WELLS WILDLIFE AREA MANAGEMENT PLANS

Washington Department of Fish and Wildlife

Prepared by Wildlife Area Manager, Marc Hallet

2006

STATE OF WASHINGTON

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The Wells Wildlife Area is primarily funded by the Douglas County Public Utilities, District No. 1 as part of 1974 wildlife mitigation agreement for the Wells Hydroelectric Project Federal Energy Regulatory License (No. 2149).
&
Newer acquisitions receive Federal Aid in Wildlife Restoration funds
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Washington State Wildlife Area Plan

WELLS WILDLIFE AREA

Washington Department of Fish and Wildlife
Wildlife Management Program
600 Capitol Way North
Olympia, WA 98501-1091

Washington State Wildlife Area Plan

Wells Wildlife Area

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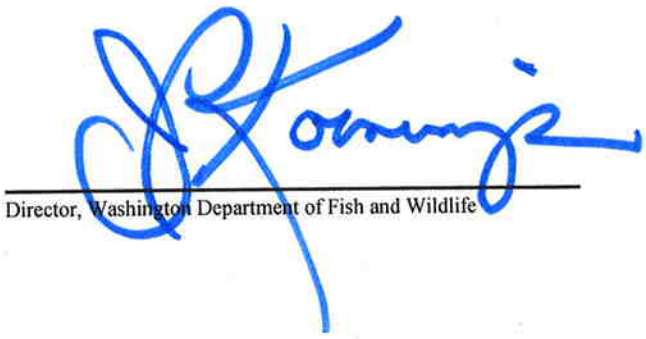

Director, Washington Department of Fish and Wildlife

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EXECUTIVE SUMMARY

The Wells Wildlife Area was created as a result of an agreement with the Douglas County Public Utilities district No. 1, aimed at mitigating the loss of wildlife caused by the construction of Wells Dam. The area originally included 7,800 acres in six separate units located in Douglas and Okanogan Counties. Recent acquisitions added 360 acres to the Central Ferry Canyon Unit.

Management objectives for the Wells Wildlife Area include 1) protecting, maintaining and enhancing wildlife habitat (habitat for state and federally listed species, priority habitat, upland game habitat and waterfowl, mule deer and non-game wildlife habitat), 2) providing public access and recreation compatible with the area's wildlife and habitat objectives, 3) satisfying the terms of the Wells Wildlife Mitigation Agreement.

Public management concerns and issues identified in the Wells Wildlife Area Plan include:

- Ensuring that access and recreational uses of the wildlife areas are consistent with the wildlife and habitat goals and objectives.
- Preparing an integrated weed management plan.
- Developing a fire plan. Treat fire (wild and prescribed) as an integral part of grassland and shrub land management.
- Protecting and preserving sensitive wildlife sites from human disturbance (such as active Sharp-tailed grouse lek sites, snake dens, active Bald and Golden eagle nests, state and federal listed plant species, big game wintering areas, etc.
- As a priority, protecting and enhancing any state and federal listed species and associated habitat found on the Wildlife Area.
- Broadening wildlife area management to include multiple species management.
- Ensuring that habitat is not fragmented for some species in the process of creating edge habitat – that is, making sure the edge is truly ecotonal and provides more resources for wildlife and avoiding fragmentation which is happening all around.

In 2006, WDFW continued to protect and maintain native habitats, developments and habitat plantings. Additionally WDFW excavated one pond on the Bridgeport Bar Unit and established riparian woody species and food plots. These efforts will continue in 2007.

CHAPTER I. INTRODUCTION

This plan provides management direction for the Wells Wildlife Area. It will be updated annually to maintain its value as a flexible working document. It identifies needs and guides activities on the area based on the agency's mission and statewide goals and objectives applied to local conditions.

1.1 Agency Mission Statement

The Washington Department of Fish and Wildlife serves Washington's citizens by protecting, restoring and enhancing fish and wildlife and their habitats, while providing sustainable and wildlife-related recreational and commercial opportunities.

1.2 Agency Goals and Objectives

The underlined goals and objectives directly apply to the management of this wildlife area. These goals and objectives can be found in the Agency's Strategic Plan.

Goal I: Healthy and diverse fish and wildlife populations and habitats

- Objective 2: Protect, restore and enhance fish and wildlife populations and their habitats.
- Objective 3: Ensure WDFW activities, programs, facilities and lands are consistent with local, state and federal regulations that protect and recover fish, wildlife and their habitats.

Goal II: Sustainable fish and wildlife-related opportunities

- Objective 6: Provide sustainable fish and wildlife-related recreational and commercial opportunities compatible with maintaining healthy fish and wildlife populations and habitats.
- Objective 7: Improve the economic well being of Washington by providing diverse, high quality recreational and commercial opportunities.

Goal III: Operational Excellence and Professional Service

- Objective 11: Provide sound operational management of WDFW lands, facilities and access sites.

1.3 Agency Policies

The following agency policies provide additional guidance for management of agency lands.

- Commission Policy 6003: Domestic Livestock Grazing on Department Lands
- Policy 6010: Acquiring and disposing of real property
- Policy 5211: Protecting and Restoring Wetlands:
- Policy 5001: Fish Protection At Water Diversions/Flow Control Structures And Fish Passage Structures
- Policy: Recreation Management on WDFW Lands
- Policy: Commercial Use of WDFW Lands
- Policy: Forest Management on WDFW Lands
- Policy: Weed Management on WDFW Lands
- Policy: Fire Management on WDFW Lands
- Other Policies/Contractual Obligations/Responsibilities

1.4 Wells Wildlife Area Goals

The primary management goal for the Wells Wildlife Area initially was to enhance and manage upland game habitat and associated recreation. This goal has broadened to include the preservation of habitat and fish and wildlife species diversity, the maintenance of healthy populations of game and non-game species and the protection and the restoration of native plant communities. It also

includes providing diverse opportunities for the public to encounter, utilize, and appreciate wildlife and wild areas. Specific management goals and objectives for the Wells Wildlife Area can be found in Chapter 3.

1.5 Planning Process

Statewide goals and objectives listed above shape management priorities on wildlife areas. Individual wildlife area information including why the area was purchased, habitat conditions, species present, and public issues and concerns are evaluated to identify specific wildlife area activities or tasks.

A Citizens Advisory Group (CAG) was established to bring public input, ideas and concerns to wildlife area management. CAG participation in planning adds credibility and support for land management practices and helps build constituencies for wildlife areas. The CAG is made up of one representative for each interest group/entity. CAG members are spokespersons for their interest group/entity.

Wells Wildlife Area Citizens Advisory Group

Jim McGee	Public Utilities District No. 1 of Douglas County
Paul Fielder	Public Utilities District No. 1 of Chelan County
Bill Stegeman	Wenatchee Sportsmen's Association
Bob Fischer	US Army Corp of Engineers – Chief Joseph Dam/ Adjacent Landowner /Recreationist
Tim Behne	Adjacent Land Owner/Cattleman/Wheat Grower/Foster Creek Conservation District
John Musser	Wildlife Biologist, Recreationist
Steve Wetzel	Washington Department of Natural Resources
Mary Hunt	Douglas County Commissioner
Terry Nouka	Chelan County Weed Board
Jon Soest	North Central Washington Audubon Society
Nancy Warner	The Nature Conservancy
Gordon Congdon	Chelan - Douglas Land Trust
Mallory Lenz	U.S. Forest Service
Bob Stoll	Adjacent Land Owner and Member of Lands Management Advisory Council
Neal Hedges	US Bureau of Land Management

Plans will incorporate cross-program input and review at the regional and headquarters level by the habitat program, wildlife program, enforcement program, and fish program. Pertinent information from existing species plans, habitat recommendations, watershed plans, ecoregional assessments, etc will be used to identify local issues and needs and ensure that the specific Wildlife Area Plan is consistent with WDFW statewide and regional priorities.

The Wells Wildlife Area plan will be reviewed annually with additional input from the CAG and district team to monitor performance and desired results. Strategies and activities will be adapted where necessary to accomplish management objectives.

We want to recognize the CAG and District Team Members and the many who have contributed to this plan and in particular John Musser, Bob Fischer, Mallory Lenz, Jim McGee and Jeff Heinlen for their help in editing this document.

CHAPTER II. AREA DESCRIPTION AND MAP

2.1 Purchase History

The Douglas County Public Utilities district No. 1 (PUD) entered into a wildlife mitigation agreement with the WDFW in 1974 as part of the Wells Hydroelectric Project Federal Energy Regulatory License (No. 2149). This agreement addressed the loss of wildlife caused by the construction of Wells Dam and led to the creation of the Wells Wildlife Area.

As a result of this agreement, the PUD acquired and transferred ownership of 5,723 acres of land to the WDFW. Additionally, the WDFW acquired lease rights to 1,550 acres of Washington Department of Natural Resources land in the Indian Dan Canyon area. The Bureau of Land Management also allowed 180 acres of its land to be included in the fenced boundary of the Indian Dan Unit.

The WA initially totaled about 7,800 acres in six separate land management units: the West Foster Creek (1,050 acres), Indian Dan Canyon (4,412 acres), Central Ferry Canyon (1,538 acres), Bridgeport Bar (450 acres), Washburn Island (about 250 acres – PUD owned) and Okanogan River Units (100 acres+). More recent acquisitions added another 370 acres to the Central Ferry Canyon Unit.

2.2 Ownership and Use of Adjacent Lands

The lower elevation units (Bridgeport Bar, Okanogan River and Washburn Island Units) are located along the Columbia River and Okanogan River. These are bordered primarily by orchard, pasture and low-density residential developments. Dryland agricultural fields and rangelands surround the more remote upland units. Rural residential development has begun to reach even the most remote borders of the Indian Dan Canyon Unit and will increase in the future.

2.3 Property Locations and Legal Description

The Wells WA (Figure 1) is located in the vicinity the towns of Brewster and Bridgeport in North Central Washington (North Douglas and southern Okanogan Counties). The wildlife area includes land (Figures 2-7) located in the following sections:

T31N, R23E: 36
T30N, R23E: 1,2 and 12
T30N, R24E: 6, 7, 8, 9, 10, 16, 17, 18, 30, 33 and 34
T29N, R24E: 2, 3, 4, 10, 11 and 15
T30N, R24E: 10
T30N, R25E: 3, 9, 10, 15, 19, 20, 21, 22, 27, 28 and 34
T28N, R25E: 16, 20, 21, 29, 28, 32 and 33

