

SCOTCH CREEK WILDLIFE AREA MANAGEMENT PLAN

Washington Department of Fish and Wildlife

Includes: Scotch Creek, Tunk Valley, Chesaw, Pogue Mountain and
Mineral Hill Units



Prepared by Wildlife Area Manager, Jim Olson



2006

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Washington State Wildlife Area Plan

SCOTCH CREEK WILDLIFE AREA

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

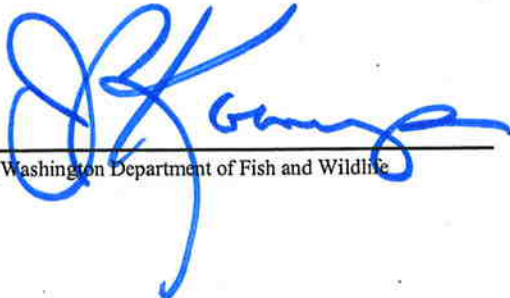
Washington State Wildlife Area Plan

Scotch Creek Wildlife Area

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

Prepared by:
Jim Olson

November 2006



Director, Washington Department of Fish and Wildlife

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EXECUTIVE SUMMARY

The Scotch Creek Wildlife Area is a complex of 5 separate management units located in Okanogan County in North Central Washington State. The project is located within the Columbia Cascade Province (Okanogan sub-basin) and partially addresses adverse impacts caused by the construction of Chief Joseph and Grand Coulee hydroelectric dams. The total size of the wildlife area is 16,560 acres.

The core properties to the Scotch Creek Wildlife Area were purchased in 1991 with funding from the Washington Wildlife and Recreation Program. The intent of the purchase was to enhance habitat and recover the declining population of Columbian Sharp-tailed grouse.

The Wildlife Areas were approved as a wildlife mitigation project in 1996 and habitat enhancement efforts to meet mitigation objectives have been underway since the spring of 1997 on Scotch Creek. Over 2,700 acres of degraded rangeland have been restored to a native shrub-steppe habitat and over 100,000 trees and shrubs have been planted to improve the riparian habitat the Prairie grouse depend on in the winter. Also a total of 63 Sharp-tailed grouse from SE Idaho and the Colville Indian reservation in Washington state were transplanted to the Scotch Creek Wildlife Area in 1998, 1999, and 2000. Recent populations estimates of Sharp-tailed grouse on the Scotch Creek unit show a halt to the decline observed since 1960, and have increased every year since 2000. Habitat enhancements and genetic supplementation through augmentation appear to be having a positive effect.

The primary management concerns and public issues identified in the Scotch Creek Wildlife Area Plan are:

- Appropriate use of livestock as a management tool was recommended.
- Weed Control. It is the recommendation of the Okanogan County Noxious Weed Board (OCNWB) that the WDFW, in the interest of good land stewardship and good neighbor relations, provide an aggressive priority approach and adequate funding for noxious weed control for existing and proposed WDFW lands.
- Access and recreation; 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.
- Management of wet soils: Concerned about mosquito breeding habitat we are creating by letting the creek flood the area below the HQ. Could be vectors for disease transmission to people or livestock.

The primary goal and specific reason for purchasing the property is to establish a viable Sharp-tailed grouse population on and adjacent to the Scotch Creek Wildlife Area. Other management goals for the Scotch Creek Wildlife Area are to preserve habitat and species diversity for wildlife resources, maintain healthy populations of game and non-game species, protect and restore native plant communities, and provide diverse opportunities for the public to encounter, utilize, and appreciate wildlife and wild areas.

Performance measures completed for 2006 include: 45 acres of native shrub-steppe seeding, built and installed 50 new bluebird nest boxes, Musk thistle controlled on the Chesaw unit which

included over 700 hours of hand pulling, held a public auction and surplused 5 buildings on the Happy Hill LLC acquisition (all material was dismantled and removed), monitored all Sharp-tail grouse lek sites, completed the wildlife area management plan, and completed the Tunk Valley unit bridge, road improvements and parking area.

2007 Performance Measures

Performance measures for the Scotch Creek Wildlife Area are listed below. Accomplishments and progress toward desired outcomes will be monitored and evaluated annually.

- 1) Shrub-steppe restoration. Summer fallow 95 acres with fall dormant seeding of native grasses and forbs on the Happy Hill, LLC acquisition on Scotch Creek (WHIP grant).
- 2) Riparian restoration. Maintain over 100,000 trees and shrubs previously planted. Include 500 new Water Birch transplants where needed.
- 3) Deer exclosure fence. Install approximately 2 miles of deer fence to prevent browsing damage to new tree and shrub plants near the Scotch Creek HQ.
- 4) Continue with weed management plan. Plans for 2007 include 40 acres of White-top, 200 acres of Russian Knapweed, and 20 acres Canadian Thistle on Scotch Creek. 40 acres of Houndstounge and 125 acres of Musk Thistle on Chesaw. 10 acres of Russian Knapweed on Pogue Mountain and 40 acres on Tunk Valley.
- 5) Restore proper hydraulic function to Scotch Creek below the HQ. Includes dredging a new meandering channel to mimic natural conditions, and a 2-year plan to eliminate the reed canary grass invasion and plant new riparian vegetation.
- 6) Boundary fence repair and signing. Inspect and repair in early spring as much of the 60 miles boundary fence as feasible on all units. Install or replace wildlife area boundary signs as needed.

CHAPTER I. INTRODUCTION

This plan provides management direction for the Scotch Creek Wildlife Area, including associated units Tunk Valley, Chesaw, Pogue Mountain, and Mineral Hill. This plan 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 Washington Department of Fish and Wildlife (WDFW) Agency Mission of “Sound Stewardship of Fish and Wildlife” and its underlying statewide goals and objectives as they apply 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 fish and wildlife-related recreational and commercial opportunities.

1.2 Agency Goals and Objectives

The following goals and objectives directly apply to the management this wildlife area. These goals and objectives are 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.
- Objective 14: Maintain a safe work environment.

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: WDFW Will Accomplish Long-Term Gain of Properly Functioning Wetlands Where Both Ecologically and Financially Feasible on WDFW-Owned or WDFW-Controlled Properties
- 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
- Contract : BPA project number 1996-094-01 SCOTCH CREEK WILDIFE AREA

1.4 Scotch Creek Wildlife Area Goals

The primary goal and specific reason for purchasing the property is to establish a viable sharp-tailed grouse population on and adjacent to the Scotch Creek Wildlife Area. Other management goals for the Scotch Creek Wildlife Area are to preserve habitat and species diversity for wildlife resources, maintain healthy populations of game and non-game species, protect and restore native plant communities, and provide diverse opportunities for the public to encounter, utilize, and appreciate wildlife and wild areas. Specific management goals and objectives for the Scotch Creek Wildlife Area can be found in Chapter 3.

1.5 Planning Process

A multifaceted approach has been undertaken to identify strategies proposed for management of the Scotch Creek Wildlife Area. This process included identifying agency goals and objectives that apply to the area; a review of the purpose for purchasing the area; a review of existing habitat conditions and species present; the formation of a Wildlife Area Citizens Advisory Group (CAG); and input and review by an internal District Team consisting of local agency representatives from each agency program. The district team also helped to identify other species or habitat plans and documents pertinent to the management of the area.

Public participation, through the formation of the CAG, will be used as an ongoing means to identify social, cultural, and economic issues important to the people of North Central Washington and the management of the wildlife area. The group will also provide input to help resolve current and future management issues and conflicts. CAG participation in planning will add credibility and support for land management practices and help build constituencies for wildlife areas. The CAG is made up of one representative from each major stakeholder group. CAG members are spokespersons for their interest groups.

Eastern Okanogan County Wildlife Area Citizens Advisory Group Representatives

Ramona Pfitzer, Ok. Co. Weed Control Board rpfitzer@co.okanogan.wa.us

Jerry Barnes, Okanogan Co. Cattlemen's sbarnes@nvinet.com

Bob Gillespie, Wenatchee Valley College bgillespie@wvc.edu

Lee Root, Okanogan Valley Land Council lsroot@nvinet.com

Joe Berney, Land Owner

Jim Weed, PNT Trail jweed@ncidata.com

Jere Gillespie, Chesaw resident columbiana@televar.com

Brian Derting, WDNR Brian.derting@wadnr.gov

Dick Finch, Okanogan Wildlife Council finch@televar.com

Rick Lind, private individual rickl@televar.com

George Wooten, private individual gwooten@mymethow.com

Individuals representing these entities will provide input during the planning process.

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 (including Washington's Comprehensive Wildlife Conservation Strategy), 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.

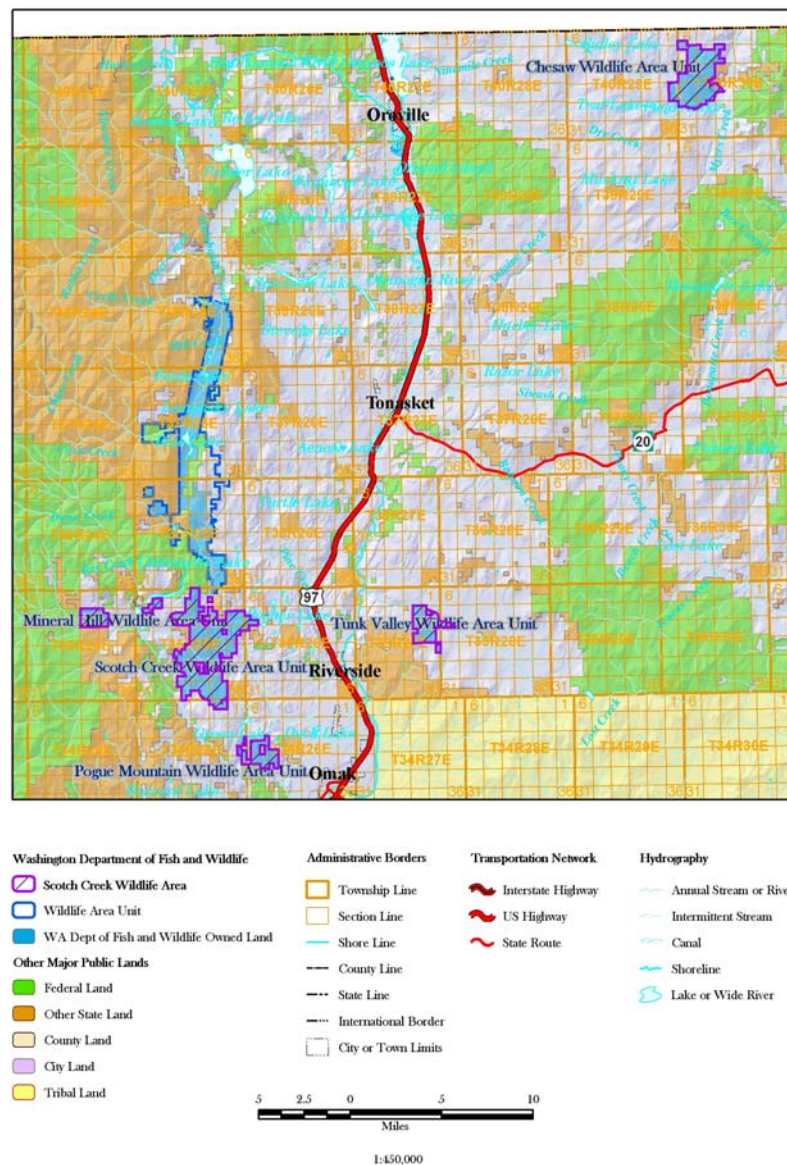
The Scotch Creek plan will be reviewed annually with additional input from the CAG and district team to monitor performance and desired results. Strategies and activities will be adapted where necessary to accomplish management objectives.

CHAPTER II. AREA DESCRIPTION AND MAPS

2.1 Purchase History

Acquisition of the Scotch Creek Wildlife Area (SCWA) began in 1991 with the purchase of the Metcalf Ranch near Conconully, the Byers ranch near Chesaw, and a complex of acquisitions in the Tunk Valley, all in north central Washington State. The primary goal of the project is to permanently protect Sharp-tailed grouse and shrub steppe habitat (WDFW 2005b). Since the initial acquisition, additional purchases have expanded the property boundaries to the current size of 16,560 acres (Figure 1). The SCWA now consist of 5 separate units in North Central Washington (WDFW 2005b). All properties currently managed under the Scotch Creek Wildlife Area were purchased with money provided from the Washington State legislature under the Washington Wildlife and Recreation Program (WWRP).

Figure 1. Scotch Creek Wildlife Area Complex



The largest continuous parcel is the Scotch Creek Unit located approximately 10 miles northwest of Omak and 4 miles southeast of Conconully. This area is a major recreation area for both fishing in the summer and deer hunting in the fall. The Metcalf ranch is also known locally as the French place, which holds a colorful history dating back to pre 1900 when the area was first homesteaded.



Metcalf Ranch

Over the previous 100 years, the area has undergone significant changes. As a working cattle ranch, approximately 1,500 acres of the native grasslands were converted to dryland agricultural fields. These farmed fields were then converted to Crested and Intermediate wheatgrass stands for livestock grazing. Another significant change was the removal of deciduous trees along the riparian corridor and the drying up of wetland areas for alfalfa production, reducing winter habitat for sharp-tailed grouse. This unit supports the core of the sharp-tailed grouse population on the SCWA. The elevation varies from 1,600 feet to 2,800 feet above sea level. The original purchase included a perpetual timber harvest encumbrance. That right was purchased by the WDFW in 2001, which now holds the future for timber management on all the Scotch Creek Areas.

The 8,694 acre Scotch Creek unit consists of 4,247 acres of shrub-dominated shrub steppe (> 15% shrub cover), 3,713 acres of grass-dominated shrub steppe (< 15% shrub cover), 522 acres of conifer forest, 80 acres maintained in agricultural (sharecrop fields), 75 acres riparian, and 57 acres in surface water. To date, nearly all of the 1,500 acres of old dryland agricultural fields have been restored to a native shrub steppe habitat, providing diversity and nesting cover for sharp-tailed grouse. In addition over 100,000 trees and shrubs have been planted every spring in

wet draws, north slopes, and more recently, under irrigation, to provide the critical winter habitat needed for sharp-tailed grouse survival.

The Mineral Hill Unit is located 2 miles southwest of Conconully along the West Fork of Salmon Creek, which runs from the west to the east and divides this unit. Salmon creek is a typical mountainous stream with 280 feet of drop in the one mile that it crosses WDFW property.

