends on many factors including the presence or absence of cultural resources on a particular property. Where cultural resources are present, ground disturbing actions, such as deepening a wetland, could have negative impacts. However, maintaining existing habitat conditions for native wildlife, instead of developing a site, would in most cases be positive for cultural resources. In general, the larger Stewardship Area is likely to be more beneficial to cultural resources.

Effects from Elk Management Actions (Not including hunting)

There are no anticipated impacts to cultural resources from potential elk management actions.

Effects from Public Use Actions

Construction, maintenance, and use of public facilities can have negative impacts to archaeological and historical sites. There are known cultural resource sites as well as unsurveyed areas along proposed new public use routes and facilities. Care in final siting of these facilities will be needed to minimize impacts.

Cultural resource protection procedures, which are required by NHPA for each project at the site specific level, are designed to reduce impacts from human activities. The potential to impact cultural resources and the workload for a cultural resource professional to implement cultural resource protection procedures would be greatest for Alternative 4 and decrease for the other alternatives to Alternative 1 which has the smallest size and quantity of new projects.

Vandalism or "pot" hunting is always a threat to cultural resources especially in areas open to the public. Under Alternative 1, the risk of vandalism to cultural sites would increase proportionate to an expected increase in use of the Refuge. For the other alternatives this would also be true on Refuge lands, with an additional increased use risk associated with more facilities (trails, pullouts, photo blinds, etc) and public use opportunities (biking, hiking, environmental education, hunting, etc.). Alternative 4 would have the greatest risk of vandalism to cultural resources on Refuge lands because it proposes the greatest quantity of public use facilities and activities. Alternative 3 would have only slightly less risk than Alternative 4; Alternative 2 would be intermediate; and Alternative 1 would have the least risk relative to the other alternatives. However, risk to cultural resources that may be currently unprotected within the Study Area could be lower under Alternatives 3 and 4, as there would be a much higher likelihood under these alternatives that lands would be permanently protected from development.

4.4.2 INDICATOR 2 - OPPORTUNITIES FOR CULTURAL RESOURCE EDUCATION AND INTERPRETATION

Promoting an understanding of human prehistory, history, and associated interactions with the natural world is an important part of the Service's cultural resource programs. Expansion of the Refuge boundary in Alternatives 3 and 4 increases the opportunity to purchase, and therefore interpret, known cultural resource sites as well as any as yet undiscovered sites within this area. Under Alternative 1, cultural resource education is already a component of the current environmental education program on the Refuge. Increasing the environmental education program in all of the action alternatives would provide many additional opportunities and a larger audience for cultural resource education. A few of these opportunities are: interpretation along the Columbia Plateau Trail of the historic Spokane, Portland & Seattle (SP&S) railroad and its role in development of the West, educational pamphlets focused on reducing cultural resource vandalism, and using actual Refuge artifacts to help create replica kits for a teachers lending library. As a whole, opportunities for cultural resource education and interpretation would be greatest with Alternative 4 and decrease for the other alternatives in numeric order to Alternative 1.

4.5 MISCELLANEOUS EFFECTS

It is expected that the existing road system on the Refuge will accommodate the current and anticipated use for the foreseeable future. However, if in the future the road system can no longer handle the increased use, road projects such as widening and adding turnouts, parking, and facilities, may be developed to address these needs.

4.6 CUMULATIVE EFFECTS

This section addresses the potential cumulative effects for all of the alternatives and is intended to consider the activities proposed under the CCP within the context of other actions on a larger temporal and spatial scale. In addition, this section considers the inter-related effects from the alternative actions on biological integrity, environmental health, and biological diversity. Under NWRSIA, The National Wildlife Refuge System is clearly mandated to maintain the first three attributes for the benefit for present and future Americans. In addition, NWRSIA mandates that Refuges shall facilitate opportunities for compatible wildlife-dependent recreation.

There is a clear trend in Spokane County of increasing development and associated habitat loss. Additional residential and commercial development could occur over the next fifteen years within the Study Area and at higher levels within the Refuge vicinity, especially to the northeast of Refuge lands. Regional and State trends also show an increase in public desire for outdoor recreation in all types of recreation potentially supportable at the refuge, except for hunting.

Alternative 1

The Refuge would continue to undertake wildlife habitat improvement projects on its lands and would work, with limited resources, to promote conservation within a smaller Stewardship Area surrounding the Refuge. Public uses would continue to grow at current rates but few additional improvements in facilities would be undertaken to support this use. Hunting, one of the priority public uses of the Refuge System, would not occur. With limited resources to affect actions within the Study Area, additional development surrounding the Refuge would occur at the current pace. This would increase fragmentation of existing habitats, further isolating the Refuge and diminishing its biological integrity and environmental health (particularly with relation to water quality and

quantity). Biological diversity (the number of species present on the Refuge) would likely remain unchanged over fifteen years, though invasive species could become more prevalent within the vicinity and additional protection for rare species would be low. Public opportunities for wildlife-dependent recreation would remain at similar levels, though the quality of the experience could decline over time.

Alternative 2

The Refuge would continue to undertake wildlife habitat improvement projects on its lands and would work, with greater resources than under Alternative 1, to promote conservation within the larger Stewardship Area designated under this Alternative. A moderate increase in public facilities and trails would support the growth trends in visitation for all wildlife-dependent uses. Elk hunting, a new Refuge use and a priority public use under the National Wildlife Refuge System, would occur. With additional resources to affect actions within the Study Area, additional development surrounding the Refuge would occur but at a slower pace than under Alternative 1. Fragmentation would continue to occur. Overall, Refuge biological integrity and environmental health would continue to decline, though more slowly than under Alternative 1. Biological diversity (the number of species present on the Refuge) would likely remain unchanged over fifteen years, though invasive species could become more prevalent within the vicinity and additional protection for rare species would be moderate. Public opportunities for wildlife-dependent recreation would increase and the quality of the experience would remain relatively stable.

Alternative 3

The Refuge would continue to undertake wildlife habitat improvement projects on its lands and would work, with greater resources than under Alternative 1, to promote conservation within the larger Stewardship Area designated under this Alternative. The capacity to add up to 12,000 additional acres to the Refuge by fee or conservation easement would increase the effectiveness of habitat protection and restoration. A larger increase in public facilities and trails would support the growth trends in visitation for all wildlife-dependent uses and potentially attract new visitors above growth rates. Elk hunting and youth waterfowl hunting, both new Refuge uses and priority public uses under NWRSIA, would occur. With additional resources to affect actions within the Study Area, the biological integrity of the Refuge would stabilize or increase. Environmental health on the Refuge and within the vicinity would improve. Biological diversity (the number of species present on the Refuge) would likely remain unchanged over fifteen years, and invasive species could decline within the vicinity. Additional protection and restoration for rare species would occur. Public opportunities for wildlife-dependent recreation would increase, including for elk and waterfowl hunting. Some impact to Refuge wetlands would occur from the increase in public uses, but the impact to other habitats would be less than under Alternative 1.

Alternative 4

The Refuge would continue to undertake wildlife habitat improvement projects on its lands and would work, with greater resources than under Alternative 1, to promote conservation within the larger Stewardship Area designated under this Alternative. The capacity to add up to 25,000 additional acres to the Refuge by fee or conservation easement would greatly increase the effectiveness of habitat protection and restoration. A large increase in public facilities and trails would support the growth trends in visitation for all wildlife-dependent uses and likely attract new visitors above growth rates. Elk hunting and waterfowl hunting, both new Refuge uses and priority public uses under NWRSIA, would occur. With additional resources to affect actions within the Study Area, the biological integrity of the Refuge would increase. Environmental health on the Refuge and within the vicinity would improve. Biological diversity (the number of

species present on the Refuge) would likely remain unchanged over fifteen years, and invasive species could decline within the vicinity. Much enhanced protection and restoration for rare species would occur. Public opportunities for wildlife-dependent recreation would increase, including for elk and waterfowl hunting. Some impact to Refuge wetlands would occur from the increase in public uses, but the impact to other habitats would be less than under Alternative 1.

APPENDIX A: LAND PROTECTION PLAN

LAND PROTECTION PLAN

Turnbull National Wildlife Refuge
Comprehensive Conservation Plan
Spokane County, Washington

June, 2005

Approved by:

_____ _____

Regional Director Date
U.S. Fish and Wildlife Service

Concurrence:

_____ _____

Director Date
U.S. Fish and Wildlife Service

1. INTRODUCTION

The Turnbull National Wildlife Refuge Habitat Management Plan (USDI 1999) and the Refuge's Draft Turnbull Comprehensive Conservation Plan/Environmental Assessment (CCP/EA) identify the need to protect certain lands surrounding the Turnbull National Wildlife Refuge. The CCP/EA evaluates different alternative strategies for land protection, and considers the environmental consequences of each alternative, including taking no action.

This Land Protection Plan briefly describes the biological resources, threats, goals / objectives, and the protection methods being considered for the area under the Draft CCP/EA preferred alternative (Alternative 3). More detailed information is available in the Draft CCP/EA, especially Chapters 2 and 3. In tables and maps, the Land Protection Plan also displays parcels within the proposed Stewardship Area and each parcel's priority for protection. The extent of the land protection strategies enacted will be contingent on availability of funds.

The area studied for land protection in the Draft CCP/EA encompasses part of a globally unique geological area known as the Channeled Scablands. Its diverse landscape resulted from several massive Ice Age flood events that scoured potholes, sloughs, and deep canyons out of the pre-existing lava plains. An extensive complex of deep permanent sloughs, semi-permanent potholes and seasonal wetlands formed in the depressions left in the scoured landscape, while uplands were left with little to none of the original 400-foot deep loess soils that had been present before the floods. Today, soils only centimeters thick on upland sites support primarily ponderosa pine intermixed with grasslands (steppe) and exposed basalt cliffs. Aspen is scattered throughout the area. The juxtaposition of all these contrasting habitats in such close proximity is a distinctive marker of the Channeled Scablands and creates conditions of exceptional wildlife and plant diversity.

Due to the unusual topography and soil conditions rendered by the floods, Turnbull and its surrounding habitats in the Study Area comprise a unique assemblage of habitats in a semi-arid and fragile landscape. The Service is compelled to pursue protecting the integrity of the Channeled Scablands before habitat loss, fragmentation, and isolation compromise its habitat values.

Protection and conservation of lands as envisioned under this Land Protection Plan would provide an opportunity to protect, restore and enhance wetland, aspen/riparian, Palouse steppe, and ponderosa pine habitats; assist in the recovery of federally listed species, including water howellia (*Howellia aquatilis*); and preserve the rich biological diversity of a region that has been largely converted to agricultural or urban uses.

The current Approved Refuge Boundary[1] for the Turnbull National Wildlife Refuge measures 20,827 acres. Within the Approved Boundary 15,656 acres have been acquired in fee by the Service and an additional 2,156 acres are under lease or agreement.

[1] A project boundary which the Director of the U.S. Fish and Wildlife Service approves upon completion of the planning and environmental compliance process. An approved refuge boundary only designates those lands which the Fish and Wildlife Service has authority to acquire and/or manage through various agreements.

2. THREATS TO AND STATUS OF THE RESOURCE

A full and complete description of the resources contained within the Study Area and threats to these resources as well as existing Refuge land can be found in Chapter 3, Sections 3.1-3.3 of the Draft CCP/EA. To summarize very briefly here, the integrity of the Channeled Scablands habitats and the species depending on these habitats is threatened by encroaching urban development, excessive groundwater withdrawals, forest overharvest, intensive agricultural development, and ranching practices. The need for protection stems from the following reasons:

1) Refuge purposes could be threatened if action is not taken to protect sources of Refuge water. Groundwater is especially critical to support migratory waterbird breeding at Refuge wetlands but both shallow and deep aquifers are being increasingly tapped for residential and urban development.

2) Widespread land conversion to agricultural and residential uses in the surrounding area has threatened the connectivity of the Refuge to other native habitats, undermining biological integrity.

3) The Channeled Scablands, of which the Refuge is a piece, is an area of regional and national conservation importance. Crossing several counties in eastern and central Washington state, the Scablands contains densities of wetland basins rivaling the Prairie Pothole region, and at intact sites, waterfowl production exceeds that of the Potholes region. Yet most of the larger wetland basins have been drained and very little of the original Channeled Scablands area is under any kind of public ownership or protected in any other fashion.

4) The area is identified as an important site in the Partners In Flight Columbia Plateau plan, the Nature Conservancy's Columbia Plateau Ecoregion Plan, the Draft Intermountain West Waterbird Conservation Plan, and the Draft Recovery Plan for Water Howellia. In addition, the Refuge itself is currently designated an Important Bird Area by the Audubon Society.

5) A broadbased common vision and collective drive for conservation work of this kind is very much alive in this area, as evidenced by the partnership activity already well underway in the Channeled Scablands area. The Refuge is a partner to an ongoing effort by fourteen public and private organizations to protect and restore wetlands and riparian areas within the Channeled Scablands. Two million dollars in federal North American Wetland Conservation Act (NAWCA) grants were recently awarded to this project, and partners have put up a total of nearly ten million dollars in matching and in-kind funds.

6) The Channeled Scablands also host the majority of the last remnants of the Palouse steppe vegetation community which is recognized nationally as a critically endangered ecosystem (Noss et.al. 1995) and was furthermore identified as the top Conservation Priority by the State GAP analysis (Cassidy et al, 1996).

3. PROPOSED ACTION AND GOALS / OBJECTIVES

The Land Protection Plan encompasses a set of strategies to protect certain valuable habitats and resources within the Channeled Scablands geological formation. This action is being proposed to protect the water quality and quantity for the wildlife and habitat at the established Refuge; to protect a critically endangered ecosystem (Palouse steppe); to provide opportunities to restore numerous wetland basins to aquatic conditions; to provide further protection for intact wetlands, ponderosa pine, and aspen communities; and to provide further protection for species in decline over widespread areas of the Interior Columbia Basin.

The Service proposes to establish a Stewardship Area surrounding the Refuge, which would measure approximately 44,536 acres. This area includes the 5,171 acres within the current Approved Refuge Boundary not acquired in fee. The Stewardship Area would function as an informally designated conservation zone surrounding the Refuge. Within the Stewardship Area, the Service would actively work with partners and neighbors for voluntary, cooperative activities that protect habitat and water resources. Key tools include but are not limited to: conservation easements, enrollment in the Wetlands Reserve Program, and technical assistance programs. Another innovative measure that could be used is installing casing on deep wells (which would prevent water from the shallow aquifer from cascading down to the deep aquifer). Easements on wells could also be obtained to limit or prevent groundwater withdrawals.

In addition, the Service would seek to protect, as part of the National Wildlife Refuge System, up to 12,000 acres of priority lands from willing sellers within the Stewardship Area, through fee, easement or agreement. These 12,000 acres would be in addition to the 5,171 acres of inholdings located inside the current Approved Refuge Boundary. Based on the percentages of habitat types estimated in the Study Area, this would equate to protection under the Refuge System of approximately 2,156 acres of wetlands; 3,637 acres of steppe; 6,092 acres of ponderosa pine; and 115 acres of aspen / riparian.

The Service would work in partnership with others, adding to efforts already underway. Two NAWCA grants were awarded recently in the amount of nearly two million dollars for protection and restoration of wetland and riparian habitats in Spokane, Lincoln, and Adams Counties in Washington State. These first two grants fund Phases 1 and 2 of a five-phase project plan for the Intermountain West Joint Venture Channeled Scablands Focus Area (CSFA). Fourteen public and private organizations provided matching and in-kind funds in the amount of $3.2 million (Phase 2) and $6.2 million (Phase 1) The organizations include: Ducks Unlimited, Spokane County Parks and Recreation Dept., Spokane County Conservation District, U.S. Bureau of Land Management, U.S. Natural Resources Conservation Service, The Nature Conservancy, Avista Corporation, U.S. Farm Services Agency, Washington Dept. of Fish and Wildlife, Inland Northwest Wildlife Council, Inland Northwest Land Trust, Friends of Turnbull National Wildlife Refuge, and Spokane Audubon Society. Numerous private landowners are also partners in the project. The goals of Phase 1 and Phase 2 of the project are to acquire, restore, and enhance over 15,000 acres of wetland, riparian, and adjacent upland habitat within the area covered by the CSFA Implementation Plan.

Implementing the Land Protection Plan would contribute to the fulfillment of seven of the eight refuge goals and numerous objectives (the objectives are not listed here but are detailed in Chapter 2 of the Draft CCP/EA).

Goal 1: Contribute to protection of local watersheds so as to maintain adequate water quality and quantity for native refuge wetland species.

Goal 2: Provide habitat conditions essential to the conservation of birds and other wildlife within a variety of wetland complexes.

Goal 3: Restore Refuge aspen and ponderosa forest to a natural distribution of stand structural and successional stages to benefit forest dependent wildlife.

Goal 4: Protect and restore the natural distribution and diversity of grassland and shrub steppe habitats to benefit wildlife.

Goal 5: Support the conservation of threatened and endangered species in their natural ecosystems.

Goal 6: Support the maintenance of biologically effective landscape linkages and corridors between the Refuge and other intact areas of vegetation zones representative of this ecoregion.

Goal 7: Foster appreciation and support of the Refuge and the Channeled Scablands ecosystem through quality environmental education, interpretation, wildlife-dependent recreation, and outreach compatible with the Refuge purposes and mission.

If the proposed Land Protection Plan is approved together with the Draft CCP/EA, the Service would have the authority to enter into purchase agreements, conservation easements, and cooperative agreements with interested landowners within the boundaries of the Stewardship Area. Lands acquired by the Service would be managed as part of the National Wildlife Refuge System under the National Wildlife Refuge System Administration Act of 1966, as amended.

4. HABITAT PROTECTION METHODS

Service policy is to adopt habitat protection measures and strategies that involve acquiring the minimum possible interest or rights in lands and waters and still meet the defined resource objectives. It is also Service policy to acquire land from willing sellers and to enter into cooperative agreements with interested participants. Any landowner within the Stewardship Area who has no interest in selling his or her property would be under no obligation to sell to the Service. The Service is required by law to offer fair-market value for all land purchases. The value is based on a professional appraisal completed in accordance with the Uniform Standards for Federal Land Acquisitions. Appraisal values are based on the highest and best use of the property which considers current zoning and market conditions. Federal funds to acquire these lands would become available primarily through appropriations from Migratory Bird Conservation Fund or possibly annual appropriations by Congress from the Land and Water Conservation Fund.

Under the Uniform Relocation Assistance and Real Property Acquisition Policies Act, Federal agencies provide benefits to persons whose residences or businesses are displaced. Such benefits may include reimbursement of reasonable moving and related expenses; replacement housing payments; and reimbursement of certain necessary and reasonable expenses incurred in selling real property to the Federal government.

Although the Service would consider a wide variety of protection methods available (e,g. fee title, easement, lease, agreement, permit, license) to achieve land protection goals, the Service anticipates the following methods would be the preferred techniques for this project.

4.1 Fee Title Acquisition or Lease

The Service acquires land by fee title from willing sellers, assembling tracts into a manageable unit. Fee title is used when (1) the land's fish, wildlife, and plant resources require permanent protection which is not otherwise available; (2) the land is needed for development associated with a priority wildlife-dependent public use; or (3) a pending land use could otherwise harm wildlife or their habitats. Fee title may be acquired by purchase, donation, exchange, or transfer.

4.2 Conservation Easements

With a conservation easement, the landowner permanently sells or donates some, but not all, property rights to the Service as specified by mutual agreement. An easement could cover only a portion of the property or limit certain uses of the property.

4.3 Cooperative Agreements and Memorandums of Understanding

The Service can enter into cooperative agreements with landowners to improve wildlife and habitat management. Cooperative agreements may specify shared responsibilities or a transfer of funds from the Service to another entity or vice-versa for management purposes. The Service can also enter into Memorandums of Understanding with landowners for the Service to oversee certain aspects of resource management on lands the Service does not own.

5. LAND PROTECTION PRIORITIES

Each of the resource factors described in section 5.1 was mapped for the Study Area (see Chapter 3) and overlaid with the taxlot (parcels) map provided by Spokane County. Resource factors (if present) and associated weights were assigned to each taxlot. A total Resource Sum Value score was assigned based on the sum of the weighted resource values.

Taxlots with total scores of 18 or above or in the groundwater buffer zone were grouped into the first order priority group if they also measured at least 35 acres (size of tax lot was incorporated into the priority ranking because larger tax lots can contribute more towards connectivity and resource values). Second order priorities included those taxlots with scores 18 and above or in the ground water zone and measuring over 20 but less than 35 acres. Also included in the second order priority grouping were taxlots not in the groundwater buffer zone but with scores between 8 and 17 and measuring at least 20 acres but less than 35 acres. Third order priority taxlots included everything not in the high or medium groups.

Map 14 displays the Stewardship Area with each parcel colored by its priority grouping. Map 15 (overview map and additional sheets) shows locations of individual taxlots in the Stewardship Area in more detail (each taxlot is labeled with the Service tract number).

Table A.1 lists the parcels within the proposed Refuge expansion boundary. Each parcel is identified by the Service's tract number (several separate parcels owned by one landowner are generally given the same tract number), County APN Number (Assessor's Parcel Number or PID_ from the county database), the Service's unique numerical identifier (FWSNUM), landowner name, acres (as calculated under GIS), the resource factors present on that parcel, total score based on a sum of the weighted resource factors present, and Service priority for protection.

5.1 Resource Factors Considered in Prioritization

- Groundwater influence zone - ½ mile buffer to south and west of Refuge; 1 mile buffer to north and east - critical for maintaining wetland area and depth on Refuge especially during summer months and drought years *(See map 9 in Chapter 3)*
- Surface watersheds - critical for maintaining wetland area, depth, and water quality on Refuge *(See map 7 in Chapter 3)*
- Priority intact (undrained) wetlands and most likely restorable drained wetlands (those that straddle 2 ownerships or less) - significant migratory waterfowl habitat; also provides potential habitat for bald eagles, and threatened species *Howellia* and *Spiranthes* (*See map 8 in Chapter 3)*
- High quality Palouse steppe habitat - highest conservation priority under State GAP analysis; also provides potential habitat for threatened species *Silene*, several PIF focal species, and several Region 1 species of management concern *(See map 11 in Chapter 3)*
- High quality ponderosa pine - habitat for several Partners In Flight focal species; state candidate species; also provides connectivity to additional forest habitat to the northeast *(See map 12 in Chapter 3)*
- Potential for adding recreational opportunities to the Refuge, especially where hunting opportunities appear viable.

6. SOCIAL AND ECONOMIC IMPACTS

Enacting various land protection strategies could alter spending, land uses, and recreational opportunities within the area. See Chapter 4 of the EA for more analysis of the social and economic impacts of land protection together with other actions undertaken in the Draft CCP/EA.

7. COORDINATION

The Service encouraged input from landowners, other individuals in the community, conservation organizations, and Federal, Tribal, State, and local governments to identify concerns and issues and to explore alternative Refuge expansion boundaries. See Appendix K of the CCP/EA for the summary of public involvement that occurred during development of the CCP and the Refuge land protection proposal.

In addition, the Service has been integrally involved in the Channeled Scablands Focus Area partnership as described under section 3.

Insert Map 14

Insert Map 15 (Index sheet plus all attachments- total of 8 sheets from page A-11 through A-18).

Print back to back like regular text because these are black and white maps). Chapter to resume on page A-18. I did not include all the blank pages in the pdf file. Just two of the eight and adjusted page numbering where text resumes.

Table A-1. ***Land Protection Priorities***

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
FIRST ORDER PRIORITY PARCELS														
ADVANTA USA, INC.	4	22222.9004	FWS772	39.6	1st order	20	Y				Y			
ADVANTA USA, INC.	5	22222.9006	FWS775	38.8	1st order	10	Y							
ALLEMAND, D M & KILGORE	9	22045.9026	FWS580	81.4	1st order	18		Y		Y	Y			
AMES, ANNA L	13	13262.9011	FWS307	39.0	1st order	18		Y		Y	Y			
ANDERSON, C E	18	12165.9002	FWS671	221.1	1st order	27	Y				Y		Y	Y
ANDERSON, C E	19	12093.9005	FWS635	157.4	1st order	23	Y			Y	Y			
ANDERSON, C E	20	12165.9002	FWS670	71.2	1st order	20	Y				Y			
ANDERSON, C E	21	12084.9005	FWS633	42.9	1st order	23	Y			Y	Y			
ANDERSON, STEVEN C & DAWN R	31	22104.9002	FWS638	159.0	1st order	27	Y	Y			Y		Y	
BABB, JOHN M & ELIZABETH A	35	22315.9001	FWS863	339.0	1st order	20					Y	Y	Y	Y
BEAL, GARY C & FRANCIS J	50	13262.9010	FWS278	38.7	1st order	20		Y			Y			Y
BELL, PEYTON A & MARC A	54	12265.9004	FWS819	472.1	1st order	28			Y	Y	Y	Y	Y	Y
BELL, PEYTON A & MARC A	55	12255.9002	FWS821	408.3	1st order	25			Y		Y	Y	Y	Y
BELL, PEYTON A & MARC A	56	12271.9001	FWS818	160.5	1st order	20				Y	Y		Y	Y
BELL, PEYTON A & MARC A	57	12355.9001	FWS859	156.7	1st order	23				Y	Y	Y	Y	Y

FIELD DEFINITIONS:

Service Tract Number - a Service assigned number. Often many or all of a landowner's separate taxlots will be given the same tract number.
County APN Number - Number assigned by Spokane County to separate taxlots. Drawn from the PID_ field in the parcels database obtained from Spokane County in September, 2002.
FWSNum - A Service assigned unique identifier for the different taxlots in this area.
GIS Acres - Acres of taxlot as calculated by a Geographic Information Systems. Not necessarily the same as the recorded acreage.
Protection Priority - Priority for action under the Turnbull CCP Land Protection Plan. 1st order indicates the highest degree of importance for protection, 2nd order indicates a lesser degree of importance for protection, etc.
Resource Sum Value - A "score" or value associated with each taxlot based on the presence of the resources of interest as described in Section 5.1.
GWAT - If Y value, parcel falls within the groundwater influence zone. Each Y value in GWAT was assigned weight of 10 points.
WSHED - If Y value, parcel falls within the surface watersheds draining into the Refuge. Each Y value in WSHED was assigned weight of 5 points.
WETS1 - If Y value, parcel contains a drained wetland that does not cross into any other ownerships. Each Y value in WETS1 was assigned weight of 5 points.
WETS2 - If Y value, parcel contains a drained wetland that does crosses into only one other ownership. Each Y value in WETS2 was assigned weight of 3 points
STEPPE - If Y value, parcel contains high quality steppe habitat. Each Y value in STEPPE was assigned weight of 10 points.
FOR - If Y value, parcel falls contains high quality ponderosa pine habitat. Each Y value in FOR was assigned weight of 3 points.
HUNTOPP - If Y value, parcel is located in an area where hunting opportunities could potentially be provided. Each Y value in HUNTOPP was assigned weight of 2 points.
INTACT - If Y value, parcel contains a high value intact wetland. Each Y value in INTACT was assigned weight of 5 points

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
BELL, PEYTON A & MARC A	58	12251.9001	FWS822	148.0	1st order	20					Y	Y	Y	Y
BELL, PEYTON A & MARC A	59	12243.9010	FWS785	144.0	1st order	33		Y	Y	Y	Y	Y	Y	Y
BELL, PEYTON A & MARC A	61	12355.9005	FWS871	122.2	1st order	20					Y	Y	Y	Y
BELL, PEYTON A & MARC A	62	12354.9008	FWS885	114.3	1st order	20					Y	Y	Y	Y
BELL, PEYTON A & MARC A	63	12265.9005	FWS820	86.2	1st order	25			Y		Y	Y	Y	Y
BELL, PEYTON A & MARC A	64	12244.9006	FWS786	80.6	1st order	20					Y	Y	Y	Y
BELL, PEYTON A & MARC A	65	12265.9003	FWS846	73.6	1st order	23				Y	Y	Y	Y	Y
BELL, PEYTON A & MARC A	67	12355.9001	FWS860	39.4	1st order	20					Y	Y	Y	Y
BLEEKER, CAROLYN	83	12051.9004	FWS528	40.5	1st order	18		Y		Y	Y			
BRASH, GUY E	86	22142.9005	FWS684	41.2	1st order	27	Y	Y			Y		Y	
BRASH, GUY EUGENE	88	23343.9010	FWS461	71.9	1st order	23	Y	Y	Y			Y		
BRASH, GUY EUGENE	89	22113.9010	FWS653	40.2	1st order	27	Y	Y			Y		Y	
BRASH, RICK & BRENT	91	23346.9012	FWS413	250.7	1st order	23	Y	Y	Y			Y		
BRASH, RICK & BRENT	92	23346.9012	FWS412	202.2	1st order	28	Y	Y	Y			Y		Y
BRASH, RICK & BRENT	93	22113.9011	FWS654	40.4	1st order	20	Y	Y				Y	Y	
BRASH, RICK & BRENT	94	23346.9012	FWS482	35.5	1st order	18	Y	Y				Y		
BRASH, RICK & BRET	96	22142.9008	FWS714	80.9	1st order	27	Y	Y			Y		Y	
BRASH, RICK & BRET	97	22142.9007	FWS689	40.2	1st order	20	Y	Y				Y	Y	
BUOB, E D & J L	106	12230.9001	FWS763	644.4	1st order	40	Y	Y	Y	Y	Y		Y	Y
BUOB, ELMER D	108	12242.9003	FWS764	90.9	1st order	38	Y	Y	Y	Y	Y	Y	Y	
CAMP, LESTER C	113	22154.9005	FWS741	81.8	1st order	25	Y	Y			Y			
CAMP, LESTER C	114	22154.9006	FWS740	79.5	1st order	20	Y				Y			
CHENEY	122	23186.9035	FWS45	265.3	1st order	18	Y					Y		Y
CHRISINGER, SHARON	127	12074.9009	FWS631	40.4	1st order	18			Y		Y	Y		
CORDILL, NELSON A	152	12175.9010	FWS668	447.1	1st order	35	Y		Y		Y	Y	Y	Y
CORDILL, NELSON A	153	12204.9006	FWS778	157.5	1st order	20	Y					Y	Y	Y
CORDILL, NELSON A	154	12201.9001	FWS754	119.6	1st order	23	Y			Y		Y	Y	Y
CORDILL, NELSON A	156	12175.9010	FWS744	36.8	1st order	25	Y				Y	Y	Y	
CURTIS, CHRIS & MICHAEL/GAMON	178	23094.9004	FWS29	153.7	1st order	18		Y	Y			Y		Y
DONEL BELSBY FARMING & RANCHING CORP	232	12343.9006	FWS897	47.5	1st order	18					Y	Y		Y
DONEL BELSBY FARMING & RANCHING CORP	233	12344.9010	FWS901	40.1	1st order	18					Y	Y		Y

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
DOW TESTAMENTARY TRUST, WALLACE F	241	12054.9012	FWS539	35.9	1st order	38	Y	Y	Y	Y	Y	Y	Y	
DOW, ALVIN A	242	13276.9076	FWS244-1	84.2	1st order	23	Y	Y	Y	Y				
DOW, ALVIN A	243	13276.9076	FWS282	59.4	1st order	33	Y	Y	Y	Y	Y			
DOW, WALLACE	274	12085.9002	FWS599	81.7	1st order	23	Y				Y	Y		
DOW, WALLACE & LUELLA	276	12054.9021	FWS540	79.7	1st order	36	Y	Y	Y	Y	Y	Y		
EMTMAN, J & D	289	13245.9040	FWS169	39.5	1st order	10	Y							
EMTMAN, J R	292	23195.9040	FWS90	553.5	1st order	25	Y	Y	Y					Y
EMTMAN, J R	293	23305.9012	FWS259	469.1	1st order	40	Y	Y	Y	Y	Y		Y	Y
EMTMAN, J R	294	13245.9028	FWS110	109.0	1st order	15	Y		Y					
EMTMAN, RUSSELL	299	13251.9002	FWS256	40.1	1st order	20	Y				Y			
FIRGROVE INV INC	305	23175.9005	FWS53	227.6	1st order	28	Y	Y	Y			Y		Y
FORD ETAL, DONALD	310	12085.9004	FWS622	243.6	1st order	26			Y	Y	Y	Y		Y
FORD ETAL, DONALD	311	12081.9001	FWS600	122.2	1st order	28	Y		Y		Y	Y		
FORD ETAL, DONALD	312	12084.9007	FWS632	78.7	1st order	23	Y			Y	Y			
GESCHKE, F H	319	13295.9010	FWS316	189.6	1st order	28	Y	Y			Y	Y		
GESCHKE, F H	320	13285.9008	FWS302	145.2	1st order	25	Y	Y			Y			
GESCHLE, G L	321	13325.9013	FWS393	150.3	1st order	18		Y			Y	Y		
GILMOUR, ERNEST H	322	23273.9015	FWS340	42.7	1st order	15	Y	Y						
GROGAN FAMILY REV LIVING TRUST	347	22034.9007	FWS551	161.6	1st order	33	Y	Y	Y		Y	Y		
GROGAN FAMILY REV LIVING TRUST	348	22031.9001	FWS510	81.8	1st order	18	Y	Y				Y		
GROGAN FAMILY REV LIVING TRUST	349	23344.9005	FWS474	43.8	1st order	18	Y	Y				Y		
GROGAN FAMILY REV LIVING TRUST	352	23344.9005	FWS478	35.6	1st order	18	Y	Y				Y		
GROGAN LAND COMPANY LLC	360	22200.9008	FWS768	651.0	1st order	35	Y	Y	Y		Y			Y
GROGAN LAND COMPANY LLC	361	22300.9004	FWS823	650.2	1st order	20					Y	Y	Y	Y
GROGAN LAND COMPANY LLC	362	22195.9001	FWS767	329.9	1st order	38	Y	Y		Y	Y	Y	Y	Y
GROGAN LAND COMPANY LLC	363	22195.9002	FWS788	329.0	1st order	30	Y				Y	Y	Y	Y
GROGAN LAND COMPANY LLC	364	22295.9003	FWS824	241.6	1st order	32	Y		Y		Y		Y	Y
GROGAN LAND COMPANY LLC	365	22073.9002	FWS636	178.7	1st order	20		Y			Y			Y
GROGAN LAND COMPANY LLC	366	22074.9003	FWS637	159.8	1st order	20		Y			Y			Y
GROGAN LAND COMPANY LLC	368	22182.9002	FWS678	80.8	1st order	20		Y			Y			Y
GROGAN LAND COMPANY LLC	369	12244.9005	FWS787	80.7	1st order	20					Y	Y	Y	Y

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
GROGAN LAND COMPANY LLC	371	22183.9004	FWS733	63.6	1st order	35	Y	Y			Y	Y	Y	Y
GROGAN RLT, WILLIAM J	379	12353.9006	FWS884	81.3	1st order	18					Y	Y		Y
GROGAN RLT, WILLIAM J	380	12352.9004	FWS869	40.5	1st order	18					Y	Y		Y
GROGAN, MICHAEL J	382	22183.9005	FWS731	51.1	1st order	20		Y			Y			Y
GROGAN, MICHAEL J	383	22183.9005	FWS746	40.5	1st order	75	Y	Y			Y	Y	Y	Y
GROGAN, RONALD	384	22182.9008	FWS677-2	48.4	1st order	20		Y			Y			Y
GROGAN-FERRANTE, RENEA	385	22182.9007	FWS677-1	49.0	1st order	20		Y			Y			Y
HAMPTON, ROBERT J	391	23295.9012	FWS243	224.9	1st order	35	Y	Y			Y	Y	Y	Y
HAMPTON, ROBERT J	392	23205.9019	FWS129-1	210.4	1st order	28	Y	Y			Y	Y		
HAMPTON, ROBERT J	393	23295.9012	FWS209	65.7	1st order	23	Y	Y				Y		Y
HAMPTON, ROBERT J	394	23203.9014	FWS157	34.4	1st order	18	Y	Y				Y		
HARRINGTON, VERN D	400	23335.9006	FWS405	368.5	1st order	23	Y	Y				Y		Y
HARRINGTON, VERN D	401	23335.9006	FWS467	35.8	1st order	20	Y	Y						Y
HELM, ROGER J & LAUREL	410	13295.9021	FWS329	133.8	1st order	18		Y			Y	Y		
HICKS, BARRY C & GAIL F	417	12272.9006	FWS817	140.4	1st order	18			Y	Y		Y	Y	Y
HOERNER, BEVERLY A	424	22045.9030	FWS525-1	99.8	1st order	28	Y	Y		Y	Y	Y		Y
INLAND NORTHWEST LAND TRUST	432	23186.9060	FWS48-1	112.2	1st order	18	Y					Y		Y
INLAND NORTHWEST LAND TRUST	433	23186.9060	FWS55-1	45.4	1st order	10	Y							
JOLLY JACK RANCH, L.L.C.	468	22090.9001	FWS615	641.8	1st order	28		Y	Y	Y	Y			Y
JOLLY JACK RANCH, L.L.C.	469	22105.9004	FWS616	249.4	1st order	20		Y	Y		Y			
JOLLY JACK RANCH, L.L.C.	470	22105.9004	FWS617	212.1	1st order	30	Y	Y	Y		Y			
JOLLY JACK RANCH, L.L.C.	471	22152.9015	FWS686	161.0	1st order	25	Y	Y			Y	Y		
JOLLY JACK RANCH, L.L.C.	472	22033.9006	FWS550	159.5	1st order	33	Y	Y	Y		Y	Y		
JORDAN REVOCABLE LIVING TRUST	483	12241.9001	FWS766	161.2	1st order	43	Y	Y	Y	Y	Y	Y	Y	Y
JORDAN REVOCABLE LIVING TRUST	484	12242.9008	FWS774	40.5	1st order	38	Y	Y	Y	Y	Y	Y	Y	
KIVER, EUGENE P	508	23273.9014	FWS381	42.8	1st order	20	Y	Y	Y					
LABISH FAMILY LIVING TRUST	515	12225.9004	FWS783	293.1	1st order	23				Y	Y	Y	Y	Y
LABISH FAMILY LIVING TRUST	516	12215.9002	FWS755	238.0	1st order	33	Y			Y	Y	Y	Y	Y
LABISH FAMILY LIVING TRUST	517	12221.9001	FWS762	161.3	1st order	30	Y		Y	Y	Y		Y	

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LABISH FAMILY LIVING TRUST	518	13233.9042	FWS140	89.5	1st order	20		Y	Y		Y			
LABISH FAMILY TRUST	524	23212.9002	FWS70	159.2	1st order	21	Y	Y		Y		Y		
LABISH FAMILY TRUST	526	23164.9004	FWS51	66.2	1st order	18		Y	Y			Y		Y
LABISH, JIM	530	23205.9008	FWS74	26.4	1st order	13	Y					Y		
LABISH, JOE	531	23205.9009	FWS73	246.3	1st order	23	Y	Y	Y			Y		
MAGER, JOHN & BONNIE	550	13272.9077	FWS317	39.6	1st order	18	Y	Y		Y				
MANSFIELD, TERRY M & KRISTIN G	553	12213.9003	FWS779	158.5	1st order	20	Y		Y	Y			Y	
MCKINLAY LIVING TRUST, WARREN & ANNA	565	22015.9016	FWS556-1	136.7	1st order	30	Y	Y			Y	Y	Y	
MCKINLAY, ANNIE/DAELLENBACH	566	22012.9018	FWS522-1	55.7	1st order	30	Y	Y			Y	Y	Y	
MCKINLAY, JACK/WILLSON	567	22016.9017	FWS255-1	44.6	1st order	30	Y	Y			Y	Y	Y	
MCKINLAY, W C	570	22014.9002	FWS559-1	301.9	1st order	30	Y	Y			Y	Y	Y	
MEADOW CONSERVATION	577	22122.9013	FWS621-2	100.4	1st order	30	Y	Y			Y	Y	Y	
MOORE ETAL, MARGARET	586	22213.9003	FWS790	160.0	1st order	25	Y				Y			Y
MOORE ETAL, MARGARET	587	22211.9001	FWS770	159.5	1st order	30	Y	Y			Y			Y
MOORE ETAL, MARGARET	588	22212.9002	FWS769	159.0	1st order	30	Y	Y			Y			Y
MOORE ETAL, MARGARET	591	22291.9001	FWS825	80.6	1st order	25	Y				Y			Y
PEGAU LIVING TRUST	626	23285.9005	FWS335	246.8	1st order	20	Y	Y	Y					
PEGAU LIVING TRUST	627	23281.9009	FWS300	71.0	1st order	23	Y	Y	Y			Y		
PENCE ETAL, R H	629	12053.9017	FWS541	121.8	1st order	21			Y	Y	Y	Y		
PHILEO DUCK & CC	634	22111.9001	FWS620	163.5	1st order	30	Y	Y			Y	Y	Y	
PHILLEO DUCK &	635	22114.9004	FWS640	107.2	1st order	30	Y	Y			Y	Y	Y	
PHILLIPS, JOHN W	636	22042.9006	FWS504	80.6	1st order	20		Y			Y			Y
PHILLIPS, JOHN W & DELPHINE	639	22045.9007	FWS531	80.2	1st order	38	Y	Y	Y		Y	Y		Y
POINDEXTER, CLAY H & MELINDA J	644	12222.9002	FWS758	161.6	1st order	35	Y		Y	Y	Y		Y	Y
POINDEXTER, CLAY H & MELINDA J	645	12211.9001	FWS759	80.1	1st order	30	Y		Y	Y	Y		Y	

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
POOL LIV TRUST, FJ/POOL LIV TRUST	647	13335.9016	FWS400	486.5	1st order	43	Y	Y	Y	Y	Y	Y	Y	Y
POOL LIV TRUST, FJ/POOL LIV TRUST	648	12045.9013	FWS486	485.9	1st order	40	Y	Y	Y		Y	Y	Y	Y
POOL LIV TRUST, FJ/POOL LIV TRUST	649	12055.9016	FWS485	71.7	1st order	35	Y	Y	Y	Y	Y		Y	
PORTER, PETER S	654	22045.9028	FWS549-1	45.5	1st order	28	Y	Y		Y	Y			
POTTER, R B	655	23275.9037	FWS217	162.0	1st order	18	Y	Y				Y		
RIETZ, GILMOUR A	682	12092.9004	FWS604	97.5	1st order	23		Y	Y	Y	Y			
ROCKY PINE RANCH LLC	685	23215.9003	FWS127	316.9	1st order	23	Y	Y				Y		Y
ROCKY PINE RANCH LLC	686	23285.9012	FWS289	125.8	1st order	31	Y	Y	Y	Y		Y		Y
ROCKY PINE RANCH LLC	687	23285.9012	FWS210	85.4	1st order	26	Y	Y		Y		Y		Y
ROCKY PINE RANCH LLC	688	23281.9013	FWS212-1	44.2	1st order	23	Y	Y				Y		Y
ROUSE TRUST, ROMYNE E	693	23344.9004	FWS463	83.2	1st order	18	Y	Y				Y		
SCOTT, MILLIE	704	13324.9010	FWS466	51.2	1st order	22		Y	Y		Y		Y	
SHOWALTER CORP	708	02130.9001	FWS660	643.7	1st order	18			Y	Y		Y	Y	Y
SMITH, BERT	717	23324.9006	FWS460	69.4	1st order	20	Y	Y						Y
STELZER, D W	733	23355.9003	FWS415	308.2	1st order	18	Y	Y				Y		
STELZER, D W	734	22025.9002	FWS511	221.6	1st order	33	Y	Y	Y		Y	Y		
STELZER, D W	735	22032.9005	FWS517	80.0	1st order	21	Y	Y		Y		Y		
STELZER, D W	736	22032.9004	FWS521	35.8	1st order	18	Y	Y				Y		
STELZER, DARRELL	741	22031.9002	FWS512	80.3	1st order	18	Y	Y				Y		
STELZER, DARRELL	742	22032.9003	FWS524	35.3	1st order	18	Y	Y				Y		
STRIEFF, RAYMOND	750	02245.9001	FWS749	569.2	1st order	28			Y	Y	Y	Y	Y	Y
STRIEFF, RAYMOND	751	12190.9006	FWS750	323.3	1st order	25			Y		Y	Y	Y	Y
STRIEFF, RAYMOND	757	12205.9007	FWS752	162.5	1st order	25	Y				Y	Y	Y	
STRIEFF, RAYMOND	761	12185.9015	FWS729	66.7	1st order	20			Y		Y	Y	Y	
TEEL DAIRY FARMS, INC	770	13286.9042	FWS280	46.1	1st order	20	Y	Y	Y					
THOMPSON, RODNEY/ENGSTROM	774	22216.9005	FWS791	150.2	1st order	30	Y	Y			Y			Y
THOMPSON, RODNEY/ENGSTROM	775	22222.9005	FWS771	81.4	1st order	20	Y				Y			

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
US DEPARTMENT OF AGRICULTURE	787	22112.9007	FWS619	146.0	1st order	25	Y	Y			Y			
WASH STATE DEPT NATURAL RESC	804	12365.9001	FWS861	507.9	1st order	25			Y		Y	Y	Y	Y
WASH STATE DEPT NATURAL RESC	805	23165.9001	FWS39	154.1	1st order	18		Y	Y			Y		Y
WILCOX, FRED & EDNA	828	13283.9012	FWS377	77.9	1st order	25	Y	Y			Y			
WILCOX, FRED & EDNA	829	13332.9017	FWS394	40.3	1st order	25	Y	Y			Y			
YOUNG, PRISCILLA M	843	23343.9014	FWS462	57.9	1st order	18	Y	Y				Y		
SECOND ORDER PRIORITY PARCELS														
AMES, ANNA LOUISE	14	13262.9005	FWS308	34.8	2nd order	15		Y			Y			
ANDERSON, C E	22	12084.9005	FWS84	30.2	2nd order	10	Y							
ANDERSON, C E	23	12092.9003	FWS685	25.8	2nd order	27	Y	Y			Y		Y	
ARTHUR, LYNN L	34	23321.9008	FWS404	22.3	2nd order	18	Y	Y				Y		
BABB, JOHN M & ELIZABETH A	36	22325.9005	FWS894	84.1	2nd order	10					Y			
BABB, JOHN M & ELIZABETH A	37	22313.9002	FWS889	30.2	2nd order	13					Y	Y		
BABB, JOHN M & ELIZABETH A	38	22322.9003	FWS874	27.5	2nd order	10					Y			
BARRATT, SHANNON A & BRENDA A	44	22025.9041	FWS573	24.0	2nd order	28	Y	Y			Y	Y		
BEAL, GARY C & FRANCIS J	51	13262.9009	FWS251	36.2	2nd order	15		Y			Y			
BELL, PEYTON A & MARC A	66	12354.9008	FWS886	45.3	2nd order	15					Y	Y	Y	
BIRCH, NANCY J/WOODGER	74	12074.9012	FWS570	20.4	2nd order	20	Y	Y				Y	Y	
BIRCH, NANCY J/WOODGER	75	12074.9011	FWS645	20.2	2nd order	13					Y	Y		
BLEEKER, CAROLYN	84	12051.9020	FWS395	21.0	2nd order	28	Y	Y		Y	Y			
CCRH, LLC	116	23154.9003	FWS50	152.0	2nd order	8		Y				Y		
CCRH, LLC	117	23221.9035	FWS105	60.6	2nd order	8		Y				Y		
CCRH, LLC	118	23221.9013	FWS93	20.3	2nd order	8		Y				Y		
CHENEY	34	23186.9035	FWS404	25.6	2nd order	18	Y	Y				Y		
CORDER, CRAIG P & JUDITH A	131	12181.9030	FWS663-1	39.4	2nd order	17			Y		Y		Y	

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CORDER, CRAIG P & JUDITH A	132	12181.9031	FWS664-1	38.7	2nd order	18			Y		Y	Y		
CORDER, CRAIG P & JUDITH A	133	12172.9028	FWS691-1	33.2	2nd order	18	Y	Y			Y	Y		
CORDER, CRAIG P & JUDITH A	134	12181.9019	FWS702	22.5	2nd order	17			Y		Y		Y	
CORDILL, N A & R	151	12302.9004	FWS803	123.8	2nd order	17					Y		Y	Y
CORDILL, NELSON A	159	12201.9001	FWS78	25.4	2nd order	10	Y							
CURTIS, CHRIS & MICHAEL/GAMON	177	23093.9003	FWS26	156.4	2nd order	16		Y		Y		Y		Y
DAHL LIVING TRUST, GARY & JENNIFER	179	12283.9003	FWS841	160.4	2nd order	10				Y			Y	Y
DAVIS, SCOTT P & DONNA	186	23252.9008	FWS266	33.3	2nd order	8		Y				Y		
DONEL BELSBY FARMING & RANCHING CORP	234	12343.9005	FWS481	26.3	2nd order	18	Y	Y				Y		
DOUGLAS, JAMES T & LINDA L	238	23233.9040	FWS149	118.2	2nd order	11		Y		Y		Y		
DOW, ALVIN A	244	13325.9031	FWS432	44.5	2nd order	15		Y			Y			
DOW, ALVIN A	245	13325.9010	FWS429	43.1	2nd order	15		Y			Y			
DOW, ALVIN A	246	13336.9019	FWS87	34.9	2nd order	10	Y							
DOW, ALVIN A	247	13325.9038	FWS440-3	32.3	2nd order	23		Y	Y	Y	Y			
DOW, ALVIN A	248	13332.9021	FWS753	30.7	2nd order	15	Y					Y	Y	
DOW, ALVIN A	249	13276.9076	FWS656	23.7	2nd order	18			Y		Y	Y		
DOW, WALLACE	275	12052.9009	FWS502	75.1	2nd order	13				Y	Y			
DOW, WALLACE & LUELLA J	277	12056.9022	FWS590	23.0	2nd order	25	Y			Y	Y		Y	
EMTMAN, J & D	290	13252.9005	FWS255	28.8	2nd order	10	Y							
FICERE TRUST, VERNA E	303	11015.9003	FWS906	98.3	2nd order	10						Y	Y	Y
FIRGROVE INV INC	304	23175.9001	FWS38	239.3	2nd order	13			Y			Y		Y
FIRGROVE INV INC	306	23083.9004	FWS31	158.2	2nd order	13			Y			Y		Y
FRANZ, H DARYL	315	12065.9004	FWS538	102.4	2nd order	13					Y	Y		
GILMOUR, ERNEST H	323	23275.9047	FWS286	32.5	2nd order	8		Y				Y		
GINSBURG, JOHN A & NATASCHA D	324	23224.9050	FWS132	70.4	2nd order	8		Y				Y		
GREEN, R	334	23264.9028	FWS359	157.4	2nd order	8		Y				Y		

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
GROGAN FAM REV LIVING TRUST	343	12364.9003	FWS887	36.3	2nd order	8						Y		Y
GROGAN FAM REV LIVING TRUST	344	12361.9002	FWS872	28.9	2nd order	8						Y		Y
GROGAN FAMILY REV LIVING TRUST	350	12344.9011	FWS902	40.3	2nd order	8						Y		Y
GROGAN FAMILY REV LIVING TRUST	351	12344.9007	FWS880	38.2	2nd order	8						Y		Y
GROGAN LAND COMPANY LLC	367	22325.9002	FWS864	120.4	2nd order	12					Y		Y	
GROGAN LAND COMPANY LLC	370	22293.9004	FWS851	79.9	2nd order	12					Y		Y	
GROGAN LAND COMPANY LLC	373	22294.9006	FWS852	40.3	2nd order	15					Y			Y
HAMPTON, JASON& PHYLLIS	389	23291.9011	FWS270	20.0	2nd order	23	Y	Y				Y		Y
HARDEE, THOMAS V & TERESA J	277	12056.9023	FWS590	20.7	2nd order	25	Y			Y	Y		Y	
HEYER, DARCY	415	12074.9008	FWS630	40.3	2nd order	13					Y	Y		
HEYER, R LARRY	416	12073.9010	FWS628	80.2	2nd order	8			Y			Y		
HOERNER, BEVERLY A	425	22045.9029	FWS525-2	22.8	2nd order	28	Y	Y		Y	Y	Y		
HUMPHREY, CURTIS B	430	23274.9044	FWS354	21.0	2nd order	8		Y				Y		
INL ASPHALT CO	431	23294.9008	FWS498	22.2	2nd order	18		Y		Y	Y			
JOLLY JACK RANCH, L.L.C.	473	22044.9023	FWS587	30.0	2nd order	20		Y	Y		Y			
JOLLY JACK RANCH, L.L.C.	474	22044.9016	FWS583	20.1	2nd order	15		Y			Y			
JORDAN REVOCABLE LIVING TRUST	485	12242.9007	FWS862	25.0	2nd order	20					Y	Y	Y	Y
KELLY LIVING TRUST, CECELIA M	504	23211.9005	FWS65	150.6	2nd order	16		Y		Y		Y		Y
KUONEN, R B & N J	511	23253.9003	FWS365	162.8	2nd order	13		Y	Y			Y		
KUONEN, ROBERT & NANCY	512	23354.9016	FWS470	30.1	2nd order	8		Y				Y		
KUONEN, ROBERT B & NANCY J	514	23365.9012	FWS420	223.1	2nd order	8		Y				Y		
LABISH FAMILY LIVING TRUST	519	12214.9004	FWS780	80.3	2nd order	10			Y	Y			Y	
LABISH FAMILY LIVING TRUST	521	12223.9003	FWS782	26.2	2nd order	10			Y	Y			Y	
LABISH FAMILY TRUST	525	23165.9002	FWS41	156.0	2nd order	13		Y	Y			Y		
LABISH FAMILY TRUST	527	23163.9003	FWS52	65.5	2nd order	13		Y	Y			Y		
LANG, BRUCE Z	532	23223.9009	FWS162	28.8	2nd order	11		Y		Y		Y		
LASSMAN, SHANNON L	533	23203.9015	FWS138-1	24.5	2nd order	23	Y	Y	Y			Y		

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
LUNDGRIN, PAUL A & ESPERANZA O	539	23321.9012	FWS439	21.8	2nd order	15	Y	Y						
MACY, DELTON E & CONNIE J	543	22151.9020	FWS83	22.0	2nd order	10	Y							
MADDUX, GENE G & KELLI J	544	23224.9019	FWS134	40.2	2nd order	8		Y				Y		
MADSEN, DANA C & THERESA M	547	23223.9041	FWS128	73.0	2nd order	13		Y				Y		Y
MALCOLM, JON & INEZ	22	23191.9027	FWS84	25.8	2nd order	10	Y							
MANSFIELD, TERRY M & KRISTIN G	554	12282.9009	FWS813-2	137.2	2nd order	13			Y	Y		Y	Y	
MANSFIELD, TERRY M & KRISTIN G	555	12282.9008	FWS813-1	20.1	2nd order	13			Y	Y		Y	Y	
MAUER, JARED	560	23261.9029	FWS264	45.9	2nd order	8		Y				Y		
MCKINSTRY, DAVID M & DONNA R	571	23271.9041	FWS276	20.5	2nd order	8		Y				Y		
MCMICHAEL, RANDALL L	572	23232.9021	FWS107	38.6	2nd order	8		Y				Y		
MCNARY ETAL, ROBERT J "JIM"	573	12286.9007	FWS815	147.9	2nd order	12			Y				Y	Y
MILL, R L	579	02234.9004	FWS777	164.0	2nd order	10			Y			Y	Y	
MOORE ETAL, MARGARET	589	22294.9005	FWS847	118.2	2nd order	10					Y			
MOORE ETAL, MARGARET	590	22282.9004	FWS828	86.6	2nd order	15					Y			Y
MOORE ETAL, MARGARET	592	22291.9002	FWS832	80.2	2nd order	15					Y			Y
MOORE ETAL, MARGARET	593	22321.9007	FWS865	62.2	2nd order	15					Y			Y
MOORE, MARGARET	597	22282.9012	FWS827	32.2	2nd order	10					Y			
NEWBRY, G B & B L	604	23225.9049	FWS67	109.9	2nd order	13		Y				Y		Y
PARKER, C L	614	23223.9048	FWS131	23.4	2nd order	11		Y		Y		Y		
PARKER, JOHN S & VONICE	617	23274.9018	FWS384	42.3	2nd order	10		Y	Y					
PENCE ETAL, GARY	628	12075.9006	FWS597	277.9	2nd order	11			Y	Y		Y		
PENCE, R H & M K	631	12053.9018	FWS542	40.4	2nd order	16				Y	Y	Y		
PHILLIPS, JOHN W	637	22043.9008	FWS547	40.5	2nd order	15		Y			Y			
PHILLIPS, JOHN W	638	22042.9022	FWS505	22.9	2nd order	15		Y			Y			
PHILLIPS, JOHN W & DELPHINE	640	22041.9001	FWS571	42.1	2nd order	28	Y			Y	Y	Y	Y	
POOL LIV TRUST, FJ/POOL LIV TRUST	650	12092.9002	FWS602	31.4	2nd order	15			Y		Y			