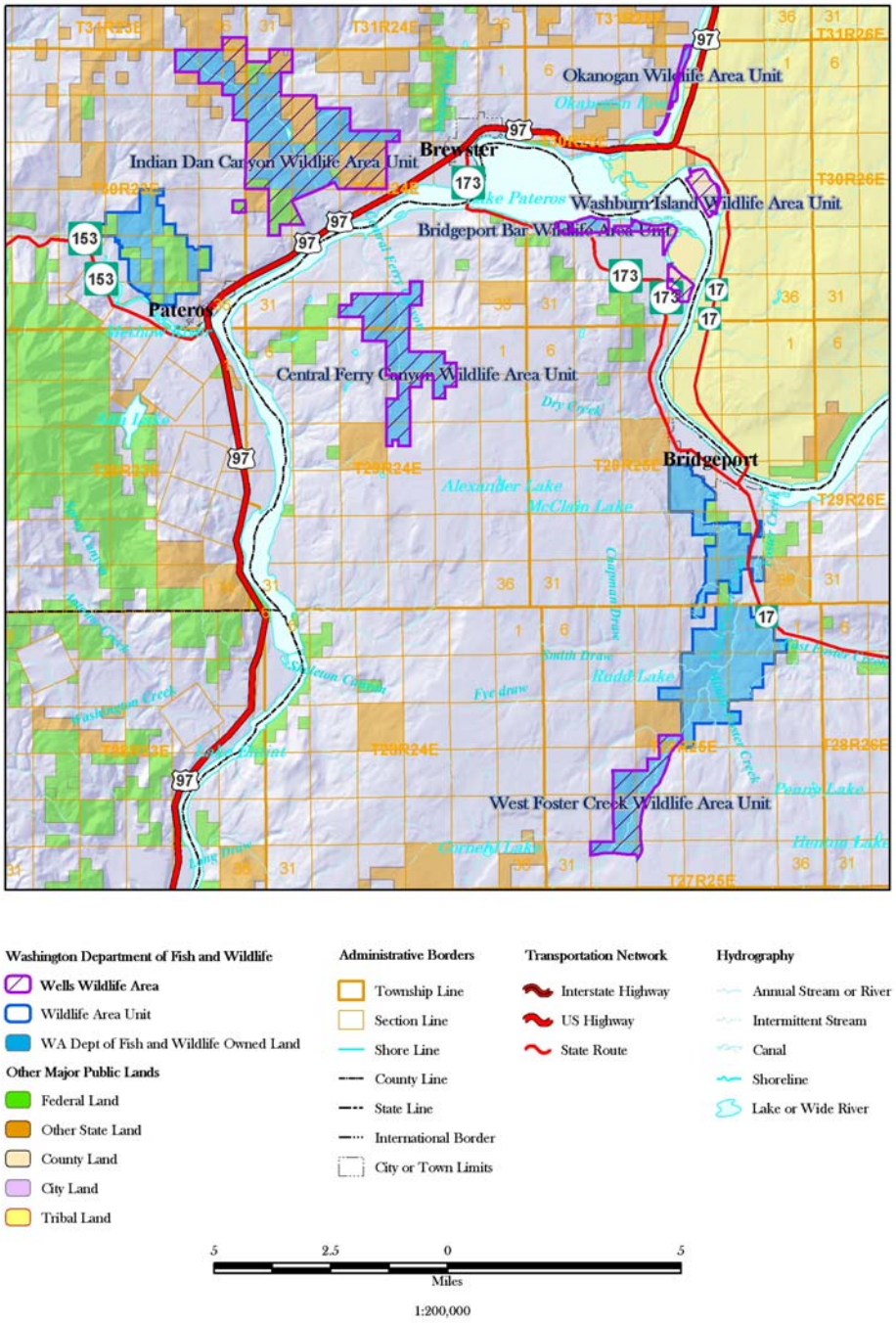

Figure 1: Wells Wildlife Area

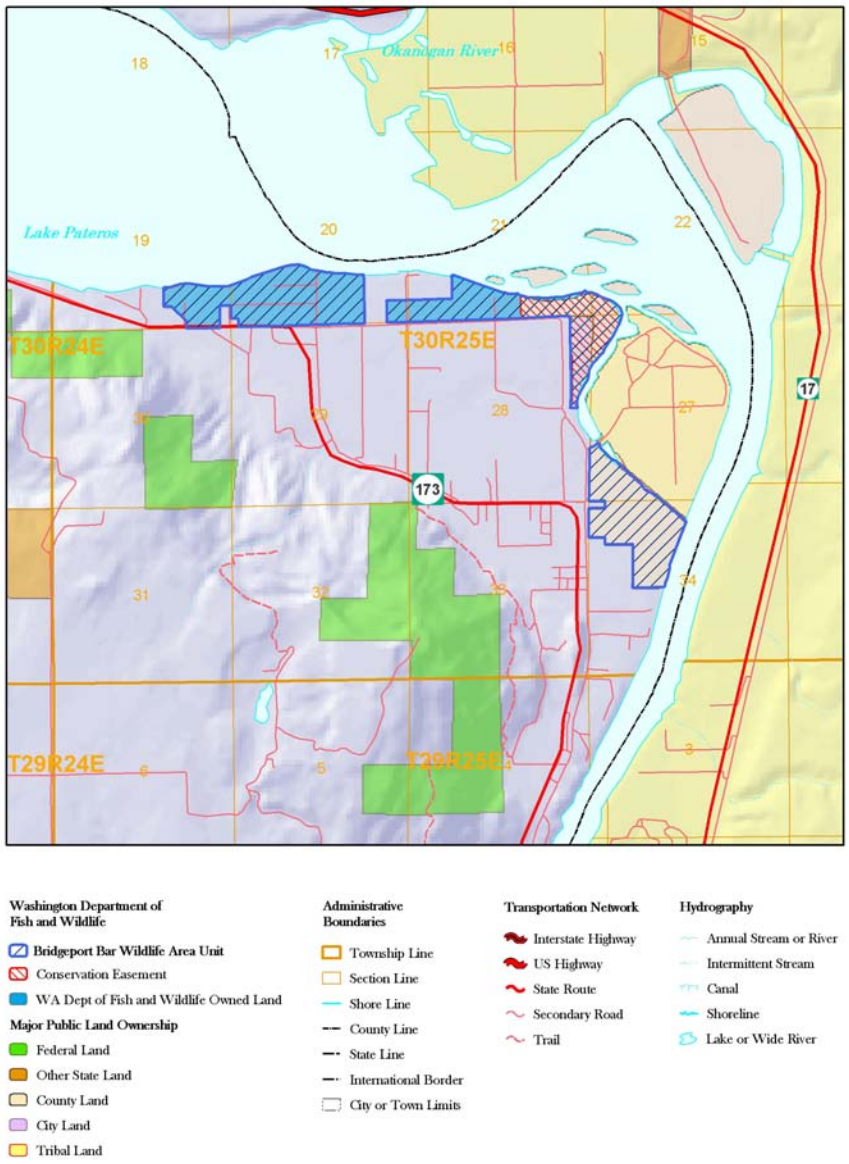

Figure 2: Bridgeport Bar Unit

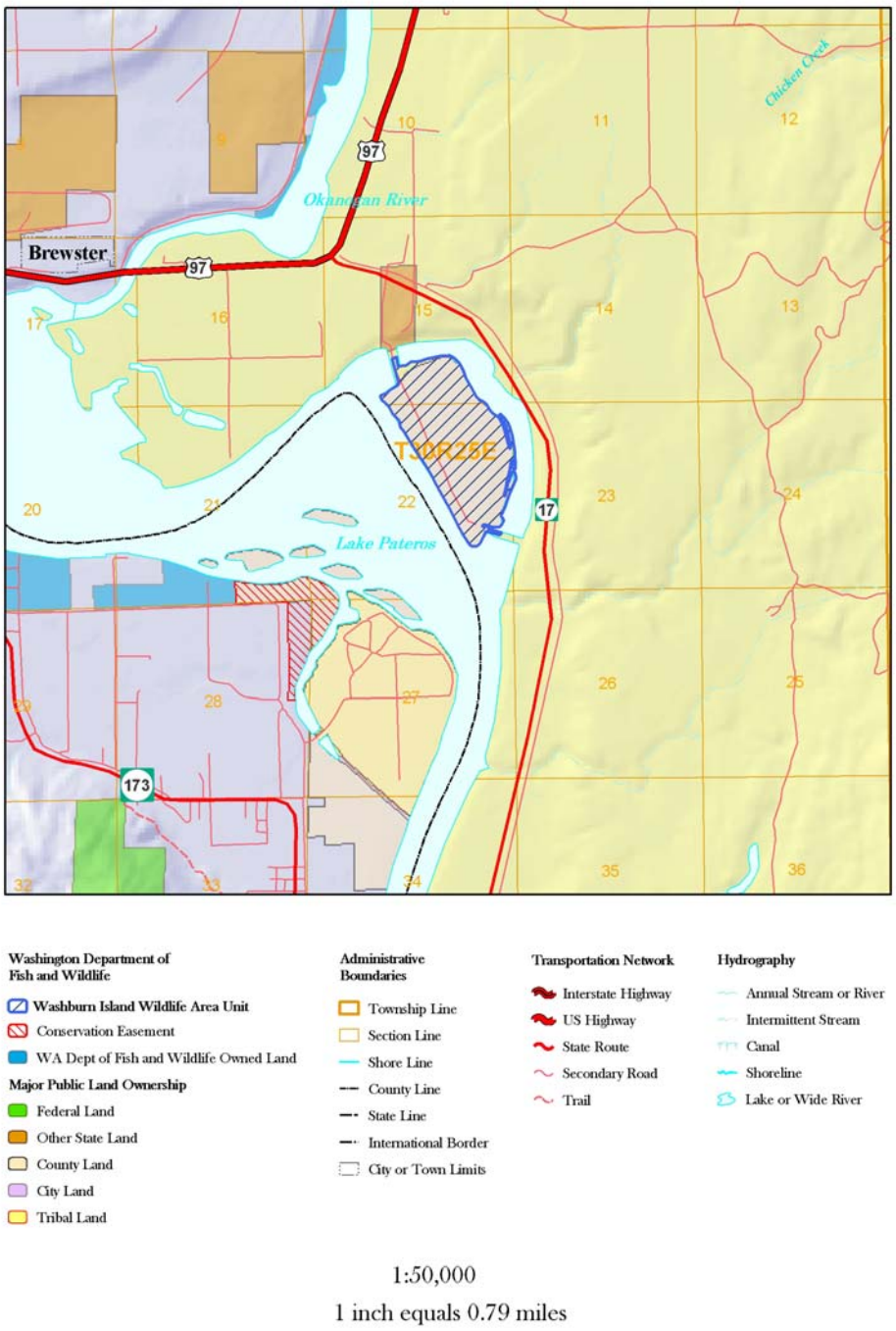

Figure 3: Washburn Island Unit

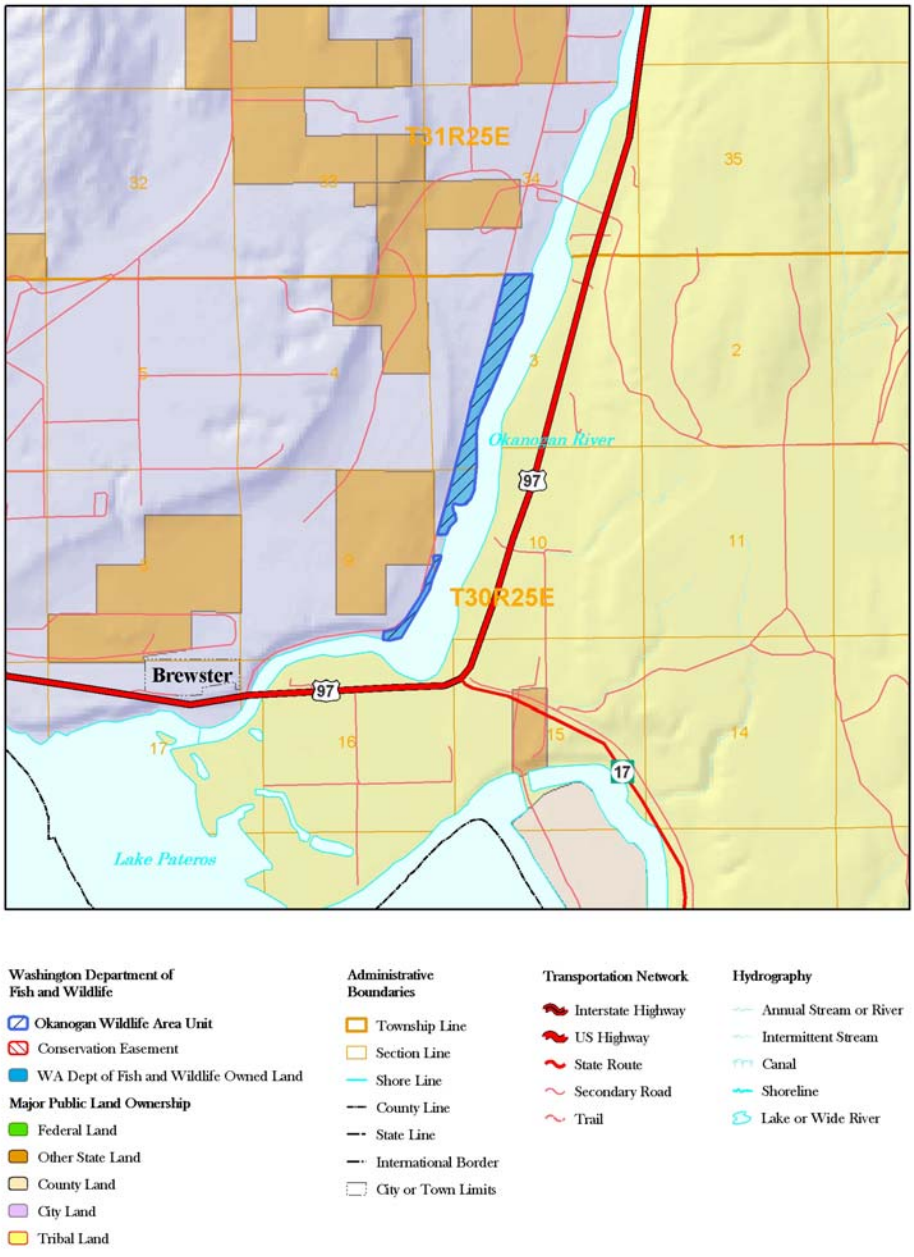

Figure 4: Okanogan River Unit

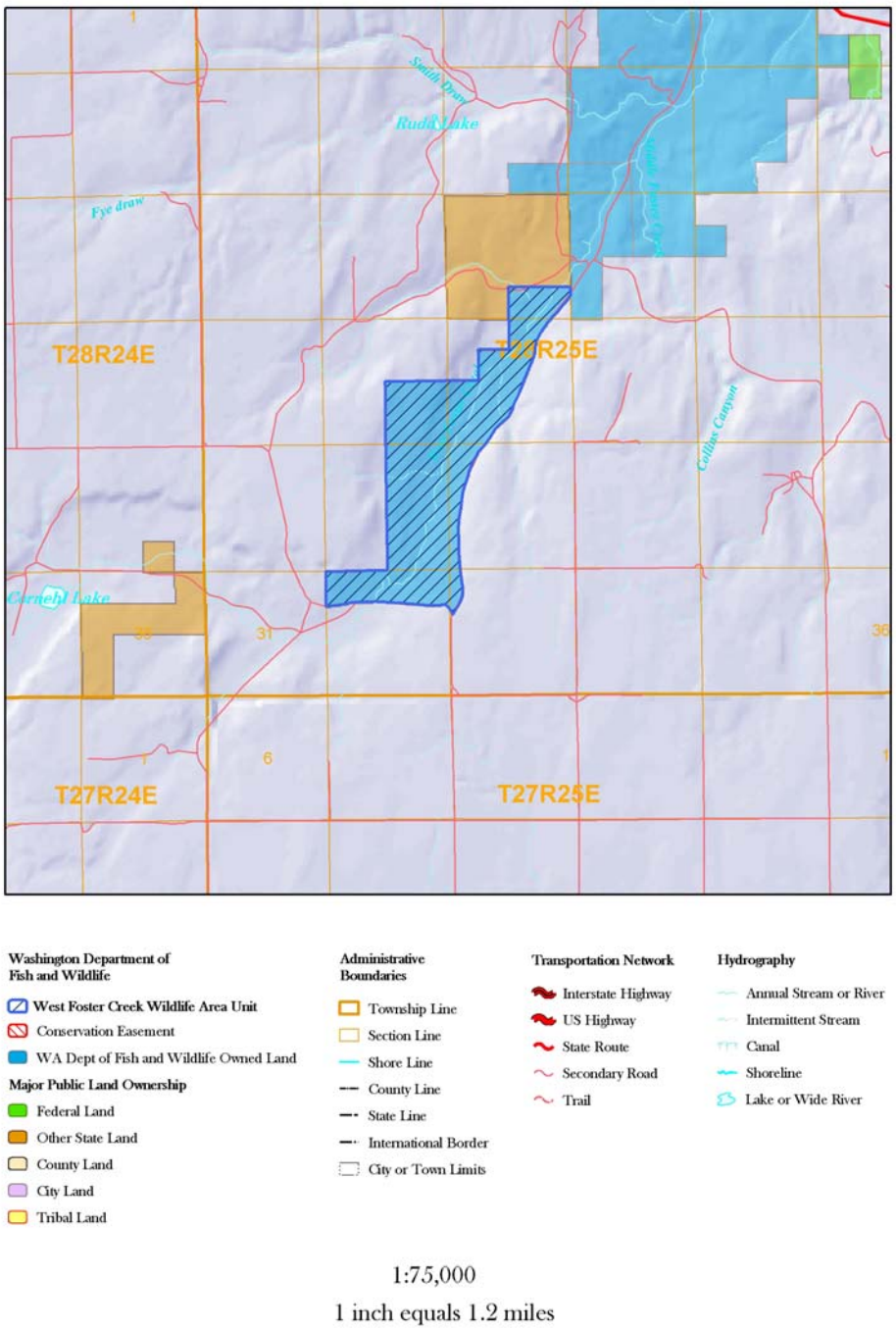

Figure 5: West Foster Creek Unit

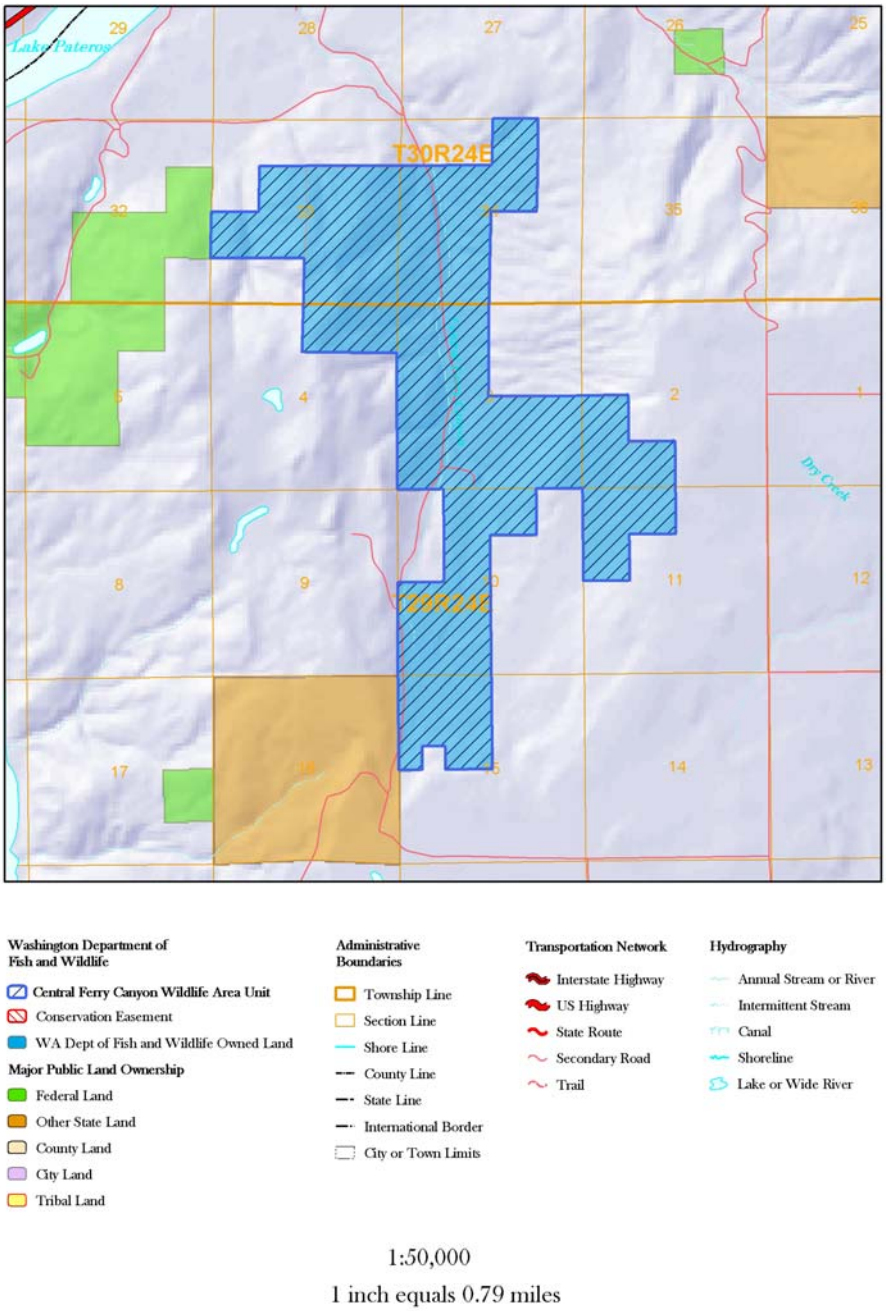

Figure 6: Central Ferry Unit

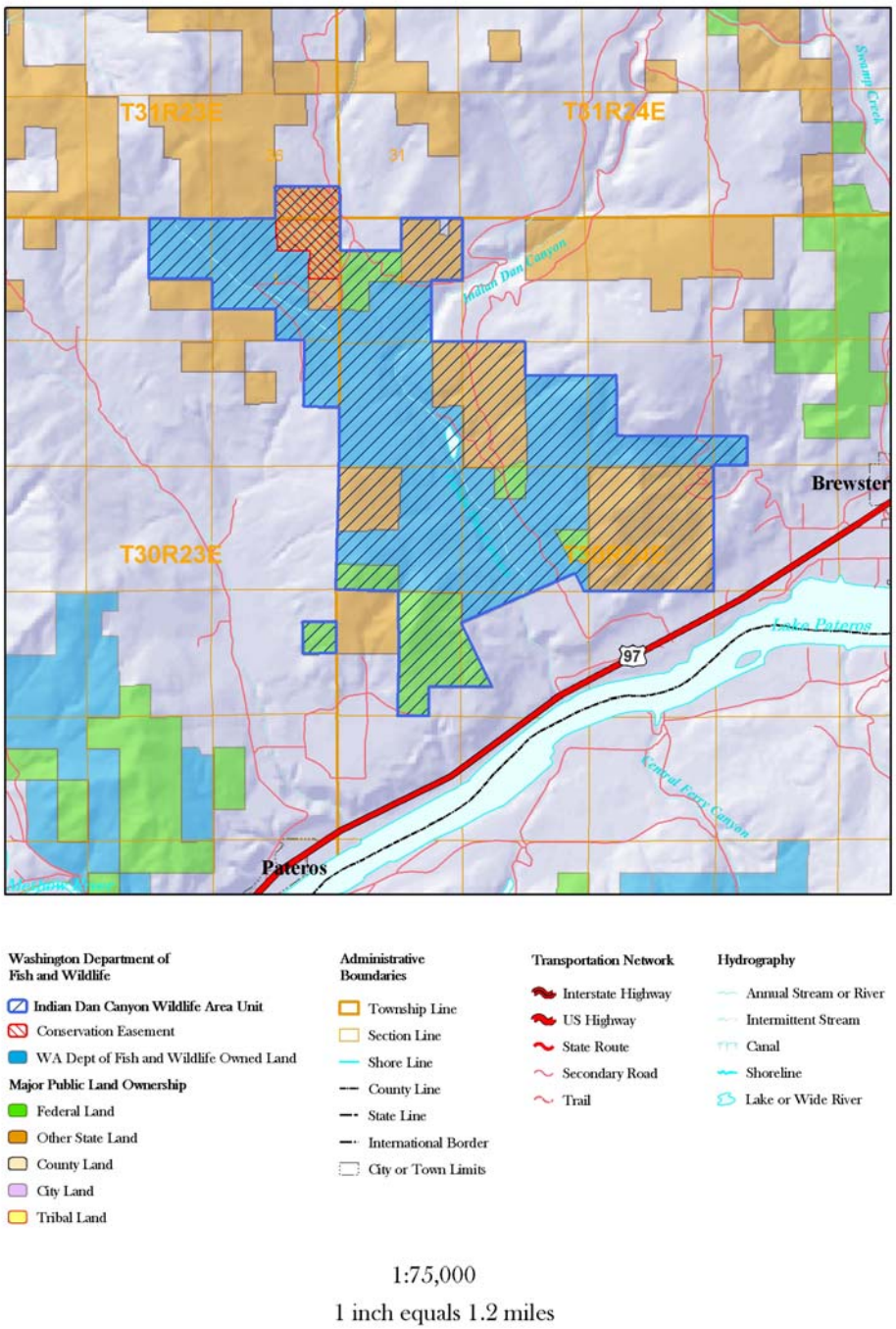

Figure 7: Indian Dan Canyon Unit

2.4 Funding

The PUD, as part of the wildlife mitigation agreement, provided $1,250,000 to the WDFW to be used for "the development, management, acquisition of lands and the propagation of wildlife" in the vicinity of Wells Pool. Annual operational expenditures have fluctuated, and are funded with the interest on a $1,000,000 investment, which is depreciated over the term of the license ending in 2012.

In 1995, concerned that the initial funding would not be inadequate to maintain the current level of management, the PUD entered into a Memorandum of Agreement with the WDFW and agreed to supplement the Wells WA budget. This move testifies to the PUD's commitment to wildlife mitigation. In recent years, the O/M base budget has been about $110,000 and the supplemental budget about $95,000.

Federal Aid in Wildlife Restoration provides 75% of the funds to manage the newer acquisitions on the Central Ferry Canyon Unit. State General Funds provide a 25% match for Federal Aid dollars.

2.5 Climate

Lying in the rain shadow of the Cascade Mountains, the area has a semi-arid climate, hot and dry in the summer and cold in the winter. The average high temperature in the summer is 83 degrees Fahrenheit while the daily minimum temperature in the winter averages about 20 degrees. Precipitation averages about 10 inches with 65% from snow accumulation. Snow depth ranges from a few inches to several feet depending on the elevation, proximity to the river and severity of the winter.

2.6 Soils and Geology

The Wildlife Area is located on the northwest edge of the Columbia Plateau, a vast area underlain by a series of basaltic lava flows. Approximately fifteen million years ago, these flows spread westward from distant sources to the southwest until they reached the crystalline rock buttress of the ancestral Cascade Range, not yet uplifted to its present heights. Most recently, during the last million years, the entire area was glaciated several times by advances of the Okanogan lobe of large ice sheets that spread south from central British Columbia. During the last advance, twelve to thirteen thousand years ago the ice extended about 30 miles south of the WA. As the ice flowed across the basalt layers, large blocks were mobilized and later deposited; forming the numerous "haystack" rocks that dot the Waterville Plateau.

When the ice-sheet on the Plateau retreated, ice rich rock debris was deposited sporadically. In areas of localized deposition, the debris formed rock knolls and numerous kettles and lakes.

During the Okanogan glaciation, sediments accumulated in lakes dammed by glacial ice forming extensive terraces. The multiple terraces in the Indian Dan Unit reflect the buildup of shore deposit and debris when water levels were stable for long periods. Many terraces are graded to the level of saddles, which were lake outlets. The gap north of Tenas Mountain, on the Indian Dan Unit, is an outstanding example of such a marginal lake spillway.

On a large scale, ice lobes in Eastern Washington dammed portions of the Columbia River, forming large lakes. The largest of these extended from Montana to Eastern Washington. Repeated washouts of the ice dams caused catastrophic floods that gouged out channeled scablands. These

and other floods deposited coarse gravel on terraces along the Columbia and heaped sediment into giant ripples of gravel.

Soil types in the vicinity of the wildlife area vary greatly and resulted from material weathered from glacial till and outwash, loess, volcanic ash and pumice, basalt, granite, sedimentary and metamorphic rock, alluvium, eolian sand and lake sediment.

2.7 Hydrology and Watersheds

Several springs, intermittent and seasonal streams and seeps occur on the upland units. Artificial ponds and Indian Dan Lake were developed using these water sources. Beaver activity in the West Foster Creek Unit has resulted in a network of beaver ponds and channels. This has increased the available wetland habitat in the northern portion of the unit.

The high water table through much of the Washburn and Bridgeport Bar Units has created wetlands and ponds.

Management of the wildlife area will consider and apply information from local watershed plans. The Washington State Watershed Management Act (WMA) of 1998 allows local government, interest groups and citizens to identify and solve water related issues in each of the 62 Water Resource Inventory Areas (WRIAs) of the state. The wildlife area lies in three of these WRIA's: WRIA 50 - Foster Creek (West Foster Creek, Central Ferry and Bridgeport Bar Units), WRIA 49 – Okanogan (Washburn Island and the Okanogan River Unit), WRIA 48 – Methow (the northwest portion of the Indian Dan Unit). Information and watershed plans for the WRIA's are available on the Department of Ecology web site: http://www.ecy.wa.gov/programs/eap/wrias/index.html.

The wildlife area is also located in two Northwest Power and Conservation Council (NWPCC) Subbasins: The Okanogan and Upper-Mid Columbia Mainstem Subbasins. Access to Subbasin plans is available on the NWPCC WEB page at:
http://www.nwppc.org/fw/subbasinplanning/admin/level2/wa/default.htm

2.8 Fire History

Long-term wildfire intervals in the shrubsteppe ecosystem are estimated to be between 60 and 110 years. Daubenmire (1970) believed that fire had little influence on the distribution and species composition of eastern Washington shrubsteppe. Several fires occurred on the wildlife area since its inception, many were man-caused. The increase in fire frequency due to human activity and the encroachment of weedy plant species negatively affects the plant community. Such fires eliminate sagebrush and bitterbrush for an extended period of time. Bunch grasses for the most part survive even the most intense fire. Weedy species out-compete stressed native species and can readily invade burns. Most fires are detrimental to shrubsteppe obligates and other species that use this habitat type. A fire in Indian Dan Canyon in 1985 destroyed 700 acres of bitterbrush. Twenty years later, this bitterbrush stand has not even begun to recover. Elsewhere on the unit, bitterbrush burned out about 60 years ago is starting to come back in patches but is far from producing the previous dense stand, which was "taller than a saddle horse". Other fires on West Foster Creek in 1984 (450 acres) and 1994 (600 acres) and Central Ferry Canyon in 1989 (about 500 acres) burned stands of large sagebrush and bitterbrush particularly important for shrubsteppe obligate species, deer, California quail and other wildlife.

Fire can be beneficial in some cases. It can rejuvenate decadent plants if fire size is limited, seed sources are maintained, and/or fire intensities are low enough to maintain crown sprouting of shrubs. Prescribed fires can take advantage of these conditions, which rarely occur during natural or accidental fires.

2.9 Vegetation Characterization

Due to low precipitation and soil types, the predominant upland habitat types on the Wells Wildlife Area are shrubsteppe and steppe. The former is promoted by soil disturbance and the later by fire. Riparian vegetation is dispersed throughout the Wildlife Area along creek bottoms, lakes and springs. Riparian species include black cottonwood, aspen, water birch, choke cherry, willow species, service berry, elderberry and black hawthorn. The major weedy species occurring on the area include diffuse knapweed, Russian knapweed, Canada thistle, cheatgrass and Dalmatian toadflax. Native habitat is resistant to weed invasion unless it is disturbed. Past agricultural and grazing activities have aggravated the weed problem on the area and resulted in the degradation of all habitat types.

2.10 Important Habitats

Shrubsteppe: Shrubsteppe habitat occurs to various extents on most of the units of the wildlife area. The most extensive parcels of this habitat type are located on the West Foster Creek, Central Ferry and Indian Dan Canyon Units. Shrubsteppe obligate species, which occur on the area, include white–tailed jackrabbit, sage grouse, sage thrasher, sage sparrow and Brewer's sparrow. This habitat is critical to the Department's goal of maintaining and increasing the populations of such priority wildlife species as mule deer, sharp-tailed grouse, sage grouse and pygmy rabbit. Forty-three other wildlife species are closely associated with shrubsteppe habitat while 103 species are generally associated with shrubsteppe.

Central Ferry Canyon Unit: Shrubsteppe and Riparian Habitat

Riparian: Riparian habitat is relatively scarce on the Wells Wildlife Area compared to other habitat types and disproportionately valuable as fish and wildlife habitat. Riparian habitats are diverse and highly productive and provide vital resources to many fish and wildlife species.