Rusty creek also joins Salmon creek toward the western portion of the property. These streams contain resident trout, however a natural barrier downstream from this property has prevented any anadromous fish species from utilizing this stream. The north slope of this unit is heavily timbered, while the south slope contains large open stands of bunch -grasses and scattered Ponderosa Pine. Timber species by dominance include Ponderosa pine, Douglas fir, Western larch, and Engelmann spruce. The elevation varies from 2,500 feet in the southeast corner to 3,400 feet at the northwest corner. The 920 acre Mineral Hill unit consists of 610 acres conifer forest, 253 acres of grass-dominated shrub steppe, and 57 acres of riparian forest.

The Pogue Mountain Unit is located four miles northwest of Omak and west of the Conconully Highway. Elevations vary from 1,600 feet to 2,800 feet at the top of Pogue Mountain. The terrain is mountainous, scattered timber with large openings of native shrub steppe. This unit was part of the Metcalf property purchase in 1991. The area was used primarily for cattle grazing and timber harvest as part of the Metcalf ranch operation. Three mining claims are present on the area, however it appears that they are not continuing to be maintained. Public access is difficult on this area as both roads leading to the property cross private land. Access is allowed to the WDFW for management purposes only. However hiking and horseback riding are still popular uses of the area from Omak residents. A grazing lease was issued early on in the ownership but voluntarily discontinued due to the lack of fencing to contain the livestock. The unit is managed as mule deer winter range, however there are historical accounts of sharp-tailed grouse use on the lower elevations. Pogue Mountain unit is predominately shrub steppe with tall stands of mature big sagebrush along the lower elevations. The area is comprised of three cover types; shrub steppe consists of 720 acres, conifer forest 475 acres, and surface water, 1 acre.

The Tunk Valley unit consists of eight different properties purchased for a total of 1,079 acres. An additional 320 acres of adjoining land has been added over the past 10 years to bring the total acreage to 1,399. Previous owners land use on this parcel includes mostly livestock grazing. There are no improvements to this property, however the WDFW has surveyed and boundary fenced the entire area. The Tunk Valley Unit is located approximately twelve miles northeast of Omak in the beautiful Tunk Valley of Okanogan County. This area is east of the Okanogan River and north of the Colville Indian Reservation. The unit has gentle topography with mostly a north facing aspect. The unit includes approximately 2 miles of Tunk Creek and associated riparian vegetation. A large flock of 64 sharp-tailed grouse were observed here in the water birch trees along Tunk Creek in the winter of 2003. The area also supports a variety of species including mule deer, white-tailed deer, sharp-tailed grouse, ruffed grouse, California quail, gray partridge, many non-game species of wildlife, hawks and owls and many species of songbirds. Woodpeckers and other cavity nesting birds inhabit the small patches of conifers in the uplands and the riparian zone along Tunk Creek. Tunk Creek also supports rainbow and brook trout. Elevations vary from 1,800 feet to 3,200 feet above sea level. The majority of the Tunk Valley unit is classified as shrub-steppe, with a small stand of timber on the steep North Slope in the center of the property and healthy stands of riparian trees and shrubs present along Tunk Creek.

Approximately 300 acres of native rangeland have been converted to agriculture in the past. Approximately 125 acres of these fields were restored to native grasslands in 2001 using enhancement funds from the BPA.

The Chesaw Unit lies in the northwest portion of Okanogan County, some four miles south of the Canadian border and approximately 10 miles west of the Ferry County line. It is within the Upper Columbia Subbasin (NPPC 2004*e*), whereas all other units lie within the Okanogan subbasin. The property lies approximately 20 miles east of Oroville, and immediately northwest of the small community of Chesaw. The area to the northwest and south is a combination of rural home sites, recreational home sites, and ranching uses with the area to the east being predominately national forest. Access to the subject is via the Mary Ann Creek Road or the main Chesaw/Oroville Highway. The area supports one sharp-tailed grouse lek site as well as mule deer, white-tailed deer, ruffed grouse, blue grouse, pheasants, Hungarian partridge and quail. The Chesaw area has relatively gentle topography over much of the area with lower elevations near 3,200 feet and higher reaches at 4,200 feet in elevation. The area is a contiguous irregular shaped parcel comprised of five cover types. This 4,351 acre unit is comprised of 2,216 acres of grass-dominated shrub steppe, 1,503 acres of shrub-dominated shrub steppe, 448 acres of conifer forest, 144 acres of riparian wetland, and 40 acres of surface water.

Scotch Creek Wildlife Area management strategies address several critical landscape level limiting factors such as shrub steppe habitat conversion, degradation, and fragmentation (Hays et al. 1998, Schroeder et al. 2000), as well as species-specific limiting factors. Management activities that have been implemented to address habitat conversion and degradation factors include seeding agricultural fields to native-like vegetation, removing livestock, protecting and maintaining existing habitat, and controlling introduced vegetation (Ashley 1994).

Project enhancements over the past 14 years (since purchase in 1991) include 2,725 acres of agricultural conversion lands restored back to a native shrub-steppe habitat; 100,000 trees and shrubs planted to restore critical riparian areas; weed control on thousands of acres to promote perennial herbaceous cover; 58 miles of new boundary fence surveyed and constructed, 20 miles restored and 30 miles of interior fence removed; 150 acres of browse pruned to improve Mule deer forage; installed 100 bluebird nest boxes, and maintained and improved all infrastructure and equipment necessary to carry out project objectives.

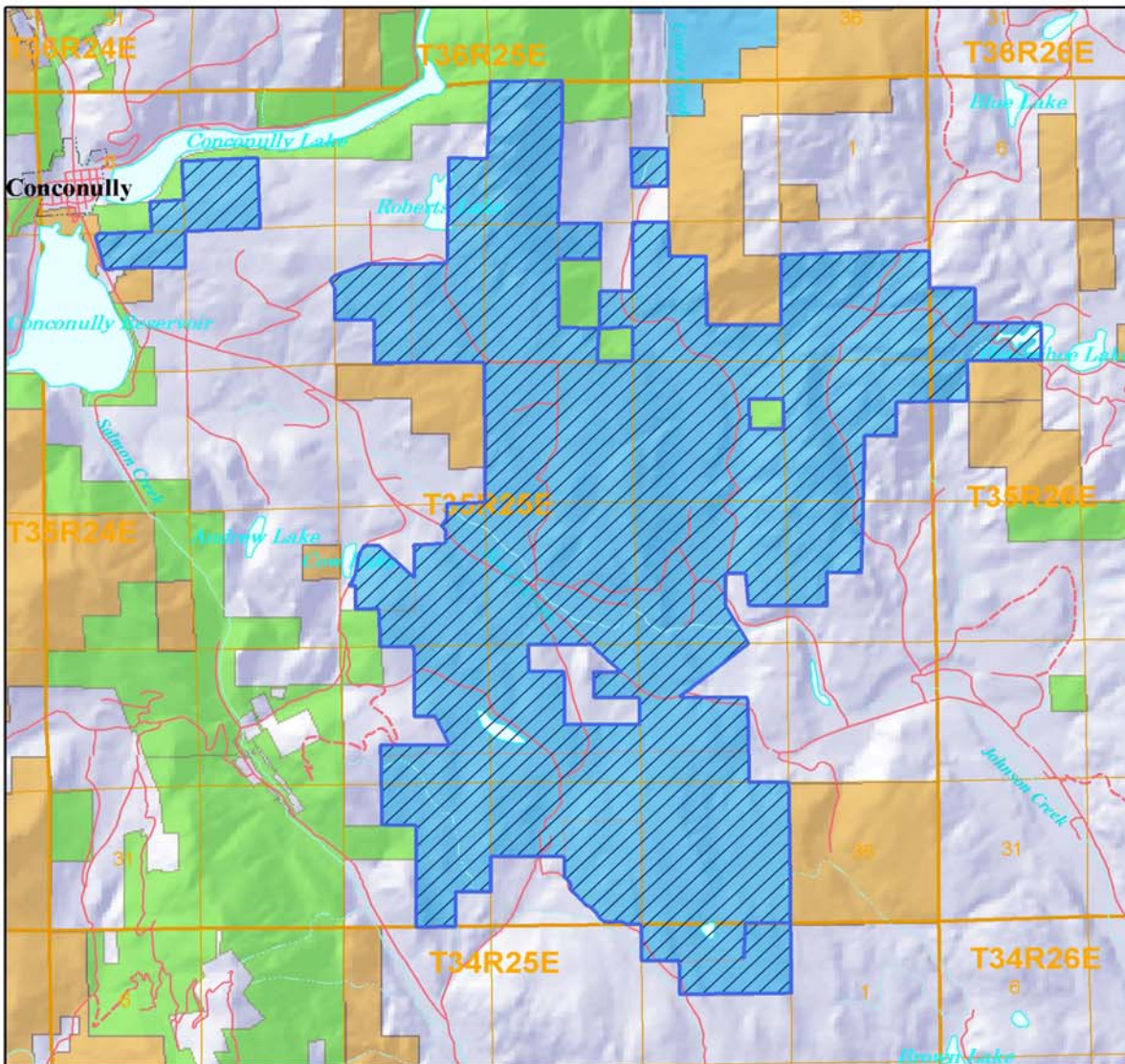
2.2 Ownership and Use of Adjacent Lands

The properties purchased for Sharp-tailed grouse protection were historically agricultural lands, used for cattle production and associated hay operations. The use of adjacent lands on all units is primarily used for similar purposes. Ag lands used for cattle grazing and agricultural production. These boundary lands are primarily privately owned with small portions in federal (BLM) or state ownership (DNR).

2.3 Property Location and Legal Description

The properties covered under this management plan are located in five separate localities in North Central Washington. The Scotch Creek unit (Figure 2) is located approximately 12 miles northwest of Omak and 4 miles southeast of Conconully. Legal Description: Parts of Sections 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 21, 22, 23, 24, 26, 27, 28, 33, 34, and 35, T35N, R25E; Part of Section 7, T35N, R26E; Part of Sections 2 and 24, T34N, R25E.

Figure 2. Scotch Creek Wildlife Area Unit



Washington Department of Fish and Wildlife

- Scotch Creek Wildlife Area Unit
 - Conservation Easement
 - WA Dept of Fish and Wildlife Owned Land
- Major Public Land Ownership**
- Federal Land
 - Other State Land
 - County Land
 - City Land
 - Tribal Land

Administrative Boundaries

- Township Line
- Section Line
- Shore Line
- County Line
- State Line
- International Border
- City or Town Limits

Transportation Network

- Interstate Highway
- US Highway
- State Route
- Secondary Road
- Trail

Hydrography

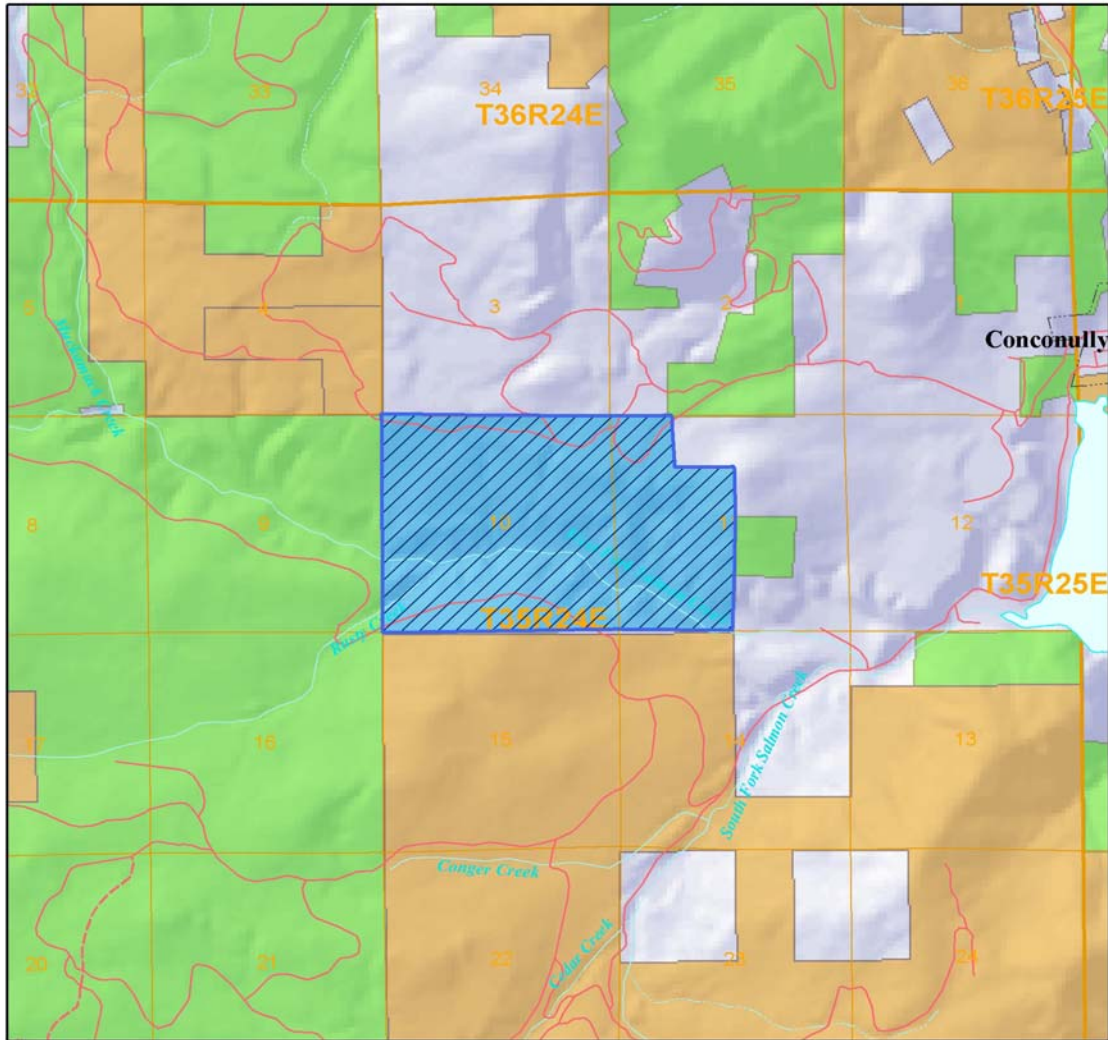
- Annual Stream or River
- Intermittent Stream
- Canal
- Shoreline
- Lake or Wide River

1:80,000

1 inch equals 1.3 miles

The Mineral Hill unit is located 2 miles southwest of Conconully along the West Fork of Salmon Creek. The unit is bordered by the DNR on the south, USFS on the west, and private lands to the north and east. Access is by Forest Service road #37 on the south or by Forest Service road #2340 on the north out of Conconully. Legal Description: Parts of Sections 10 and 11, T35N, R24E.