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
QUINN, SUSAN & ROBERT R	667	23273.9042	FWS345	62.9	2nd order	10		Y	Y					
RIPLEY DEVELOPMENT LLC	684	22021.9048	FWS520-4	20.8	2nd order	28	Y	Y			Y	Y		
RUSSE, DAVID L & RICHARD W	697	23252.9031	FWS283	20.2	2nd order	8		Y				Y		
SEIPP, HALEY & ROBERT J	705	23274.9038	FWS350	21.0	2nd order	8		Y				Y		
SHOWALTER CORP	709	02144.9003	FWS724	157.1	2nd order	10			Y			Y	Y	
SHOWALTER CORP	712	02123.9005	FWS646	25.2	2nd order	8				Y		Y	Y	
SPANJER LIVING TRUST	720	23155.9002	FWS46	177.0	2nd order	8		Y				Y		
SPOONER, EUGENE & MARLA A	730	23262.9025	FWS242	166.1	2nd order	13		Y				Y		Y
SPOONER, EUGENE & MARLA ANN	732	23232.9038	FWS71	80.0	2nd order	8		Y				Y		
STELZER, D W	737	23355.9003	FWS310	21.6	2nd order	15	Y	Y						
STRICKLAND, R & S	748	02244.9002	FWS795	80.2	2nd order	17					Y		Y	Y
STRIEFF ETUX, B R	749	02252.9002	FWS805	120.9	2nd order	10						Y	Y	Y
STRIEFF, RAYMOND	752	02235.9005	FWS748	323.2	2nd order	10			Y			Y	Y	
STRIEFF, RAYMOND	753	12190.9006	FWS751	313.3	2nd order	15					Y	Y	Y	
STRIEFF, RAYMOND	754	23095.9005	FWS20	307.0	2nd order	11		Y		Y		Y		
STRIEFF, RAYMOND	755	12185.9015	FWS661	305.8	2nd order	13				Y		Y	Y	Y
STRIEFF, RAYMOND	756	23085.9020	FWS19	290.2	2nd order	13			Y			Y		Y
STRIEFF, RAYMOND	758	23105.9009	FWS23	155.2	2nd order	8		Y				Y		
STRIEFF, RAYMOND	759	23045.9034	FWS12	140.2	2nd order	8		Y				Y		
STRIEFF, RAYMOND	760	02125.9007	FWS629	136.5	2nd order	8				Y		Y	Y	
T & N HEINEMANN LIVING TRUST	768	23341.9001	FWS414	83.0	2nd order	8		Y				Y		
VISSOTZKY, DAVID A & ANDREA J	795	23235.9039	FWS120	81.9	2nd order	11		Y		Y		Y		
WASH STATE DEPT NATURAL RESC	806	23165.9001	FWS43	105.0	2nd order	8		Y				Y		
WASH STATE DEPT NATURAL RESC	807	23364.9007	FWS476	70.7	2nd order	8		Y				Y		
WASH STATE DEPT NATURAL RESC	808	12365.9001	FWS699	24.8	2nd order	25	Y	Y			Y			
WESTERMAN ETUX, W	819	23234.9005	FWS139	165.3	2nd order	11		Y		Y		Y		
WESTERMAN, WILLIAM A & JUDY T	822	23231.9037	FWS75	123.9	2nd order	16		Y	Y	Y		Y		

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
WESTERN STS OP ENG INST OF TNG TRUST	823	23363.9019	FWS472	60.6	2nd order	8		Y				Y		
WICHMAN, LYNN M & MATTHEW R	808	22151.9018	FWS699	21.3	2nd order	25	Y	Y			Y			
WINTERS, STEVEN E & KATHLEEN A	834	23363.9013	FWS471	45.5	2nd order	8		Y				Y		
YOUNG, BRADLEY GUY & SANDRA J	234	23343.9013	FWS481	24.7	2nd order	18	Y	Y				Y		
YOUNG, GORDON O & SHARON L	839	22021.9047	FWS520-3	25.3	2nd order	28	Y	Y			Y	Y		
YOUNG, GORDON O & SHARON L	840	22021.9050	FWS520-2	20.4	2nd order	28	Y	Y			Y	Y		
Unknown	850		FWS835	129.0	2nd order	10						Y	Y	Y
THIRD ORDER PRIORITY PARCELS														
ABRAMOWITZ FERSZT, MIRIAM	1	22025.9020	FWS568	8.7	3rd order	25	Y	Y			Y			
ADKINS, MICHAEL R & DEBRA I	2	23261.9037	FWS296	10.2	3rd order	8		Y				Y		
ADKINS, MICHAEL R & DEBRA I	3	23261.9037	FWS332	5.1	3rd order	5		Y						
ADVANTA USA, INC.	6	22222.9007	FWS789	0.4	3rd order	10	Y							
AG ENTERPRISES SUPPLY, INC	7	13286.9077	FWS222	10.0	3rd order	10	Y							
AG ENTERPRISES SUPPLY, INC	8	13286.9077	FWS207	1.0	3rd order	0								
ALLEMAND, D M & KILGORE	10	22045.9025	FWS593	10.3	3rd order	15		Y			Y			
ALVIS, DARRELL H	11	12184.9014	FWS725	36.4	3rd order	7			Y				Y	
ALVIS, DARRELL H	12	12184.9012	FWS745	15.3	3rd order	10			Y			Y	Y	
AMON,T & W/MURPHY	15	23261.9034	FWS293	12.1	3rd order	5		Y						
AMON,T & W/MURPHY	16	23261.9035	FWS294	11.2	3rd order	5		Y						
ANDERSON, BRIAN W	17	23301.9011	FWS261	19.2	3rd order	18	Y	Y		Y				
ANDERSON, C E	24	12165.9002	FWS742	5.1	3rd order	12					Y		Y	
ANDERSON, C E	25	12084.9005	FWS657	3.6	3rd order	20	Y				Y			
ANDERSON, C E	26	12165.9002	FWS708	2.5	3rd order	10	Y							
ANDERSON, C E	27	12093.9005	FWS634	2.5	3rd order	10	Y							
ANDERSON, C E	28	12093.9005	FWS659	1.3	3rd order	10					Y			

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
ANDERSON, KATHERINE L	29	13224.9016	FWS206	2.1	3rd order	15	Y	Y						
ANDERSON, ROBERT E & LUANN M	30	13291.9013	FWS221	22.6	3rd order	0								
ANDERSON, T J	32	23023.9059	FWS18	4.8	3rd order	3						Y		
ANDERSON, VICTOR A/ANDERSON	33	13291.9018	FWS229	19.8	3rd order	0								
BABB, JOHN M & ELIZABETH A	39	22314.9005	FWS892	17.7	3rd order	10					Y			
BABB, JOHN M & ELIZABETH A	40	22322.9003	FWS873	11.3	3rd order	15					Y			Y
BABB, JOHN M & ELIZABETH A	41	22325.9005	FWS893	3.2	3rd order	10					Y			
BABB, JOHN M & ELIZABETH A	42	22314.9005	FWS891	0.3	3rd order	10					Y			
BARNETT, GEORGE/BOLTE	43	23033.9024	FWS9	6.2	3rd order	3						Y		
BARRATT, SHANNON A & BRENDA A	45	22025.9034	FWS575	18.2	3rd order	28	Y	Y			Y	Y		
BARRATT, SHANNON A & BRENDA A	46	22025.9033	FWS576	15.4	3rd order	25	Y	Y			Y			
BATES, KAREN	47	13286.9039	FWS225	9.5	3rd order	10	Y							
BATES, KAREN	48	13286.9039	FWS198	3.2	3rd order	10	Y							
BAUMGARTNER, DAROL	49	13271.9014	FWS284	3.7	3rd order	15	Y	Y						
BELL, D R	52	12344.9009	FWS890	25.0	3rd order	5								Y
BELL, D R	53	12343.9003	FWS881	9.1	3rd order	5								Y
BELL, PEYTON A & MARC A	60	12274.9008	FWS844	129.2	3rd order	7							Y	Y
BELL, PEYTON A & MARC A	68	12352.9002	FWS855	19.7	3rd order	5								Y
BELL, PEYTON A & MARC A	69	12243.9009	FWS784	13.5	3rd order	17		Y			Y		Y	
BELL, PEYTON A & MARC A	70	12355.9001	FWS858	1.5	3rd order	15					Y			Y
BELL, RONALD & ANTOINETTE	71	23265.9024	FWS352	6.0	3rd order	5		Y						
BENSON, ELLEN TRUSTEE	72	23271.9026	FWS305	14.8	3rd order	8		Y				Y		
BETZ, FRANKLIN	73	12184.9007	FWS726	25.1	3rd order	5			Y					
BIRCH, NANCY J/WOODGER	76	12074.9016	FWS650	10.0	3rd order	15			Y		Y			
BIRCH, NANCY J/WOODGER	77	12074.9015	FWS649	10.0	3rd order	15			Y		Y			
BIRCH, NANCY J/WOODGER	78	12074.9014	FWS648	10.0	3rd order	18			Y		Y	Y		
BIRCH, NANCY J/WOODGER	79	12074.9013	FWS647	9.9	3rd order	18			Y		Y	Y		

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
BITZ, DEAN W & DEBORAH L	80	13214.9027	FWS164	9.2	3rd order	15	Y	Y						
BLACKLEDGE, GARLYN & LYUBOV	81	13286.9032	FWS240	11.2	3rd order	18	Y	Y		Y				
BLACKLEDGE, GARLYN & LYUBOV	82	13286.9032	FWS167	7.7	3rd order	10	Y							
BLEEKER, CAROLYN	85	12051.9005	FWS529	12.6	3rd order	20		Y		Y	Y		Y	
BRASH, GUY E	87	22151.9022	FWS683	19.7	3rd order	27	Y	Y			Y		Y	
BRASH, GUY EUGENE	90	23343.9010	FWS488	8.3	3rd order	18	Y	Y				Y		
BRASH, RICK & BRENT	95	23346.9012	FWS493	1.1	3rd order	18	Y	Y				Y		
BRASH, SHAWN W/SAGERSER	98	22025.9032	FWS579	9.2	3rd order	25	Y	Y			Y			
BRASH, SHAWN W/SAGERSER	99	22025.9029	FWS582	9.2	3rd order	25	Y	Y			Y			
BRASH, SHAWN W/SAGERSER	100	22025.9030	FWS577	8.8	3rd order	25	Y	Y			Y			
BRAY, BOBBY L & ANN R	101	23233.9015	FWS136	2.9	3rd order	8		Y				Y		
BREEDLOVE, JOSEPH & CYNTHIA	102	23294.9010	FWS333	18.8	3rd order	15	Y	Y						
BROOK, RANDY L & APRIL	103	22024.9017	FWS555	10.3	3rd order	25	Y	Y			Y			
BROOK, RANDY L & APRIL	104	22024.9018	FWS564	8.2	3rd order	25	Y	Y			Y			
BULAT, A R & L G	105	23281.9010	FWS298	9.9	3rd order	18	Y	Y				Y		
BUOB, E D & J L	107	12230.9001	FWS799	0.6	3rd order	12					Y		Y	
BURDICK, KELLY R & MICHELLE	109	13214.9026	FWS160	10.8	3rd order	15	Y	Y						
BUSTIN A ADVENTURES, LLC	110	23191.9031	FWS117	3.8	3rd order	10	Y							
C & P PROPERTIES	111	13234.9066	FWS148	10.4	3rd order	10					Y			
CAMP, BERNARD L	112	23033.9025	FWS10	6.9	3rd order	3						Y		
CANWELL, JAMES A	115	12342.9013	FWS856	6.8	3rd order	0								
CCRH, LLC	119	23232.9027	FWS106	2.2	3rd order	8		Y				Y		
CCRH, LLC	120	23232.9008	FWS95	1.9	3rd order	8		Y				Y		
CHARLTON, DERRICK G	121	13275.9031	FWS330	10.0	3rd order	25	Y	Y			Y			
CHENEY	123	23185.0014	FWS44	82.2	3rd order	3						Y		
CHENEY	125	13214.9046	FWS185	1.0	3rd order	10	Y							

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
CHENEY	126	23186.9035	FWS77	1.0	3rd order	10	Y							
CLAYDEN ETUX, D	128	23174.9004	FWS60	4.9	3rd order	3						Y		
COOLEY LIVING TRUST, JAMES O & CONNIE J	129	23224.9039	FWS163	10.0	3rd order	8		Y				Y		
COOLEY LIVING TRUST, JAMES O & CONNIE J	130	23233.9028	FWS694-1	0.0	3rd order	5		Y						
CORDER, CRAIG P & JUDITH A	135	12172.9027	FWS688	18.9	3rd order	10					Y			
CORDER, CRAIG P & JUDITH A	136	12172.9029	FWS507-1	12.9	3rd order	18	Y	Y				Y		
CORDER, CRAIG P & JUDITH A	137	12176.9004	FWS707	12.6	3rd order	0								
CORDER, CRAIG P & JUDITH A	138	12172.9006	FWS697	11.3	3rd order	10					Y			
CORDER, CRAIG P & JUDITH A	139	12172.9005	FWS700	11.0	3rd order	0								
CORDER, CRAIG P & JUDITH A	140	12181.9020	FWS703	10.6	3rd order	0								
CORDER, CRAIG P & JUDITH A	141	12181.9022	FWS705	9.9	3rd order	3						Y		
CORDER, CRAIG P & JUDITH A	142	12181.9021	FWS704	9.6	3rd order	0								
CORDER, CRAIG P & JUDITH A	143	12186.9025	FWS718	8.0	3rd order	5			Y					
CORDER, CRAIG P & JUDITH A	144	12181.9018	FWS701	7.7	3rd order	5				Y			Y	
CORDER, CRAIG P & JUDITH A	145	12186.9024	FWS716	6.3	3rd order	5			Y					
CORDER, CRAIG P & JUDITH A	146	12186.9024	FWS715	5.7	3rd order	5			Y					
CORDER, CRAIG P & JUDITH A	147	12176.9004	FWS706	4.5	3rd order	0								
CORDER, CRAIG P & JUDITH A	148	12186.9025	FWS722	3.0	3rd order	0								
CORDER, CRAIG P & JUDITH A	149	12181.9018	FWS693	1.1	3rd order	2							Y	
CORDILL JR, NELSON & RONDA	150	02251.9001	FWS802	161.3	3rd order	7							Y	Y
CORDILL, NELSON A	155	12205.9003	FWS773	88.9	3rd order	5						Y	Y	
CORDILL, NELSON A	157	12292.9015	FWS811	33.5	3rd order	0								
CORDILL, NELSON A	158	12205.9003	FWS781	25.7	3rd order	0								
CORDILL, NELSON A	160	12175.9010	FWS669	11.7	3rd order	20	Y				Y			
CORDILL, NELSON A	161	12292.9005	FWS831	7.2	3rd order	0								
CORDILL, NELSON A	162	12293.9017	FWS837	4.3	3rd order	0								
CORDILL, NELSON A	163	12292.9015	FWS810	2.5	3rd order	0								

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
CORDILL, NELSON A	164	12204.9006	FWS798	1.3	3rd order	2							Y	
CORDILL, NELSON A	165	12304.9008	FWS836	1.1	3rd order	0								
CORDILL, NELSON A	166	12293.9009	FWS838-1	0.6	3rd order	0								
COWAN, J/FISHER, G	167	23252.9020	FWS312	20.3	3rd order	8		Y				Y		
CREAGER JR, DONALD L & CHRISTINA D	168	23033.9027	FWS14	19.5	3rd order	3						Y		
CROWN FINANCIAL INC.	169	13324.9025	FWS456	7.7	3rd order	15		Y			Y			
CURTIS, BEN F	170	23155.9005	FWS40	239.2	3rd order	3						Y		
CURTIS, BEN F	171	23104.9007	FWS27	85.2	3rd order	3						Y		
CURTIS, BEN F	172	23103.9003	FWS30	75.0	3rd order	3						Y		
CURTIS, BEN F	173	23104.9007	FWS33	63.8	3rd order	3						Y		
CURTIS, BEN F	174	23155.9005	FWS42	31.9	3rd order	3						Y		
CURTIS, BEN F	175	23103.9003	FWS37	2.7	3rd order	3						Y		
CURTIS, CHRIS & MICHAEL/GAMON	176	23105.9001	FWS21	238.1	3rd order	3						Y		
DAHL LIVING TRUST, GARY & JENNIFER	180	12214.9005	FWS797	79.9	3rd order	7			Y				Y	
DAHL LIVING TRUST, GARY & JENNIFER	181	12214.9005	FWS588-1	0.1	3rd order	35	Y		Y	Y	Y		Y	Y
DARE, L	182	23082.9003	FWS24	75.7	3rd order	3						Y		
DARE, L	183	23074.9030	FWS35	40.0	3rd order	3						Y		
DARE, L	184	23074.9027	FWS32	37.0	3rd order	3						Y		
DARE, L	185	23074.9027	FWS34	35.6	3rd order	3						Y		
DAVIS, SCOTT P & DONNA	187	23252.9022	FWS267	10.3	3rd order	8		Y				Y		
DELANEY, WESLEY & MARGARET	188	23245.9015	FWS133	20.4	3rd order	5		Y						
DELANEY, WESLEY & MARGARET	189	23245.9020	FWS123	20.1	3rd order	5		Y						
DELANEY, WESLEY & MARGARET	190	23243.9014	FWS154	15.3	3rd order	5		Y						
DELANEY, WESLEY & MARGARET	191	23243.9008	FWS156	15.2	3rd order	5		Y						
DELANEY, WESLEY & MARGARET	192		FWS79	12.0	3rd order	8		Y				Y		
DELANEY, WESLEY & MARGARET	193	23243.9007	FWS204	10.3	3rd order	8		Y				Y		
DELANEY, WESLEY & MARGARET	194	23243.9012	FWS150	10.3	3rd order	5		Y						

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
DELANEY, WESLEY & MARGARET	195	23242.9018	FWS121	10.3	3rd order	5		Y						
DELANEY, WESLEY & MARGARET	196	23243.9017	FWS143	10.3	3rd order	5		Y						
DELANEY, WESLEY & MARGARET	197	23242.9024	FWS112	10.3	3rd order	5		Y						
DELANEY, WESLEY & MARGARET	198	23242.9025	FWS97	10.3	3rd order	0								
DELANEY, WESLEY & MARGARET	199	23242.9021	FWS116	10.2	3rd order	5		Y						
DELANEY, WESLEY & MARGARET	200	23242.9028	FWS102	10.2	3rd order	0								
DELANEY, WESLEY & MARGARET	201	23242.9029	FWS86	10.2	3rd order	0								
DELANEY, WESLEY & MARGARET	202	23243.9006	FWS202	10.0	3rd order	8		Y				Y		
DELANEY, WESLEY & MARGARET	203	23242.9023	FWS113	10.0	3rd order	5		Y						
DELANEY, WESLEY & MARGARET	204	23242.9026	FWS98	9.8	3rd order	0								
DELANEY, WESLEY & MARGARET	205	23243.9004	FWS199	9.8	3rd order	11		Y		Y		Y		
DELANEY, WESLEY & MARGARET	206	23243.9009	FWS175	9.7	3rd order	5		Y						
DELANEY, WESLEY & MARGARET	207	23242.9027	FWS101	9.7	3rd order	0								
DELANEY, WESLEY & MARGARET	208	23243.9011	FWS173	9.6	3rd order	8		Y		Y				
DELANEY, WESLEY & MARGARET	209	23242.9022	FWS115	9.6	3rd order	5		Y						
DELANEY, WESLEY & MARGARET	210	23243.9005	FWS200	9.5	3rd order	11		Y		Y		Y		
DELANEY, WESLEY & MARGARET	211	23242.9019	FWS122	9.5	3rd order	5		Y						
DELANEY, WESLEY & MARGARET	212	23242.9032	FWS80	9.2	3rd order	0								
DELANEY, WESLEY & MARGARET	213	23242.9030	FWS82	8.9	3rd order	0								
DELANEY, WESLEY & MARGARET	214	23242.9031	FWS88	8.8	3rd order	8		Y		Y				
DELANEY, WESLEY & MARGARET	215	23243.9010	FWS174	8.8	3rd order	8		Y		Y				
DELANEY, WESLEY & MARGARET	216	23243.9016	FWS144	6.8	3rd order	5		Y						
DELANEY, WESLEY & MARGARET	217	23243.9013	FWS151	5.1	3rd order	8		Y		Y				
DELANEY, WESLEY & MARGARET	218	23243.9013	FWS152	3.9	3rd order	5		Y						
DELANEY, WESLEY & MARGARET	219	23243.9016	FWS145	2.5	3rd order	5		Y						
DELANEY, WESLEY & MARGARET	220	23242.9031	FWS81-1	0.3	3rd order	8		Y				Y		

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
DELANEY, WESLEY & MARGARET	221	23243.9010	FWS182	0.2	3rd order	5		Y						
DELANEY, WESLEY & MARGARET	222	23243.9004	FWS263	0.2	3rd order	8		Y				Y		
DELANEY, WESLEY & MARGARET	223	23242.9032	FWS81-2	0.2	3rd order	8		Y				Y		
DELANEY, WESLEY & MARGARET	224	23242.9030	FWS91	0.2	3rd order	0								
DELANEY, WESLEY & MARGARET	225	23242.9019	FWS137	0.1	3rd order	5		Y						
DELANEY, WESLEY & MARGARET	226	23243.9004	FWS687-1	0.1	3rd order	8		Y				Y		
DICKERSON, H A	227	12335.9005	FWS853	432.9	3rd order	7							Y	Y
DICKERSON, H A	228	12275.9007	FWS843	170.4	3rd order	7							Y	Y
DICKERSON, H A	229	12284.9004	FWS842	163.4	3rd order	7							Y	Y
DICKERSON, H A	230	12334.9008	FWS878	75.7	3rd order	5						Y	Y	
DICKERSON, H A	231	12335.9005	FWS877	1.0	3rd order	2							Y	
DONEL BELSBY FARMING & RANCHING CORP	235	12334.9003	FWS904	13.4	3rd order	3						Y		
DOUGLAS, G H	236	23191.9035	FWS100	6.1	3rd order	10	Y							
DOUGLAS, G H	237	23191.9004	FWS108	2.2	3rd order	10	Y							
DOUGLAS, KELLY P & BRIGITTE L	239	23224.9027	FWS178	10.3	3rd order	8		Y				Y		
DOUGLAS, KELLY P & BRIGITTE L	240	23233.9017	FWS179	0.2	3rd order	5		Y						
DOW, ALVIN A	250	13281.9025	FWS318	13.2	3rd order	15	Y	Y						
DOW, ALVIN A	251	13284.9025	FWS374	12.6	3rd order	25	Y	Y			Y			
DOW, ALVIN A	252	13281.9026	FWS327	11.5	3rd order	15	Y	Y						
DOW, ALVIN A	253	13284.9075	FWS363	10.9	3rd order	25	Y	Y			Y			
DOW, ALVIN A	254	13284.9024	FWS336	10.4	3rd order	25	Y	Y			Y			
DOW, ALVIN A	255	13321.9029	FWS431	10.3	3rd order	15		Y			Y			
DOW, ALVIN A	256	13321.9028	FWS430	10.1	3rd order	15		Y			Y			
DOW, ALVIN A	257	13284.9027	FWS338	10.0	3rd order	15	Y	Y						
DOW, ALVIN A	258	13324.9036	FWS440-5	10.0	3rd order	23		Y	Y	Y	Y			
DOW, ALVIN A	259	13275.9032	FWS323	10.0	3rd order	25	Y	Y			Y			
DOW, ALVIN A	260	13284.9026	FWS337	9.7	3rd order	25	Y	Y			Y			

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
DOW, ALVIN A	261	13324.9037	FWS440-4	9.7	3rd order	23		Y	Y	Y	Y			
DOW, ALVIN A	262	13325.9040	FWS440-1	9.6	3rd order	23		Y	Y	Y	Y			
DOW, ALVIN A	263	13324.9050	FWS455-1	9.6	3rd order	15		Y			Y			
DOW, ALVIN A	264	13324.9051	FWS455-2	9.5	3rd order	15		Y			Y			
DOW, ALVIN A	265	13271.9012	FWS275	9.0	3rd order	15	Y	Y						
DOW, ALVIN A	266	13336.9022	FWS454	4.1	3rd order	18		Y		Y	Y			
DOW, ALVIN A	267	13336.9019	FWS389	2.6	3rd order	25	Y	Y			Y			
DOW, ALVIN A	268	13336.9022	FWS453	1.4	3rd order	18		Y		Y	Y			
DOW, ALVIN A	269	13276.9076	FWS215	1.3	3rd order	15	Y	Y						
DOW, ALVIN A	270	13332.9021	FWS434	0.9	3rd order	15		Y			Y			
DOW, ALVIN A	271	13333.9023	FWS465	0.6	3rd order	17		Y			Y		Y	
DOW, BARRY & JANICE ELAINE	272	13325.9039	FWS440-2	9.7	3rd order	23		Y	Y	Y	Y			
DOW, LELAND G	273	13226.9075	FWS241	17.6	3rd order	15	Y	Y						
DOW, WALLACE & LUELLA J	278	12056.9022	FWS572	1.3	3rd order	25	Y				Y	Y	Y	
DRISCOLL, JOHN F & JULIE A	279	23033.9028	FWS13	19.1	3rd order	3						Y		
DRISCOLL, JOHN F & JULIE A	280	23033.9023	FWS8	10.6	3rd order	3						Y		
EAST CHENEY GRNG	281	22042.9004	FWS527	0.9	3rd order	15		Y			Y			
ELDRIDGE, GEORGE L & HEIDI A	282	23271.9018	FWS233	14.6	3rd order	8		Y				Y		
ELLIOTT, RHONDA M	283	23291.9016	FWS322	16.5	3rd order	15	Y	Y						
EMTMAN, FREDA	284	13252.9004	FWS254	3.1	3rd order	0								
EMTMAN, FREDA	285	13243.9012	FWS171	1.2	3rd order	10	Y							
EMTMAN, FREDA	286	13252.9004	FWS271	0.2	3rd order	0								
EMTMAN, FREDA	287	13243.9012	FWS181	0.1	3rd order	0								
EMTMAN, FREDA	288	13252.9004	FWS665-1	0.0	3rd order	20		Y			Y			Y

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
EMTMAN, J & D	291	13252.9005	FWS285	1.5	3rd order	5		Y						
EMTMAN, J R	295	23195.9038	FWS135	9.8	3rd order	13	Y					Y		
EMTMAN, JAMES R & DARLA	296	23191.9039	FWS114	12.8	3rd order	13	Y					Y		
EMTMAN, JAMES R & DARLA M	297	23196.9041	FWS89	8.2	3rd order	10	Y							
EMTMAN, JAMES R & DARLA M	298	23196.9041	FWS72	3.3	3rd order	10	Y							
ENGELSEN LLC	300	22114.9006	FWS655	5.8	3rd order	18	Y	Y				Y		
FARRELL, GARY R	301	13286.9078	FWS223	17.5	3rd order	10	Y							
FARRELL, GARY R	302	13286.9078	FWS201	3.8	3rd order	10	Y							
FIRGROVE INV INC	307	23084.9007	FWS36	16.3	3rd order	8			Y			Y		
FIRGROVE INV INC	308	23175.9005	FWS64	4.2	3rd order	3						Y		
FISK, STEVEN D & JULIE A	309	23271.9024	FWS281	4.3	3rd order	8		Y				Y		
FORD ETAL, DONALD	313	12084.9007	FWS658	1.5	3rd order	20	Y				Y			
FRANK, ALFRED C & AMY L	314	23354.9034	FWS479	17.4	3rd order	5		Y						
FRANZ, LARRY D	316	12051.9003	FWS489	0.1	3rd order	10					Y			
GERDES, BLAKE & JEAN	317	13286.9034	FWS237	7.4	3rd order	15	Y		Y					
GERDES, BLAKE & JEAN	318	13286.9034	FWS176	7.1	3rd order	10	Y							
GINSBURG, JOHN A & NATASCHA D	325	23224.9051	FWS177	8.6	3rd order	8		Y				Y		
GINSBURG, JOHN A & NATASCHA D	326	23224.9051	FWS211	0.6	3rd order	8		Y				Y		
GLEAVE, LARRY & ERIN	327	22021.9044	FWS534	19.9	3rd order	25	Y	Y			Y			
GOODSON, FLORIDA M	328	23271.9034	FWS313	9.8	3rd order	8		Y				Y		
GOODSON, FLORIDA M	329	23271.9033	FWS328	7.3	3rd order	8		Y				Y		
GOODSON, FLORIDA M	330	23271.9033	FWS346	0.2	3rd order	5		Y						
GOODWATER, LEONE C/GOODWATER	331	22025.9008	FWS562	5.6	3rd order	25	Y	Y			Y			
GRAHAM, DONALD C	332	23261.9030	FWS265	15.2	3rd order	8		Y				Y		
GREEN, KELLY	333	23265.9027	FWS334	12.1	3rd order	5		Y						
GREEN, R	335	23263.9018	FWS362	68.0	3rd order	5		Y						

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
GREEN, R	336	23263.9018	FWS361	6.0	3rd order	5		Y						
GREEN-VIETZ REV LV TRUST, K J & B L	337	13286.9037	FWS227	8.8	3rd order	10	Y							
GREEN-VIETZ REV LV TRUST, K J & B L	338	13286.9036	FWS228	8.3	3rd order	10	Y							
GREEN-VIETZ REV LV TRUST, K J & B L	339	13286.9035	FWS236	7.8	3rd order	15	Y		Y					
GREEN-VIETZ REV LV TRUST, K J & B L	340	13286.9035	FWS180	6.3	3rd order	10	Y							
GREEN-VIETZ REV LV TRUST, K J & B L	341	13286.9036	FWS183	5.5	3rd order	10	Y							
GREEN-VIETZ REV LV TRUST, K J & B L	342	13286.9037	FWS186	4.7	3rd order	10	Y							
GROGAN FAM REV LIVING TRUST	345	12364.9003	FWS888	2.9	3rd order	3						Y		
GROGAN FAMILY REV LIVING TRUST	346	12341.9001	FWS854	165.0	3rd order	5								Y
GROGAN FAMILY REV LIVING TRUST	353	12341.9001	FWS868	16.8	3rd order	5								Y
GROGAN FAMILY REV LIVING TRUST	354	12344.9008	FWS896	8.8	3rd order	5								Y
GROGAN FAMILY REV LIVING TRUST	355	12344.9008	FWS882	5.9	3rd order	0								
GROGAN FAMILY REV LIVING TRUST	356	22313.9003	FWS899	2.5	3rd order	8						Y		Y
GROGAN FAMILY REV LIVING TRUST	357	22313.9003	FWS903	1.9	3rd order	3						Y		
GROGAN FAMILY REV LIVING TRUST	358	12344.9007	FWS883	1.2	3rd order	5								Y
GROGAN FAMILY REV LIVINGTRUST	359	11021.9002	FWS907	1.2	3rd order	13					Y	Y		
GROGAN LAND COMPANY LLC	372	22322.9004	FWS875	40.8	3rd order	0								
GROGAN LAND COMPANY LLC	374	22321.9008	FWS876	20.3	3rd order	0								
GROGAN LAND COMPANY LLC	375	22183.9004	FWS732	15.2	3rd order	15		Y			Y			
GROGAN LAND COMPANY LLC	376	12254.9003	FWS849	10.8	3rd order	15					Y	Y	Y	
GROGAN LAND COMPANY LLC	377	22325.9002	FWS870	0.4	3rd order	10					Y			
GROGAN LAND COMPANY LLC	378	22182.9002	FWS730	0.1	3rd order	15		Y			Y			
GROGAN RLT, WILLIAM J	381	12352.9003	FWS866	18.7	3rd order	8						Y		Y
GRUNEWALD, ROY & SARAH	386	22151.9021	FWS698	9.5	3rd order	27	Y	Y			Y		Y	
HAMEL, RAY O	387	23191.9036	FWS85	14.8	3rd order	10	Y							
HAMPTON, DAVID M	388	23203.9016	FWS187-1	13.7	3rd order	28	Y	Y	Y		Y	Y		
HAMPTON, LISA D	390	23203.9018	FWS205-1	13.3	3rd order	28	Y	Y			Y	Y		

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
HAMPTON, ROBERT J	395	23203.9017	FWS573-1	17.1	3rd order	23	Y	Y	Y			Y		
HANRAHAN, CHARLES R & DAN E	396	23033.9019	FWS17	19.2	3rd order	8		Y				Y		
HANRAHAN, CHARLES R & DAN E	397	23033.9018	FWS11	1.3	3rd order	3						Y		
HARDEE, THOMAS V & TERESA J	399	12056.9023	FWS591	2.6	3rd order	22	Y				Y		Y	
HARRIS, JOHN H	402	12291.9012	FWS812	139.6	3rd order	2							Y	
HARRIS, JOHN H	403	12292.9004	FWS830	40.2	3rd order	0								
HARRIS, JOHN H	404	12293.9010	FWS840	1.0	3rd order	0								
HARTMAN JR, WILLIAM & DIANA	405	13286.9029	FWS379	8.4	3rd order	25	Y	Y			Y			
HARTMAN JR, WILLIAM & DIANA	406	13286.9029	FWS397	3.9	3rd order	25	Y	Y			Y			
HARTMAN, WILLIAM AND DIANA	407	13286.9028	FWS396	6.0	3rd order	25	Y	Y			Y			
HARTMAN, WILLIAM AND DIANA	408	13286.9028	FWS387	4.9	3rd order	25	Y	Y			Y			
HELM, ROGER J & LAUREL	409	13292.9007	FWS235	138.1	3rd order	0								
HELM, ROGER J & LAUREL	411	13291.9003	FWS232	48.2	3rd order	0								
HELMS, JERRY S & CHADYNE M	412	12175.9009	FWS692-1	10.0	3rd order	20	Y				Y			
HELSING, DAVID M	413	13234.9064	FWS146	9.5	3rd order	15		Y			Y			
HEYER, DARCY	414	12073.9018	FWS644	62.2	3rd order	5						Y	Y	
HIGASHI FAMILY LIMITED PARTNERSHIP	418	23221.9032	FWS124	10.2	3rd order	8		Y				Y		
HIGASHI FAMILY LIMITED PARTNERSHIP	419	23221.9034	FWS118	10.1	3rd order	8		Y				Y		
HIGASHI FAMILY LIMITED PARTNERSHIP	420	23232.9024	FWS119	0.6	3rd order	8		Y				Y		
HIGASHI FAMILY LIMITED PARTNERSHIP	421	23232.9024	FWS125	0.4	3rd order	8		Y				Y		
HILTON, EARL L	422	23281.9014	FWS214	16.2	3rd order	18	Y					Y		Y
HILTON, JERRY L	423	23282.9011	FWS309	16.0	3rd order	21	Y	Y		Y		Y		
HOLBROOK, TERRY V & ROXANNE	426	23263.9030	FWS370-3	21.3	3rd order	5		Y						
HOOVER, L L & V J	427	13291.9015	FWS230	2.0	3rd order	0								
HUME, D J	428	23145.9013	FWS49	6.9	3rd order	3						Y		
HUMPHREY, CURTIS B	429	23274.9045	FWS383	42.5	3rd order	5		Y						

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
INLAND NORTHWEST LAND TRUST	434	23173.9059	FWS48-2	15.3	3rd order	18	Y					Y		Y
INLAND NORTHWEST LAND TRUST	435	23186.9053	FWS603-2	14.9	3rd order	20	Y				Y			
INLAND NORTHWEST LAND TRUST	436	23176.9057	FWS48-4	10.7	3rd order	18	Y					Y		Y
INLAND NORTHWEST LAND TRUST	437	23202.9055	FWS78-2	10.2	3rd order	10	Y							
INLAND NORTHWEST LAND TRUST	438	23176.9058	FWS48-3	8.3	3rd order	18	Y					Y		Y
INLAND NORTHWEST LAND TRUST	439	23186.9051	FWS55-3	7.6	3rd order	10	Y							
INLAND NORTHWEST LAND TRUST	440	23186.9052	FWS55-4	5.6	3rd order	10	Y							
INLAND NORTHWEST LAND TRUST	441	23186.9052	FWS603-3	4.9	3rd order	20	Y				Y			
INLAND NORTHWEST LAND TRUST	442	23176.9058	FWS78-1	4.0	3rd order	10	Y							
INLAND NORTHWEST LAND TRUST	443	23186.9053	FWS55-5	3.3	3rd order	10	Y							
INLAND NORTHWEST LAND TRUST	444	23186.9051	FWS603-4	2.2	3rd order	20	Y				Y			
INLAND NORTHWEST LAND TRUST	445	23176.9057	FWS78-5	0.2	3rd order	10	Y							
INLAND NORTHWEST LAND TRUST	446	23202.9055	FWS48-7	0.1	3rd order	18	Y					Y		Y
ISABELL,WM P & CYNTHIA	447	13286.9038	FWS226	9.2	3rd order	10	Y							
ISABELL,WM P & CYNTHIA	448	13286.9038	FWS194	4.0	3rd order	10	Y							
JACKSON, MIKE R & CANDYCE L	449	13291.9017	FWS231	5.5	3rd order	0								
JACKSON, PRESTON M	450	23031.9040	FWS2	29.1	3rd order	3						Y		
JACKSON, PRESTON M & GRACE L	451	23034.9008	FWS5	147.6	3rd order	3						Y		
JAMES, MILDRED D	452	23224.9036	FWS189	4.6	3rd order	8		Y				Y		
JAMES, MILDRED D	453	23224.9036	FWS220	0.1	3rd order	8		Y				Y		
JAMISON, GLEN A & BRENDA L	454	13214.9025	FWS159	11.0	3rd order	15	Y	Y						
JANKE, KEITH & HEATHER	455	23275.9046	FWS224	20.4	3rd order	8		Y				Y		
JARMS, RONALD L	456	13322.9014	FWS392	5.1	3rd order	15		Y			Y			
JARMS, RONALD L	457	13322.9012	FWS391	5.0	3rd order	15		Y			Y			
JARMS, W L/ANGELL-SMITH	458	13293.9022	FWS388	10.2	3rd order	15		Y			Y			
JARMS, W L/ANGELL-SMITH	459	13293.9020	FWS390	10.1	3rd order	15		Y			Y			

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
JERNEGAN, MICHAEL F & NATALIA	460	23252.9014	FWS279	10.5	3rd order	8		Y				Y		
JEWEL INVESTMENT CO LLC	461	22025.9031	FWS594	8.5	3rd order	25	Y	Y			Y			
JEWEL INVESTMENT CO LLC	462	22023.9025	FWS595	6.8	3rd order	25	Y	Y			Y			
JEWEL INVESTMENT CO LLC	463	22023.9026	FWS592	5.9	3rd order	25	Y	Y			Y			
JEWEL INVESTMENT CO LLC	464	22023.9024	FWS596	5.9	3rd order	25	Y	Y			Y			
JEWEL INVESTMENT CO LLC	465	22023.9027	FWS589	4.9	3rd order	25	Y	Y			Y			
JEWEL INVESTMENT CO LLC	466	22023.9028	FWS585	4.3	3rd order	25	Y	Y			Y			
JOHNSON, SALLY A	467	23113.9012	FWS28	1.1	3rd order	3						Y		
JOLLY JACK RANCH, L.L.C.	475	22151.9014	FWS713	15.5	3rd order	25	Y	Y			Y			
JOLLY JACK RANCH, L.L.C.	476	22151.9012	FWS719	15.4	3rd order	25	Y	Y			Y			
JOLLY JACK RANCH, L.L.C.	477	22112.9008	FWS618	13.6	3rd order	15		Y			Y			
JOLLY JACK RANCH, L.L.C.	478	22151.9011	FWS711	12.6	3rd order	25	Y	Y			Y			
JOLLY JACK RANCH, L.L.C.	479	22151.9013	FWS712	11.4	3rd order	25	Y	Y			Y			
JOLLY JACK RANCH, L.L.C.	480	22151.9008	FWS720	5.2	3rd order	20	Y				Y			
JOLLY JACK RANCH, L.L.C.	481	22151.9009	FWS723	5.2	3rd order	20	Y				Y			
JOLLY JACK RANCH, L.L.C.	482	22151.9010	FWS721	4.7	3rd order	20	Y				Y			
KAISER, WESLEY H & LAURA C	486	13271.9026	FWS306	9.8	3rd order	18	Y	Y		Y				
KAISER, WESLEY H & LAURA C	487	13271.9027	FWS314	9.6	3rd order	18	Y	Y		Y				
KAISER, WESLEY H & LAURA C	488	13271.9028	FWS325	8.1	3rd order	18	Y	Y		Y				
KAISER, WESLEY H & LAURA C	489	13271.9028	FWS326	1.6	3rd order	18	Y	Y		Y				
KAISER, WESLEY H & LAURA C	490	13271.9027	FWS321	0.2	3rd order	18	Y	Y		Y				
KALOUS, R K/MENSER	491	13224.9075	FWS184	4.8	3rd order	15	Y	Y						
KALOUS, ROBERT AND MARILYN	492	13226.9070	FWS196	4.4	3rd order	15	Y	Y						
KALOUS, ROBERT AND MARILYN	493	13226.9070	FWS247	0.2	3rd order	15	Y	Y						
KALOUS, ROBERT K & MARILYN M	494	13276.9029	FWS246	4.2	3rd order	15	Y	Y						
KALOUS, ROBERT K & MARILYN M	495	13226.9071	FWS203	4.0	3rd order	15	Y	Y						

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
KALOUS, ROBERT K & MARILYN M	496	13276.9029	FWS218	0.6	3rd order	15	Y	Y						
KALOUS, ROBERT K & MARILYN M	497	13226.9071	FWS245	0.6	3rd order	15	Y	Y						
KAPLAN FAM REF LIVING TRUST	498	11021.9001	FWS905	12.4	3rd order	15					Y	Y	Y	
KARY, CALVIN T	499	23033.9026	FWS15	19.8	3rd order	8		Y				Y		
KARY, CALVIN T	500	23035.9022	FWS7	11.0	3rd order	3						Y		
KARY, CALVIN T	501	23035.9021	FWS4	7.9	3rd order	3						Y		
KARY, CALVIN T & LAURA J	502	23032.9020	FWS1	9.0	3rd order	3						Y		
KAUTZMAN, DANNY J	503	23273.9043	FWS344	22.3	3rd order	5		Y						
KELLY LIVING TRUST, CECELIA M	505	23222.9003	FWS66	79.5	3rd order	3						Y		
KEPL, TED V	506	22123.9005	FWS641	8.1	3rd order	20	Y	Y				Y	Y	
KINNEY, BRIAN R	507	23223.9047	FWS130	17.0	3rd order	8		Y				Y		
KUDAMATSU, ROBERT & JOYCE	509	13286.9043	FWS219	9.8	3rd order	10	Y							
KUDAMATSU, ROBERT & JOYCE	510	13286.9043	FWS213	0.2	3rd order	0								
KUONEN, ROBERT & NANCY	513	23354.9016	FWS515	0.2	3rd order	5		Y						
LABISH FAMILY LIVING TRUST	520	13234.9072	FWS141	40.8	3rd order	5		Y						
LABISH FAMILY LIVING TRUST	522	13233.9041	FWS190	4.6	3rd order	5		Y						
LABISH FAMILY LIVING TRUST	523	12225.9004	FWS808	0.2	3rd order	2							Y	
LABISH FAMILY TRUST	528	23163.9003	FWS62	11.5	3rd order	8		Y				Y		
LABISH FAMILY TRUST	529	23164.9004	FWS61	9.9	3rd order	8		Y				Y		
LESLIE/ALICE MILL LIVING TRUST	534	02261.9001	FWS806	80.1	3rd order	2							Y	
LINDELL LAND CO	535	13214.9024	FWS158	11.8	3rd order	15	Y	Y						
LOCKWOOD, ANNE C	536	22024.9019	FWS565	10.8	3rd order	25	Y	Y			Y			
LOVERME, JOEL A & MARLENE S	537	13322.9033	FWS428	10.1	3rd order	15		Y			Y			
LUCAS, JAMES G	538	12301.9014	FWS807-1	92.2	3rd order	7							Y	Y
LUNDGRIN, PAUL A & ESPERANZA O	540	23321.9011	FWS427	18.9	3rd order	18	Y	Y				Y		
LUTCHENDORF, R C	541	23294.9009	FWS371	14.8	3rd order	15	Y	Y						
MACY, DEL	542	22151.9016	FWS695	9.5	3rd order	27	Y	Y			Y		Y	

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
MADDUX, GENE G & KELLI J	545	23224.9019	FWS161	0.1	3rd order	5		Y						
MADSEN, DANA C & TERRY M	546	23223.9040	FWS197	6.2	3rd order	8		Y				Y		
MADSEN, DANA C & THERESA M	548	23211.9004	FWS68	10.1	3rd order	8		Y				Y		
MADSON, DANA C & THERESA M	549	23223.9010	FWS195	9.8	3rd order	8		Y				Y		
MAGER, JOHN & BONNIE	551	13284.9028	FWS364	10.8	3rd order	25	Y	Y			Y			
MANSFIELD, TERRY M & KRISTIN G	556	12213.9003	FWS794	0.1	3rd order	2							Y	
MARTIN, TERRY & PRISCILLA M	557	22021.9037	FWS533	16.2	3rd order	15	Y	Y						
MARTIN, TERRY & PRISCILLA M	558	22021.9037	FWS537	2.4	3rd order	15	Y	Y						
MATHEWS, DAVID D & LYNN E	559	22044.9024	FWS586	7.6	3rd order	15		Y			Y			
MCCORD, OLIVER & ANNA	561	13236.9070	FWS126	8.7	3rd order	20	Y				Y			
MCCORMICK, R & K	562	22023.9005	FWS578	5.9	3rd order	25	Y	Y			Y			
MCINTIRE, GABRIELE	563	22024.9014	FWS560	5.8	3rd order	25	Y	Y			Y			
MCKINLAY LIVING TRUST, W C & A N	564	22014.9008	FWS561	18.0	3rd order	8		Y				Y		
MCKINLAY, JACK/WILLSON	568	22016.9017	FWS621-1	8.3	3rd order	30	Y	Y			Y	Y	Y	
MCKINLAY, JACK/WILLSON	569	22016.9017	FWS621-3	6.1	3rd order	30	Y	Y			Y	Y	Y	
MCNARY ETAL, ROBERT J "JIM"	574	12286.9007	FWS816	17.2	3rd order	2							Y	
MCNARY ETAL, ROBERT J "JIM"	575	12281.9006	FWS833	9.3	3rd order	2							Y	
MCTAGGART, MARK A & SANDY L	576	23261.9031	FWS257	10.0	3rd order	5		Y						
MILL, L E & A M	578	02262.9003	FWS800	83.3	3rd order	2							Y	
MILL, R L	580	02265.9002	FWS801	162.5	3rd order	7			Y				Y	
MILLER, BARRY M & TERRIANN	581	13234.9065	FWS147	10.0	3rd order	15		Y			Y			
MILLER, LENNY D & KAREN L	582	23263.9023	FWS372	13.6	3rd order	5		Y						
MONTGOMERY, W P	583	13322.9021	FWS446	4.9	3rd order	15		Y			Y			
MONTGOMERY, W P	584	13322.9015	FWS444	1.1	3rd order	5		Y						
MONTGOMERY, WM P	585	13322.9024	FWS443	3.9	3rd order	15		Y			Y			
MOORE ETAL, MARGARET	594	22281.9007	FWS829	18.9	3rd order	0								

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
MOORE ETAL, MARGARET	595	22324.9006	FWS895	16.0	3rd order	10					Y			
MOORE ETAL, MARGARET	596	22285.9009	FWS848	5.6	3rd order	10					Y			
MORAVEC, MICHAEL G & MARCI L	598	23224.9037	FWS191	4.7	3rd order	8		Y				Y		
MOREHOUSE, LYLE	599	12291.9013	FWS814	11.3	3rd order	5				Y			Y	
MORRISSEY, MICHAEL J & SALLY L	600	12301.9013	FWS804-1	40.4	3rd order	7							Y	Y
MYERS REALTY, INC	601	23351.9030	FWS452	10.4	3rd order	8		Y				Y		
MYERS, W J/EDWARDS	602	23206.9013	FWS99	14.6	3rd order	13	Y					Y		
NETZLEY, TIMOTHY C & BONNIE L	603	13322.9034	FWS436	9.4	3rd order	15		Y			Y			
NEWBRY, G B & B L	605	23222.9048	FWS111	10.0	3rd order	3						Y		
NICKLOUS, MICHAEL W	606	23231.9034	FWS103	10.2	3rd order	3						Y		
NORGAARD, ARNOLD	607	22024.9016	FWS554	12.3	3rd order	25	Y	Y			Y			
OAKES, ROBERT A AND CONNIE L	608	13284.9023	FWS367	12.4	3rd order	25	Y	Y			Y			
ODELL, NANCY L	609	23282.9007	FWS288	15.3	3rd order	18	Y					Y		Y
ODUM, PHILIP L & KAREN	610	23261.9036	FWS295	10.4	3rd order	8		Y				Y		
OIEN, LOYAL J	611	12342.9012	FWS857	86.8	3rd order	7							Y	Y
OLSEN, TRACY J & OLAF E	612	23354.9035	FWS469	18.3	3rd order	8		Y				Y		
PARKER J S ETUX	613	23261.9021	FWS320	19.3	3rd order	8		Y				Y		
PARKER, FRANK (LIVE ESTATE)	615	23023.9073	FWS6	41.2	3rd order	3						Y		
PARKER, JOHN S & VONICA D	616	23191.9034	FWS109	6.4	3rd order	10	Y							
PARKER, JOHN S & VONICE	618	23274.9004	FWS355	40.1	3rd order	5		Y						
PARKER, JOHN S & VONICE	619	23291.9015	FWS291	12.3	3rd order	18	Y	Y				Y		
PARKER, JOHN S & VONICE	620	23291.9014	FWS290	11.8	3rd order	18	Y	Y				Y		
PARKER, JOHN S & VONICE	621	23274.9004	FWS368	0.1	3rd order	5		Y						
PARKER, JOHN S & VONICE	622	23274.9004	FWS356	0.1	3rd order	5		Y						
PARKER, JOHN S & VONICE D	623	23291.9013	FWS304	11.1	3rd order	18	Y	Y				Y		
PARKER, JOHN S & VONICE D	624	23274.9003	FWS357	0.9	3rd order	5		Y						
PARKER, ROBERT J	625	23022.9005	FWS3	0.4	3rd order	0								

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
PENCE ETAL, R H	630	12082.9003	FWS598	40.9	3rd order	6				Y		Y		
PENCE, R H & M K	632	12061.9009	FWS536	0.2	3rd order	10					Y			
PETERSON, MARK A & JOAN M	633	22223.9012	FWS793	30.3	3rd order	0								
PHILLIPS, JOHN W & DELPHINE	641	22044.9011	FWS548	17.9	3rd order	25	Y	Y			Y			
PHILLIPS, JOHN W & DELPHINE	642	22045.9007	FWS532	0.2	3rd order	18	Y	Y				Y		
PHILLIPS, JOHN W/DELPHINE B	643	22041.9003	FWS535	1.8	3rd order	28	Y	Y			Y	Y		
POINDEXTER, CLAY H & MELINDA J	646	12222.9002	FWS761	0.5	3rd order	17	Y		Y				Y	
PORTER, MARK H & SANDRA D	651	13286.9074	FWS386	11.0	3rd order	25	Y	Y			Y			
PORTER, MARK H & SANDRA D	652	13284.9073	FWS373	9.8	3rd order	25	Y	Y			Y			
PORTER, MARK H & SANDRA D	653	13286.9074	FWS399	0.1	3rd order	25	Y	Y			Y			
POTTER, R B	656	23275.9037	FWS216	4.1	3rd order	3						Y		
POWER, MYRON D & MARIE A	657	13286.9033	FWS172	7.9	3rd order	10	Y							
POWER, MYRON D & MARIE A	658	13286.9033	FWS238	6.9	3rd order	13	Y			Y				
PRESSWOOD, THOMAS A & GLORIA A	659	23354.9006	FWS477	21.5	3rd order	5		Y						
PROSTER, MARK E. & ANDREA C.	660	23186.9054	FWS603-1	8.2	3rd order	20	Y				Y			
PROSTER, MARK E. & ANDREA C.	661	23186.9054	FWS78-3	7.1	3rd order	10	Y							
PROSTER, MARK E. & ANDREA C.	662	23186.9054	FWS55-6	1.6	3rd order	10	Y							
PROSTER, MARK E. & ANDREA C.	663	23186.9054	FWS48-6	0.5	3rd order	18	Y					Y		Y
PROSTOR, MARK E & ANDREA C	664	23186.9056	FWS55-2	17.2	3rd order	10	Y							
PROSTOR, MARK E & ANDREA C	665	23186.9056	FWS48-5	12.7	3rd order	18	Y					Y		Y
PROSTOR, MARK E & ANDREA C	666	23186.9056	FWS78-4	1.3	3rd order	10	Y							
REILLY, ALLEN W	668	23351.9042	FWS421	15.6	3rd order	5		Y						
REILLY, ALLEN W	669	23354.9033	FWS473	12.7	3rd order	8		Y				Y		
REILLY, ALLEN W	670	23351.9040	FWS416	10.7	3rd order	5		Y						
REILLY, ALLEN W	671	23351.9041	FWS417	10.5	3rd order	5		Y						
REILLY, ALLEN W	672	23351.9043	FWS422	10.5	3rd order	5		Y						
REILLY, ALLEN W	673	23351.9024	FWS418	10.5	3rd order	5		Y						