Riparian habitat forms natural corridors that are important travel routes between foraging areas, breeding areas and seasonal ranges, and provides protected dispersal routes for young wildlife. Protected access to water is also an essential attribute of intact riparian habitat. Approximately 85% of Washington's terrestrial vertebrate species use riparian habitat for essential life activities.

Additionally riparian habitat is important in stabilizing stream banks, thus reducing sedimentation and maintaining water quality.

Talus/Rock: Basalt erratics (locally called haystack rocks), rocky outcrops and talus slopes occur in the upland units. This habitat type provides habitat for many species including rattlesnakes, bats, yellow-bellied marmots, cottontail rabbit, bobcat and weasels. Dispersed rocky outcrops particularly on steep hillsides provide an important habitat component for chukar. Talus and rocky areas serve as a "water collection apron", which promotes the growth of shrub and trees and thus vegetative diversity even in the driest sites. These also protect shrubs and trees from fire, which can provide important "islands" of habitat over an extended period of time – e.g. bald eagle perches

Meadow/Wetland: Several meadows occur on the area. Beaver activity has greatly modified the largest meadow, which is located on the West Foster Creek Unit increasing wetland habitat. The largest wetland system, occurring on Washburn Island, was created by the construction of two causeways on the north and south ends of the island. Minor wetlands occur on all units and are primarily associated with artificial ponds, the Columbia River and beaver activity.

2.11 Fish and Wildlife

Due to its diversity in habitat types, the Wells Wildlife Area supports a great diversity of wildlife. Bridgeport Bar, Washburn Island and the Okanogan Unit are located adjacent to Wells Pool and thus also provide habitat for waterfowl. Upland game found on the area includes blue grouse, ruffed grouse, gray partridge, chukar partridge, ring-necked pheasant and California quail. Mule deer are common throughout the area while white-tailed deer are present mostly on the Indian Dan Unit. The southern portion of the Indian Dan Unit provides the best mule deer wintering habitat on the wildlife area.

West Foster Creek Unit: Sharp-tailed grouse in water-birch

Columbian sharp-tailed grouse occur in small, localized populations in Central Ferry Canyon and West Foster Creek. Sage grouse have been observed on the West Foster Creek Unit. Both of these species are classified as "threatened" in the state and have been petitioned for federal listing. The WDFW has also developed management plans for these species as well as a sage grouse recovery plan.

A great diversity of other wildlife species uses the area. These include neotropical birds, many raptor species and water birds. Wells Pool attracts thousands of waterfowls and other water birds. Bald eagles around Wells Pool primarily feed on waterfowl and carrion during the winter and on fish the rest of the year. Three bald eagle nests and one golden eagle nest are located in the vicinity of Wells Pool. American white pelicans, long-billed curlews and sandhill cranes visit this pool as well.

Priority species, which are found on the wildlife area include; bald eagle, golden eagle, merlin, peregrine falcon, prairie falcon, northern goshawk, blue grouse, California quail, Lewis woodpecker, loggerhead shrike, and Rocky Mountain mule deer. (Information on priority Habitats and Species list are available at http://wdfw.wa.gov/hab/phsvert.htm#birds)

Listed species that occur, or have the potential to use the wildlife area include:

Greater Sage grouse	ST, FC
Columbian Sharp-tailed grouse	ST
Loggerhead shrike	SC, FSC
Sage thrasher	SC
Sage sparrow	SC
Sandhill crane	SE
Northern goshawk	SC, FSC
Ferruginous hawk	ST, FSC
Golden eagle	SC
Merlin	SC
Peregrine falcon	SE, FSC
Burrowing owl	SC, FSC
White-tailed jackrabbit	SC

Black-tailed jackrabbit	SC
Washington ground squirrel	SC, FC
Sagebrush lizard	SC

State endangered (SE), State threatened (ST), State candidate for listing (SC), Federal endangered (FE), Federal candidate (FC), Federal species of concern (FSC)

2.12 Cultural Resources.

Cultural, geological, and other non-renewable resources are protected, and may not be removed unless such removal is beneficial to wildlife, habitat, or the Wildlife Area, or for scientific or educational purposes. WDFW will coordinate with the appropriate agency of jurisdiction for the protection of such resources. Past issues have included the removal of various rock formations, Native American artifacts, plants, seeds, and other items by members of the public.

CHAPTER III. MANAGEMENT OBJECTIVES, ISSUES & STRATEGIES

Statewide goals and objectives listed in chapter one shape management priorities on wildlife areas. Specific wildlife area information including why the area was purchased, habitat conditions, species present, and public issues and concerns are evaluated to identify wildlife area activities or tasks. Strategies are listed in priority order.

Management of the Wells Wildlife Area will follow WDFW Game Management Plan guidelines when possible and will strive to satisfy the terms of the wildlife mitigation agreement between the WDFW and Public Utilities District No. 1 of Douglas County.

Objectives and associated tasks specific to the Wells Wildlife Area are listed where appropriate under applicable agency objectives. Unfunded needs are underlined. (Note: The Douglas PUD claims no mitigation responsibility for unfunded needs. It considers these agency rather than mitigation needs). Strategies derived partially or entirely from the CAG's input are italicized.

Agency Objective: Protect, Restore & Enhance Fish and Wildlife Populations and Their Habitats

1. Manage for upland game

The Wells Wildlife Area was purchased primarily to mitigate for the loss of upland game caused by the construction of Wells Dam. Upland game will be managed on the Wells Wildlife Area in accord with the WDFW Game Management Plan (2003-2006) and to satisfy the terms of the Wells Wildlife Mitigation Agreement.

A. Strategy: As a priority, protect and enhance sharp-tailed grouse habitat and in particular wintering and nesting habitat. Time frame: Ongoing. Throughout the year.

B. Strategy: Protect maintain and enhance upland game habitat (see Agency Objective: Protect, Restore & Enhance Fish and Wildlife Populations and Their Habitats. Sub-objective 6, 7, and 8.) Time frame: Ongoing. Throughout the year.

C. Strategy: Protect upland game habitat from fire, disturbance and weed invasion (see Agency Objective: Ensure that WDFW Activities, Programs, Facilities and Lands are Consistent With Local, State and Federal Regulations that Protect and Recover Fish, Wildlife and Their Habitats. Sub-objective 1 and 3.) Time frame: Ongoing. Growing and fire season.

D. Strategy: Establish about 100 acres of dense herbaceous cover and shrubsteppe on Washburn Island and Bridgeport Bar to provide nesting cover for pheasants and other ground nesting birds. Time frame: Fifteen to twenty five acres will be established annually for the next 5 to 10 years.

E. Strategy: Maintain springs and guzzlers to provide water for upland birds and other species (currently: 6 developed springs and 11 guzzlers). Assess impact of water development on listed species. Time frame: Annual maintenance. Develop 5 watering sites on the Central Ferry Canyon Unit in the next 5 years.

F. Strategy: Annually, fill and maintain upland bird feeders through the winter (25+) provided they do not conflict with listed species. Assess impact of bird feeders on listed species. Time frame: As funding allows. Funding will be sought from grants or re-prioritization of other tasks.

G. Strategy: Annually cultivate 25 to 35 acres of food plots primarily along perennial cover. Ongoing.

H. Strategy: Provide brush piles in areas where planting woody cover is not practical. Where feasible, plant Clematis along brush piles. Scheduling will depend on availability of material. Time frame: As availability of material allows.
I. Strategy: Annually, release 100 to 250 California quail and other game birds to augment over-hunted local populations unless such releases are in conflict with listed species. Time Frame: Annually. January through February.
J. Strategy: Assess impact of releases on listed species.
K. Strategy: Annually conduct upland bird surveys. Determine hunting and upland game population trends through the annual hunter registration program. Time Frame: October through January.

2. Manage for waterfowl

Three units of the Wildlife Area are located adjacent to Wells Pool, which provides resting and feeding sites for waterfowl. Waterfowl management on these units includes production of agricultural crops, establishment of nesting habitat and erection of nesting structures. It is also in accord with the WDFW Game Management Plan (2003-2006) and the terms of the Wells Wildlife Mitigation Agreement.

A. Strategy: Protect, maintain and restore wetlands and other waterfowl habitat (see Agency Objective: Protect, Restore & Enhance Fish and Wildlife Populations and Their Habitats. Sub-objective 6, 7, 8.) Time frame: Ongoing. Throughout the year.
B. Strategy: Protect waterfowl habitat from fire, disturbance and weed invasion (see Agency Objective: Ensure that WDFW Activities, Programs, Facilities and Lands are Consistent With Local, State and Federal Regulations that Protect and Recover Fish, Wildlife and Their Habitats. Sub-objective 1 and 3.) Time frame: Ongoing. Throughout the year.
C. Strategy: Grow approximately 75 to 100 acres of irrigated grain crops annually on Washburn Island and Bridgeport Bar to provide feed for waterfowl and other wildlife and promote waterfowl hunting opportunity. Time Frame: Growing season each year.
D. Strategy: Maintain approximately 200 artificial waterfowl nesting structures in the Wells Pool area and West Foster Creek and the Indian Dan Units. Time frame: Ongoing. Throughout the year.
E. Strategy: Conduct annual goose nesting surveys on Wells Pool. Determine hunting and waterfowl use trends through the hunter registration program. Time Frame: Annually, March through May.
F. Strategy: Conduct waterfowl nesting surveys on all suitable Units.
G. Strategy: See Agency Objective: Provide sound operational management of WDFW lands, facilities and access sites. Sub-objective 2. See Agency Objective: Ensure that WDFW Activities, Programs, Facilities and Lands are Consistent With Local, State and Federal Regulations that Protect and Recover Fish, Wildlife and Their Habitats. Sub-objective 2.

3. Manage for big game

Management for other wildlife and plant species benefits mule deer and white-tailed deer using the WA. Big game will be managed on the Wells Wildlife Area in accord with the

WDFW Game Management Plan (2003-2006) and the Wells Wildlife Mitigation Agreement.

A. Strategy: Protect, maintain and restore mule deer habitat (see Agency Objective: Protect, Restore & Enhance Fish and Wildlife Populations and Their Habitats. Sub-objective 6, 7, and 8.) Time frame: Ongoing. Throughout the year.

B. Strategy: Protect big game habitat from fire, disturbance and weed invasion (see Agency Objective: Ensure that WDFW Activities, Programs, Facilities and Lands are Consistent With Local, State and Federal Regulations that Protect and Recover Fish, Wildlife and Their Habitats. Sub-objective 1 and 3.) Time frame: Ongoing. Throughout the year.

C. Strategy: Regulate public access in big game wintering areas. Seasonally close roads, control antler hunting and snowmobiling use, etc to minimize disturbance during the stressful winter and early spring periods. Time frame: Ongoing. December through April if authorized by upper management.

D. Strategy: Restore mule deer wintering habitat. Seed or plant bitterbrush and other mule deer forage and browse species in burned and/or disturbed areas. (Fire eliminates bitterbrush, a major deer browse in the area for a long period of time.) Include locally collected bitterbrush seed in seed mixes used to restore mule deer habitat when practical.

E. Strategy: Work with the Mule Deer Foundation to conduct projects that improve winter range for mule deer primarily on the Indian Unit. Time frame: As time allows.

F. Strategy: Conduct annual deer surveys.

G. Strategy: See Agency Objective: Provide sound operational management of WDFW lands, facilities and access sites. Sub-objective 2. Also see Agency Objective: Ensure that WDFW Activities, Programs, Facilities and Lands are Consistent With Local, State and Federal Regulations that Protect and Recover Fish, Wildlife and Their Habitats. Sub-objective 2.

4. Improve and maintain fish populations

Although fisheries management this is not a high priority for the Wildlife Area, habitat enhancements for terrestrial species also benefit fish. Streams located on the area do not support fish. The Bridgeport Bar, Washburn Island and Okanogan Units lie adjacent to the Columbia River (Wells Pool) where upland management can affect listed and other species of fish. Indian Dan Lake was illegally planted to large-mouth bass and bluegill and provided good fishing for about two years. Bass were fished out and small bluegills over-populated the lake. The lake subsequently dried out completely and no longer supports fish.

The Upper Columbia Salmon Recovery Board (UCSRB), established by the Salmon Recovery Planning Act in 1998 is responsible for developing Salmon Recovery Plans for the Okanogan, Methow, Moses Coulee and Foster Creek watersheds. Management of the area will be consistent with these plans.

A. Strategy: Manage the portion of watershed under our control in a manner, which minimizes erosion and stream sedimentation. This is a basic requirement since all habitats are dependent on the condition of the watershed. Manage and control livestock grazing and other mechanical disturbances and plant disturbed areas to

permanent cover (see Agency Objective Other Issues or Concerns. Sub-objectives 1). Time frame: Ongoing, throughout the year.

B. Strategy: Protect, restore and maintain habitat affecting the fish resource (see Agency Objective: Protect, Restore & Enhance Fish and Wildlife Populations and Their Habitats. Sub-objective 6, 7, and 8.) Time frame: Ongoing. Throughout the year.

C. Strategy: Restore riparian habitat (shrubs and trees) along streams and Wells Pool. Time frame: Annual and as funding allows. Funding will be sought through grants or re-prioritization of other tasks.

5. Manage for species diversity

Develop and maintain quality habitat that will provide life requisites for a diversity of species. Nearly all activities on the wildlife area benefit a diversity of species.

A. Strategy: As a priority and consistent with WDFW priorities, protect, maintain and enhance habitat for state and federally listed species (see Agency Objective: Protect, Restore & Enhance Fish and Wildlife Populations and Their Habitats. Sub-objective 6, 7 and 8.) Where management conflicts with a listed species, proceed to preserve and protect the listed species. Time frame: Ongoing. Throughout the year.

B. Strategy: Identify, protect and restore all native plant associations. This is necessary to maintain biodiversity dependent on a variety of habitat types. Time frame: Ongoing. Throughout the year.

C. Strategy: Protect and preserve sensitive wildlife sites such as active sharp-tailed and sage grouse lek sites, all snake dens (especially during spring emergence), active bald and golden eagle nests, bald eagle communal roosts, state and federal listed plant species, big game wintering areas, etc. from human disturbance. These sites are essential for the protection of local populations. Time frame: Ongoing. Throughout the year.

D. Strategy: Protect, restore and maintain habitat affecting the diverse species of wildlife found on the wildlife area (see Agency Objective: Protect, Restore & Enhance Fish and Wildlife Populations and Their Habitats. Sub-objective 6, 7, and 8.) Time frame: Ongoing. Throughout the year.

E. Strategy: Protect diversity species habitat from fire, disturbance and weed invasion (see Agency Objective: Ensure that WDFW Activities, Programs, Facilities and Lands are Consistent With Local, State and Federal Regulations that Protect and Recover Fish, Wildlife and Their Habitats. Sub-objectives 1 and 3). Time frame: Ongoing. Throughout the year.

F. Strategy: *Protect continuous habitat from fragmentation.* Time frame: Ongoing. Throughout the year.

G. Strategy: Increase habitat "edge" and plant species diversity to promote use of the area by a greater diversity of wildlife species *while avoiding increase in habitat fragmentation.* Time frame: Ongoing. Throughout the year.

H. Strategy: Determine species use by conducting and/or facilitating surveys of various bird, reptile, amphibian and mammal, vascular plant, moss, lichen and selected insect species. Time frame: As funding allows. Funding will be sought through grants or re-prioritization of other tasks. *Cooperate with agencies and*

private groups to acquire information on wildlife use of the area. Time frame: As time allows.

I. Strategy: See Agency Objective: Ensure that WDFW Activities, Programs, Facilities and Lands are Consistent With Local, State and Federal Regulations that Protect and Recover Fish, Wildlife and Their Habitats. Sub-objective 2.

6. Protect and restore riparian habitat

Riparian habitat is a WDFW priority habitat type important to a great diversity of fish and wildlife species. It provides important breeding areas and movement corridors for many species.

A. Strategy: Protect all riparian areas from fire, disturbance and weed encroachment (see Agency Objective: Ensure that WDFW Activities, Programs, Facilities and Lands are Consistent With Local, State and Federal Regulations that Protect and Recover Fish, Wildlife and Their Habitats. Sub-objective 1 and 3.) Time frame: Ongoing. Throughout the year.

B. Strategy: Control beaver activity to ensure protection of key trees and shrubs. Install protective wire cages around trees and relocate beavers as needed. Time frame: Ongoing. Throughout the year.

C. Strategy: Construct and maintain big game fences to protect shrub and tree seedlings when practical. Time frame: As needed and as funding allows. Funding will be sought through grants or re-prioritization of other tasks.

D. Strategy: Restore riparian habitat in all units. Focus on areas with adequate soil moisture and irrigated areas. Plant an average of 5000 shrubs and trees per year. Maintain and protect new plantings. Continue planting riparian habitat on Washburn Island for the next five years. Interplant in existing plantings as needed. Time frame: Annual, March through April.

E. Strategy: Collect seeds of locally adapted native riparian species for propagation of stock to be used on the area. Time frame: As needed and as time allows.

F. Strategy: Install irrigation system to water riparian habitat where needed to establish and/or maintain shrub and tree plantings. Time frame: As needed and as funding allows. Funding will be sought through grants or re-prioritization of other tasks.

G. Strategy: Assess insect infestations and release bio control agents. Coordinate treatment with Washington State University Extension Office. See Agency Objective: Provide sound operational management of WDFW lands, facilities and access sites. Sub-objective 2. Agency objective: Other Issues or Concerns. Sub-objective 2. Agency Objective: Ensure that WDFW Activities, Programs, Facilities and Lands are Consistent With Local, State and Federal Regulations that Protect and Recover Fish, Wildlife and Their Habitats. Sub-objective 2.

7. Protect and restore shrubsteppe habitat

Shrubsteppe habitat management and protection is a WDFW priority. This is especially important in this area, where listed shrubsteppe dependent wildlife species such as sage and sharp-tailed grouse occur. Shrubsteppe is the dominant habitat type on the wildlife area and provides habitat for a diversity of fish and wildlife species and for comparatively high densities of animals. Shrubsteppe is also very vulnerable to fire, weed invasion and habitat conversion and alteration practices.

A. Strategy: Protect shrubsteppe habitat from fire, disturbance and weed encroachment (see Agency Objective: Provide sustainable fish and wildlife-related recreational and commercial opportunities compatible with maintaining healthy fish and wildlife populations and habitats. Improve the economic well being of Washington by providing diverse, high quality recreational and commercial opportunities. Sub-objective 1 and 3.) Time frame: Ongoing. Throughout the year.
B. Strategy: Restore old agricultural fields and other disturbed areas to native shrubsteppe habitat. Maintain and renew the current CRP contracts (+/- 500 acres). Restore shrubsteppe in old fields in the Central Ferry Canyon and West Foster Creek Units (100-200 acres) over the next ten years. Time frame: 2006-2016
C. Strategy: See Agency Objective: Other Issues or Concerns. Sub-objective 2.
D. Strategy: Conduct shrubsteppe condition surveys to assess habitat quality issues.
E. Strategy: *Evaluate and use prescribed fires to rejuvenate and improve shrubsteppe habitat and reduce the risk of catastrophic fires.*
F. Strategy: *Collect seeds of native species, especially forbs, from the Wells WA or vicinity to provide a source of locally adapted seed for restoration uses.*
G. Strategy: See Agency Objective: Ensure that WDFW Activities, Programs, Facilities and Lands are Consistent With Local, State and Federal Regulations that Protect and Recover Fish, Wildlife and Their Habitats. Sub-objective 2.

8. Protect and restore wetland and meadow habitat:
The agency has prioritized wetland habitat management and protection. This habitat type has comparatively high fish and wildlife density and high fish and wildlife species diversity. It also has important fish and wildlife breeding habitat and important fish and wildlife seasonal ranges. The availability of these habitat types is limited and they are highly vulnerable to alteration.

A. Strategy: Protect, maintain and/or restore wetland and meadow habitat from disturbance, fire and weed encroachment (See Agency Objective: Ensure that WDFW Activities, Programs, Facilities and Lands are Consistent With Local, State and Federal Regulations that Protect and Recover Fish, Wildlife and Their Habitats. Sub-objective 1 and 3.) Time frame: Ongoing. Throughout the year.
B. Strategy: Control beaver activity annually to ensure the protection of key habitat and to ensure that pond development occurs in suitable areas. Time frame: Annual.
C. Strategy: Build ponds and consider pothole blasting on Washburn Island and the West Foster Creek Unit..
D. Strategy: See Agency Objective: Ensure that WDFW Activities, Programs, Facilities and Lands are Consistent With Local, State and Federal Regulations that Protect and Recover Fish, Wildlife and Their Habitats. Sub-objective 2.

9. Protect and manage other species including Threatened and Endangered Species
Listed species will be managed according to the department's Management Recommendations for Washington's Priority Habitats and Species (PHS). These detailed documents identify the needs of fish and wildlife based on the best available science and include guidelines for their incorporation in management decisions.

A. Strategy: As a priority and consistent with PHS listing, protect, maintain and enhance habitat for state and federally and State listed species and other species (see

Agency Objective: Protect, Restore & Enhance Fish and Wildlife Populations and Their Habitats. Sub-objective 6, 7, and 8.)

B. Strategy: Assess conflicts between the management of listed species and other wildlife. Manage for listed species when a conflict exists. Assess mortality of non target species through hunting and especially accidental take of sharp-tailed grouse by bird hunters.

C. Strategy: Protect nesting and foraging habitat for several woodpecker species. Protect and create snags. Time Frame: As funding allows. Funding will be sought through grants or re-prioritization of other tasks.

D. Strategy: *Determine presence or role of the more cryptic species such as mollusks and the presence/role of rare or unique plants.*

E. Strategy: *Protect and preserve Cryptogrammic soils. These were greatly disrupted by grazing and may have a role in noxious weed prevention.* Time frame: Ongoing. Throughout the year.