Figure 3. Mineral Hill Wildlife Area Unit



Washington Department of Fish and Wildlife

- Mineral Hill Wildlife Area Unit
 - Conservation Easement
 - WA Dept of Fish and Wildlife Owned Land
- Major Public Land Ownership**
- Federal Land
 - Other State Land
 - County Land
 - City Land
 - Tribal Land

- Administrative Boundaries**
- Township Line
 - Section Line
 - Shore Line
 - County Line
 - State Line
 - International Border
 - City or Town Limits

- Transportation Network**
- Interstate Highway
 - US Highway
 - State Route
 - Secondary Road
 - Trail

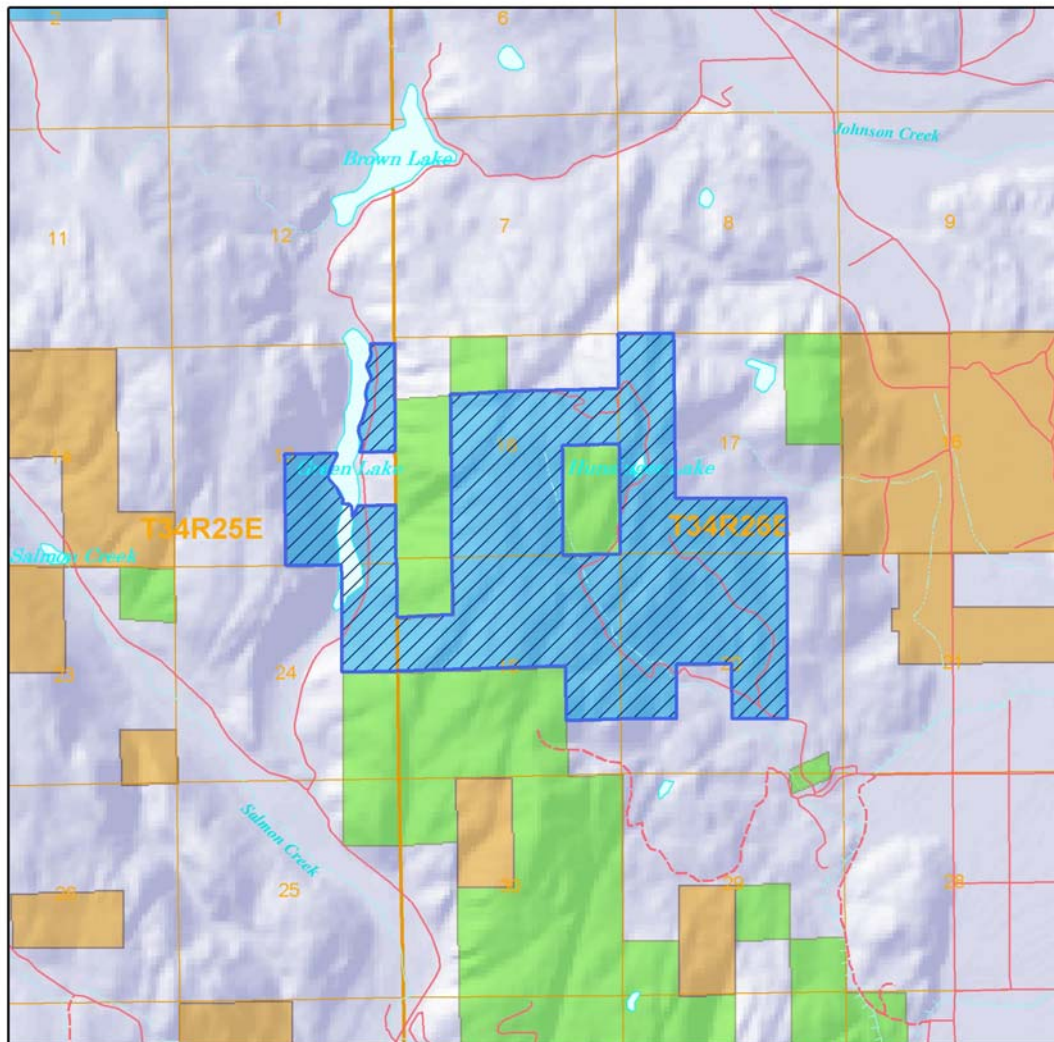
- Hydrography**
- Annual Stream or River
 - Intermittent Stream
 - Canal
 - Shoreline
 - Lake or Wide River

1:50,000

1 inch equals 0.79 miles

The Pogue Mountain Unit is located just four miles northwest of Omak and west of the Conconully Highway. Legal Description: Parts of Sections 17, 18, 19, and 20, T34N, R26E; Parts of Section 13 & 24 of T34, R25.

Figure 4. Pogue Mountain Wildlife Area Unit



Washington Department of Fish and Wildlife

- Pogue Mountain Wildlife Area Unit
- Conservation Easement
- WA Dept of Fish and Wildlife Owned Land
- Major Public Land Ownership**
- Federal Land
- Other State Land
- County Land
- City Land
- Tribal Land

Administrative Boundaries

- Township Line
- Section Line
- Shore Line
- County Line
- State Line
- International Border
- City or Town Limits

Transportation Network

- Interstate Highway
- US Highway
- State Route
- Secondary Road
- Trail

Hydrography

- Annual Stream or River
- Intermittent Stream
- Canal
- Shoreline
- Lake or Wide River

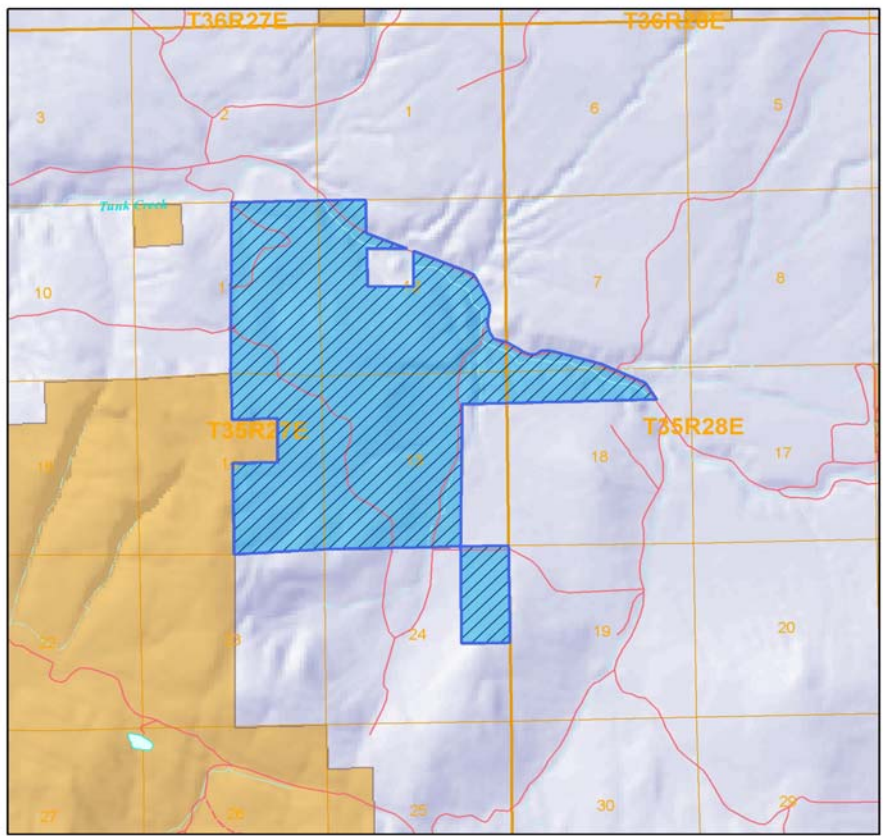
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1 inch equals 0.79 miles

The

Tunk Valley unit is located approximately twelve miles northeast of Omak and lies south of the Tunk Valley road, from 2.5 miles to 4.5 miles west of Synarep. Legal Description: Part of Sections 7 and 18, T35N, R28E; Part of Sections 11, 12, 13, 14 and 24, T35N, R27E.

Figure 5. Tunk Valley Unit

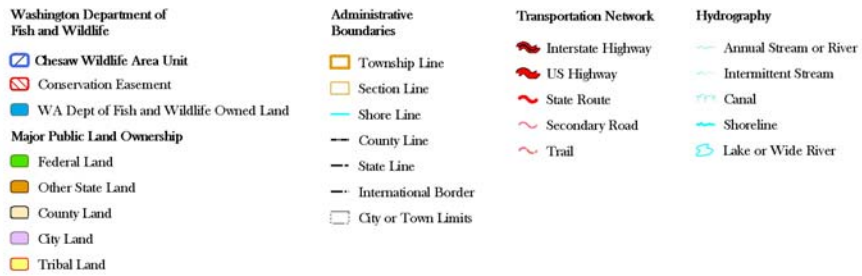
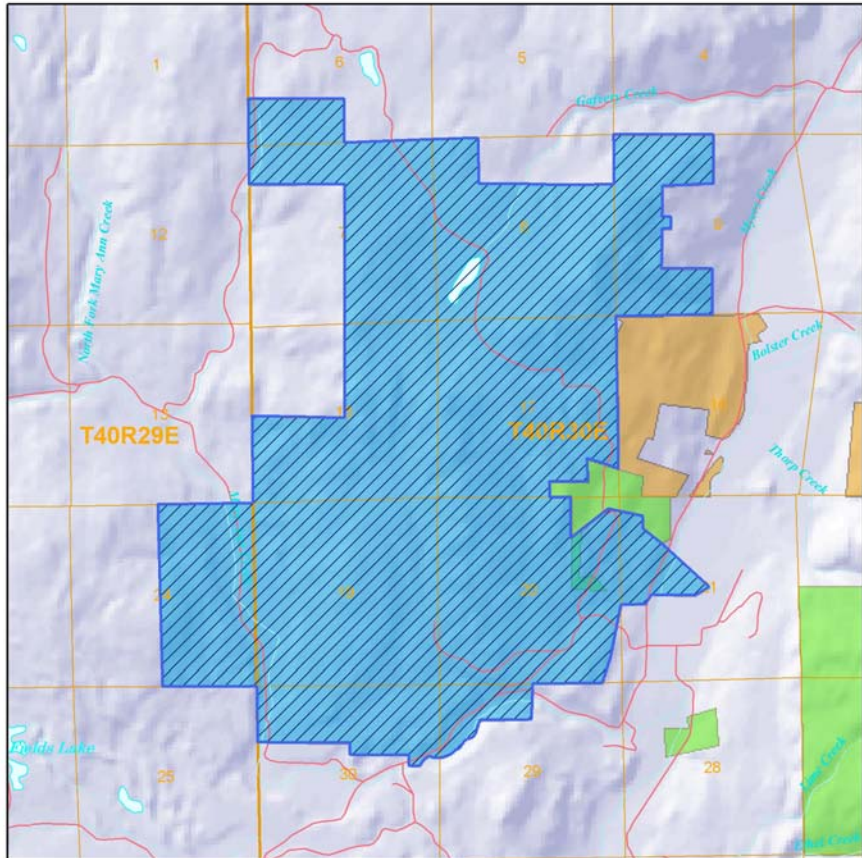


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|---|--|--|--|
| <p>Washington Department of Fish and Wildlife</p> <ul style="list-style-type: none"> Tunk Valley Wildlife Area Unit Conservation Easement WA Dept of Fish and Wildlife Owned Land <p>Major Public Land Ownership</p> <ul style="list-style-type: none"> Federal Land Other State Land County Land City Land Tribal Land | <p>Administrative Boundaries</p> <ul style="list-style-type: none"> Township Line Section Line Shore Line County Line State Line International Border City or Town Limits | <p>Transportation Network</p> <ul style="list-style-type: none"> Interstate Highway US Highway State Route Secondary Road Trail | <p>Hydrography</p> <ul style="list-style-type: none"> Annual Stream or River Intermittent Stream Canal Shoreline Lake or Wide River |
|---|--|--|--|

1:50,000
1 inch equals 0.79 miles

The Chesaw Unit lies in the northwest portion of Okanogan County, some four miles south of the Canadian border and approximately 10 miles west of the Ferry County line. The property lies approximately 20 miles east of Oroville, and immediately northwest of the small community of Chesaw. Legal Description: Parts of Sections 6, 7, 8, 9, 17, 18, 19, 20, 21, 29, and 30, T40N, R30E. Part of Section 24, T40N, R29E.

Figure 6. Chesaw Unit



1:50,000
1 inch equals 0.79 miles

2.4 Funding

All of the properties for the Scotch Creek Wildlife Area units were purchased by the Washington Department of Fish and Wildlife (WDFW) with funds provided by the Washington Wildlife and Recreation Program (WWRP). These funds are provided by the Washington State legislature, in response to the rapidly expanding human population in Washington State, to protect critical wildlife habitats and recreation areas. In the first year of this program, Okanogan County received funding for approximately 14,000 acres of critical shrub steppe habitat, for the protection of Sharp-tailed Grouse (STG) and other obligate species. This was the beginning of the Scotch Creek Wildlife Area (SCWA), which has expanded with this funding program to the present size of 16,560 acres in three geographic locations of North Central Okanogan County.

At the time of acquisition in 1991, the Scotch Creek Wildlife Area units were complexed with the Sinlahekin wildlife area and the operation and maintenance funding provided for the Sinlahekin was shared between all areas. However weed control, property boundary survey, and new fence construction costs were provided with WWRP program funding for the first three years after acquisition. Operations and maintenance funding for the Sinlahekin was from Federal Aid in Wildlife Restoration Funds, with state general funds providing a 25% match for Federal Aid dollars. In 1997, the Bonneville Power Administration (BPA) accepted full management responsibilities to partially meet BPA's mitigation obligation to compensate for losses resulting from the construction of Grand Coulee and Chief Joseph hydroelectric dams. By funding the habitat enhancements and operations and maintenance (O&M) for the life of the project, BPA will receive credit towards their mitigation debt. The budget for the 2005 fiscal year is \$289,225, which supports all operations and maintenance including salaries on the area. Scotch Creek Wildlife Area staff includes:

- 1.0 FTE, Wildlife Area Manager (Fish and Wildlife Biologist 3)
- 1.0 FTE, Assistant Wildlife Area Manager (Maintenance Mechanic 1)
- 0.75 FTE, Maintenance Mechanic 1
- 6 month WCC Crew, (Supervisor, Crew leader, and 2 crew members)

The Department will, as part of the implementation of this plan, submit grant proposals and applications and identify other strategies to address unfunded management needs on the wildlife area.