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
REILLY, ALLEN W	674	23351.9023	FWS419	10.5	3rd order	5		Y						
REILLY, ALLEN W	675	23351.9019	FWS423	10.4	3rd order	5		Y						
REILLY, ALLEN W	676	23351.9020	FWS424	10.4	3rd order	5		Y						
REILLY, ALLEN W	677	23351.9021	FWS425	10.4	3rd order	5		Y						
REILLY, ALLEN W	678	23355.9034	FWS447	10.4	3rd order	8		Y				Y		
REILLY, ALLEN W	679	23351.9044	FWS438	10.2	3rd order	5		Y						
REILLY, ALLEN W	680	23351.9045	FWS445	10.2	3rd order	5		Y						
RHODES, RAYMOND	681	23252.9016	FWS292	10.3	3rd order	8		Y				Y		
RIETZ, GILMOUR A	683	12043.9010	FWS584	8.8	3rd order	30	Y	Y			Y	Y	Y	
ROCKY PINE RANCH LLC	689	23281.9015	FWS212-2	11.5	3rd order	23	Y	Y				Y		Y
ROCKY PINE RANCH LLC	690	23281.9015	FWS272-1	8.2	3rd order	18	Y	Y				Y		
ROCKY PINE RANCH LLC	691	23281.9013	FWS272-2	0.6	3rd order	18	Y	Y				Y		
ROGERS, MICHAEL F & DAWN M	692	23231.9033	FWS96	10.6	3rd order	3						Y		
ROYALTIES LMTD	694	22024.9015	FWS553	8.0	3rd order	25	Y	Y			Y			
RULE, M I/RANCOURT	695	22045.9018	FWS581	10.1	3rd order	15		Y			Y			
RUPP SR, HAROLD & MARCELLE	696	13291.9002	FWS234	9.5	3rd order	0								
SANDERSON, RODNEY R & CARLA J	698	23354.9009	FWS475	10.1	3rd order	5		Y						
SCHULTES, FRANZ E & TAMARA A	699	23231.9036	FWS76	10.3	3rd order	3						Y		
SCIBA, DARWIN R & REBECCA L	700	23355.9017	FWS449	31.2	3rd order	8		Y				Y		
SCIBA, DARWIN R & REBECCA L	701	23351.9022	FWS426	10.4	3rd order	8		Y				Y		
SCIBA, DARWIN R & REBECCA L	702	23355.9035	FWS448	10.4	3rd order	8		Y				Y		
SCIBA, DARWIN R & REBECCA L	703	23354.9032	FWS468	10.4	3rd order	8		Y				Y		
SEUBERT, PATRICK M & ANGIE M	706	13286.9020	FWS376	10.7	3rd order	25	Y	Y			Y			
SEUBERT, PATRICK M & ANGIE M	707	13286.9020	FWS398	1.8	3rd order	25	Y	Y			Y			
SHOWALTER CORP	710	02145.9001	FWS735	49.5	3rd order	2							Y	

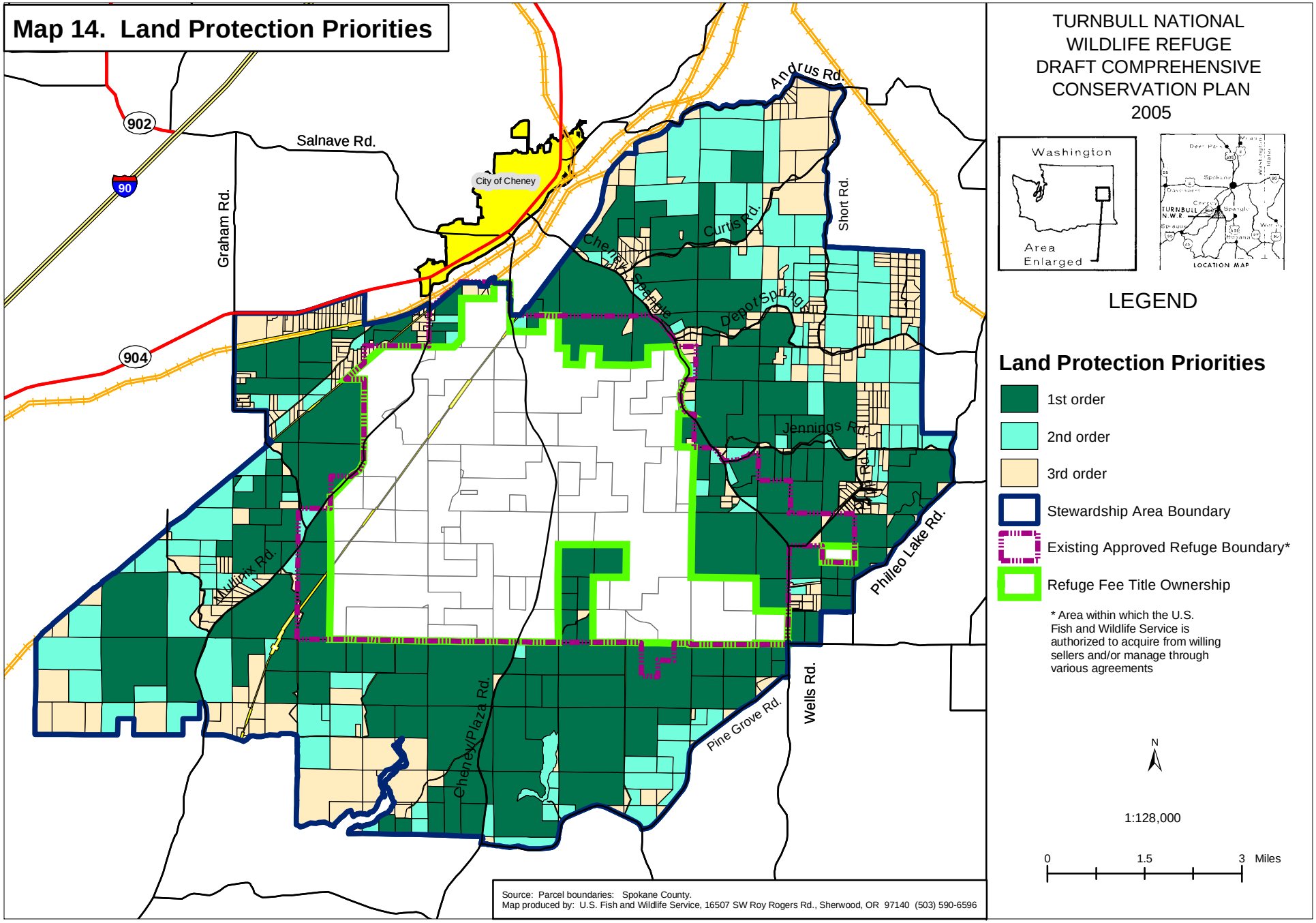
OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
SHOWALTER CORP	711	02145.9001	FWS696	48.2	3rd order	5						Y	Y	
SHOWALTER LAND CORP	713	12073.9017	FWS652	16.5	3rd order	8				Y		Y	Y	
SHOWALTER, MARGARET E	714	02121.9021	FWS624	10.5	3rd order	5						Y	Y	
SHUSKO, GLEE D	715	13271.9008	FWS249	1.5	3rd order	15	Y	Y						
SMITH, B E	716	23324.9007	FWS484	10.4	3rd order	15	Y	Y						
SMITH, BERT	718	23324.9006	FWS459	2.3	3rd order	15	Y	Y						
SOOY, AMY JO	719	02233.9003	FWS776	163.8	3rd order	2							Y	
SPANJER LIVING TRUST	721	23164.9005	FWS58	34.8	3rd order	3						Y		
SPANJER LIVING TRUST	722	23155.9002	FWS47	14.0	3rd order	3						Y		
SPANJER LIVING TRUST	723	23164.9005	FWS59	2.0	3rd order	3						Y		
SPANJER LIVING TRUST	724	23164.9005	FWS57	0.9	3rd order	3						Y		
SPEAR, STEVEN A & LORNA L	725	23224.9017	FWS192	8.9	3rd order	5		Y						
SPEAR, STEVEN A & LORNA L	726	23233.9029	FWS193	0.4	3rd order	5		Y						
SPOKANE COUNTY	727	22282.9011	FWS826	6.7	3rd order	10					Y			
SPOKANE COUNTY	728	23224.9028	FWS208	0.1	3rd order	0								
SPOKANE PRODUCE INC	729	23221.9015	FWS69	19.0	3rd order	8		Y				Y		
SPOONER, EUGENE & MARLA A	731	23262.9025	FWS360	0.0	3rd order	5		Y						
STELZER, D W	738	22025.9002	FWS508	15.4	3rd order	18	Y	Y				Y		
STELZER, D W	739	22032.9004	FWS516	2.9	3rd order	18	Y	Y				Y		
STELZER, D W	740	22025.9002	FWS601	1.8	3rd order	25	Y	Y			Y			
STELZER, DARRELL	743	22032.9003	FWS514	3.8	3rd order	18	Y	Y				Y		
STELZER, DARRELL	744	22031.9002	FWS513	0.2	3rd order	18	Y	Y				Y		
STIMSON, STEVE C & ANGELA M	745	13322.9023	FWS441	4.8	3rd order	15		Y			Y			
STOUGHTON, DONALD A & MARY J	746	22021.9043	FWS519-1	9.7	3rd order	15	Y	Y						
STRALEY, GEORGE L & JACKIE	747	13322.9011	FWS442	9.9	3rd order	15		Y			Y			
STRIEFF, RAYMOND	762	23054.9065	FWS16	25.2	3rd order	3						Y		

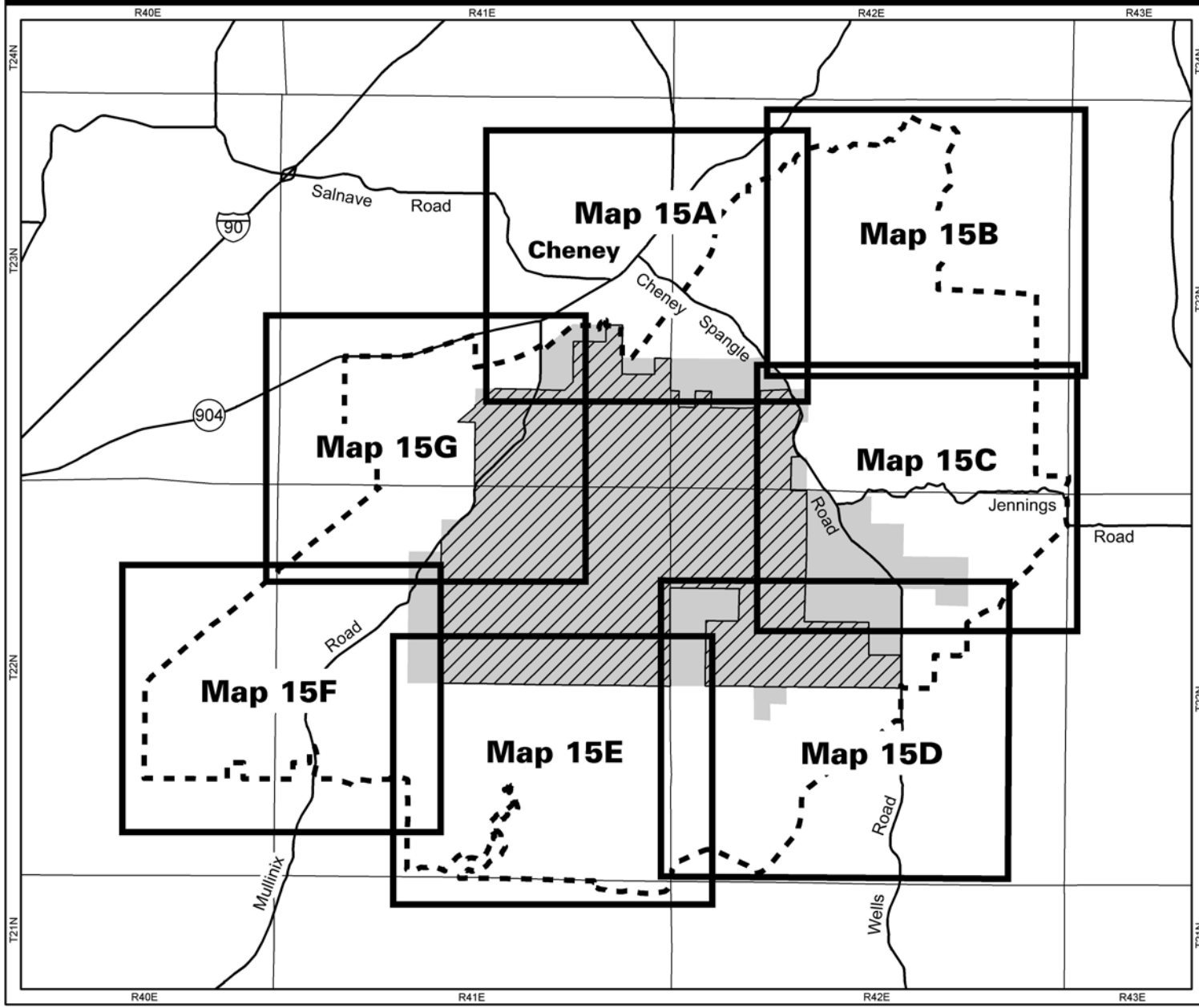
OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
STRIEFF, RAYMOND	763	12185.9015	FWS728	18.3	3rd order	5						Y	Y	
STRIEFF, RAYMOND	764	02143.9002	FWS747	13.7	3rd order	2							Y	
STRIEFF, RAYMOND	765	12185.9015	FWS662	4.5	3rd order	2							Y	
SWEDBERG, K C	766	23191.9033	FWS94	5.4	3rd order	10	Y							
SYKVAS, CHARLES E/BORELLI	767	23231.9035	FWS92	10.3	3rd order	3						Y		
TEEL DAIRY FARMS INC	769	13281.9041	FWS287	5.4	3rd order	15	Y	Y						
TEEL DAIRY FARMS, INC	771	13286.9042	FWS277	6.6	3rd order	15	Y	Y						
TERRY, MARK A & MARLA J	772	23112.9094	FWS22	34.5	3rd order	3						Y		
TERRY, MARK A & MARLA J	773	23112.9093	FWS25	2.0	3rd order	3						Y		
THOMPSON, RODNEY/ENGSTROM	776	22216.9005	FWS792	17.2	3rd order	0								
TITUS, SHIRLEY	777	22023.9006	FWS566	7.7	3rd order	25	Y	Y			Y			
TITUS, SHIRLEY	778	22023.9007	FWS567	6.7	3rd order	25	Y	Y			Y			
TITUS, SHIRLEY	779	22023.9012	FWS563	6.0	3rd order	30	Y	Y	Y		Y			
TOBLER, LEON N & DEBRA L	780	13271.9013	FWS248	10.2	3rd order	15	Y	Y						
TOBLER, MARVIN W & DEBORAH L	781	13271.9025	FWS273	10.2	3rd order	15	Y	Y						
TOLER, GREGORY L/LYNN M	782	13275.9033	FWS324	13.0	3rd order	25	Y	Y			Y			
TOWEY, WILLIAM T & KARLYN A	783	12051.9019	FWS487	15.4	3rd order	17		Y			Y		Y	
TUPPER, EDDY ROY & MARIE	784	23252.9023	FWS268	15.7	3rd order	8		Y				Y		
TUTTLE, DONNA K	785	23271.9027	FWS239	12.4	3rd order	8		Y				Y		
TUTTLE, SCOTT H & DONNA K	786	23271.9036	FWS274	10.7	3rd order	8		Y				Y		
US DEPARTMENT OF AGRICULTURE	788	22101.9003	FWS625	17.3	3rd order	25	Y	Y			Y			
USA	789	12343.9004	FWS879	22.9	3rd order	5								Y
USA	790	12035.9001	FWS491	2.0	3rd order	27	Y	Y			Y		Y	
USA	791	23303.9006	FWS380	2.0	3rd order	17		Y			Y		Y	
USA	792	13243.9011	FWS188	0.7	3rd order	10	Y							
VAN TINE, DOUG K & BONNIE J	793	23263.9029	FWS370-2	21.3	3rd order	5		Y						

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
VANTINE, D & B	794	23263.9017	FWS369	8.7	3rd order	5		Y						
WADE, E R & M B	133	22042.9021	FWS691-1	0.0	3rd order	18	Y	Y			Y	Y		
WADE, E R & M B	796	22042.9021	FWS506	8.1	3rd order	18	Y	Y				Y		
WADE, E R & M B	797	22042.9021	FWS523	4.4	3rd order	18	Y	Y				Y		
WADE, E R & M B	798	22042.9021	FWS526	0.6	3rd order	18	Y	Y				Y		
WAGGENER LIVING TRUST	800	13214.9023	FWS153	12.6	3rd order	15	Y	Y						
WAGNER, PENNY JO	801	22151.9007	FWS710	11.8	3rd order	25	Y	Y			Y			
WALLINGFORD JR, R M & A L	802	13286.9076	FWS341	7.4	3rd order	25	Y	Y			Y			
WALLINGFORD JR, R M & A L	803	13286.9076	FWS342	3.1	3rd order	25	Y	Y			Y			
WASH STATE DEPT NATURAL RESC	809	23165.9001	FWS54	6.5	3rd order	3						Y		
WASH STATE DEPT NATURAL RESC	810	23364.9007	FWS499	4.2	3rd order	5		Y						
WASH STATE DEPT NATURAL RESC	811	23165.9001	FWS56	3.0	3rd order	3						Y		
WASH STATE DEPT NATURAL RESC	812	23165.9001	FWS63	2.3	3rd order	8		Y				Y		
WASHINGTON STATE UNIVERSITY FOUNDATION	813	23354.9031	FWS464	10.4	3rd order	8		Y				Y		
WAYMIRE, ELDA	814	13282.9007	FWS299	2.7	3rd order	10	Y							
WAYMIRE, ELDA	815	13282.9007	FWS303	0.1	3rd order	10	Y							
WEEKS, DAVID S	816	22041.9014	FWS509	5.0	3rd order	18	Y	Y				Y		
WESSLEN ETUX, J D	817	23252.9021	FWS311	17.9	3rd order	13		Y	Y			Y		
WESSLEN ETUX, J D	818	23252.9019	FWS315	10.0	3rd order	8		Y				Y		
WESTERMAN, W H	820	23265.9028	FWS370-1	13.0	3rd order	5		Y						
WESTERMAN, W H	821	23265.9028	FWS353	9.3	3rd order	5		Y						
WHITNEY, STEWART	824	22025.9011	FWS552	6.2	3rd order	25	Y	Y			Y			
WICHMAN, PHIL & BROWN	826	23354.9004	FWS490	6.9	3rd order	5		Y						
WICHMAN, PHILLIP & KAREN S	827	22021.9039	FWS518	3.9	3rd order	15	Y	Y						
WILSON, KAREN R	830	13332.9020	FWS437	6.1	3rd order	18		Y		Y	Y			
WILSON, KAREN R	831	13332.9020	FWS433	3.2	3rd order	15		Y			Y			

OWNER	MAP KEY	COUNTY APN NUMBER	FWSNUM	GIS ACRES	PROTECTION PRIORITY	RESOURCE SUM VALUE	GWAT	WSHED	WETS1	WETS2	STEPPE	FOR	HUNT OPP	INTACT
WILSON, MICHAEL E & LORIE M	832	23252.9012	FWS331	10.3	3rd order	5		Y						
WINKLER, RICHARD H & MARGARET A	833	22025.9010	FWS558	5.8	3rd order	25	Y	Y			Y			
WIPPERT, LARRY & DIANE	835	23261.9032	FWS260	10.0	3rd order	5		Y						
WIPPERT, LARRY C & DIANE M	836	23261.9033	FWS262	10.1	3rd order	8		Y				Y		
WOODGER, BLAIR C	837	12072.9005	FWS626	4.1	3rd order	3						Y		
YOUNG, GORDON O & SHARON L	841	22021.9049	FWS520-5	19.9	3rd order	28	Y	Y			Y	Y		
YOUNG, GORDON O & SHARON L	842	22021.9046	FWS520-1	19.3	3rd order	28	Y	Y			Y	Y		
ZABEL, MARIE J	844	23271.9025	FWS269	2.6	3rd order	8		Y				Y		
ZABLE, MARIE	845	23271.9035	FWS301	9.8	3rd order	8		Y				Y		
ZACHER LIVING TRUST, HARVEY & PENELOPE	846	12295.9018	FWS809	63.7	3rd order	0								
ZACHER LIVING TRUST, HARVEY & PENELOPE	847	12203.9005	FWS796	40.2	3rd order	2							Y	
ZACHER LIVING TRUST, HARVEY & PENELOPE	848	12295.9019	FWS834	8.0	3rd order	0								
ZIMMERMAN, LINDA	849	22025.9009	FWS557	7.0	3rd order	25	Y	Y			Y			
Unknown	851	13262.9004	FWS250	4.2	3rd order	5		Y						
Unknown	852		FWS569	2.2	3rd order	25	Y				Y	Y	Y	
Unknown	853		FWS898	0.2	3rd order	7							Y	Y
Unknown	854	23335.9006	FWS839-1	0.1	3rd order	18	Y	Y				Y		

Map 14. Land Protection Priorities





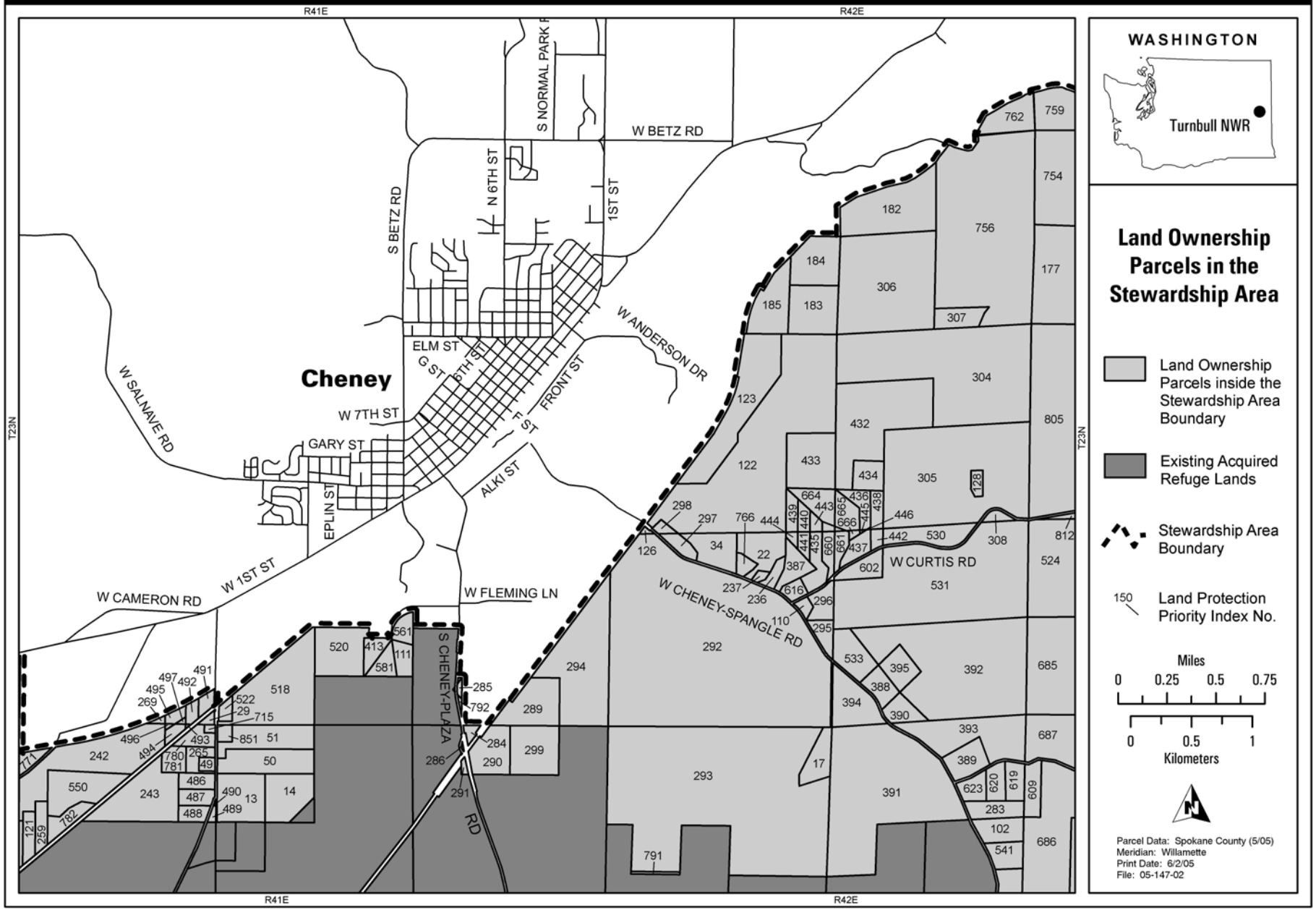
Land Ownership Parcels in the Stewardship Area

- Turnbull National Wildlife Refuge Approved Refuge Boundary
- Existing Acquired Refuge Lands
- Stewardship Area Boundary

Miles: 0 1 2 3

Kilometers: 0 1 2 3

Parcel Data: Spokane County (5/05)
Meridian: Willamette
Print Date: 6/2/05
File: 05-147-01


R41E
R42E
T23N
Cheney
W BETZ RD
S NORMAL PARK RD
N 6TH ST
1ST ST
S BETZ RD
W ANDERSON DR
ELM ST
G ST
6TH ST
FRONT ST
W 7TH ST
GARY ST
W SALNAVE RD
EPLIN ST
ALKI ST
W 1ST ST
W CAMERON RD
W FLEMING LN
W CURTIS RD
W CHENEY-SPANGLE RD
S CHENEY-PLAZA RD
WASHINGTON
Turnbull NWR
Land Ownership Parcels in the Stewardship Area
Land Ownership Parcels inside the Stewardship Area Boundary
Existing Acquired Refuge Lands
Stewardship Area Boundary
150 Land Protection Priority Index No.
Miles
0 0.25 0.5 0.75
0 0.5 1
Kilometers
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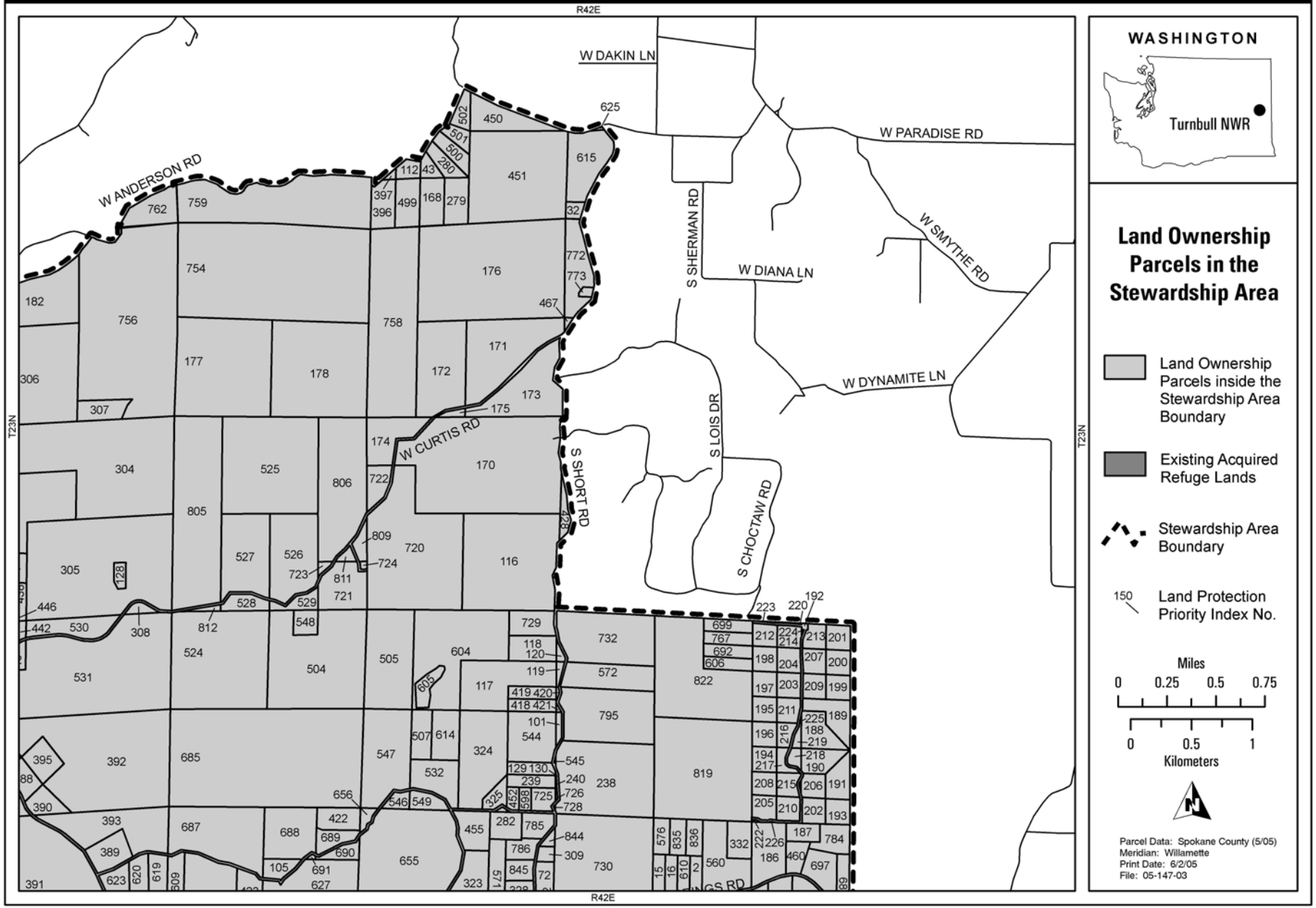
R42E
T23N
W DAKIN LN
W PARADISE RD
W ANDERSON RD
W SMYTHE RD
S SHERMAN RD
W DIANA LN
W DYNAMITE LN
S LOIS DR
W CURTIS RD
S SHORT RD
S CHOCTAW RD
WASHINGTON
Turnbull NWR
Land Ownership Parcels in the Stewardship Area
Land Ownership Parcels inside the Stewardship Area Boundary
Existing Acquired Refuge Lands
Stewardship Area Boundary
150 Land Protection Priority Index No.
Miles
0 0.25 0.5 0.75
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Kilometers
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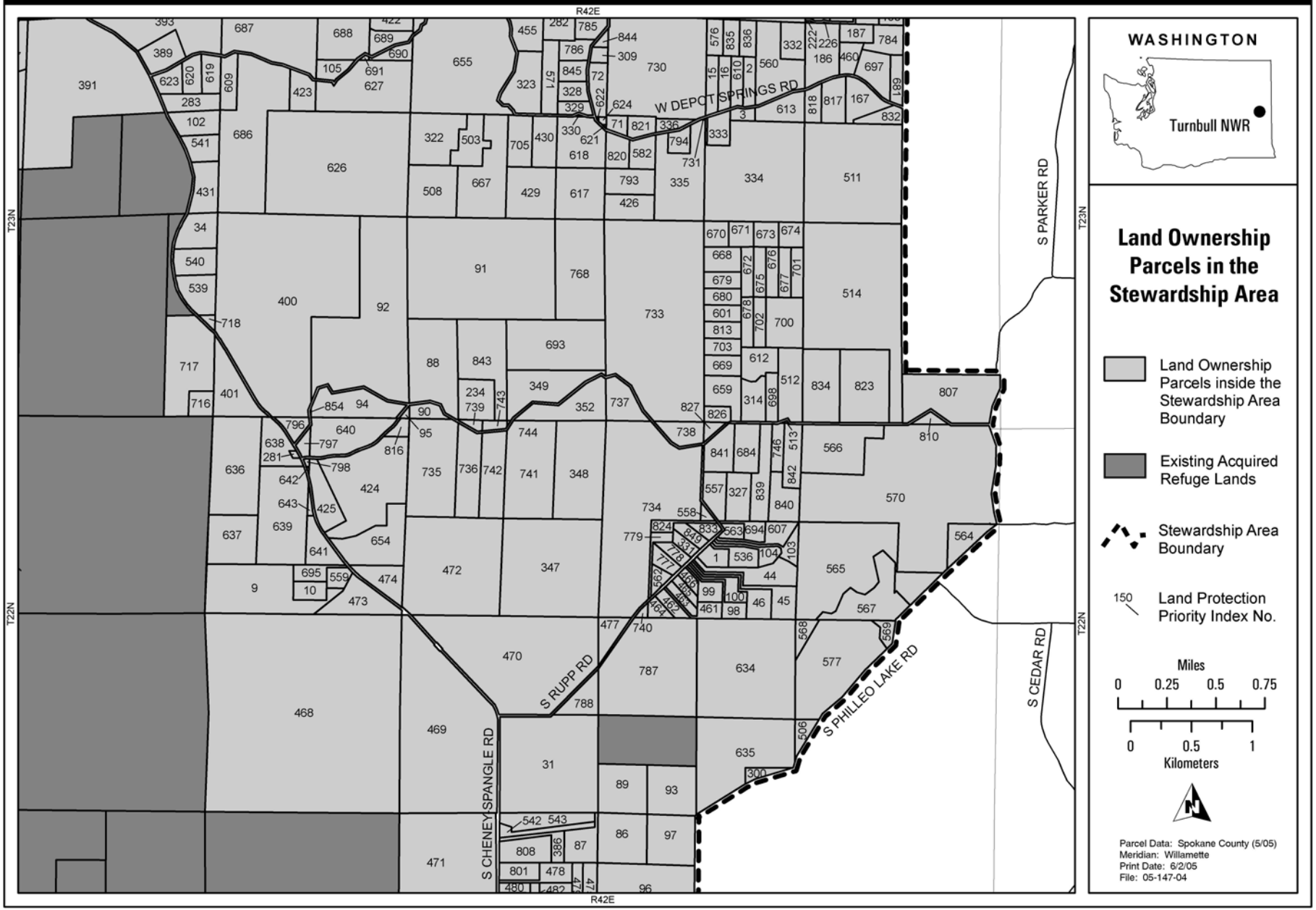
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T23N
T22N
W DEPOT SPRINGS RD
S PARKER RD
S CEDAR RD
S RUPP RD
S PHILLEO LAKE RD
S CHENEY-SPANGLE RD
WASHINGTON
Turnbull NWR
Land Ownership Parcels in the Stewardship Area
Land Ownership Parcels inside the Stewardship Area Boundary
Existing Acquired Refuge Lands
Stewardship Area Boundary
150 Land Protection Priority Index No.
Miles
0 0.25 0.5 0.75
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Kilometers
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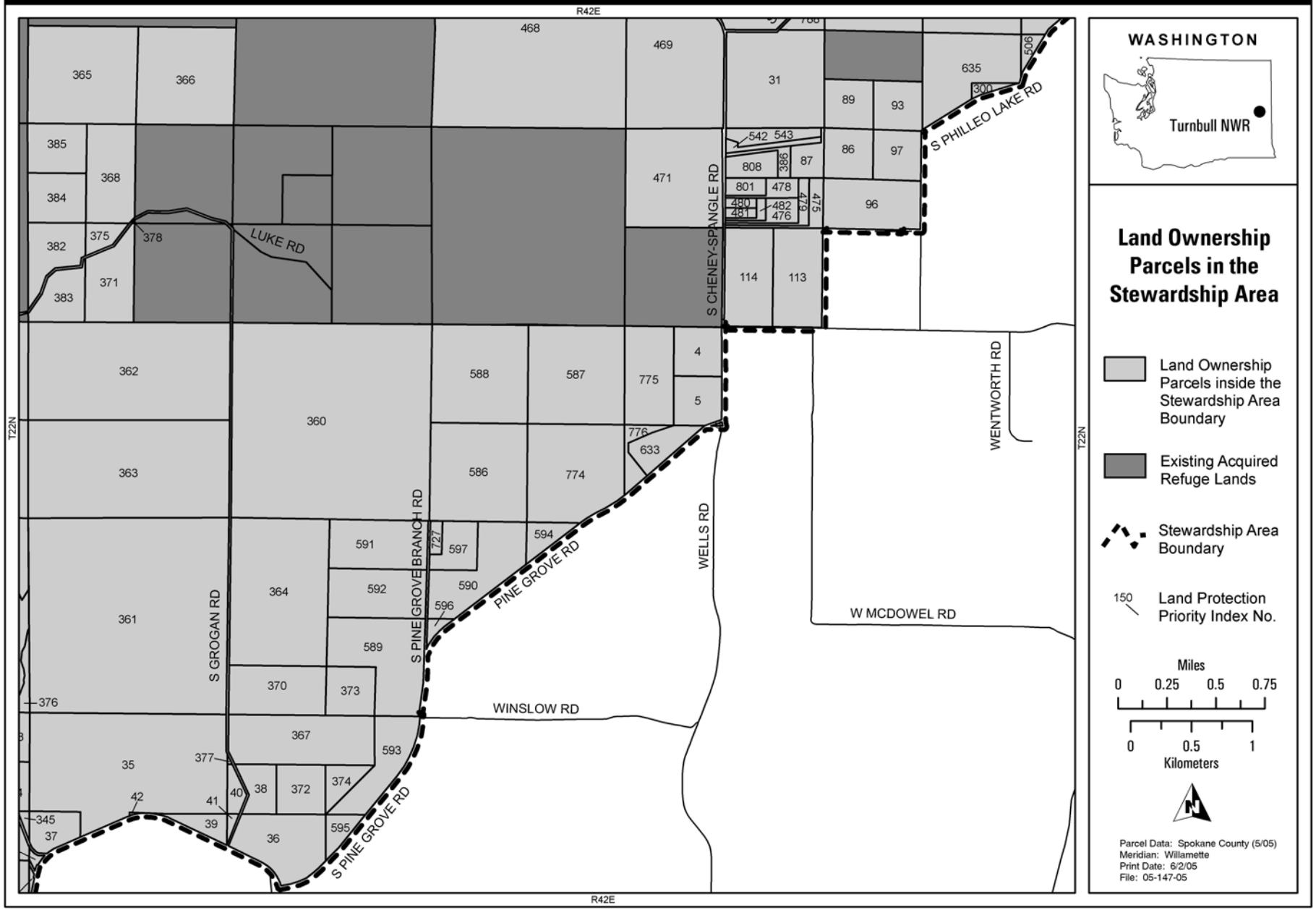
Meridian: Willamette
Print Date: 6/2/05
File: 05-147-04


R42E
T22N
LUKE RD
S CHENEY-SPANGLE RD
S PHILLEO LAKE RD
WENTWORTH RD
W MCDOWEL RD
WELLS RD
WINSLOW RD
PINE GROVE RD
S PINE GROVE BRANCH RD
S PINE GROVE RD
S GROGAN RD
WASHINGTON
Turnbull NWR
Land Ownership Parcels in the Stewardship Area
Land Ownership Parcels inside the Stewardship Area Boundary
Existing Acquired Refuge Lands
Stewardship Area Boundary
150 Land Protection Priority Index No.
Miles
0 0.25 0.5 0.75
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Kilometers
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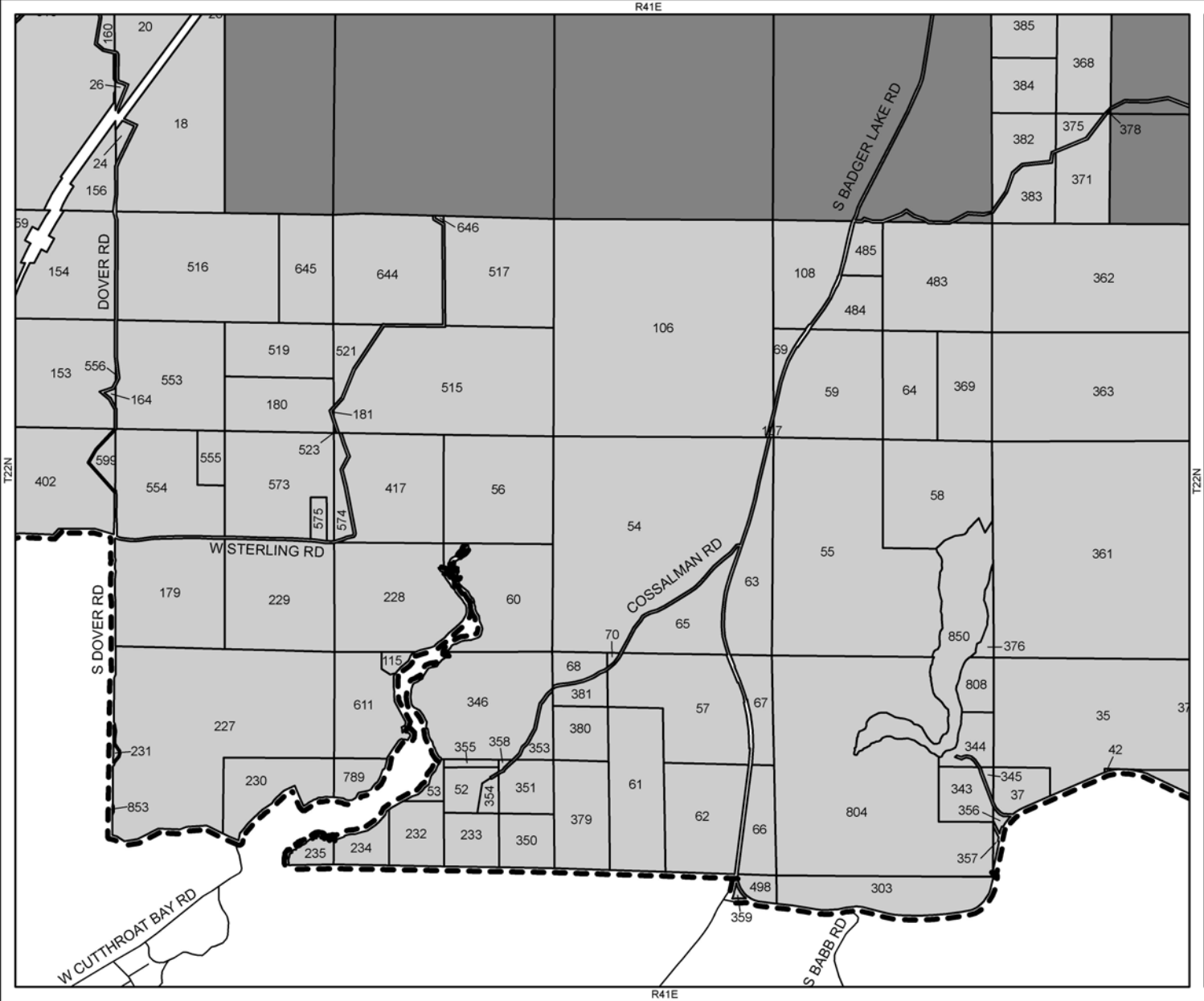


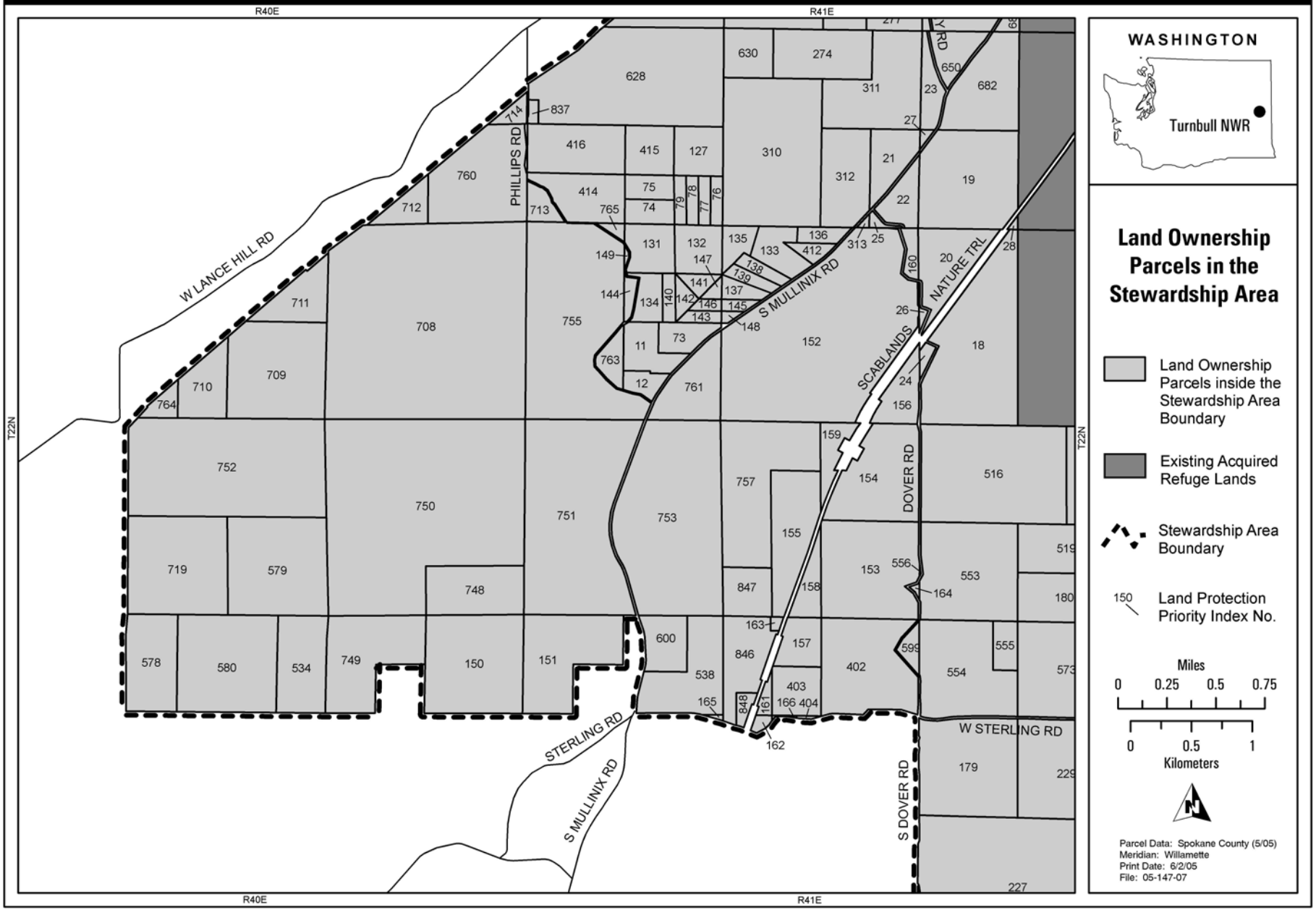
Land Ownership Parcels in the Stewardship Area

- Land Ownership Parcels inside the Stewardship Area Boundary
- Existing Acquired Refuge Lands
- Stewardship Area Boundary
- 150 Land Protection Priority Index No.

Miles: 0, 0.25, 0.5, 0.75

Kilometers: 0, 0.5, 1

Parcel Data: Spokane County (5/05)
Meridian: Willamette
Print Date: 6/2/05
File: 05-147-06


R40E
R41E
T22N
W LANCE HILL RD
PHILLIPS RD
S MULLINIX RD
SCABLANDS
NATURE TRL
DOVER RD
S DOVER RD
W STERLING RD
STERLING RD
S MULLINIX RD
WASHINGTON
Turnbull NWR
Land Ownership Parcels in the Stewardship Area
Land Ownership Parcels inside the Stewardship Area Boundary
Existing Acquired Refuge Lands
Stewardship Area Boundary
150 Land Protection Priority Index No.
Miles
0 0.25 0.5 0.75
0 0.5 1
Kilometers
Parcel Data: Spokane County (5/05)
Meridian: Willamette
Print Date: 6/2/05
File: 05-147-07

Land Ownership Parcels in the Stewardship Area

- Land Ownership Parcels inside the Stewardship Area Boundary
- Existing Acquired Refuge Lands
- Stewardship Area Boundary
- 150 Land Protection Priority Index No.

Miles: 0, 0.25, 0.5, 0.75

Kilometers: 0, 0.5, 1

Parcel Data: Spokane County (5/05)
Meridian: Willamette
Print Date: 6/2/05
File: 05-147-08

APPENDIX B: HABITAT MANAGEMENT PLAN SUMMARY

B.1 HABITAT MANAGEMENT PLAN EXECUTIVE SUMMARY

The Turnbull Habitat Management Plan (HMP) was developed prior to the CCP and was signed in 1999 (USDI, 1999). The following appendix summarizes the HMP and presents all of the objectives and strategies written for the HMP.

In recent years, the mission and goals of the refuge have evolved from an emphasis on the production and maintenance of migratory waterfowl to a more holistic ecosystem management approach. The new mission is to restore and maintain ecosystem processes that provide for a natural diversity of flora and fauna native to the wetland, steppe and ponderosa pine communities of Eastern Washington. In order to fulfill this mission, specific goals were developed for each of the major plant communities, water quality and quantity, endangered and threatened species and maintenance of landscape connectivity.

An analysis of the current condition of the refuge ecosystem found that several factors limit the ability of the refuge staff to achieve these goals. These limitations are the outcome of past alterations to habitats and natural disturbance regimes by private landowners prior to refuge acquisition, subsequent refuge management, and increased urbanization of the area surrounding the refuge.

Significant non-point sources of nitrogen and phosphorus are entering the refuge from private lands north and east of the refuge. Refuge wetlands appear to have a greater susceptibility to drought that may be the result of increased usage of the water table for domestic and agricultural uses around the refuge, artificial recharge deficits as a result of extensive management drawdowns, and decreasing water yield from increased forest cover in refuge watersheds.

Past logging, grazing and suppression of fire has created pine stands with tree densities 2 to 4 times the pre-settlement condition. Large trees greater than 24 inches (60 cm) in diameter constitute less than 10% of the stands. Greater than 75% of the refuge ponderosa pine forest exists as closed canopy, multi-storied stands with a similar age and size structure. The forest understory is dominated by decadent snowberry and a dense layer of organic debris that suppresses the growth of native bunchgrasses and forbs. Fuel loading in refuge pine stands is 5 times greater than the average for this forest type. Conditions are ripe for catastrophic loss due to insects, disease, and fire.

The average density of snags in refuge forest stands is less than 1 per acre. Optimum conditions for cavity nesting birds require on the average 3 suitable snags per acre greater than 15 inches (38 centimeters)in diameter. Past logging and suppression of fire has resulted in the loss of mature and old growth stands that produce large diameter snags that persist over long periods of time. Existing stands are overstocked with pole and sapling sized pines that suppress tree growth and root development. Most snags are less than 15 inches (38 centimeters) in diameter and are susceptible to decay and windfall. Aspen/deciduous shrub habitat important habitat for a large number of refuge neotropical migratory landbird species has been significantly reduced on the refuge by competition from encroaching ponderosa pine and the suppression of aspen and shrub regeneration by past grazing. Aspen and deciduous shrub dominated plant communities have been reduced by 65%. In the past, periodic fire removed encroaching pines and encouraged regeneration of aspen and understory shrubs.

Wet meadows and seasonal wetlands have been invaded by reed canarygrass (*Phalaris arundinacea*), an exotic perennial grass which out competes nearly all native plant species. Gone are the diverse seasonal wetland habitats dominated by native sedges, rushes, and grasses. Water howellia, a federally threatened aquatic plant species restricted to seasonal wetlands, is at risk of being displaced by reed canarygrass.

Nearly 300 acres of seasonal wetland habitat has been impacted through the creation of over 700 nesting islands. These islands were created from spoil pushed up in the seasonal portion of several large sloughs and smaller potholes. Built too close to shore and each other and in water too shallow to prevent access by predators, these islands have not been used successfully by nesting waterfowl.

Exotic species such as cheatgrass brome (*Bromus tectorum*), Canada thistle (*Cirsium arvense*), dalmatian toadflax (*Linaria dalmatica*), St. Johns wort (*Hypericum perfoliatum*), spotted and diffuse knapweed (*Centaurea diffusa* and *C. maculosa*), and leafy spurge (*Euphorbia esula*) are present in refuge plant communities. Although limited in distribution on the refuge through integrated pest management practices. The potential exists for expansion without continued management effort. Cheatgrass is dominant in many areas of the refuge displacing native perennial grass and forb communities.

The refuge occurs on a narrow extension of the Ponderosa Pine Zone into the Columbia Basin. This peninsula of ponderosa pine forest surrounded by intensively developed agricultural land is in danger of being isolated from the rest of the forested zones to the north by urban development around Spokane and the Interstate 90 corridor. Further isolation has resulted from forest practices on private lands surrounding the refuge. Past and current timber management activities on these lands have created either suppressed stands of ponderosa pine vulnerable to catastrophic fire or relatively young even aged stands of trees with little structural diversity.

Both qualitative and quantitative objectives have been established to provide more detailed direction and targets that will need to be met in order to achieve refuge goals. Objectives address limitations to meeting refuge goals identified by the Service, the habitat needs of native wildlife species, and the maintenance of the integrity of the refuge in its ecoregional setting. The habitat needs of wildlife species were addressed using a wildlife guild concept that groups wildlife by their common use of 10 different habitat strata for both breeding and foraging. Because guilds are often large, key management or indicator species were selected for each guild to focus management actions. These species were chosen because of legislative mandate(threatened or endangered), their significance to conserving biodiversity, the critical status of their populations, or the fact that their habitat requirements represent a subset of the membership of their respective guild.

Management strategies have been developed to meet these objectives. These strategies include both manipulative and administrative actions that will be applied over the next 15 - 20 years.

- Manipulative actions will include restoration of fire through prescribed burning, tree removal utilizing a variety of silvicultural methods, noxious weed control, livestock grazing, water management, wetland restoration, and riparian and grassland vegetation restoration.
- Administrative actions will primarily involve increased coordination with other public agencies and private landowners to protect the quantity and quality of water entering the refuge and prevent the further isolation of the refuge resulting from increased urbanization of landscape linkages.

Specifically these actions will involve:

- Silvicultural treatment of approximately 400 acres annually for the next 15 years using a combination of non-commercial and commercial thinning, single tree selection harvest, and group selection harvest to achieve a natural distribution of stand conditions.

- Prescribed burning of between 800 - 1600 acres per year.

- Continuation of integrated weed management using either singly or in combination, cultural, chemical, biological, or mechanical management practices.
- An experimental program to control reed canarygrass in seasonal wetland habitat and restore native plant diversity in cheatgrass dominated steppe and forested habitats.
- A refined water management program to meet objectives for emergent vegetation and open water in 22 managed wetlands.
- Restoration of the natural contours of 29 altered wetland basins by removal of artificial islands and berms.
- Coordination and cooperation with local, county, and state regulatory agencies and private landowners to reduce threats to water quality and quantity.
- Use of available incentive programs to change private land-uses that are impacting the quality and quantity of water entering the refuge.
- Use of fee or easement acquisition from willing sellers when necessary to protect water quality and quantity, water howellia habitat, meadow steppe plant communities and landscape linkages.
- Research would be initiated to answer critical questions about habitat requirements and species biology of water howellia in order to design sound management plans for restoring and maintaining natural occurrences.

Full implementation of this plan will cost approximately $330,000 annually. Primary costs are associated with the need for the equivalent of three full-time personnel for planning, implementation and monitoring of forest and prescribed fire management and 1 full time equivalent employee for wetland restoration work. Additional costs are associated with equipment, fuel, native plant materials, research contracts, and outreach.

This plan takes an adaptive management approach. Habitat monitoring will be undertaken to insure that assumptions made in developing strategies are correct. If objectives are not being met then corrections can be made. Monitoring procedures have ben been or will be developed for each breeding and foraging strata and water howellia.

Implementation of this plan over the next 20 years should result in improved water quality and quantity, improved wetland conditions, improved forest health, increased stand diversity and snag densities, reduction in the risk of stand replacing wildfires, restoration of native plant diversity, increased area of aspen riparian habitat and maintenance of landscape linkages.