F. Strategy: *Protect and plant large roost trees that may be used by bald eagles.* Time frame: Ongoing. Throughout the year. Plant 50 to 100 trees (primarily Cottonwood) annually along Wells Pool to provide eagle roosting and nesting habitat.

G. Strategy: *Evaluate the area for western gray squirrel and sharp-tailed grouse re-introduction.*

H. Strategy: Protect and maintain 7 osprey platforms. Maintain and replace, as needed about 200 nest boxes (kestrel, bluebird, owl etc.). Time frame: Annual.

I. Strategy: See Agency Objective: Ensure that WDFW Activities, Programs, Facilities and Lands are Consistent With Local, State and Federal Regulations that Protect and Recover Fish, Wildlife and Their Habitats. Sub-objective 2. Also see Agency Objective: Provide sound operational management of WDFW lands, facilities and access sites. Sub-objective 2.

Agency Objective: Ensure that WDFW Activities, Programs, Facilities and Lands are Consistent With Local, State and Federal Regulations that Protect and Recover Fish, Wildlife and Their Habitats

1. Manage weeds consistent with state and county rules and to protect and recover fish and wildlife and their habitats (Weed Management Plan: Appendix 2).

State law requires weed control to protect public, economic and natural resources. Invasive weeds are one of the greatest threats to fish and wildlife habitat quality. Cooperative weed control efforts are encouraged to improve efficacy and to minimize impacts on adjacent landowners as part of the agencies good-neighbor policy.

A. Strategy: Preventing weed establishment, as the most cost effective part of a weed management program, is a priority. This includes restoring disturbed sites, closing roads and minimizing soil disturbance. Time frame: Ongoing and as funding allows. Funding will be sought through grants or re-prioritization of other tasks.

B. Strategy: *Produce and implement an integrated weed management plan to include weed identification and inventory, risk/threat, control priorities, and monitoring.* Time frame: 2006. Implementation will be ongoing.

C. Strategy: *Coordinate weed prevention and control efforts with federal, state and local entities to improve efficacy and minimize costs*. Time frame: Ongoing. Growing season.

D. Strategy: Control weeds along 25 miles of road and on about 100 acres annually. Time Frame: Annually, March though November.

E. Strategy: See Agency Objective: Ensure that WDFW Activities, Programs, Facilities and Lands are Consistent With Local, State and Federal Regulations that Protect and Recover Fish, Wildlife and Their Habitats. Sub-objective 2.

2. Manage species and habitats in compliance with the Endangered Species Act and Washington State fish passage, road management and forest practice rules.

Federal law requires the protection and management of threatened and endangered species. State law requires fish passage and screening issues and forest road sedimentation issues to be addressed on state public lands. Forest thinning operations on agency lands must follow state forest practice law.

A. Strategy: Comply with federal and state regulations. Time frame: Ongoing. Throughout the year.

B. Strategy: Protect buffers adjacent to wetlands and riparian habitat. Time frame: Ongoing. Throughout the year.

C. Strategy: Consider specific strategies associated Washington State listed and ESA species present or potentially present. Time frame: Ongoing. Throughout the year.

D. Strategy: Complete a forest Road Management and Abandonment Plan. Time frame: 2006-2007.

E. Strategy: See Agency Objective: Ensure that WDFW Activities, Programs, Facilities and Lands are Consistent With Local, State and Federal Regulations that Protect and Recover Fish, Wildlife and Their Habitats. Sub-objective 2.

3. Provide fire control on agency lands (Appendix 3)**.**

Fire suppression agreements must exist for all agency lands to protect the people of Washington and to protect natural and economic resources of the agency and adjacent landowners. WDFW will take measures to prevent fires and facilitate fire fighting.

A. Strategy: Maintain annual contract with local, state or federal entities to provide fire suppression support on the Wells Wildlife Area. Time Frame: Ongoing.

B. Strategy: Construct/develop and maintain firebreaks and green strips to prevent the spread of fire onto critical habitat and facilitate fire fighting. *Use native species in green strips if possible.* Time frame: Annual/Ongoing. Growing season.

C. Strategy: Limit vehicular travel and access during the fire season. Post the area "No Fires or Fireworks" as needed. Time frame: Annual.

D. Strategy: Maintain roads to facilitate fire fighting. Time frame: Ongoing. April though November as needed.

E. Strategy: Provide fire fighting water sources including ponds and reservoir. Time frame: Ongoing. Throughout the year.

F. Strategy: Use prescribed fires to reduce fuel load. Time frame: As resources and permits allow.

G. Strategy: Provide annual fire training for wildlife area personnel and update the fire plan (*develop a fire plan),* to include a list of fire responsible individuals. Time frame: Ongoing.

H. Strategy: Cooperate with local fire districts in educating the public about fire prevention. Time frame: As opportunity comes up.

I. Strategy: See Agency Objective: Ensure that WDFW Activities, Programs, Facilities and Lands are Consistent With Local, State and Federal Regulations that Protect and Recover Fish, Wildlife and Their Habitats. Sub-objective 2.

4. Protect cultural resources consistent with state and federal law

Federal and state law requires an assessment of cultural resources on agency lands prior to activities that may impact those resources.

A. Strategy: Assess cultural resource value (historic and archaeological) of all structures before renovation or removal. Time frame: Ongoing. As needed.

B. Strategy: Perform cultural resource survey and assessment as required. *Protect American Indian and other artifacts.* Time frame: When required or needed.

5. Pay county Payment in Lieu Tax (PILT) and assessment obligations.

State law requires the agency to pay PILT and county assessments

A. Strategy: Pay PILT and assessments to Okanogan County. Douglas County has elected to receive WDFW fine income (WDFW citations) in lieu of PILT. Time frame: Annual.

Agency Objective: Provide Sustainable Fish and Wildlife-Related Recreational and Commercial Opportunities Compatible With Maintaining Healthy Fish and Wildlife Populations and Habitats. Improve the Economic Well Being of Washington by Providing Diverse, High Quality Recreational and Commercial Opportunities.

1. Provide public access compatible with fish, wildlife and habitat protection

Access for hunting, fishing, wildlife viewing and other activities is an agency priority. However, access and recreation must be controlled to protect fish and wildlife resources and to comply with federal and state regulations. *Public input clearly emphasizes the importance of providing recreational access with protections for the resource.*

A. Strategy: *Manage roads including closures, reclamation, signing, etc. Provide roads open to vehicular travel where consistent with resource goals for the area* and when there are sufficient resources to maintain them. Address requirements in Road Management and Abandonment Plans in 2006 and 2007. *Consider posting only roads that are open (such as the green dot program).* Close road access where road conditions are not safe or where conditions have a negative impact on fish and wildlife. Consider creating hiking trails on old abandoned roads in areas where it will adversely impact wildlife. *Evaluate the demand for hiking trails on the area considering their impact on the fish and wildlife resource.* Time frame: Ongoing. Throughout the year.

B. Strategy: Work with the enforcement program in 2006 to provide input on specific regulations enforcing social behavior on WDFW property – camping length of stay, removal of property, noise etc. Ensure that the ATV use policy is consistent agency wide. Time frame: Ongoing. Throughout the year.

C. Strategy: Improve and manage wildlife viewing opportunities in a manner that is not detrimental to the wildlife resource. Time frame: Ongoing. Throughout the year.

D. Strategy: Provide limited camping if compatible with resource and recreational goals of the area. *Establish time limits for camping on the area.* Time frame: After new regulation is established.

E. Strategy: Provide hunting opportunities for persons with disabilities. Time frame: As funding allows. Funding will be sought through grants or re-prioritization of other tasks.

F. Strategy: Monitor public use of the area. Time Frame: Annually monitor hunting use of the area through the registration program.

2. Provide Information about the area and educational opportunities to the public

A. Strategy: *Provide informational kiosks and signs. Cooperate with other agencies in developing and implementing educational and informational programs.* Time frame: Ongoing. Throughout the year.

B. Strategy: *Provide information about the area and educational opportunity to the public.* Time frame: Ongoing, as funding allows. Funding will be sought through grants or re-prioritization of other tasks.

C. Strategy: Develop brochure and map of Wells WA units for public distribution. Develop a map of the area like that of the Sinlahekin Wildlife Area.

D. Strategy: Develop GIS layers of all resources, roads, trails, parking and camping areas and other facilities available to the public.

E. Strategy: *Request Olympia staff to consider developing a "GO LOOK" program on the WDFW web site to provide non-hunters information on wildlife viewing*. Time frame: 2006.

F. Strategy: *Request Olympia staff to review Montana Department of Fish, Wildlife and Parks interactive hunt planner and wildlife management area web site section*. Time frame: 2006.

Agency Objective: Provide sound operational management of WDFW lands, facilities and access sites

1. Maintain facilities to achieve safe, efficient and effective management of the wildlife area

A. Strategy: Maintain headquarter to provide a safe and effective workplace. Time frame: Ongoing. Throughout the year.

B. Strategy: Maintain parking areas. Time frame: Ongoing. Throughout the year.

C. Strategy: Dispose of buildings/structures which pause safety or other risks. Time frame: As funding and time allow.

D. Strategy: Plan and construct developments as needed. Construct additional equipment shelter.

E. Funding will be sought through grants, submission of new capital project requests or re-prioritization of other tasks.

2. Maintain other structures and physical improvements

A. Strategy: Maintain all roads, signs, gates, culverts, water developments, wells, feeders, guzzlers, nesting structures, parking areas, ponds and irrigation systems.

Maintain roads to prevent resource damage and provide access. Time frame: Ongoing. Throughout the year.

B. Strategy: *Consider replacing some developments (guzzlers, feeders, nest structures etc.) with low maintenance alternatives, or through self-maintaining ecosystem restoration approach*. Time frame: Ongoing. Throughout the year.

C. Strategy: Replace/install and maintain fences to control livestock trespass and deer damage to shrub and tree seedlings. Time frame: Ongoing, as needed.

D. Strategy: Remove useless fences. Time frame: Ongoing. Throughout the year.

E. Strategy: Replace or install physical improvements. Time frame: As needed and as funding allows. Funding will be sought through grants or re-prioritization of other tasks.

3. Maintain equipment

A. Strategy: Service and repair all equipment including trucks, tractor and implements, weed sprayers, trailers, etc. Replace equipment as needed. Time frame: Ongoing and as funding allows. Funding will be sought through grants or re-prioritization of other tasks.

4. Pursue funding opportunities

A. Strategy: Enroll in federal programs to generate revenue and accomplish desired habitat conditions. Evaluate renewing Conservation Reserve Program (CRP) contracts for Central Ferry and West Foster Creek fields (500 acres) in 2006. *Consider impact on private CRP contractors*.

B. Strategy: Consider sharecropping agreements with neighbors to address agricultural and operational needs. Time frame: Ongoing. Throughout the year.

C. Strategy: Apply for grants and other funding opportunities consistent with planned priorities and to supplement funding. Time frame: As time allows.

5. Assess forest conditions with regard to catastrophic fire, insect and disease risks

A. Strategy: Fire suppression in many cases has resulted in high forest tree densities. Dense forest stands may create fire safety issues and risk to the spread of detrimental forest insects and disease. Strategy: Assess the benefit of a timber-thinning project in the Central Ferry Canyon bottom in to reduce potential insect and fire danger and create forest conditions more suitable to a diversity of species. Time frame: 2007-2008, as funding allows. Funding will be sought through grants or re-prioritization of other tasks.

B. Strategy: Thin tree stands as needed.

6. Perform administrative duties

A. Strategy: Work with staff to ensure high morale and job satisfaction. Promote self-motivation and good work ethics. *Evaluate and optimize staff deployment. Maintain staff flexibility*. Time frame: Ongoing. Throughout the year.

B. Strategy: Develop monitor and implement budgets. Monitor the Wells Special Account. Time Frame: Ongoing. Throughout the year.

C. Strategy: Interview, hire, train, evaluate, equip and supervise wildlife area staff. Provide ongoing training opportunity for staff. Time frame: Ongoing. March through November.

D. Strategy: Supervise contractors, lessees, permittees, volunteers, Washington Conservation Corps employees, other WDFW personnel, public and private organizations and fire crews on the area. Time frame: Ongoing. Throughout the year.

E. Strategy: Negotiate, write and monitor leases and permits (none currently). Time frame: As needed.

F. Strategy: *Evaluate the benefit of centrally vs. individually managed wildlife areas or both, with teams of volunteers*. Time frame: Ongoing. Throughout the year.

G. Strategy: *Consider including neighbors and volunteers who might serve as stewards helping to manage and monitor individual sites*. Time frame: Ongoing. Throughout the year.

H. Strategy: Monitor and evaluate habitat management programs. Time frame: As time and funding allows. Funding will be sought through grants or re-prioritization of other tasks.

I. Strategy: Write, update and implement a wildlife area management plan, weed control plan and fire control plan. Time frame: Ongoing. Throughout the year.

J. Strategy: Convene CAG and district team to assess wildlife area specific performance measures, accomplishments, and results and to identify new strategies. Complete annual performance report. Timeframe: Annually

K. Strategy: Conduct annual wildlife and habitat surveys. Identify and prioritize information and survey needs. Time frame: Annual and as funding allows. Funding will be sought through grants or re-prioritization of other tasks.

L. Strategy: *Apply for grants and implement grant funded projects. Apply for stewardship decal program funding.*

M. Strategy: Manage an extensive equipment inventory used for habitat maintenance, enhancement, restoration and preservation. Time frame: Ongoing. Throughout the year.

N. Strategy: Plan for and purchase supplies, tools and equipment. *Whenever possible, use and support local contractors and vendors*. Time frame: Ongoing. Throughout the year.

O. Strategy: Attend meetings and meet with private individuals and agency representatives as needed. Time frame: As needed.

P. Strategy: Work with the PUD regarding budgets, cooperative projects, PUD project land management annually and Wells Project relicensing in 2006. Provide the PUD an annual report of accomplishment.

7. Protect and apply water rights for best use

Water rights can impact wildlife area operations including food plots, restoration projects, etc. Water use can also reduce instream flow, impacting fish and other animals.

A. Strategy: Identify and record all water rights and uses of water (Appendix 4). Time frame: 2006

B. Strategy: Use water rights efficiently. Time frame: Ongoing. Irrigation season.

C. Strategy: Move all unneeded water rights permanently or temporarily into the State Trust Water Rights. Time frame: As needed.

D. Strategy: Replace pumps and suction lines to increase watering efficiency and conserve on power and water. Time frame: Four pumps and suction lines will be replaced in 2006.

Other Issues or Concerns:

1. Preserve, protect and improve the watershed in which the area is located.

The quality of the watershed in which the wildlife area is located influences all aspect of the wildlife area. Degradation of the watershed will increase erosion and consequently the loss of soil that supports wildlife habitat.

A. Strategy: Cooperate with private and public landowners to maintain and improve watershed quality. Time frame: Ongoing. Throughout the year.

B. Strategy: Ensure that management of the wildlife area considers watershed plan recommendations. Time frame: Ongoing. Throughout the year.

C. Strategy: Work with the Natural Resources Conservation Service (NRCS) to ensure the continuation of the Conservation Reserve Program, the Wetland Reserve Program and other conservation programs. Time frame: Ongoing. Throughout the year.

D. Strategy: Enroll in NRCS conservation programs. Time frame: As opportunity comes up.

E. Strategy: *Coordinate and cooperate with the Foster Creek Conservation District and with the Habitat Conservation Plan (HCP).* Time frame: Ongoing. Throughout the year.

F. Strategy: See sections Agency Objective: Protect, Restore & Enhance Fish and Wildlife Populations and Their Habitats. Also see, Agency Objective: Ensure that WDFW Activities, Programs, Facilities and Lands are Consistent With Local, State and Federal Regulations that Protect and Recover Fish, Wildlife and Their Habitats. Also see, Agency Objective: Provide sustainable fish and wildlife-related recreational and commercial opportunities compatible with maintaining healthy fish and wildlife populations and habitats. Improve the economic well being of Washington by providing diverse, high quality recreational and commercial opportunities. Also see, Agency Objective: Provide sound operational management of WDFW lands, facilities and access sites.

2. Acquire and trade land to increase wildlife area management efficiency

A. Strategy: Cooperate with other agencies and private individuals to acquire and/or trade lands to consolidate the WDFW ownership. Time frame: Ongoing, as funding allows. Funding will be sought through grants or re-prioritization of other tasks.

B. Strategy: Acquire good quality habitat. Land acquisition efforts should focus on areas adjacent or close to existing wildlife area units. In the Central Ferry Canyon and West Foster Creek area, follow the criteria in the management plans for sharp-tailed and sage grouse. Time frame: Ongoing, as funding allows. Funding will be sought through grants or re-prioritization of other tasks.

C. Strategy: Pursue IAC and Salmon Recovery funding for habitat acquisition. Time frame: As funding and time allows. Funding will be sought through grants or re-prioritization of other tasks.

CHAPTER IV. PERFORMANCE MEASURES, EVALUATION AND UPDATES TO THE WELLS WILDLIFE AREA PLAN

The wildlife area plan is a working document that will evolve as habitat and species conditions change, as new regulations are enacted, and as public issues and concerns change. Plan updates will address these changes.

1. Wells Wildlife Area Performance Measures in 2006 include:

- Capture and band 150+/- California quail on adjacent un-hunted sites following the hunting season and relocate on the Central Ferry, West Foster Creek and Indian Dan Unit as needed.
- Survey hunting related public use through the hunter registration program to document use and wildlife population trends.
- Grow 75 acres of irrigated grain on Bridgeport Bar and Washburn Island (wheat, barley, corn, millet etc.) and 30 acres of dryland wheat on the Indian Dan and West Foster Creek Units.
- Establish and irrigate about 50 acres of permanent nesting cover on Washburn Island.
- Plant about 1,000 shrubs and trees. Irrigate and maintain 60 acres of woody plantings.
- Fill and maintain 24 bird feeders located throughout the area.
- Maintain 11 gallinaceous guzzlers and 6 developed springs on the Indian Dan, Central Ferry and West Foster Creek Units as needed.
- Service and maintain about 100 nest boxes and 50 goose nest structures on and in the vicinity of Wells Pool including twenty islands, the Bridgeport Bar, Okanogan River and Washburn Units.
- Maintain 3 deer exclosures surrounding West Foster Creek shrub and tree plantings. Construct one exclosure.
- Release about 3,000 bio control agents to control knapweed, purple loosestrife and Dalmatian Toadflax primarily in the West Foster and Central Ferry Canyon units.
- Mow about 25 acres of weeds on the West Foster Creek Unit and treat 85 acres of weeds with herbicides throughout the wildlife area.
- Maintain one mile of firebreaks on the West Foster Creek Unit and two miles on Bridgeport Bar.
- Maintain 13 hunter registration booths, one office building, a shop and storage facilities. Maintain vehicles and equipment.
- Construct one equipment shelter.
- Survey goose nesting on 20 islands and wetlands adjacent to Wells Pool. Coordinate with volunteer to survey kestrel and wood duck nesting.
- Conduct fall wildlife population surveys on the Indian Dan and Bridgeport Bar Units using other WDFW staff and volunteers. Extent of survey is dependent on volunteer availability.
- Cultivate about 20 acres on Bridgeport Bar to be planted to permanent cover in the spring of 2007.

2. Annual Evaluation of Performance.

Evaluate performance measures and produce an annual report. At the beginning of each calendar year, the manager will convene the CAG and district team to assess wildlife area specific performance measures and accomplishments that will be used to develop the annual plan update. This update will be an attachment to the plan.

3. Annual Plan Update.
As projects are completed and new issues arise, this plan will be updated, without needing to be re-written. With CAG and District Team input, the plan will continually reflect the strategies, goals and objectives of the current year.

APPENDIX 1. PUBLIC ISSUES

Citizens Advisory Group (CAG) and District Team (DT) Issues and Concerns
Wells, Sagebrush Flat and Chelan Wildlife Areas
June 5, 2005

The Wildlife Area Manager Marc Hallet and Dan Peterson, Wildlife Area Assistant Manager, met with the CAG on February 15, 2005 and the Wenatchee District Team on February 17. Marc Hallet met with the Okanogan District Team on March 9, 2005 (part of the Wells Wildlife Area lies in the Okanogan District). The purpose of meeting with the CAG and DT was to obtain input to help guide management actions on the wildlife areas. Drafts of the wildlife area management plans and copies of the Agency's goals and objectives were distributed for review and discussion. Below is a list of issues and concerns identified by the CAG and DT. This input will assist in developing strategies to implement management goals and objectives. Underlined statements indicate that the input was received from the DT. Issues that are not underlined originated from the CAG.

Issue A. Access/Recreation

- Regulate public access in big game wintering areas. Seasonally close road, control antler hunting, snowmobile use etc.
- Regulate camping (maximum number of days).
- Provide and/or maintain opportunities for ATV users to recreate on DFW roads.
- Improve and manage wildlife viewing opportunities in a manner that is not detrimental to the wildlife resource.
- Trails: balance recreation opportunities with wildlife concerns (winter range, raptor nest, etc.). Active involvement in placement and management by WDFW staff.
- Define recreational uses and timing.
- Need to provide access to publicly held lands, especially in Okanogan County.
- USFS trying to close all areas to ATV use unless designated open – WDFW should do the same.
- It seems that any road management and abandonment plan should really be an access management plan that incorporates the need for hiking trails that can be accommodated without adversely impacting wildlife. It is a great opportunity to increase public appreciation and understanding of wildlife and the wildlife area mission.
- Ensure that access and recreational uses of the wildlife areas are consistent with the wildlife and habitat goals and objectives.