2.5 Climate

Precipitation varies from the Scotch Creek unit, at 1,600 feet, the lowest in elevation and receives approximately 12 inches of precipitation, to the Chesaw unit at 4,000 feet and receives approximately 18 - 20 inches of precipitation annually. Average annual maximum temperature for Okanogan is 63.2 while the average minimum temperature is 38.2, and the mean temperature is 50.7 degrees F (Okanogan County Info Book, 2003). The frost-free season is 130 to 150 days. See Climatic Data – Appendix 5.

2.6 Soils and Geology

Soils in the Scotch Creek unit consist mainly of the Conconully Series. These consist of deep, well drained soils formed in glacial till. These nearly level to very steep soils are on uplands at elevations of 1,500 to 3,000 feet. Conconully soils are used mainly for irrigated orchards, hay, and pasture. Some areas are used for dryland crops, grazing, and woodland. The soils in the Tunk Valley unit consist mainly of the Owhi Series. These are deep, well drained soils underlain

by very gravelly coarse sand. These nearly level to steep soils are on terraces and terrace escarpments at elevations of 1,400 to 3,000 feet. They formed in glacial outwash. Permeability is moderately rapid to a depth of 31 inches and very rapid below. The available water capacity is low or moderate and roots penetrate to 60 inches or more. Owhi soils are used mainly for the same purposes as the Conconully series. Soils on the Chesaw unit are primarily of the Molson-Lithic Xerochrepts-Koepke association and the Republic-Mires-Chesaw association. Soils of these associations are characteristically deep, well drained and formed in glacial till. In various locations, volcanic ash forms a portion of the inorganic soil matrix.

2.7 Hydrology and Watersheds

The main unit has Scotch Creek, a spring fed stream originating approximately 3 miles west of the WLA boundary. The creek subs into a marsh area at the eastern boundary of the WLA. There are no inlets, outlets or tributaries to this 10-mile long perennial stream. Several springs and two lakes are also located on the property. Tunk Creek traverses the northern boundary of that unit, which also has several springs and one man made pond. Both of these units drain into the Okanogan River watershed. The Chesaw unit has Mary Ann Creek, a perennial stream that flows in a southerly direction. Numerous beaver dams and remnants of dams exist on this stretch of the creek. The flood plain along Mary Ann Creek is fairly wide in selected areas. Riparian vegetation flourishes on the floodplain and along stream channel. Several springs are located on the Chesaw unit, one of the larger springs is used as the source of potable water for the residence. Water from this spring is piped to and collected in a concrete cistern for storage until needed. This unit also has several lakes and man-made ponds.

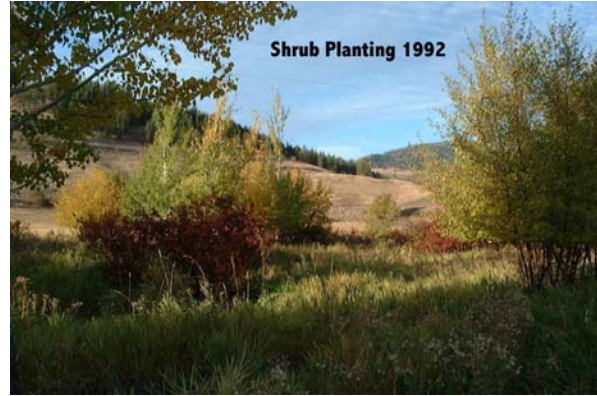
2.8 Fire History

Three small grass fires have occurred on the Scotch Creek Unit over the past 5 years. All these fires were sparked by man made causes and burned during the dry and hot fire season. All were contained to less than 100 acres due to the quick response time of Fire District #9, and the Washington Department of Natural Resources. Fires prior to WDFW ownership are not known. When talking with the previous owner of the Chesaw unit, Bill Byers, he noted that he has not had a fire on the area in his 40 year ownership.

2.9 Vegetation Characterization

The 8,694-acre Scotch Creek unit consists of 4,247 acres of shrub-steppe (grassland with > 15% shrub canopy cover), 3,713 acres of grassland (< 15% shrub canopy cover), 522 acres of conifer forest, 80 acres maintained in agricultural (sharecrop fields), 75 acres riparian, and 57 acres in surface water.

Since acquisition nearly all of the 1,500 acres of dryland agricultural fields have been restored to a native shrub-steppe habitat, providing diversity and nesting cover for STG. In addition over 100,000 trees and shrubs have been planted in every spring, wet draw, north-slope and more recently, under irrigation, to provide the critical winter habitat needed for STG survival. In recent years between 30 and 40 STG have wintered in the Water Birch plantings near the Headquarters.



In addition over 100,000 trees and shrubs have been planted in every spring, wet draw, north-slope and more recently, under irrigation, to provide the critical winter habitat needed for STG survival. In recent years between 30 and 40 STG have wintered in the Water Birch plantings near the Headquarters.

Table 1. Scotch Creek Unit cover types/acres.

Cover Type	Acres
Shrub-Steppe	4,247
Grasslands	3,713
Conifer Forest	522
Agriculture	80
Riparian	75
Surface Water	57

The 920-acre Mineral Hill unit consists of 610 acres Conifer forest, 253 acres of grasslands, and 57 acres of Riparian Forest.

Table 2. Mineral Hill Unit cover types/acres.

Cover Type	Acres
Conifer Forest	610
Grasslands	253
Riparian	57

The 1,196-acre Pogue Mountain unit is predominately shrub-steppe with tall stands of mature big sagebrush along the lower elevations. The area is comprised of three cover types. Shrub-steppe consists of 720 acres, Conifer forest 475 acres, and surface water, 1 acre.

Table 3. Pogue Mountain Unit cover types/acres.

Cover Types	Acres
Shrub-steppe	720
Conifer Forest	475
Surface Water	1

The majority of the Tunk Valley unit is classified as shrub-steppe, with a small stand of timber on the steep North Slope in the center of the property and healthy stands of riparian trees and shrubs present along Tunk Creek. Approximately 300 acres of native rangeland has been converted to agriculture in the past. 125 acres of the most weed infested of these areas have been restored to native grasslands in 2001 using enhancement funds from the BPA.

Table 4. Tunk Valley Unit cover types/acreage.

Cover Types	Acres
Shrub-Steppe	981
Riparian	178
Grasslands	172
Conifer Forest	68

The Chesaw area has relatively gentle topography over much of the area with lower elevations near 3,200 feet and higher reaches at 4,200 feet in elevation. The area is a contiguous irregular shaped parcel comprised of five cover types. This 4,311-acre unit is comprised of 2,176 acres of grasslands, 1,503 acres of shrub steppe, 448 acres of Conifer forest, 144 acres Riparian, and 40 acres of Surface water.

Table 5. Chesaw Unit cover types/acres.

Cover Type	Acres
Grasslands	2,216
Shrub-steppe	1,503
Conifer	448
Riparian	144
Surface water	40

2.10 Important Habitats

Shrub-steppe; The major driving force behind all of the Scotch Creek acquisitions has been the protection and restoration of shrub-steppe habitats, for the recovery of the Sharp-tailed grouse population. This critical component of the prairie grouse life cycle is in high demand for agricultural purposes. The shrub-steppe component in the sharp-tailed grouse management areas will be permanently protected.



Native Shrub-steppe and Grassland

Riparian; An equally important habitat for the recovery of Sharp-tailed grouse is the deciduous shrubs and trees along all water courses, ponds, springs and seeps. This vegetation is critical for wintering grouse when snow levels cover their preferred upland habitats.

Cliffs and Bluffs; Limited availability for a number of dependent species of wildlife. Provides valuable habitat for raptors and other non-game wildlife. Golden Eagle nesting sites have been documented on Dunn Mountain, and potentially just east of the Pogue mountain boundary.

2.11 Fish and Wildlife

The Columbian sharp-tailed grouse have undergone a dramatic decline throughout Washington. The Washington Fish and Wildlife Commission listed this species as threatened in 1998 and they have been petitioned for federal listing. Small, isolated populations in Washington are present only in Okanogan, Douglas, Spokane, and Lincoln Counties. Protection measures taken by the DFW since the acquisition of Scotch Creek in 1991 have been successful. This is the only area in the state



Sharp-tailed Grouse Population Decline

where Sharp-tail grouse numbers have been increasing over the past 10 years. Habitat enhancements and genetic augmentation through supplementation efforts are having a positive effect.

Priority species, which are found on the wildlife areas include; bald eagle, golden eagle, peregrine falcon, prairie falcon, northern goshawk, blue grouse, chukar, ring necked pheasant, lewis woodpecker, loggerhead shrike, White-tailed deer 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:

Columbian Sharp-tailed grouse	ST
Loggerhead shrike	SC, FSC
Western bluebird	SC
Sage thrasher	SC
Sage sparrow	SC
Northern goshawk	SC, FSC
Ferruginous hawk	ST, FSC
Golden eagle	SC
Peregrine falcon	SE, FSC
Burrowing owl	SC, FSC
Pileated woodpecker	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 strategies. *Public issues from past planning efforts and the Citizens Advisory Group are noted in italics and are captured in Appendix 1.* Objectives and associated strategies or tasks specific to the Scotch Creek Wildlife Area are listed where appropriate under applicable agency objectives. Unfunded needs are underlined.

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

1. Maintain big game populations

Mule Deer: The SCWA units were purchased primarily for Sharp-tailed grouse. However Mule Deer and White-tailed deer habitat is present on all areas. Activities to meet the statewide management objectives will be performed on those habitat areas. The Mineral Hill, Pogue Mountain, and Limebelt units of the SCWA are managed for mule deer winter range and diversity of other obligate species. In addition the Tunk Valley, and Chesaw units contain important habitats for mule deer. Fire suppression over the past 100 years has changed the lower elevation landscape from open ponderosa pine savannah forest in which the Washington Mule deer evolved to dense stands of small ponderosa pine and Douglas fir. Additionally, Ponderosa pine and Douglas fir have invaded areas that once were open steppe or shrub-steppe habitats. The resulting habitat changes, e.g., early successional vegetation types have declined and late successional stages have increased. Habitat changes from fire exclusion include vegetation composition, vigor, nutritional quality, structural and species changes as well as homogenization of habitats, i.e., loss of a mosaic of habitats comprised of early to late successional stages and all the variability of plant community composition. The historic frequent fire regime likely contributed to spatially decreased densities of parasites and diseases of Mule deer. *Public comments include: Plant food plots to pull deer off of private ground and feed for sharp-tailed grouse; Manage for sensitive species and priority species.*

The Game Management Plan Statewide Goals for deer management calls for:

“1. Preserve, protect, perpetuate, and manage deer and their habitat to ensure healthy, productive populations.

2. Manage deer for a variety of recreational, educational, and aesthetic purposes including hunting, scientific study, cultural, subsistence, and ceremonial uses by Native Americans, wildlife viewing, and photography.

3. Manage statewide deer populations for a sustainable annual harvest.”

Additionally Objective 57 under Mule deer management states:

“Try to maintain or enhance mule deer habitat including forage and security cover.

Direct the Department’s focus toward mule deer habitat improvement and protection.”

And the Strategies under Objective 57 are listed as:

“a. Acquire critical mule deer habitat or conservation easements on critical mule deer habitat.

b. Work with state, federal, and private land managers to conduct prescribed burns that will benefit mule deer.

- c. Work with county government growth management planners to limit the expansion of human development on mule deer range.”
- d. Work with the Mule Deer Foundation to conduct projects that improve winter range for mule deer.”

A. Strategy: Conduct, in cooperation with the Mule Deer Foundation and others, prescribed fuels treatment, e.g., thinning and logging on all timbered units of the SCWA to improve Mule deer habitat quality. Timeline will depend on availability of DFW Forester and BPA funding. This includes portions of the Limebelt unit, Pogue Mountain, Mineral Hill, and Chesaw.

B. Strategy: Conduct, in cooperation with the Mule Deer Foundation and the North Central Washington Prescribed Fire Council, prescribed burning on all timbered units of the SCWA to improve Mule deer habitat quality. This includes portions of the Limebelt unit, Pogue Mountain, Mineral Hill, Tunk Valley and Chesaw. Timeline will depend on liability and smoke management issues being addressed by the NCWPFC.

C. Strategy: Work with adjacent landowners and other landowners to acquire conservation easements or use other means to provide long-term protection of Mule deer habitat. Timeframe: Ongoing

D. Strategy: Work with private, county, state and federal land managers to promote use of prescribed fire, in a coordinated effort on all lands, to improve Mule deer habitat. Timeframe: Ongoing

E. Strategy: Use well managed livestock grazing treatments where appropriate as a tool to improve habitat for Mule Deer. Spring allotments may reduce competition with shrubs (winter deer forage) and reduce fuels for a possible wildfire. Another strategy may be late summer/fall livestock use to remove mature herbaceous plant material and to promote winter and spring forage available to deer. Timeframe: Ongoing

F. Strategy: Continue alfalfa food plots to attract deer off of private ground. Timeframe: Ongoing

G. Strategy: Restore mule deer wintering habitat. Seed or plant bitterbrush in burned and/or disturbed areas as they arise.

2. Improve and maintain fish populations

Scotch Creek is a spring fed perennial stream that originates approximately 3 miles west of the property boundary and subs into a marshy area just east of the property boundary. It has no inlet, outlet, or tributaries. Only non-native brook trout inhabit the waterway with the largest fish observed about 6”. Other ponds or springs on the unit do not support fish and have been drastically reduced due to the recent drought. The Mineral Hill unit has one mile of the West Fork Salmon Creek, which is a natural mountain stream with typical native salmonid species, including rainbow trout, sculpins and dace. The West Fork is above a natural barrier and is considered to never have had anadromous fish species at this elevation. Pogue Mountain has no fish bearing waterways. Tunk Valley has approximately 2 miles of Tunk Creek. Again, with the typical native salmonid species mentioned above, and above a natural barrier, which precludes any anadromous species from the Okanogan River. The Chesaw unit contains about 1½ miles of Mary Ann Creek, a tributary of Myers Creek and the San Poil River. Native salmonids occur throughout this system. The exact fish species composition on Scotch Creek Wildlife Area units are not know and will be a strategy

in 2006 to determine what fish species are present in all fish bearing waterways of the Scotch Creek units. No Threatened or Endangered species of fish are present on any of the wildlife area units.