B.2. HABITAT MANAGEMENT OBJECTIVES AND STRATEGIES

In order to achieve refuge goals and resolve resource challenges, both qualitative and quantitative objectives were established that address the habitat needs of breeding and foraging guilds as well as maintaining the integrity of the refuge in its ecoregional setting. Habitat objectives for guilds are mostly quantitative and were set to restore and maintain specific habitat elements using guild management guidelines. Recognizing that these guidelines represent optimum conditions, refuge objectives were

tempered by the natural capacity of the refuge to provide these elements. The overriding theme in the objective setting process is the restoration and maintenance of ecological processes that produce a natural diversity and distribution of habitats. These ecological processes are dynamic resulting in variations in the abundance and distribution of habitat strata both spatially and temporally. Because of this variability, objectives generally cover a range of values. Objectives for achieving goals necessary to maintain the ecological integrity of the refuge in the larger landscape are more qualitative and deal with minimizing the effect of off-refuge activities on refuge resources.

GOAL#1. Provide habitat conditions essential to the conservation of migratory birds and other wildlife within a variety of wetland complexes.

1A. OPEN WATER ACREAGE OBJECTIVE: Manage the 22 refuge wetlands with water control capability at a level that maintains between 500 and 750 acres of permanent open water annually to support the water surface and emergent stratum breeding guild.

Guild Management Guidelines

Water surface breeding guild

- For every 1000 acres of habitat, maintain at least one large wetland, greater than 100 acres, with deep water and beds of dense submerged aquatic plants available from March 15th to August 30th.

Emergent stratum breeding guild

- Permanent wetlands should be maintained at a density of 2 ponds per square mile larger than 50 acres.
- Between 30 and 50% of a permanent wetland basin should be managed as open water in blocks of at least 25 acres in size.
- Open water areas should contain interspersed patches of dense, submerged aquatic plant beds. Submerged aquatic plants provide a substrate for invertebrate production. Aquatic invertebrates are critical to egg production, the maintenance of incubating females and growth and survival of broods.

Strategies

- Maintain water control capability in 22 permanent wetland basins and establish peak operating levels of the 22 managed wetlands to achieve objectives for wetland strata(Table 4 in HMP). Stabilize water levels in all managed wetlands by April 1.
- Develop contour maps of the 22 managed wetland basins. These maps will allow the use of existing wetland vegetation models that account for annual runoff and evapotranspiration to establish operating levels that will achieve wetland strata objectives over the long-term.
- Until contour mapping is completed, peak water levels will be based on existing operating levels (Table 5). Interim adjustments to operating levels will be made if monitoring indicates that objectives for wetland strata are not being met.
- Because the bottom of the control structure is often higher than the lowest point in the basin, a piezometer well is required near the structure of each managed wetland to measure the level of the water table and water use to refine water management and support existing water rights and claims. Piezometer wells are currently in place at Kepple Lake, Upper Turnbull, Lower Turnbull and Long Lake. The topography of these four wetlands will be surveyed and mapped first. Eighteen more piezometer wells will be placed at the remaining managed wetlands.

Rationale:

There are 22 wetlands with water control structures where water levels can be established that will meet habitat objectives for a range of values for open water, emergent vegetation and water depths. Meeting these objectives will provide the strata necessary to support wetland breeding and foraging guilds. Water levels can be established using both vegetation simulation models and empirical data. Supplemental water can be used to augment local runoff to reach these water levels. It is important to note that even with supplemental water it will not be possible or desirable to maintain stable quantities or distributions of different vegetation zones and water depths within a wetland basin overtime. Long-term stability of wetlands is often associated with declining productivity in terms of the interspersion of wetland vegetation zones, productivity and composition of submerged aquatic plant communities, and the diversity and abundance of aquatic invertebrates. Use of supplemental water can, however, reduce the extremes of natural cycles and maintain objective levels of wetland strata for longer periods of time.

Peak operating level for each managed wetland basin that will have the greatest probability of meeting objectives for wetland strata can be established using wetland vegetation models. Rules for the model have been empirically derived for prairie pothole wetlands to predict changes in wetland vegetation zones as a result of different hydrologic inputs (van der Valk 1981). The rules predict conversion from one vegetation type to another as a result of different drawdown and flooding scenarios. These rules have been incorporated into spatial simulation models to predict potential effects of global warming on prairie wetlands (Poiani and Johnson 1991). Recently this model with some modifications was applied to a wetland basin on the refuge with good predictive ability (Mahrer 1995).

1B. EMERGENT PLANT STRATA OBJECTIVE: Establish an annual operating level for the 22 managed wetlands that maintains an emergent plant strata that covers between 10% and 30% of the wetland basin to support the emergent and water surface stratum breeding and foraging guilds. Fifty percent of this zone should have a width of greater than 100 feet.

Guild Management Guidelines

Emergent Stratum Breeding and Foraging Guilds

- The ratio of open water areas to emergent plant beds should be near 1:1. At least half of the emergent plant beds should be at least 100 feet in width to provide adequate area for the establishment of territories and security for nesting.
- Stem densities should be greater than 14 stems per square foot in at least 50% of the emergent stands.

Strategies

(see Strategies for Objective 1A)

Rationale

See rationale for Objective 1B

1C. WATER DEPTHS IN EMERGENT PLANT ZONE OBJECTIVE: Manage water annually to maintain water depths of at least 18 inches in the emergent plant zone of managed wetlands from April 1 through July 30 for nesting birds in the emergent stratum breeding guild.

Guild Management Guidelines

Emergent Stratum Breeding Guild

- Water depths in hardstem bulrush stands should not drop below 18 inches (45 cm) from April 1 to July 30.

Strategies

(see Strategies Objective 1A)

Rationale

Maintenance of the specified minimum water depths in managed wetlands during the nesting season is critical to the success of nesting attempts by members of the emergent stratum breeding guild (Low 1945, Lokemoen 1966, Siegfried 1976, and Stoudt 1982). Adequate water depths mainly serve to limit access to the nest by potential predators.

1D. RESTORATION OF NATURAL HYDROLOGY OBJECTIVE: By 2007, restore the natural hydrology of 250 acres of managed wetlands that occur in isolated watersheds and are not downstream from off refuge water sources.

Guild Management Guidelines

Emergent Stratum Breeding Guild

- A diversity of wetland types and sizes are required to meet all wetland associated needs of this guild seasonally and annually.
- Fluctuating water levels seasonally and between years promotes both a temporal and spatial diversity of conditions in emergent stands. Under these conditions, suitable habitat is provided for all guild members over the long-term.

Water Surface and Water Column Feeding Guilds

- Without full water management capability, maintenance of a complex of natural wetlands with dynamic hydrologic cycles will provide the greatest diversity of foraging opportunities during spring and fall migration periods.

Bare Surface Feeding Guild

- A complex of wetlands with different hydrologic regimes, will provide the diversity of habitats required by all waterbird species in a localized area.

Strategies

•	The long-term strategy should be to maximize water retention in these basins. Existing water control structures (McDowell Lake, 30-Acre Lake, and Hale Lakes) can be replaced by a spillway set at a desired maximum level. Drainage ditches can be back-filled and the wetland basin returned to its natural configuration by removal of near shore islands and recontouring.

Rationale

Several previously drained wetlands on the refuge occur at the head of a drainage system and do not receive supplemental water from other wetlands. Because supplemental water is not available to recover from drawdown or maintain water depths over extended periods of time in these wetlands, active water management is not generally feasible. Based on overall depth, wetlands in this category can be separated into two types. The deeper wetland type with greater than 20% permanent open water has little need for a water control structure because drawdowns can result in artificial deficits that may be difficult to overcome in all but the wettest years without supplemental water. The remaining wetlands in this category are more shallow and seasonal in nature and have no permanent open water. This may be the result of either a shallower natural basin or the placement of a water control structure below the elevation of the natural outlet. As a result of the shallowness of these wetlands, they are often dominated by reed canarygrass. Control of reed canarygrass in these managed wetlands can be accomplished in part by raising the elevation of the outlet to allow deeper flooding.. This is an option in wetlands such as Palmer Meadow where the maximum elevation of the current outlet is lower than the pre-drainage outlet .

1E. RESTORATION OF NATURAL BASIN TOPOGRAPHY OBJECTIVE: By 2017, restore the natural basin topography and historic wetland function of 29 wetlands that have been manipulated in the past to create deeper wetland habitat and waterfowl nesting islands.

Guild Management Guidelines

Water column breeders

- Natural basin topography should be maintained or restored to a 10:1 slope to provide the necessary shallow, warm water areas needed for maintenance of this guild under a variety of water conditions.

Terrestrial covered surface breeders

- Islands can be excellent predator free breeding habitat for waterfowl members of this guild when they are located in the right environment. Critical features include a distance from shore of at least 160 feet, maintenance of water depths in excess of 50 inches around islands throughout the breeding season, a spacing of at least 60 feet between islands, and no more than two islands per 20 acres of wetland area.

Water column and water surface feeders

- Whenever possible large wetlands with gentle shoreline slopes should be flooded in the winter and spring to a depth that maximizes the amount of shallow flooded shoreline areas. These wetlands should be allowed to drawdown naturally through the spring and summer. These large wetlands have the highest potential for providing a sustained diversity of foraging strata for this guild overtime.

Bare surface feeders (shorebirds)

- Availability of exposed mudflats and an adjacent, shallow wetland zone with less than 25% vegetative cover from mid-June to the end of September is key to the maintenance of this guild during migration.
- Wetlands with a gradual sloping bottom provide a greater diversity of water depths and shoreline edge resulting in greater invertebrate diversity. As food diversity increases so does the diversity of species using different foraging strategies.

Strategies

- There are 29 wetland basins that have been manipulated through ditching, excavation of emergent plant beds and/or construction of nesting islands(Table 6 and Figure 5 of HMP). Primary restoration activities will involve the removal of the 427 islands and berms that do not meet minimum requirements (see terrestrial covered surface guild guidelines, Appendix D of HMP) for secure nesting islands. The material from both islands and berms will be pushed back into the borrow areas and recontoured to the original slope of the wetland basin. Because of the large quantity of work, only 3 small wetlands or a single large managed wetland will be restored per year. To avoid creating artificial recharge deficits, large, managed wetlands should not be drawn down to gain access for restoration work . The larger permanent wetlands may not be accessible until a year or two of below average recharge. The shallower more seasonal wetlands can generally be accessed during the late summer and fall of most years. All manipulated wetlands will be surveyed for the presence of water howellia prior to treatment.

Rationale

From 1968 to 1985, nearly 300 acres of seasonal wetland habitat has been impacted through the creation of over 700 nesting islands and activities to increase the interspersion of open water and emergent vegetation. The islands were created from spoil pushed up in the seasonal portion of several large sloughs and smaller potholes. Built too close to shore and each other and in water too shallow to prevent access by predators, these islands have not been used successfully by nesting waterfowl. Island construction resulted in the direct loss of seasonal wetland habitat by burial and the scrapes often exposed the underlying tephra layer. These areas are in general devoid of a vegetative substrate for egg attachment, predator escapement and aquatic invertebrates, the primary food source. In some wetlands, the entire shoreline area has been recontoured to a more abrupt slope. The potential negative impact to the water column breeding guild is the loss of the gentle shoreline gradient that provides shallow, warmwater breeding sites and foraging areas for hatchlings and older larvae.

1F. REED CANARYGRASS CONTROL OBJECTIVE: By 2000, develop and apply on an experimental basis management strategies to restore and maintain native plant communities of seasonal wetlands and wet meadows dominated by reed canarygrass.

Guild Management Guidelines

Bare surface feeders (shorebirds)

- Availability of exposed mudflats and an adjacent, shallow wetland zone with less than 25% vegetative cover from mid-June to the end of September is key to the maintenance of this guild during migration.

Water column and water surface feeders

- Whenever possible large wetlands with gentle shoreline slopes should be flooded in the winter and spring to a depth that maximizes the amount of shallow flooded shoreline areas. These wetlands should be allowed to drawdown naturally through the spring and summer. These large wetlands have the highest potential for providing a sustained diversity of foraging strata for this guild overtime.

***Howellia* guidelines**

- Evasive exotic species capable of invading water howellia habitat, such as reed canarygrass, may through competition for light and space reduce or eliminate the area of suitable habitat in a wetland basin.

Strategies

- There are 4 wetland basins (Helms Meadow, Schaefer Meadow, Palmer Meadow, and McDowell Meadow that have large enough stands of reed canarygrass to warrant the use of replacement control strategies (HMP Figure 6). Experimental plots will be established in these areas to test various restoration strategies involving the use of deep flooding, prescribed fire, high intensity short duration grazing, haying, herbicides, discing and seeding. Although these sites are not typical water howellia habitat, a survey will be conducted prior to any treatment. Treatments found to be effective will be applied n a larger scale. This site and future experimental treatments will be monitored to determine their success in restoring native plant communities.

Rationale

Wet meadows and seasonal wetlands have been invaded by reed canarygrass (*Phalaris arundinacea*), an exotic perennial grass which out competes nearly all native plant species. Gone are the diverse seasonal wetland habitats dominated by native sedges, rushes, and grasses. Loss of native plant diversity and the heavy accumulation of litter and higher stem density of reed canarygrass areas decreases the biodiversity of the refuge and severely limits use by wetland dependent wildlife. Water howellia, a federally threatened aquatic plant species restricted to seasonal wetlands, is at risk of being displaced by reed canarygrass.

GOAL#2. Protect and restore water quality and quantity sufficient to maintain native wetland flora and fauna.

2A. WATER RIGHTS REVIEW OBJECTIVE: By 1999, review the status of current adjudicated water rights and all claims for water rights and update to coincide with current water management objectives.

Strategies

- Work with the Regional Engineer to review current adjudicated water and all water right claims to assure they coincide with current water management objectives.

Rationale

The Service has claims on all major drainages flowing onto the Refuge but only five water rights have been adjudicated. The majority of the Refuge's water rights are still unadjudicated claims. The State of Washington has no immediate plans to complete the adjudication of claims in this area. It will be likely many decades before the Refuge has a final determination of its water rights. Although the Refuge's claims are valid water rights which allow for the diversion and use of water in the Refuge wetlands,

because they are unadjudicated, the State will not regulate other water users to protect the Refuge's water rights. Therefore, the water supply to the refuge may be threatened.

2B. MONITORING OF WETLANDS LEVELS OBJECTIVE: Annually monitor wetland recharge and water losses for the 22 managed wetlands to quantify water usage and the status of local groundwater resources.

Strategies

- Contour maps of the 22 managed wetland basins will be developed through contract surveying or by refuge staff using a geographic positioning system and measurement of water depths relative to the water control structure. Contour maps and water level monitoring will allow calculation of water volumes in individual basins. Because the bottom of the control structure is often higher than the lowest point in the basin, a piezometer well is required near the structure of each managed wetland to measure the level of the water table and water use to support existing water rights and claims. Piezometer wells are currently in place at Kepple Lake, Upper Turnbull, Lower Turnbull and Long Lake. The topography of these four wetlands will be surveyed and mapped first. Eighteen more piezometer wells will be placed at the remaining managed wetlands. adjudicated water and all water right claims to assure they coincide with current water management objectives.

Rationale

Monitoring of groundwater and wetland water levels on the Refuge has clearly demonstrated that wetland water levels are supported through the summer months by inflow from the shallow water table. The greater the number of wells drilled into the local aquifer, the higher the likelihood that subsurface water flows to Refuge wetlands will diminish, ultimately affecting Refuge habitats for waterfowl and other species.-Most of the current and future domestic and industrial development in the area is reliant on groundwater withdrawals from the local shallow aquifer, much of which is unregulated. Under State regulations, individual and Group B (2-14 connections) systems pumping less than 5,000 gallons per day are exempt from the standard water permitting procedure. In addition, the city of Cheney has recently added additional deep municipal wells. The number of new wells and the lack of institutional mechanisms to curb groundwater "mining" pose a threat to the shallow aquifers in the area. Use of the aquifer faster than its recharge rate will result in a lowering of the water table. There is indication that drought, coupled with increased domestic well use, has lowered the water table on the Refuge already. With shallower wetlands, we will see increased encroachment of the invasive species, reed canary grass, together with other marsh edge species. This would negatively affect the production of waterfowl and other waterbirds through declining acres of open water and a lack of adequate brood rearing habitat in summer.

2C. WATERSHED YIELD OBJECTIVE: Restore and maintain the natural water yield of refuge watersheds through restoration of open forest conditions and riparian habitats within the annual forest treatment areas.

Strategies

See strategies under Objectives 3A and 3C.

Rationale

The hydrologic regime of many small wetlands have been altered through changes in the density of coniferous forest cover in local water sheds. Reduction of coniferous forest cover and restoration of deciduous riparian vegetation should increase water yields through decreased transpiration and interception of precipitation (Gifford et al. 1984). Coniferous trees transpire for a longer period of the year than either deciduous woody vegetation or grass and forbs. The presence of tree foliage throughout the year in coniferous forest results in the interception of a greater amount of snowfall by the tree canopy. This results in less snow pack and potentially less runoff to wetland basins. It is likely that intercepted snow evaporates more readily than snow on the ground because of the greater surface area exposed to solar radiation and wind (Debyle 1985).

2D. WATERSHED QUALITY COORDINATION OBJECTIVE: By 2000, identify properties adjacent to the refuge that contain large portions of the four major drainage systems that enter the refuge and their watersheds, and coordinate with federal, state, and local agencies to identify and reduce non-point sources of pollution and to protect water quantity.

Strategies

See strategies for objective 2F in CCP.

Rationale

Grazing and mechanical disturbance of soil associated with the use of heavy equipment during habitat improvement work on the refuge can potentially affect water quality through increased erosion and sediment transport to wetlands. Heavy concentrations of livestock can deposit nitrogenous waste into wetlands resulting in eutrophication. Drained wetland basins on private lands are currently used as pasture and hay for livestock. Many of these basins are drained by the four major ditches that enter the refuge. A study of water quality completed on the refuge in 1992 by Eastern Washington University (Whalen et. al. 1992) found high concentrations of nitrogen and phosphorus entering the refuge in drainwater from both the Kaegle and Phillips Ditch. The private pastures drained by these two ditches are used as pasture in late summer and fall and during the winter as feedlots. Spring thaw and rain transports the accumulated animal waste into the drainage ditch and onto the refuge. The result is nutrient enrichment of affected wetlands resulting in extensive algal blooms. Algal blooms caused severe oxygen debt and the death of fish and invertebrate species. Dense algal mats in late summer restrict access of young waterfowl to invertebrate and plant food resources.

All homes outside the Cheney city limits are on septic systems. The majority of residential development within a mile of the refuge will be using septic systems. There is a strong possibility these systems could contaminate the shallow aquifer resulting in nutrient enrichment and eutrophication of refuge wetlands.

In 1992, a potential landowner applied for a permit from the county to allow placement of an auto wrecking yard adjacent to Philleo Ditch. During a public hearing, the refuge manager and several private citizens testified to the importance of Stubblefield Lake to wildlife and the inadequacy of the applicant's environmental checklist as required by the State Environmental Protection Act. The hearing officer found the checklist inadequate and denied the permit until the applicant completed a more thorough review. The applicant has not yet reapplied. As the area around the refuge becomes increasingly urbanized there will be other applications of this sort and a real potential for contamination of surface and ground waters entering the refuge.

GOAL #3. Restore refuge forest to a natural distribution of stand structural and successional stages to benefit forest dependent wildlife.

3A. RESTORATION OF PONDEROSA PINE OBJECTIVE: Restore and manage refuge ponderosa pine forest through the annual treatment of a minimum of 400 acres to improve forest health, restore diverse native understory plant communities and maintain natural tree densities and the distribution and diversity of stand conditions necessary to sustain native forest-dependent wildlife(Figure 3 and Figure 4).

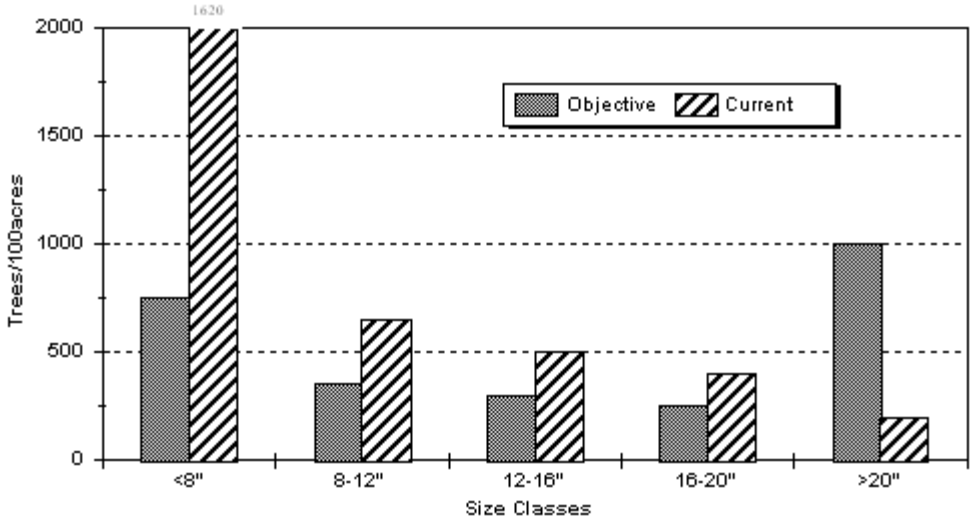


Figure 3 . Comparison of objective and current mean tree densities by size class.

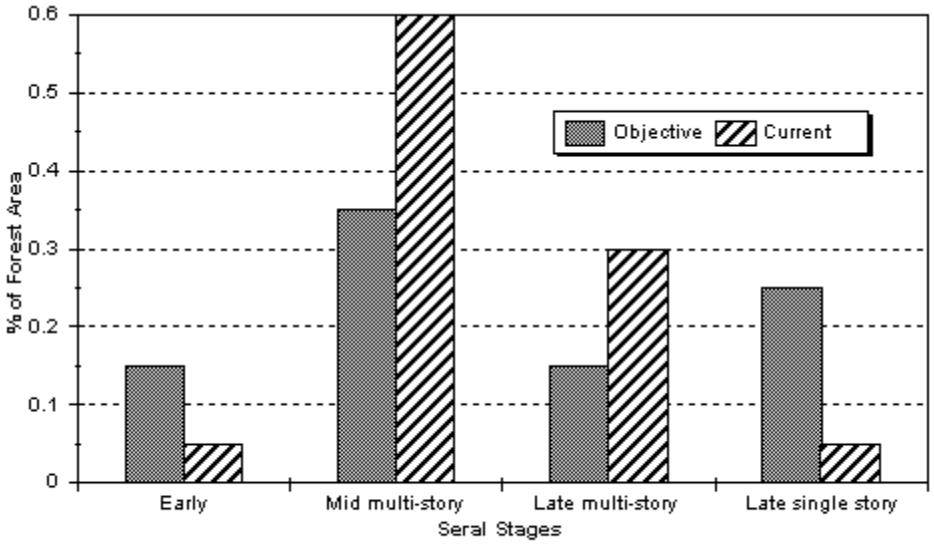


Figure 4. Comparison of objective and current distribution of forest seral stages.

Guild Management Guidelines

Tree canopy breeders

- In general, higher breeding densities of individual guild members are associated with greater height to the bottom of the tree canopy and greater volume of individual tree canopies.
- The majority of the guild membership are found more frequently and in greater abundance in open forest that provide access to open air spaces and surface and shrub strata for foraging.

Cave/Crevice breeders

- The plant community and the structural or successional stage in which these features occur and the proximity of preferred foraging strata may be important determinants of suitability. Management of the refuge for a natural distribution and diversity of plant communities and structural and successional stages should met the needs of all guild members.

Terrestrial sub-surface breeders

- Highest densities of fossorial guild members are found in areas of deep soils with a minimum of rock.
- Successional stage and structure of the overlying plant community and the proximity to water are important determinants of habitat suitability.
- Deep soil habitat with open or early successional plant cover with an abundance of herbaceous forb species is important to both key indicator species, the northern pocket gopher and Columbian ground squirrel.
- Maintenance of the natural distribution and diversity of successional stages and structural classes on these deep soil sites should meet the needs of this guild.

Terrestrial Covered surface feeders

- In general, maintenance of a natural distribution and diversity of plant communities and successional stages will provide the habitats necessary to sustain this guild during migration and wintering periods.

Strategies

- In general, trees greater than 24 inches should be reserved.
- Unless the lack of larger size class prevents meeting tree density objectives, tree stems less than 8 inches in diameter should be cut and removed from the site. If left on site, they should be piled for later burning.
- Commercial harvest should be employed to remove excess trees in intermediate size classes. Single -tree selection and group-selection should be used to create a grouped spatial arrangement of different densities and size classes, including openings for future regeneration.
- All commercial harvest involving the use of heavy equipment should take place in the winter when soils are frozen and snow covered
- Thinning and commercial harvest activities should be followed up with low intensity/high moisture burn to remove a portion of the slash and piles. Another higher intensity/low moisture burn should be completed in the late summer or fall of the following year to complete fuel reductions and understory treatment.
- Treatment units should be burned again at approximately 10 to 25 year intervals to mimic natural fire return intervals (Arno 1988 and Kinateder and Stein 1998).

Rationale:

Based on studies in ponderosa pine communities in the Southwest, pre-settlement stocking densities of ponderosa pine stands ranged from 19 - 47 trees per acre (Covington and Moore 1994). Trees were often found in relatively even-aged clumps approximately 0.07 acres in size (Cooper 1961, West 1969, White 1985). Although a diversity of different age and tree densities were present in the landscape, the overall aspect of the forest was open and park-like, with predominately large diameter trees in single-storied stands(Quigley and Arbelbide 1996). The bottom of the tree canopy was higher as result of frequent pruning by ground fires. This higher canopy resulted in less needle scorch and needle fall. These higher canopies and more open stands favored many members of the canopy and tree and snag bole breeding and aerial feeding guilds. The presettlement understory consisted of a dense ground cover of bunchgrasses or low shrubs that favored ground breeding and foraging species. Common snowberry and Wood's rose, although common, were probably less abundant and represented by a higher proportion of live stems as a result of frequent low intensity ground fires. Excessive accumulations of needles and other organic debris would have been reduced by these fires promoting the development of cryptogamic soil crusts on bare soils between the low shrubs and bunchgrasses. These understory conditions provided valuable breeding and foraging habitats for members of the terrestrial covered surface breeding and foraging guilds.

Past logging, grazing and suppression of fire has created pine stands with tree densities 2 to 4 times the pre-settlement condition. Large trees greater than 24 inches (60 cm) in diameter constitute less than 10% of the stands. Large portions of the refuge ponderosa pine forest have a similar age and size structure. The forest understory is dominated by decadent snowberry and a dense layer of organic debris that suppresses the growth of native bunchgrasses and forbs. Fuel loading in refuge pine stands is 5 times greater than the average for this forest type. Gone is the open park-like savanna of large ponderosa pine trees with an understory of bunchgrasses and forbs typical of this forest type. Conditions are ripe for catastrophic loss due to insects, disease, and fire.

3B. SNAG RECRUITMENT OBJECTIVE: During annual forest treatments, provide conditions in refuge ponderosa pine and aspen stands that result in recruitment of the density and distribution of snags necessary to sustain 40% of the maximum potential breeding populations of cavity excavating wildlife species (Table 3).

Table 3. Objective and current snag densities (snags/100acres) in ponderosa pine and aspen stands of Turnbull National Wildlife Refuge.

	Ponderosa Pine		Aspen	
Size Class	Objective	Current	Objective	Current
> 12 inches	309	74	144	1862

Guild Management Guidelines

Tree bole and Snag breeders

- The larger the tree or snag diameter the better. As a rule, most guild members use snags or trees greater than 15 inches in diameter at breast height.
- Snags are more valuable in clumps than individually.
- Trees with large diameter dead tops are important snag resources because of their height and greater longevity
- Forest stand conditions should provide a density of snags necessary to maintain at least 40% of the maximum breeding population of cavity excavators. A good rule of thumb is a density of approximately 3 hard snag equivalents per acre.

Strategies

- Long-term strategy for meeting objectives for snags and downed woody material requires the restoration and maintenance of forest stand conditions that foster recruitment and retention of large diameter snags.(see Strategies Objective 3a). Forest conditions should promote the growth of larger, older trees that are more resistant to decay and less susceptible to crown scorch. These conditions should also deter large scale disturbances that kill large numbers of trees and limit the ability of damaged trees to respond to insect attack.
- Because of the current low numbers of snags in refuge pine stands, meeting snag density objectives in the short-term will require increasing snag recruitment and retention. Snags can be created in association with forest restoration activities through the use of fire, girdling, or blasting.
- An alternative to snag creation is the use of artificial nest boxes until snag objectives are met through forest restoration. Nest boxes also provide an opportunity to monitor the productivity of cavity using species.

Rationale

Since trees near the end of their physiological life were present in many presettlement stands, there were probably a fair number of large dbh snags available within the landscape. These larger snags were more resistant to rot and windfall and probably persisted for decades providing an adequate habitat base for

cavity using wildlife requiring more open habitat. Keen (1961) reported average snag densities of 4 snags per acre in ponderosa pine forest in the early part of this century. Densities ranged from 1.1 to 7.9 snags per acre. This range of densities correspond with the recommendations of several researchers studying the needs of cavity using wildlife (Balda 1975, Cunningham et al. 1980, Scott and Oldemeyer 1983, Raphael and White 1984).

The current average density of snags in refuge forest stands is less than 1 per acre. Past logging and suppression of fire has resulted in the loss of mature and old growth stands that produce large diameter snags that persist over long periods of time. Existing stands are overstocked with pole and sapling sized pines that suppress tree growth and root development. Most snags are less than 15 inches(38 centimeters) in diameter and are extremely susceptible to blow down.

3C. ASPEN / RIPARIAN RESTORATION WITHIN PINE CLIMAX STANDS

OBJECTIVE: Within annual forest treatment units, restore the natural diversity of stand conditions and the dominance of aspen and native deciduous shrub species in riparian habitat now dominated by Ponderosa Pine to increase the number and size of habitat patches to support members of the tree canopy and shrub strata breeding and foraging guilds.

Guild Management Guidelines

Shrub breeders and foragers

- Patches of shrub habitat greater than the average reported territory size of shrub nesting passerines (0.83 acres) should be maintained.
- The greater the number of patches, the larger the patch size, and the closer patches are to each other the greater occupancy rate and productivity of guild members.
- Greater volume of shrub foliage in habitat patches provides better security cover by impeding the movement of predators and shielding the nest and/or activities of parents and neonates that can alert a predator.

Tree canopy breeders and foragers

- In general, higher breeding densities of individual guild members are associated with greater height to the bottom of the tree canopy and greater volume of individual tree canopies.
- For guild members that require deciduous tree cover, greater habitat occupancy is found in larger habitat patches in close proximity to other suitable patches in the landscape.

Strategies

- Meeting aspen/shrub riparian objectives will require strategies that can return dominance of aspen and deciduous shrubs to stands where ponderosa pine is climax, regenerate declining, even-aged stands, and restore degraded stream side riparian habitat. The periodic use of prescribed fire can remove advance regeneration of ponderosa pine and kill above ground aspen stems stimulating regeneration through root sprouting.

- Where mature pines are suppressing aspen growth and vigor, commercial harvest or non-commercial thinning can be used to remove trees(see Strategies for Objective 3a). Pine trees greater than 24 inches in diameter at breast height can be killed and left as snag habitat. If these large diameter pines, represent the only old growth pine remaining in an area they should be maintained.

- Restoration of degraded riparian habitats can be accomplished through the use of plantings. An excellent discussion of species and techniques related to plantings are provided by Monsen (1983) and in a symposium proceedings compiled by Clary et al. (1992). This strategy has already been employed on the reach of Pine Creek from Headquarter Pond to Winslow Pool using volunteers from the local Audubon chapter and scout groups. Rooted stock of thin-leafed alder (*Alnus incana*), black cottonwood (*Populus trichocarpa*), aspen, and red-osier dogwood have been used in these plantings. Because many of these areas are currently dominated by reed canarygrass, a planting area of approximately 16 ft^2 was cleared to reduce competition with shrub and tree plantings.

Rationale

Aspen dominated forest stands are a critical resource for species requiring both cavities and deciduous foliage in tree and shrub canopies for breeding and foraging. These aspen and deciduous shrub riparian habitat types have been significantly reduced on the refuge by competition from encroaching ponderosa pine and the suppression of aspen and shrub regeneration by past grazing. Aerial coverage of aspen and deciduous shrub dominated plant communities has been reduced by 65%. Existing stands are dominated by overmature trees with little regeneration. In the past, periodic fire removed encroaching pines and encouraged regeneration of aspen and understory shrubs.

3D. DOWNED LOGS OBJECTIVE: Annual forest management activities will provide at least 4 downed trees per acre, 15 to 17 inches in diameter at the large end and 20 feet or more in length to support the members of the terrestrial covered surface breeding guild requiring this habitat feature.

Guild Management Guidelines

Terrestrial covered surface breeders

- Several guild members require large dead and down material as cover above the soil surface. At least 4 logs, 15 to 17 inches in diameter at the large end and 20 feet or more in length should be maintained per acre.

Strategies

- Long-term strategy for meeting objectives for snags and downed woody material requires the restoration and maintenance of forest stand conditions that foster recruitment and retention of large diameter snags.(see Strategies Objective 3a).

Rationale

Coarse woody debris is an important breeding stratum for several members of the terrestrial covered surface breeding and foraging guilds. Current levels of large woody debris is considerably higher than presettlement conditions as a result of the suppression of fire and higher fall rates associated. Reintroduction of fire during forest restoration strategies will likely reduce the quantity and distribution of this habitat feature.

GOAL # 4. Protect and restore the natural distribution and diversity of grassland and shrub steppe habitats to benefit indigenous wildlife.

4A. LITTER COVER PERCENT OBJECTIVE: Annually, maintain at least 75% of grassland and steppe habitats as nesting cover for resident and migratory birds as indicated by at least 50% ground cover of litter and a visual obstruction measurement greater than 8 inches taken prior to any spring growth.

Guild Management Guidelines

Terrestrial cover surfaced breeders

- For upland nesting waterfowl and other waterbirds, areas of grass and low shrub cover within 200 yards of brood-rearing wetlands is of critical importance.
- A residual vegetation component should be maintained in at least 75% of the wet meadow and grass and low shrub dominated upland plant communities. As a rule, the maintenance of a visual obstruction reading of 10 inches or greater taken prior to initiation of current years growth will provide the best nesting cover. Visual obstruction is measured by estimating the height a pole is completing hidden from view by an individual 13.4 feet away.
- Litter is an important component of the terrestrial covered surface stratum and should be present but not in excess of 50% ground cover or a depth of 1 inch.

Rationale

Nearly all members of the terrestrial covered surface breeding guild require grass cover and litter. This requirement is particularly true of upland nesting waterfowl with three exceptions. Both the mallard and gadwall have been found in a variety of cover types and frequently use low shrubs and dense forbs that provide adequate concealment(Greenwood et al , 1995). Nest of green winged teal are often found in areas of tree and shrub cover and security cover is often provided by low shrubs and downed logs. Blue-winged teal, cinnamon teal, northern pintail, and northern shoveler nest are found primarily in grass dominated cover (Greenwood et al 1995). Several species especially the sparrows, also require grass and litter as a ground cover component. Wray and Whitmore(1979) found that successful vesper sparrow nest had a greater percentage of litter cover than unsuccessful nests. In a study of shrub-steppe birds of the Great Basin, Wein and Rotenberry(1981) found that grasshopper sparrows, meadowlarks and savannah sparrows were associated with greater grass and litter cover. The song sparrow, California quail and ruffed grouse utilize grass and litter cover under an overstory of shrubs or trees.

4B. ENCROACHING PINE REMOVAL OBJECTIVE: Restore and maintain the open grassland aspect to at least 50 acres of steppe habitat annually through removal of encroaching ponderosa pine trees.

Rationale

Many of the terrestrial covered surface breeding guild members that breed in the steppe portion of the Channeled Scablands avoid areas of extensive tree cover. Increasing canopy cover can also reduce grass cover a critical component of breeding habitat for members of this guild.

4C. EXOTIC PLANT SPECIES CONTROL OBJECTIVE: Control exotic plant species on between 25 and 50 acres of upland grassland and steppe habitats annually and by 1999 initiate an experimental program to investigate strategies to reduce the dominance of cheatgrass and restore native plant communities.

Strategies

- The primary strategy for controlling the expansion of introduced plant species will be maintenance of vigorous native plant communities. Soil disturbance will be kept to a minimum during habitat and facility management activities. Where soil disturbance does occur, disturbed sites will be replanted with native species.
- The control strategies for 6 herbaceous noxious plant species will include mowing of roadsides, manual pulling, discing and reseeding with native species, release of biological control agents, and use of herbicides (HMP Table 8).
- An experimental program will be initiated to determine the feasibility of using late winter and early spring burning followed by seeding of native plant species to control cheatgrass in steppe and forested habitats.

Rationale

The main limitation to achieving objectives for refuge steppe and grassland areas is the presence of exotic plant species. Exotic species were established in this community during past agricultural practices that involved farming and livestock grazing. These practices introduced the seeds of exotic species and disturbed the soil surface allowing invasion of native plant associations. The primary exotic species in these stands include cheatgrass brome (*Bromus tectorum*), ventanata (*Ventanata dubius*), St. Johns Wort , dalmatian toadflax, diffuse and spotted knapweed, and leafy spurge. Many of the mound areas in refuge steppe habitats are dominated by cheatgrass and ventanata with few remaining native species. Cheatgrass decreases the survival of native perennial seedlings by rapidly exploiting available soil water and nutrients (Harris 1967). Cheatgrass germinates earlier and over a longer period of time and continues root growth during cooler temperatures than native perennial species. The productivity and density of cheatgrass on the mounds and its early senescence also create a thick layer of thatch that further decreases survival of native plant seedlings, reduces the vigor of native forb species, reduces the cover of cryptogamic soil crust and may increase the frequency and intensity of fires(Mack 1981 and Tausch et al. 1994). Increased fire frequency and intensity further modifies steppe plant communities favoring cheatgrass.

4D. IDENTIFICATION OF INTACT GRASSLAND AND STEPPE OBJECTIVE: By 2000, identify areas of intact native upland grasslands and meadow steppe habitat adjacent to the refuge and through cooperation and coordination with private landowners, local, state and federal agencies, and private organizations maintain these lands as native plant communities.

GOAL #5. Maintain the biodiversity of the refuge through support of the conservation of threatened and endangered species in their natural ecosystems

5A. WATER HOWELLIA RESEARCH AND MONITORING OBJECTIVE: By 1999, conduct research and monitoring to answer critical questions about habitat requirements and species biology in order to design sound management plans for restoring and maintaining natural occurrences of water howellia.

Strategies

- Work with the Endangered Species Office and university researchers to develop a research design and acquire funding for this project.

Rationale

The Refuge contains 35 of 170 known occurrences of this species. Water howellia was listed as a threatened species under the Federal Endangered Species Act by the U.S. Fish and Wildlife Service in July 1994. A recovery plan is being drafted for the species. The recovery objective in the draft plan is " ... to provide an adequate level of protection for the species and its habitats so that there will be self-sustaining populations distributed throughout its range." Development and implementation of habitat management plans to sustain water howellia on federal lands is a Priority 1 recovery action..

Little information is available on the historic occurrence of this species on the refuge. Alteration of refuge wetlands through the years may have had a negative impact on this species reducing the amount of suitable habitat. Management or historic land use activities that significantly altered the basin bottom through mechanical excavation, combustion or sedimentation may have displaced the seedbed or caused direct mortality of seeds and jeopardized sub-populations of this species. Alteration of the hydrologic regime of a wetland through drainage or changes in the water yield of watersheds due to increased coniferous forest cover may have reduced the amount of available habitat. The introduction of evasive exotic species capable of invading water howellia habitat, such as reed canarygrass, may have through competition for light and space reduced or eliminated the area of suitable habitat in refuge wetland basins. Changes in water chemistry or temperature as a result of increased sedimentation or nutrient input could have resulted in changes in macrophyte and algal communities that may adversely affected the survival of individual populations through competition for light and space.

Research is needed on the ecology of water howellia, impacts of management actions on howellia and its habitat, and control methods for reed canarygrass. The findings of this research would assist in the development of more specific management plans.

5B. HOWELLIA PRECAUTION OBJECTIVE: Assure that annual management activities adjacent to known occurrences of water howellia do not create habitat conditions that fall outside the range of suitability for this species and may jeopardize its continued existence.

Strategies

- A survey for water howellia will be completed in all historic and potential habitats prior to any management treatment that may alter its habitat. Known occurrences will be avoided or restoration foregone in occupied wetlands.
- Forest restoration activities involving commercial tree harvest and restoration of seasonal wetlands have a potential to increase soil erosion and sedimentation. Mitigative measures would be utilized to minimize the risk to water quality that can impact important wetland values including the threatened plant species, water howellia. All tree harvest activities would take place only during periods of time that soils are resistant to compaction and erosion(dry or frozen). Log skidding will be minimized and landing areas will be dispersed and placed to avoid long skid trails. The butt-end of all felled trees would be lifted off the ground when skidded. Wide wheeled or tracked vehicles would be required to minimize impacts associated with rutting and disturbance of soil cover. Where possible harvester loaders and Feller/bunchers would be utilized to reduce damage from skidding. All disturbed areas including skid trails, landings and temporary access roads would be rehabilitated by replacing topsoil and seeding with native species. Hydro-seeding or a slurry mulch would be utilized in areas where greater than 75% of the ground cover is removed.
- Any tree harvest adjacent to wetlands would require that trees be felled away from the wetland and no tracked vehicle would be allowed within 25 yards of a wetland edge. Use of heavy equipment in wetland habitats for restoration purposes would be conducted when possible when the area is dry to avoid sediment movement throughout the basin.. Work would also be restricted to periods when water is static between ponds preventing transport of sediment between wetlands.

Rationale

Management activities in wetlands and uplands that disturb the soil (island removal, tree harvest, log skidding, prescribed fire etc.) have the potential to negatively impact water howellia. Increased sedimentation in wetlands can directly impact howellia by burying the seed bed thereby preventing germination or covering seedlings. Sedimentation can indirectly impact this plant species by altering water chemistry and light penetration that may change the associated plant community and existing competitive relationships. Use of heavy equipment in wetlands can also directly impact howellia by either displacing the seed bed or causing direct mortality to seedlings.

***5C. REDUCTION OF REED CANARYGRASS COMPETITION OBJECTIVE*:** By 2000, identify and apply on an experimental basis management strategies that may reduce the impact of reed canarygrass on the survival of water howellia.

Strategies

- Work with the Endangered Species Office and university researchers to develop a research design and acquire funding for this project.

Rationale

The introduction of evasive exotic species capable of invading water howellia habitat, such as reed canarygrass, may have through competition for light and space reduced or eliminated the area of suitable habitat in refuge wetland basins.

5D. HOWELLIA EDUCATION OBJECTIVE: By 2001, form partnerships with local, state, and federal agencies, and private organizations and individuals to develop and initiate an educational program concerning conservation of water howellia on private land.

Strategies

- An integral part of the proposed actions to protect water howellia habitat is an outreach and education program that informs the general public of its ecology and current and potential threats to its viability and strategies to minimize these threats. The refuge currently has an outreach and environmental education program directed at school-age children. This program needs to be extended to the community-at-large including refuge neighbors, local government agencies, and private groups and individuals. This can be accomplished by development of outreach media including pamphlets, posters, video programs, community service projects and presentations by refuge staff to local business and service groups. Without an informed public, it will be difficult to accomplish objectives that involve the development of partnerships to minimize the impacts of private land use activities on howellia habitat and the refuge.

Rationale

A large percentage of the meta-population that includes the Turnbull NWR sub-populations occurs on non-federal lands. Because there is no regulatory authority to protect threatened species on these lands, outreach is needed in order to promote voluntary involvement in howellia habitat protection.

5E. HOWELLIA HABITAT PROTECTION OBJECTIVE: By 2001, explore options to protect additional water howellia habitat off refuge.

Rationale

Numerous potential howellia wetlands occur within the landscape surrounding the refuge. Recovery of this species requires that it ‘s current geographic distribution is maintained. This requires not only protection of occurrences on federal lands, but further protection of sub-populations within a larger meta-population.

GOAL #6. Support the maintenance of biologically effective landscape linkages and corridors between the refuge and other intact areas of vegetation zones representative of this ecoregion.

6A. PARTICIPATION IN COUNTY / MUNICIPALITY PLANNING OBJECTIVE: On a continuing basis, provide input into growth management planning of the counties and local municipalities surrounding the refuge to assure the maintenance of lands with natural vegetative cover between the refuge and other large intact natural areas.

Strategies

- Refuge staff will provide input on state, county, and local permits and proposed zoning changes that will affect land use of important areas adjacent to the refuge.
- Work with regulatory agencies to provide input to and improve compliance of land and water protection ordinances.

Rationale

For most of the refuge's existence, surrounding land use has mostly complemented the refuge by maintaining open space, providing a larger habitat base, and serving as critical linkage to other undisturbed habitats. However, in the past twenty years, Spokane County's population has increased by 30%. Accelerated home construction, business developments, and the transportation infrastructure to service this growing population have begun to isolate the refuge from other undisturbed habitat. This development increases the potential for threats such as contamination of air and water, altered or depleted supplies of surface and ground water, loss of connectivity to other suitable or complimentary habitats, and the invasion of exotic plant and animal species that erode the integrity o f the refuge. The above strategies will help to minimize the negative impacts of the area's growth.

6B. MAINTENANCE OF NATIVE LAND COVER OBJECTIVE: Through coordination and cooperation with private landowners, local, state, and federal agencies, and private organizations identify opportunities to maintain the native land cover on properties within undeveloped areas contiguous with the refuge that support the goal of maintaining landscape linkages and corridors.

Strategies

- Work with partners to expand the currently limited refuge education and outreach program to include refuge neighbors, local, state, and federal government agencies, private organizations and individuals.
- Coordinate with the above mentioned groups to identify opportunities to maintain native land cover .
- Use cooperative agreements, acquisition of easements and fee-title purchase to protect native land cover within the approved refuge boundary and encourage landowner participation in conservation programs within the stewardship area.

Rationale

For most of the refuge's existence, surrounding land use has mostly complemented the refuge by maintaining open space, providing a larger habitat base, and serving as critical linkage to other undisturbed habitats. However, in the past twenty years, Spokane County's population has increased by 30%. Accelerated home construction, business developments, and the transportation infrastructure to service this growing population have begun to isolate the refuge from other undisturbed habitat. This development increases the potential for threats such as contamination of air and water, altered or depleted supplies of surface and ground water, loss of connectivity to other suitable or complimentary habitats, and the invasion of exotic plant and animal species that erode the integrity o f the refuge. The above strategies will help to minimize the negative impacts of the area's growth.

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APPENDIX C: FIRE MANAGEMENT PLAN SUMMARY

C.1 INTRODUCTION

This appendix is a summary of the Fire Management Plan (FMP) for Turnbull National Wildlife Refuge which was approved in 2001. The summary is intended to give readers an introduction to the FMP and how it relates to the rest of the planning process.

C.2 WILDFIRE RISK: NEED FOR FIRE MANAGEMENT PLAN

Due to the success of local fire agencies in preventing and suppressing wildland fires both on and off the Refuge for many years, extreme levels of live and dead fuels now occupy the forest environment, creating conditions of high probability for a large devastating wildland fire within the near future. One of the greatest threats to the resource integrity of Turnbull NWR is uncontrolled wildland fires. A medium sized wildland fire (5,000 to 10,000 acres) would alter the Refuge environment for decades to come, affecting the wildlife that inhabit the refuge, water quality, aesthetic value to visitors, and economic value to the community. A wildland fire could threaten numerous private residences built on lands immediately adjacent to the Refuge and on lands leased by the USFWS for wildlife easements. Several Refuge buildings, including historic structures, would be threatened by wildfire.

The expansion of the urban interface to the boundaries of the Refuge creates a complex fire environment, which constrains fire management options in both fire suppression and prescribed fire. Currently, there are hundreds of homes in the ponderosa pine forests surrounding the refuge creating contiguous fuels from the refuge through the urban interface. Extreme fire weather in the local fire environment is punctuated by hot, dry winds blowing from the southwest off the Palouse. There is the potential for a fire originating on or burning through the Refuge, attaining extreme size and extreme fire behavior in the process and continuing across Refuge boundaries into residential areas causing significant structural loss and damage. Similarly a fire could originate in the urban interface and spread onto the refuge damaging wildlife habitat and refuge facilities.

As the human population continues to increase around the Refuge boundaries, the potential for human caused fires increases proportionally. The combination of natural ignition potential coupled with the human factors that increase fire risk, including more residential development, traffic, visitors and human activity around the Refuge, creates an extremely high fire potential for the area. Large amounts of dead fuels that have accumulated in the pine forests within and surrounding the refuge also increase the risk.

Department of Interior policy requires that all Refuges with vegetation capable of sustaining fire, develop a fire management plan that details wildland fire suppression policies, the use of prescribed fire for attaining resource management objectives and fire program operational procedures. The Fire Management Plan is an extension of the Refuge Habitat Management Plan. It describes in detail fire management programs, activities and methods that will be undertaken by the U.S. Fish & Wildlife Service in meeting the wildland fire suppression objectives and fire management strategies which utilize prescribed fire to attain the habitat management goals established for Turnbull NWR. The plan also assesses the potential environmental effects of the proposed fire management program in relation to Refuge resources, the local environment as well as impacts to the public, adjacent landowners and surrounding communities. Consideration of these issues is required by the mandates of the *National Environmental Policy Act of 1972 (NEPA)* and other applicable federal laws and regulations.

C.3 FIRE PROGRAM PURPOSE AND CAPABILITY

The purpose of the wildland fire suppression program at Turnbull NWR is to provide the equipment and personnel necessary to suppress wildland fires that occur within or near the Refuges boundaries that threaten life, property and Refuge resources. It is also the intention of the USFWS to provide cooperative wildland fire suppression assistance to local, state and other federal firefighting agencies in the suppression of wildland fires when requested through the provisions of various mutual-aid agreements, cooperative agreements, and as mandated by federal law.

Current suppression capability on the Refuge consists of a 500 gallon 4 wheel drive quick attack engine (ICS type V), a 900 gallon extended operations engine (ICS type IV), a 300 gallon engine unit (ICS type VI) and a 3000 gallon water tender (ICS type II). All initial attack engines are "Class A" foam equipped to increase effectiveness in all aspects of fire operations. The Refuge also maintains a 20 person fire cache consisting of hand tools, chainsaws, personal protective equipment, field pack meals and first aid supplies. Various equipment such as porta-tanks and a "Mark III" porta-pump support fire suppression and prescribed fire activities

C.4 PLAN DECISIONS

It is the intention of the U.S. Fish & Wildlife Service to continue to suppress all wildland fires occurring within Turnbull NWR, including natural lightning ignitions. Prescribed fire will be utilized under controlled conditions and defined weather variables to mimic the natural role of fire in sustaining ecosystem functions, improve habitat conditions for wildlife and reduce hazardous accumulations of dead fuels for fire prevention.

The FMP needs to be viewed side by side with the Habitat Management Plan, completed in 1999, which describes specific actions and techniques that will be undertaken by the U.S. Fish & Wildlife Service to manage the various habitat types found within the Refuge. Since wildland fire played an essential role in the evolution of the ponderosa pine/bunchgrass ecosystem, prescribed fire is one of many techniques for manipulating vegetation within the Refuge to meet habitat management objectives.

The specific objectives of the wildland fire management program are to:

1. Protect human life and property both within and adjacent to Refuge areas.
2. Perpetuate, restore, replace or replicate natural processes where appropriate.
3. Protect natural and cultural resources from unacceptable impacts due to fire and fire management activities.
4. Promote an interagency approach to managing fires on an ecosystem basis.
5. Develop and implement a process to ensure the collection, analysis and application of high quality fire management information needed for sound management decisions.
6. Employ strategies to suppress all wildland fires, which minimize costs and resource damage, consistent with values at risk.
7. Prevent unplanned human-caused ignitions.
8. Restore and rehabilitate facilities lost in or damaged by fire or suppression activities.
9. Minimize and mitigate human-induced impacts to resources or natural processes.
10. Promote public understanding of fire management programs and objectives.
11. Conduct fire activities in a manner consistent with applicable laws, policies and regulations.
12. Organize and maintain a fire management capability which consistently applies the highest standards of professional and technical expertise.

13. Encourage research to advance understanding of fire behavior, effects, and ecology.
14. Integrate fire management with all other aspects of Refuge management.

Refuge fire crews, engines and qualified incident management personnel are national resources and will be fully utilized to respond to requests for assistance from other agencies. The Interagency Fire Agreement (No. 83-SIE) provides the basis for cooperation between the agencies of the Departments of the Interior and Agriculture on all aspects of wildland fire management and to facilitate the cooperative use of fire related resources during national or regional non-fire emergencies.

As part of the Refuge wildland fire pre-suppression program staff will identify areas of hazardous accumulations of woodland and range fuels and attempt to reduce wildland fire potential and effect by using various means of fuel reduction including; manual fuel reduction by crews, mechanical fuel reduction with Refuge equipment and hazard fuel reduction prescribed burns. The U.S. Fish & Wildlife Service will also participate and provide fire prevention activities and awareness programs within and around the Refuge in cooperation with other local and State fire agencies.

In addition to the interagency agreements between federal firefighting agencies, Turnbull NWR has entered into specific mutual aid agreements with local and state fire suppression agencies. These agreements are with Spokane County Fire District #3 and the State of Washington Department of Natural Resources.

The basic concept of these agreements is that no single agency has the suppression capability to control large and devastating wildland fires within local area and that it is more cost effective to enlist the support of other agencies within the region. These agreements are generally executed without exchange of funds between the agencies, with the understanding that unusual amounts or types of resources, (such as air tankers) or in extended attack situations will require some reimbursement. The agreements specify that each agency involved will retain autonomy in the command of it's individual resources through the implementation of the "Unified Command System" in which agency representatives of each agency involved in the suppression effort will be included within the command organization of the incident.

The existence of the wildland/urban interface surrounding the Refuge presents significant constraints on the use of prescribed fire in relation to potential liabilities resulting from escaped fires. An escaped fire resulting from a Refuge habitat management prescribed fire that burns into private property will cause severe constraints to be placed upon the use of prescribed fire by the FWS. Due to the importance of using prescribed fire in the management of the Refuge, extreme caution should be used when implementing prescribed fires. The USFWS must maintain a significant initial attack capability of engines, crews, dozers and water tenders to deal with this risk. Cooperative agreements and/or funding is required to provide for remuneration to local fire agencies to assist Refuge staff in the implementation of the prescribed fire program. The values at risk from an escaped prescribed fire are too great to allow escapes to occur into areas surrounding the Refuge. This constraint will continue to increase the urban interface continues to develop adjacent to the Refuge. Communication is necessary with local agencies about the magnitude of the wildland fire problem on and around the Refuge.

C.5 FIRE ECOLOGY

Fire is a natural phenomenon and has played a critical role in the ecosystem dynamics of natural communities represented within Turnbull National Wildlife Refuge (NWR). Before the advent of current wildland fire suppression capabilities, naturally caused fires burned thousands of acres of upland and wetland vegetation in eastern Washington each year. Prior to the advent of significant fire suppression

capabilities in the early third of this century, fires within the local region area were ignited primarily by lightning and possibly aboriginal burning practices. Lightning is frequent in eastern Washington during summer and fall. Lightning activity coincides with fuel moisture conditions conducive to natural ignitions, causing fires of significant size.