Issue B. Wildlife Area Management

- Evaluate benefit of centrally vs. individually managed wildlife areas or both, with teams of volunteers.
- The wildlife area needs to manage for big game (deer and elk), waterfowl, and non-game such as threatened, endangered and sensitive species.
- Prepare an integrated weed management plan.
- Cooperate and coordinate with adjacent landowners, weed boards and county governments to improve and expand weed control efforts.
- Make prevention of weed establishment a priority.
- Develop a fire plan. Treat fire (wild and prescribed) as an integral part of grassland and shrub land management. Recognize that fire is difficult to exclude. A fire plan is a great idea – it

should include appropriate fuel reduction activities and not just rely on prevention because, eventually, wildfires WILL occur. Prescribed burning could be tricky in some of these areas but should be considered where appropriate.

- Include watershed planning and Multiple Species Habitat Conservation Plan (HCP) information in all management plans. Cooperate with Planning Units.
- Develop habitat and improvements on the Swakane Unit to discourage big game crossing of highway 97.
- In Douglas County, do not renew WDFW - CRP contracts to allow more private lands to remain in the program.
- Assess the need for livestock fencing and remove all un-needed fences, particularly where they are a hazard and/or barrier for humans and wildlife.
- Fire can rejuvenate decadent plants, and be quite beneficial if fire size is limited, seed sources are maintained, and/or fire intensities are low enough to maintain crown sprouting of shrubs. Bitterbrush and sagebrush respond quite differently and it is important to recognize which is the dominant type and manage accordingly
- Consider replacing some developments (guzzlers, feeders, nest structures etc.) with low maintenance alternatives, or through self-maintaining ecosystem restoration approach
- Consider prescribed fire as appropriate
- Overall – the largest issue I see with the draft plan is the somewhat agricultural approach to habitat improvement (structures such as guzzlers, bird feeders, fences, nest boxes) that are expensive to maintain and prone to being damaged by fire, and the need to recognize that fire is a part of the ecosystem – need to work with it, not always fight it.
- The White River should be primarily managed for fisheries, wetlands and riparian species, while restoring the native plant species.
- The primary management goal for the Wells Wildlife Area is to mitigate for the loss of wildlife caused by the construction of Wells Dam. Although the initial focus for the area was upland game habitat enhancement, the goal for the area has broadened to include the
- Public participation, in the form of a Citizens Advisory Group (CAG), is encouraged as a means to identify social, cultural, and economic issues important to the people of North-Central Washington.
- Improve riparian and forest conditions in the White River flood plain by reconnecting wetlands to river channels, planting native genetic stock of riparian vegetation, removal of noxious weeds (oxeye daisy, knapweed, mullein).
- Pothole blasting and pond construction may not be best for restoration ecology in the White River. The White River is becoming a showcase in wetlands restoration, and perhaps a different approach should be considered.
- When initiating or renewing leases and permits, consider the impact of creating co-dependence between the lessee/permittee and WDFW, which limits our management flexibility particularly in the long term.
- When making management decisions, evaluate and consider short term and long term impacts on:

  -Watershed functions, water quality, wildlife (particularly impact on T&E species).
  -The wildlife area budget.
  -Critical/sensitive sites, which can be disproportionately severe.
  -Plant and wildlife diversity. This includes potential introduction of new weedy species and aggravation of current weed problems.

-Habitat important to wildlife currently **and** potentially present on the area (such as in sharp-tailed grouse, bighorn sheep and sage grouse historical range).

Issue C. Habitat

- Prevent the introduction of non-native wildlife into the White River watershed when inconsistent with fish and native wildlife goals.
- Restore shrubsteppe for sage grouse and pygmy rabbits.
- Use restoration dollars to acquire key habitat, especially wetlands.
- We should manage for cliff, emergent wetlands, forested wetlands, and riparian.
- Protect and preserve sensitive wildlife sites such as active Sharp-tailed and Sage grouse lek sites, all snake dens (during spring emergence), active Bald and Golden eagle nests, state and federal listed plant species, big game wintering areas, etc. from human disturbance.
- As a priority, protect and enhance any state and federal listed species and associated habitat found on the Wildlife Area.
- Where management conflicts with a listed species preserve and protect the listed species.
- Actively manage for an increase in cottonwood gallery forest and associated habitat on Washburn Island and the Okanogan Unit.
- Manage for native habitats and the processes that sustain them.
- Broaden wildlife area management to include multiple species management.
- If big leaf maple is present, these could be important habitat for Western Gray Squirrels
- Any management distinction between Native and non-Native Species?
- What species would be used for green strips? It would be nice to restore the native bunch grasses that stay green longer in the spring and then occur in bunches that don't spread fire as easily or contiguously as annuals such as cheatgrass or even some of the commonly used rehab grasses.
- Determine presence or role of the more cryptic species such as mollusks and the presence/role of rare or unique plants. Cryptogrammic soils were greatly disrupted by grazing, and may have a role in noxious weed prevention – need to ID and protect any remaining patches, or attempt to recover in other areas.
- Ensure that habitat is not fragmented for some species in the process of creating edge habitat – that is, make sure the edge is truly ecotonal and provides more resources for wildlife and avoid fragmentation which is happening all around.
- Protect/develop large roost trees that may be used by Bald Eagles, particularly on the Columbia River side of the wildlife areas.

Issue D. Roads

- Manage roads: closures, reclamation, signing etc.
- Acquire a list of the roads that could be affected by the RMAP program on WDFW lands and maps of the same?

Issue E. Enforcement

- Completely review of WDFW codes for lands.
- Need to get regulations on the books to standardize camping limits to be the same as other public agencies.
- Law enforcement action can be taken regarding trespass livestock.

- Law enforcement needs specific regulations to enforce social behavior on WDFW property – camping length of stay, removal of property, noise etc.
- Need a better picture on the "No ATV Allowed" signs.
- ATV use policy needs to be consistent agency wide.

Issue F. Public Information, Education and Involvement

- Increase public awareness of the area with maps, kiosks, signs, more information on the web, etc.
- Educate the public regarding public access and other regulations.
- Install informational signs and provide brochures for each wildlife area stating reason for purchase, funding source, funding resources, management funding, in lieu of taxes, etc.
- All wildlife areas should have maps like the Sinlahekin map.
- Need informational boards at each end of wildlife areas stating what is allowed and not allowed, to get away from signing each individual site. Consider using "Vehicular Travel Limited to County Roads" signs when appropriate.
- Develop "GO LOOK" on the web site for non-hunting wildlife recreation
- Review Montana Fish, Wildlife and Parks interactive hunt planner and wildlife management area web site section.

Issue G. Monitor, Survey and Inventory

- Develop a centralized inventory of wildlife developments (springs, guzzlers, feeders etc.) with neighboring landowners.
- Inventory public use of the area.
- Recognize and inventory smaller ecosystem - cryptogrammic soil crusts, etc.
- Include volunteers and neighbors who might serve as stewards helping to manage and monitor particular sites.
- Identify and prioritize information gaps and the identify priority survey needs.
- Monitor and evaluate the effectiveness of management treatments for success and longevity.

Issue H. Other

- Evaluate and optimize staff deployment.
- Maintain staff flexibility. Assign staff to specific areas, facilitating communications with neighboring landowners. Assign staff to live on site. Create shared positions between WDFW with other agencies.
- Whenever possible use and support local contractors and vendors.
- IAC acquired property – need to be aware that some uses may not be compatible on property purchased for critical habitat with IAC dollars. On the other hand, micromanagement by the IAC can be counterproductive.
- Rename the Sagebrush Flat Wildlife Area West Foster Creek Unit to avoid confusion with the West Foster Creek Unit of the Wells Wildlife Area.
- When possible, plant county road sides to permanent cover
- Extend access stewardship decal program to the wildlife areas with funds generated coming back to the wildlife areas
- Protect American Indian artifacts.

APPENDIX 2. WELLS WILDLIFE AREA WEED MANAGEMENT PLAN

Weed Control Goals on WDFW Lands

The goal of weed control on Department lands is to maintain and improve habitat for wildlife, meet legal obligations, provide good stewardship and protect adjacent private lands.

Weed control activities and restoration projects that protect and enhance fish and wildlife populations and their habitats on Department lands are a high priority. When managing for specific wildlife species on our lands the weed densities that trigger control are sometimes different than on lands managed for other purposes (e.g. agricultural, etc.). For example, if a weed is present at low densities and does not diminish the overall habitat value, nor pose an immediate threat to adjacent lands, control may not be warranted. WDFW focuses land management activities on the desired plant species and communities, rather than on simply eliminating weeds.

Control for certain, listed species is mandated by state law (RCW 17.10 and 17.26) and enforced by the County Noxious Weed Board. WDFW will strive to meet its legal obligation to control for noxious weeds listed according to state law (Class A, B-Designate, and county listed weeds).

Importantly, WDFW will continue to be a good neighbor and partner regarding weed control issues on adjacent lands. Weeds do not respect property boundaries. The agency believes the best way to gain long-term control is to work cooperatively on a regional scale. As funding and mutual management objectives allow, WDFW will find solutions to collective weed control problems.

Weed Management Approach

State law (RCW 17.15) requires that WDFW use integrated pest management (IPM), defined as a coordinated decision-making and action process that uses the most appropriate pest control methods and strategy in an environmentally and economically sound manner to meet agency programmatic pest management objectives, to accomplish weed control. The elements of IPM include:

Prevention- Prevention programs are implemented to keep the management area free of species that are not yet established but which are known to be pests elsewhere in the area.

Preventing weed establishment and aggravation of existing weed problems is the most cost effective part of a weed management program and therefore a priority. This includes:

- Restoring disturbed sites.
- Minimizing soil disturbance.
- Controlling livestock use on the area.
- Controlling public use.
- Coordinating weed prevention and control efforts with federal, state and local entities to improve efficacy and minimize costs.

Livestock grazing is a dominant soil disturbance factor, which effectively prepares the grazed site for weed infestation. Livestock can also transport weed seeds to the wildlife area and weaken native and/or desirable non-native plants that could compete with weeds. It will likely initiate new or aggravate existing weed infestations. Although some grazing systems can lessen weed promotion by livestock, all grazing will include more intensively grazed sites that are ideal for weed "pioneering". The environmental, administrative and weed control costs (especially long term

costs) associated with grazing can be very high and needs to be thoughtfully considered before initiating or continuing grazing an area.

Monitoring- Monitoring is necessary to implement prevention and to document the weed species, the distribution and the relative density of weeds on the management area. Monitoring will include mapping weed infestation and recording treatment success.

Prioritizing- Prioritizing weed control is based on many factors such as monitoring data, the invasiveness of the species, management objectives for the infested area, the value of invaded habitat, the feasibility of control, the legal status of the weed, past control efforts, and available budget.

Treatment- Treatment of a weeds using biological, cultural, mechanical, and chemical control serves to eradicate pioneering infestations, reduce established weed populations below densities that impact management objectives for the site, or otherwise diminish their impacts. The method used for control considers human health, ecological impact, feasibility, and cost-effectiveness. Herbicide can be an effective tool for controlling weeds in many instances. Applicators should refer to the Pacific Northwest West (PNW) Weed Management Handbook, or other reputable resources, for product recommendations and timing. Herbicide applications are often not selective enough to not affect desirable habitat. Biological control will be the preferred control method when effective especially in remote inaccessible areas and where other methods pose a threat to the habitat.

Adaptive Management- Adaptive management evaluates the effects and efficacy of weed treatments and makes adjustments to improve the desired outcome for the management area.

The premise behind a weed management plan is that a structured, logical approach to weed management, based on the best available information, is cheaper and more effective than an ad-hoc approach where one only deals with weed problems as they arise.

Weed Species of Concern on the Wells WA

Weeds of concern on the Wells WA include those listed in Table 1. This list is based on species that have been documented on the wildlife area.

Table 1. Wells Wildlife Area Weeds Including the State and County Weed Class Listing and Acres Treated.

Weed Species	2005 State Weed Class	*2005 Okanogan County Weed Class	Wildlife Unit(s)	2005 Treated Acres
Dalmatian Toadflax	B-Designate	B-Designate	All	146 (1300 bioagents)
Houndstongue	B	R & S	Bridgeport Bar	<1
Diffuse Knapweed	B	R & S	All	10
Whitetop	C		Indian Dan, Okanogan River	0
General Weeds			All	160
Canadian Thistle	C		All	0
Russian Knapweed	B		All	10
Field Bindweed	C		Bridgeport Bar	10
Saint Johnsworth	C		Bridgeport Bar, Indian Dan	0
Leafy spurge	B		Indian Dan, Bridgeport Bar	< 1
Purple Loosestrife	B		Bridgeport Bar, Okanogan River, Washburn Island	100 (2500-3000 biocontrol agents)

B-Designate are state-listed and mandatory for control to prevent seed production/spread.
New Invader is not an official state classification, but indicates the county reserves the right to implement control.
R&S (Reduction and Suppression) Weeds are of wide distribution. Control along transportation corridors is recommended.
* Although part of the area lies in Douglas County, this county does not have a weed control board.

Management for individual weed species can be found in the following "Weed Species Control Plan" (WSCP) sections. We acquired description and management information from the Washington State Weed Board web site (http://www.nwcb.wa.gov/weed_list/weed_listhome.html) and The Nature Conservancy (TNC) Invasive Species Initiative web site (http://tncweeds.ucdavis.edu/). Additional information is available on these and other web sites.

WELLS WILDLIFE AREA WEED SPECIES CONTROL PLAN

Weeds degrade habitat and limit opportunities for restoration of native habitat. An effective weed management program is therefore essential.

GOAL

Prevent new weed infestations and control existing weed infestations through an integrated pest management program.

OBJECTIVES

- Prevent new infestations and aggravation of existing weed problems
- Treat infestations with biological agents when effective and/or when weeds locations are inaccessible or within sensitive habitat.
- Aggressively control weeds in high use areas

- Survey and map existing populations
- More accurately calculate acreage affected by weeds
- Treat all plants that can be reached with equipment before they produce seed
- Monitor all units for weed infestations

DALMATIAN TOADFLAX

Scientific Name: *Linaria dalmatica ssp. dalmatica* **Common Name:** Dalmatian toadflax
Updated: 2005

DESCRIPTION: Dalmatian toadflax is an erect, short-lived, perennial herb, 0.8 to 1.5 m tall. It is a perennial species that spreads by horizontal or creeping rootstocks and by seed. A mature plant can produce up to 500,000 seeds, which are primarily dispersed by wind. Its seeds may live up to ten years in the soil (Robocker 1974; Morishita 1991). Most seedlings emerge in the spring when soil temperature reaches 8° C at 2.5 cm. Germination in the fall is probably limited by soil water content, as well as possibly seed dormancy with the average life span of a plant being three years (Robocker 1974).

Mature Dalmatian toadflax plants are strongly competitive. Studies indicate that plots without Dalmatian toadflax may produce two and a half times as much grass as plots with toadflax (Robocker 1974). Mature plants are especially competitive with shallow-rooted perennials and winter annuals. Because of its competitive ability, Dalmatian toadflax is a concern in pasture and rangelands, as well as in natural areas, where it may out-compete more desirable, native species. Dalmatian toadflax occurs in a variety of habitats, including: roadsides, pastures, rangelands, and waste areas. It has spread most extensively west of the 100th meridian, occurring primarily on coarse-textured soils, ranging from sandy loams to coarse gravels (Alex 1962).

This weed appears to be spread by cars, deer, and birds. Individual plants and small groups of plants are found throughout much of the wildlife area and its vicinity.

Dalmatian toadflax is a state-listed class B-Designate in the management areas.

MANAGEMENT INFORMATION:
Herbicide can be an effective tool for controlling Dalmatian toadflax. Applicators should refer to the Pacific Northwest West (PNW) Weed Management Handbook, or other reputable resources, for product recommendations and timing

Calophasia lunula, a defoliating moth, is well established in Washington and reportedly provides good control (William et al. 1996) and *Mecinus janthinus,* a recently introduced stem boring weevil, shows promise. *Brachypterolus pulicarius,* although usually associated with yellow toadflax, can survive and may reduce seed production of Dalmatian toadflax.

Although not practical in most situations, intensive clean cultivation can effectively control Dalmatian toadflax. A successful approach includes at least a two year effort, with eight to ten cultivations in the first year and four to five cultivations in the second year (Morishita 1991; Butler and Burrill 1994). Cultivation should begin in early June and be repeated so that there are never more than seven to ten days with green growth visible (Butler and Burrill 1994). Since Dalmatian toadflax seedlings do not compete well for soil moisture against established winter annuals and perennials, control efforts should include attempting to establish and manage desirable species that will compete with toadflax (Morishita 1991; Butler and Burrill 1994).

CURRENT DISTRIBUTION ON THE SITE
The first infestations of Dalmatian toadflax in the vicinity of the Wells WA were noted along the State Highway at the west end of Bridgeport Bar in the late 1970's. Infestations on the WA now occur on many scattered sites primarily on Bridgeport Bar, West Foster Creek and Central Ferry Canyon.

ACRES AFFECTED BY WEED: ~200 **WEED DENSITY**: Low -Medium (Most Widely Scattered)

ACTIONS PLANNED
Continue using prevention methods as discussed above. In 2006, the Central Ferry canyon Unit will be surveyed more extensively. High use and other accessible areas will be treated with herbicide.

The biological agents, *Mecinus janthinus*, will be released in the spring or early summer in areas where the terrain is too difficult to survey, or implement control. Other biological agents will be released as they become available.

Monitoring will continue on an annual basis.

CONTROL SUMMARY AND TREND
2002- Released 3,050 *Mecinus jantinus*, Sprayed 18 acres
2003- Released 9,000 *Mecinus jantinus,* Sprayed 38 acres
2004- Released 4,500 *Mecinus jantinus,* Sprayed 17 acres
2005- Released 1,300 *Mecinus jantinus,* Treated 160 acres

Dalmatian toadflax is very prolific and unlike most weeds appears to be able to invade good condition shrubsteppe habitat. We have made little progress in controlling this weed. Biological control has had sporadic success and for the most part cannot keep up with the steady increase in weed density. Much of the infestations are hard to reach and occur where herbicide application would threaten important habitat components. Effective control of this weed will require the availability and use of more effective biological control agents.

HOUNDSTONGUE

Scientific Name: *Cynoglossum officinale* **Common Name:** Houndstongue
Updated: 2005

DESCRIPTION: Houndstongue is a biennial or short-lived perennial that grows 1-4 ft tall. Houndstongue is a very strong competitor that competes with desirable forage. Its thick, deep taproot enables it to be a strong competitor for soil resources. The seeds have the ability to attach to people, the coats of livestock and vehicles, enabling the plant to spread great distances. Houndstongue is poisonous. It contains pyrrolizidine alkaloids that stop the reproduction of liver cells. Considered non-palatable under range conditions, livestock will avoid it. However, houndstongue is eaten when dried plants are found in hay, and the toxic properties are still capable of poisoning livestock.

Seeds germinate from February to May. Seeds remaining on the soil surface can remain viable up to two years. At 1-6 inch soil depth the seeds germinate within one year. The highest germination percentage occurred in seeds buried at 1/2inch. A rosette forms the first year and is able to resist mowing and grazing and also able to withstand severe drought. Flowering occurs the following year around June and seeds are formed and dropped at the end of the summer. The seeds over-winter in about the top 1cm of soil.

MANAGEMENT INFORMATION:
Herbicide can be an effective tool for control and applicators should refer to the PNW Weed Management Handbook, or other reputable resources, for product recommendations and timing.

Cultivation of young rosettes in the autumn or early spring gives effective control. Mow flowering stems close to ground to reduce seed set. Clipping during the second year flowering can greatly reduce seed production. Reseed problem areas with fast growing grasses. Do not overgraze. Biocontrols for houndstongue include *Mogulones cruciger* (approved and released in Canada) is a root-feeding weevil. Another, *Longitarsus quadriguttatus*, has good results but may have an effect on native North American Boranginaceae (Lamming).

CURRENT DISTRIBUTION ON THE SITE
The only known infestation of houndstongue was found at the Wildlife Area headquarter. The plants were hand-pulled and destroyed. The site is being monitored closely.

ACRES AFFECTED BY WEED: > 1 acre **WEED DENSITY**: Low

ACTIONS PLANNED
Continue using prevention methods as discussed above. The known small infestation site on Bridgeport Bar will be closely monitored. It will be surveyed in early July and mature plants pulled.

Monitoring will continue on an annual basis on all units.

CONTROL SUMMARY AND TREND
2002- No known infestation

2003- No known infestation
2004- Treated < 1 acre.
2005- Treated < 1 acre.

DIFFUSE KNAPWEED

Scientific Name: *Centaurea diffusa* **Common Name :** Diffuse knapweed
Updated: 2005

DESCRIPTION: *Centaurea diffusa* is a highly competitive herb of the aster (sunflower) family (*Asteraceae*). The plants first form low rosettes and may remain in this form for one to several years. After they reach a threshold size they will bolt, flower, set seed, and then die. Thus they may behave as annuals, biennials or short-lived perennials, bolting in their first, second, third, or later summer, respectively. Plants of this type are often called semelparous perennials or short-lived monocarpic perennials. Stems are upright, 10-60 cm (4-24 in) tall from a deep taproot, highly branched, angled, with short stiff hairs on the angles (Allred and Lee 1996). There are two types of leaves. The long, deciduous basal leaves, which form the rosette, are stalked and divided into narrow, hairy segments, 3-8 cm (1-3 in) long, and 1-3 cm (0.4-1 in) wide (Zimmerman 1997, Allred and Lee 1996). The stem, or cauline, leaves, which are alternately arranged on the stems, are smaller, less divided, stalkless, and become bract-like near the flower clusters (Zimmerman 1997, Allred and Lee 1996). Flower heads are broadly urn-shaped, 1.5-2.0 cm (0.6-0.8 in) tall, solitary or in clusters of 2-3 at the ends of the branches (Allred and Lee 1996, Watson and Renney 1974). The heads contain two types of flowers, ray flowers around the edges surrounding tubular disk flowers. The petals are white, rose-purple, to lavender (Allred and Lee 1996, Watson and Renney 1974). Mature seeds are formed by mid-August (Watson and Renney 1974). A single diffuse knapweed plant can produce up to 18,000 seeds (Harris and Cranston 1979) and a stand of diffuse knapweed can produce up to 40,000 seeds per square meter (Watson and Renney 1974). In one study, open-pollinated, purple-flowered plants set significantly more seed than white-flowered plants (Harrod and Taylor 1995). Schirman (1981) determined that diffuse knapweed seed production was 1,000 fold that necessary to maintain observed levels of infestation. Laboratory germination tests showed up to and sometimes greater than 95% seed viability (Zimmerman 1997, Schirman 1981). These two observations indicate that an extreme reduction of seed production would be needed to control diffuse knapweed.