A. Strategy: Assess fish species composition and abundance on all streams of the SCWA in summer 06.

3. Manage for upland birds

The SCWA was purchased primarily to protect sharp-tailed grouse and to enhance native shrub steppe habitat. This will continue to be the highest priority in steppe and shrub steppe habitats. Natural production of other upland birds on the wildlife area provide recreational opportunities and will be permitted as long as impacts to sharp-tailed grouse are minimized. The Grey Partridge is the most common game bird on the Scotch Creek unit. Accidental take of STG by upland game bird hunters is a major concern of the WDFW. *Public comments: Need augmentation of indigenous STG populations with birds from other areas. Consider all species of grouse in management plans.*

A. Strategy: Maintain springs and guzzlers to provide water for upland birds and other species. Timeframe: Spring 2006.

B. Strategy: Sign and patrol to ensure no accidental take of STG occurs during hunting seasons. Timeframe: Ongoing

C. Strategy: Supplement STG populations with birds from outside the area when the opportunity arises. Timeframe: Depends on the availability of STG from other states.

4. 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. *Public comments: Broaden wildlife area management to include multiple species management. Include in the Wildlife Area goals a broadened approach to preserve, protect and manage for fish and wildlife species diversity (including habitat diversity) not just game species.*

A. Strategy: Assess timber-thinning projects to reduce potential insect and catastrophic fire danger and create forest conditions more suitable to a diversity of species.

B. Strategy: Determine species use and need by conducting and or facilitating surveys of various bird, reptile, amphibian and mammal species. Cooperate with agencies and birding groups to acquire information on wildlife use of the area.

5. Protect and restore riparian habitat

The agency has prioritized riparian habitat management and protection. Riparian areas provide habitat for a large diversity of fish and wildlife species, for high densities of animals, for important breeding areas and movement corridors.

A. Strategy: Restore 1/2 mile of Scotch Creek below the Headquarters to mimic a natural stream corridor (low gradient) with a wide, narrow, and deep meandering channel. Replant riparian vegetation. Timeframe: Summer 2007.

B. Strategy: In areas permitted for grazing by domestic livestock on Chesaw and the limebelt unit of Scotch Creek, fence riparian habitats to protect from

unmanaged grazing impacts. Protect Aspen stands, and other wetland habitats, while providing for stock water. Timeframe: Summer 2006.

6. Protect and restore shrub steppe habitat

The SCWA has the highest priority to protect and enhance shrub-steppe habitat. The agency has also prioritized shrub-steppe habitat management and protection. Shrub steppe areas provide habitat for a diversity of fish and wildlife species and for comparatively high densities of animals. Shrub steppe is also very vulnerable to habitat conversion and alteration practices. Over the past 14 years (since acquisition) all units of the SCWA have undergone native shrub steppe restoration. Over 2,700 acres have been restored from an agricultural field composition to a diverse mix of native grasses and forbs. *Public Comments: Need more restoration planting of native grasses for STG.*

An important aspect of protecting and restoring habitats on the Scotch Creek WLA involves securing in-holdings and adjacent properties that if converted to non-compatible uses would seriously compromise the integrity of existing wildlife area lands. The department is currently working to acquire an important in-holding on the north end of the Scotch Creek Unit that would connect the Scotch Creek Wildlife Area and the Sinlahekin Wildlife Area. Non-wildlife compatible uses on this property would seriously undermine the long term viability of adjacent fish and wildlife lands and could seriously impact sharp-tail grouse recovery plans. This property is available from a willing seller.

A. Strategy: Perform shrub steppe condition surveys to assess habitat quality issues. Timeframe: Summer 2006.

B. Strategy: Continue to restore old agriculture fields to native shrub steppe habitat. Timeframe: At rate of 100-acres per year for the next 25 years.

C. Strategy: Conduct, with the cooperation of the DNR and other fire districts, prescribed fire on the shrub steppe habitat of the Tunk Valley unit to promote a higher cover of herbaceous plants and create a mosaic of woody species to increase overall diversity. Timeframe: Depends on funding, smoke management policy, permits and potential liability.

D. Strategy: Collect seeds of native plant species on the SCWA to have commercially grown to provide a large quantity of locally adapted seed stock for restoration purposes.

E. Strategy: Evaluate and use prescribed fires on all areas where appropriate to rejuvenate and improve shrub-steppe habitat and reduce the risk of catastrophic fires.

F. Strategy: Apply for acquisition grants to purchase important in-holdings on Scotch Creek Wildlife Area. Timeframe: Summer 2006

7. Protect and manage other species

A. Strategy: Maintain high quality shrub-steppe, forest, and riparian habitat conditions to enhance obligate species protection. Timeframe: Ongoing

B. Strategy: Protect nesting and foraging habitat for several woodpecker species. Protect and create snags. Many cavity nesting forest birds depend on the primary cavity excavators. Many, like the white headed woodpecker, depend on large diameter snags for foraging and nesting. Timeframe: Year-round.

C. Strategy: Maintain and expand nest box placement on all units. Timeframe: Spring 2006.

Agency Objective: Ensure 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 control is required by state law to protect public economic and natural resources. Invasive weeds are one of the greatest threats to fish and wildlife habitat quality. Cooperative weed efforts are encouraged to improve efficacy and to minimize impacts on adjacent landowners as part of the agencies good-neighbor priority. *Public Comments: There have been successes, but there are other weeds present and a sustained effort at eradication and control needs to be maintained. Keep weed management in plan when planning activities that create disturbance. Other comments from weed control board, as well as weed control plan are in appendix 2.*

A. Strategy: Produce and implement weed management plan (**Appendix 2**) to include weed identification and inventory, risk/threat, control priorities, and monitoring. Timeframe: 2006.

B. Strategy: Coordinate weed efforts with federal, state and local entities to improve efficacy and minimize costs. Timeframe: Ongoing

C. Strategy: Mow Russian knapweed patches in July 2006, and treat with herbicides in November 2006 on Scotch Creek and Tunk Valley units.

D. Strategy: Search and destroy new invaders and “B” designate weed species, including Dalmatian Toadflax, Scotch Thistle, Musk Thistle, and Whitetop on all units. Continuous survey work is required. Timeframe: Ongoing

E. Strategy: Increase control efforts on Houndstounge on Chesaw and Pogue mountain units. Timeframe: Ongoing

F. Strategy: Continue to use Integrated Pest Management strategies, including biological control, chemicals, mechanical and cultural methods, to control invasive weeds. Timeframe: Ongoing

G. Strategy: Continue to control weeds along all roads on the SCWA - TBD miles of roads to reduce the spread of weeds. Timeframe: Year-round

H. Strategy: Map all weed locations using GPS to create GIS layers showing locations of weeds and to assist in monitoring weed control efforts. Timeframe: Spring 2006

I. Work with the Contracts Office to obtain a contract with Okanogan County jail to allow use of trustee work crews to cut and pull weeds. Timeframe: 2006.

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: Protect buffers adjacent to wetlands and riparian habitat. Timeframe: Ongoing

B. Strategy: Strategy: List specific management practices associated with ESA species present or likely present. Timeframe: End of 2006

C. Strategy: Inventory all forest roads and fish passage structures to identify sedimentation and passage issues. Timeframe: Fall 2005

D. Strategy: Complete a forest Road Management and Abandonment Plan.

E. Strategy: Use PHS maps to identify all ESA species and their habitats on the SCWA and develop GIS layers depicting the location and species. Timeframe: End of 2006

3. Provide fire management 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.

A. Strategy: Contract with local, state or federal entities annually to provide fire suppression support on all units of the Scotch Creek Wildlife Area. Timeframe: 2006

B. Strategy: Provide red card fire training for wildlife area manager and assistant manager and annual refresher courses. Develop a list of fire responsible individuals. Timeframe: Ongoing

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. Timeframe: Spring 2006

B. Strategy: Perform cultural resource survey and assessment before digging-including posts for new fence line, parking lots, toilets, buildings, renovation of agricultural fields, etc. Timeframe: Ongoing

5. Pay county PILT and assessment obligations

State law requires the agency to pay PILT and county assessments.

A. Strategy: Pay PILT and assessments to counties. Timeframe: By April 15th of each year.

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. Protect and preserve sensitive wildlife sites such as active Sharp-tailed 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.*

- A. Strategy: Provide open roads where no resource issues exist and when there are sufficient resources to maintain them. Assess a seasonal opening to improve public access to the Tunk Valley unit. Provide a parking/turnaround area. Timeframe: Summer 2006.
- B. Strategy: Close road access where road conditions are not safe or where conditions have a significant negative impact on fish and wildlife. Timeframe: Ongoing
- C. Strategy: Assess the possibility of easements or acquisition to provide public access to Pogue Mountain. Work with the DNR to provide parking off the Conconully Highway and construct a foot/horse trail to the 1,150 acre unit.
- D. Strategy: Protect and preserve sensitive wildlife sites such as active Sharp-tailed lek sites, active Bald and Golden eagle nests, and big game wintering areas from human disturbance. Timeframe: Year-round
- E. Strategy: Provide limited camping where no resource issues exist. Dispersed camping and adjacent to public roads is allowed throughout the SCWA units. Firewood cutting is allowed for camp use only and only for downed trees. Do not cut snags. Timeframe: Year-round
- F. Strategy: Provide hunting opportunities for persons with disabilities. One late season permit is available on the Chesaw unit to access the Strawberry Lake area by vehicle. Timeframe: Ongoing
- G. Strategy: Develop brochure and map of SCWA units for public distribution.
- H. Strategy: Develop GIS layers of all resources, roads, trails, parking and camping areas, and other facilities available to the public. Timeframe: 2006.
- I. Strategy: Construct parking area for public access to the Chesaw unit.

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 office to provide a safe and effective workplace. Provide utilities, phone, computers, etc. Timeframe: Year-round
- B. Strategy: Maintain all fences to prevent trespass livestock thereby protecting habitat. Survey entire boundary fence in early spring as weather and snow conditions allow. Timeframe: Year-round
- C. Strategy: Survey ownership and construct 2 miles new stock fence on the south boundary of Scotch Creek unit to describe property boundary and prevent trespass livestock.
- D. Strategy: 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. Timeframe: Year-round
- E. Strategy: Maintain roads to prevent resource damage and provide access. Silver Hill, Tunk Creek, and Chesaw interior roads need to be graded and rocked.
- F. Strategy: Maintain parking areas to prevent resource damage and provide access. Maintain all signs and reader boards.
- G. Strategy: Using the Region Two Facility/Building Inventory Assessment, identify the five highest priority structures that need to be addressed based on safety issues. Work with engineering staff to schedule and complete work. Engineering should include a cultural resource assessment for historic structures.

Surplus any materials/structures to generate revenue prior to demolition or removal. Timeframe: Fall 06.

H. Strategy: Advertise for surplus, residence and outbuildings on the new Happy Hill LLC acquisition. Timeframe: Spring 06. Complete removal of materials. Timeframe: November 2006.

I. Strategy: Replace one ¼ mile wheel-line and mover to improve irrigation operations in the Coulee Creek sharecrop.

2. Maintain other structures and physical improvements

A. Strategy: Maintain all signs, gates, culverts, water structures, wells, irrigation systems to perform operation and maintenance of area. Timeframe: Ongoing

B. Strategy: Replace/install new boundary and unit signs. Timeframe: Ongoing

3. Maintain equipment

A. Strategy: Service all equipment including trucks, tractors and implements, weed sprayers, trailers, etc. Request replacement equipment when needed.

Timeframe: Ongoing

B. Strategy: Rent equipment when it is more efficient to do so or when needed.

Timeframe: Ongoing

4. Pursue funding opportunities

A. Strategy: Apply for grants and other funding opportunities consistent with planned priorities to supplement funding. Timeframe: Ongoing

B. Strategy: Enroll lands in CRP and other federal programs to generate revenue and accomplish desired habitat conditions. Timeframe: Ongoing

C. Establish sharecropping agreements with neighbors to address artificial cultivation needs and generate additional revenue to support enhanced O&M.

Timeframe: Ongoing

D. Strategy: Pursue “Internship” program for student volunteers to work on the SCWA. Timeframe: Ongoing

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

The history of fire suppression in many cases has resulted in forest tree densities far greater than historic levels. Dense forest stands may create fire safety issues and risk to the spread of detrimental forest insects and disease.

A. Strategy: Assess timber-thinning projects on Pogue Mountain and Chesaw units to reduce potential insect and fire danger and create forest conditions more suitable to a diversity of species.

6. Perform administrative responsibilities

A. Strategy: Develop and monitor budgets. Timeframe: Ongoing

B. Strategy: Supervise employees. Timeframe: Ongoing

C. Strategy: Maintain files and records. Timeframe: Ongoing

D. Strategy: Write reports. Timeframe: Ongoing

E. Strategy: Monitor for compliance, and renew grazing and sharecrop leases.

Timeframe: Ongoing

F. Strategy: Attend and participate in CRM meetings involving grazing permits on the SCWA or adjacent lands that could impact management on the SCWA.

Timeframe: Ongoing

G. Strategy: Work with staff to ensure high morale and job satisfaction. Hold staff meetings and promote self-motivation and good work ethics. Timeframe: Ongoing

H. Strategy: Supervise contractors, lessees, permittees, volunteers, Washington Conservation Corps employees, other WDFW personnel, public and private organizations and fire crews on the area. Timeframe: Ongoing

I. Strategy: Write, update and implement a wildlife area management plan, weed control plan and fire control plan. Timeframe: Ongoing

J. Strategy: Conduct wildlife and habitat surveys. Identify and prioritize information and survey needs. Timeframe: Ongoing

K. Strategy: Manage an extensive equipment inventory used for habitat maintenance, enhancement, restoration and preservation. Timeframe: Ongoing

L. Strategy: Plan for and purchase supplies, tools and equipment. Timeframe: Ongoing

M. Strategy: Attend meetings and meet with private individuals and agency representatives as needed. Timeframe: Ongoing

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 in-stream volumes for fish and other animals.

Public comment: Water rights – keep them up-to-date so you don't lose them. Water developments – Make sure regulations and policies regarding springs and intermittent streams are met.