Natural disturbance is one of the primary progenitors in the maintenance and succession of natural vegetation communities. Fire is one of the most significant and frequent mechanisms for natural disturbance in the forest and range vegetation communities in western North America (Ahlgren & Ahlgren 1960). Extensive research has been conducted into the role of natural fire in the development and extent of the ponderosa pine/bunchgrass vegetation type, which predominates the upland communities of Turnbull NWR. Weaver (1955) and Kinateder (1998) studied fire scarred ponderosa pine stump sections in eastern Washington and found an average fire frequency of one fire every 8 years between the middle 1700's to the early 1900's. The frequency of fire in ponderosa pine communities is a function of the climatic conditions found within the habitats occupied by the species. Ponderosa pine generally prefers drier site soil conditions and requires full sunlight for successful reproduction without the competition of overstory canopy. Aboriginal ponderosa pine forests were described as forests consisting of large trees of even-age classes widely spaced apart, giving the appearance of a well managed park. Tree reproduction in these primal forests was in small even-aged groups growing in open clearings. These forest openings were generated by a variety of processes including windfall, insect attacks or mortality from old age. The accumulations of dead material within these areas of tree mortality created conditions conducive to intense fires which produced forest openings suitable for regeneration of the shade intolerant ponderosa pine seedlings (Biswell 1963, Weaver 1955).

The short fire return interval in ponderosa pine forests kept levels of dead material from accumulating to amounts in which the subsequent fire would be of sufficient intensity to cause mortality to the mature trees which are protected by a thick layer of bark. These frequent low intensity fires also kept shade-tolerant trees and shrubs out of the forest understory, which insured the perpetuation of the ponderosa pine forest type. Fire caused openings in the forest provided excellent regeneration sites for ponderosa pine seedlings; exposure to full sunlight, good penetration of the forest canopy of the available moisture, and high levels of available nutrients through pyrolytic decomposition of dead forest biomass.

As the ponderosa pine regeneration reached the sapling stage, heavy drops of pine needles (a characteristic of ponderosa pine which makes this community inherently more flammable) would accumulate to a degree sufficient to support a low intensity fire, which would serve to thin the stand of young trees. The surviving trees, growing with less competition, would subsequently become more vigorous and more resistant to future fires. Trees reaching maturity would thus be those with the best adaptive traits to survive fire and through time genetic selection favored ponderosa pine with characteristics that made them even more resistant to fire.

Natural fires occurring within the Channeled Scabland ecosystem that comprises Turnbull NWR probably ranged in size from small single tree fires to fires that burned thousands of acres over a period of several weeks to months, under the right conditions of fuel moisture and wind. These larger fires, which occurred less frequently than the more common low intensity lightning caused fire, burned not only the upland ponderosa pine communities, but the adjacent wetland communities as well. In very dry years, these fires had the capability to burn into the marsh basins, removing the dead biomass (peat) that accumulated in the marsh bottoms and in the process, deepen the wetland basin.

This same pre-historic scenario of frequent small fires, and infrequent large fires served to maintain other vegetation communities that are found within Turnbull NWR, including the annual grasslands,

perennial grasslands, shrub, and riparian communities. The riparian communities probably burned with less frequency (40 to 80 year intervals) and intensity due to the moisture content of the vegetation present. Long fire return intervals of large intense wildland fires probably played the most important role in the renewal of riparian communities due to the time periods required for sufficient fuel buildup and drought conditions sufficient to allow fire to carry through the usually moist riparian vegetation.

After wildland fire suppression capabilities improved, the natural role of fire in sustaining dynamic ecosystem conditions within the vegetation communities of Turnbull NWR declined. In the 1980's the U.S. Fish & Wildlife Service began a program of using controlled burning in marshes and forested areas within the Refuge to re-introduce the influence of fire in maintaining habitat conditions favorable to waterfowl production and natural diversity.

For more specific information about the vegetation and ecology of the various habitat types at Turnbull NWR, see the full Fire Management Plan or the Habitat Management Plan.

C.6 OTHER RESOURCE CONSIDERATIONS

Cultural Resources: All Refuge fire management activities require compliance with the National Historic Preservation Act. All prescribed fire plans are required to be reviewed by the Regional Cultural Resource Specialist for compliance with state and federal historic preservation acts.

Air Quality: Air quality and its relationship to the fire management program and smoke management is a very sensitive issue within the local communities surrounding Spokane. Portions of Spokane County have been designated as non-attainment areas for particulate matter (PM-10: particulates 10 microns or less in size) under the provisions of the Clean Air Act (Public Law 95-95). The Clean Air Act established "National Ambient Air Quality Standards" and provides the States with the primary jurisdiction in air quality management. Under the act, States are required to identify areas which have air pollutant levels which do not meet national standards. Working with Washington State Department of Natural Resources (DNR) and Spokane County Air Pollution Control Agency (SCAPCA) the U. S. Fish & Wildlife Service will minimize smoke impacts on the local communities from the larger controlled broadcast burns.

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APPENDIX D: SPECIES LISTS

The following lists show species confirmed or expected on the Refuge or the Study Area. Status codes are defined at the end of the Appendix.

ANIMAL LIST

CLASS	ORDER	Common Name	Genus	species	STATUS
ACTINOP-TERYGII		eastern brook trout	Salvelinus	fontinalis	EX, extirpated
		rainbow trout	Onchorynchus	mykiss	EX
		kokanee	Onchorynchus	nerka	EX
		cutthroat trout	Onchorynchus	clarki	EX*
		largemouth bass	Micropterus	salmoides	EX
		smallmouth	Micropterus	dolomieu	EX*
		pumpkinseed	Lepomis	gibbosus	EX
		black crappie	Pomoxis	nigromaculatus	EX*
		speckled dace	Rhinichtys	osculus	
		redside shiner	Richardsonius	balteatus	
		tench	Tinca	tinca	EX
		Yellow perch	Perca	flavescens	EX*
		brook stickleback	Culaea	inconstans	EX
		brown bullhead	Ictalurus	nebulosus	EX
AMPHIBIA		blotched tiger salamander	Ambystoma	tigrinum	SM
		East. long-toed salamander	Ambystoma	macrodactylum	
		Pacific chorus frog	Hyla	regilla	
		Columbian spotted frog	Rana	lutriventris	SC
		Great Basin spadefoot toad	Bufo	woodhousii	
REPTILIA		rubber boa	Charina	bottae	
		west. yellow-bellied racer	Coluber	constrictor	
		valley garter snake	Thamphis	eyrtopsis	
		wandering garter snake	Thamphis	elegans	
		Great Basin gopher snake	Pituophis	melaleucus	
		N. Pacific rattlesnake	Sistrurus	catenatus	
		Western painted turtle	Chrysemys	pictabelli	EX
AVES	ANSERIFORMES	mallard	Anas	platyrhynchos	NAWCA
		northern pintail	Anas	acuta	NAWCA
		green-winged teal	Anas	crecca	
		cinnamon teal	Anas	cyptera	
		blue-winged teal	Anas	discors	
		northern shoveler	Anas	clypeata	
		gadwall	Anas	strepera	
		American wigeon	Anas	americana	
		ruddy duck	Oxyura	jamaicensis	
		canvasback	Aythya	valisineria	NAWCA
		lesser scaup	Aythya	affinis	NAWCA
		redhead	Aythya	americana	NAWCA
		ring-necked duck	Aythya	collaris	NAWCA
		wood duck	Aix	sponsa	NAWCA
		bufflehead	Bucephela	albeola	
		Barrow's goldeneye	Bucephala	islandica	

CLASS	ORDER	Common Name	Genus	species	STATUS
		common goldeneye	Bucephala	clangula	
		white-winged scoter	Melanitta	fusca	
		hooded merganser	Lophodytes	cucullatus	
		red-breasted merganser	Mergus	serrator	
		common merganser	Mergus	merganser	
		snow goose	Chen	caerulescens	
		Canada goose	Branta	canadensis	
		great white-fronted goose	Anser	albifrons	
		trumpeter swan	Cygnus	buccinator	
		tundra swan	Cygnus	columbianus	
	APODIFORMES	Vaux's swift	Chaetura	vauxi	SC,PIF
		black-chinned hummingbird	Archilochus	alexandri	
		calliope hummingbird	Stellula	calliope	
		rufous hummingbird	Selasphorus	rufus	
	CAPRIMULGIFORMES	common nighthawk	Chordeiles	minor	
	CHARADRIIFORMES	killdeer	Charadrius	vociferus	
		lesser golden plover	Pluvialis	fulua	
		semi-palmated plover	Charadrius	seimipalmatus	
		black-bellied plover	Pluvialis	squatarola	
		black tern	Chlidonias	niger	R1,SM
		ring-billed gull	Larus	delawararensis	
		Franklin's gull	Larus	pipixcan	
		Forster's tern	Sterna	forsteri	SM
		California gull	Larus	californicus	
		Bonaparte's gull	Larus	philadelphia	
		American avocet	Recurvirostra	americana	
		black-necked stilt	Himantopus	mexicanus	SM
		Wilson's phalarope	Phalaropus	tricolor	
		northern phalarope	Phalaropus	lobatus	
		spotted sandpiper	Actitis	macularia	
		common snipe	Gallinago	gallinago	
		semi-palmated sandpiper	Calidris	pusilla	
		red-necked phalarope	Phalaropus	lobatus	
		least sandpiper	Calidris	minutilla	
		long-billed curlew	Numenius	americanus	SM
		pectoral sandpiper	Calidris	melatos	
		western sandpiper	Calidris	mauri	
		lesser yellowlegs	Tringa	flavipes	
		dunlin	Calidris	alpina	
		marbled godwit	Limosa	fedoa	
		greater yellowlegs	Tringa	melanoleuca	
		long-billed dowitcher	Limdromus	scolopaceus	
	CHARADRIIFORMES	solitary sandpiper	Tringa	solitaria	
		sanderling	Calidris	alba	
		Baird's sandpiper	Calidris	bairdii	
	CICONIIFORMES	great blue heron	Ardea	herodias	SM
		American bittern	Botaurus	lentiginosus	R1
		great egret	Ardea	alba	SM
	COLUMBIFORMES	mourning dove	Zenaida	macroura	

CLASS	ORDER	Common Name	Genus	species	STATUS
	CORACIIFORMES	belted kingfisher	Ceryle	alcyon	
	FALCONIFORMES	red-tailed hawk	Buteo	jamaicensis	
		northern harrier	Circus	cyaneus	
		ferrugius hawk	Buteo	regalis	R1,ST
		sharp-shinned hawk	Accipiter	striatus	
		northern goshawk	Accipiter	gentilis	SC
		golden eagle	Aquila	chrysaetos	SC
		rough-legged hawk	Buteo	lagopus	
		Swainson's hawk	Buteo	swainsoni	SC
		Cooper's hawk	Accipiter	cooperii	
		bald eagle	Haliaeetus	leucocephalus	FT, ST
		turkey vulture	Cathartes	aura	SM
		American kestrel	Falco	sparverius	
		peregrine falcon	Falco	peregrinus	FE,SE
		merlin	Falco	columbarius	SM
		prairie falcon	Falco	mexicanus	SM
		osprey	Pandion	haliaetus	SM
	GALLIFORMES	ruffed grouse	Bonasa	umbellus	
		ring-necked pheasant	Phasianus	colchicus	EX
		gray partridge	Perdix	perdix	EX
		California quail	Callipepla	californica	
		sharp-tailed grouse	Tympanuchus	phasianellus	SC
	GAVIIFORMES	common loon	Gavia	immer	
	GRUIFORMES	sandhill crane	Grus	canadensis	SE
		sora	Porzana	carolina	
		American coot	Fulica	americana	
		Virginia rail	Rallus	limicola	
	PASSERIFORMES	horned lark	Eremophila	alpestris	
		cedar waxwing	Bombycilla	cedrorum	
		Bohemian waxwing	Bombycilla	garrulus	
		black-headed grosbeak	Pheucticus	melanocephalus	
		lazuli bunting	Passerina	amoena	
		brown creeper	Certhia	americana	
		black-billed magpie	Pica	pica	
		common raven	Corvus	corax	
		American crow	Corvus	brachyrhyncos	
		Steller's jay	Cyanocitta	stelleri	
		Clark's nutcracker	Nurifraga	columbiana	
		song sparrow	Melospiza	melodia	
		grasshopper sparrow	Ammodramus	savannarum	PIF, R1,SM
		spotted towhee	Pipilo	maculatus	
		vesper sparrow	Pooecetes	gramineus	SM
		lark sparrow	Chandestes	grammacus	R1
		dark-eyed junco	Junco	hyemalis	
		chipping sparrow	Spizella	passerina	PIF
		savannah sparrow	Passerculus	sandwichensis	
		Lincoln's sparrow	Melospiza	lincolnii	
		American tree sparrow	Spizella	arborea	
		fox sparrow	Passerella	iliaca	

CLASS	ORDER	Common Name	Genus	species	STATUS
		white-crowned sparrow	Zotrichia	leucophrys	
		white-throated sparrow	Zotrichia	albicollis	
		Cassin's finch	Carpodacus	cassinii	
		American goldfinch	Carduelis	tristis	
		pine siskin	Carduelis	pinus	
		house finch	Carpodacus	mexicanus	
		red crossbill	Loxia	curvirostra	
		common redpoll	Carduelis	flammea	
		rosy finch	Leucosticte	atrata	
		pine grosbeak	Pinicola	enucleator	
		evening grosbeak	Coccothraustes	vespertinus	
		violet-green swallow	Tachycineta	thalassina	
		barn swallow	Hirundo	rustica	
		cliff swallow	Petrochelidon	pyrrhota	
		bank swallow	Riparia	riparia	
		tree swallow	Tachycineta	bicolor	
		n. rough-winged swallow	Stelgidopteryx	serripennis	
		red-winged blackbird	Agelaius	phoeniceus	
		brown-headed cowbird	Molothrus	aeneus	
		Brewer's blackbird	Euphagus	cyanocephalus	
		yellow-headed blackbird	Xanthocephalus	xanthocephalus	R1
		northern oriole	Icterus	bullockii	
		western meadowlark	Sturnella	neglecta	
		loggerhead shrike	Lanius	ludovicianus	R1,SC
		northern shrike	Lanius	excubitor	
		northern mockingbird	Mimus	polyglottos	
		gray catbird	Dumetella	carolinensis	
		water pipit	Anthus	rubescens	
		veery	Catharus	fuscescens	
		American robin	Turdus	migratorius	
		western bluebird	Sialia	mexicana	
		Townsend's solitaire	Myadestes	townsendi	
		mountain bluebird	Sialia	currucoides	
		hermit thrush	Catharus	guttatus	
		varied thrush	Ixoreus	naevius	
		Swainson's thrush	Catharus	bicknelli	
		black-capped chickadee	Poecile	atricapillus	
		mountain chickadee	Poecile	gambeli	
		yellow warbler	Dendroica	petechia	
		common yellowthroat	Geothlypis	trichas	
		Nashville warbler	Vermivora	ruficapilla	
		orange-crowned warbler	Vermivora	celata	
		Townsend's warbler	Dendroica	townsendi	
		American redstart	Setophaga	ruticilla	
		Wilson's warbler	Wilsonia	pusilla	
		yellow-rumped warbler	Dendroica	coronata	
		MacGillivray's warbler	Oporornis	tolmiei	
		yellow-breasted chat	Icteria	virens	
		house sparrow	Passer	domesticus	EX
		ruby-crowned kinglet	Regulus	calendula	
		golden-crowned kinglet	Regulus	satrapa	
		white-breasted nuthatch	Sitta	carolinensis	
		red-breasted nuthatch	Sitta	canadensis	
		pygmy nuthatch	Sitta	pygmaea	

CLASS	ORDER	Common Name	Genus	species	STATUS
		European starling	Sturnus	vulgaris	EX
		Western tanager	Piranga	ludoviciana	
		rock wren	Salpinctes	obsoletus	
		marsh wren	Cistothorus	palustris	
		Bewick's wren	Thyromanes	bewickii	R1
		house wren	Troglodytes	aedon	
		winter wren	Troglodytes	troglodytes	
		canyon wren	Catherpes	mexicanus	
		Say's phoebe	Sayornis	saya	
		western wood-pewee	Nocontopus	sordidulus	
		eastern kingbird	Tyrannus	tyrannus	PIF
		western kingbird	Tyrannus	verticalis	
		willow flycatcher	Empidonax	traillii	SS
		western flycatcher	Empidonax	occidentalis	
		dusky's flycatcher	Empidonax	olberholseri	
		Hammond's flycatcher	Empidonax	hammondii	
		olive-sided flycatcher	Contopus	cooperii	R1,
		warbling vireo	Vireo	gilvus	
		solitary vireo	Vireo	solitarius	
		red-eyed vireo	Vireo	olivaceus	
	PICIFORMES	downy woodpecker	Picoides	pubescens	
		northern flicker	Colaptes	auratus	
		hairy woodpecker	Picoides	villosus	
		red-naped sapsucker	Sphyrapicus	nuchalis	
		yellow-bellied sapsucker	Sphyrapicus	varius	
		Lewis' woodpecker	Melanerpes	lewis	R1,SC
	PODICIPEDIFORMES	pied-billed grebe	Podilymbus	podiceps	
		eared grebe	Podiceps	nigricollis	
		horned grebe	Podiceps	auritus	SM
		western grebe	Aechmorphorus	occidentalis	SM
		red-necked grebe	Podiceps	grisegena	SM
	SIGIFORMES	northern pygmy owl	Glaucidium	gma	
		short-eared owl	Asio	flammeus	R1
		long-eared owl	Asio	otus	
		great horned owl	Bubo	virginianus	
		northern saw-whet owl	Aefolius	acadicus	
		western screech owl	Otus	Kennicotti	
		common barn owl	Tyto	alba	
MAMMAL	ARTIODACTYLA	Rocky Mountain elk	Cervus	canadensis	
		white-tailed deer	Odocoileus	virginianus	
		mule deer	Odocoileus	hemionus	
		moose	Alces	alces	
	CARNIVORA	coyote	Canis	lepophagus	
		bobcat	Felis	rufus	
		striped skunk	Mephitis	mephitis	
		river otter	Lutra	canadensis	
		long-tailed weasel	Mustela	frenata	
		mink	Mustela	vison	
		badger	Taxidea	taxus	

CLASS	ORDER	Common Name	Genus	species	STATUS
		raccoon	Procyon	lotor	
		black bear	Ursus	americanus	
	CHIROPTERA	little brown myotis	Myotis	lucifugus	
		Yuma myotis	Myotis	yumanensis	
		California myotis	Myotis	californicus	
		long-eared myotis	Myotis	evotis	SM
		big brown bat	Eptesicus	fuscus	
		fringed myotis	Myotis	thysanodes	SM
		small-footed myotis	Myotis	ciliolabrum	SM
		Silver-haired bat	Lasionycteris	noctivagans	
		pallid bat	Antrozous	pallidus	SM
		hoary bat	Lasiurus	cinereus	
		Townsend's big-eared bat	Plecotus	townsendii	SC
		long-legged myotis	Myotis	volans	SM
	INSECTIVORA	vagrant shrew	Sorex	vagrans	
	LAGOMORPHA	mountain cottontail	Sylvilagus	nuttallii	
	RODENTIA	beaver	Castor	canadensis	
		bushytail woodrat	Neotoma	cinera	
		meadow vole	Microtus	pennsylvanicus	
		Montana vole	Microtus	montanus	
		muskrat	Ondatra	zibethicus	
		deer mouse	Peromyscus	maniculatus	
		porcupine	Erethizon	dorsatum	
		northern pocket gopher	Thomomys	talpoides	
		Great Basin pocket mouse	Perognathus	parvus	
		yellow-bellied marmot	Marmota	flaviventris	
		Columbian ground squirrel	Citellus	columbianus	
		red squirrel	Tamiasciurus	hudsonicus	
		yellow pine chipmunk	Eutamias	amoenus	
		rthern flying squirrel	Glaucomys	sabrinus	
		western jumping mouse	Zapus	princeps	

PLANT LIST

Common Family	Family	Common Name	Genus	Species	Status
Water plantain	Alismataceae	American Water plantain	Alisma	plantago-aquatica	
		Arumleaf Arrowhead	Sagittaria	cuneata	
		Broadleaf Arrowhead	Sagittaria	latifolia	
Amaranth	Amaranthaceae	White Pigweed	Amaranth	albus	
		Redroot Amaranth	Amaranth	retroflexsus	
Sumac	Anacardiaceae	Poison ivy	Rhus	radicans	
Dogbane	Apocynaceae	Spreading dogbane	Apocynum	androsaemifolium	
Milkweed	Asclepiadaceae	Showy Milkweed	Asclepias	speciosa	
Barberry	Berberidaceae	Creeping Oregon Grape	Berberis	repens	
		Shining Oregon Grape	Berberis	aquifolium	
		European Barberry	Berberis	vulgaris	EX
Birch	Betulaceae	Mountain Alder	Alnus	incana	
		Red Birch	Betula	occidentalis	
		Paper Birch	Betula	papyrifera	
Borage	Boraginaceae	Fiddleneck	Amsinckia	lycopsoides	
		Small-flowered Fiddleneck	Amsinckia	menziesii	
		Madwort	Asperugo	procumbens	
		Torrey's Cryptantha	Cryptantha	torreyana	
		Western Hound's Tongue	Cynoglossum	spp.	
		Corn Gromwell	Lithospermum	ruderale	
		Western Gromwell	Lithospermum	arvense	
		Long-flowered Bluebells	Mertensia	longiflora	
		Blue scorpion-grass	Myosotis	micrantha	
		Popcorn Flower	Plagiobothrys	scouleri	
		Slender-branch Plagiobothrys	Plagiobothrys	leptocladus	
Harebell	Campanulaceae	Scotch Bluebells	Campanula	rotundifolia	
		Gray Howellia	Howellia	aquatilis	FT
		Showy Downingia	Downingia	elegans	
Honeysuckle	Caprifoliaceae	Blue Elderberry	Sambucus	cerulea	
		Snowberry	Symphoricarpos	albus	
Pink	Caryophyllaceae	Blunt-leaf Sandwort	Arenaria	lateriflora	
		Bigleaf Sandwort	Arenaria	macrophylla	
		Jagged Chickweed	Holosteum	umbellatum	
		Wild Pink	Silene	spp.	
		Spalding's silene	Silene	spladingii	FT
		Long stalk Starwort	Stellaria	longipes	
		Shining chickweed	Stellaria	nitens	
		Nodding chickweed	Stellaria	nutans	
Hornwort	Ceratophyllaceae	Coontail	Ceratophyllum	demersum	
Goosefoot	Chenopodiaceae	Wedgescale Orache	Atriplex	truncata	
		White Goosefoot	Chenopodium	album	
Aster	Compositae	Yarrow	Achillea	millefolium	
		False-dandelion	Agoseris	glauca	
		Low Pussytoes	Antennaria	dimorpha	
		Woodrush Pussytoes	Antennaria	luzuloides	
		Rosy Pussytoes	Antennaria	microphylla	
		Orange Arnica	Arnica	fulgens	

Common Family	Family	Common Name	Genus	Species	Status
Aster	Compositae	Prairie Sagebrush	Artemesia	ludoviciana	
		Scab Sagebrush	Artemesia	rigida	
		Three-tip sage	Artemesia	tripartita	
		Aster	Aster	spp.	
		Arrowleaf Balsamroot	Balsamorhiza	sagittata	
		Bachelor's Button	Centaurea	cyanus	
		Russian thistle	Centaurea	repens	
		Knapweed	Centaurea	spp	
		Chicory	Cichorium	intybus	
		Canada thistle	Cirsium	arvense	EX
		Palouse Thistle	Cirsium	brevifolium	
		Bull thistle	Cirsium	vulgare	EX
		Horseweed	Conyza	canadensis	
		Dwarf mountain fleabane	Erigeron	compositus	
		Gaillardia	Gaillardia	aristata	
		Slender Cudweed	Gnaphalium	microcephalum	
		Gumweed	Grindelia	spp.	
		Hounds-tongue Hawkweed	Hieracium	cynoglossoides	
		Hawkweed	Hieracium	spp.	
		Blue Lettuce	Lactuca	pulchella	
		Prickly Lettuce	Lactuca	serriola	
		Little Tarweed	Madia	exigua	
		Cluster Tarweed	Madia	glomerata	
		Slender Tarweed	Madia	gracilis	
		Small Head Tarweed	Madia	minima	
		Pineapple Weed	Matricaria	matricarioides	
		Alkali-marsh Butterweed	Senecio	hydrophilis	
		Western Groundsel	Senecio	integerrimus	
		Canada Goldenrod	Solidago	canadensis	
		Goldenrod	Solidago	Spp.	
		Common Tansy	Tanacetum	vulgare	
		Common Dandelion	Taraxacum	officinale	
		Yellow Salsify	Tragopogon	dubius	
		Mule's Ears	Wyethia	amplexicaulis	
Morning-glory	Convolvulaceae	Field Morning-glory	Convolvulus	arvensis	EX
Dogwood	Cornaceae	Red-osier Dogwood	Cornus	stolonifera	
Stonecrop	Crassulaceae	Wormleaf Stonecrop	Sedum	stenpetalum	
Mustard	Cruciferae	Common Wall Cress	Arabidopsis	thaliana	
		Sicklepod Rockcress	Arabis	sparsiflora	
		American Wintercress	Barbarea	orthocerus	
		Falseflax	Camelina	sativa	
		Shepard's Purse	Capsella	bursa-pastoris	
		Little Western Bittercress	Cardamine	oligosperma	
		Blue Mustard	Chorispora	tenella	
		Western Tansymustard	Descurainia	pinnata	
		Flixweed	Descurainia	sophia	
		Spring Whitlow-grass	Draba	verna	
		Scalepod	Idahoa	scapigera	
		Common Pepperweed	Lepidium	densiflorum	
		Clasping Pepperweed	Lepidium	perfoliatum	
		Western Yellowcress	Rorippa	curvisiliqua	
		Hispid Yellowcress	Rorripa	islandica	
		Water-cress	Rorripa	nasturtium - aquaticum	EX
		Tumblemustard	Sisymbrium	altissimun	EX
		Field Pennycress	Thlapsi	arvense	EX
Dodder	Cuscutaceae	Dodder	Cuscuta	sp.	
Sedge	Cyperaceae	Inflated Sedge	Carex	vesicaria	
		Thread-leaved Sedge	Carex	fififolia	

Common Family	Family	Common Name	Genus	Species	Status
Sedge	Cyperaceae	Inflated Sedge	Carex	vesicaria	
		Spike Rush	Eleocharis	spp.	
		Hardstem Bullrush	Scirpus	acutis	
		American Great Bullrush	Scirpus	vallidus	
Teasel	Dipsacaceae	Teasel	Dipsacus	sylvestris	EX
Oleaster	Elaeagnaceae	Russian Olive	Elaeagnus	angustifolia	EX
Horsetail	Equisetaceae	Horsetail	Equisetum	arvense	
		Common Scouring-Rush	Equisetum	hyemale	
		Smooth Scouring-Rush	Equisetum	laevigatum	
Heath	Ericaceae	Bearberry, Kinikinik	Arctostaphylos	uva-ursi	
		Prince's Pine	Chimaphila	umbellata	
		Pinedrops	Pterospora	andromedea	
		Wintergreen	Pyrola	spp.	
		Dwarf Huckleberry	Vaccinium	caespitosum	
Spurge	Euphorbiaceae	Thyme-leaf Spurge	Euphorbia	serpyllifolia	
Gentain	Gentianaceae	White-stemmed Frasera	Frasera	albicaulis	
		Gentian	Gentiana	spp.	
Geranium	Geraniaceae	Stork's Bill	Erodium	cicutarium	EX
		Bicknell's Geranium	Geranium	bicknellii	
		Sticky Geranium	Geranium	viscosissimum	
Grass	Gramineae	Interrupted Apera	Agrostis	interrupta	EX
		Crested Wheatgrass	Agropyron	cristatum	EX
		Bearded Wheatgrass	Agropyron	caninum	
		Slender Wheatgrass	Agropyron	trachycaulum	
		Quack Grass	Agropyron	repens	EX
		Blue-Bunch Wheatgrass	Agropyron	spicatum	
		Wheatgrass	Agropyron	spp.	
		Meadow Foxtail	Alopecurus	pratensis	EX
		Oatgrass	Arrhenatherum	spp.	EX
		Rattlesnake Grass	Bromus	brizaeformis	EX
		Hairy Brome	Bromus	commutatus	EX
		Smooth Brome	Bromus	inermis	EX
		Japanese Brome	Bromus	japonicus	EX
		Soft Cheat	Bromus	mollis	EX
		Cheat Grass	Bromus	tectorum	EX
		Pine Grass	Calamagrostis	rubescens	
		Reedgrass	Calamagrostis	spp.	
		Orchard Grass	Dactylis	glomerata	EX
		Oatgrass	Danthonia	spp	EX
		Tufted Hairgrass	Deschampsia	caespitosa	
		Annual Hairgrass	Deschampsia	danthonoides	
		Giant Wildrye	Elymus	cinereus	
		Idaho Fescue	Festuca	idahoensis	
		Fescue	Festuca	spp.	
		Northern Mannagrass	Glyceria	borealis	
		Foxtail Barley	Hordeum	jubatum	
		Prairie Junegrass	Koeleria	cristata	
		Cutgrass	Leersia	oryzoides	
		English Ryegrass	Lolium	perenne	EX
		Common witchgrass	Panicum	capillare	EX
		Reed canarygrass	Phalaris	arundinaceae	EX
		Common Timothy	Phleum	pratense	EX
		Big bluegrass	Poa	ampla New-juncifolia	EX
		Canada Bluegrass	Poa	compressa	
		Thurber's Needlegrass	Stipa	thurberiana	
		Bottlebrush Squirreltail	Sitanion	hystrix	

Common Family	Family	Common Name	Genus	Species	Status
Grass	Gramineae	Sandberg's Bluegrass	Poa	sandbergii	
		Kentucky Bluegrass	Poa	pratensis	EX
		Fowl Bluegrass	Poa	palustris	EX
		Bulbous Bluegrass	Poa	bulbosa	EX
		Ventanata	Ventanata	dubia	EX
Gooseberry	Grossulariaceae	Golden Currant	Ribes	aureum	
		Squaw Currant	Ribes	cereum	
		White-stem Gooseberry	Ribes	inerme	
		Gooseberry	Ribes	spp.	
Water-Milfoil	Haloragaceae	Spiked Water-Milfoil	Myriophyllum	spicatum	
		American Milfoil	Myriophyllum	exalbescens	
Hydrangea	Hippuridaceae	Mare's Tail	Hippuris	vulgaris	
Hydrangea	Hydrangeaceae	Syringa	Philadelphus	lewisii	
Frog's-Bit	Hydrocharitaceae	Rocky Mountain Waterweed	Elodea	canadensis	
		American Wild Celery	Vallisneria	americana	
		California Hesperochiron	Hesperochiron	californicus	
		Ballhead Waterleaf	Hydrophyllum	capitatum	
		Silverleaf Phacelia	Phacelia	hastata	
		Threadleaf Phacelia	Phacelia	linearis	
St. John's Wort	Hypericaceae	Common St. John's Wort	Hypericum	perforatum	EX
Iris	Iridaceae	Western Blue Flag	Iris	missouriensis	
		Grass Widow	Sisyrinchium	inflatum	
		Blue-eyed Grass	Sisyrinchium	angustifolium	
Rush	Juncaceae	Baltic Rush	Juncus	balticus	
		Rush	Juncus	spp.	
		Field Woodrush	Luzula	campestris	
Mint	Labiatae	Common Dead Nettle	Lamium	amplexicaule	
		Red Dead Nettle	Lamium	purpureum	
		Horehound	Marrubium	vulgare	EX
		Corn Mint	Mentha	arvensis	
		Catnip	Nepeta	cataria	EX
		Self-heal	Prunella	vulgaris	
		Wood-sage	Teucrium	canadensis	SS
		Blue-curls	Trichostema	oblongum	
Pea	Leguminosae	Purple Milk Vetch	Astragalus	agrestis	
		Milk Vetch	Astragalus	spp.	
		Sweet-pea	Lathyrus	spp.	EX
		Deer vetch	Lotus	spp.	
		Velvet Lupine	Lupinus	leucophyllus	
		Bigleaf Lupine	Lupinus	polyphyllus	
		Silky Lupine	Lupinus	sericeus	
		Black Medic	Medicago	lupilina	EX
		Alfalfa	Medicago	sativa	EX
		White Sweet Clover	Melilotus	alba	EX
		Yellow Sweet Clover	Melilotus	officinalis	EX
		Clover	Trifolium	sp	
		American Vetch	Vicia	americana	
		Vetch	Vicia	sp.	
Bladderwort	Lentibulariaceae	Common Bladderwort	Utricularia	vulgaris	
Duckweed	Lemnaceae	Star Duckweed	Lemna	trisulca	
		Water Lentil	Lemna	minor	

Common Family	Family	Common Name	Genus	Species	Status
Lily	Liliaceae	Hooker Onion	Allium	acuminatum	
		Geyer's Onion	Allium	geyeri	
		Douglas' onion	Allium	columbiana	
		Asparagus	Asparagus	officinalis	EX
		Douglas' Brodiaea	Brodiaea	douglasii	
		Common Camas	Camassia	quamash	
		Wartberry Fairy-bell	Disporum	trachycarpum	
		Yellow Bell	Fritillaria	pudica	
		Western Solomon Plume	Smilacina	racemosa	
		Starry Solomon Plume	Smilacina	stellata	
		Death Camas	Zigadenus	venenosus	
Meadow Foam	Limnanthaceae	False-mermaid	Floerkea	prosperpinacoides	
Flax	Linaceae	Blue Garden Flax	Linum	perenne	EX
Mallow	Malvaceae	Dwarf Mallow	Malva	neglecta	
		Oregon checker-mallow	Sidalcea	oregana	
Water Lily	Nymphaceae	Yellow Pond Lily	Nuphar	polysepalum	
Olive	Oleaceae	Common Lilac	Syringa	vulgaris	
Evening Primrose	Onagraceae	Elkhorn Clarkia	Clarkia	puchella	
		Fireweed	Epilobium	angustifolium	
		Autumn Willow-herb	Epilobium	paniculatum	
Orchid	Orchidaceae	Fairy-slipper	Calypso	bulbosa	
		Coral Root	Corallorhiza	sp.	
		Yellow Lady's slipper	Cypripedium	calceolus	SE
			Cypripedium	montanum	
		Hooded Ladies' Tresses	Spiranthes	romanzoffiana	
Broomrape	Orobanchaceae	Naked Broomrape	Orobanche	uniflora	
		Clustered Broomrape	Orobanche	fasciculata	
Pine	Pinaceae	Ponderosa Pine	Pinus	ponderosa	
		Douglas Fir	Pseudotsuga	menziesii	
Phlox	Polemoniaceae	Large Flowered Collomia	Collomia	grandiflora	
		Pink Microsteris	Microsteris	gracilis	
		Needle-leaf Navarretia	Navarretia	intertexta	
		Clumped Caespitosa	Phlox	caespitosa	
		Showy phlox	Phlox	speciosa	
		Little bells Polemonium	Polemonium	micranthum	
Plantain	Plantaginaceae	English Plantain	Plantago	lanceolata	EX
		Indian-wheat	Plantago	patagonica	
Buckwheat	Polygonaceae	Northern Buckwheat	Eriogonum	compositum	
		Wyeth Buckwheat	Eriogonum	heracleoides	
		Snow Buckwheat	Eriogonum	niveum	
		Doorweed	Polygonum	aviculare	
		Sulfur Buckwheat	Eriogonum	umbellatum	
		Water Smartweed	Polygonum	coccineum	
		Palouse Knotweed	Polygonum	majus	
		Spotted Thumbweed	Polygonum	periscaria	
		White- margined Knotweed	Polygonum	polygaloides	
		Knotweed	Polygonum	spp.	
		Red Sorrel	Rumex	acetosella	EX
		Curly Dock	Rumex	crispus	EX
		Seaside Dock	Rumex	maritimus	EX

Common Family	Family	Common Name	Genus	Species	Status
Common Fern	Polypodiaceae	Brittle Bladder-Fern	Cystoptris	fragilis	
		Bracken Fern	Pteridium	aquilinum	
		Woodsia	Woodsia	oregana	
Purslane	Portulaceae	Bitterroot	Lewisia	rediviva	
		Dwarf Montia	Montia	dichotoma	
		Narrow-leaved montia	Montia	linearis	
		Miners Lettuce	Montia	perfoliata	
		Common Purslane	Portulaca	oleracea	
Primrose	Primulaceae	Slimpod Shooting Star	Dodecatheon	conjugans	
		Few-flowered shooting star	Dodecatheon	pulchellum	
		Fringed Loosestrife	Lysimachia	ciliata	
Pondweed	Potamogetonaceae	Ribbon-leaf Pondweed	Potamogeton	epihydrus	
		Sago Pondweed	Potamogeton	pectinatus	
		Richardson's Pondweed	Potamogeton	richardsonii	
		Flat-Stemmed Pondweed	Potamogeton	zosteriformes	
		Broad-leaved Pondweed	Potamogeton	nutans	
Buttercup	Ranunculaceae	Upland Larkspur	Delphinium	nutallianum	
		Least Mouse-tail	Myosurus	minimus	EX
		White water Buttercup	Ranunculus	aquatilis	
		Yellow water Buttercup	Ranunculus	flabellaris	
		Creeping Buttercup	Ranunculus	flammula	
		Sagebrush Buttercup	Ranunculus	glaberrimus	
		Blister Buttercup	Ranunculus	sceleratus	EX
		Horn-seed Buttercup	Ranunculus	testiculatus	EX
Rose	Rosaceae	Serviceberry	Amelanchier	alnifolia	
		Black Hawthorn	Crataegus	douglasii	
		Wood's Strawberry	Fragaria	vesca	
		Large-leaved Avens	Geum	macrophyllum	EX
		Old man's Whiskers	Geum	triflorum	
		Oceanspray	Holodiscus	discolor	
		Nine bark	Physocarpus	malvaceus	
		Common Silverweed	Potentilla	anserina	EX
		Sticky Cinquefoil	Potentilla	glandulosa	
		Cinquefoil	Potentilla	sp.	
		Serviceberry	Amelanchier	alnifolia	
		Chokecherry	Prunus	virginiana	
		Apple	Pyrus	malus	EX
		Apple	Pyrus	spp.	EX
		Wood's Rose	Rosa	woodsii	
		Annual Burnet	Sanguisorba	occidentalis	EX
		Pyramid Spirea	Spirea	pyramidata	
Madder	Rubiaceae	Goose Grass	Galium	aparine	
		Northern Bedstraw	Galium	boreal	
		Small Bedstraw	Galium	trifidum	
Willow	Salicaceae	Quaking Aspen	Populus	tremuloides	
		Black Cottonwood	Populus	trichocarpa	
Saxifrage	Saxifragraceae	Roundleaf Alumroot	Heuchera	cylindrica	
		Bulbiferous Fringecup	Lithophragma	bulbifera	
		Small flower Fringecup	Lithophragma	parviflora	
		Swamp Saxifrage	Saxifraga	integrifolia	
Figwort	Scrophulariaceae	Red Besseya	Besseya	rubra	
		Paintbrush	Castilleja	lutescens	
		Small-flowered Blue-eyed Mary	Collinsia	parviflora	
		Dalmatian Toadflax	Linaria	dalmatica	EX
		Butter and Eggs	Lineria	vulgaris	EX

Common Family	Family	Common Name	Genus	Species	Status
Figwort	Scrophulariaceae	Thin leaved Owl Clover	Orthocarpus	tenuifolius	
		Hot-Rock Penstemon	Penstemon	deustus	
		Common Mullein	Verbascum	thlapsus	
		Common Speedwell	Veronica	arvensis	
		Purslane Speedwell	Veronica	peregrina	EX
		Skullcup Speedwell	Veronica	scutellata	
Selaginella	Selaginellaceae	Compact Selagenella	Selagenella	densa	
Nightshade	Solanaceae	Climbing Nightshade	Solanum	duleamara	
Bur-reed	Sparganiaceae	Bur-reed	Sparganium	eurycarpum	
Cattail	Typhaceae	Common cattail	Typha	latifolia	
Parsley	Umbelliferae	Western water Hemlock	Cicuta	douglasii	
		Cow Parsnip	Heracleum	lanatum	
		Swale Desert-parsely	Lomatium	ambignum	
		Fern-leaved Lomatium	Lomatium	dissectum	
		Couer d'Alene Lomatium	Lomatium	farinosum	
		Geyer's Lomatium	Lomatium	geyeri	
		Gorman's Lomatium	Lomatium	gormanii	
		Large Fruit Lomatium	Lomatium	macrocarpum	
		Nine Leaf Lomatium	Lomatium	triternatum	
		Blunt-Fruit Sweet-Root	Osmorhiza	depauperata	
Nettle	Urticaceae	Stinging Nettle	Urtica	dioica	
Valerian	Valerianaceae	long-horn Plectritis	Plectriris	macrocera	
		Tobacco Root	Valeriana	edulis	
Verbena	Verbenaceae	Bracted Verbena	Verbena	bracteata	
Violet	Violaceae	Hook Violet	Viola	adunca	

Status codes for both plants and animals

*species found only in the study area

SM State Monitor Species
SC State Candidate for listing
ST State Threatened
SE State Endangered

EX Exotic-no Federal protection
SS Federal Sensitive
FT Federal Threatened
R1 FWS Region 1 Species of Mgmt Concern

NAWCA- North American Waterfowl Conservation Act priority waterfowl
PIF - Partners in Flight priority species with ratings $\geq$9

APPENDIX E: COMPATIBILITY DETERMINATIONS

INTRODUCTION

This set of compatibility determinations (CDs) evaluates uses as projected to occur under the Preferred Alternative 3 in the Draft EA for the Comprehensive Conservation Plan (Draft CCP/EA). The evaluation of funds needed for management and implementation of each use also assumes implementation as described under Alternative 3.

Chapter 4 of the Draft CCP/EA also contains analysis of the impacts of public uses to wildlife and habitats. That portion of the document is intended to be incorporated through reference into this set of CDs.

Uses that occur on the Columbia Plateau Trail (CPT) are not evaluated in these CDs. The CPT is managed by the Washington State Parks and Recreation Commission; the Refuge maintains a Cooperative Agreement with the State of Washington which allows for responses from the Service on issues related to law enforcement, weed management, and fire. Recreational uses that are allowed on the CPT (mostly bicycling, hiking, and equestrian activity) are outside the bounds of Service authority.

USES EVALUATED AT THIS TIME

The following section includes full CDs for all Refuge uses that are required to be evaluated at this time. According to Service policy, compatibility determinations will be completed with all newly proposed uses under a Comprehensive Conservation Plan. Existing wildlife-dependent recreational uses must also be re-evaluated and new CDs prepared during development of a CCP. According to the Service's compatibility policy, uses other than wildlife dependent recreational uses are not explicitly required to be re-evaluated in concert with preparation of a CCP unless conditions of the use have changed or unless significant new information relative to the use and its effects have become available, or unless the existing CDs are more than ten 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. Given this, and the potential that some recently evaluated uses could occur in the proposed expanded area, we chose in this document to revise some recently prepared CDs.

Accordingly, the following CDs are included in this document for public review:

Use	Reason CD prepared	Year Due for Re-Evaluation
E.1 Wildlife Observation and Photography	Existing wildlife dependent rec use	2020
E.2 Environmental Education and Interpretation	Existing wildlife dependent rec use	2020
E.3 Waterfowl Hunting	Proposed wildlife dependent rec use	2020
E.4 Elk Hunting	Proposed wildlife dependent rec use	2020
E.5 Bicycling, Jogging, and Cross-Country Skiing	Local conditions have changed	2015
E.6 Research	Existing CD ten years old	2015
E.7 Agricultural Practicies	To evaluate potential use in expanded area	2015
E.8 Commercial Tree Harvest	To evaluate potential use in expanded area	2015
E.9 Firewood Collecting	Existing CD ten years old	2015

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 and dates back to 1918, as a concept. As policy, it has been used since 1962. The Refuge

Recreation Act of 1962 (Recreation Act) directed the Secretary of Interior to allow only those public uses of Refuge lands that were "compatible with the primary purposes for which the area was established."

Legally, Refuges are closed to all public uses until officially opened through a compatibility determination. 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 the Refuge. If a proposed use is found not compatible, the Refuge manager is legally precluded from approving it. Economic uses that are conducted by or authorized by the Refuge also require compatibility determinations.

Under compatibility policy, uses are defined as recreational or economic/commercial or management use of the 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 over the use. Such examples might include: property rights vested in others; legally binding agreements exist; treaty rights by tribes etc. In addition, aircraft overflights, emergency actions, some activities on navigable waters, and activities by other Federal agencies on "overlay Refuges" are exempt from the compatibility review process.

New compatibility regulations, required by the National Wildlife Refuge System Improvement Act of 1997 (NWRSIA), were adopted by the Service in October, 2000 (http://refuges.fws.gov/policymakers/nwrpolicies.html). The regulations require that a use must be compatible with both the mission of the System and the purposes of the individual Refuge. This standard helps to ensure consistency in application across the Refuge System. The Act also requires that compatibility determinations be written and that the public have an opportunity to comment on most use evaluations.

The System mission emphasizes that the needs of fish, wildlife, and plants must be of primary consideration. NWRSIA defined a compatible use as one that ". . . in the sound professional judgement of the Director, will not materially interfere with or detract from the fulfillment of the mission of the System or the purposes of the Refuge." Sound professional judgement is defined under NWRSIA as ". . . a finding, determination, or decision, that is consistent with principles of sound fish and wildlife management and administration, available science and resources. . . ." Compatibility for priority wildlife-dependent uses may depend on the level or extent of a use.

Court interpretations of the compatibility standard have found that compatibility is a biological standard and cannot be used to balance or weigh economic, political, or recreational interests against the primary purpose of the Refuge (Defenders of Wildlife v. Andrus [Ruby Lake Refuge I]).

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 Turnbull NWR are based on the professional judgement of Refuge and planning personnel including observations of Refuge uses and reviews of appropriate scientific literature.

LITERATURE CITED

Defenders of Wildlife v. Andrus (Ruby Lake Refuge I). 11 Envtl. Rptr. Cases 2098 (D.D.C. 1978), p. 873.

House of Representatives Report 105-106 (on NWRSIA) - http://refuges.fws.gov/policyMakers/mandates/HR1420/part1.html

New compatibility regulations, adopted by the Service in October, 2000: (http://refuges.fws.gov/policymakers/nwrpolicies.html).

E.1 WILDLIFE OBSERVATION AND PHOTOGRAPHY COMPATIBILITY DETERMINATION

Use: Wildlife Observation, Wildlife Photography (Alternative 3)

Refuge Name: Turnbull National Wildlife Refuge, Spokane County, Washington

Establishing and Acquisition Authorities:

- Executive Order 7681, dated July 30, 1937
- Migratory Bird Conservation Act [16 U.S.C. 715-715d, 715e, 715f-715r]
- 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):

- "*... as a refuge and breeding ground for migratory birds and other wildlife...*" (Executive Order 7681, dated July 30, 1937)
- "*... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.*" (16 U.S.C. 715d [Migratory Bird Conservation Act])
- "*... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ...*" (16 U.S.C. 460k-1) ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 16 U.S.C. 460k-2 (Refuge Recreation Act (16 U.S.C. 460k-460k-4), as amended).
- "*... for the development, advancement, management, conservation, and protection of fish and wildlife resources ...* "(16 U.S.C. 742f(a)(4) ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... 16 U.S.C. ¤¤ 742f(b)(1) (Fish and Wildlife Act of 1956).

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, as amended [16 U.S.C. 668dd-668ee])

Description of Use: Wildlife observation and wildlife photography are wildlife-dependent, non-consumptive uses with similar elements and so are considered together in this compatibility determination. Under the Preferred Alternative 3, the majority of wildlife observation and photography activities at the Refuge would occur within the Public Use Area and along the Columbia Plateau Trail. Some observation would occur along the Cheney-Plaza Highway, Cheney Spangle Highway and Mullinix Road as visitors pass by the Refuge. Visitors would engage in wildlife observation while walking trails or driving the auto tour route (or occasionally, while cross-country skiing or biking on the Refuge. Jogging, bicycling and cross-country skiing as specific uses on their own are treated separately in another CD.) This Compatibility Determination assesses effects from persons engaged in wildlife observation or photography while on foot or in a vehicle. At the current time, visitors are allowed to roam off-trail anywhere within the Public Use Area.

Existing facilities that are involved in these uses include: the auto tour route, all pedestrian trails on the Refuge, photo blinds, the entry fee station, and public restrooms. The auto tour route is 5.3 miles of graveled surface that runs through the heart of the Public Use Area. The auto tour route includes numerous pull-outs, parking areas with associated foot trails, and an accessible boardwalk with interpretive signs. Currently there are 7.75 miles of trails within the Public Use Area. In addition, visitors can access a 4.75 mile stretch of the Columbia Plateau Trail (CPT) that transects the Refuge near its western boundary (however, as explained in the Introduction above, uses occurring on the CPT are not analyzed in this CD due to lack of Service authority over that land).

New facilities proposed under Preferred Alternative 3 include the development of an additional 3.75 miles of pedestrian trails in the Public Use Area (the Public Use Area itself would also be enlarged). In addition, the Refuge would seek to develop four pullouts with developed viewpoints and interpretation on local county roads as described in Chapter 2 of the draft . The Preferred Alternative also proposes the development of additional photo/observation blinds at East Blackhorse Lake, Kepple Peninsula and along the CPT at Long Lake, and an elevated platform to be built at Stubblefield Lake. Visitors coming to view and photograph wildlife would also benefit from the substantial investment made in interpretive materials (signs), facilities and programs that are explored more fully under the Environmental Education / Interpretation CD.

Of the visitors arriving at the Refuge, more engage in wildlife observation and/or photography than any other use. In 2003, wildlife observation and photography visitation to the Refuge from non-student groups was approximately 20,000. Under Preferred Alternative 3, visitation numbers for these two uses are expected to rise, reaching approximately 30,000 by 2018. Visitation estimates are explained more fully in Chapter 4 of the CCP/EA. Approximately 20% of those coming to observe wildlife carry cameras and intend to photograph wildlife and wildlands. The most heavily used areas include trails and access points to Winslow Pool, Pine Lake, Blackhorse Lake, and Kepple Lake. The majority of use would occur on spring and summer weekends during the daytime.

Visitors are allowed to bring dogs but they must be kept leashed.

See Chapter 2 of the *Turnbull National Wildlife Refuge Draft Environmental Assessment for the Comprehensive Conservation Plan* for a detailed description of the use under the Preferred Alternative 3. Also see Map 5 for proposed locations and facilities of the use under Preferred Alternative 3 in Chapter 2 of the Draft CCP/EA. See Chapter 3 of the same document for a detailed description of the use at the current time.

This use is defined as a wildlife-dependent recreational use under the Improvement Act. See Implementation section (Appendix F of the Draft CCP/EA) to determine priority of projects associated with these uses as funding becomes available.

Use Within the Proposed Expansion Area: Chapter 2 of the draft CCP/EA identifies areas in which the Service would seek to acquire land from willing sellers outside of the current approved boundary [proposed Refuge expansion area]. Except for the Columbia Plateau Trail, which reaches beyond the Refuge to the northeast and to the southwest, there are no developed public wildlife observation, interpretation or photography facilities or sites located within the proposed Refuge expansion areas. Compatible wildlife observation, and photography could be allowed in the future expansion area in designated localities. Since we do not presently know which landowners may be willing sellers and which may not, we are not able to address specific uses in specific locations at this time. If lands are acquired, trails, pullouts, and signs supporting wildlife observation activities may be established, if determined compatible.

Availability of Resources: The following funds would be required to run a program as designed under the Preferred Alternative 3. The projected need represents an increase of approximately 300% in recurring expenses compared to current funding for this program. For the one-time expenses, all available sources would be investigated.

Activity or Project	One Time Expense	Recurring Expense
Design and construction of three photography blinds and elevated viewing platform	30,000	
Pedestrian trail development and accessibility improvements	154,000	
Development of pulloffs and viewpoints on county highways	250,000	
Screening and signing	5.000	
Maintenance of Public Use Facilities		50,000
Program Operation, Monitoring, and Law Enforcement		55,000
Totals	439,000	105,000

Offsetting revenues:

Annual Entrance fee receipts	$ 8,000
In kind services of volunteers	$ 50,000

Existing Refuge resources are not adequate to properly and safely administer the use as envisioned under the Preferred Alternative 3. To implement the use, the Refuge would pursue partnerships with appropriate cooperators and/or volunteers. Additional funds and in-kind services would be needed, especially to construct new facilities and upgrade facilities to Americans with Disabilities Act (ADA) standards.

Anticipated Impacts of the Use(s):

Wildlife Observation:

Physical and habitat alteration: The impact of these activities depends upon the size of the group(s), the season of use, the location within the Public Use Area, and the duration of the activity. The construction and maintenance of visitor use facilities (i.e. trails, observation points, photography blinds) would have some effect 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).

Human disturbance - general: The presence of people observing or photographing wildlife will also cause some impact to wildlife. Numerous studies have confirmed that people on foot can cause a variety of disturbance reactions in wildlife, including flushing or displacement (Erwin 1989; Fraser et al 1985; Freddy 1986), heart rate increases (MacArthur et al 1982), altered foraging patterns (Burger and Gochfeld, 1991), and even, in some cases, diminished reproductive success (Boyle and Samson 1985). These studies and others have shown that the severity of the effects depends upon the distance to the disturbance and its duration, frequency, predictability, and visibility to wildlife (Knight and Cole 1991). The variables found to have the greatest influence on wildlife behavior are a) the distance from the animal to the disturbance and b) 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).

Short term and immediate responses to disturbance are fairly simple to document. A question that has received less research attention is whether these short term responses, which generally require increased energetic expenditures on the part of the individual, ultimately diminish an individual or population's capacity to survive and breed successfully (fitness). Energetic demands of responding to disturbance events were measured by Belanger and Bedard (1989). In Quebec, they found that if disturbance was severe enough to cause the geese to fly and not resume feeding upon alighting, hourly energy expenditure increased by 3.4%; hourly metabolized energy intake decreased by 2.9 to 19.4%. A 32% increase in nighttime feeding was required to restore the energy losses incurred.

Wildlife are frequently more sensitive to disturbance from people on foot than in vehicles (Skagen 1980; Grubb and King 1991; MacArthur et al 1982).

Disturbance from Dogs: 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. Dog-walkers will be required to maintain control of their animal 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).

Effect of disturbance intensity: 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.

Effect of human proximity: Other 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. Elk in Yellowstone National Park were disturbed when people were at average distances of 573 m (Cassirer, 1990). These elk temporarily left the drainage and their home range core areas and moved to higher elevations, steeper slopes, and closer to forested areas. Average return time to the drainage was 2 days. 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 130m; 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.

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% 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.

In a review of several studies of the reaction of waterfowl and other wetland birds to people on foot, distances greater than 100 meters in general did not result in a behavioral response (DeLong 2002).

Effects on migrant birds versus resident birds: 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% versus 91%) and spent more time running (33% versus 2%), fighting with other chicks (4% versus 0.1%), and standing alert (9% versus 0.1%) 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% versus 97%) and more time up in the grass (66% versus 0.1%) during periods of human disturbance.

Wildlife Photography: 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 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% of the nest failures.