Centaurea diffusa is a native of Asia Minor, the Balkans, and the southern portion of the former Soviet Union, especially the Ukraine and Crimea (Zimmerman 1997). Diffuse knapweed is also common in Romania, the former Yugoslavia, northern Italy, Turkey, Greece, Bulgaria, Syria, and the eastern shore of the Mediterranean (Zimmerman 1997). Diffuse knapweed is found on plains, rangelands, and forested benchlands, particularly on rugged terrain that is not well suited for cultivation. In the United States, *Centaurea diffusa* is generally found on light, dry, porous soils (6). Diffuse knapweed has a northern limit of 53°N Latitude (Watson and Renney 1974), and has been observed at elevations up to 7,000 feet (Zimmerman 1997). Diffuse knapweed can thrive in semi-arid and arid conditions, which allows it to be a serious problem in the western United States and the arid southwestern interior of Canada, especially British Columbia (Zimmerman 1997). The density of a diffuse knapweed stand is often correlated with the level of soil disturbance. Additionally, diffuse knapweed prefers open habitats to shaded areas (Watson and Renney 1974). *Centaurea diffusa* is not common on cultivated lands or irrigated pasture because it cannot tolerate cultivation or excessive moisture (Watson and Renney 1974).

MANAGEMENT INFORMATION:
An effective management program needs to first control existing infestations, and then develop a land management plan to deter re-infestation. Since diffuse knapweed reproduces entirely by seed, the key to controlling existing infestations is to eliminate new seed production and deplete the existing seed bank. Since diffuse knapweed tends to grow in dense patches, it is relatively easy to locate and conduct spot treatments. If adequate labor is available, and the infested area is relatively small, hand pulling before seed set may be an effective method of control. Tordon (picloram) is the most widely recommended herbicide for treatment of diffuse knapweed (Harris and Cranston 1979, Watson and Renney 1974). 2,4-D, dicamba, and glyphosate are also considered effective (Muller-Scharer and Shroeder 1993, Watson and Renney 1974). Effective, long-term control will be extremely difficult without development of effective biocontrols for diffuse knapweed (Harris and Cranston 1979).

Once the existing infestation has been controlled, steps should be taken to deter any new infestations of diffuse knapweed. Walk through hand pulling or spot herbicide treatment programs should be conducted three times annually for several years to eliminate any seedlings that germinate from seeds that break out of dormancy. In the fall, the number of rosettes can indicate the quantity of diffuse knapweed plants that will bolt the following spring and help determine what type of management effort will be required. A successful management program should set a goal of < 5% knapweed cover. This is the assumed density of the weed in its native range (Muller-Scharer and Shroeder 1993). Lasting control will require a combination of proper land management, biological control, physical control, chemical control, and suppression by desirable vegetation. This “cumulative stress” method will keep the plant constantly under stress, reducing its ability to flourish and spread. Also, a cumulative stress approach provides a level of redundancy in case one type of control treatment is missed or ineffective. Additionally, since diffuse knapweed has the ability to travel and spread seeds over relatively long distances as a tumble weed, an effort should be made to analyze prevailing winds and infestations on neighboring lands to identify any populations that may pose a threat. Finally, public awareness should be included in any management program. Diffuse knapweed does not respect boundaries and maintaining a high level of public awareness is important for successful control (Muller-Scharer and Shroeder 1993). Several herbicides are relatively effective at controlling diffuse knapweed. Tordon (picloram) is the most widely recommended (Harris and Cranston 1979, Watson and Renney 1974). Other effective herbicides include dicamba, 2,4-D, and glyphosate (Beck 1997, Youtie 1997, Watson and Renney 1974). To save money and reduce grass injury resulting from higher use rates of a single herbicide, several of these herbicides can be combined (Beck 1997). Tank-mixes of picloram and dicamba (0.25 to 0.5 lb./acre + 0.125 to 0.25 lb./acre), picloram plus 2,4-D (0.188 lb./acre + 1.0 lb./acre), and dicamba plus 2,4-D (0.5 lb./acre + 1.0 lb./acre) all control diffuse knapweed (Beck 1997). A backpack sprayer or a wick is highly recommended in small areas to minimize damage to non-target plants. Herbicides should be applied before the mature plants set seed to maximize effectiveness.

Currently, there is no single biological control agent that effectively controls diffuse knapweed populations. The biological control of weeds is based on the premise that insect feeding kills and/or stresses plants, or reduces seed production, and eventually causes a reduction in weed density (Berube and Myers 1982). Biological controls, which lower the competitive ability of weeds, could also enhance the effectiveness of other control methods. Biological agents rarely completely eliminate the target pest from an area. Complete elimination of the pest would be self-

defeating to long-term control as it would lead to the starvation of the agent and leave the area wide open to re-invasion. WDFW has had some success releasing *Larinus minutus*. *Larinus minutus* a seed eating weevil native to Greece, and now established Montana, Oregon, and Washington. Adult weevils are 4 to 5 mm (0.16 to 0.2 in) long, black, and have a large snout. They deposit eggs in the unopened seed-heads between the pappus hairs from June to September. The larvae feed on pappus hairs and move downward to the seeds. Each larva constructs a cocoon and pupates within it. Adults are active in the field from May until August and will feed on leaves and flowers prior to laying eggs. Adults generally live up to fourteen weeks.

CURRENT DISTRIBUTION ON THE SITE: Diffuse knapweed is present to various degrees in all units.

ACRES AFFECTED BY WEED: ~ 200 **WEED DENSITY**: Low, scattered

ACTIONS PLANNED: Continue using prevention methods as discussed above. Apply chemicals to roadsides and other high use areas. Release effective bio control agents such as Larinus minutus.

CONTROL SUMMARY AND TREND
2002- Sprayed 22 acres
2003- 3.5 acres, 9 miles of road
2004- 4 acres
2005-

Diffuse knapweed has increased in the area from a few acres in the early 1970's to about 300 acres through the 1990's. It was very much associated with disturbance and farming in particular. The annual herbicide treatments and the releases of the biocontrol agent Larinus minutus drastically reduced the density and distribution of this weed on the wildlife area. It is now considered contained.

WHITE TOP

Scientific name: *Cardaria draba* **Common Name:** White top
Updated: 2005

DESCRIPTION: *C. draba* is a hardy perennial with stout, erect or procumbent stems that can grow 2-5 dm tall. The plant is leafy below and branching above with grayish stems (Jepson, 1953). Plants are glabrous or nearly so at the top and densely hairy below (Mulligan & Findlay, 1974). In general, they have a gray-green, soft hairy appearance (hence the name 'hoary'). Seedlings are distinguished by their hypocotyl, which is dull brown-green, but green above. Seed leaves are 2.5x7-9mm, pale, dull gray-green, with a sharp, pepper taste. While young, the leaves are more or less opposite below but alternate above and obscure the stem. Leaves are rolled in bud (Kummer, 1951).

Mature *C. draba* leaves are blue-green, 1.5-7.5 (or even 10) cm long (Fernald, 1950), and are broadly ovate to obovate (Fischer *et al*., 1978). The lower leaves are long, slender, and taper to a short petiole (Robbins, 1952; Mulligan & Frankton, 1962). The margins are irregular, and may be either smooth or toothed. The leaf surface is weakly to densely hairy (Mulligan and Findlay, 1974). These leaves wither before the flowers open (Scurfield, 1962) and are shed as the seeds mature (Selleck, 1965). The upper leaves are shorter and broader (Fischer *et al*., 1978). They lack developed petioles, and clasp the stem. The leaf bases may have two sagittate lobes (Fischer *et al*., 1978; Mulligan & Frankton, 1962).

C. draba blooms in early spring and looks like conspicuous patches of snowy white (Robbins *et al*., 1952; Fischer *et al*., 1978). The showy inflorescences consist of many white flowers in a flattened corymb of racemes. The flower pedicels (stalks) diverge slightly from the stem. Each flower is 2mm wide, and has four petals with long narrow bases, like a spoon (Robbins *et al*., 1952; Mulligan & Findlay, 1974). The sepals are green and 1.5-2.5mm long. Like other mustard species, there are six stamens and one pistil. *Cardaria* species are native to southwest Asia, although *C. draba*'s range extends into southeast Europe (Mulligan & Frankton, 1962).

MANAGEMENT INFORMATION:
Because they can regenerate from their extensive root systems, the hoary cresses readily re-establish after eradication measures. Therefore, control must be persistent, and requires at least 2-3 years of follow-up work (Blackman, *et al*. 1939; Garrad, 1923; Willis, 1950)**.**

Successful control is most likely achieved with a combination of approaches. Selleck (1965) used a combination of mowing and competitive cropping to control *C. chalepensis* and *C. pubescens*. O'Brien and O'Brien (1994)--managers for The Nature Conservancy--controlled *C. draba* by ceasing its irrigation, removing outlying plants, and increasing the general health of the grasslands they were managing. Other managers for The Nature Conservancy have decreased grazing (Carr, 1995), or developed restoration plans (Hill, 1995).

Prevent new infestations originating from seed sources. Seed may travel in contaminated hay, on farming equipment, and in fresh manure (Carr, 1995). Cardaria seeds have been eliminated from manure after one month of decomposition under very moist, warm conditions in late summer (Anonymous, 1970).

Cutting is somewhat effective in controlling *C. draba*. A combination of weed-whacking and applying 2,4-D from a backpack sprayer has provided 50% control at a preserve maintained by The Nature Conservancy (O'Brien & O'Brien, 1994). Meanwhile, a single late-April treatment of cutting plants back to the ground did nothing to control plants in England (Willis, 1950). Cutting in this way, combined with an herbicide application, was no more effective than using herbicides alone. If cutting is to be used, it clearly should be timed properly. Cutting before plants are flowering does little to control plants, while waiting for the plants to be in full flower will result in smaller plants and less seed production (McInnis *et al*., 1990). However, McInnis *et al.* 1990 recommend that cutting plants be combined with grazing as a primary or long-term solution for control of *C. draba*.

CURRENT DISTRIBUTION ON THE SITE: Indian Dan Canyon, Bridgeport Bar (new infestation) and the Okanogan River Unit

ACRES AFFECTED BY WEED: ~35 **WEED DENSITY**: Dense in isolated patches

ACTIONS PLANNED: Continue using prevention methods as discussed above. Search for herbicides effective on white top and not harmful to valuable habitat. Monitor developments in biocontrol.

CONTROL SUMMARY AND TREND
2002- Sprayed 9 acres
2003- Sprayed 2 acres
2004- Sprayed 3 acres
2005- None

White top is difficult to control primarily because it occurs in wet areas in and around valuable habitat. Furthermore, spring is the most effective time for effective herbicide treatment, when the soil moisture level of white top sites is especially high. White top is increasing on the wildlife area.

CANADIAN THISTLE

Scientific Name: *Cirsium arvense* **Common Name:** Canada thistle
Updated: 2005

DESCRIPTION: *Cirsium arvense* is an erect perennial rhizomatous thistle, usually 0.5 - 1.0 m tall, distinguished from all other thistles by 1) creeping horizontal lateral roots; 2) dense clonal growth; and 3) small dioecious (male and female flowers on separate plants) flowerheads. Four varieties are recognized: var. *vestitum* Wimm. & Grab. (leaves, gray-tomentose below); var. *integrifolium* Wimm. & Grab. (leaves, glabrous below, thin, flat, and entire or shallowly pinnatifid); var. *arvense* (leaves glabrous below, thin, flat, and shallowly to deeply pinnatifid); var. *horridum* Wimm. and Grab. (leaves, glabrous below, thick and wavy, with many marginal spines) (Moore 1975). The most common variety of the species in North America is *horridum*. All varieties are interfertile, and one plant of var. *integrifolium* produced seedlings of all four varieties (Detmers 1927). Within each variety there are numerous genotypes, which vary in appearance and in response to management activities. Additionally, *Cirsium arvense* changes morphology in response to environmental conditions (Nadeau and Vanden Born 1989).

Phenology of *Cirsium arvense* varies with ecotype, but follows a general pattern. In Washington State, overwintering Canada thistle develops new underground roots and shoots in January and begins to elongate in February (Rogers 1928). Shoots emerge March - May when mean weekly temperatures reach 5^{o} C. Rosette formation follows, with a period of active vertical growth (about 3 cm/day) in mid-to-late June. Flowering is from June to August in the U.S., and June to September in Canada, when days are 14 to 18 hours long (Hodgson 1968, Van Bruggan 1976, Moore 1975): *Cirsium arvense* is a long-day plant (Linck and Kommedal 1958, Hunter and Smith 1972). Natural areas invaded by *Cirsium arvense* include prairies and other grasslands in the midwest and Great Plains and riparian areas in the intermountain west. *Cirsium arvense* threatens natural communities by directly competing with and displacing native vegetation, decreasing species diversity, and changing the structure and composition of some habitats. Canada thistle invades natural communities primarily through vegetative expansion, and secondarily through seedling establishment. *Cirsium arvense* spreads primarily by vegetative growth of its roots. The root system can be extensive, growing horizontally as much as 6 m in one season (Rogers 1928). Most patches spread at the rate of 1-2 m/year (Amor and Harris 1975). Most *Cirsium arvense* roots can be found directly below the above-ground shoots, with little extension beyond the border of a patch (Donald 1994). Apparently, the horizontal roots give rise to shoots frequently as they expand the range of a patch. Horizontal roots grow within 15-30 cm of the soil surface, and typically grow in a straight line for 60-90 cm, then bend down and grow vertically. Another horizontal root system is usually initiated at the downward bend (Rogers 1928). Vertical roots can grow as deep as 6.8 m (Rogers 1928) but most roots are in the upper 60 cm of soil (Haderlie et al. 1987). *Cirsium arvense* roots commonly reach a depth of 1.5 m in one-year old plants, and 2 m in 2-10 year old plants (Nadeau 1988). *Cirsium arvense* spreads vegetatively through horizontal growth of the root system, which can extend 4-5 m radially in one season (Bakker 1960). Individual clones can reach 35 m in diameter (Donald 1994).

Cirsium arvense readily propagates from stem and root fragments and thus plowing or other soil disturbance can increase thistle densities (Nadeau and Vanden Born 1989). Small root fragments (2 cm) can survive and produce clones up to 2.8 m across within one year (Rogers 1928). Hayden (1934) reported plants developing from root fragments as small as 0.5 cm, and 95% establishment from 1 cm

long root fragments. Root fragments are able to produce new shoots, independent of the presence of root buds (Nadeau 1988). Rogers (1928) stated that a six week old root fragment can still regenerate a plant. Partially buried stem fragments have much higher survival than fully buried fragments, as the cut stems remain photosynthetically active (Magnusson *et al*. 1987). Regrowth from stem fragments is highest in mid-June (>70%) and lower thereafter (0-55%) (Magnusson *et al*. 1987). *Cirsium arvense* is native to southeastern Europe and the eastern Mediterranean (Moore 1975) and possibly to northern Europe, western Asia and northern Africa (Detmers 1927, Amor and Harris 1974). It now has a near global distribution between 37 and 58-59 degrees N in the northern hemisphere (Moore 1975), and at latitudes greater than 37 degrees S in the southern hemisphere exclusive of Antarctica (Amor and Harris 1974). *Cirsium arvense* occurs throughout Europe, northern Africa, western and central Asia, northern India, Japan, China, and northern North America, South Africa, New Zealand, Tasmania, and southeastern Australia (Dewey 1901, Rogers 1928, Hayden 1934, Amor and Harris 1974).

MANAGEMENT INFORMATION:

Where possible it is best to kill all *Cirsium arvense* plants within a site. Where resources are limited two strategies are recommended: 1) Target *Cirsium arvense* clones based on location, controlling plants in high quality areas first, then in low quality areas. Treat entire clones to prevent resprouting from undamaged roots: 2) Target female clones to reduce seed production and additional spread of *Cirsium arvense*. However, some apparently "male" clones are self-fertile. Control techniques for natural areas are constrained by the need to minimize damage to native species. The best option in prairies and other grasslands is to first enhance growth of native herbaceous species by spring burning, and then cut or spot treat Canada thistle with glyphosate when it is in late bud or early bloom (usually June). It is necessary to prevent shoot growth for at least two years to deplete roots and kill Canada thistle. *Cirsium arvense* management programs should be designed to kill established clones since the species spreads primarily by vegetative expansion of the root system. Prevention of seed production is a secondary consideration since spread by seeds is relatively rare. On the other hand, seedlings are the most susceptible growth stage (Bakker 1960). In areas that are susceptible to thistle invasion but which have not yet been invaded, management programs should be implemented to prevent the species from becoming established. It is important to understand the biology of *Cirsium arvense* as control is greatly influenced by clonal structure (Donald 1994), growth stage (Tworkoski 1992), season of treatment, weather conditions, ecotype (Hodgson 1964), soil type, and control method(s) used. A single control method is rarely effective and it is often necessary to use two or more methods at any given site (Lee 1952, Donald 1992, Diamond 1993). In addition, treatments or combinations that are effective at one site may be ineffective at others (Frank and Tworkoski 1994).

Canada thistle's deep, well-developed root systems make it resilient to most control methods including herbicides. However, *Cirsium arvense* undergoes several growth stages during the growing season and during certain stages root carbohydrates are depleted. Root carbohydrate depletion is related to growth stage and is greatest when flowering occurs, but replenishment is related only to environmental conditions, and generally occurs in late summer and fall. Younger growth stages (spring) are likely more susceptible to herbicide, but the root system is larger and more difficult to kill in spring before the flower stalk emerges; older growth stages (fall) are somewhat less susceptible, but the root system is depleted and smaller, and assimilates are naturally moving from the leaf tissues to the root system (Tworkoski 1992). More assimilate (and hence herbicide) moves into the roots under short days and low temperatures (fall) than long days and warm temperatures (summer; McAllister 1982).

Herbicide effect is enhanced when 1) *Cirsium arvense* roots are weakened during the growing season by herbicide treatment, crop competition, or frequent mowing or tilling; and 2) new shoots are stimulated to grow. Suitable herbicides (e.g. glyphosate) should be applied to new growth when leaves are green (September or October). Avoid applying herbicide to old leaves (thick cuticle limits absorption) or to drought-stressed leaves. Hunter (1996) found that control is improved if thistles are cut in late July and the resprouts treated with glyphosate about 4 weeks later in late August (the 'August rosette stage'). Second best treatment time is at flower-bud stage, when root reserves are lowest, particularly under droughty conditions (Haderlie *et al.* 1987). However, during the growing season, herbicide application can damage native species.

Mowing temporarily reduces above-ground biomass, but does not kill *Cirsium arvense* unless repeated at 7-28 day intervals for up to 4 years. This intensity of mowing is not recommended in natural areas, where it would likely damage native vegetation. Mowing just twice a year, in mid-June and September may reduce or contain Canada thistle. When mowing, cut high enough to leave > 9 leaves/stem, or >20 cm of bare stem tissue, as mature Canada thistle leaves and stems independently inhibit development of shoots from rootbuds. When the primary stem is removed, rootbuds are stimulated to produce new shoots that might otherwise be suppressed, especially under low humidity.

Early studies recommended mowing at frequent intervals to starve Canada thistle's root systems and remove *it* from farm fields and pastures (Cox 1913, Johnson 1912, Hansen 1918, Detmers 1929). Mowing monthly for a four-year period eliminated practically all thistles (Welton et al. 1929) and mowing at 21-day intervals weakened roots and prevented seed production (Seely 1952). Hodgson (1968) found that mowing alfalfa fields twice annually, at Canada thistle's early-bud to pre-flowering stage (early to mid-June in Montana) and early fall (September) reduced Canada thistle to 1% of its initial value in four years. Mowing two to three times a year can prevent seed set (Hansen 1913, Rogers 1928) but mowing once a year is ineffective (Donald 1990). In order to prevent production of viable seeds, stems must be mown before the flowers open when they have been open for only a few days. Stems with flowers that have been open 8-10 days can develop viable seeds (Derscheid and Schultz 1960).

CURRENT DISTRIBUTION ON THE SITE
All units in moister soil sites. It occurs primarily on the West Foster Creek and Indian Dan Units.

ACRES AFFECTED BY WEED: ~75 **WEED DENSITY**: High but localized

ACTIONS PLANNED
Continue using prevention methods as discussed above. Use mowing and spraying and monitor developments in biological control.

CONTROL SUMMARY AND TREND
2002- Unknown
2003- Mowed 25 acres of Canada thistle/quackgrass
2004- Mowed 10 acres of Canada thistle/quackgrass, Released 800 *Larinus planus*
2005- Mowed 20 acres of Canada thistle/quackgrass

Canada thistle occurs in wetter areas such as meadows and riparian habitat. Annual mowing appeared to have helped slowed the spread of this weed and decreased the density of the stand.