A. Strategy: Identify and record all water rights and uses of water (**Appendix 4**). Timeframe: Fall 2005

B. Strategy: Move all unneeded water rights permanently or temporarily into the State Trust Water Rights Program. Timeframe: Ongoing

C. Strategy: Use water rights efficiently and effectively. Timeframe: Ongoing

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: Ensure that management of the wildlife area considers watershed plan recommendations. Timeframe: Ongoing

B. Strategy: Cooperate with private and public landowners to maintain and improve watershed quality. Timeframe: Ongoing

C. Strategy: Work with the Natural Resources Conservation Service (NRCS) to pursue possibilities for the Conservation Reserve Program, the Wetland Reserve Program and other conservation programs. Timeframe: Ongoing.

CHAPTER IV: PERFORMANCE MEASURES, EVALUATION AND UPDATES TO THE SCOTCH CREEK WILDLIFE AREA PLAN

Accomplishments and desired outcomes will be evaluated to produce an annual performance report. 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. The Scotch Creek Wildlife Area Performance Measures:

- Reseed 100 acres of agricultural fields on the Scotch Creek unit to native shrub steppe habitat.
- 1,000 trees and shrubs planted to expand deciduous riparian habitat on all units.
- Expand and maintain nest boxes
- Maintain all previous (over 100,000) shrub plantings.
- Stop all Musk Thistle seed production on Chesaw with spot spraying and hand pulling crews.
- 5 structures removed and/or repaired that have been identified as safety concerns. Perform cultural resource survey on all structures prior to demolition.
- Survey and repair 60 miles of boundary fence on all SCWA units.
- Replace flooded reed canary grass marsh with a functional stream channel that mimics natural stream morphology (.25 miles) on the Scotch Creek unit below the Headquarters.
- Monitor all existing sharp-tailed grouse leks, and search adjacent lands for new leks.
- Maintain contact with CAG at least once per year.
- Plans completed including WA plan, weed plan, and RMAP.
- Initiate timber-thinning project on Pogue Mountain. Pursue the possibility of a fuels treatment implementation grant through the National Fire Plan.
- Initiate timber-thinning project on Chesaw.
- Initiate prescribed burning treatments on both logged units.
- Monitor 2 grazing permits.
- Survey and list all fish species on wildlife area streams.
- Complete construction of Tunk Creek Bridge.
- Improve access road surface and construct parking area on Tunk Valley unit.
- Assess the possibility of DNR and private lands lease to create public access to Pogue Mountain.
- Mow 200 acres of Russian Knapweed on Scotch Creek and treat with herbicides in late fall.
- Survey Tunk Valley unit for Dalmatian Toadflax and destroy all new invaders.
- Increase Houndstounge control on Chesaw and Pogue Mountain.
- Move unneeded water rights to trust.
- Survey and fence 2 miles of Boyce acquisition south boundary line.
- Grade and gravel 1 mile of Silver Hill road, and 1 mile Tunk Valley road.
- Install new wood routed entrance sign at Chesaw.
- Provide parking area on the Chesaw unit.
- Assess Habitat conditions.

- Maintain informational signs, reader boards, and kiosks.
- Monitor recreational use.
- Maintain physical improvements.

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/Concerns

The purpose of meeting with the Citizens Advisory Group (CAG) and the District Team (DT) was to obtain input to help guide management actions on the wildlife area. A draft of the introduction and history of the wildlife area 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 previous planning efforts as well as meetings with the CAG and DT in 2005. This input will assist in developing strategies to implement management goals and objectives. Underlined statements below indicate that the input was received from the DT. Issues that are not underlined originated from the CAG. Comments specific to other programs, i.e. Fish Management or Wildlife Management, or other wildlife areas such as the Methow and Sinlahekin, were not listed here, but rather sent to the respective areas.

Issue A. Access/Recreation

- 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.
- Need to provide access to publicly held lands, especially in Okanogan County.
- Improve and manage wildlife viewing opportunities in a manner that is not detrimental to the wildlife resource.
- ATV use policy needs to be consistent agency wide.
- USFS trying to close all areas to ATV use unless designated open – WDFW should do the same.
- You need better campgrounds with garbage collection, and possibly water pumps. Better tables and fire pits if and when money is available. Control people.
- Charge a possible camping fee. You could employ a person or go with a self pay station.
- Define recreational uses and timing.
- Need a better photograph/picture on the “No ATV Allowed” signs.

Issue B. Wildlife Area Management

- 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.
- Need augmentation of indigenous STG populations with birds from other areas.
- Manage for sensitive species and priority species
- Include in the Wildlife Area goals a broadened approach to preserve, protect and manage for fish and wildlife species diversity (including habitat diversity) not just game species.
- Organize community groups, church, sports groups, etc. to help out on the wildlife areas.
- Broaden wildlife area management to include multiple species management.
- I think the reintroduction of fire to Driscoll Island was a good idea. I recommend that be used in other locations as well. It appears to stimulate growth for a wider variety of plants, which in turn benefits wildlife. It adds to the diversity of the ecosystem.

- Include language for long range plans, not only specific projects, i.e., whenever culverts wash out, not specific locations.
- Water rights – keep them up-to-date so you don't lose them.
- Don't consider the wildlife area as an island; look at neighboring lands and the management on those lands.
- Water developments – Make sure regulations and policies regarding springs and intermittent streams are met.
- Consider all species of grouse in management plans.
- Mule deer are more economical for the local businesses.
- Plant food plots to pull deer off of private ground and feed for sharp-tailed grouse.
- Grow more corn and grain for upland birds. STG used to be heavy in Rye at harvest, and on the green up late in fall after cattle grazed it down.
- Install more guzzlers for grouse.
- I like the new Lands Vision 20/20 policy and the words “citizen supported” which is in the mission statement. I do not believe the WDFW is “citizen supported” due to a lack of stewardship. The WDFW needs to manage for ecosystem health, not single species management.
- Concerned that the WDFW is just “using” the people on the CAG as “window dressing” for the planning process.
- Concerned about mosquito breeding habitat we are creating by letting the creek flood the area below the HQ. Could be vectors for disease transmission to people or livestock.

Issue C. Habitat

- Manage for native habitats and the processes that sustain them.
- Specify what habitat objectives are in the plan.
- Need more restoration planting of native grasses for STG.
- The grass plantings on Scotch Creek are too thick. It may be bunch grass but there isn't any space between the bunches. Suggest using prescribed fire to maintain the open bunch grasses. Years ago I studied how often areas burned around here (one site in Boulder Creek, others east of Tonasket). The lower the elevation, the more frequent the fires. Few areas went over 10 years without a fire. This all changed shortly after the turn of the century 1800 – 1900. Euro-American influence, I would guess. I looked at P. pine stumps to determine when a fire occurred. I suspect the lower grass lands burned at the same frequency. What does sharp-tail research say about burning? I think you should look into burning some of the thicker stands. This would be the time of year to do it. Put in your fire lines in the fall and burn in the spring as early as the weather allows. Shouldn't be too labor intensive. Grass won't burn at night this time of year. DT discussion on how to manage grass residual and fire danger on Scotch Creek. Please add it to the list.
- Comments addressing the CAG comment “Grasses are too thick on Scotch Creek”, what do we do? Team discussion: Prescribed burning or short term grazing on small parcels (ex. Graze or burn the entire wildlife area over a 10-year period). It's possible that some of the plantings are too thick, but I'm not sure that anybody knows what the limit is. I'm not aware of any other areas where sharp-tailed grouse have been studied that are not grazed. Grazing has its downsides (fences and weeds). If we try burning, I think we should pay to have somebody come here from the central states

that do this type of burning for a living (perhaps for a workshop). They do a lot of this type of management in Minnesota and Wisconsin for prairie-chickens and sharp-tailed grouse. Ranchers to improve the range burn much of the prairie-chicken range in the Flint Hills of Kansas every spring. Although this type of annual burning is probably not helping prairie chickens, they are certainly able to adapt to it. The interesting thing about this discussion is that there is rarely concern about the areas with too little cover, which dominate the region by far.

- Aspen stands need regeneration/restoration by logging, fire and other disturbances.
- Timber management – fuels management and prescribed (Rx) burning income can help program.
- 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.
- Concern for keeping disturbance out of parcels permanently, i.e., fencing out riparian area and not grazing or burning it.
- I'm also in favor of planting blackberry as I've seen them utilized extensively by wildlife, especially in the winter. However such planting would be conditional upon the reintroduction of fire to control the blackberry plants. My dog prefers thorn less blackberry please.
- Concerned that when WDFW purchases land (therefore, loss of agriculture lands) WDFW is actually losing more habitats than we are conserving.
- Use augured holes when planting shrubs. Seems to increase survival and growth rate.
- Use solar/wind power to provide water to shrub plantings where possible. Fertilize plants often and use temporary deer fencing to increase growth.
- Increase forb component in grass plantings. Research techniques and use experimental trials to achieve success.

Issue D: Livestock Use

- Use effective grazing management techniques, i.e., fall trees over streams to make access to riparian areas difficult vs. fencing out riparian areas (may be cost prohibitive).
- 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.
- WDFW grazing leases create co-dependence for lessee and limits management flexibility.
- Can justify grazing through good Coordinated Resource management (CRM) – apply and influence good stewardship on other lands, e.g., federal lands and private lands.
- Grazing – restore economically and environmentally sustainable grazing using grazing plans, fencing, water, supplements, etc.
- A winter feeding program for cattle will help upland birds.
- Fall grazing will provide short spring grass and early green up.
- Consider flash grazing – Heavy grazing for a short period of time.

Issue E: Weed Control

- It is the recommendation of the Okanogan County noxious Weed Board (OCNWB) that the WDFW, in the interest of good land stewardship and good neighbor relations, provide an aggressive priority approach and adequate funding for noxious weed

control for existing and proposed WDFW lands. A long-term noxious weed control plan should be established, utilizing an integrated approach. Include; areas and accesses to be treated annually to reduce the spread of noxious weeds (including aquatic weeds), and re-vegetation of all disturbed terrestrial soil with a suitable certified grass or native plant mixture. The OCNWCB also recommends practicing and maintaining effective and appropriate weed control measures on all property and road systems within the WDFW areas. We suggest using a long term Integrated Weed Management plan (IWM) utilizing all methods of weed control. In Okanogan County we have noted infestations of Musk Thistle, Scotch Thistle, Hoary Alyssum, Dalmatian Toadflax, Diffuse and Spotted Knapweed, Russian Knapweed, and various other noxious weeds, which are either mandatory control or a concern to our county. These noxious weeds are aggressive in Okanogan County and we encourage everyone to control them on the land they are responsible for. We would like everyone involved to become familiar with the identification of noxious weeds to prevent further spread and infesting private landowners adjoining these properties. Also, we recommend that you research the native grasses and shrub species for wildlife forage compatibility in our County. We also advocate a strong prevention program in the long term to prevent re-infestation after control methods have been in place. Concentrate specifically on the paths, roads, trails, fence lines, parking lots and unused areas surrounding these sites; keep these areas weed free, treated and vegetated. Do not permit invasive terrestrial or aquatic species to be transported from one site to another.

- Keep weed management in plan when planning management activities that may create weed habitat, e.g., logging.
- Develop a long-term plan for weed control. Spray in blocks and hit roads and campgrounds.
- Weeds – there have been successes, but there are other weeds present and a sustained effort at eradication and control needs to be maintained.
- Check on cost share with the county weed board for weed control.
- Use crossbow for woody species control. For goatweed use 1 qt tordon/acre in spring. Use escort for Dalmatian toadflax.

Issue F: Roads and Trails

- Trails: balance recreation opportunities with wildlife concerns (winter range, raptor nest, etc.). Active involvement in placement and management by WDFW staff.
- Develop a plan for trails on the wildlife areas and limiting them to the abandoned roadbeds. Reasoning would include managing public impact, noxious weeds, and erosion, which all can cause damage if poorly designed or user built trails start being allowed. The two old roadbeds are more than adequate trail access and are (or could easily be made) handicapped accessible. These old roadbeds will not create erosion, but would facilitate noxious weed management as part of the management plan. The County envisions a time when they would talk about a trail from Fish Lake through Scotch Creek to the Conconully Highway. It is an excellent chance to do educational kiosks on weed management, public impacts etc.
- Culverts – Plan needs to address road systems. Public roads vs. management only roads. Weed management along roads, and maintenance of roads.
- Provide more interpretive trails on Wildlife Areas.

- Provide more pullouts along roads in Wildlife areas.

Issue G: Enforcement

- Complete review of WDFW codes for lands is needed.
- Law enforcement needs specific regulations to enforce social behavior on WDFW property – camping length of stay, removal of property, noise etc.
- Law enforcement action can be taken regarding trespass livestock.
- Need to get regulations on the books to standardize camping limits to be the same as other public agencies.
- We lack enforcement in this area. Watch for fish going out of the post office.

Issue H: Public Information, Education and Involvement

- Informational signs and brochures for each wildlife area are needed stating reason for purchase, funding source, funding resources, management funding, in lue of taxes, etc.
- Publicize the economic impacts of wildlife to the public, and the tax revenues generated.
- Wildlife Areas can be an educational opportunity to all levels of education.
- Inform the tourists, birdwatchers, and campers of the non-game wildlife that are available to watch.
- Develop Informational fliers and have available at local businesses, agency offices or reader boards.
- All wildlife areas should have maps like the Sinlahekin map.
- You need more information boards. Educate the public.
- Use news releases to inform the public.
- CAG needs to be familiar with lands we are talking about.
- Citizen supported group is important.
- More signs – interpretive signs, e.g., wildlife to see, explaining management activities
- Provide bird, mammal, butterfly, reptile and amphibian checklists.
- Route maps for wildlife watching with places to stop for rests and meals.
- Need informational boards at each end of wildlife areas stating what is allowed and not allowed to get away from signing each individual site. Look into signs “Vehicular Travel Limited to County Roads”.
- Provide students with educational opportunities.

Issue I: Monitor, Survey and Inventory

- You need flexibility in your management. Monitor the plan and have the flexibility to change. Have measurable objectives you can monitor.

Issue J: Other

- 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. The

comment emphasizes that wildlife related recreation is vital to the small local economies in Eastern Washington.

- The increase in people using the wildlife area will benefit the economics of the local area.
- Birds in general – people have an interest in seeing a variety of birds – bird watching can provide positive economic benefits.
- DFW lands important for local economies.
- The CAG felt it was appropriate that the Methow WLA should have a separate CAG apart from Eastern Okanogan County Wildlife Areas CAG.
- Employees on Eastern Okanogan County Wildlife Areas are appreciated.