Summary: Effect at Turnbull: Both Refuge visitation and the number of facilities devoted to wildlife observation and photography are projected to increase under the Preferred Alternative 3 (viewpoints, observation blinds, trail miles). Given this, future disturbance effects are likely to be somewhat higher than present. Most studies cited above have demonstrated immediate, rather than long term, responses to disturbance. Long term responses are inherently more difficult and expensive to determine. Given that wildlife observation and activity is not typically a loud or intense kind of activity, the area of habitat within a known distance of human activity centers (Public Use Area, trails, EE sites, viewpoints) is considered a reasonable indicator to evaluate the disturbance effects of public uses on Refuge wildlife. This analysis is presented within Chapter 4, Section 4.1 of the Draft CCP/ EA. According to this analysis, the maximum percent of total habitat by category expected to be affected by public use activities under the Preferred Alternative 3 is: pine forest: 2.6% ; aspen: 4.1%; steppe: 13.5%; and wetlands 11.4%.

Anecdotally, Turnbull NWR staff have noted that most of the Refuge elk sightings occur outside the Public Use Area, indicating the elk are disturbed by the human presence there and avoid human contact by staying in the more secluded portions of the Refuge. This is likely to change once hunting is initiated on the Refuge; elk will be more likely to avoid the higher risk hunting areas and to move into the Public Use Area and other no-hunting zones on and off the Refuge.

Wildlife observation and photography may impact threatened and endangered species, including Spalding's silene and bald eagle. Impact to the silene populations are expected to be minimal. Disturbance impacts to the bald eagle would be expected to increase, but could be reduced to a certain extent through the design of public use facilities. See Section 4.1.7 of the Draft CCP/EA for further discussion of the effects of this use on threatened and endangered species.

Impacts from wildlife observation / photography, and the modes of transport used by visitors engaged in these activities, can be contained most effectively, mitigating the overall effect on Refuge wildlife, by ensuring that visitors remain on trails and within the areas designated for public use. This strategy (containing visitor use to trails) will be implemented under Preferred Alternative 3. Enforcement will be required to ensure that visitors follow the new on-trail-only rule. The Refuge is aware that some visitors

already disregard signs along the Columbia Plateau Trail requiring visitors to stay on the trail. These visitors leave the trail and make unauthorized routes to get closer to the lakes and wetlands nearby. Such events create greater disturbance to wildlife than that expected to occur from use of the trails themselves. It also contributes to direct damage of some habitat.

Public education that informs photographers of ethical and least intrusive methods is proposed under all alternatives and could reduce some impacts. Three new photo blinds are proposed in under Preferred Alternatives 3. The purpose of these photo blinds is to provide a site where photographers can get close-up photographs without disturbing wildlife. Placement of these additional blinds would likely reduce disturbance from wildlife photographers.

Although disturbance to wildlife from these activities will be higher than at present, we anticipate that the overall effect to the Refuge wildlife will still be minimal, being mostly dealt with at the outset by being contained within trails and other public facilities only within the Public Use Area and on the Columbia Plateau Trail.

Anticipated Impacts of the Use within the Proposed Expansion Area: If and when the Refuge acquires land within the expansion area, there could be opportunities for compatible wildlife observation and/or wildife photography. Due to the similarity of species and habitats with current Refuge owned lands, this use would be anticipated to have impacts similar to those described for current Refuge owned lands. If the Refuge manager determines that those opportunities would substantially change the conditions under which this use was found compatible, or that there is new, substantive information regarding the effects of the use, this CD would need to be re-evaluated.

Public Review and Comment: Public review and comments will be solicited in conjunction with the CCP/EA in order to comply with the National Environmental Policy Act and with Service policy.

Determination :

____ Use is Not Compatible

_X_ Use is Compatible With Following Stipulations

Stipulations Necessary to Ensure Compatibility:

User Stipulations:
- Visitors will be required to stay on trails and designated roadways throughout the year.
- Use is restricted to daylight hours only.
- Pets must be kept leashed at all times.

Administrative stipulations:
- Allowing the use as described in Preferred Alternative 3 is contingent upon finding the full funding to properly manage and administer the use. However, if funds are short for construction of facilities associated with this use, that should not be construed as invalidating the compatibility of the use overall.
- At least 50% of the Refuge will be managed as wildlife sanctuary free from routine human disturbance.
- Where feasible native trees and shrubs will be planted to create screening along trails and at observation points to reduce disturbance.

- Elevated observation platforms, accessible trails, and boardwalks will be designed to help reduce negative visitor impacts to soils, vegetation and hydrology.
- Regulations will be available to the public through a Refuge brochure.
- Directional, informational and interpretive signs will be posted and maintained to help keep visitors on trails and help educate the public on minimizing wildlife and habitat disturbance.
- Monitor human use levels by activity and evaluate impacts of increased human uses on Refuge.

Justification: Wildlife observation and photography are two 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. By limiting these activities to a small percentage of the Refuge and by usually providing wildlife sanctuary from human disturbance in other areas of the Refuge, these programs will not interfere with the Refuge achieving its purposes of providing *sanctuary* and a *breeding ground for migratory birds and other wildlife*. These uses contribute to the purpose of *wildlife-oriented recreational development*. Although there are impacts from these activities, the wildlife observation, interpretation, and photography programs complement the Refuge purpose, vision and goals and the NWRS Mission.

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 (check one below):

___ Categorical Exclusion without Environmental Action Statement
___ Categorical Exclusion and Environmental Action Statement
___ Environmental Assessment and Finding of No Significant Impact
___ Environmental Impact Statement and Record of Decision

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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

E.2 ENVIRONMENTAL EDUCATION AND INTERPRETATION COMPATIBILITY DETERMINATION

Use: Environmental Education and Interpretation (Alternative 3)

Refuge Name: Turnbull National Wildlife Refuge, Spokane County, near Cheney,Washington

Establishing and Acquisition Authorities:

- Executive Order 7681, dated July 30, 1937
- Migratory Bird Conservation Act [16 U.S.C. 715-715d, 715e, 715f-715r]
- 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):

- "*... as a Refuge and breeding ground for migratory birds and other wildlife...*" (Executive Order 7681, dated July 30, 1937)
- "*... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.*" (16 U.S.C. 715d [Migratory Bird Conservation Act])
- "*... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ...*" (16 U.S.C. 460k-1) ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 16 U.S.C. 460k-2 (Refuge Recreation Act (16 U.S.C. 460k-460k-4), as amended).
- "*... for the development, advancement, management, conservation, and protection of fish and wildlife resources ...* "(16 U.S.C. 742f(a)(4) ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... 16 U.S.C. ¤¤ 742f(b)(1) (Fish and Wildlife Act of 1956).

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, as amended [16 U.S.C. 668dd-668ee])

Description of Use: Environmental Education (EE) consists of educational activities conducted by Refuge staff, volunteers, partners and teachers. EE themes pertain to the Refuge, the NWRS, wildlife and their habitats and the human environment. The EE program goal is to foster an understanding of and appreciation for resource management, to broaden understanding of the human impacts on wildlife habitats, and to encourage active participation in resource protection. Between 3,000 - 8,000 students are currently served each year by the Refuge's EE program.

Interpretation occurs in less formal activities (i.e. infrequently scheduled tours or casual talks) conducted by Refuge staff or volunteers. Interpretive material is also available to visitors through exhibits (mostly found in the EE classroom), signs and brochures.

Environmental education currently occurs within the 2,200-acre Public Use Area at four outdoor designated sites and in the EE classroom. Under Preferred Alternative 3, the Refuge proposes improving each of these sites as well as expanding the EE classroom. Each EE site would eventually consist of a shelter, vault toilet, parking facilities for bus and car, and an activities trail.

With a full time environmental education staff person, seasonal help, and volunteers, the Refuge could host approximately 10,000 students per year. The students would be engaged in education activities using curricula approved and/or designed by Refuge staff and reviewed by teachers. EE use of the

Refuge would be most intensive during spring (mid April - mid June) and fall (mid September - mid November).

Interpretive materials are not widely available now on the Refuge, with the exception of signs and/or markers on three interpretive trails. The Columbia Plateau Trail Interpretive panels would be developed following plans laid out in the Refuge's Interpretive Prospectus (under development) and as described for the Preferred Alternative 3 in Chapter 2. Panels would be established at various pullouts, trails, and observation points within the Public Use Area and at four county highway pullouts. The Friends of Turnbull NWR are developing an interpretive brochure for the Kepple Peninsula trail that interprets various features, habitats and wildlife that can be observed along the trail. Seasonal public use staff will also be available for some guided tours/hikes within the Public Use Area. These guided interpretive activities will most likely occur in summer when heavier public use occurs and be provided to such requesting groups as Boy Scouts, Girl Scouts, senior citizen groups, etc. An interpretation exhibit area would be designed in concert with new office space to be constructed sometime over the next fifteen years. Chapter 2 of the Draft CCP/EA provides additional details regarding the EE and interpretation programs. Also see Map 5 for proposed locations and facilities of the use under Preferred Alternative 3 in Chapter 2 of the Draft CCP/EA.

Environmental education and interpretation are both defined as wildlife-dependent recreational uses under the Improvement Act. See Implementation section (Appendix F of the Draft CCP/EA) to determine priority of projects associated with these uses as funding becomes available.

Use Within the Proposed Expansion Area: Chapter 2 of the draft CCP/EA identifies areas in which the Service would seek to acquire land from willing sellers outside of the current approved boundary. There are no developed public environmental education centers or sites within the expansion area. Since land acquisition within an expanded boundary is an unknown quantity, we are not able to address specific environmental education uses in specific locations at this time. Due to transportation and field site logistics (all classes now make a visit to the EE classroom as part of their learning experience) it is unlikely that environmental education activities would be expanded onto lands outside the existing Public Use Area and the Eastern Washington University Turnbull Lab for Ecological Studies.

Availability of Resources: The following funds would be required to run a program as designed under the Preferred Alternative 3. The projected need represents an increase of approximately 65% in recurring expenses compared to current funding for this program. For the one-time expenses, all available sources would be investigated.

Activity	One Time Expense	Recurring Expense
Construct and outfit EE classroom addition	$ 430,000	
Operate & maintain classroom		$ 12,500
Staff classroom		$71,000
Install and maintain EE shelters (3)	$ 51,000	$ 1,000
Design and construction of office with visitor contact area:	$1,500,000	
Operate and maintain office/visitor contact area		$35,000
Interpretive exhibits and outfitting for visitor contact area	$ 300,000	$ 2,000

Interpretive panels and structures	$ 96,000	$ 500
Harden EE sites, construct piers, and plant screening vegetation	$ 5,000	$ 500
Totals	$2,382,000	$122,500

Offsetting revenues: Currently Friends of Turnbull NWR are donating approximately $6,000 annually to support Environmental Education facilitator stipends. They are attempting to build an endowment fund that could eventually contribute to annual support for a full-time Environmental Education Coordinator as well as up to two Environmental Education facilitators. There are also annual in-kind services donations equal to 5200 volunteer hours and valued at $80,000. These are expected to continue in the future at approximately this level or higher.

Existing Refuge resources are not adequate to properly and safely administer the use as envisioned under the Preferred Alternative 3. To implement the use, the Refuge would pursue partnerships with appropriate cooperators and/or volunteers. Additional funds and in-kind services would be needed.

Anticipated Impacts of the Use(s): Impacts from environmental education activities at Turnbull NWR occur mostly in the area of Pine Creek, where school groups concentrate to conduct pond and stream studies. Impacts observed include: trampling of vegetation, disturbance to nesting birds, and disturbance to feeding or resting birds or other wildlife in the proximate vicinity. An unpublished study (Jose, 1997) examined the effect of EE site activities at Blackhorse Lake on the Turnbull Refuge. The study was designed to compare waterfowl presence and behavior patterns between the times when EE activities were occurring and when EE classes were not on-site. The study results indicated that fewer waterfowl were present in the study area when EE classes were on site as compared to the control times. The study also found more short flights undertaken by birds when EE classes were on site. Redheads displayed the highest number of flight responses, followed by mallards. Ruddy ducks almost never flew but had the highest increase in directional swimming away from the EE classes. The study author recommended that sites heavily used by smaller bodied birds, such as ruddy ducks, buffleheads, and teals, not be used as environmental education sites.

Effects from the EE program are thus similar in type to effects from wildlife observation and photography activities (see Wildlife Observation and Photography CD). In addition to wildlife disturbance, EE activity will result in some trampling of vegetation. With the growth of the environmental education program, future effects can be expected to be higher than present. Although public uses, including environmental education, do have a certain detrimental impact on Refuge habitats and wildlife, the effect is mostly reduced at the outset by being contained within the Public Use Area, and within this area, to the four designated field study sites. Currently, approximately 85% of the existing Refuge is off-limits to year-round public use. After implementation of preferred Alternative 3, about a third of the total Refuge will be open seasonally to elk hunting, and about 20% of the Refuge will be open to year round public use. About fifty percent of the Refuge will remain closed to public use.

This use may impact threatened and endangered species, including Spalding's silene and bald eagle. Impact to the silene populations are expected to be minimal. Disturbance impacts to the bald eagle would be expected to increase, but could be reduced to a certain extent through the design of public use facilities. See Section 4.1.7 of the Draft CCP/EA for further discussion of the effects of this use on threatened and endangered species.

Anticipated Impacts of the Use within the Proposed Expansion Area: At this time, no impacts within the proposed expansion area are anticipated, since the environmental education and interpretation program would not occur outside of the current Public Use Area.

Public Review and Comment: Public review and comments will be solicited in conjunction with the draft CCP/EA for Turnbull NWR in order to comply with the National Environmental Policy Act and with Service policy. Following the public review and comment period, comments and actions taken to address comments will be summarized here.

Determination :

____ Use is Not Compatible

_X_ Use is Compatible With Following Stipulations

Stipulations Necessary to Ensure Compatibility:

User Stipulations:

- Advance reservations required for groups participating in environmental education activities.
- All groups will be instructed in trail etiquette and ways to reduce wildlife and habitat disturbance during their welcome session.
- Students/visitors will be required to stay on trails within the four Environmental Education Study Sites.
- Wetland/pond activities are limited to designated sites within the four Environmental Education Study sites.
- Groups will provide their own drinking water and carry out all their own garbage.
- Students and teachers will be encouraged to participate in stewardship activities including habitat restoration or monitoring.

Administrative stipulations:

- Allowing the use as described in Preferred Alternative 3 is contingent upon finding the full funding to properly manage and administer the use However, if funds are short for construction of facilities associated with this use, that should not be construed as invalidating the compatibility of the use overall.
- The Refuge will conduct yearly workshops to "teach the teachers" trail etiquette, minimizing wildlife disturbance, and how to facilitate their own field trips.
- An effort will be made to spread out use by large groups while reservations are made, reducing disturbance to wildlife and overcrowding of Refuge facilities during times of peak demand.
    - ✓ A maximum of 70 students will conduct EE activities per study site per day and no more than 35 students shall be at a study site at one time.
    - ✓ Only three of the four study sites will be used on any one day; the fourth site will be rested.
    - ✓ No single study site will be used more than four days/week.
    - ✓ The classroom can be used up to seven days/week for activities, both daytime and evening, pending staff resources.
- The EE classroom and at least one study site will be accessible to all visiting public, including disabled citizens.
- Signs, pamphlets, and verbal instructions from Refuge staff and volunteers will promote appropriate use of trails, boardwalks, and platforms to minimize wildlife and habitat disturbance.

- Periodic monitoring and evaluation of sites and programs will be conducted to assess if objectives (see chapter 2 of the draft CCP/EA) are being met and the resource is not being unacceptably degraded.
- At least 50% of the Refuge will be managed as wildlife sanctuary where human disturbance is infrequent.
- Where feasible, native trees and shrubs will be planted to create screening along trails and at observation points to reduce disturbance.
- EE sites will be hardened and piers constructed to facilitate aquatic studies and to help reduce negative visitor impacts to soils, vegetation and hydrology.
- Regulations will be available to the public through a Refuge brochure.
- Directional, informational and interpretive signs will be posted and maintained to help keep visitors on trails and help educate the public on minimizing wildlife and habitat disturbance.
- Any new construction related to the EE program shall ensure that facilities are sited either 328 feet from wetlands or out of view of any wetland wildlife.

Justification: Environmental Education and Interpretation contribute to the mission of the National Wildlife Refuge System by providing wildlife-oriented educational and recreational benefits to Americans. Environmental Education and Interpretation are two 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. By limiting the numbers of students/groups as well as always providing sanctuary from human disturbance in other areas of the Refuge, these programs will not interfere with the Refuge achieving its purposes of providing *sanctuary* and a *breeding ground for migratory birds and other wildlife* and they contribute to the purpose of *wildlife-oriented recreational development*. Environmental Education and interpretation are also an important part of the Turnbull NWR vision and goals.

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 (check one below):

___ Categorical Exclusion without Environmental Action Statement
___ Categorical Exclusion and Environmental Action Statement
___ Environmental Assessment and Finding of No Significant Impact
___ Environmental Impact Statement and Record of Decision

Literature Cited:

Jose, J. 1997. Evaluation of the Effect of Environmental Education Classes on Waterfowl Behavior. Unpublished report. Biology 454 class, Eastern Washington University, Cheney, Washington.

Signatures:

_____ _____
Prepared by (signature) Date

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_____ _____
Refuge Manager/Project Leader Approval (signature) Date

Concurrence

_____ _____
Refuge Supervisor (signature) Date

_____ _____
Regional Chief, National Wildlife Refuge System (signature) Date

E.3 WATERFOWL HUNTING COMPATIBILITY DETERMINATION

Use: Waterfowl Hunting (Alternative 3)

Refuge Name: Turnbull National Wildlife Refuge, Spokane County, near Cheney,Washington

Establishing and Acquisition Authorities:
- Executive Order 7681, dated July 30, 1937
- Migratory Bird Conservation Act [16 U.S.C. 715-715d, 715e, 715f-715r]
- 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 Purposes:
- "*... as a Refuge and breeding ground for migratory birds and other wildlife...*" (Executive Order 7681, dated July 30, 1937)
- "*... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.*" (16 U.S.C. 715d [Migratory Bird Conservation Act])
- "*... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ...*" (16 U.S.C. 460k-1) "*... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ...*" 16 U.S.C. 460k-2 (Refuge Recreation Act (16 U.S.C. 460k-460k-4), as amended).
- "*... for the development, advancement, management, conservation, and protection of fish and wildlife resources ...*"(16 U.S.C. 742f(a)(4) "*... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ...*" 16 U.S.C. ¤¤ 742f(b)(1) (Fish and Wildlife Act of 1956).

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, as amended [16 U.S.C. 668dd-668ee])

Description of Use: Turnbull NWR lands currently are not open to waterfowl hunting. Under Preferred Alternative 3, the US Fish & Wildlife Service proposes a 2-day youth waterfowl hunt in late September within the boundaries of Turnbull NWR. This alternative would open approximately 140 acres of wetlands and associated shoreline each year to waterfowl hunting. The proposed waterfowl hunting area is the north side of Upper Turnbull Slough. Hunting areas would be posted with signs. Hunting would be allowed consistent with annual State hunting regulations. Hunter numbers would be limited to two with an adult supervisor per spaced hunting site. Youths must be accompanied by an adult. By spacing hunters at least 300 yards apart we are estimating there would be sites available for six to eight hunting blinds across Upper Turnbull Slough. Under this scenario, we envision the Refuge accommodating approximately 6-16 youth hunters per day. No construction of permanent facilities will be made except for spaced numbered posts noting designated hunting blind. Dogs will be allowed for retrieval, however they must be under control of the hunter at all times. Should an additional 300+ acres of restored wetland be added to the Refuge through acquisition or conservation easement in the identified Stewardship Area, the US Fish and Wildlife Service would consider expanding the waterfowl hunt on the existing Refuge into the regular state waterfowl season. Under this scenario, we envision the Refuge accommodating approximately 24-36 hunters per day. The waterfowl season would last anywhere from 3 weeks to 3 months depending upon the season/freeze up. See description of the proposed use in Chapter 2 of the Draft CCP/EA. Also see Map 5 for proposed locations and facilities of the use under Preferred Alternative 3 in Chapter 2 of the Draft CCP/EA.

This use is defined as a wildlife-dependent recreational use under the Improvement Act. See Implementation section (Appendix F of the Draft CCP/EA) to determine priority of projects associated with these uses as funding becomes available.

Use Within the Proposed Expansion Area: Waterfowl hunting currently occurs within some portions of the proposed Refuge expansion area. Philleo Lake is one area within the proposed expansion that currently receives waterfowl hunting from a private duck club. There are no public lands that support waterfowl hunting within the expansion area at this time.

Compatible waterfowl hunting could be allowed in the future expansion area in designated localities if large enough blocks are added. Since we do not presently know which landowners may be willing sellers and which may not, we are not able to address future hunting use in specific locations at this time. However, if Philleo Lake is acquired, waterfowl hunting could be permitted at this area, under similar program management and stipulation features as waterfowl hunts permitted on the Refuge.

Availability of Resources: The following funds would be required to run a program as designed under Alternative 3 with a 2-day youth hunt. 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 would 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

Offsetting revenues:
Hunt permit fees $240-$480 (@$10/hunter per day)

Anticipated Impacts of the Use(s): 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, 50-60% of the pintails on the Refuge were located on the isolated units that contained 26-28% 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 sixteen percent of the pintails on the Refuge were located on hunted units (36-40% 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% 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 Chincoteage 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.

This use may impact threatened and endangered species, including Spalding's silene and bald eagle. Impact to the silene populations are expected to be minimal. Disturbance impacts to the bald eagle would be expected to increase, but could be reduced to a certain extent through the design of public use facilities. See Section 4.1.7 of the Draft CCP/EA for further discussion of the effects of this use on threatened and endangered species.

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 would be separated spatially from the Public Use Area and the Columbia Plateau Trail. See Map for Alternative 3 in Chapter 2 of the Draft CCP/EA.

Summary and application to Turnbull NWR: The studies cited above display the variety and scale of negative impacts to waterfowl from hunting. In full consideration of these studies, a youth waterfowl hunting program at Turnbull, were it to be implemented as envisioned under Alternative 3, is not expected to have a major effect on Refuge waterfowl populations. The most likely effect would be a shift in waterfowl populations away from hunted areas to non-hunted areas on the Refuge. Total fall wetland habitat available to waterfowl at the present time is estimated at 800 acres. Under Alternative 3, approximately 17.5% of the existing fall Refuge wetland base would be open to waterfowl hunting. Hunters would be limited to 25 shells per day per hunter, with non-toxic shot permitted only.

By its very nature, waterfowl hunting has very few if any positive effects on waterfowl and other birds while the activity is occurring, but it is well recognized that this activity has given many people a deeper appreciation of wildlife and a better understanding of the importance of conserving their habitat, which has ultimately contributed to the Refuge System mission. At Turnbull NWR, efforts would be made to ensure that hunting impacts would be minimal, by restricting the hunt to a two day youth, and requiring hunting from a limited number of fixed spaced hunting sites.

Anticipated Impacts of the Use within the Proposed Expansion Area: A block of lands would have to be acquired, sufficient in size to support a quality hunt program and sanctuary area, before a hunt program could be initiated. Staffing would also have to increase to adequately manage and enforce the hunt program. Preliminary stipulations that would have to be met before a waterfowl hunting program could be implemented in the expansion area include:

1) There is no significant indirect, direct, or cumulative threat anticipated to human health or safety;

2) There is no significant indirect, direct, or cumulative threat anticipated to natural or cultural resources;
3) The use is consistent with management of existing Turnbull NWR lands and would contribute to achieving Refuge goals;
4) The newly acquired lands represent a meaningful unit within which to manage the activity; and
5) There are no significant anticipated conflicts with other wildlife-dependent recreational uses.

If and when the US Fish & Wildlife Service acquires land within the expansion area, there could be opportunities for compatible waterfowl hunting. Due to the similarity of species and habitats with current Refuge owned lands, this use would be anticipated to have impacts similar to those described for current Refuge owned lands. If the Refuge manager determines that those opportunities would substantially change the conditions under which this use was found compatible, or that there is new, substantive information regarding the effects of the use, this CD would need to be re-evaluated.

Public Review and Comment: Public review and comments will be solicited in conjunction with the release of the Draft CCP/EA. Substantive comments will be addressed along with others in any necessary revisions of the CCP before publication of a Final CCP. in order to comply with the National Environmental Policy Act and with Service policy. Public review of a step down Hunt Plan (see Stipulations) as required under Service policy would be conducted before opening the Refuge to hunting.

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.
- Daily limit of 25 shells per hunter, non-toxic shot only.
- Hunting permitted from stationary posted spaced hunting sites only.
- Hunting limited to the early fall two day Youth Waterfowl Hunting season.
- Hunting dogs will be under hunter control at all times.
- Before expanding the waterfowl hunt to the regular state hunting season, an additional 300+ acres of wetlands shall be restored in the Stewardship area surrounding the Refuge.

Administrative stipulations:
- Allowing the use as described is contingent upon finding the full funding to properly manage and administer the use.
- Prior to opening of a hunt, a complete Hunting Plan package (Hunting Plan, NEPA documentation, state concurrence, Section 7 ESA consultation, and Federal register regulations,) will be completed as required under Refuge System policy. Hunting will not be allowed until regulations allowing hunting have been published in the Federal Register.
- The US Fish & Wildlife Service would install 6-8 stationary blinds spaced at least 300 yards apart to minimize crowding.
- Hunt areas would be well separated from other public use areas of the Refuge.

- Hunt areas and no hunting zones would be well posted.
- Refuge staff would issue hunt permits, conduct law enforcement, maintain hunting facilities, and monitor wildlife impacts.

Justification: Waterfowl hunting at Turnbull 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.* 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.

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 (check one below):

___ Categorical Exclusion without Environmental Action Statement
___ Categorical Exclusion and Environmental Action Statement
___ Environmental Assessment and Finding of No Significant Impact
___ Environmental Impact Statement and Record of Decision

Literature Cited:

Belanger, L. and Bedard, J. 1989. Responses of staging greater snow geese to human disturbance. J. Wildl. Manage. 53:713-719.

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Owens, N. W. 1977. Responses of wintering brant geese to human disturbance. Wildfowl 28:5-14.

White-Robinson, R. 1982. Inland and saltmarsh feeding of wintering brent geese in Essex. Wildfowl 33:113-118.

Wolder, M. 1993. Disturbance of wintering northern pintails at Sacramento National Wildlife Refuge, California. M.S. Thesis, Humboldt Stat Univ., Arcata, California, 62 pp.

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

E.4 ELK HUNTING COMPATIBILITY DETERMINATION

Use: Elk Hunting (Alternative 3)

Refuge Name: Turnbull National Wildlife Refuge, Spokane County, near Cheney,Washington

Establishing and Acquisition Authorities:
- Executive Order 7681, dated July 30, 1937
- Migratory Bird Conservation Act [16 U.S.C. 715-715d, 715e, 715f-715r]
- 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):
- "*... as a Refuge and breeding ground for migratory birds and other wildlife...*" (Executive Order 7681, dated July 30, 1937)
- "*... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.*" (16 U.S.C. 715d [Migratory Bird Conservation Act])

- "*... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ...*" (16 U.S.C. 460k-1) ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 16 U.S.C. 460k-2 (Refuge Recreation Act (16 U.S.C. 460k-460k-4), as amended).
- "*... for the development, advancement, management, conservation, and protection of fish and wildlife resources ...* "(16 U.S.C. 742f(a)(4) ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... 16 U.S.C. ¤¤ 742f(b)(1) (Fish and Wildlife Act of 1956).

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, as amended [16 U.S.C. 668dd-668ee])

Description of Use: No hunting occurs on the Refuge at the current time. Elk hunting is proposed under the Preferred Alternative 3 of the CCP to respond to issues related to elk management, especially: a) heavy browsing of young aspen and other deciduous shrubs and trees on the Refuge; b) neighbor complaints of elk damage to hay, fences and other property items; and c) to facilitate hunting as a wildlife-dependent recreational use as specified under the Improvement Act.

Under Preferred Alternative 3, elk hunting would occur each year, but the number of permits issued and length and number of seasons would vary depending on aspen monitoring results conducted each year. Elk hunting would occur outside the Public Use Area in special safe hunting areas designated by the Refuge Manager. Areas tentatively identified include the west side of the Refuge below the Turnbull Slough, and the east side of the Refuge north of the Public Use Area and east of the Turnbull Pines Research Natural Area. Hunting areas would be specified in a hunt plan. The hunt program would permit vehicles at parking facilities accessing these hunt areas. Hunters would access hunting areas by foot. Key facilities involved include parking areas at two to three hunter access points. Special needs for disabled hunters would be accommodated upon request.

Under the Preferred Alternative 3, approximately 6-10 elk hunt permits may be issued for each of the hunt seasons proposed in any particular year (example: 6-10 permits for an archery season plus 6-10 permits for a youth rifle hunt). The actual number of permits will be determined after consultation with Washington Fish & Wildlife Department and based on wildlife and habitat monitoring results. All hunting would occur in the months of September, October, November, and/or December during legal hunting hours. No overnight camping would be permitted.
See Chapter 2 of the *Turnbull National Wildlife Refuge Draft Environmental Assessment for the Comprehensive Conservation Plan* for a detailed description of the use under the Preferred Alternative 3. Also see Map 5 for proposed locations and facilities of the use under Preferred Alternative 3 in Chapter 2 of the Draft CCP/EA.

This use is defined as a wildlife-dependent recreational use under the Improvement Act. See Implementation section (Appendix F of the Draft CCP/EA) to determine priority of projects associated with these uses as funding becomes available.

Use Within the Proposed Expansion Area: Chapter 2 of the draft CCP/EA identifies areas in which the Service would seek to acquire land from willing sellers outside of the current approved acquisition boundary [proposed Refuge expansion area]. Elk hunting currently occurs within the proposed Refuge expansion areas. Compatible elk hunting could be allowed in the future expansion area in designated localities if large enough land blocks are added. Since we do not presently know which landowners may be willing sellers and which may not, we are not able to address future hunting use in specific locations at this time.

Availability of Resources: The following funds would be required to run a program as designed under the Preferred Alternative 3. 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 would be investigated.

Activity	One Time Expense	Recurring Expense
Development and administration of Hunt Plan and associated documentation	$20,000	$2,500
Development and maintenance of hunter parking	$48,000	$2,000
Placement and maintenance of signs	$1,000	$ 500
Law enforcement staffing	0	$10,000
Biological staff for monitoring effects	0	$ 5,000
Totals	$69,000	$20,000

Offsetting revenues: (recurring)
Hunt permit fees $ 3,000

Existing Refuge resources are not adequate to properly and safely administer the use as envisioned under the Preferred Alternative 3. To implement the use, the Refuge would pursue partnerships with appropriate cooperators and/or volunteers. Additional funds and in-kind services would be needed, especially to assist in costs of administering and patrolling the hunt.

Anticipated Impacts of the Use(s):

Impacts to Wildlife and Habitats: Direct mortality to elk associated with the hunt would of course occur. Some wounding would occur as well. In all cases, the Refuge would seek to minimize needless elk mortality while providing a quality hunt experience and obtaining habitat objectives.

Foot travel associated with elk hunting could potentially result in trampling of vegetation. Since elk hunting would involve small numbers of hunters, and take place during the time of the year most understory plants are dormant, this activity would likely have little direct impact on any native plant species.

The activity of hunters pursuing elk on the Refuge could also disturb some wildlife species. These potential impacts are described more fully in the Wildlife Observation CD. Hunters walking in close proximity to wetlands and associated gun fire can result in behavioral responses by waterfowl and other wetland birds. Any portions of the Refuge that may be open to elk hunting would include wetlands. Waterfowl use, however, occurs only on the permanent and semipermanent wetlands of the Refuge

through mid-November when freeze-up usually occurs and waterfowl move to rivers and larger, deeper lakes off-Refuge. This short period of overlap between the elk hunting season and the period of peak fall waterfowl concentrations coupled with a small number of hunters and a hunting season tied into habitat damage, would likely result in only minimal impacts to waterfowl.

This use may impact threatened and endangered species, including Spalding's silene and bald eagle. Impact to the silene populations are expected to be minimal. Short-term disturbance impacts to the bald eagle would be expected to increase inside the hunt units. Some short-term effects to bald eagle use within the hunt units would also be expected. Wintering populations of bald eagles have shown susceptibility to disturbance resulting in disrupted foraging behavior and changes in social dynamics between other species in the avian scavenger guild (Skagen 1991) and avoidance of areas with high disturbance (Stalmaster and Newman 1978). Stalmaster and Newman (1978) also found that recreational activities occurring within 250 meters of roosting and foraging areas resulted in changes in distribution patterns by displacement to areas of lower human activity. With regards to hunting, Stalmaster and Newman (1978) found that gunshots were the only noises that elicited overt escape behavior by eagles in their study. Edwards (1969) also found that gunshots could be used to flush eagles from their roost (cited in Stalmaster and Newman 1978). Hunt units would likely incorporate portions of large permanent wetlands utilized by bald eagles for foraging, potentially placing hunters within 250 meters of this habitat.

Elk hunting can also have indirect impacts to habitat by reducing populations or redistributing elk thereby changing densities of elk in a given area. Under very high densities, elk can damage habitats through overgrazing and trampling resulting in the loss of preferred forage species, soil damage, increased erosion and spread of less palatable exotic species on disturbed areas. Generally elk populations (unless extremely large) do not impact the ponderosa pine and steppe communities found on the Refuge because of the low preference for pine and the resistance of most grasses and forbs to moderate grazing pressure. The only impacts to pine forest that have been observed on the Refuge to date have been in the tall shrub phase of the Ponderosa pine /snowberry association. In these areas high use of blue elderberry, serviceberry, chokecherry and spiraea has occurred impacting growth form and reproduction. Elk use and preference for aspen and other deciduous browse is, however, well documented (Debyle 1985). Under high elk densities and limited habitat, elk browsing during winter can have a negative impact on the regeneration of aspen and other deciduous trees and shrubs. Elk browse the tips of new shoots below 2.5 meters and also eat the bark of mature aspen. When browsing intensity is high enough to remove the majority of the current years growth, aspen develops a shrub form or the new sprouts are killed. Without recruitment of an adequate density of well formed aspen stems, mature trees that die will not be replaced and the stand will decline.

It is important to note that redistributing elk from areas of high density to areas providing relatively greater security without reductions in population size will only transfer impacts. If hunting is applied on an annual basis in the same units, elk may alter use patterns and begin using the remaining no-hunting zones to a greater degree. These no-hunting zones would be private parcels and portions of the Refuge set aside for other public uses. The main no-hunting zone on the Refuge would be the Public Use Area. This portion of the Refuge has historically received low elk use as a result of the relatively greater level of human disturbance. Since disturbance associated with hunting has a greater influence on elk behavior than other public uses (Skovlin 1982), elk will likely begin to habituate to the level of human disturbance in the no shooting areas (Ward 1973). Increased density of elk in these areas may increase the intensity of grazing and browsing resulting in habitat damage .

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 would be separated spatially from the Public Use Area and the Columbia Plateau Trail. See Map for Alternative 3 in Chapter 2 of the Draft CCP/EA.

Elk hunting could have a positive effect on wildlife observation / photography quality. Hunt areas would be located outside the boundaries of the Public Use Area and buffered from the Columbia Plateau Trail and County roadways. Although uncertain, wildlife observation / photography opportunities could be increased as a variety of animals move away from the hunted zones toward no hunting zones, including the Public Use Area. The ultimate outcome for the visitor is that higher numbers of animals may be visible, but the aesthetic value of the experience may be diminished somewhat by the occasional sound of shots.

Anticipated Impacts of the Use within the Proposed Expansion Area: A block of lands would have to be acquired, sufficient in size to support a quality hunt program and sanctuary area, before a hunt program could be initiated. Staffing would also have to increase to adequately manage and enforce the hunt program. Preliminary stipulations that would have to be met before an elk hunting program could be implemented in the expansion area include:

1) There is no significant indirect, direct, or cumulative threat anticipated to human health or safety;
2) There is no significant indirect, direct, or cumulative threat anticipated to natural or cultural resources;
3) The use is consistent with management of existing Turnbull NWR lands and would contribute to achieving Refuge goals;
4) The newly acquired lands represent a meaningful unit within which to manage the activity; and
5) There are no significant anticipated conflicts with other wildlife-dependent recreational uses.

If and when the Refuge acquires land within the expansion area, there could be opportunities for compatible elk hunting. Due to the similarity of species and habitats with current Refuge owned lands, this use would be anticipated to have impacts similar to those described for current Refuge owned lands. If the Refuge manager determines that those opportunities would substantially change the conditions under which this use was found compatible, or that there is new, substantive information regarding the effects of the use, this CD would need to be re-evaluated.

Public Review and Comment: Public review and comments will be solicited in conjunction with the CCP/EA in order to comply with the National Environmental Policy Act and with Service policy. Public and state review would also be solicited during preparation of the step-down Sport Hunting Plan subsequent to approval of the CCP.

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 permitted from within designated hunting areas only.
- Access will be walk-in only except upon special request to reasonably accomodate disability.
- Hunting dogs will be under hunter control at all times.

Administrative stipulations:
- Allowing the use as described in Preferred Alternative 3 is contingent upon finding the full funding to properly manage and administer the use. However, if funds are short for construction of facilities associated with this use, that should not be construed as invalidating the compatibility of the use overall.
- Prior to opening of a hunt, a complete Hunting Plan package (Sport Hunting Plan, NEPA documentation, state concurrence, Section 7 ESA consultation regulations, and Federal Register regulations) will be completed as required under Refuge System policy. Hunting will not be allowed until regulations allowing hunting have been published in the Federal Register.
- Hunt units will be well posted and separated from other public use areas of the Refuge including the main Public Use Area, Columbia Plateau Trail, Turnbull Laboratory for Ecological Studies, and County roads to assure public safety.
- The Refuge will vary hunt units to reduce impacts to non-target wildlife by providing spatial and /or temporal sanctuary from disturbance associated with elk hunting.
- To the extent possible, the Refuge will vary hunt units spatially and/or temporally to also minimize habituation by elk and their concentration in no shooting zones.
- Approximately 6-10 elk hunt permits may be issued for each of the hunt types (i.e. archery hunt, rifle hunt) proposed in any particular year. The actual number of permits will be determined after consultation with Washington Fish & Wildlife Department and based on wildlife and habitat monitoring results.

Justification: Elk hunting at Turnbull NWR as described in this CD contributes to the mission of the National Wildlife Refuge System by conserving aspen stands through elk management. Elk browsing of aspen is a known concern on the Refuge. Elk hunting will reduce and redistribute elk densities which can decrease browsing intensity on aspen sprouts enough to allow escapement and height growth putting them beyond the reach of elk. Disturbance concerns can be incorporated into the design of the hunt area, mitigating these impacts to a certain extent. Elk hunting also contributes to the mission 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, an elk hunting program will not interfere with the Refuge achieving its purposes of providing *sanctuary* and a *breeding ground for migratory birds and other wildlife*. The use also contributes to the purposes of *wildlife-oriented recreational development* and *the protection of natural resources*. 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.

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 (check one below):

___ Categorical Exclusion without Environmental Action Statement
___ Categorical Exclusion and Environmental Action Statement
___ Environmental Assessment and Finding of No Significant Impact
___ Environmental Impact Statement and Record of Decision

Literature Cited:

Debyle, N. V. 1985. Water and watershed. pp 153-167. In: Debyle, N.V. and R. P. Winokur (eds.). Aspen: Ecology and management in the western United States. USDA Forest Service General Technical Report RM-119. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado, 283 pp.

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Ward, A.L. 1973. Elk behavior in relation to multiple uses on the Medicine Bow National Forest. Proc. West. Assoc. State Game and Fish Comm. 53:125-141.

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

E.5 BICYCLING, JOGGING AND CROSS-COUNTRY SKIING COMPATIBILITY DETERMINATION

Use: Bicycling, jogging and cross country skiing (Alternative 3)

Refuge Name: Turnbull National Wildlife Refuge, Spokane County, Washington, near Cheney

Establishing and Acquisition Authorities:
- Executive Order 7681, dated July 30, 1937
- Migratory Bird Conservation Act [16 U.S.C. 715-715d, 715e, 715f-715r]
- 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):
- "*... as a Refuge and breeding ground for migratory birds and other wildlife...*" (Executive Order 7681, dated July 30, 1937)
- "*... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.*" (16 U.S.C. 715d [Migratory Bird Conservation Act])
- "*... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ...*" (16 U.S.C. 460k-1) ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 16 U.S.C. 460k-2 (Refuge Recreation Act (16 U.S.C. 460k-460k-4), as amended).
- "*... for the development, advancement, management, conservation, and protection of fish and wildlife resources ...* "(16 U.S.C. 742f(a)(4) ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... 16 U.S.C. ¤¤ 742f(b)(1) (Fish and Wildlife Act of 1956).

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, as amended [16 U.S.C. 668dd-668ee])

Description of Use: By one estimate, obtained through a survey of about 500 visitors, approximately twelve percent of visitors to Turnbull NWR bicycle while on the Refuge (EDAW, 1999). Others estimate that the number is smaller - around 1000 visitors per year. Other visitors, likely fewer, jog (run), or cross country ski while at the Refuge. While biking, jogging, or skiing, these visitors may frequently view wildlife while at the Refuge. However, these activities are treated separately in this CD since impacts are of a different nature and bicycling, jogging, running, and skiing do not automatically support the six wildlife-dependent priority uses.

Most of the bicycling is observed March-October, seven days a week during daylight hours. Use currently occurs on the Auto Tour Route within the 2,200-acre Public Use Area. Some use occurs now

on the closed road which accesses Stubblefield Lake, though this use is not considered legal. There are no current designated facilities for biking, jogging, or skiing.

Under the Preferred Alternative 3, a new 2.6 mile bicycle trail would be constructed that would run from the entrance road to the Public Use Area along Cheney Plaza Highway utilizing remnants of the old highway bed and fire guards along the Refuge boundary. This bike trail would link to the Columbia Plateau Trail (CPT). Hikers and skiers will be allowed on the new bike route. Under preferred Alternative 3, bicycles will be allowed only on the new bike trail, the auto tour route, and the CPT.

Special events and training will not be permitted on the Refuge. The Refuge will limit the number of individuals in any biking group to five.

Cross country skiing is a pastime only observed at Turnbull NWR during those winters when there is sufficient snow upon which to ski (~ 3 out of 10 years). The skiing occurs November-February when there is suitable snow cover. Skiers utilize the entrance road, auto tour route and also in the past have skied off trail within the Public Use Area. They can also use the Columbia Plateau Trail and will have access to the proposed bicycle trail linking the CPT to the Public Use Area. There are no plans for providing groomed ski trails.

Jogging occurs occasionally at the present time on Refuge trails and roads. Group training will not be permitted on the Refuge.

See Chapter 2 of the *Turnbull National Wildlife Refuge Draft Environmental Assessment for the Comprehensive Conservation Plan* for a description of the uses under the Preferred Alternative 3. Also see Map 5 for proposed locations and facilities of the use under Preferred Alternative 3 in Chapter 2 of the Draft CCP/EA. See Chapter 3 of the same document for a description of the uses at the current time.

These uses are not defined as wildlife-dependent recreational uses under the Improvement Act. See Implementation section (Appendix F of the Draft CCP/EA) to determine priority of projects associated with these uses as funding becomes available.

Use Within the Proposed Expansion Area: Bicycling, skiing, and jogging take place within the expansion area along the CPT and along public roads. Future use in the expansion area would not likely increase were the Refuge to acquire additional lands.

Availability of Resources: The following funds would be required to run a program as designed under the Preferred Alternative 3. All available sources would be investigated.

Activity or Project	One Time Expense	Recurring Expense
Bike Trail development (Refuge portion)	600,000	
Staff costs		2,500
Equipment and Maintenance		250
Materials and supplies		575
Screening and signing	8,000	

Law enforcement		3,000
Total	$608,000	$6,375

Offsetting revenues: None

Existing Refuge resources are not adequate to properly and safely administer the use as envisioned under the Preferred Alternative 3. To implement the use, the Refuge would pursue partnerships with appropriate cooperators and/or volunteers. Additional funds and in-kind services would be needed, especially to assist with bicycle trail construction.

Anticipated Impacts of the Use(s): See the Wildlife Observation and Photography CD for a summary of scientific findings on impacts to wildlife from human activity associated with wildlands recreation.

Wildlife Response to Jogging: Rapid movement by joggers is more disturbing to wildlife than slower moving hikers (Bennett and Zuelke 1999). 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 are reduced by restricting human activity to an established trail. Animals show greater flight response to humans moving unpredictably than to humans following a distinct path (Gabrielsen and Smith 1995).

Wildlife Response to Bicycling: Rapid movement directly toward wildlife frightens them, while movement away from or at an oblique angle to the animal is less disturbing (Knight and Cole 1995). Knight and Cole (1991) suggest that sound may elicit a much milder response from wildlife if animals are visually buffered from the disturbance.

Under Preferred Alternative 3, the new bike trail's course along the old Cheney-Plaza Highway would put individuals on foot and bicycle near several wetlands including the Overpass Pond, East Tritt Lake and Reeves Lake. Similarly, outside the Public Use Area, the Columbia Plateau Trail crosses 4.75 miles of the Refuge where individuals on foot, bicycle and horseback pass within 30 meters and in full view of 56 acres of several important wetlands (Overpass Ponds, Wetland, Long Lake, and Ballinger Lakes). Several of the areas adjacent to the CPT provide important waterfowl migration habitat in the spring and fall. Depending on the level of use and compliance to regulations restricting off-trail use, some impact to wildlife would be expected.

Use of both the CPT and the new Refuge bike trail would be expected to increase over the next fifteen years. Although biking has the potential to cause flushing of birds from these important breeding and foraging habitats, bicycling on the Refuge trails and on the CPT is not anticipated to cause large disturbances to wildlife as long as riders do not directly approach wetlands or areas where wildlife congregate, and riders stay predictably on the designated bike trails. This will allow wildlife to habituate to the use.

In addition, group size will be limited by prohibiting special events and training within the Refuge's portion of the trail. Under Preferred Alternative 3, the Refuge would implement regulations restricting walking, hiking, jogging, and skiing to trails only to minimize wildlife disturbance. Enforcement of these provisions should minimize negative effects, especially disturbance effects, to wildlife and habitats.

Wildlife Response to Cross-Country Skiing:

In two different studies of winter recreation impacts to wildlife in Yellowstone National Park, Aune (1981) and Cassirer (1990) found that, except for coyotes, all wildlife species observed (mostly big game) reacted more quickly to an approaching skier than to a snowmobile, and the flight distance was generally greater from skiers. Bison were found to respond dramatically to skiers who were off established trails. All wildlife species studied, including bison, were wary of people on foot. Aune (1981) also observed that in Yellowstone National Park, elk were less likely to flee from snowmobiles or skiers late in the winter than they were earlier in the season. He suggested that this was likely due in part to habituation by elk to snowmobile traffic, and in part to decreased vigor of elk later in the season combined with the increasing difficulty of flight through deep, crusted snow. Proximity of escape cover that breaks the line of sight between elk and the disturbance may reduce flight distances and consequently the amount of energy used in flight. Moving automobiles and trail bikes had little effect on elk resting in timber at distances of only 0.13 miles (Lyon and Ward 1982).

Ferguson and Keith (1982) researched the influence of crosscountry ski trail development and skiing on elk and moose distribution in Elk Island National Park in Alberta, Canada. They found no indication that overwinter distribution of elk was altered by cross-country skiing activity. However, it did appear that elk moved away from ski trails, particularly those that were heavily used, during the ski season.

Aune (1981) also reported that snowmobile activity in YNP resulted in average elk flight distances of 33.8 m, compared to average flight distances of 53.5 m in response to skiers. In another study, elk began to move when skiers approached to within 15 m in an area heavily used by humans year-round, and within 400 m in an area where human activity is much lower (Cassirer et al. 1992). Elk in YNP fled more frequently and over greater distances from skiers off established trails than from skiers on established trails (Aune 1981).

Rudd and Irwin (1985) investigated the movements of moose in response to cross-country skiing and found that the average distance 19 moose moved away from people on snowshoes or skis was 16.6 yards, and the average distance at which moose were displaced was 80.7 yards.

Overall Impact at Turnbull NWR: The studies cited above show that these activities can and do disturb wildlife. However we anticipate the impacts would be small, given the relatively low numbers of users. Containing these uses to designated trails and/or roads should prevent most of the worst of the potential impacts and allow wildlife in the area to habituate to the use.

This use may impact threatened and endangered species, including Spalding's silene and bald eagle. Impact to the silene populations are expected to be minimal. Disturbance impacts to the bald eagle would be expected to increase, but could be reduced to a certain extent through the design of public use facilities. See Section 4.1.7 of the Draft CCP/EA for further discussion of the effects of these uses on threatened and endangered species.

Anticipated Impacts of the Use within the Proposed Expansion Area: If and when the Refuge acquires land within the expansion area, there could be opportunities for biking, jogging, and cross-country skiing. Due to the similarity of species and habitats with current Refuge owned lands, this use would be anticipated to have impacts similar to those described for current Refuge owned lands. If the Refuge manager determines that those opportunities would substantially change the conditions under which this use was found compatible, or that there is new, substantive information regarding the effects of the use, this CD would need to be re-evaluated.

Public Review and Comment: Public review and comments will be solicited in conjunction with the CCP/EA in order to comply with the National Environmental Policy Act and with Service policy.

Determination :

____ Use is Not Compatible
_X_ Use is Compatible With Following Stipulations

Stipulations Necessary to Ensure Compatibility:

User Stipulations:
- Joggers, bicyclists, and skiiers are required to stay on trails and designated roadways year-around.
- Bicyclists and cross country skiers can only go on the Auto Tour Route, Columbia Plateau Trail, the proposed connecting bike trail and entrance road. All other trails will be pedestrian only.
- Use is restricted to daylight hours only.
- Groups will be limited to five people or less.

Administrative stipulations
- Allowing the use as described in Preferred Alternative 3 is contingent upon finding the full funding to properly manage and administer the use. However, if funds are short for construction of facilities associated with this use, that should not be construed as invalidating the compatibility of the use overall.
- At least 50% of the Refuge will be managed as wildlife sanctuary where human disturbance is infrequent.
- Where feasible native trees and shrubs will be planted to create screening along the new bike trails to reduce disturbance.
- Regulations will be available to the public through a Refuge brochure.
- Directional, informational and interpretive signs will be posted and maintained to help keep visitors on trails and help educate the public on minimizing wildlife and habitat disturbance.

Justification: Biking, jogging, and cross-country skiing do not directly contribute to the mission of the National Wildlife Refuge System nor to the wildlife purposes of the Turnbull NWR. They are merely ways visitors access the Refuge. We believe some biking, jogging, and cross-country skiing visitors come with the expectation of wildlife observation which 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. Though these activities can cause disturbance, we believe that by limiting these activities to a small percentage of the Refuge and by always providing wildlife sanctuary from human disturbance in other areas of the Refuge, these activities will not interfere with the Refuge achieving its purposes of providing *sanctuary* and a *breeding ground for migratory birds and other wildlife*.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

_____ Mandatory 15-year Re-Evaluation Date (for priority public uses)
____X____ Mandatory 10-year Re-Evaluation Date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

___ Categorical Exclusion without Environmental Action Statement

___ Categorical Exclusion and Environmental Action Statement
___ Environmental Assessment and Finding of No Significant Impact
___ Environmental Impact Statement and Record of Decision

Literature Cited:

Aune, K. E. 1981. Impacts of winter recreationists on wildlife in a portion of Yellowstone National Park, Wyoming. Thesis, Montana State University, Bozeman, Montana, USA.

Bennett, K. A. and E. Zuelke. 1999. The effects of recreation on birds: a literature review. Delaware Natural Heritage Progam, Smyrna, DE 19977

Cassirer, E. F. 1990. Responses of elk to disturbance by cross-country skiers in northern Yellowstone National Park. M.S. Thesis, University of Idaho, Moscow.

Cassirer, E. F., D. J. Freddy, and E. D. Ables. 1992. Elk responses to disturbance by cross-country skiers in Yellowstone National Park. Wildlife Society Bulletin 20:375-381.

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Gabrielson , G. W. and E. N. Smith. 1995. Physiological responses of wildlife to disturbance. Pages 95-107 in R. L. Knight and K. J. Gutzwiller, ed. Wildlife and Recreationists: coexistence through management and research. Island Press, Washington, D. C. 372pp.

Ferguson, M. A. D., and L. B. Keith. 1982. Influence of Nordic skiing on distribution of moose and elk in Elk Island National Park, Alberta. Canadian Field Naturalist 96:69–78.

Hoopes, E.M. 1993. Relationships between human recreation and piping plover foraging ecology and chick survival. Thesis, University of Massachusetts, Amherst, Massachusetts.

Knight, R. L. and D. N. Cole. 1991. Effects of recreational activity on wildlife in wildlands *in* Transactions of the North American Wildlife and Natural Resources Conference. 56:238-247.

Knight, R. L. and D. N. Cole. 1995. Wildlife responses to recreationists. Pages 71-79 in R. L. Knight and K. J. Gutzwiller, ed. Wildlife and Recreationists: coexistence through management and research. Island Press, Washington, D. C. 372pp

Lyon, J., and A. L. Ward. 1982. Elk and land management. Pages 443–478 *in* J. W. Thomas and D. E. Toweill, editors. Elk of North America: ecology and management. Stackpole Books, Harrisburg, Pennsylvania, USA.

Rudd, L. T., and L. L. Irwin. 1985. Wintering moose vs. oil/gas activity in western Wyoming. Alces 21:279–298.

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

E.6 RESEARCH AND MONITORING COMPATIBILITY DETERMINATION

Use: Research and Monitoring including the Operation of the Turnbull Laboratory for Ecological Studies (Alternative 3)

Refuge Name: Turnbull National Wildlife Refuge (NWR), Spokane County, Cheney Washington

Establishing and Acquisition Authorities:
- Executive Order 7681, dated July 30, 1937
- Migratory Bird Conservation Act [16 U.S.C. 715-715d, 715e, 715f-715r]
- 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]

Other Applicable Authorities:
- Intergovernmental Cooperative Agreement between the Bureau of Sport Fisheries and Wildlife and Eastern Washington State College for the establishment and operation of an environmental research facility on Turnbull NWR, dated June 1973.
- Intergovernmental Cooperative Agreement between the US Fish and Wildlife Service (USFWS) and Eastern Washington University for the operation and maintenance of an environmental research facility on Turnbull NWR, dated October, 1988.
- Memorandum of Understanding between the US Fish and Wildlife Service and Eastern Washington University for the purpose of conducting environmental and biotic studies at the Turnbull Laboratory for Ecological Studies, dated July 2004.
- Delegated State Rental Agreement between State of Washington, Department of Ecology and U.S. Fish and Wildlife Service, Turnbull National Wildlife Refuge for lease of a site on Turnbull NWR for ambient air condition monitoring station, dated October 2003.

Refuge Purpose(s):
- "*... as a Refuge and breeding ground for migratory birds and other wildlife...*" (Executive Order 7681, dated July 30, 1937)
- "*... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.*" (16 U.S.C. 715d [Migratory Bird Conservation Act])
- "*... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ...*" (16 U.S.C. 460k-1) ... the Secretary ... may accept and use ... real ... property. Such

acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 16 U.S.C. 460k-2 (Refuge Recreation Act (16 U.S.C. 460k-460k-4), as amended).