RUSSIAN KNAPWEED

Scientific Name: *Acroptilon repens* **Common Name**: Russian knapweed
Updated: 2005

DESCRIPTION: *Acroptilon repens* is a perennial herbaceous plant of the aster (sunflower) family (Asteraceae). It is characterized by its extensive root system, low seed production, and persistence. Russian knapweed spreads through creeping horizontal roots and seed. The stems of *Acroptilon repens* are erect, thin, stiff, corymbosely branched, 45-90 cm (18 to 36 in) tall, and when young are covered with soft, short, gray hair. Lower stem leaves are narrowly oblong to linear-lanceolate, and deeply lobed. The upper leaves are oblong, toothed, and become progressively smaller. Rosette leaves are oblanceolate, irregularly pinnately lobed or almost entire, 5-10 cm long, and 1-2.5 cm broad. The flower heads of Russian knapweed are urn-shaped, solitary, 15-17 mm high, and composed of disk flowers only (Zimmerman 1996). Involucres are 12-14 mm high, 5-7 mm broad, ovoid, entire, and greenish at the base with a papery, finely hairy tip. Flowers are numerous, all tubular. The petals are 12.5-13 mm, pink or purple, turning straw colored at maturity. Anthers are 4.5-5.5 mm long, tails absent. The stigma is 3.5 mm long. The pollen diameter is 48-51 μm, spherical, 3-pored, thin-walled, about 2 μm thick and finely granular.

Achenes (seeds) are 2-3 mm long, oval and compressed, 2 mm broad and 1 mm thick (Watson 1980). Achenes are grayish or ivory, with long white bristles (pappus); 6-11 mm long at the tip when young, but these fall from the seed as it matures (Allred and Lee 1996). Achenes are slightly ridged longitudinally with a sub-basal scar immediately lateral to the tip of the base of the seed (Watson 1980).

Acroptilon repens has a well-developed root system, which functions as the major means of propagation and spreading. The roots of *Acroptilon repens* can extend more than 7 meters below the soil surface with 2-2.5 meters of growth occurring the first year and 5-7 meters in the second year (Zimmerman 1996). The roots are easily recognizable by their black or dark brown color and presence of small alternately arranged, scale leaves, which support buds in their axils (Zimmerman 1996). These buds develop into adventitious shoots, enabling the plant to spread rapidly, and form dense colonies. The plant extends radially in all directions and can cover an area of 12 m^2 within two years (Watson 1980).

MANAGEMENT INFORMATION:
Lasting control requires an integration of mechanical control, chemical control, biological control, proper land management, and vegetative suppression. Effective management programs must first control existing infestations, and then promote repopulation by native plants. Continued monitoring and follow-up treatments should be conducted annually to eliminate any re-infestation of knapweed.

The keys to controlling Russian knapweed are to 1) stress the weed and cause it to expend nutrient reserves in its root system, 2) eliminate new seed production, and 3) control its vegetative spread. If sufficient human resources are available, mechanical control is good place to start. Pulling Russian knapweed plants two to three times annually contained, but did not eliminate, an infestation in Washington (Youtie 1998). Cutting, mowing or discing several times annually will also control the existing topgrowth. Often, the plants that do re-emerge are smaller in size and

lower in vigor. This is a good indication that the plants are under stress and that their nutrient reserves are declining.

If an infestation is too large to be treated mechanically, herbicides can be applied for effective control. Tordon™ (picloram), Transline™ (clopyralid), Curtail ™ (clopyralid + 2,4-D), and Roundup® (glyphosate) are herbicides that have been shown to be effective (Beck 1996, Duncan 1994). Timing the application of herbicides can be critical and is dependent upon the particular herbicide and surrounding environmental conditions.

Biological control agents can place additional stress on Russian knapweed plants. Two biological agents for Russian knapweed have been released in the United States; *Subanguina picridis*, a gall forming nematode, and *Aceria acroptiloni*, a seed gall mite.

Once the initial infestation has been controlled, native species should be replanted to act as a vegetative suppressant. Suppresser species must remove a significant amount of moisture from the soil during the seedling stage, when knapweeds are most vulnerable. Early emergence, rapid dense growth, and maintenance of high vigor until frost are attributes required by plant species to suppress Russian knapweed.

CURRENT DISTRIBUTION ON THE SITE: Moister soil sites in all units.

ACRES AFFECTED BY WEED: ~ 65 **WEED DENSITY**: High but localized.

ACTIONS PLANNED: Continue using prevention methods as discussed above. Apply chemicals to Russian knapweed sites while protecting critical habitat. Contain infestations located in riparian or wetland habitat susceptible to herbicide damage. Explore biological control.

CONTROL SUMMARY AND TREND
2002- Sprayed 2 acres
2003- None
2004- None
2005- Sprayed 10 acres

Russian knapweed occurs in moister soil sites and often co-exists with valuable riparian species, limiting control options. Herbicide use has been limited to more upland sites in areas where non-target valuable habitat is lacking. No known effective bio control agents are available for this weed.

We treated a large patch of Russian knapweed on the Indian Dan Unit (about 40 acres) in the late 1970's for eight years. Herbicide applications (24-D, Tordon and Banvel) followed by restoration to perennial grasses. This controlled most of the knapweed and allowed meadow species to reinvade the site. Only few sparse patches of Russian thistle remain.

FIELD BINDWEED

Scientific Name: *Convolvulus* **Common Name:** Field bindweed, morning glory
Updated: 2005

DESCRIPTION: Field bindweed is a persistent, perennial vine of the morning-glory family (Convolvulaceae) which spreads by rhizome and seed (Wiese & Phillips, 1976). It is a weak-stemmed, prostrate plant that can twine and may form dense tangled mats (Gleason & Cronquist, 1963). Stems can grow to 1.5 m or longer, and its underground rhizomes may range from 5cm to 2.6m long. The extensive roots can measure 6.6m long and penetrate deeply into the soil (Wiese & Phillips, 1976). Field bindweed roots that store carbohydrates and proteins. They help field bindweed spread vegetatively and allow it to resprout repeatedly following removal of aboveground growth.

The number of seed per plant varies from 25 to 300 (Brown & Porter, Weaver & Riley, 1982). Estimates of the number of seeds in a pure stand of field bindweed range from 50,000 to 20 million per hectare (Weaver & Riley, 1982).

Field bindweed may be mildly toxic to some grazing animals. However, grazing has been used in the past as an attempt to control the weed (see below). The amount of field bindweed that can be safely eaten by sheep, cattle, and goats is not known. It is reported to cause distress in hogs that eat it (Callihan *et al.,* 1990).

MANAGEMENT INFORMATION
Field bindweed must be managed for several years to bring it under control. Field bindweed control entails chemical applications, discing or hand-pulling on a regular basis (perhaps only once per year), plus yearly monitoring. The herbicide 2,4-D is generally the most effective against field bindweed, but glyphosate can provide some control. Alcock *et al.* (1974) suggest the following as general goals in the control of field bindweed: 1. Reduce seed in soil, 2. Prevent seedling growth, 3. Deplete food reserves in the root system, 4. Prevent spread of the weed. With diligence the roots can be removed leaving only the seedlings, however, even with intensive management field bindweed will persist as seed for several years. Three to five growing seasons are required in agricultural settings to eliminate all seedlings (Callihan *et al.,* 1990).

A long-term perspective is important for a noxious perennial weed where total eradication is not a realistic short-term goal. When the aboveground biomass of field bindweed is destroyed, the massive root system forms a new shoot and reserves are thus depleted. If the aboveground portion of the weed is continually destroyed, the root eventually starves and dies. However, if the aboveground portion is allowed to regenerate and feed the root system, the plant can continue to flourish. The key to implementing a successful control program is to continue treatment even after it appears the infestations are significantly reduced.

Tilling may be useful for ridding infestations at sites previously used for agriculture, or which are otherwise very disturbed. For small areas this may be done using hand-held tools, but for large areas machinery is required. Mowing is unsuccessful because plants can be missed and it encourages ground-hugging growth (Callihan *et al.,* 1990). Repeated cultivation is required for field bindweed control because plants can regenerate from roots as deep as 1.5m (Bakke &

Gaessler, 1945). According to Bakke *et al.* (1939), concentrations of food reserves in field bindweed roots were substantially higher at soil depths of 1.8-2.4m.

In the last decade, intensive use of tillage has been discouraged because it erodes soil and in some cases encourages weed proliferation (Cousen & Mortimer, 1995). It has long been known that field bindweed may proliferate if broken into small parts (Cox, 1915), and Frazier (1943b) attributes resprouting to undamaged plant parts left underground. Discing may aid field bindweed control when tilling is infrequent (Cousen & Mortimer, 1995). Timmons (1949) found that the number of bindweed seedlings increased with the number of tillage operations in a cropping system. It is not clear, however, if these were actually seedlings or sprouts from severed roots.

Burning alone is not an effective control method (Callihan *et al*., 1990). It may be useful in combination with other methods, however.

It may be difficult to find native species that can outcompete field bindweed. The outcome of competition between species can be complicated and unpredictable, but it appears the competitive balance between field bindweed and other species may depend mostly on soil water status (Seely *et al.*, 1944; Wiese & Rea, 1955; Bakke, 1939). Swarz (pers. comm.) found that field bindweed is more competitive where there are leaks in the irrigation system. Callihan *et al*. (1990) suggest that competitive crops may need to be fortified with an early season nitrogen application, and reseeded/planted where needed. Furthermore, early and mid-spring grazing should be avoided Beidleman and Knight (1995) (Phantom Canyon Preserve) were unable to establish native species to compete with field bindweed, while Chris O'Brien (see "TNC Case Study" above) at Thousand Springs Preserve successfully established perennial grasses.

Some TNC preserve managers report success controlling field bindweed with herbicides. Youtie (1994) used glyphosate applied from backpack sprayers to control field bindweed, and while her infestations persist, they are not spreading. Meanwhile, O'Brien and O'Brien (1994) found that a very late fall application of Roundup and 2,4-D from a commercial spray rig did little to control field bindweed.

Timing is important when applying herbicides, whether you wish to kill the aboveground growth or translocate herbicides to the root system. The time of year, developmental stage of the plants, and rainfall/soil moisture conditions are all-important factors to consider (Westra & Barton, 1992).

Herbicides should be applied when they will be most effectively absorbed and translocated to the roots, but before the plants produce seed and new buds. Most researchers suggest that herbicides be applied to field bindweed when the plant is most vigorous.

Many parasitic organisms have been under investigation for control of field bindweed and one has been approved, but none have yet proven useful. Several insect and mite species in North America and Eurasia attack field bindweed but are not effective control agents. The prospective biocontrol agents themselves are heavily parasitized, do not feed exclusively one species, or simply do not cause sufficient damage to field bindweed (Callihan *et al.*, 1990). Many other species have been collected from field bindweed in Canada and the U.S. and a list of these may be found in Weaver and Riley (1982). Species that may be useful in the future are listed below.

CURRENT DISTRIBUTION ON THE SITE; Primarily in the Bridgeport Bar agricultural fields.

ACRES AFFECTED BY WEED: ~10 acres **WEED DENSITY**: High but localized

ACTIONS PLANNED: Continue using prevention methods as discussed above and avoid using cultural practices, which spread this weed. Apply herbicide to patches where possible.

CONTROL SUMMARY AND TREND
2002- No data, included with "general weeds"
2003- No data, included with "general weeds"
2004- No data, included with "general weeds"
2005- 10 acres

Field bindweed infestations are limited almost entirely to old and active agricultural fields located on Bridgeport Bar. Herbicide treatment has reduced the total infestation and it can be considered contained.

SAINT JOHNSWORT

Scientific Name: *Cardaria chalapensis* **Common Name:** Saint Johnswort
Updated: 2005

DESCRIPTION: Saint Johnswort is an erect, opposite-leaved perennial herb, ranging from two to four feet tall arising from a taproot. The plant can have single or multiple stems. The reddish stems are smooth, somewhat two-edged, woody at the base, and branching out toward the top of the plant. The narrow, lance shaped leaves are about one inch long, stalkless with pointed tips. Each leaf is spotted with tiny translucent dots. Each flower has five yellow petals and many yellow stamens. The black dots often visible along the petal margins are glands containing hypericin. This red pigment is also visible in glands on leaf margins giving the leaf a perforated look. The inflorescence is a flat topped cluster of many flowers found at branch ends. The extended flowering period is from May to late September. St. Johnswort spreads both by underground and above-ground creeping stems, and by seed.

Hypericum perforatum negatively impacts rangelands and pastures when it out-competes and replaces native and forage species used by livestock and wildlife. This species also has the ability to be toxic to livestock. While livestock will ignore St. Johnswort as long as forage is available, it is toxic if ingested, particularly to light skinned animals. The blistering can lead to secondary infections, which can lead to death. It retains these toxins in dried plants found in hay. The impacts caused to the California dairy industry both in losses to livestock and rangelands were only rectified with the introduction of several beetles used effectively and successfully as biological control agents.

St. Johnswort is well adapted to a variety of temperate climates and soil types. It prefers poor soils and full sun, and can be found primarily in meadows, dry pastures, rangelands, roadsides, and empty fields. However, it has the capability to invade healthy rangelands. It is not considered a serious threat in cultivated fields.

Hypericum perforatum is a somewhat long-lived perennial herb. Germination occurs during summer, and seedlings are not considered competitive. It may take two to several years to reach maturity. St. Johnswort flowers from May to September. Basal foliage that overwinters will start growing in early spring, followed by vertical stem growth. Each plant may include several well-spaced crowns, each with lateral roots. Lateral root buds are capable of producing new crowns. Plants connected by these lateral roots separate when these roots rot. (Piper 1997).

St. Johnswort spreads both by underground and aboveground creeping stems, and by seed. The amount of seed produced annually ranges from 15,000 to 33,000 (Tisdale et al. 1959, Parsons 1981 and Cromptom et al. 1988 cited in Piper 1997) and up to 100,000 with a small percentage germinating and reaching maturity (Cech 1997). Germination is increased after rainy periods, due to a germination inhibitor that is washed off by heavy rains. (Rees et al. 1996) The seeds are viable in the ground from six to ten years (Clark 1953, Bellue 1945 cited in Piper 1997). Dissemination is by wind, animals (both externally and internally), water and human activity.

MANAGEMENT INFORMATION:
The best time to apply 2,4-D is right after germination on new seedlings, before any blossoms open. Repeated applications will be necessary. Biological control agents are recommended for large weed infestation sites. Escort, with a surfactant is recommended as a postemergent for use in non-cropland, pastures and rangeland. (William et al. 1997)

St. Johnswort seedlings will readily establish in disturbed situations that include roadsides, overgrazed pastures, or open rangeland where native or forage species do not offer any competition. The combination of site-specific range management, which includes encouragement of beneficial plants species as well as a grazing management plan will prevent new infestations and re-infestations (Piper 1997). A successful control program in Australia included cultivation, sowing a competitive grass species, and fertilization. (Campbell and Delfosse 1984 as cited in Piper 1997; Moore et al. 1989 as cited in Mitich 1994).

Pulling should only be considered an option on new or small infestation sites and repeated pulls will be necessary to ensure removal of the whole plant and any lateral roots. Do not leave plants at the site, since vegetative growth will occur, and the seed source will remain. Tillage is effective when repeated in croplands (Crompton et al. 1988 as cited in Piper 1997). Mowing is a limited option depending both on site accessibility and whether seed formation has occurred. Repeated cuts are necessary (Piper 1997). Wear gloves and avoid touching the eyes when pulling and collecting. Reports of contact photosensitivity include second-degree blisters on eyelids and forehead (Upton 1997 as cited in Hobbs 1997).

Two foliage beetles, *Chrysolina hyperici* and *C. quadrigemina* were released in California from 1945 to 1946, and established within two years. This was the first intentional release of biological control agents on a weed population in North America. (Holloway 1957 cited in Piper 1997). A root-boring beetle *Agrilus hyperici* and a leaf bud gall-forming midge *Zeuxidiplosis giardi* were released in 1950 to help the *Chrysolina* spp. (Holloway and Huffaker 1953 as cited in Piper 1997). These established California colonies became the source for collections and distribution to *Hypericum perforatum* infestations throughout the western United States. Recently released and established is the moth *Aplocera plagiata.* (McCaffrey et al. 1995 cited in Piper 1997).

CURRENT DISTRIBUTION ON THE SITE: The northwest portion of the Indian Dan Unit.

ACRES AFFECTED BY WEED: ~ 20 acres **WEED DENSITY**: Low

ACTIONS PLANNED: Continue using prevention methods as discussed above. Monitor the extent and spread of this weed and design a program to control it if necessary.

CONTROL SUMMARY AND TREND
2002- None
2003- Some spot spraying
2004- None
2005- None

The extent, density and rate of spread for this weed are low and we have not begun efforts to control it.

LEAFY SPURGE

Scientific Name: *Euphorbia esula*
Updated: 2005

DESCRIPTION: Leafy spurge is a perennial plant with erect stems 1.5 to three feet tall. These stems originate from a crown just below the soil surface. The plants begin growing in early spring, before their competitors, and tend to appear in patches. Alternate leaves, three inches in length and no more than 1/4-inch wide, crowd along the stem; they are yellow-green from mid-summer to fall, when they turn red with the first frost. Leaves, stems, and roots all exude a milky, irritating sap when broken. In late May or early June, showy yellow bracts appear toward the tips of the short terminal branches, followed in a week or two by inconspicuous small green flowers without petals. Seed production takes about a month and continues until cold weather. Seeds, borne three to a capsule, are about 1/10 inch in diameter, gray to brown in color and often flecked with yellow. The seeds can be shot 20 or more feet when the capsule ripens and explodes. Another unique characteristic of leafy spurge, which contributes to the plants ability to persist once it invades an area, are numerous stem buds, which cover the thick very invasive roots. These stem buds can initiate growth when broken into small segments by tillage and are transported by birds, grazing animals, or in soil.

Leafy spurge reduces the livestock carrying capacity of pasture and rangeland by 20 to 50 percent, causing an estimated $35-45 million loss per year in United States beef and hay production in addition to the millions of dollars spent for control. In Europe, natural controls keep leafy spurge from becoming a problem.

Leafy spurge has been reported worldwide with the exception of Australia. On our continent, it is most troublesome in north central United States and south central Canada.

Leafy spurge can survive under a wide range of unfavorable conditions. However it spreads most rapidly in areas where cattle or other grass-preferring animals remove competing plants, permitting leafy spurge to take over by utilizing the advantages of shooting seeds and invading roots.

It was initially believed that leafy spurge was introduced to this continent in the early nineteenth century and spread westward through the United States and Canada. The first herbarium specimen was collected in Newbury, Massachusetts in 1827. Examination of more recently collected samples from across North America has shown that leafy spurge is not a single species but an aggregate of closely related variants suggesting that multiple strains were imported at different times from Europe and Asia, probably in grass or cereal seed, or in ship ballast. It appears that leafy spurge of European origin is found along the east coast and that areas of the Great Plains are infested with leafy spurge imported from Russia. Studies are in progress to determine if different control measures are required for plants in various areas.

The vigorous and extensive growth of long roots capable of regeneration provides leafy spurge with the extraordinary capability to invade, colonize, and persist. North America is essentially free of the pests and diseases that control this plant in its native European habitat. Furthermore, leafy spurge is toxic to some animals and unpalatable to most, so it thrives in areas where competitive plants are heavily grazed.

The female flowers of leafy spurge develop prior to the male, minimizing self pollination. The pollen and nectar are important food sources for insects, and their avid feeding results in high rates of pollination. Seed production is high even when leafy spurge is grown in competition with perennial grasses. Seed maturation often coincides with hay harvest, aiding in the widespread dissemination of the noxious weed. Viability of seed varies with depth of burial; in one representative experiment, more than 50 percent of the seeds recovered from a depth of eight feet germinated, but seed closer to the surface did not survive as well. In addition to very efficient reproduction by seed, leafy spurge spread occurs by crown and root buds.

MANAGEMENT INFORMATION:
Herbicides are commonly used to control or limit the spread of leafy spurge, but this practice is far from a complete answer. Numerous selective and non-selective herbicides in various combinations or sequences applied with specialized equipment have been evaluated over the years. Some formulations do a good job of controlling top growth but do not effectively kill roots; all are expensive.

Control of leafy spurge in established forage grasses can usually be accomplished by spraying with maximum labeled doses of selective herbicides such as 2,4-D, dicamba and picloram, followed by fertilizing to encourage the growth of the forage grasses. Spraying should be done when leafy spurge is between the early bud and first bloom stage and again usually in the fall, when the leafy spurge regrowth is four to six inches high. This routine must be repeated each year until the weed is eliminated.

On smaller areas, such as home sites, leafy spurge can be managed with the application of 2,4-D and dicamba when flowers and seeds are developing or with glyphosate alone in midsummer or after fall regrowth, taking care to avoid non-target plants.

Intensive cultivation and the planting of competitive crops are useful methods for the control of leafy spurge in cultivated fields, but with heavy infestations on rangeland, the addition of chemicals and/or grazing sheep or goats is usually necessary to further diminish weed growth.

The high cost, relative inefficiency, and environmental impact of herbicides have all contributed to a strong interest in natural control systems, such as insects, interspecific competition, and grazing animals. Studies nearly 50 years ago reported that three or more years of continuous sheep grazing significantly reduced the density of established leafy spurge growth. More recently, interest has shifted to the Angora goat, which may provide a good level of weed suppression at less cost than sheep. The major drawback to the approach is the difficulty maintaining sufficient number of sheep or goats to consume spurge plants before they seed but not letting the animals overgraze the grass. Low cost electrical fencing, llamas as sheepherders, and new methods of range weed management are among the many innovations currently being evaluated.

Numerous insects and specimens of fungi have been collected from leafy spurge growing in Europe, Asia, and North America and are being evaluated as potential biocontrol agents. The studies are promising. The United State Department of Agriculture selected and released in test plots, five species of insects which attack different parts of the leafy spurge plant; some feed on leaves or stems, others on root crown, shoot tip, or deep secondary roots. Among the insects selected for first round of testing is the ferambyciid long horned beetle, imported from Hungary and

Italy, *Oberea erythrochphala*. The adult feeds of the outside of the plant and girdles the stem. The larvae bore into the stem and rootcrown and consume the inside of the plant.