APPENDIX 2: Scotch Creek Wildlife Area Weed Management Plan

Weed Control Goals on WDFW Lands

The goal of weed control on Department managed lands is to maintain and improve the 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 managed 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 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.

Monitoring- Monitoring is necessary to implement prevention and to document the weed species, the distribution and the relative density on the management area.

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 weed 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.

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 Scotch Creek WLA

Weeds of concern on Scotch Creek include Dalmatian toadflax (*Linaria dalmatica ssp. dalmatica*), Houndstongue (*Cynoglossum officinale*), Diffuse Knapweed (*Centaurea diffusa*), Whitetop (*Cardaria pubescens*), Russian knapweed (*Centurea repens*), Musk Thistle (*Carduus nutans L*), Scotch Thistle (*Onopordum acanthium*) and Canada Thistle (*Cirsium arvenge*). This list is based on species that have been documented on the wildlife area (Table 1).

Table 1. Scotch Creek Wildlife Area weeds including the state and county weed class listing and acres treated.

Weed Species	2005 State Weed Class	2005 County Weed Class	Wildlife Unit(s)	2005 Treated Acres
Dalmatian Toadflax	B	B-Designate	Tunk Valley, Pogue Mt.	Trace
Houndstongue	B	R & S	Chesaw, Pogue Mt.	7
Diffuse Knapweed	B	R & S	Scotch Creek, Mineral Hill, Pogue Mt., Tunk Valley	24
Whitetop	C	B-Designate	Scotch Creek	21
General Weeds			All	47
Musk Thistle	B	B-Designate	Chesaw	121
Canada Thistle	C	R & S	Scotch Creek, Pogue Mt.	Trace
Russian Knapweed	B	R & S	Scotch Creek, Pogue Mt., Tunk Valley	17
Scotch Thistle	B	B-Designate	Scotch Creek	1
Kochia	B	R & S	Scotch Creek,	6

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.

Management for individual weed species can be found in the following “Weed Species Control Plan” (WSCP) sections.

The following description and management information was taken from the Washington State Weed Board web site (http://www.nwcb.wa.gov/weed_list/weed_listhome.html) and the TNC Invasive Species Initiative web site (<http://tncweeds.ucdavis.edu/>).

DALMATION TOADFLAX CONTROL PLAN

Scientific name: *Linaria dalmatica ssp. dalmatica*

Common name: Dalmatian toadflax

DESCRIPTION: Dalmatian toadflax is an erect, short-lived, perennial herb, 0.8 to 1.5 m tall. Dalmatian toadflax is a perennial species that spreads by horizontal or creeping rootstocks and by seed. Leaves are broad, 2-5 cm long, ovate to ovate-lanceolate, 1-2.5 cm long and are alternate, generally clasping but crowded. Flowers are born in loose, elongate, terminal racemes. The pedicels are 2-4 mm long when the flowers are mature and releasing pollen. The calyx is 5-7.5 mm long, the segments subequal, broadly lanceolate to ovate, sharply acute, and rigid. The corolla is strongly two-lipped and 14-24 mm long, excluding the 9-17 mm spur. The upper lip is 10-15 mm long. The lower lip is 5-11 mm long with a well-developed palate closing off the throat. The palate is densely white to orange bearded. Flowers are bright yellow. *Linaria genistifolia ssp. dalmatica* typically flowers from May to August. It produces egg-shaped to nearly round capsulate fruits 4-10 mm long by 4-8 mm wide. Seeds are sharply angular, slightly winged, and 1-2 mm long. A mature plant can produce up to 500,000 seeds annually, and they can remain dormant for up to ten years. Dalmatian toadflax produces seed from July to October. Dalmatian toadflax rapidly colonizes open sites. It is most commonly found along roadsides, fences, rangelands, croplands, clear cuts, and pastures. Disturbed or cultivated ground is a prime candidate for colonization. Toadflax can significantly reduce crop yields and stress native communities. Dalmatian toadflax is a persistent, aggressive invader capable of forming colonies through adventitious buds from creeping root systems. These colonies can push out native grasses and other perennials, thereby altering the species composition of natural communities. In North America toadflax is considered a strong competitor. It is quick to colonize open sites, and capable of adapting growth to a wide range of environmental conditions (4).

It generally grows in open, sunny places, from sea level up to 2,800 meters (roughly 9,200 feet). In North America, it primarily occurs on sandy or gravelly soil on roadsides, railroads, pastures, cultivated fields, range lands, and clear cuts (Saner *et al.* 1995). It can adapt its growth to fit a range of habitats, and has a tolerance for low temperatures and coarse textured soils. It has a northern limit of 55° to 65° latitude.

Dalmatian toadflax is most common in the western United States. In northeastern Washington, it is spread throughout open, low-elevation, coniferous forests and adjacent shrub-steppe. Once established, high seed production and the ability for vegetative reproduction allow for rapid spread and high persistence (Saner *et al.* 1995). It relies upon insects for pollination. Spring emergence occurs about mid-April and depends primarily on temperature. The stems of seedling plants seldom exceed 40 cm. Prostrate stems emerge in September and produce leaves that are ovate, 3.8 cm by 2.2 cm in size. Prostrate stems are tolerant to freezing and are associated with floral stem production the following year (Robocker 1974).

The strong upright floral stems that characterize mature toadflax plants develop after a winter's dormancy, and emerge about the same time as new seedlings in mid-April. The ultimate survival of the stand, and probability of re-establishment, depends heavily on the number of floral stems and their seed production (Robocker 1974). Flowering occurs from May-August and seeds mature from July-September. Stems develop from adventitious buds on primary and lateral roots. Vegetative reproduction from root buds can occur as early as 2-3 weeks after germination, and is possible from root fragments as short as 1 cm in length (Zimmerman 1996). These buds

can grow their own root and shoot systems, and become independent plants the next year. Vegetative propagation can allow a stand of toadflax to spread rapidly. In addition to promoting growth, the large, deep, root system exploits water efficiently. The tap root may penetrate 1 meter into the soil and lateral roots may be several meters long. The deep root system prevents grazing and shallow cultivation methods from dislodging or destroying plants (Saner *et al.* 1995).

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

MANAGEMENT INFORMATION:

The key to managing Dalmatian toadflax is to: 1) eliminate or greatly reduce seed production from established individuals (by cutting or pulling seed stalks prior to seed set, or by using insects to destroy flowers, seeds, or damage plants sufficiently so that no or few seeds are produced); and 2) destroy toadflax seedlings that arise from the soil seed bank before these plants become established. Permanent, long-term control cannot be achieved with herbicide treatment alone (Saner *et al.* 1995). Herbicides should be applied during flowering when carbohydrate reserves in the root of the plants are at their lowest. At the latest, herbicide treatment should be applied before seed dispersal, if it is to be effective.

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.

A bioagent, *Mecinus janthinus*, a stem-boring weevil, has been shown to be effective in controlling Dalmatian toadflax and is present in Northern Washington.

CURRENT DISTRIBUTION ON THE SITE

Dalmatian toadflax is confined to the Tunk Valley and Pogue Mt. Units. Current distributions at Tunk Valley are limited to hand full of affected areas. Ranging in size from single plant to small groups with low densities. Pogue Mt. currently one has 1 affected area small in size with low density.

ACRES AFFECTED BY WEED: < 1

WEED DENSITY: Low

GOALS

- Eradicate all new invaders
- Control expanding populations
- Prevent new occurrences

OBJECTIVES

- Survey and map existing populations
- Continue treating small infestations with herbicides
- Prevent new occurrences

ACTIONS PLANNED

In 2006, the Tunk Valley WLA and Pogue Mt. WLA will be surveyed and spot treated with herbicide by ATV.

Monitoring will continue on an annual basis on both units

CONTROL SUMMARY AND TREND

2005- Approximately < 1 acre were treated.

Toadflax was first detected on the Tunk Valley WLA in the spring of 2005, all detections were hand pulled and treated at a later date with herbicides.

RUSSIAN KNAPWEED CONTROL PLAN

Scientific name: *Acroptilon repens*

Common name: Russian knapweed

DESCRIPTION: Russian Knapweed 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 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.

Russian Knapweed has a well-developed root system, which functions as the major means of propagation and spreading. The roots 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.

It was first introduced in California between 1910-1914. Since then, it has become widespread in the United States and is currently found in at least 412 counties in 21 states (Maddox *et al.* 1985). It is most common in the semi-arid portions of the western U.S. and adjacent Canada, but infestations have also been reported in South Dakota, Minnesota, and Virginia (Maddox *et al.* 1985). The worst infested states are California, Idaho, Montana, Oregon, and Washington.

Russian Knapweed is a strong competitor and can form dense colonies in disturbed areas. Dense patches of Russian knapweed may have up to 100-300 shoots/m² (Watson 1980). The plant extends radially in all directions and can cover an area of 12 m² within two years (Watson 1980).

Russian knapweed invades many disturbed western grassland and shrubland communities, as well as riparian forests. Once established, Russian knapweed can dominate an area and significantly reduce desirable vegetation (e.g. perennial grasses). Russian Knapweed contains an allelopathic polyacetylene compound which inhibits the growth of competing plants (Watson 1980). Tests conducted with alfalfa (*Medicago sativa*), barnyard grass (*Echinochloa crusgalli*), and red millet (*Panicum miliaceum*) indicated Russian knapweed effectively inhibits root length elongation of grasses as well as broad-leaved plants by 30% when the polyacetylene compound is at a soil concentration of 4 parts per million (Stevens 1986). This allelopathic effect, combined with dense vegetative reproduction, allows for Russian knapweed to quickly colonize and dominate new sites. Infestations of Russian knapweed can survive indefinitely through their root system (Watson 1980). A stand in Saskatchewan has survived for almost 100 years (Allred and Lee 1996), and Watson (1980) reported that stands of Russian knapweed have been reported to survive for more than 75 years.

Russian Knapweed is a state-listed class B-Designate in the management areas.

MANAGEMENT INFORMATION:

There is no single “silver bullet” control method for Russian knapweed. 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 top growth. 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.

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. Suppressor 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.

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.

CURRENT DISTRIBUTION ON THE SITE

Russian Knapweed can be found on Scotch Creek WLA, Pogue Mt. WLA and Tunk Valley WLA. Infestation can be found in varying areas and densities.

ACRES AFFECTED BY WEED: ~ 400

WEED DENSITY: Low-High

GOALS

Control expanding populations
Prevent new occurrences

OBJECTIVES

Survey and map existing populations
More accurately calculate the acres affected by Russian knapweed
Continue treating infestations with herbicides

ACTIONS PLANNED

In 2006, continue herbicide treatment on all 3 WLA. Treatments on the Tunk Valley WLA have been limited in past years, due to limited access.

CONTROL SUMMARY AND TREND

2001- Approximately 191 acres were treated.

2002- Approximately 302 acres were treated.

2003- Approximately 340 acres were treated.

2004- Approximately 150 acres were treated.

2005- Approximately 17 acres were treated.

Infestations on both Scotch Creek and Pogue Mt. WLA's are declining both in density and area. Affected areas on Tunk Valley are static. Control efforts at Tunk Valley have been limited due to limited access through adjacent private lands. Control efforts at Scotch Creek were low in 2005, due to the requirement of Ecological survey imposed by BPA. Research indicated that no Ecological survey was needed for weed control.

DIFFUSE KNAPWEED CONTROL PLAN

Scientific name: *Centaurea diffusa*

Common name: Diffuse knapweed

DESCRIPTION: Diffuse Knapweed 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.

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). Idaho, Montana, Oregon, and Washington report the worst infestations (Zimmerman 1997). In western Canada, levels of diffuse knapweed are increasing and roughly 7.5 million hectares appear to be susceptible to knapweed invasion (Harris and Cranston 1979).

Diffuse Knapweed is a state-listed class B-Designate in the management areas.

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. 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).

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.

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.

CURRENT DISTRIBUTION ON THE SITE

Affected areas include Scotch Creek WLA, Mineral Hill WLA, Pogue Mt. WLA and Tunk Valley WLA. Infestations on the Pogue Mt. WLA and Tunk Valley WLA are isolated to access roads and adjacent areas. Infestations on Mineral Hill WLA are confined to access roads and riparian areas. Scotch Creek infestations are most predominant on the 2005 Boyce property acquisition. *Larinus minutus* insects are present at all 4 areas.

ACRES AFFECTED BY WEED: ~100

WEED DENSITY: Low-High

GOALS

Control expanding populations
Prevent new occurrences

OBJECTIVES

Survey and map existing populations
More accurately calculate the acres affected by diffuse knapweed
Continue treating infestations with herbicides
Release bio-control at large infestations

ACTIONS PLANNED

In 2006, collect and release bio control *Larinus minutus* on the Boyce Property and treat with herbicides. Spot treat affected areas on the Pogue, Mineral Hill and Tunk Valley WLA's as needed. Monitor bio control insect population on all areas and distribute as necessary.

Monitoring will continue on an annual basis on all units

CONTROL SUMMARY AND TREND

2001- Approximately 100 acres were treated
2002- Approximately 360 acres were treated
2003- Approximately 14 acres were treated
2004- Approximately 60 acres were treated
2005- Approximately 24 acres were treated

Infestations on all 4 areas are declining. When used together both chemical and biological control methods provide an excellent tool in controlling Diffuse Knapweed on these 4 areas.

KOCHIA CONTROL PLAN

Scientific name: *Kochia scoparia*

Common name: Kochia

DESCRIPTION: Kochia is an annual plant that reproduces from seeds. It has a deep taproot. The erect, much-branched stems are three to seven feet long, smooth below but usually hairy above. The alternate, simple leaves are pubescent to nearly glabrous, one to two inches long, lanceolate to linear with hairy margins, and without petioles. The small green flowers lack petals and are found in clusters in the axils of the upper leaves and in terminal spikes. The brown flattened seeds are about 1/16 inch long and grooved on each side. The species typically produces around 14,600 seeds per plant. Seeds are dispersed in the fall when the plant becomes a tumbleweed. The plant tumbles with the wind, dropping seeds as it is blown. Laboratory studies report germination rates of 76 percent or better over a temperature range of 39-106 degrees F. Seeds buried in the soil have five percent viability after one year and zero percent after two years. Kochia reproduces by seed only. Like many other species of the Chenopodiaceae, it becomes a tumbleweed when mature. An abscission zone develops at the base of the stem in autumn. When winds reach velocities of 25 miles per hour, the stem breaks and the plants tumble. Kochia overwinters as seeds. The seeds germinate very early in spring because of their frost tolerance. Kochia grows very rapidly through spring and summer and sends down a very long taproot (up to 16 feet). It flowers in late summer and sets seed. Kochia is able to spread long distances very rapidly. Its ability to tolerate drought also enables it to spread quickly. It was considered a rare plant in North Dakota and Kansas in the late 1920's, but with the drought during the 1930's it became abundant. Native to southern and eastern Russia, kochia was introduced to North America from Europe. It was grown as an ornamental hedge around gardens, or used as a backdrop planting because of its dense, conical shape and attractive red color in the late fall. It has since escaped cultivation and spread westward.