- "*... for the development, advancement, management, conservation, and protection of fish and wildlife resources* ... "(16 U.S.C. 742f(a)(4) ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... 16 U.S.C. ¤¤ 742f(b)(1) (Fish and Wildlife Act of 1956)

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

Description of Use: The Refuge Manager issues up to six Special Use Permits (SUP) per year for approved research projects on Turnbull Refuge. This is the number of permits the staff can currently handle in one year. This limit also helps restrict research-related wildlife and habitat disturbance and also minimizes researcher competition for space and project interference. Resource management oriented research is given priority, but other compatible research is permitted. Research activities include collection of specimens, measuring, observation, monitoring, photography, live trapping, data analysis, and report writing. Research is conducted by students and professors from local universities and colleges (such as Eastern Washington University and Washington State University). Additional permits will be considered on a case by case basis.

Data on air quality and weather is also collected by Federal, State and County agencies through stationary monitoring equipment. Air quality monitoring stations are located on the Refuge and operated by the Washington Department of Ecology and Spokane County Air Pollution Control Agency (SCAPCA). The County monitoring station is used as a control for the County's air quality monitoring system. A national climate station is being proposed for installation on the Refuge.. This is one of 100 stations being located across the United States to measure long term climatic conditions.

Both air quality monitoring stations are located at the same site, near the Refuge headquarters at the site of the old well pump house just south of Pine Creek and Headquarters Pond. The SCAPCA station sits on the existing cement pad from the old well pump house. A single SCAPCA employee visits the station frequently (sometimes as often as once a day during periods of poor air quality) to ready the monitors and change filters. They approach the site either on foot or by vehicle on an existing dirt access road. Electrical consumption is minimal and has been provided to the County by the Refuge in the past. WA Department of Ecology monitors their site electronically. The State has been paying a nominal fee to the Refuge for electrical consumption. The proposed locations for the National Oceanic and Atmospheric Association (NOAA) national climate station are the current location of the station's weather (RAWS) station near the maintenance shop or near the Refuge bunkhouse.

Research occurs year-round throughout the 15,656 acres of the Refuge, in and around wetlands and streams, springs, and in all upland habitats. The activity occurs mostly during the period March through October, on weekdays, and during daylight hours. Research may occasionally occur on weekends and rarely at night. Monitoring stations would be operated year-around.

In addition to the research above, Eastern Washington University (University) would continue to operate an environmental research facility known as the Turnbull Laboratory for Ecological Studies (TLES) and conduct research in an area of approximately 50 acres near this facility in the northern portion of the Refuge along the Cheney-Plaza Road at T23N, R41E, S1/2 Section 25 and T22N, R42E, E1/2E1/2 Section 5. University research activities are subject to the terms of the cooperative agreement between the University and the Service which was first entered into in 1973, renewed in 1988, and again in 2004 as a memorandum of understanding (MOU). (See Other Applicable Authorities, above) In particular, under the MOU, "The facility is for the purpose of conducting environmental and biotic studies that will assist the Service in accomplishing the objectives for which the Refuge was established." This facility provides the opportunity for environmental studies and research on-site within a National Wildlife Refuge. Because of the existence of this facility and the cooperative agreement, the designated research site adjacent to TLES receives the most concentrated amount of research activities on the Refuge. In operating the facility and using Refuge lands the University is required to comply with all Federal and State laws applicable to Turnbull NWR.

Pending future funding, the university has proposed to put an addition on the existing laboratory doubling the square feet in order to add additional classroom and laboratory space.

This use is not defined as a wildlife-dependent recreational use under the Improvement Act. See Map 2 in Chapter 1 of the Draft CCP/EA for locations of the TLES facility.

Availability of Resources: The following funds would be required to run a program as designed under the Preferred Alternative 3. The projected need is equivalent to the existing recurring expenses for this program.

One time expenses: none

Recurring expenses for research activities:

Staffing: Salaries (Refuge Biologist, Refuge Manager)	$8,000/year
Administrative oversight of monitoring station agreements	$ 250/year
TOTAL RECURRING EXPENSES:	$8,250/year

Offsetting revenues: WA Dept of Ecology reimburses the Refuge $250/year for electricity used in their monitoring station. With renewal of the Spokane County agreement the County will also be required to reimburse the USFWS for any electrical consumption associated with their station. The same will go for the NOAA national climate station.

TOTAL RECURRING EXPENSES: $8,250

Offsetting revenues: none

Existing Refuge resources are adequate to properly and safely administer the use as envisioned under the Preferred Alternative 3. However, grants may be sought with the assistance of the Friends of Turnbull NWR to assist the University in providing research funds for graduate students.

Anticipated Impacts of the Use(s): Disturbance to breeding, resting and feeding wildlife and their habitats may occur through frequent contact with researchers performing data collection and monitoring

activities. Results of disturbance could include the abandonment of nest and young resulting from frequent visitation to nest or breeding sites. In addition, trapping and marking of wildlife for habitat and population studies may result in injury and mortality; study of food habits, parasitism or disease may require the sacrifice of animals; and measurement of habitat characteristics or experimental manipulation of habitats may result in the alteration or destruction of wildlife habitat.

The TLES facility is an earth-shelter facility that blends well with the environment at the site and reduces the negative visual impacts of development at the site. Current impacts from the operation and maintenance of the facility and the research studies occurring on the site involve disturbance both to habitats and wildlife populations. With the anticipated level of activity occurring at the site over the next ten years, these impacts are determined to be insignificant at this time.

Should the USFWS allow the University to add on to the existing structure there will be direct impacts to habitats at the building site, displacing vegetation and animal life. This compatibility determination will be reviewed and amended as appropriate should the University request permission to add on to the laboratory facility.

Anticipated Impacts of the Use within the Proposed Expansion Area: If and when the U.S. Fish and Wildlife Service acquires land within the expansion area, there could be opportunities for compatible research. Due to the similarity of species and habitats with current Refuge owned lands, this use would be anticipated to have impacts similar to those described for current Refuge owned lands. If the Refuge Manager determines that those opportunities would substantially change the conditions under which this use was found compatible, or that there is new, substantive information regarding the effects of the use, this Compatibility Determination would need to be re-evaluated. The acreage covered under the MOU with the University would not be extended into the expansion area. There are no plans to re-locate or locate any monitoring stations from their present or proposed locations.

Public Review and Comment: Public review and comments will be solicited in conjunction with the CCP/EA in order to comply with the National Environmental Policy Act and with Service policy.

Determination :

_____ Use is Not Compatible

__X__ Use is Compatible With Following Stipulations

Stipulations Necessary to Ensure Compatibility:

User Stipulations:

- All researchers will be required to submit a detailed research proposal for review and recommendation by the Refuge biologist and approval by the Refuge Manager. The biologist will provide the required proposal format to researchers.
- Researchers will be required to submit progress and final reports, as well as hard and electronic copies of all publications resulting from on-Refuge research.
- Special use permit conditions must be adhered to or the research and/or monitoring will be suspended.
- Under the terms of the Memorandum of Understanding between Eastern Washington University and the Service: a) the Service has the right to restrict the University from engaging in any projects when the Service determines that it is in its best interest to do so, b) Use of the lands

upon which the laboratory is located and all use of the premises outside the building are coordinated with and subject to the approval of the Refuge Manager and will be compatible with Refuge purposes and the mission of the National Wildlife Refuge System. c) The Service may terminate the MOU for failure of the University to comply with any or all of the terms or conditions of the cooperative agreement. Eastern Washington University is responsible for all maintenance and operational costs of running the laboratory facility.

- Any new construction or changes to the TLES facility will require Refuge Manager approval, an agreement amendment, review of this compatibility determination and must be in accordance with State and Federal laws, regulations and policy.
- Agencies and entities operating stationary monitoring stations requiring utilities (air quality, weather) will cover maintenance and operating costs including utilities for their station.
- All samples and specimens collected from the Refuge are Refuge property. Once the research project is complete or terminated, researchers shall check with Refuge to ascertain whether staff would prefer samples and specimens turned over to Refuge offices. Service personnel shall be provided access to the samples and specimens at any time at no cost (unless arrangements are made to the contrary).

Administrative Stipulations:

- The Refuge Biologist will review all research proposals and identify any conditions of the research permits that eliminate or minimize negative impacts to any one area, species or habitat of the Refuge. The Refuge Biologist will make a recommendation to the Refuge Manager on whether the research should occur, based on weighing of benefits and impacts.
- Research requiring the collection of animals will only be authorized after careful consideration by the Refuge Biologist and Refuge Manager as to the importance of Refuge populations to the conservation of the species, the possible adverse impacts to the Refuge populations, and the humaneness of the collection methodology. State and federal collection permits are required.
- Consultation will be conducted for any research activities that may possibly have an impact on threatened or endangered species.
- The Refuge Manger will issue no more than six special use permits annually for research outside the TLES research site. Additional permits may be considered depending upon staff workload and cumulative impacts of existing research projects on wildlife and habitats and on each other. The permit holder will list the names of each person assisting on the research project and provide description and license number of vehicles that will be used.
- Semiannual reviews (April and October) will be conducted of the TLES Memorandum of Understanding, facility operations, and on-going research.
- Refuge staff will monitor research projects to ensure that on-going research is not causing any habitat damage or impacting any animal populations.
- Refuge staff will monitor operation and maintenance of the laboratory to ensure that the building and utilities attached to the TLES facility are not causing any further impacts to the site.
- Additional site specific and research specific terms and conditions will be included in all SUPs.

Justification: Research contributes to the NWRS mission and Turnbull NWR purposes by providing scientific data that expands biological knowledge of the Refuge. Research can assist the Service in making Refuge management decisions. Research is also an important part of the Refuge Vision and Goals and contributes to a quality environmental education program on the Refuge. The stipulations provided herein, and the terms and conditions that would be included on each SUP, will ensure that all research remains compatible. The operation of the air quality monitoring stations does not interfere with the management of the Refuge. The USFWS will benefit from any knowledge gained by the State and County on air quality issues. The USFWS would like to maintain a working partnership with the

Department of Ecology and Spokane County Air Pollution Control Agency in all aspects of Refuge management. The proposed NOAA national climate station will also provide information beneficial to the Refuge and the NWRS.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

_____Mandatory 15-year Re-Evaluation Date (for priority public uses)
__X__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 (for special use permits)
____ Categorical Exclusion and Environmental Action Statement
__X_Environmental Assessment and Finding of No Significant Impact
(The Turnbull Laboratory for Ecological Services was also discussed in an Environmental Assessment for the operation of Turnbull NWR dated August 1973).
_____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

E.7 AGRICULTURAL PRACTICES COMPATIBILITY DETERMINATION

Use: Grazing, Mowing and Haying (Alternative 3)

Refuge Name: Turnbull National Wildlife Refuge (NWR)

Establishing and Acquisition Authorities:
- Executive Order 7681, dated July 30, 1937
- Migratory Bird Conservation Act [16 U.S.C. 715-715d, 715e, 715f-715r]
- 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):

- "... as a Refuge and breeding ground for migratory birds and other wildlife." (Executive Order 7681, dated July 30, 1937)
- "...for use as an inviolate sanctuary, or for any other management purpose for migratory birds." 16 U.S.C. & 715d (Migratory Bird Conservation Act)
- "...suitable for - (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." 16 U.S.C. &460k-1 (Refuge Recreation Act).
- "...for the development, advancement, management, conservation, and protection of fish and wildlife resources..." (16 U.S.C. 742f(a)(4)...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude...16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956)

National Wildlife Refuge System Mission: "To preserve a national network of lands and waters for the conservation and management of the fish, wildlife, and plants of the United States for the benefit of present and future generations." (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee])

Description of Use: As identified in the Turnbull NWR Habitat Management Plan (USDI, 1999) there is a need to control exotic plant species in both the seasonal wetland habitat as well as upland habitat sites. Suggested management tools include high intensity short duration grazing, mowing, and haying, as well as other restoration strategies, such as deep flooding, prescribed fire, herbicides, disking and seeding. The primary objective of using grazing, mowing, and haying is to manage vegetation to maintain or increase its value to wildlife at minimal cost to the government.

The U.S. Fish and Wildlife Service (USFWS) would permit livestock (cattle) operators to graze in selected wetland basins as needed to control reed canarygrass. The livestock could be used on approximately 200 acres of the Refuge annually to remove annual growth of this exotic species as part of a program to increase native plant diversity in Refuge wet meadow habitat. Although grazing was used in the past as an economic use in all upland and wetland habitats on this Refuge and was found incompatible, the use of cattle grazing as a management practice only to control reed canarygrass is a new application. Stressing reed canarygrass with high intensity short duration grazing is one tool to be used to improve habitat for native wetland plant species by reducing competition for light, space and nutrients. Grazing is expected to reduce and eliminate the accumulation of a heavy litter layer that would cover or shade out native plant species from germinating and growing.

The number of Animal Unit Months (AUM's) will be determined after experimentation and will be dependent upon the number of acres in the annual prescription. The permittee may be required to construct fencing using materials furnished by the Service. The permittee will be expected to maintain fences, gates adjoining their permit areas during the period their permit is in effect. All necessary materials for fence maintenance will be furnished by the Service (6 RM 9 and 9 RM 3). Temporary electric fencing will be used throughout this experimental grazing program. Once it has been determined whether this is a feasible tool for reed canarygrass control, consideration may be given to permanent fencing.

The USFWS will employ mowing and haying on approximately 300 acres of the Refuge. Haying and mowing will be used to remove annual growth of exotic species such as reed canarygrass, Canada thistle, tansy and knapweed . It also may be used to reduce flashy fuels in an effort to reduce wildfire hazards

along roadsides, trails and dikes and around facilities. Mowing and haying from mid-June through July would 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 these agricultural practices will be closely monitored on an initial 17 acres of grazing on Helm marsh and 33 acres of haying on Helm Marsh and Stubblefield Lake to determine their impacts and success before implementation on a larger scale (200-300 acres). Success would be controlling further spread and/or reducing of the exotic plant species. These actions would support Turnbull NWR Habitat Management Plan Objective 1F: "By 2000, develop and apply on an experimental basis management strategies to restore and maintain native plant communities of seasonal wetlands and wet meadows dominated by reed canarygrass" (USDI, 1999). Also see Rule (2004).

These uses are not defined as wildlife-dependent recreational uses under the Improvement Act. See Implementation section (Appendix F of the Draft CCP/EA) to determine priority of projects associated with these uses as funding becomes available.

Use Within the Proposed Expansion Area: Any new land acquired will be assessed for weed and hazardous fuel problems and the appropriate management tool applied to abate the problem. Based on the success of the pilot program on existing Refuge lands the Refuge manager may propose to allow grazing, haying or mowing to enhance resource management.

Availability of Resources: The following funds would be required to run a program as designed under the Preferred Alternative 3. Currently, there is zero funding for this proposed program. For the one-time expenses, all available sources would be investigated.

One time expenses:	Staff-conducted	Cooperator-conducted
Planning	$1,500	
Purchase of electric fencing materials	$1,500	
TOTAL ONE TIME EXPENSES	$3,000	
Recurring expenses:		
Implementation and monitoring	$3,000	
Annual tractor maintenance	$ 500	
Diesel fuel	$ 500	
Maintenance Worker WG-8 Salary	$1,800	
Permit compliance	$ 0	$ 300
TOTAL RECURRING EXPENSES:	$5,800	$ 300

Offsetting revenues: Grazing permittees would be charged fair market value for forage consumed. Haying permittees would be charged fair market value for hay.

Anticipated Impacts of the Use: Because of the limited nature of this use (short term, small acres) it is not anticipated that these activities will have major adverse effects on native Refuge flora or fauna or other Refuge uses. Livestock excrement may increase the nutrient level of the area being grazed and could increase the levels of nitrogen, and phosphorus in the wetland basin after spring run-off. Accumulations of these nutrients over time can have an impact on water quality (Whalen, S.G. 1990).

There will be short-term disturbance to wildlife caused by the presence of people, and livestock or haying machinery. Cover will be removed as livestock graze or haying is implemented. Nesting by some late ground nesting birds may be disrupted. Agricultural implements and livestock will cause some disturbance to soils and plants.

There is a potential for introduction of invasive plant species from private equipment used in haying. However, it is anticipated that removal of exotic grasses and weeds before they go to seed will reduce the spread of exotics.

These management actions to control reed canarygrass would result in improving native plant diversity in wet meadow plant communities. There are 100 species of native plants that should occur in habitats susceptible to invasion by reed canarygrass. Survey work on the Refuge has shown that plant species diversity of invaded stands has been reduced to 11 species on the average with some stands having three species or less. Every wetland basin on the Refuge and in the surrounding area has at this time been invaded by reed canarygrass (Rule, 2004).

A native plant of interest while managing reed canarygrass is *Howellia aquatilis*, a species federally listed as threatened. Monitoring of reed canarygrass control methods such as grazing will allow the Refuge to determine if the strategy is improving conditions for howellia and other native wetland plants. Fire danger will be decreased in mowed and grazed areas. Early spring 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 Habitat Management Plan/Environmental Assessment (USDI, 1999a).

Anticipated Impacts of the Use within the Proposed Expansion Area: If and when the Refuge acquires land within the expansion area, there could be opportunities for compatible haying or grazing. Due to the similarity of species and habitats with current Refuge owned lands, this use would be anticipated to have impacts similar to those described for current Refuge owned lands. If the Refuge manager determines that those opportunities would substantially change the conditions under which this use was found compatible, or that there is new, substantive information regarding the effects of the use, this Compatibility Determination would need to be re-evaluated.

Public Review and Comment: Public review and comments will be solicited in conjunction with the CCP/EA in order to comply with the National Environmental Policy Act and with Service policy.

Determination (check one)

____ Use is Not Compatible

__X__ Use is Compatible With Following Stipulations

Stipulations Necessary to Ensure Compatibility:
User stipulations:

- Only high intensity short duration grazing will be permitted.
- All grazing activities will be restricted to designated areas for the periods prescribed.
- Permittee must own the livestock.
- Permittee will install and remove the temporary electric fence around the unit.

- Grazing will occur in May-June when reed canarygrass is most palatable and livestock water is available.
- Cooperator's tractors and farming implements as well as Refuge equipment 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.
- Refuge farm equipment will be washed at the shop equipment wash stall
- All haying and mowing activities will be restricted to designated areas.
- Haying and mowing activities will start after July 1 each year and be completed by November 1.

Administrative stipulations:

- A Special Use Permit (SUP) will be issued to all cooperators associated with grazing, haying, and mowing activities and will require that the above stipulations be met.
- Permits shall be issued annually .
- Each unit necessitating grazing treatment shall be grazed for no less that two years.
- Permits will be issued through sale by lottery (USFWS 6RM 9.10B).
- AUM's and hay prices will be set annually based on fair market value.
- Cattle stocking rate will be high enough to achieve at least 80% utilization of reed canarygrass within two weeks.
- Counts of livestock will be made at entrance and exit to ensure compliance.
- 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.
- Areas will be monitored to ensure treatments are improving habitat conditions and to ensure grazing and haying are the appropriate management strategies for a particular site.
- Refuge staff will monitor cooperator activities to ensure that special conditions required under the SUP and/or Cooperative Land Management Agreement are met.

Justification: These uses, as described in this Compatibility Determination, contribute to fulfilling the mission of the National Wildlife Refuge System and to the purposes of Turnbull NWR by managing wet meadows and seasonal wetland plant communities to conserve native plants, including the threatened water howellia, and their associated wildlife species. Grazing may be an effective strategy to help control the very aggressive exotic reed canarygrass and, when used in combination with other integrated pest management tools (chemical treatment, disking, prescribed fire, flooding, mowing and shading), can assist the Refuge in achieving its Vision and Goals. An experimental program of controlled livestock grazing was proposed under the Habitat Management Plan that will be closely monitored to determine its impacts and success before implementation on a larger scale. There are ten units identified on the Refuge that will received either singly or in combination one of the reed canarygrass treatments listed above. Treatments will be assigned based on logistical considerations; accessibility for equipment and perspective livestock permittees, and existing infrastructure (fences, water level control, livestock water, etc.).

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

_____ Mandatory 15-year Re-evaluation date (for priority public uses)
__X__ 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

Literature Cited:

Rule, Mike. 2004. The Adaptive Management Plan for the Control of Reed Canarygrass on Turnbull NWR.

USDI Fish and Wildlife Service. 1999. Turnbull National Wildlife Refuge Habitat Management Plan, December 1999. Cheney, Washington.

USDI Fish and Wildlife Service. 1999a. Environmental Assessment, Turnbull National Wildlife Refuge Habitat Management Plan, August 1999. Cheney, Washington.

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

E.8 COMMERCIAL TIMBER HARVEST COMPATIBILITY DETERMINATION

Use: Commercial Timber Harvest (Alternative 3)

Refuge Name: Turnbull National Wildlife Refuge, Spokane County, Washington

Establishing and Acquisition Authorities:
- Executive Order 7681, dated July 30, 1937
- Migratory Bird Conservation Act [16 U.S.C. 715-715d, 715e, 715f-715r]
- 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):

- "*... as a Refuge and breeding ground for migratory birds and other wildlife...*" (Executive Order 7681, dated July 30, 1937)
- "*... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.*" (16 U.S.C. 715d [Migratory Bird Conservation Act])
- "*... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ...*" (16 U.S.C. 460k-1) ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 16 U.S.C. 460k-2 (Refuge Recreation Act (16 U.S.C. 460k-460k-4), as amended).
- "*... for the development, advancement, management, conservation, and protection of fish and wildlife resources ...* "(16 U.S.C. 742f(a)(4) ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... 16 U.S.C. ¤¤ 742f(b)(1) (Fish and Wildlife Act of 1956).

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, as amended [16 U.S.C. 668dd-668ee])

Description of Use: This use is further defined and analyzed in the Habitat Management Plan's Environmental Assessment (USDI 1999). Under the Habitat Managment Plan (HMP), the Refuge determined to use commercial tree harvest as a forest restoration technique to achieve HMP habitat goals (similar or identical to the goals listed in Chapter 1 of the CCP) in ponderosa pine forest and aspen riparian woodlands. The Refuge has been utilizing this tool as prescribed under the HMP since 1999 on approximately 400 acres/year. Continuing into the future, approximately 400 acres could be treated annually (more if additional lands acquired and in need of forest restoration) and harvested utilizing the following generic prescription.

- Cutting of trees 8 inch diameter at breast height (d.b.h.) or less could be completed on a minimum of 200 acres annually. Average densities in this size class range from 64-305 trees per acre with maximum densities above 1000 trees/acre. Stems would be removed for the small wood market, fuel wood, and piled or broadcast for later burning.
- Single tree selection harvest could be conducted on 400 acres of ponderosa pine forests annually to remove up to 60 percent of the trees between 8 - 24 inch d.b.h. This amounts to a removal on the average of between 5- 40 trees per acre > 8" d.b.h. The largest number of stems to be removed is actually in the < 8" d.b.h size classes which can amount to from 50 – 2,000 trees/acre.
- Group selection cuts less than .25 acres in size could be completed on approximately 5% of annual treatment areas to create forest openings for regeneration where they currently do not occur.
- In mixed stands of pine and aspen, up to 100% of the ponderosa pine less than 24 inches in diameter could be removed from annual forest treatment area (approximately 35 acres annually). Regeneration of aspen would be stimulated by burning or mechanical methods.

Commercial timber harvest with the use of heavy equipment will occur in most cases on frozen ground with a cover of snow. Other periods may be considered based upon equipment being used and moisture level in soils. Forest units will be cruised and marked by Refuge staff prior to bid proposals going out to

potential permittees. Awards will be determined through competitive bidding. The successful bidder will be issued a Special Use Permit with conditions attached.

This use is not defined as a wildlife-dependent recreational use under the Improvement Act. See Implementation section (Appendix F of the Draft CCP/EA) to determine priority of projects associated with these uses as funding becomes available.

Use Within the Proposed Expansion Area: Chapter 2 of the draft CCP/EA identifies areas in which the Service would seek to acquire land from willing sellers outside of the current approved boundary [proposed Refuge expansion area]. Were the Refuge to acquire some of these lands, timber harvest may be allowed in the future expansion area in designated localities dependent upon the condition of the forests. Since we do not presently know which landowners may be willing sellers and which may not, we are not able to address specific uses in specific locations at this time.

Availability of Resources: The following funds would be required to run a program as designed under the Preferred Alternative 3. For the one-time expenses, all available sources would be investigated.

One time expenses (each sale site):

Graveling haul road:	$50,000
Re-seeding skid trails and landing sites:	$30,000
Pre and Post Monitoring:	$ 5,000
TOTAL ONE TIME EXPENSES PER SALE SITE:	$85,000*

(note: Each sale site includes an estimate of rehabilitation work needed and prospective purchasers need to submit bid to pay for this work. Refuge does not anticipate the need for recurring road maintenance or reseeding after contract closes).

Recurring expenses:

Administration of permit and contract inspection:	$ 2,500
Cruising and marking timber sale:	$10,000
TOTAL RECURRING EXPENSES:	$12,500

Offsetting revenues: Revenues from sale of timber (approximately 500 thousand board feet (mbf) annually), pulpwood, and hogfuel: $100,000. Revenues received by the Refuge are submitted to the US Treasury. The Refuge benefit would be in any funds coming back to the Station to administer the permits.

The permittee either pays directly or reimburses Service for costs of rehabilitation and monitoring on each sale site.

In kind services (students from Student Conservation Corps natural resources program assisting with cruising) $2,500

Anticipated Impacts of the Use(s): The following is a brief description of potential impacts. A more detailed impact analysis of this proposed use is contained in the Turnbull NWR Habitat Management Plan/Environmental Assessment (USDI, 1999a). The potential negative impacts of commercial tree harvest include ground disturbance from the use of heavy equipment and disturbance to wildlife from tree harvest activities. Ground disturbance will likely occur when skidding trees to a landing. Impact will also occur at the landing site during log processing and loading. It is expected that between 50-100

acres of the Refuge will be subject to potentially ground disturbing activities annually for the next 15 years. If mineral soils are exposed there is a high probability that these sites will be invaded by exotic plant species such as ventanata (*Ventanata dubius*), cheat grass (*Bromus tectorum*), Canada thistle (*Cirsium arvense*), common mullein (*Verbascum thlaspus*) and dalmation toadflax (*Linaria dalmatica*) unless the disturbed sites are rehabilitated.

Impacts to wetlands can be expected if heavy equipment is allowed to work within the wetland basin or near the wetland edge. This disturbance can increase erosion and sediment transport to the wetland. Increased sedimentation can impact aquatic plant and animal communities including the threatened plant species water howellia (*Howellia aquatilis*).

Some disturbance of wildlife is expected to occur during tree harvest activity, which creates noise in addition to the presence of machinery and people. Some landbirds (songbirds, grouse, owls, and hawks), white-tailed deer (*Odocoileus virginianus*), Rocky mountain elk (*Cervus elaphus*), and coyotes (*Canis latrans*) are expected to avoid areas of high activity. These species will readily move into these sites after the disturbance is removed. This level of activity is expected to occur on less than 5% of the Refuge at any given time. Foliage roosting bats such as the hoary bat (*Lasiurus cinereus*) and the silver-haired bat (*Lasionycteris noctivagans*) may be dislodged from roost trees if tree harvest occurs during the summer months. Tree harvest activities occurring during the nesting season can directly impact both ground and foliage nesting birds.

Cavity nesting birds may be impacted if snags or dead top trees are removed. Because the use of mechanized fellers is required, operations can occur near large snags without violating Occupational Safety and Hazard Administration rules. No snags will to be cut if they measure 8" d.b.h or larger.

This use may impact threatened and endangered species, including Spalding's silene and bald eagle. Impact to the silene populations are expected to be minimal. Disturbance impacts to the bald eagle would be occur but would be of a temporary nature. See the Turnbull NWR Habitat Management Plan/Environmental Assessment (USDI, 1999) for further discussion of the effects of this use on threatened and endangered species.

Anticipated Impacts of the Use within the Proposed Expansion Area: If and when the Refuge acquires land within the expansion area, there could be opportunities for compatible forestry operations. Due to the similarity of species and habitats with current Refuge owned lands, this use would be anticipated to have impacts similar to those described for current Refuge owned lands. If the Refuge manager determines that those opportunities would substantially change the conditions under which this use was found compatible, or that there is new, substantive information regarding the effects of the use, this CD would need to be re-evaluated.

Public Review and Comment: Public review and comments will be solicited in conjunction with the CCP/EA in order to comply with the National Environmental Policy Act and with Service policy.

Determination :

____ Use is Not Compatible

__X__ Use is Compatible With Following Stipulations

User Stipulations:

Equipment:

- Unless approved in writing in advance by Refuge Manager only high flotation rubber tired equipment will be permitted.
- Only rubber tired Forwarders may be used.
- Metal tracked vehicles may be used at the landings and along existing roads with the prior approval of the Refuge Manager.
- Under no circumstances shall oil, grease, fuel, de-greasers or other hazardous chemicals be dumped, buried, or otherwise disposed of in the treatment unit or elsewhere in the Refuge.

Ground disturbance, roads and landings:

- Harvesting and heavy equipment use will be limited to periods of time when soils are either frozen or soil moisture is just enough to cushion the ground but not be either soggy nor powder dry. Manager will make the determination whether the ground conditions are right for operation.
- Trees will be skidded by lifting the butt-end off the ground to minimize ground disturbance.
- New road construction will not be allowed within the unit.
- Existing road access will be improved as specified in the SUP, if necessary for specified harvest and haul equipment so that road surface degradation can be avoided.
- Landings will be of the minimum size required and shall not encompass more than 5 acres of the unit.
- Service will comply with current policies and procedures related to cultural resource protection and perform mitigation required through cultural resources review.

Sensitive Resource Protection:

- Limited tree harvest activities will be allowed during the peak of the spring/summer breeding season to avoid impacts to roosting bats and ground and foliage nesting birds. Determination will be made by the Refuge manager as to location and quantity of harvest allowed during this period.
- No snags or dead top trees capable of housing cavity-using wildlife will be removed (snag / dead top trees $\geq$ 8 inches d.b.h. shall be retained).
- Heavy equipment will not be allowed within 25 yards of a wetland.
- Any trees cut within 25 yards of wetlands must be manually fallen away from the wetland and cabled outside the buffer before skidding.
- Heavy equipment will not be used on large exposed rock outcrops.
- All open steppe areas except those identified as potential landing sites will be avoided during skidding operations to minimize disturbance to shallow soil areas.
- Known cultural resource areas will not be disturbed. Contracts would be designed to avoid known cultural resource areas. If new cultural resource sites are discovered during contract activities, contract modification would be undertaken to avoid further ground disturbance in the area.
- Excessive disturbance of wildlife, and disturbance to sensitive areas and cultural resources shall result in permit suspension.

Rehabilitation:

- All soil surfaces disturbed by harvest operations shall be restored to their natural surface contours and re-seeded with native seed mixes upon completion of harvest operations.
- Rehabilitation of disturbed areas by replacement of topsoil and re-seeding with native species will be required of all timber operators.

Administrative Stipulations:

- The Refuge will provide the permittee with maps of wetland and other sensitive areas (cultural or historical).
- Monitoring provided by the permittee will be completed on all treatment units to assure stipulations are adhered to, expected benefits are realized, and negative impacts fall within the range anticipated.

Justification: The use of commercial tree harvesting contributes to the System mission and the purposes of Turnbull NWR by helping to restore the Refuge's ponderosa pine forests to historical conditions of widely spaced, large diameter trees and by reducing the encroachment of pine trees into aspen riparian areas. It also supports the National Fire Plan in reducing hazardous fuel loads on federal lands. As detailed in the HMP, the Refuge's forests are in poor condition due to past logging, grazing and fire suppression. Current conditions are ripe for catastrophic loss to insects, disease, and/or fire. While fire was the primary natural disturbance that maintained healthy historic forest conditions on the Refuge, a combination of commercial tree harvesting, firewood cutting, and prescribed fire is needed to address today's current forest conditions, air quality and human safety concerns, and resource protection needs.

Commercial tree harvesting may also contribute to the mission of the NWRS and purposes of the Refuge by improving wetland habitat conditions for the threatened plant species water howellia. The hydrologic regime of many small wetlands that are habitat for water howellia have been altered through changes in the density of coniferous forest cover in local watersheds. Reduction of coniferous forest cover and restoration of deciduous riparian vegetation should increase water yields through decreased transpiration and interception of precipitation (Gifford et al. 1984). Restoration of riparian deciduous vegetation and increasing water yield in Refuge watersheds will increase the amount of available *Howellia* habitat by restoring the natural hydrology of Refuge wetlands.

Mandatory Re-Evaluation Date

_____ Mandatory 15-year Re-Evaluation Date (for priority public uses)
____X___ Mandatory 10-year Re-Evaluation Date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

_____ Categorical Exclusion without Environmental Action Statement
____ Categorical Exclusion and Environmental Action Statement
__X__ Environmental Assessment and Finding of No Significant Impact
____ Environmental Impact Statement and Record of Decision

Literature Cited:

Gifford, G. F., W. Humphries, and R. Jaynes. 1984. A preliminary quantification of the impacts of aspen to conifer succession on water yield. II. Modeling results. Water Resources Bulletin 20 (2):181-186

USDI Fish and Wildlife Service 1999. Habitat Management Plan, Turnbull National Wildlife Refuge. Cheney, Washington.

USDI Fish and Wildlife Service. 1999a. Environmental Assessment for the Habitat Management Plan, Turnbull National Wildlife Refuge. Cheney, Washington.

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

E.9 FIREWOOD COLLECTING COMPATIBILITY DETERMINATION

Use: Firewood Collecting (Alternative 3)

Refuge Name: Turnbull National Wildlife Refuge, Spokane County, Washington

Establishing and Acquisition Authorities:

- Executive Order 7681, dated July 30, 1937
- Migratory Bird Conservation Act [16 U.S.C. 715-715d, 715e, 715f-715r]
- 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):

- "*... as a Refuge and breeding ground for migratory birds and other wildlife...*" (Executive Order 7681, dated July 30, 1937)
- "*... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.*" (16 U.S.C. 715d [Migratory Bird Conservation Act])
- "*... suitable for (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ...*" (16 U.S.C. 460k-1) ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ... 16 U.S.C. 460k-2 (Refuge Recreation Act (16 U.S.C. 460k-460k-4), as amended).
- "*... for the development, advancement, management, conservation, and protection of fish and wildlife resources ...* "(16 U.S.C. 742f(a)(4) ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ... 16 U.S.C. ¤¤ 742f(b)(1) (Fish and Wildlife Act of 1956).

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, as amended [16 U.S.C. 668dd-668ee])

Description of Use: The use involves public firewood salvage following Refuge forest management practices. The purpose of providing firewood to the public is to assist the Refuge in cleaning up non-commercially thinned ponderosa pine slash prior to running a prescribed fire through the stand. Removal of downed trees will reduce the fire intensity and improve the efficiency of the prescribed burn. Densely stocked ponderosa pine stands and heavy fuel loading within the Refuge creates a fire hazard. Forest management practices implemented under the Habitat Management Plan (USDI 1999) prescribe removal of excess fuels to re-establish historical pine densities that existed prior to the suppression of wildfire in this region.

Special Use Permits will be issued by the Refuge Manager within active forest management units where non-commercial thinning practices have been employed. Firewood permits for a minimum of two and a maximum of four cords of wood would be issued to the general public to salvage downed wood from Refuge thinning practices. Permits will be issued for specific project sites within one year of a thinning practice. Permittees will be assigned a specific period in which to collect the wood. Permittees will be allowed to drive their vehicles to the salvage site and cut up downed trees (with chainsaws or hand saws) and remove the slash from the site. Only recently cut small diameter trees, the vast majority under 8" in diameter, will be allowed for firewood collection.

The firewood shall be used for personal use or charity and cannot be sold for profit. Firewood permits will usually be issued August through December. Permittees are allowed a minimum of two and a maximum of four cords at an administrative fee of $10/cord. Fees will be adjusted as administrative costs increase.

This use is not defined as a wildlife-dependent recreational use under the Improvement Act.

Use Within the Proposed Expansion Area: Chapter 2 of the draft CCP/EA identifies areas in which the Service would seek to acquire land from willing sellers outside of the current approved boundary [proposed Refuge expansion area]. Some of these lands probably provide firewood collection, however there are no public firewood sites known at this time.

Availability of Resources:

One time expenses:	N/A
Recurring expenses:	
Administration & compliance inspection of Permits:	$1000
TOTAL RECURRING EXPENSES:	$1000
Offsetting revenues: (permit fees)	$ 600

Anticipated Impacts of the Use(s): Some wildlife disturbance would occur as a result of people accessing forested stands to collect firewood. Most of the environmental impacts will be incurred during the actual thinning operation and not the salvage of firewood. Firewood salvage by the general public

will however cause temporary disturbance to wildlife in the area. Firewood collectors generally use chain saws, which will cause high decibel localized noise. See the discussion of anticipated impacts in the commercial timber harvest compatibility determination for expected kinds of disturbance impacts caused by chainsaw noise, especially temporary wildlife movement away from the cutting area.

Use would be seasonal, usually August-December. There may be some impact from any illegal off-road vehicle travel. With the use of chainsaws there is the chance of a spark causing a fire. Uncontrolled fire in any of the Refuge habitats can have catastrophic impacts. Therefore precautions will be taken to reduce any chance of fire in the firewood salvage areas (see stipulations).

Loss of large woody debris to the ecosystem is not anticipated to affect fish and wildlife habitats. Only small diameter material will be allowed for collection. Streams are rare at Turnbull. Wildlife species utilizing large wood generally prefer larger material than that which will be removed.

This use may impact threatened and endangered species, including Spalding's silene and bald eagle. Impact to the silene populations are expected to be minimal. Disturbance impacts to the bald eagle would be occur but would be of a temporary nature. See the Turnbull NWR Habitat Management Plan/Environmental Assessment (USDI, 1999a) for further discussion of the effects of this use on threatened and endangered species.

Anticipated Impacts of the Use within the Proposed Expansion Area: If and when the Refuge acquires land within the expansion area, there could be opportunities for compatible firewood collecting. Due to the similarity of species and habitats with current Refuge owned lands, this use would be anticipated to have impacts similar to those described for current Refuge owned lands. If the Refuge manager determines that those opportunities would substantially change the conditions under which this use was found compatible, or that there is new, substantive information regarding the effects of the use, this CD would need to be re-evaluated.

Public Review and Comment: Public review and comments will be solicited in conjunction with the CCP/EA in order to comply with the National Environmental Policy Act and with Service policy.

Determination :

____ Use is Not Compatible

__X__ Use is Compatible With Following Stipulations

Stipulations Necessary to Ensure Compatibility:

User stipulations:

- Firewood collecting will only occur under a Special Use Permit and in areas designated by the permit.
- Only downed trees and branches may be taken, size not to exceed 8" diameter. Standing trees, live or dead, will not be cut.
- There will be no off-road vehicle travel allowed.
- Chainsaws must have spark arresters and users must have a fire extinguisher available.
- No cutting would be allowed on high or extreme fire danger days. Firewood collectors are responsible for contacting Refuge Manager to determine the fire danger rating during each visit.

Administrative stipulations:

- Firewood collecting is to be used only to support Refuge forest management practices in the support of Refuge purposes, goals, or objectives and not for economic purposes.
- There will be an administrative fee charged for the SUP.
- Compliance inspections will be undertaken by the Service from time to time.

Justification: Firewood collecting contributes to the mission of the NWRS and the purposes of Turnbull NWR by reducing high-intensity fire danger that might damage habitats and kill wildlife. This use complements forest thinning and prescribed fire projects by removing slash. It is a tool to reduce hazardous fuel loading in forest management units as well as insect and disease or blow down areas of Refuge forests. It also results in less smoke being generated during prescribed burning activities and there is a community benefit to allowing public to collect firewood.

Mandatory Re-Evaluation Date (provide month and year for "allowed" uses only):

_____ Mandatory 15-year Re-Evaluation Date (for priority public uses)
___X____ Mandatory 10-year Re-Evaluation Date (for all uses other than priority public uses)

NEPA Compliance for Refuge Use Decision (check one below):

___ Categorical Exclusion without Environmental Action Statement
___ Categorical Exclusion and Environmental Action Statement
_X_ Environmental Assessment and Finding of No Significant Impact (USDA 1999a)
___ Environmental Impact Statement and Record of Decision

Literature Cited:

USDI Fish and Wildlife Service. 1999. Habitat Management Plan, Turnbull National Wildlife Refuge. Cheney, Washington.

USDI Fish and Wildlife Service. 1999a. Environmental Assessment for the Habitat Management Plan, Turnbull National Wildlife Refuge. Cheney, Washington.

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 F: IMPLEMENTATION

I. OVERVIEW

Implementation of the preferred alternative 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 Transportation Equity Act (TEA-21) 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 MMS- Maintenance Management System) which are used to request funding from Congress. Currently, a large backlog of maintenance needs exists on the Refuge. In 2002 the MMS backlog for Turnbull NWR was $5,850,000. An attempt at reducing this backlog needs to be addressed and is included here in the analysis of funding needs. The Refuge Operational Needs System (RONS) documents proposed new projects to implement the CCP to meet Refuge goals and objectives and legal mandates.

Annual revenue sharing payments to Spokane County will continue. If the Refuge expands through the purchase of inholdings (privately owned lands within the current approved boundary) or through an expanded refuge boundary, additional in lieu of tax payments will be made to the county (see Chapter 4, section 4.3 for a summary of the economic effects). Total revenue sharing payments made to Spokane County in 2001 and 2002 were $52,107, and $53,185 respectively.

Revenues to the county will also increase based on any economic uses occurring on the Refuge such as commercial thinning projects. Currently, commercially thinning about 500 thousand board feet (mbf) of timber generates to the federal government revenues between $90,000 and $120,000. Saw timber value at this time averages about $450 / mbf. Permittee's costs are running between $120-$130 / mbf and rehabilitation costs currently run about $400/acre. The Refuge expects about five more years of commercial thinning activity within the next decade.

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.

II. COSTS TO IMPLEMENT CCP

The following sections detail both one time and recurring costs for various projects, by alternative. One time costs reflect the initial costs associated with a project whether it is purchase of equipment, contracting services, construction, purchase of land etc. Recurring costs reflect the future operational and maintenance costs associated with the project.

A. ONE TIME COSTS

One time costs are project costs that have a start up cost associated with them, such as purchasing a new vehicle for wildlife and habitat monitoring or designing and installing an interpretive sign. These projects are usually projects that can be completed in 3 years or less. These projects do not include permanent operational costs (staff salary and support). They can, however, include the cost of temporary or term salary associated with a short term project. Salary for new positions and operational costs are reflected in operational or "recurring" costs.

Funds for one time costs will be sought through increases in Refuge base funding, special project funds, grants, TEA3 funding, etc. Some projects also might require Fire Funds, land acquisition funds, or other special appropriations or grants.

Projects listed below in Table F-1 show one time costs, such as those associated with building and facility needs such as offices, public use facilities, road improvements, and new signs. One time 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, put under some kind of conservation agreement or purchased. Table F-1 below compares one time costs between the four alternatives. The table is divided into four parts (A, B, C, and D).

Table F-1. *Part A. One Time Costs (in thousands) for Research and Monitoring*

Project -Research & Monitoring	Priority	Unit Cost	Alt 1	Alt 2	Alt 3	Alt 4	Potential Fund Source
Prescribed Fire monitoring (equipment support)	H	$33K	$33	$33	$40	$40	9263 RONS 98001R
Water quality monitoring (equipment support)	H	$5K	$35	$35	$40	$60	RONS 00001R Contaminants
Expand wildlife and habitat monitoring program (equipment support)	M	$22K	$22	$22	$44	$44	RONS 97004R 02006R 00005R
Wetland Contour Mapping	M	$9K	$180	$180	$234	$270	RONS 98004R 00011R
Hydrology study of Stubblefield Lake	H	$110K	$110	$110	$110	$110	RONS 00006R
Research (several needs including rail, redhead & tern nesting ecology, pest plant, overflight impacts, howellia, elk movements, invasive fish species)	H	$20K/ project	$20	$20	$40	$80	RONS 98002R 02010R 02012R 97005R 02011R 02013R 03010R 03008R/ grants
All Research and Monitoring Projects Subtotal (thousands)			**400**	**400**	**508**	**604**	
High Priority Research and Monitoing Only (thousands)			**198**	**198**	**230**	**290**	

Table F-1. *Part B. One Time Costs (in thousands) for Facilities*

Project - Facilities	Priority	Unit Cost	Alt 1	Alt 2	Alt 3	Alt 4	Fund Source
EE Classroom Addition w/ furnishings	M	$275/sf	0	1200SF $430	1200 SF $430	1200 SF $430	1262 Deferred Maint. RONS 00003R
Office w/ visitor contact area & furnishings	H	$290/SF	0	$1000 3600 sf	$1,500 4500 sf	$1,500 4500 sq	00006M Construction RONS 00003R
Fire Facilities (office, crew room, fire cache and engine storage)	H	$150/SF	0	2000SF $300	2000SF $300	2000SF $300	Fire 9251
EE Shelters	L	$20K ea	0	$60	$60	$60	RONS 03004R In Kind Services
New Trails	M	$20K/mi	0	3.5 mi $70	3.5 mi $70	3.5 mi $70	Grants, RONS 03005R or TEA 3
Bicycle Trails	M	$218K/mi	0	0	2.75mi 600	5.75 mi. $1, 250	RONS 02002R Grants/ or TEA 3
Observation/Photo Blinds	H	$10K ea	0	$20	$20	$20	Grants/ RONS 03006R
Interpretive Signs	H	$5K ea	0	$80	$96	$96	Grants/ RONS 00008R 00010R
Parking (Hunter Access) Construction	M	$16K ea	$32K	$32	$48	$96	Grants/ RONS 03007R
Pullouts (County Hwys) with Observation platforms	L	$62.5K ea	0	0	$250	$250	RONS 02003R Refuge Roads/ TEA 3
Refuge Video Production	L	$43K	$43	$43	$43	$43	RONS 02005R
Public Use Support (includes costs associated with hunt plan, public safety, maintenance, and operations)	H	$40K	$40	$40	$40	$40	RONS 02004R 02001R 00012R 00007R 97003R
All Facilities Subtotal (in thousands)			**$115**	**$2,145**	**$3,527**	**$4,225**	
High Priority Facilities Subtotal (thousands)			**$40**	**$1,440**	**$1,956**	**$1,956**	

Table F-1. *Part C. One Time Costs (in thousands) for Habitat Management.*
(The following projects include the assumption that some acres will be treated several times over the course of the 15 year CCP time frame.)

Project - Habitat	Priority	Unit Cost	Alt 1	Alt 2	Alt 3	Alt 4	Fund Source
Forest Management on Refuge over 15 years	H	$190/ac	6660 ac $1,260	6660 ac $1,260	8850 ac $1,681	9600 ac $1,824	9263/ 9264 RONS 98008R
Wetland Restoration on-Refuge over 15 years	H	$200/ac	1850 ac $370	1850ac $370	2725 ac $545	3007 ac $601	NAWCA 97006R
Pest Plant Management over 15 years)	H	$250/ac	1500 ac $375	1500 ac $375	3,750 ac $937	5,250 ac $1030	RONS 00009R, 02007R, 98002R Special Funds
Prescribed Fire over15 years	H	$60/ac	12,000 ac $720	12,000 ac $720	17,100 ac $1026	18,750 ac 1125	9263 Project
Meadow Steppe Restoration	M	$40K	$40	$40	$80	$160	RONS 03009R
Riparian Management.	H	$250/ acre	32ac $8	32ac $8	96ac $24	120 ac $30	RONS 02008R NAWCA/WRP In Kind Services
Install Pieziometer Wells to monitor water rights	H	$5K/ea	$106	$106	$130	$150	RONS 97007R
All Habitat Projects Subtotal (in thousands)			**2,879**	**2,879**	**4,423**	**4,920**	
High Priority Habitat only Subtotal (in thousands)			**2,839**	**2,839**	**4,343**	**4,760**	

Table F-1. *Part D. One Time Costs (in thousands) for Land Acquisition*

Land Acquisition (estimated available acres w/in 15 years)	H	$2K/ac	2000ac $4,000	2000 ac $4,000	6800 ac $13,600	9000 ac $18,000	Land and Water Conservation Fund/ Migratory Bird Conservation Commission funds

B. OPERATIONAL (RECURRING) COSTS

Operational costs reflect Refuge spending of base funds allocated each year. These are also known as recurring costs and are usually associated with day to day operations and projects that last longer than three years. Operational costs use base funding in Service fund codes 1260, 9251 and 9263.

Table F-2 displays operating costs by alternative. Alternative 1 is based on a breakdown of how FY 2002 funds were spent on day to day operations. Alternatives 2, 3, and 4 reflect 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.

Table F-2 includes costs for permanent and seasonal staff needed year after year. It does not

include staff costs associated with special projects; these are summarized in Table F-1. Table F-2 is also related to the Refuge Comprehensive Accomplishment Report. Alternative 1 reflects how allocations were spent among management activities in FY 2002 at Turnbull NWR. The table includes funds spent in 1121, 1261, 1262, 9251, 9263, 6860. The table does not show costs other than operational (for example, costs of contracts for hazardous fuel or wildland urban interface projects are not included, though staff time administering these contracts is included).

Table F-2. *Operational (Recurring) Costs*

Project	Action	Resources Needed	Alt 1	Alt 2	Alt 3	Alt 4
1.a Surveys & Censuses	All methods of enumerating fish and wildlife populations, vegetative habitats, analysis, interpretation and reporting.	1260 - Biologist & Bio Techs and volunteers ½ Volunteer Coordinator	$75K	$75K	$125K	$125K
1.b Studies & Investigations	Research projects for managing fish and wildlife populations and habitats	1260 - Biologist & cooperators	$15K	$15K	$50K	$50K
2.a Wetland Restoration	The conversion of altered or degraded on-refuge wetland habitats, including riparian zones back to their original condition	1260, special project funds ½ Maintenance Worker	$28K	$28K	$52K	$52K
2.b Upland Restoration	The conversion of altered or degraded on-refuge upland habitats back to their original condition by such actions as replanting native species	1260 & special project funds	$1K	$2K	$6K	$12K
3.a Water Level Management	The manipulation of water bodies to affect vegetation and/or create desired wildlife conditions	1260	$12K	$12K	$28K	$38K
3.c Graze/Mow/Hay	The management of grasslands and other habitats for the benefit of wildlife by any combination of grazing, mowing, and haying.	1260	$6K	$6K	$12K	$24K

Project	Action	Resources Needed	Alt 1	Alt 2	Alt 3	Alt 4
3.e Forest Management	All mechanical forestry practices other than tree planting that are designed to alter forested habitat composition or succession to benefit wildlife. Selected thinning by staff or contractors.	1261,9251, 9263 & special project funds ½ FMO, ½ Eng Boss, 1/2 PS Fire Fighter ½ (3) Temp FF,1/2 Crew leader & ½ (5) crew	$230K	$230K	$250K	$275K
3.f Fire Management	Prescribed burning and wildfire preparedness activities. Follow-up monitoring and reporting.	1261,9251, 9263 - ½ FMO, Eng Boss, 1 PS Fire Fighter 3 Temp FF, Crew leader & 5 crew, special project funds	$235K	$235K	$265	$280K
3.h Invasive Plant Management	The eradication, reduction, or control of invasive or exotic plants. Includes monitoring.	1260, special project funds	$5K	$8K	$18K	$36K
4.a Bird Banding	Marking and banding of birds	1260, volunteers	$12K	$12K	$24K	$36K
4.d Nest Structures	The installation and maintenance of artificial nesting structures	1260, volunteers	$2K	$2K	$4K	$8K
4.e Native Pest Animal/Predator Control	The eradication, reduction or control of invasive or exotic animals (fish)	1260, volunteers	$1K	$1K	$2K	$4K
5.a Interagency Coordination	Interaction with other Federal, State and local governments to share information, resolve problems, develop cooperative efforts, and manage species & habitats	1260/9251	$24K	$24K	$36K	$48K
5.b Tribal Coordination	Activities associated with the development of cooperative agreements, MOU's annual funding agreements and similar cooperation/coordination/communication efforts with tribes.	1260	$1K	$1K	$2K	$2K
5.c Private Land Activities	Efforts to assist private land owners with habitat improvement and wildlife issues. (Initiate Stewardship Mgt.)	1121,9264	$5K	$5K	$50K	$50K

Project	Action	Resources Needed	Alt 1	Alt 2	Alt 3	Alt 4
6.a Law Enforcement	Public Safety, Resource Protection, Hunt Program	1260, ½ Refuge Officer (LE)	$30K	$30K	$55K	$55K
6.b Permits & Economic Use Management	Explaining, issuing, and monitoring special use permits	1260, 9263	25K	$25K	$30K	$35K
6.c Contaminant Investigation	investigation, studies, and monitoring. Baseline monitoring of air and water quality	1260, contaminant funding	6K	$6K	$10K	$16K
6.e Water Rights Management	Activities associated with compliance with state and federal laws to protect and achieve adequate supplies of water. Reading, maintaining and installing measurement devices and gaging stations, preparing water mgt. Plans, also monitoring off-refuge water uses.	1260	$2K	$2K	$14K	$22K
6.f Cultural Resource Management	Supporting the study and protection of significant prehistoric and historic sites. Evaluation of cultural resources and management of museum property.	1260, 9251	$4K	$4K	$28K	$43K
6.g Land Acquisition Support	Staff participation in land acquisition activities, including development of acquisition proposals and appraisals, meetings, inventories and surveys.	1260	$5K	$5K	$50K	$76K
7.a Visitor Services	Providing access, facilities, and programs for refuge visitors. Planning, construction, operation and maintenance of visitor facilities such as roads, trails, signs. Interpretation, environmental education, hunting and other recreation.	1260, EE Specialist, ½ Volunteer Coordinator, ½ maintenance worker, temp Park Ranger (EE) , ½ LE officer	$215K	$225K	$400K	$400K
7.b Outreach	Off-site education of public about Service activities through presentations, exhibits news releases and radio/TV spots.	1260	$40K	$40K	$50	$65K
TOTALS	**Subtotal Annual Operational Costs (in thousands)**		**$979**	**$993**	**$1,561**	**$1,752**
	Operational Costs over 15 years (in thousands)		**$14,685**	**$14,895**	**$23,415**	**$26,280**

C. MAINTENANCE COSTS

The maintenance need over the next fifteen years (funds needed to repair or replace buildings, equipment and facilities) is summarized in Table F-3. Maintenance costs include the maintenance "backlog" - maintenance needs that have come due but are as yet unfunded.

Maintenance includes preventative maintenance; cyclic maintenance; repairs; replacement of parts, components, or items of equipment; adjustments, lubrication, and cleaning (non-janitorial) of equipment; painting; resurfacing; rehabilitation; special safety inspections; and other actions to assure continuing service and to prevent breakdown.

Alternative 1 & 2 reflect the current backlog. Alternatives 3 and 4 reflect the backlog and chart the increased maintenance need associated with new facilities and additional acquisitions.

D. STAFFING

Staff is needed to conserve and enhance the quality and diversity of indigenous wildlife habitats on the Turnbull 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 so 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 optimum refuge outputs within this planning period (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 F-4 below shows the staffing levels associated with each alternative with salary 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 and indication of what percent of the total recurring costs would be allocated towards staff.