Three species of chrysomelid flea beetles, from central Europe, *Aphthona flava, Aphthona czwalinea* and *Aphthona cyparissiae* are in the study group. The adult stage of these beetles feed on leaves for about three months and then the females produce about 250 offspring each, which mine the roots and eat the fine roothairs of the succulent spurge plant. The final member of this voracious quintet is the ceridomyiid midge, a species of *Bayeria*, a tiny fly whose natural home is Italy. The adult flies live only a day or two but during this time, each generation of females lays about six dozen eggs, which yield larvae that feed on new shoots causing the formation of galls where flowers would normally appear.

Together, this array of ravenous insects weakens and destroys the undesirable weed. Research scientists are trying to identify the combination of spurge enemies that achieves maximum control in their experimental plots and then test that recipe on a large scale.

It is not expected that biocontrol by itself will lead to the elimination of leafy spurge. The plan to make biocontrol part of an integrated weed management effort which will include competitive planting, cultivation, herbicides, and selective grazing.

CURRENT DISTRIBUTION ON THE SITE: Two small infestations on Bridgeport Bar and one on the Indian Dan Canyon.

ACRES AFFECTED BY WEED: < .5 **WEED DENSITY**: low

ACTIONS PLANNED: Continue close monitoring of treated sites. Apply herbicide annually until eradicated.

CONTROL SUMMARY AND TREND
2002- Sprayed .25 acres
2003- Sprayed 2 acres
2004- Sprayed 1 acre
2005- Sprayed 1 acre

Leafy spurge is contained in three small sites which are regularly monitored and spot treated.

PURPLE LOOSESTRIFE

Scientific Name: *Cardaria chalapensis* **Common Name:** Purple loosestrife
Updated: 2005

DESCRIPTION: Purple loosestrife is a perennial, emergent aquatic plant (Thompson, et al. 1987; Malecki, 1991). As many as 30 -50 herbaceous, erect, annual stems rise to about nine feet tall from a persistent perennial tap root and spreading rootstock. Short, slender branches spread out to form a crown five feet wide on established plants. (Thompson, et al. 1987). The somewhat squarish stems are four to six sided, with nodes evenly spaced. Stems submerged under water develop aerenchyma tissue characteristic of aquatic plants. The stalkless leaves can be opposite or decussate (opposite with alternating pairs at 90 degree angles) or sometimes in whorls of three, near the base. The upper leaves and floral bracts can be alternate (Mal, et al. 1992). The leaves are 1 ½ to four inches long, wider and rounded or heart-shaped at the base. Leaf shape varies from lanceolate to narrowly oblong, and the leaves are sometimes covered with fine hairs. Light levels influence the variability in pubescence and leaf shape - leaf area increases and fine hairs decrease with lower light levels.

The showy, magenta flowering stems end in a 4-16 inch flowering spike. Flowers appear from July to early October. The (usually) magenta flowers are in pairs or clusters of the upper leaf axils. Each flower is complete, containing five to seven petals, with the same number of sepals as petals, and twice as many stamens as petals. Typical flowers have six sepals, six petals and twelve stamens. The ovary is superior, with two fused carpels. The narrow, wrinkled petals are from 1/4 to 5/8 inch long. The petal color can range from white to pink to red to purple. The fruit is a two-valved capsule enclosed in the pubescent calyx. The pollen grain color and size varies, depending on the style length of the flower.

Purple loosestrife is favored by some as a source of nectar and pollen for overwintering colonies of bees and as a horticultural plant. Washington State, however, placed purple loosestrife on the Washington State Department of Agriculture Quarantine list under Wetland and Aquatic Weeds in 1991. The sale of all hybrids and cultivars is also prohibited.

Purple loosestrife disrupts wetland ecosystems by displacing native plants and animals. Waterfowl, fur-bearing animals, and birds vacate wetland habitat when they lose their food source, nesting material, and ground cover due to native vegetation loss and replacement. Economic impacts are high in agricultural communities when irrigation systems are clogged or when wetland pastures are lost to grazing.

Purple loosestrife is a prolific seed producer. Seed banks build for years, unnoticed until the right conditions of disturbance appear, resulting in a population explosion. It also has the ability to spread vegetatively when a single node containing adventitious buds along submerged stems is broken, producing new roots or shoots. Seed dispersal by waterfowl, riparian pathways, and human disturbance contribute to the spread and dominance of purple loosestrife in wetland areas. The pervasiveness of this species is amplified by the fact that monospecific stands are long-lived in North America, as compared to European infestations.

Growth and Development: Purple loosestrife is a perennial, emergent aquatic plant that grows from a persistent taproot and spreading rootstock. The taproot develops early in the seedling stage.

When mature the taproot and major root branches become thick and woody. The stems are annual, and they can reach nine feet tall and form a crown that can reach five feet wide.

Seed Germination: Critical temperatures at the soil surface necessary for germination are between 15 and 20 degrees Centigrade. These temperature requirements may be the southern limiting factors in the distribution of purple loosestrife. Light requirements (day length) does not affect germination rates. Purple loosestrife tolerates a broad pH range, with successful germination occurring between pH of 4.0 and 9.1. (Shamsi and Whitehead 1974 as cited in Thompson, et al. 1987). Under favorable conditions germination to flowering can occur in eight to ten weeks. Spring-germinated seedlings have a higher survival rate than summer-germinated seedlings. (ESA - The Nature Conservancy), and seedling establishment is higher when seeds overwinter at least one year. Seedling establishment requires moist soils.

Seed Viability: Seed dry stored and refrigerated, germinated after three years. No such study was done on propagules. The lack of energy reserves in the seed suggests that viability in the field would not last more than a few weeks (Thompson et al. 1987). More study needed.

The longevity of monotypic stands can be attributed to the unknown genetics of the European stock as compared to North American stock. A possibility exists that the North American forms are more adaptive and vigorous.

Reproduction: Seed Production and Dispersal: A mature plant can produce 2.7 million thin-walled, flat seeds. The indeterminate flowering stalks produce and dehisce seed from the lowest capsules first while the upper capsules are still immature and green. The seeds lack endosperm, are about 400 x 200 microns - the size of ground pepper. Some seeds sink in the water, and resurface after germination. Water dispersal includes floating seedlings and floating un-germinated seeds. The seeds are small and light enough (weight 0.5 - 0.6 mg) for wind dispersal, but the evidence points toward minimal wind distribution. Most dispersal is down slope, and not downwind. Seedling densities sharply fall within 34 feet of the parent plant. Other distribution methods include transport through wetland mud by animals, humans, boats, or vehicles. Spread also occurs when seeds are eaten. (Thompson et al. 1987)

Purple loosestrife also spreads vegetatively. Buried stems harbor adventitious buds with the ability to produce shoots or roots. Disturbance to the plant, such as stomping and breaking underground stems, or breaking off stems or roots during incomplete plant removal, does initiate bud growth.

MANAGEMENT INFORMATION:

Prevention must be a major consideration for eliminating purple loosestrife infestations. Purple loosestrife is aggressive and competitive and it takes full advantage of the disturbance to wetlands.

Although a non-selective herbicide, glyphosate (Rodeo) provides good control. Triclopyr and 2,4-D are also effective in controlling purple loosestrife.

Cutting alone is not a control option for purple loosestrife. Shoots and adventitious roots will develop. Cutting late in the season reduced shoot production more than mid summer cutting, indicating that carbohydrate reserves could not be restored for next years growth.

Flooding is only recommended for large infestations because of the problems associated with maintaining constant water levels and because of the negative impacts to native plants (Malecki and Rawinski 1985).

Black plastic covering did not kill the roots of mature plants in test plots, although it did slow down growth and seed production. However, root crowns did die in plots where heavy litter from mowing remained covered until June. More study needed. (WDFW PLS 1992 Activity Report).

In 1992 three beetles were released in Washington. Their damaging impact on purple loosestrife populations was evident in the Winchester Wasteway area of Grant County in 1997. Biological control agents may provide the long-term success in controlling this noxious weed. *Galerucella calmariensis* and *G. pusilla* - are both leaf-feeding chrysomelids. These beetles defoliate, and attack the terminal bud area, drastically reducing seed production. The mortality rate to purple loosestrife seedlings is high. Evidences of *Galerucella* ssp. damage are round holes in the leaves. Four to six eggs are laid on the stems, axils, or leaf underside. The larvae feed constantly on the leaf underside, leaving only the thin cuticle layer on the top of the leaf. By 1996 populations of *Galerucella* ssp. visibly impacted purple loosestrife stands in the Winchester Wasteway.

Hylobius transversovittatus is a root-mining weevil that also eats leaves. This beetle eats from the leaf margins, working inward. The female crawls to the lower two to three inches of the stem then bores a hole to the pithy area of the stem, where one to three eggs are laid daily from July to September. Or, the female will dig through the soil to the root, and lay eggs in the soil near the root. The larvae then work their way to the root. *H. transversovittatus* damage is done when xylem and phloem tissue are severed, and the carbohydrate reserves in the root are depleted. Plant size is greatly reduced because of these depleted energy reserves in the root. The larvae evidence is seen in the zig-zag patterns in the root.

CURRENT DISTRIBUTION ON THE SITE: Purple Loosestrife occurs primarily in wetlands on the Wasburn Island, Bridgeport Bar, and Okanogan River Units. It also occurs along Wells Pool. One plant found on the Indian Dan Unit and

ACRES AFFECTED BY WEED: ~ 100 acres **WEED DENSITY**: high

ACTIONS PLANNED: Continue using prevention methods as discussed above. Annually release biological control agents as needed. Remove and dispose flower heads and pioneering plants.

CONTROL SUMMARY AND TREND
2002- Released 600 *Galerucella calmariensis*
2003- Released 3,000 *Galerucella calmariensis*
2004- None
2005- Released 2,500-3,000 *Galerucella calmariensis*

Purple loosestrife invaded wetlands in the vicinity of Wells Pool around the mid 1980's. Initially the department and the Douglas County PUD applied herbicide to control the weeds. This had mediocre results and killed everything on the site opening it to future weed infestations. The

subsequent availability of an effective biological control agent *Galerucella calmariensis* allowed for the near eradication of this weed. It is now reduced to a few small isolated patches.

GENERAL WEEDS

Scientific Name: *Various* **Common Name:** General Weeds
Updated: 2005

DESCRIPTION: General weeds describe mixed vegetation that interferes with maintenance, agricultural, or restoration activities, where keying plants to individual species is not appropriate or practical. Examples of general weeds include vegetation occurring along roadsides, parking areas, trails, agricultural fields and structures and species like cheatgrass, sandbur, puncturevine, kochia, Russian thistle, cheatgrass, Russian knapweed, Jim Hill mustard, reed canarygrass, quackgrass, bindweed, thistle, goatgrass, etc.

MANAGEMENT INFORMATION:
Herbicide can be an effective tool for control of these weeds and applicators should refer to the PNW Weed Management Handbook, or other reputable resources, for product recommendations and timing depending on the weed and desired management objectives. Mechanical weed control may include mowing, burning, to the plowing and disking entire fields.

CURRENT DISTRIBUTION ON THE SITE: All public accesses, roadsides and agricultural fields on the wildlife area contain miscellaneous weeds to varying degrees.

ACRES AFFECTED BY WEED: ~ 500 **WEED DENSITY**: Low - High

ACTIONS PLANNED
Continue using prevention methods as discussed above. Annually, treat affected portions of roadsides, parking lots, access sites, and trailheads with a residual herbicide to eliminate the production and spread of weed seeds and improve appearance and public access for the entire season.

In 2006, restore two agricultural fields (30 acres) on Bridgeport Bar and one on Washburn Island (20 acres) in the spring. Summer fallow one West Foster Creek field (20 acres) through the year and planted to a shrub-steppe mix.

Cultivate firebreaks to eliminate weeds and fuel.

CONTROL SUMMARY AND TREND
2002- Sprayed 10 acres of quackgrass and controlled general weeds in agricultural fields
2003- Mowed 43 acres and sprayed 21 acres of quackgrass.
-Controlled general weeds in agricultural fields.
2004- Sprayed 40 acres of cheatgrass and 7.5 acres of quackgrass.
-Mowed 32 acres of miscellaneous weeds.
-Removed about 2 acres of Russian olive and Chinese elms encroaching on shrub and tree plantings.
-Controlled weeds in agricultural fields
2005-Treated 160 acres
- Removed about 2 acres of Russian olive and Chinese elms encroaching on shrub and tree plantings.

-Controlled weeds in agricultural fields.

Irrigation water and high bird use of the agricultural area has increased the diversity and dispersal of miscellaneous weeds associated with cultivation. The warm season grasses, which have increased in irrigated fields, are more difficult to control than broadleaf species and require more intensive management.

APPENDIX 3. WELLS WILDLIFE AREA FIRE MANAGEMENT PLAN

Fire Control

The Wells Wildlife Area maintains protection contracts with two local fire districts:

1) Douglas County #5 of Mansfield for the West Foster Creek Unit
2) Douglas-Okanogan County #15 of Brewster and Bridgeport Bar for the other units of the Wells WA.

These districts are paid an annual fee based on the assessed value of the Wildlife Area lands within their districts.

It is the WDFW's policy that its employees will not fight fires. Wildlife Area personnel are trained in fire fighting and fire behavior (blue and/or red card), however, in order to provide support and information regarding critical habitat values, access and water sources to the Incident Commander of the responding fire district.

Wildlife Habitat Concerns: The Wells Wildlife Area contains fire sensitive habitat that is critical to several species of wildlife including the Columbian sharp-tailed grouse and sage grouse. Therefore, when a fire occurs in or near the wildlife area, WDFW asks that the Incident Commander or other fire fighting personnel on site to notify WDFW personnel immediately in the order listed below. A WDFW advisor will provide information to the Incident Commander regarding wildlife habitat concerns.

Fire on the Area: The incident commander is asked to seek aerial support from the Interagency Dispatch Office if needed to extinguish a fire promptly. It is absolutely critical that any fire on the Area is attacked as aggressively as possible during the initial attack. The importance of aerial support cannot be overstated.

Any Off-site Fire Threatening the Area: If, in the professional judgment of the Incident Commander, a fire on lands adjacent to the Wells Wildlife Area pauses an immediate threat to the area, WDFW requests that he/she seeks aerial support as outlined above.

Any Fire Within One Mile of the Area: The incident commander can alert the Interagency Dispatch Center and request it to be on standby.

Wells Wildlife Area Fire Contacts

Fire Districts – DIAL 911

Douglas Co. FD 5 Mansfield, Tom Snell - Chief	509-683-1114	509-683-1974
Douglas-Okanogan Co. District 15 Brewster and Bridgeport Bar, Mike Webster – Chief	509-689-9408	509-733-1674

Department of Fish and Wildlife Contacts – Contact in order listed

Name	TELEPHONE	PRIVATE TEL:	CELL
Marc Hallet, Wells WA Manager,	509-686-4305		509-679-4780

Office			509-449-0386
Dan Peterson, Wells WA Assistant manager	509-686-4305		509-670-1284 509-449-0016
Fidel Rios, Wells WA	509-686-4305		509-670-2485
Fred Wiltse, Wildlife Agent, Brewster			509-733-0079
Jim Brown – Sargeant, Omak Office	509-826-7371		
Regional Office - Ephrata	509-754-4624		
Regional Program Manager – Matt Monda	509-754-4624 (Ext. 16)		
Beau Patterson, District Biologist	509-663-9764		509-670-9089
Tom McCall, Field Biologist	509-886-5287		509-670-2199
State Patrol Dispatch (WDFW Enforcement)	911		
Steve Dauma, Enforcement Captain, Ephrata	509-754-4624 (Ext. 18)		509-989-4984

DNR- contact in order listed and request Operations or Staff Coordinator

Interagency Dispatch Office Wenatchee	509-663-8575 800-826-3383

Local Aerial support

Golden Wing Aviation, Brewster	509-689-2712
Johnson Air Service, Waterville	509-745-8983

Fire Prevention: (See Management Plan Section Agency Objective: Ensure that WDFW Activities, Programs, Facilities and Lands are Consistent With Local, State and Federal Regulations that Protect and Recover Fish, Wildlife and Their Habitats. Sub-objective 3.)

- Construct and maintain firebreaks.
- Plant and maintain green strips.
- Use prescribed fires to reduce fuel.
- Limit vehicular travel and access during the fire season.
- Restrict campfires and firework (signs).
- Cooperate with local fire districts to educate the public regarding fire prevention.

APPENDIX 4. WATER RIGHTS

Wells Wildlife Area Water Rights

Bridgeport Bar Unit

File #	Cert #	Stat	Doc	Priority Dt	Purpose	Qi	UOM	Qa	Irrig. Acres	WRIA	County	TRS	QQ/Q	1stSrc
CG4-GWC981-D	981-D	A	ChgApp	10/13/95	IR	400	GPM			50	DOUGLAS	30.0N 25.0E 19	SE/SE	WELL
CG4-GWC980-D	980-D	A	ChgApp	10/13/95	IR	400	GPM			50	DOUGLAS	30.0N 25.0E 19	SE/SE	WELL
CS4-22860C@1		A	ChgApp	10/13/95	IR	220	GPM			50	DOUGLAS	30.0N 25.0E 20		WELL
CG4-22858C		A	ChgApp	10/13/95	IR	330	GPM			50	DOUGLAS	30.0N 25.0E 20	SW/SE	WELL
CG4-GWC974-D	974-D	A	ChgApp	10/13/95	IR	640	GPM			50	DOUGLAS	30.0N 25.0E 20	SW/SE	WELL
CG4-GWC973-D	973-D	A	ChgApp	10/13/95	IR	640	GPM			50	DOUGLAS	30.0N 25.0E 20	SW/SE	WELL
G4-32328		A	NewApp	7/5/95	IR	440	GPM		30	50	DOUGLAS	30.0N 25.0E 20		WELL
S4-24473CWRIS		A	Cert	12/10/76	IR	1	CFS	388	97	50	DOUGLAS	30.0N 25.0E 34		COLUMBIA RIVER
S4-28672NWRIS		A	Cert	4/25/85	IR	0.89	CFS	160	40	50	DOUGLAS	30.0N 25.0E 21	SE/SE	COLUMBIA RIVER
S4-22861P					IR	1.2	CFS	216			DOUGLAS	30.0N 25.0E 21		COLUMBIA RIVER

Central Ferry Canyon Unit

File #	Cert #	Stat	Doc	Priority Dt	Purpose	Qi	UOM	Qa	Irrig. Acres	WRIA	County	TRS	QQ/Q	1stSrc
S4-29936		A	NewApp	2/17/89	WL	0.022	CFS		0.5	50	DOUGLAS	29.0N 24.0E 15		UNNAMED SPRING
S4-29937		A	NewApp	2/17/89	WL	0.022	CFS		0.5	50	DOUGLAS	29.0N 24.0E 15		UNNAMED SPRING

Indian Dan Canyon Unit

File #	Cert #	Stat	Doc	Priority Dt	Purpose	Qi	UOM	Qa	Irrig. Acres	WRIA	County	TRS	QQ/Q	1stSrc
G4-31944		A	NewApp	2/28/94	IR	250	GPM		25	49	OKANOGAN	30.0N 24.0E 17		WELL

Central Ferry Canyon Unit

File #	Cert #	Stat	Doc	Priority Dt	Purpose	Qi	UOM	Qa	Irrig. Acres	WRIA	County	TRS	QQ/Q	1stSrc
S4-29559					IR						OKANOGAN	30.0N 25.0E 22		COLUMBIA RIVER
3465-A		A	CERT		IR	860	GPM				OKANOGAN	30.0N 25.0E 23		COLUMBIA RIVER

West Foster Creek Unit

File #	Cert #	Stat	Doc	Priority Dt	Purpose	Qi	UOM	Qa	Irrig. Acres	WRIA	County	TRS	QQ/Q	1stSrc
S4-29950		A	NewApp	3/10/89	IR, Ponds, FR	1.4	CFS		0.3	50	DOUGLAS	28.0N 25.0E 21		WEST FOSTER CREEK
S4-29951		A	NewApp	3/10/89	IR, Ponds, FR	0.4	CFS		0.35	50	DOUGLAS	28.0N 25.0E 32		WEST FOSTER CREEK

APPENDIX 5. MANAGEMENT PLAN COMMENTS & RESPONSES

Washington State Department of Fish and Wildlife, February 2007

No public comments were received on the Wells Wildlife Area Plan.

REFERENCE AND RELATED LINKS

Wells Wildlife Mitigation Agreement, July 15, 1974
Public Utilities No. 1 of Douglas County Memorandum of Agreement, 1995
Wells Wildlife Mitigation Program Funding Status and Recommendations, January 4, 1994
Birds in a Sagebrush Sea, Managing Sagebrush Habitats for Bird Communities. Paige & Ritter, 1999
Steppe Vegetation of Washington. Daubenmire, 1970
Northwest Power Planning Council (NWPPC), Upper Middle Mainstem Subbasin Plan, 2004(http://www.nwcouncil.org/fw/subbasinplanning/uppermidcolumbia/plan/)
WRIAs 44/50 Watershed Plan – Moses Coulee/Foster Creek
WRIA 49 Watershed Plan – Okanogan Watershed Plan
WDFW Strategic Plan (http://wdfw.wa.gov/depinfo/strat_goals_obj.htm)
Wildlife Area Statewide Plan (http://wdfw.wa.gov/lands/lands2020/)
WDFW Policies and procedures (http://wdfw.wa.gov/depinfo/strat_goals_obj.htm)
WDFW Priority Habitat and Species List (http://wdfw.wa.gov/hab/phslist.htm)
WDFW Priority Habitat and Species Recommendations (http://wdfw.wa.gov/hab/phsrecs.htm)
WDFW Sage grouse Recovery Plan, 2004
WDFW Sharp-Tailed Grouse Recovery Plan, 1997
WDFW Bald Eagle Status Report, 2001