Table F-3. *Maintenance Costs by Alternative*

Maintenance Need	Action	Resources	Alt 1	Alt 2	Alt 3	Alt 4
Buildings	Maintain offices, EE classroom, maintenance. shop, storage buildings, restrooms, vault toilets, well houses, EE shelters, residences	1262, Maintenance Backlog	1,500K	$1,500K	$1,500K	$1,500K
Facilities	Maintain roads, trails, signs, fencing, gates, wells, water control structures, and public use facilities	1262	2,700K	$2,700K	$3,000K	$3,333K
Equipment	Maintain heavy Equip., vehicles, other equipment, office equipment	1262	$1,650K	$1,650K	$1,850K	$1,850K
Totals	**Buildings, Facilities & Equipment**	**1262**	**5,850K**	**5850K**	**6,350K**	**6,683K**

Table F-4. *Annual costs, annual salary and benefits, associated w/ Staff by Alternative*

Staff - Refuge Operations		Staff position	Ann. Salary	1	2	3	4
Refuge Manager	PFT	GS-0485-12/13	$80,000	$80,000	$80,000	$80,000	$80,000
Deputy Refuge Manager	PFT	GS-0485-11/12	$75,000	$75,000	$75,000	$75,000	$75,000
Wildlife Biologist	PFT	GS-0486-11/12	$75,000	$75,000	$75,000	$75,000	$75,000
Wildlife Biologist	PFT	GS-0486-7/9/11	$70,000	0	0	$70,000	$70,000
Administrative Officer	PFT	GS-0341-09	$55,000	$55,000	$55,000	$55,000	$55,000
Eng. Equipment Operator	PFT	WG-5716-10	$60,000	$60,000	$60,000	$60,000	$60,000
Maintenance Worker	PFT	WG-4749-08	$50,000	$50,000	$50,000	$100,000	$100,000
Superv. Park Ranger /Volunteer Coordinator	PFT	GS-025-09	$55,000	$55,000	$55,000	$55,000	$55,000
Maintenance Worker	Temp (0.5)	WG-4749-06	$16,000	$16,000	$16,000	$16,000	$32,000
Park Ranger (EE)	Temp (0.5)	GS-025-5/7	$16,000	$16,000	$16,000	$16,000	$32,000
Biological Tech	Temp (0.5)	GS-0404-5/7	$16,000	$16,000	$16,000	$32,000	$32,000
Refuge Operations Specialist	PFT	GS-0485-9/11	$70,000	0	0	$70,000	$70,000
Purchasing Agent	PFT	GS-1105-5/7	$35,000	0	0	$35,000	$35,000
Park Ranger/Refuge Officer (LE)	PFT	GS-025 -5/7/9	$48,000	0	0	$48,000	$48,000
Environmental Educ. Specialist	PFT	GS-1001-7/9	$55,000	0	0	$55,000	$55,000
Information & Education Specialist	Term	GS-1001-5/7	$35,000	0	0	$35,000	$35,000
Totals			**$811,000**	**$498,001**	**$498,002**	**$877,003**	**$909,004**

PFT: Permanent Full Time
PS: Permanent Seasonal
Temp: Temporary position
Term: Term position
GS: General Schedule Federal Employees
WG: Wage Grade Scale

Staff - Fire Program		Staff position	Annual Salary	1	2	3	4
Fire Mgt. Officer	PFT	GS-0401-9/11	$70,000	$70,000	$70,000	$70,000	$70,000
Supv. Forest Tech/Rx Fire Crew Leader	PFT	GS-0462-08	$55,000	$55,000	$55,000	$55,000	$55,000
Lead Forest Tech/Rx Fire Crew Asst. Leader	PS (.85)	GS-0462-06	$40,000	$40,000	$40,000	$40,000	$40,000
Supv. Forest Tech /Engine Boss (Fire)	PS (0.7)	GS-0462-08	$40,000	$40,000	$40,000	$40,000	$40,000
Forest Tech/Firefighter	PS (0.7)	GS-0462-05	$26,000	$26,000	$26,000	$52,000	$52,000
Forest Tech/Rx Fire Crew	PS (.85)	GS-0462-05	$30,000	$120,000	$120,000	$150,000	$180,000
Forest Tech/ Firefighter	Temp (0.5)	GS-0462-05	$13,700	$27,400	$27,400	$27,400	$27,400
Forest Tech/Firefighter	Temp (0.33)	GS-0462-04	$8080	$8080	$8080	$8080	$8080
Forest Tech/Firefighter	Temp (0.33)	GS-0462-03	$7200	$7200	$7200	$7200	$7200
Totals			**$289,980**	**$393,681**	**$393,682**	**$449,683**	**$479,684**

E. Partnership Opportunities

The Refuge's location next to a large metropolitan area facilitates many 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 past partners include local schools, and non-profit groups (such as The Audubon Society, Friends of Turnbull NWR, Inland Northwest Wildlife Council, Eastern Washington University, Washington State Parks and Recreation Commission, The Nature Conservancy, Spokane County Fire District 3 and many others). Future partners will include these groups as well as state and tribal agencies. Partnerships like these will increase our effectiveness, knowledge, and community support, as well as reduce Refuge operating costs.

In order for the Service to be effective in the Stewardship area around the Refuge we will strive to exchange information and provide technical assistance to neighboring landowners to promote protection of valuable wildlife habitat on neighboring properties. Volunteers will continue to assist with various Refuge programs, as detailed in Chapter 3, Section 3.11

F. Budget Summary

Table F-5 summarizes the data from the above tables and displays the overall **annual** funding need, by alternative, for Turnbull National Wildlife Refuge.

Table F-5. *Summary of Refuge Annual Funding Need, by CCP Alternative*

Budget Category	Alt 1	Alt 2	Alt 3	Alt 4
One Time expenditures - all projects (total costs over 15 years)				
Research and Monitoring	400,000	400,000	508,000	604,000
Facilities	115,000	2,145,000	3,527,000	4,225,000
Habitat Management	2,879,000	2,879,000	4,423,000	4,920,000
Land Acquisition	4,000,000	4,000,000	13,600,000	18,000,000
A. Subtotal One Time Expenditures - all	**7,394,000**	**9,424,000**	**22,058,000**	**27,749,000**
One time expenditures - high priority projects only (total costs over 15 years)				
Research and Monitoring	198,000	198,000	230,000	290,000
Facilities	40,000	1,440,000	1,956,000	1,956,000
Habitat Management	2,839,000	2,839,000	4,343,000	4,760,000
Land Acquisition	4,000,000	4,000,000	13,600,000	18,000,000
B. Subtotal One Time Expenditure high priority projects only	**7,077,000**	**8,477,000**	**20,129,000**	**25,006,000**
C. Recurring Costs - all projects / salaries	**14,685,000**	**14,895,000**	**23,415,000**	**26,280,000**
D. Maintenance Need (total over 15 years)	**5,850,000**	**5,850,000**	**6,350,000**	**6,683,000**
Total Annual Budgetary Need: High priority projects only = (B +C +D) / 15	**$ 1,840,800**	**$ 1,948,133**	**$ 3,326,267**	**$3,864,600**
Total Annual Budgetary Need: All projects = (A +C +D) / 15	**$ 1,861,933**	**$ 2,011,267**	**$ 3,454,867**	**$4,047,467**

APPENDIX G: COMPLIANCE

In undertaking the proposed action, the following Executive Orders and legislative acts have been or will be acted upon.

1. Executive Order No. 11593, Protection and Enhancement of the Cultural Environment. If the Service proposes any development activities that would affect the archaeological or historical sites, the Service will consult with Federal and State Historic Preservation Officers to comply with Section 106 of the National Historic Preservation Act of 1966, as amended.

2. Executive Order No. 11988, Floodplain Management. No structures or other barriers that could either be damaged by or significantly influenced the movement of floodwaters are planned for construction by the Service in the project area. The proposal supports the preservation and enhancement of the natural and beneficial values of floodplains.

3. Executive Order No. 11990, Protection of Wetlands. The proposal will help conserve the natural and beneficial values of the wetland habitat. The Service will undertake no activity that would be detrimental to the continuance of the vital wetlands.

4. Executive Order No. 12372, Intergovernmental Review of Federal Programs. Coordination and consultation is ongoing with local and State governments, Tribes, Congressional representatives, and other Federal agencies. All relevant governmental partners will be sent copies of the Draft Comprehensive Conservation Plan and Environmental Assessment for distribution to State and County agencies and departments.

5. Executive Order No. 12996, Management and General Public Use of the National Wildlife Refuge System. Through the development of the Comprehensive Conservation Plan, the Service has completed compatibility determinations for existing wildlife-dependent recreational activities that will be allowed to continue in the Final Comprehensive Conservation Plan.

6. Executive Order No. 12898, Environmental Justice in Minority Populations and Low-income Populations. This environmental justice analysis concluded that the socioeconomic, cultural, physical, and biological effects of the proposed alternative does not predict any outcomes that would cause disproportionately high and adverse human health impacts in any population, nor would they result in disproportionally high or adverse impact to low-income or minority populations, nor would any alternative create a greater burden on low-income households.

7. Secretarial Order 3127 (602 DM 2) Contaminants and Hazardous Waste Determination. No contaminants or hazardous waste are know to exist on the Refuge and none will be created.

8. Endangered Species Act of 1973, as amended, Section 7. An informal intra-service Section 7 consultation is underway as of the time of the release of this EA. The Refuge's Biological Assessment found that implementation of the Preferred Alternative is not likely to adversely affect listed or candidate species. The Ecological Services branch of the US Fish and Wildlife Service is expected to concur with the Biological Assessment. The concurrence letter will be summarized in the Finding of No Significant Impact (FONSI).

9. Refuge Recreation Act as amended. The CCP is in compliance.

10. National Wildlife Refuge System Act of 1966, as amended. The CCP is in compliance.

APPENDIX H: WILDERNESS REVIEW

H.1 INTRODUCTION

H.1.1. POLICY AND DIRECTION

U.S. Fish and Wildlife Service policy (Sec 602, also Sec 610 of Refuge Manual) requires wilderness reviews to be completed as part of the Comprehensive Conservation Planning process. When a Refuge is in the process of acquisition planning, (adding to an existing refuge), a preliminary inventory of wilderness resources of the proposed unit(s) is also required to be completed.

A wilderness review is the process we use to determine whether or not we should recommend NWRS lands and waters to Congress for wilderness designation. The wilderness review process consists of three phases: inventory, study, and recommendation. The inventory is a broad look at the Refuge and acquisition lands to identify lands and waters that meet the minimum criteria for wilderness. All areas meeting the criteria are classified as wilderness study areas (WSAs). If WSAs are identified, the review moves on to the study phase.

During the study phase, WSAs are further analyzed for all values (ecological, recreational, cultural), resources (wildlife, water, vegetation, minerals, soils), and uses (management and public) within the Wilderness Study Area. The findings of the study determine whether or not the WSAs merit recommendation from the Service to the Secretary for inclusion in the Wilderness System.

If it is determined during the inventory that no areas qualify as WSAs or if we conclude from the study that we should not recommend any areas as wilderness, we prepare a brief report that documents the unsuitability of the lands and waters for wilderness study or recommendation. The report is submitted to the Director of the Fish and Wildlife Service.

B. Previous Wilderness Review at Turnbull

In 1973, a wilderness study review was conducted for the Turnbull NWR, which at that time measured 17, 171 acres (including leased areas). The study was completed with substantial public involvement (the mailing list numbered in the hundreds with officials and individuals represented in most of the fifty states) and a public hearing were conducted to review the results of the study. The study recommended that no portion of the Refuge be then recommended for wilderness designation.

H.2 WILDERNESS INVENTORY

H.2.1 CRITERIA FOR LANDS TO BE IDENTIFIED AS FOR POTENTIAL INCLUSION IN THE NATIONAL WILDERNESS PRESERVATION SYSTEM

The Wilderness Act of 1964 (Public Law 88-577; Section 2(c)) 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 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..."

Criteria for identifying areas as wilderness are described further on in Section 2(c) of the Act, and are elaborated upon in draft Service wilderness management policy. As quoted from the draft Service policy, the area must:

a. Be affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable.
b. Have outstanding opportunities for solitude or a primitive and unconfined type of recreation.
c. Have at least 5,000 contiguous acres (2,000 ha) or be sufficient in size as to make practicable its preservation and use in an unimpaired condition, or we could restore the wilderness character through appropriate management, at the time of review.
d. Not substantially exhibit the effects of logging, farming, grazing, or other extensive development or alteration of the landscape, or we could restore the wilderness character through appropriate management, at the time of review.
e. Be a roadless island.

H.2.2 Lands Considered Under This Wilderness Review

All Refuge-owned lands within the Turnbull NWR current approved boundary were considered during the inventory of wilderness areas. In addition, we also considered all lands within the Study Area for Refuge expansion. This is consistent with current policy.

H2.3 Status, Condition, and Use of Lands Considered

Habitats and Biological Resources

Chapter 3 of the CCP provides a detailed description of the key habitats and biota found on the Refuge. In general, there are four major habitat types: coniferous forest, aspen/riparian forest, grassland steppe, and wetlands. The juxtoposition of these four types in close proximity creates conditions for exceptional biodiversity on the Refuge.

Although detailed surveys of habitats and biota have not been completed for lands located within the Study Area, an analysis of aerial photos, U.S. Geological Survey maps, and National Wetland Inventory data provide compelling evidence that the habitats and their condition are similar to those found on the Refuge. We believe that many of the same species found at the Refuge inhabit the Study Area.

Land Management Practices

History: The Channeled Scablands ecosystem was inhabited by the Spokan people. The area is thought to have had largely transient, seasonal use for hunting and plant processing (see Cultural Resources section in Chapter 3 for more detail). European-American settlement began in the 1870s; and approximately 60 homesteads were established on the area that the Refuge now occupies. The early settlement years were a period of dramatic modifications in the Channeled Scablands ecosystem, including the area now designated as Refuge. Early settlers exploited the forests, logging the majority of the native large ponderosa pine. Upland soils were rocky, thin, and generally unsuitable for agriculture, so early settlers determined to utilize the bottomlands for farming. To facilitate these efforts, an extensive ditch drainage network was dug throughout the area, and the majority of the area's lakes and

wetlands were drained by the 1930s. Early settlers tried to grow hay and grain in the bottomland soils, but met with recurring problems. The drained bottomlands proved less hospitable for agriculture than settlers had hoped, and they generally abandoned cropping in favor of hay production and grazing on the former wetlands. Grazing also occurred on the adjacent uplands.

Other changes accompanied these settlement-induced modifications. Fire, a key natural disturbance, was for the most part suppressed. Exotic species were introduced both intentionally and accidentally.

It was not until 1937 that the Refuge was established as a wildlife Refuge and much of the current Refuge remained in private land ownership for many subsequent years until monies were available to acquire the land.

Current and historical practices in Study Area: The stage for a more industrial, extractive type of human development was set over a hundred years ago, and extractive management still drives most private land use within the study area. Though the Study Area possesses a rural, natural feel and appearance compared to an urbanized area, it is rife with evidence of human-induced changes to the natural ecosystem and landscape. These changes are a direct result of land management practices and settlement. Where forested stands exist, they show the effects of long-ago logging primarily by the size and spacing of the regenerated forest. Few large old trees are left. In some parts of the Study Area, logging of second growth timber has taken place as well.

The grassland/steppe areas are managed primarily as cattle ranches. Livestock grazing on the local steppe vegetation spurs a number of vegetative and soil changes that are evident within the Study Area. Undisturbed steppe areas are characterized by a cryptogramic soil crust comprised of numerous moss and lichen species. These small inconspicuous crust-associated species are thought to play a critical role in nutrient cycling, germination, and survival of native plant species. Unfortunately this crust is very fragile and susceptible to loss through trampling, frequent fire, and excessive accumulation of litter. Grazing has caused soil disturbance, degradation of these crusts and initiated conditions ripe for the introduction and establishment of non-native grasses and forbs. In addition, fences dissect portions of the study area.

Former wetlands have not been restored, and for the most part, spring snowmelt and precipitation runs off through the regional drainage system, rather than remaining in the wetland basins. Of the 8,028 acres of wetlands within the Study Area, 60 percent are drained annually. The drained wetlands continue to serve as summer foraging areas for cattle.

Historical practices on the Refuge: After Refuge establishment in 1937 by Executive Order, the primary focus of habitat management was waterfowl. Early managers focused on restoring wetlands that had been drained and grew grain crops for migratory waterfowl. In later years, management emphasis moved from restoration to enhancement, the goal always being to produce or maintain as many waterfowl as possible. Enhancement involved creating additional semi-permanent wetland habitat for breeding diving ducks, especially redheads. Spoil removed when deepening the marshes was used to create numerous nesting islands for upland nesting ducks. Habitat manipulation for redheads involved deepening seasonal and temporary marshes and increasing the interspersion of open water to emergent vegetation with heavy equipment. Although the Refuge wetlands now present a largely natural appearance, the largest are in fact highly managed with the use of water control structures. In addition, the domination of reed canarygrass in the meadows is not natural, but few recognize this type of disturbance.

The uplands were also a focus of management, but here the management emphasis was more focused on direct human benefit. Until fairly recently, the Refuge itself was managed for a variety of extractive

uses, including grazing, haying, trapping, and timber extraction, continuing the pattern of extraction and development initiated by the early settlers. Some of these practices were directed at improving wildlife habitat but others were undertaken primarily for maintaining goodwill with the local community and provision of economic benefits.

After the Refuge was established in 1937, grazing was stopped for a five-year rest period. In 1943, grazing was again permitted, but it was controlled. Subsequently, grazing was retired from the public use portion of the Refuge, including both the Stubblefield Lake grazing unit and the auto tour route area, adjacent to the headquarters area. Available records indicate that the amount of forage removed ranged from 611 to 4,098 AUMs each season. In 1993, grazing as an economic use was deemed incompatible with the purposes of the Refuge and discontinued as a program on the Refuge. Consequent to developing a habitat management plan, prescription grazing as a specific management tool was determined compatible.The effects of overgrazing prior to Refuge establishment is still reflected by the presence of cheatgrass which invaded the overgrazed uplands.

Haying by local farmers and ranchers was continued after the Refuge was established. Over 300 tons of hay were removed annually from 8 units, totalling 250 acres throughout the Refuge. Most hay was cut on the wet canary grass meadows, with some harvest of alfalfa in conjunction with the food plot rotations. All operations were conducted under terms of a Refuge permit. Haying was gradually discontinued in later years and most of the older hay units were turned over to cattle for grazing. By 1972, less than 50 tons of hay were harvested from one 30-acre wet meadow, and two alfalfa plots totalling 40 acres.

After time, the Public Use Area was defined. This 2,200-acre area serves as the primary locus for visitor access to the Refuge. The rest of the Refuge (with the exception of the section of the Columbia Plateau Trail that traverses the Refuge) is officially closed to visitor use, although occasional supervised tours are allowed. The Refuge has maintained the greater portion of its lands closed in order to protect wildlife from disturbance and to protect habitats from recreation-induced modification.

Existing Developments

Roads / Railways: Map 2 (see Chapter 1) shows the distribution of roads and railway beds on the Refuge and within the Study Area. One railbed (recently converted into the cross-state Columbia Plateau Trail) crosses the Refuge and the Cheney-Plaza County Highway blacktopped highway bisects the Refuge from north to south. Two more railroads and a 4-lane "expressway" are nearby. The blacktopped Mullinix Road and Cheney-Spangle Highway form portions of the west and east Refuge boundary. The Refuge currently contains approximately 56 miles of dirt roads, 7 miles of gravel roads, and 5.8 miles of the black-topped Cheney-Plaza County Highway within its interior. This roading level translates into an average density of 1.9 miles / mile^2 dirt or gravel roads over the 20,726 acres within the approved boundary.

Eighty-five percent (85 %) of the current Refuge is within one mile of a main, publicly accessible blacktopped road. Only about 200 acres are more than 1.5 miles from a main road. The largest unroaded area within the Refuge measures 2061 acres, next largest is 1,498 acres and next largest is 1325 acres.

Roads criss-cross the Study Area at varying densities. Road densities are highest in the northeast section of the Study Area, where the lots are smallest and a higher density of houses is found.

Drainage Network, Dikes, and Water Control Structures: As part of the Channeled Scablands ecosystem, Turnbull NWR occupies a portion of the landscape rich in natural wetlands, lakes and

potholes. As previously discussed, these features were not uniformly valued by early settlers. They attempted to drain the lakes and marshes in order to provide some land suitable for agricultural development, the dry, rocky uplands proving too difficult to farm. Early settlers formed a drainage district, constructing numerous ditches which connected the previously separate lakes and wetlands, and between 1910-1912, all of the lakes on the area now encompassed by the Refuge (except Stubblefield Lake) were drained. Most of the large lakes and wetlands located within the Study Area were also drained at this time.

In 1937, the Turnbull National Wildlife Refuge was established and restoration of the natural wetland habitats was begun. This was accomplished by building dikes and water control structures at lake outlets. There are now 17 low dikes varying from 40-800 feet in width across the Refuge. There are also 22 water control structures used to manage water depth and distribution amongst the now connected wetlands and lakes. There are few known water control structures within the Study Area. The wetlands there generally continue to be drained annually through the ditch network.

Drains and ditches for four separate drainage networks traverse the network. The four main networks, or subwatersheds are Company, Philleo, Kaegle, and Phillips. Map 7 (see Chapter 3) shows the location of ditches and the outlines of the four main drainage "watersheds" or networks that extend from the surrounding area into the Refuge.

Some of the drainage ditches along with ditch plugs and low dikes installed for restoration have grown over through the years, blending well into the natural landscape. Others have not. Five lakes in the Pine Creek Drainage are entirely man-made. Old C.C.C. water control structures and dams are quite obvious since most are along the main routes of travel.

Fire trails, fire breaks*:* The interior road network serves as the backbone of fire breaks, as well as providing quick and efficient access for fire suppression activities. At one time, the Refuge maintained a peripheral fire break (surrounding the Refuge), but this has not been maintained in fifteen years. The road network within the Study Area also serves as the main fire break there.

Buildings, other developments: On the Refuge, existing facilities have been developed over a long period beginning in the late 1930's. The Refuge headquarters covers approximately 30 acres adjacent to Pine Creek. Buildings at headquarters include two residences, office, shop-service building, two equipment and supply storage pole barns, two vehicle storage buildings, comfort station, environmental education classroom, and well house. Other public use facilities, all in the area adjacent to headquarters, include a five-mile, unpaved public auto trail, a wheelchair accessible boardwalk, and a small picnic area. In the 1970s, a laboratory owned and maintained by Eastern Washington University was constructed on Refuge lands. Other buildings on the Refuge include those a residence on the former Helms tract (property purchased by the Refuge in 1987) and a house, garage, barn and equipment shed located on the former Goodwin tract.

Within the Study Area, houses are scattered unevenly about. The northeast portion of the Study Area has the highest density of homes, barns, wells, and other structures.

Current and Future Management of Refuge Lands and Expansion Area under Preferred Alternative

On the Refuge, habitat management was reviewed in depth between 1994-1999, culminating in the publication of two plans, a Habitat Management Plan (HMP) and a Fire Management Plan (FMP). The CCP incorporates these plans (as written) for the Refuge and would extend similar management

philosophies, objectives, and practices to any future acquired lands. Under the vision, goals and objectives articulated in the 1999 Habitat Management Plan and the 2000 Fire Management Plan, numerous active management practices will be undertaken over the next fifteen years. These management practices include, but are not limited to:

- Continued use of water control structures at 22 Refuge lakes to regulate water depth and acreage for managing wetland habitats for waterfowl, wading birds, and other wetland-dependent fauna
- Removal of 427 artificial islands and berms that do not serve as secure nesting islands. This work will be accomplished with heavy equipment at the rate of three small wetlands or 1 large wetland per year.
- Backfill and recontouring of unnecessary drainage ditches
- Potential compaction of wetland basin at Stubblefield Lake to remedy water retention problems.
- Experimental treatments at four large wetland basins. to eliminate reed canary grass, including deep flooding, prescribed fire, high intensity short duration grazing, herbicides, discing and seeding.
- Silvicultural treatments involving cutting of trees less than 8 inches DBH on at least 100 acres annually. In addition, single tree selection harvest will occur on 400 acres/year for removal of 60% of the trees between 8-24 inches. Mechanized harvesting is envisioned for much of the work, topography, access, and soil types proving suitable.
- Removal of the large wood to market and removal of small wood for market and/or to piles for burning.
- Complete removal of ponderosa pine from aspen stands
- Planting of native trees and shrubs in selected riparian areas.
- Prescribed burning, in forested areas with the intent of reducing fuel hazard, in aspen areas with the intent of regenerating decadent aspen, and in selected experimental plots in steppe habitats with the intent of increasing vigor of native perennial grasses and suppressing cheatgrass seed production.
- Noxious weed control, involving roadside mowing, manual pulling, discing and reseeding, release of biological control agents, and use of herbicides.

As apparent from the list above, the management activities to be undertaken will, as a group, involve a great deal of mechanized and in some cases, heavy equipment, over a substantial period of time into the future. In addition, chemical substances will be actively used for certain kinds of management (fire ignitions, some weed treatment) throughout the Refuge. Although no place on the Refuge is very far from a road, typical efficiencies that were assumed throughout the development of both the Habitat Management Plan and the Fire Management Plan included use of vehicles and maintenance of a network of management access roads.

H.3 CONCLUSIONS

H.3.1 AREAS MEETING THE "FORCES OF NATURE" CRITERION.

Which portions of the Refuge or the Study Area are "affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable"?

As described above, changes wrought by man are noticeable and pervasive throughout the Refuge and Study Area. The signs of these changes include the past changes in forest structure and ongoing management of the forest areas, the existence of a widespread road network, the existence of numerous dikes, ditches and water control structures, the regular presences of houses, barns, wells, and other structures, and weedy dominance of cheatgrass and reed canary grass in many of the grassland and marsh habitats. Even the areas of the Refuge most "natural" in appearance are closely managed for desired forest stocking levels, water distribution and to protect against unwanted forest fire.

In conclusion, there are no areas within the Refuge or Study Area that meet this criterion.

H.3.2 Areas meeting the "outstanding opportunities for solitude" criterion

Which portions of the Refuge or the Study area "have outstanding opportunities for solitude or a primitive and unconfined type of recreation "?

As discussed above, most of the Refuge and the Study area is in close proximity to a main road, and permitted public use on the Refuge is confined to the 2,200 acre Public Use area and the Columbia Plateau Trail. The topography, being generally flat, permits long sight distances in unforested areas of the Refuge and the sounds of trains from the nearby railbeds, airplanes, and auto traffic from the three county roads flanking and crossing the Refuge permeate many parts of the Refuge. In addition, with the proximity of Spokane International Airport, Geyer Field, and Fairchild Air Force Base, air traffic over the Refuge and Study Area is extensive. Rarely passes an hour without sight or sound of commercial or military overflights. Cattle can also be heard near the perimeters of the Refuge.

While solitude could be found on certain days and in certain places within the Refuge, it would be a stretch to classify the solitude as "outstanding" or the recreational experience as "primitive and unconfined." Too many human established boundaries and noises limit the potential for an "primitive and unconfined" recreational experience.

There are no areas within the existing boundary of the Refuge nor within the Study Area that can be said to meet the criterion. The only way to change this would be a) to eliminate public county roads; and/or b) to dramatically expand the size of the area permitted for public access. Option (a) is infeasible and impractical at this time and option (b) would have potential to undermine the Refuge's ability to meet its purpose.

H.3.4 Areas meeting the 5000-acre size or "sufficient" size criterion

Which portions of the Refuge or the Study Area "have at least 5,000 contiguous acres (2,000 ha) or be sufficient in size as to make practicable its preservation and use in an unimpaired condition, or we could restore the wilderness character through appropriate management, at the time of review" ?

Refuge owned lands total 15,656 acres at this time. Under the preferred alternative, the Refuge will expand its boundary and the new approved boundary will encompass 45,615 acres. However, until the lands within the expanded area are acquired from willing sellers, they will remain under private ownership and control. The largest area free from roads on the current Refuge totals 2,061 acres. The largest areas free from roads within the Study Area totals 2650 acres (northwest corner) and another patch in the southwest corner measures 2169 (SW corner) acres. Other roadless patches are smaller.

There are no areas on the Refuge measuring at least 5000 contiguous acres that are not crossed by roads. It is possible to eradicate many of these roads, since they are Refuge owned, native surface, and maintained for management access only. However, doing so would compromise the ability of the Refuge to meet its objectives stated under the Habitat Management Plan and Fire Management Plan. The roads are a critical part of the fire break system. Wildfire containment is an important objective of the Fire Management Plan. Prescribed fire is a critical tool to be used in restoration of the forest landscape on the Refuge and is consistent with national policy encouraging reintroduction of fire in highly fire-dependent ecosystems. Without the native surface road network, the ability of the Refuge to safely and successfully utilize prescribed fire and to fight wildfire would be jeopardized.

Within the Study Area, the potential roadless areas are larger, but none meet the 5000-acre size criterion. Jurisdiction over road management within the Study Area is currently a mix of county and private. These jurisdictional issues would make the elimination of roads within the Study Area more problematic. In addition, all lands acquired in the Study Area would require a certain amount of restoration work, which could extend over many years. This restoration work is similar to the kinds of restoration that will occur on the Refuge over the next fifteen years - i.e. forest thinning, wetlands restoration, fire treatments, etc.

Whether scattered 2000 acre parcels are "sufficient in size" to preserve or restore a wilderness character within this landscape is a judgement call. At this time, we do not believe that they would represent high quality additions to the wilderness system, based on the configuration of these parcels, the surrounding land uses and the restoration needs that will be ongoing over at least fifteen years.

Finally, acquisition of parcels within the Study Area will occur in a fashion that is not completely under Service control. Given this, it is premature at this time to endorse wilderness designation on any part of the Study Area.

H.3.4 AREAS MEETING THE "WILDERNESS CHARACTER" CRITERION

Which portions of the Refuge or the Study Area do "not substantially exhibit the effects of logging, farming, grazing, or other extensive development or alteration of the landscape, or we could restore the wilderness character through appropriate management, at the time of review"?

As discussed above, most of the areas within the Study Area clearly exhibit the effects of logging, farming, grazing, and settlement. These practices have been ongoing since settlement began and continue today.

On the Refuge, where grazing and farming have been phased out, and most early homesteads removed or lost to time, the signs of human development are not necessarily substantial to the untrained eye. Restoration has been a key goal of Refuge management practice since establishment and will continue to be an integral component of Refuge management. However, restoration under the Habitat Management and Fire Management Plans is not geared towards "wilderness character" *per se*, but rather toward achieving the purposes of the Refuge. As discussed in Chapter 1 of the CCP, the purposes emphasize refugia and breeding grounds for migratory birds, incidental fish and wildlife recreation, protection and management of fish and wildlife and other natural resources, and conservation of endangered and threatened species.

A key question becomes, then, can the Refuge effectively achieve these purposes without the use of permanent structures, mechanized tools and motorized access? Ironically, restoration often involves the very tools (water management, tree cutting) that created an altered landscape in the first place. A

reasoned answer is that uplands habitat and fire management could probably be achieved, but it would be severely compromised in efficiency and cost without the ability to use mechanized tools and motorized access. Moreover, risks of uncontrolled fire would be higher. In this area, where the wildland/urban interface is quite evident, to risk wildfire would be imprudent, to say the least.

The network of wetland habitats is particularly dependent on maintenance of water control structures and the associated drainage network. Loss of the ability to use permanent artificial structures would essentially destroy the wetlands complex, and these habitats are critical to migratory birds. Water control structures could be removed and replaced with permanent dikes or plugs but the ability to control flooding or move water would be lost. Moreover, the Refuge could not singlehandedly eradicate the drainage network that criss-crosses the Refuge, because upstream property owners will continue to drain their wetlands to keep the bottomlands clear for summer cattle grazing. Were the Refuge to fill all of the drainage ditches and replace control structures along the networks with permanent plugs, the runoff from property owners upstream would literally have no place to go and would wreak havoc on the landscape, spilling over onto uplands and causing untold erosion.

Given this, achieving the purposes of the Refuge is generally incompatible with restoring it to wilderness character.

H.3.5 AREAS MEETING THE "ROADLESS ISLAND" CRITERION.

Which portions of the Refuge or the Study Area are "roadless islands"?

A variety of natural islands, man-made islands, ephemeral islands and islands exist in Refuge impoundments. Only one, a rocky island in Kepple Lake, can be considered a bona-fide natural and permanent island of any significance. It is less than a half acre in size. All other "natural" islands are little more than small rocks jutting above the water or small patches of emergent vegetation which exist as islands only during a particular phase of manipulated water levels. Most of the other "islands" on the Refuge are of artificial origin and are slated for removal under the objectives and strategies outlined in the Habitat Management Plan.

While the rocky island in Kepple Lake is undeveloped and roadless, it is not of sufficient size or significance to merit wilderness classification on its own.

There are no known islands in the Study Area.

H.3.6 SUMMARY

There are no locations on the Refuge or in the Study Area that meet all of the above criteria for wilderness designation, or even most of the criteria. Some areas could perhaps be judged to passably meet the "sufficient size" or "wilderness character" criteria, but no areas stand out as exceptionally suited to wilderness designation.

Moreover, given the area's history of landscape modification, restoration needs, and the Refuge's continuing links to the regional drainage network, restoration of the area's "wilderness character" is not clearly compatible with achievement of the Refuge's purposes.

It is therefore concluded that there are no areas on Turnbull National Wildlife Refuge or within the Study Area are that can be recommended as suitable for further consideration as wilderness.

APPENDIX I: REFERENCES

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INTERNET SITES

Chapter 1

Applying Washington GAP
http://depts.washington.edu/rsal/GAP/spokane_brochure/index.html

Digest of Federal Resource Laws of Interest to the U.S. Fish and Wildlife Service
http://laws.fws.gov

U.S. Fish and Wildlife Service, National Wildlife Refuge System policies
http://refuges.fws.gov/policymakers/nwrpolicies.html.

Chapter 3

Access Board information: http://www.access-board.gov/

Spokane County. Information on rural population.
http://www.spokanecounty.org/BP/Census/2000/2000cntysum.asp)

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U.S. Fish and Wildlife Private Stewardship Grants program:
http://endangered.fws.gov/grants/private_stewardship

APPENDIX J: GLOSSARY

Abbreviations

Act	National Wildlife Refuge System Improvement Act of 1997 (also Improvement Act or NWRSIA)
ADA	Americans with Disabilities Act
AHPA	Archaeological and Historic Preservation Act
ARPA	Archaeological Resources Protection Act
BLM	Bureau of Land Management
CCP	Comprehensive Conservation Plan
CFR	Code of Federal Regulations
CPI	Conservation Priority Index
CSFA	Channeled Scablands Focus Area
EA	Environmental Assessment
EE	Environmental Education
ERU	Ecological Reporting Unit
EWU	Eastern Washington University
FMP	Fire Management Plan
FWS	U.S. Fish and Wildlife Service (also, Service, USFWS)
GAP	Gap Analysis Program
GIS	Geographic Information System
HMP	Habitat Mangement Plan
IAC	Interagency Committee for Outdoor Recreation (Washington State)
ICBEMP	Interior Columbia Basin Ecosystem Management Project
Improvement Act	National Wildlife Refuge System Improvement Act of 1997(also Act, NWRSIA)
INLT	Inland Northwest Land Trust
MMS	Maintenance Management System
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
N	Nitrogen
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge
NWRS	National Wildlife Refuge System
NWRSIA	National Wildlife Refuge System Improvement Act of 1997
P	Phosphorus
PIF	Partners in Flight
PILT	Payment in lieu of taxes.
R1	Region 1 of the FWS (WA, OR, CA, HI, NV, ID)
Refuge.	Turnbull National Wildlife Refuge
RNA	Research Natural Area
RONS	Refuge Operating Needs System
SCORP	Statewide Comprehensive Outdoor Recreation Plan
Service	U.S. Fish and Wildlife Service (also FWS, USFWS)
TES	Threatened and Endangered Species
TLES	Turnbull Laboratory for Ecological Studies
TNC	The Nature Conservancy
TPL	Trust for Public Land
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington State Department of Fish and Wildlife
WPA	Works Projects Administration
WSPRC	Washington State Parks and Recreation Commission

Glossary

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

Adjudication of Water Rights. An adjudication is an administrative or judicial determination of all rights to use water in a particular stream system or watershed to establish the priority, point of diversion, place and nature of use, and the quantity of water used among the various claimants. These stream or watershed adjudications can be initiated by a water user (including the United States) or by the State. The United States may be joined in an adjudication if the requirements of the McCarran Amendment are met. (water rights sec 403 from refuge manual)

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

Alternative. Alternatives are different means of accomplishing refuge purposes and goals and contributing to the System mission (draft Service Manual 602 FW 1.5). The no action alternative is current refuge management while the action alternatives are all other alternatives.

Approved Acquisition Boundary. A National Wildlife Refuge boundary approved by the National or Regional Fish and Wildlife Service Director for potential acquisition of lands by the Service. (R1 Landowner guide, USFWS Division of Refuge Planning)

Archeology. The scientific study of material evidence remaining from past human life and culture (Webster's II).

Basalt. A dark dense volcanic rock (Webster's II).

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

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. (NWRS Biological integrity policy)

Bisquit and Swale Steppe. A mosaic of exposed, fractured basalt, small mounds of deeper soils and swales comprised of shallow lithosols found in the uplands of the flood tracts of the Channeled Scablands. (Turnbull CCP / EA, Chapter 3, Section 3.1)

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).

Channeled Scablands. A diverse complex of lakes, sloughs and ponds formed by the scouring of catastrophic floods through wind deposited soils and subsequent deposition of glacial outwash sediments plus volcanic ash on portions of the Columbia Plateau. (Turnbull CCP/EA, Chapter 3, Section 3.1)

Columbia Basin. The region drained by the Columbia River system.

Columbia Plateau. An approximately 80,000 square mile depression in the earth's crust caused by the immense weight of over 200 lava flows piling up in the broad valleys of the Columbia River Basin between 6 and 16 million years ago. (Turnbull CCP/EA, Chapter 3, Section 3.1)

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 (Service Manual 603 FW 3.6). A compatibility determination supports the selection of compatible uses and identifies stipulations or limits necessary to ensure compatibility.

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

Consumer surplus. Consumer surplus represents the amount an individual would be willing to pay for a good or service over and above the asking price. Individuals are often able to enjoy recreational activities at a price that is less than the amount they would be willing to pay. Thus, the consumer surplus measure captures the added benefit consumers gain beyond that reflected in the dollar value of goods and services purchased in the process of participating in these activities (Laughland and Caudill, 1999).

Contaminants. or Environmental contaminants - Chemicals present at levels greater than those naturally occurring in the environment resulting form 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. This is a simple habitat protection action, and no property rights are acquired. An agreement is usually long term but can be modified by either party. They are most effective in establishing multiple use management of land. An example would be a wildlife agreement on a Corps reservoir.

Cover Type. The present vegetation of an area.

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

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

Deciduous. Describes trees and shrubs which shed all of their leaves each year.

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

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

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

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).

Edaphic. Resulting from or influenced by the soil rather than the climate. (yourdictionary.com)

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

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

Environmental Education Facility. A building with one or more classrooms and environmental education materials to accommodate groups of students.

Environmental Education Field Sites. Outdoor locations where groups of students receive hands-on environmental education.

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. (NWRS Biological integrity policy)

Enhancement. Improvement, especially for the benefit of habitats and/or species.

Expanded Refuge boundary. Proposed new Approved Refuge Boundary for potential land acquisition.

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).

GAP analysis. Analysis done to identify and map elements of biodiversity that are not adequately represented in the nation's network of reserves. It provides an overview of the distribution and conservation status of several components of biodiversity, with an emphasis on vegetation and terrestrial vertebrates. (Cassidy et al.1997)

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

Guild. Or wildlife guild - an aggregation of species that tend to utilize resources for both feeding and reproduction in a similar manner. (Turnbull NWR Habitat Management Plan)

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

Habitat Connectivity (Also Landcape 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. (Turnbull NWR Habitat Management Plan)

Habitat Management Plan. A plan that guides refuge activities related to the maintenance, restoration, and enhancement of habitats for the benefit of wildlife, fish, and plant populations.

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

Headquarters. An administrative center. (Webster's II)

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. (NWRS Biological integrity policy)

Hydrologic influence. Having an effect on water quality and quantity. In this document much of the study area was selected for its hydrologic influence on the Refuge's wetlands.

Hydrology. A science dealing with the properties, distribution, and circulation of water on and below the earth's surface and in the atmosphere. (yourdictionary.com)

IMPLAN. (MicroIMPLAN - Impact Analysis for Planning) An economic analysis tool designed by the U.S. Forest Service and owned and maintained by the Minnesota IMPLAN group. IMPLAN is used by many state and federal planning agencies to evaluate the economic impact of policy choices.

Indicator. Something that serves as a sign or symptom. (Webster's II)

Inholding. Refers to lands within an Approved Refuge Boundary for a refuge, that are not owned by the Fish and Wildlife Service. These can be private lands or lands owned by city, county, state, or other federal agencies.

Interpretation. A teaching technique that combines factual information with stimulating explanation. (yourdictionary.com) Frequently used to help people understand natural and cultural resources.

Interpretive Trail. A trail with informative signs, numbered posts that refer to information in a brochure, or where guided talks are conducted for the purpose of providing factual information and stimulating explanations of what visitors see, hear, feel, or otherwise experience while on the trail.

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

Land Protection. The acquisition of fee-title, easement, or lease of a given land parcel to protect important natural resource values on the land from incompatible land uses.

Landform. A natural feature of a land surface (yourdictionary.com)

Landscape linkages. Landscape features linking areas of similar habitat. Plants and smaller animals are able to use landscape linkages to move between larger landscape blocks over a period of generations. (Turnbull Habitat Management Plan)

Limnology. The scientific study of bodies of freshwater such as lakes. (yourdictionary.com)

Lithic Debris Scatter. Flakes and fragments of cryptocrystalline silica, or sometimes basalt and obsidian, indicating the manufacture of projectile points, scattered about a site that probably represents a temporary Native American campsite. (adapted from Holstine et. al.)

Lithosols. A shallow soil without zonation and consisting of imperfectly weathered rock fragments. ((Turnbull Habitat Management Plan)

Loess. Soils that are the result of wind deposition. (Turnbull Habitat Management Plan)

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)

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

Migratory birds. Those species of birds listed under 10.13 of 50 CFR chapter 1. USFWS, DOI. (11/23/2001 draft policy).

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

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

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

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. (NWRS Biological integrity policy)

National Register of Historic Places. The Nation's master inventory of known historic properties administered by the National Park Service. Includes buildings, structures, sites, objects, and districts that possess historic, architectural, engineering, archeological, or cultural significance at the national, state, and local levels. (USFWS, Considering Cultural Resources)

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

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

National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). A federal law that amended and updated the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668).

Non-attainment areas. A geographic area that is not in compliance with the National Ambient Air Quality Standards for a particular pollutant. (Turnbull Habitat Management Plan)

Non-consumptive 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.

Nutrient Loading. The presence of nutrients such as nitrogen and phosphorus in waterways which cause algal blooms and oxygen depletion with potentially lethal effects on fish and other wildlife species.
Objective. An objective is a concise target statement of what will be achieved, how much will be achieved, when and where it will be achieved, and who is responsible for the work. Objectives are derived from goals and provide the basis for determining management strategies. Objectives should be attainable and time-specific and should be stated quantitatively to the extent possible. If objectives cannot be stated quantitatively, they may be stated qualitatively (Draft Service Manual 602 FW *1.5).*

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 & pest control, upkeep of grounds, vehicle rentals, waste management, and personnel costs for operating staff are generally included within the scope of operations.

Outreach. The process of providing information to the public on a specific issue through the use of the media, printed materials, and presentations. (Turnbull Habitat Management Plan)

Pacific Flyway. One of several major north-south travel corridors for migratory birds. The Pacific Flyway is west of the Rocky Mountains.

Palouse (Prairie) Steppe. Open grassland habitat found on both the rolling palouse hills and the bisquit and swale landform of the Channeled Scablands.

Payment in Lieu of Taxes (PILT). See Revenue Sharing.

Piezometer Well. A hollow tube placed in the ground that allows measurement of the height of the water table. Often times fitted with an automated depth recorder.

Planning Team. The primary U.S. Fish and Wildlife staff and others who played a key role in developing and writing the CCP

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

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

Playa Lake. (Referring to Stubblefield lake). A level area at the bottom of a desert basin that is at times covered with water. (Webster's II)

Prairie Potholes. Permanent and seasonal wetlands formed by glacial activities of the last ice age (12-15,000 years ago). The prairie pothole region is a large area that extends from south central Canada into the north central United States.

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

Priority Public Uses. Hunting, fishing, wildlife observation and photography, environmental education and interpretation were identified by the National Wildlife Refuge system Improvement Act of 1997 as the six priority public uses of the National Wildlife Refuge System.

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

Public. Individuals, organizations, and groups; officials of Federal, State, and local government agencies; Indian tribes; and foreign nations. It may include anyone outside the 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.

Public Use Area. A designated area within the Turnbull NWR which is open to the public year-round. All trails and facilities with the exception of those associated with Columbia Plateau trail are within the public use area.

Pyrolitic. Heat induced, as in changes caused by a fire.

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

Refuge 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. (RMIS descriptions)

Refuge Purpose(s). The purpose(s) specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, a refuge unit, or refuge subunit (Draft Service Manual 602 EW 1.5).

Refuge Vicinity. This is an area that was not specifically outlined, but generally extends outside the refuge for approximately 5-7 miles in each direction. (CCP/EA, Chapter 1)

Research Natural Area. A federal land designation that establishes areas with predominantly natural conditions and processes for research and educational purposes.

Restoration. The act of bringing 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.

Seral. Of or relating to an ecological sere; a seral stage. (yourdictionary.com)

Site index. Refers to the ability of a particular site to grow trees. A high site index indicates that trees will grow faster and become larger than an area with a low site index.

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

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

Steppe. Arid land dominated by shrubs and grasses where soil and moisture limit the growth of trees. (Turnbull Habitat Management Plan)

Stewardship Area. Each of the Alternatives in this CCP/EA has a delineated area where the Service will develop partnerships, provide information, and otherwise encourage private landowners to participate in land and water conservation practices.

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

Stratum. A horizontal layer, as one of a number of layers of rock of the same kind. (Webster's II)

Study Area. The area reviewed in detail for wildlife, habitat, and public use potential. For purposes of this Draft CCP/EA the Study Area includes the lands within the currently Approved Refuge Boundary and adjacent lands that were studied or analyzed in terms of hydrology, habitat quality, recreation, and land use. See Chapter 1, section 1.4 for more details.

Subwatershed. A division within a larger watershed, drained by a stream and its tributaries.

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

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

Threshhold. The lowest level or intensity at which a stimulus is perceptible or can produce an effect. (Webster's II) This term is sometimes used in connection with monitoring the effects of public uses on natural resources.

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

Viewpoint. A designated point that provides an opportunity to see wildlife or habitats of interest. The point may or may not be "supported" with an interpretive sign. Usually the viewpoint is supported by a pullout or a parking area. (CCP Team definition, 9/10/02)

Visitor Center. A building and staff which provide visitors with interpretation, education, and general information about the natural and cultural resources of the refuge and the local area.

Visitor Contact Point or Center. An kiosk or other location where visitors may go to learn about refuge resources, facilities, trails etc.

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

Watershed. The region or area drained by a river system or other body of water. (Webster's II) See also subwatershed.

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. (Service Manual 660 FW 2) **Permanent wetland -** a wetland basin or portion of a basin that is covered with water throughout the year in all years except extreme drought. Typically the basin bottom is vegetated with submerged aquatic plant species including milfoil, coontail, and pondweeds. **Semi-permanent wetland -** a wetland basin or portion of a basin where surface water persists throughout the growing season of most years. Typical vegetation is composed of cattails and bulrushes. **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. Typically vegetated with sedges, rushes, spikerushes or burreed. (Turnbull Habitat Management Plan)

Wildlife-dependent recreation. Hunting, fishing, wildlife observation and photography, environmental education and interpretation. These are also referred to as the priority public uses of the National Wildlife Refuge System.

APPENDIX K: PUBLIC INVOLVEMENT

Public involvement was sought throughout the development of the CCP, starting in the summer of 1999. Public involvement strategies emphasized face-to-face meetings with key agencies, tribes with ancient links to the area, federally elected officials, and Refuge neighbors. The refuge also held open houses, conducted a planning workshop, sent newsletters, conducted surveys, and gave presentations at community organizations to inform the public, invite discussion and solicit feedback.

A mailing list of approximately 900 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 2, 2000. Met with Congressional aides to Senator Gorton, Senator Murray
- April 24, 2000. Met with Congressman George Nethercutt.
- April 4, 2001. Met with Judy Olsen and Steve Taylor, aides to Senator Murray and Congressman Nethercutt.
- November 1, 2001. Met with Judy Olsen, aide to Senator Murray.
- November 13, 2001. Met with Robert Thoms, aide to Senator Cantwell.
- December 13, 2001. Met with Steve Taylor, aide to Congressman George Nethercutt.

Meetings with Tribal Officials

- April 14 , 2000. Met with Spokane Tribe Natural Resources staff.
- March, April, 2000 - solicited meetings w/ Coeur d'Alene and Colville Tribes but Tribes both declined.
- March, April, 2000 - solicited meetings w/ Kalispel Tribe but no response.
- October, November 2001 - solicited meetings w/ Coeur d'Alene and Spokane Tribes but no responses.

Meetings with Local Elected Officials

- November 5, 2001. Met with Phil Harris, Spokane County Commissioner District 3.
- October, November 2001 - solicited meeting w/ Mayor Amy Sooy, Mayor of Cheney, but no response.
- November 21, 2001. Met with John Roskelley, Spokane County Commissioner
- December 5, 2001. Met with Kate McCaslin, Spokane County Commissioner

Meetings with Refuge Neighbors

- January 22, 2002. Cheney. Meeting with neighbors to Northeast of Refuge (4 attendees)
- January 24, 2002. Cheney. Meeting with neighbors to northwest of Refuge
- February 5, 2002. Cheney. Meeting with neighbors to east of Refuge
- February 11, 2002. Fire Station. Meeting with neighbors to west side of Refuge
- February 19, 2002. Cheney. Meeting with neighbors to southeast of refuge
- February 26, 2002. Cheney. Meeting with neighbors to south of Refuge.
- April 2, 2002. Individual meeting with refuge neighbors Don, Mark, and Dana Bell.
- February 6, 2003. Tour of Refuge and meeting with Cow Creek ranchers.

Meetings with Community Organizations

- November 18, 1999. Meeting with Inland Northwest Land Trust
- February 7, 2000. Met with Friends of Turnbull to discuss upcoming CCP.
- October 29, 2001. Met with Eastern Washington University / Turnbull Laboratory for Ecological Studies Directors.
- March 5, 2002. Presentation to Inland Northwest Wildlife Council.
- Fall, 2001. Presentation to Spokane Chapter of The Audubon Society
- ____ . Presentation to Kiwanis Club.
- ____. Meeting with Inland Northwest Joint Venture Channeled Scabland Focus Group
- March 5, 2002. Presentation to Inland Northwest Land Trust
- Monthly, 2002. Met with West Plains Chamber of Commerce
- April 16, 2002. Met with Cheney Rotary Club.

Public Open Houses / Workshops

- Feb 29, 2000. Cheney High School. Open House to solicit input at outset of CCP (approximately 50 attendees).
- March 1, 2000. Spokane Falls Community College. Open House to solicit input at outset of CCP (approximately 40 attendees).
- December 1-2, 2001. Turnbull NWR Headquarters. Open house to celebrate remodeled EE classroom, highlight Refuge programs and CCP
- May 12, 2001. Open house to celebrate International Migratory Bird Day. Included CCP display.
- June 22, 2002. Turnbull NWR Headquarters. Workshop to solicit feedback on seven preliminary alternatives (approximately 35 attendees).

Agency Meetings

- April 5, 2000. Meeting with Washington Department of Ecology staff.
- May 3, 2000. Met with Spokane County Division of Long Range Planning staff.
- May 23, 2000. Met with Washington Department of Fish and Wildlife Staff
- September 2000. Met with Washington Department of Fish and Wildlife staff.
- Spring or summer, 2000. Spokane County Department of Long-Range Planning
- March 21, 2001. Washington Parks and Recreation Commission.
- March 22, 2001. Met with Washington Department of Fish and Wildlife.
- May 8, 2002. Met with Natural Resource Conservation Service.
- October 3, 2002. Met with Bureau of Land Management.
- November 19, 2002. Met with Washington State Parks and Recreation Commission.
- September 9, 2004. Met with Washington Department of Fish and Wildlife staff

Planning Updates

- January, 2000. Planning Update #1 sent to ~ 800 persons / organizations / officials.
- November, 2000. Planning Update #2 sent to ~850 persons / organizations / officials.
- December, 2001. Planning Update #3 sent to ~875 persons / organizations / officials.
- May, 2002. Planning Update #4 sent to ~900 persons / organizations / officials.

Other Tools

- Summer, 1999. Friends of Turnbull conducted visitor surveys to 531 persons at nine different locations near Turnbull NWR.
- Spring, 2000. Received 86 responses to public comment form distributed with Planning Update #1 and distributed at open houses on Feb 29, March 1, 2000.

- Summer 2002, Received 28 comments to public comment form distributed with Planning Update #4.
- September, 2001. Booth at Spokane Interstate Fair.
- March 19, 2002. Participated in Interagency Committee workshop for recreation facilities grants.
- September, 2002. Booth at Spokane Interstate Fair.

Press Coverage:

- March 10?, 2000. Interview w/ KBPX
- ___, 2000. Other radio interview
- March, _ 2000. Spokesman Review article
- _____. Spokesman Review article
- June, 2002 . Cheney Free Press article.
- September, 2002. Spokesman Review article.

Federal Register Notices:

- March 2, 2000. Federal Register published *Notice of Intent to Prepare a Draft Comprehensive Conservation Plan and Associated Environmental Assessment; and Notice of Public Meetings*

APPENDIX L: LIST OF PREPARERS

United States Fish and Wildlife Service:

Name	Position	Degree(s)	Years of Experience
Sharon Selvaggio	Conservation Planner	M.S. Energy and Resources B.A. Biology	17
Nancy Curry	Project Leader	B.S. Wildlife Biology	28
Mike Rule	Refuge Wildlife Biologist	M.S. Natural Resource Management B.S. Wildlife Management	20
Sandy Rancourt	Volunteer and Environmental Education Coordinator	M.S. Biology B.S. Biology	25
Amy Wing	Land Protection Planner	M.A. Interdisciplinary Studies B.A. Environmental Studies	21
Wendy Castineira	Realty Specialist	B.A. Geography A.A.S. Agriculture	19
Ronnie Sanchez	Deputy Refuge Manager	B.S. Wildlife Sciences	13
Kathleen Fulmer	(former Assistant Refuge Manager)	M.S. Wildlife Resources B.S. Wildlife Resources	22
Jane Bardolf	Assistant Planner	M.S. Natural Resources B.S. Environmental Conservation	19
Nicholas Valentine	Archaeologist	M.S. Anthropology	14
Glenda Franich	Visual Information Specialist /Graphic Artist	B.S. Graphic Design	33
David Hoy	Lead Cartographer	B.S. Social Science	8
Mary Anderson	Cartographic Technician		31

Consultants:

Name and Company	Position	Degree(s)	Years of Experience
Chuck Everett EDAW, Inc.	Principal	M.L.A. Masters of Landscape Architecture B.S. Management	23
Gregg Roy Jones and Stokes	Economist	B.S. Political Economy of Natural Resources	15