MANAGEMENT INFORMATION:

Early tillage in the spring gives good control of the kochia seedlings. Mowing or slashing the plants before flowering is effective in reducing seed production. Infestations of triazine resistant kochia has been found along railroad lines in eleven states. Research has shown that triazine resistant biotypes were more susceptible to 2,4-D ester than triazine susceptible biotypes. There are also biotypes resistant to 2,4-D or Banvel (dicamba). It is suggested that rotating herbicides would reduce the possibility of an increase in the proportion of plants tolerant to 2,4-D or Banvel.

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.

CURRENT DISTRIBUTION ON THE SITE

Found predominately in new grass seeds, roadsides, access parking areas and along fire breaks on the Scotch Creek WLA.

ACRES AFFECTED BY WEED: ~20

WEED DENSITY: Low to high

GOALS

Control expanding populations
Prevent new occurrences

OBJECTIVES

Survey and map existing populations
Continue treating small infestations with herbicides

ACTIONS PLANNED

In 2006, continue to monitor infestations and treat as necessary. Continue to maintain firebreak.

CONTROL SUMMARY AND TREND

2004- Approximately 20 acres were treated.
2005- Approximately 6.5 acres were treated

CANADA THISTLE CONTROL PLAN

Scientific name: *Cirsium arvense*

Common name: Canada thistle

DESCRIPTION: Canada Thistle 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 roots develop new underground roots and shoots in January and begin to elongate in February (Rogers 1928). Shoots emerge March - May when mean weekly temperatures reach 5° 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): 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 aboveground 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, native species can be damaged by growing season herbicide application.

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. Stems with flowers that have been open 8-10 days can develop viable seeds (Derscheid and Schultz 1960).

CURRENT DISTRIBUTION ON THE SITE

Canada thistle has only been found on the Scotch Creek WLA and Pogue Mt. WLA. Infestations on the Scotch Creek WLA are primarily confined to riparian areas and low areas with moist growing conditions. A few small infestations can be found on the uplands and along the Abright Lake Rd in the Limebelt unit.

Infestations on Pogue Mt. are confined to areas around Hunsinger Lake.

ACRES AFFECTED BY WEED: ~30

WEED DENSITY: Low to high

GOALS

Control expanding populations
Prevent new occurrences

OBJECTIVES

Survey and map existing populations
More accurately calculate the acres affected by Canada thistle
Continue treating infestations with a combination of mechanical control and appropriate use of herbicide

ACTIONS PLANNED

In 2006, the Scotch Creek and Pogue Mt. WLA will be surveyed and spot or broadcast treated in spring-summer by mowing or herbicide.

CONTROL SUMMARY AND TREND

2003- Approximately 1 acres were treated.

2004- Approximately 28 acres were treated.

2005- Approximately 4 acres were treated.

Control is slowly reducing densities with little or no change in affected area

WHITETOP CONTROL PLAN

Scientific name: *Cardaria draba*

Common name: Whitetop

DESCRIPTION: Whitetop is a hardy perennial with stout, erect or procumbent stems that can grow 2-5dm 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). *C. draba* probably traveled to the USA in ship's ballast or contaminated alfalfa (Mulligan & Findlay, 1974). It was first collected in North America in Yreka, California in 1876, and Ontario, Canada in 1878 (Robbins, 1940; Mulligan & Findlay, 1974). Other collections, such as in Napa, California (in 1893), a southwestern alfalfa field (in 1898), and New York City (also in 1898) firmly established its presence on the continent (Robbins, 1940; Robbins *et al.*, 1952).

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.

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*.

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.

CURRENT DISTRIBUTION ON THE SITE

Whitetop infestations are confined to the Scotch Creek Wildlife Area.

ACRES AFFECTED BY WEED: ~50

WEED DENSITY: Low-High

GOALS

Control expanding populations
Prevent new occurrences

OBJECTIVES

Survey and map existing populations
More accurately calculate the acres affected by Whitetop.
Continue treating infestations by spot or broadcast treatment

ACTIONS PLANNED

In 2006, the Scotch Creek WLA will be surveyed and spot or broadcast treated in late spring-early summer by ATV
Monitoring will continue on an annual basis on all units

CONTROL SUMMARY AND TREND

2001- Approximately 29 acre was treated
2002- Approximately 79 acres were treated.
2003- Approximately 50 acres were treated.
2004- Approximately 30 acres were treated.
2005- Approximately 21 acres was treated.

Whitetop infestations have only been found on the Scotch Creek WLA. Herbicides have proved to be an affective control method. Most infestations can be found in areas of limited competition from native plant species.

HOUNDSTONGUE CONTROL PLAN

Scientific name: *Cynoglossum officinale*

Common name: Houndstongue

Updated: 2005

DESCRIPTIO: Houndstongue is a biennial or short-lived perennial that grows 1-4 ft tall. The taproot is thick, woody, black and branching. A rosette with hairy leaves forms the first year. The leaves are alternate and are hairy, rough and lacking teeth or lobes. Lower leaves are linear, from 4-12 inches long, 3/4 inch wide, pointed and tapering to the stem. The upper leaves are smaller and without stems. The flower is a dull reddish-purple, about 3/8-inch wide and 5-lobed. It has 5 anthers, 5 petals, and 5 sepals, which form a star shaped calyx. The tube is shorter than the calyx and the calyx is 4-6 mm long in flower, enlarging to 1 cm in fruit. Fruit is composed of 4 prickly nutlets each about 1/3-inch long. Seeds are ovoid, flat on top with a scar that runs near the lower surface. Stems are erect, single, unbranched below the inflorescence, hairy, and coarse. The green plants of houndstongue have a disagreeable odor. Houndstongue is a very strong competitor that competes with desirable forage. The seeds have the ability to attach to people, the coats of livestock and vehicles, enabling the plant to spread great distances. Zones consist of hot, dry summers and cold winters. Soils: from well drained, relatively coarse, alkaline soils to clay subsoil in the open coniferous and deciduous forest. Houndstongue is a shade tolerant plant and thrives in wetter grasslands. Found on roadsides, meadows and disturbed places. Reproduction is by seed only. Seeds are produced by autogamy (self pollination). Seed production varies from about 314-674 seeds per plant. 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..

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 Boraginaceae (Lamming).

Houndstongue is a state-listed class B-Designate

CURRENT DISTRIBUTION ON THE SITE

Houndstongue has only been found on two WLA's- Chesaw and Pogue Mountain. Individual and small groups of this weed are widely scattered on both areas with few large infestations.

ACRES AFFECTED BY WEED: ~50
Scattered)

WEED DENSITY: Low (Widely

GOALS

Control expanding populations
Prevent new occurrences

OBJECTIVES

Survey and map existing populations
More accurately calculate the acres affected by houndstongue
Treat all plants that can be reached by ATV before they produce seed
Survey nearby units for pioneering infestations

ACTIONS PLANNED

In 2006, the Chesaw WLA will be surveyed and houndstongue rosettes and plants will be spot treated in the spring by ATV using herbicide.
Due to low densities of houndstongue at Pogue Mountain WLA, the infestation will be surveyed in early July and rosettes pulled or spot treated depending on densities, when they become visible.

CONTROL SUMMARY AND TREND

2002- Approximately 8 acres were treated.
2003- Approximately 35 acres were treated.
2004- Approximately 8 acres were treated.
2005- Approximately 7 acres were treated.

A consistent maintenance effort is required each year to keep houndstongue at the current level. The number of infestations and the densities of these infestations are on the decrease. Monitoring adjacent areas is important, due to the seeds ability to travel long distances.

MUSK THISTLE CONTROL PLAN

Scientific name: *Carduus nutans* L

Common name: Musk Thistle

DESCRIPTION: Musk thistle is a biennial plant although it may occasionally act as a winter annual. It is a robust thistle and given the right conditions may grow to six or seven feet tall. The large solitary flowers heads at the ends of the stem are reddish purple. The flower heads droop at maturity. Each plant may have 50 to 100 flower heads with up to 1,000 seeds per head. The seeds do not have a plume or parachute. The stems are spiny and winged except just below the flower head. The deeply lobed, spiny leaves are alternate on the stem. Musk thistle invades pastures, meadows, and fields. In so doing it crowds out other more desirable forage plants. It spreads rapidly by seed. It also invades streambanks, hindering access, and has been reported as problematic in grain fields.

Plants of all ages overwinter as rosettes. Both flowering and seed production are positively correlated with rosette size. In one Kansas study, plants greater than 14 cm in rosette size in late April flowered the following summer regardless of their age (Lee and Hamrick 1983). Bolting begins as early as March in Kentucky (Lacefield and Gray 1970) until as late as May in Minnesota (Durgan pers. comm.). Flowering begins from early June in the south to as late as mid-July in the north and may continue for up to seven weeks (McCarty 1982). Within a single flowering head, florets develop centripetally over a period of 36 to 48 hours. Pollinators include bees (*Apis mellifera*), bumblebees (*Bombus* spp.), and sphinx moths (*Hyles* spp.). Florets on the same head are self-compatible (Lee and Hamrick 1983).

Seed maturity and dispersal occur within 7 to 10 days of flowering (McCarty and Scifres 1969) and begin as early as the first week in June in Kentucky (Lacefield and Gray 1970). Seed production can be as great as 11,000 seeds per plant (McCarty and Scifres 1969). Terminal heads average 1000 seeds per head, whereas the last blooming side branches average only 125 seeds. Early-maturing, terminal seeds are heavier and exhibit a higher rate of viability than later-maturing seeds from secondary branches (McCarty 1982). The bulk of the seeds fall near the parent plant with less than 1% being carried further. Experimental studies in Virginia suggest that seeds do not travel far from the parent plant, with over 80% of seeds deposited within 40 m of the parent plant (Smith and Kok 1984). However, McCarty (pers. comm.) reports that a pilot in Nebraska flew through a cloud of musk thistle seeds at an altitude of 500 feet. Seeds have been reported to remain viable in the soil for periods as long as ten years (Burnside et. al. 1981).

Musk Thistle is a state-listed class B-Designate

MANAGEMENT INFORMATION:

Cultural, mechanical, biological and chemical control methods have all been used on musk thistles with varying degrees of success in different parts of the country. The effectiveness of individual treatment methods and of integrated pest management varies with the target species, the time of treatment, and (in the case of biological control agents) the biotype of the control agent.

Hand-cutting or mowing can provide control if repeated over a period of years. The effective control is obtained when cutting is done with a sharpened shovel at the base of the bud and the

top of the root crown. If only the terminal bud is destroyed, the side buds can develop into leaders and set seed (McCarty pers. comm.).

93 European insects have been evaluated as potential control agents for *Carduus* species. The most widely introduced species is *Rhinocyllus conicus* (Coleoptera: Cuculionidae). Larvae of this European weevil feed on the immature heads of *Carduus* and three other genera (Turner pers. comm.). Since 1969, *R. conicus* has been released in a large number of states including Maryland, Virginia, Pennsylvania, West Virginia, New Jersey, Missouri, Nebraska, Minnesota, North Dakota, Montana, and California (Trumble and Kok 1982, Boldt 1978). The most successful introductions have occurred on mountainous areas where night temperatures remain cool longer into the season. Weevils produce a finite number of eggs that are laid rapidly and depleted in warmer areas but laid over a longer period of time where night temperatures are cooler (McCarty pers. comm.). McCarty believes that in warmer areas, the musk thistle bloom period outlasts the weevil's egg-laying capacity so that late blooming heads go unfested. If this hypothesis is true, biological control by weevils should be most effective in areas with cool summer temperatures. The hypothesis is supported by the fact that effectiveness of weevil establishment in Virginia and Canada was enhanced by spring weevil releases (Kok 1975, Trumble and Kok 1982, Zwolfer and Harris 1984, Boldt 1978). A second European weevil, *Trichosirocalus horridus* (also known as *Ceuthorrhynchidus horridus*) weakens *Carduus* plants by infesting the crown tissues of the rosettes. Tests in Virginia indicate that although infested spring rosettes exhibit a higher initial rate of necrosis, infested overwintering rosettes have a lower recovery rate (Sieburth et al. 1983). The species has been released in Virginia and Canada but is not suitable for release in California because it damages lettuce and artichokes (Trumble and Kok 1982, Boldt 1978).

Chemical Control: The effectiveness of chemical control is influenced both by weather and by growth stage. Choice of chemicals will depend on cost, effectiveness of initial treatment, effect on production of germinable seed, side effects on non-target species, and residual effects. Residual effects can result in lower post-treatment seed production, pre-emergence control of new seedlings, or control of the first-year rosettes and new seedlings at the time of treatment. Chemical control of all types is most effective in the rosette stage and least effective after plants are fully bolted and have begun to flower (Roeth 1980, Durgan 1987, Feldman et al. 1968).

CURRENT DISTRIBUTION ON THE SITE

Chesaw Wildlife Area

Musk Thistle infestations occur throughout much of the area, including both privately and publicly owned lands adjacent to the Chesaw WLA. Infestations are evenly distributed across the WLA, ranging in size and density from single plants to large groupings of plants.

ACRES AFFECTED BY WEED: 280

WEED DENSITY: Low-High

GOALS

Control expanding and current populations

Continue to detect and prevent new occurrences

OBJECTIVES

Survey and map existing populations
More accurately calculate the acres affected by Musk Thistle
Treat all plants that can be reached by ATV before they produce seed
Survey nearby units for pioneering infestations

ACTIONS PLANNED

In 2006, the Chesaw WLA will be surveyed and spot or broadcast treated in the spring by ATV or truck sprayer using herbicide. Hand pulling will be used in areas where plants reach reproductive maturity.

Research other biological control insects.

Monitoring will continue on an annual basis on nearby units.

CONTROL SUMMARY AND TREND

2002- Approximately 286 acres were treated
2003- Approximately 135 acres were treated and 618 hours hand pulling
2004- Approximately 89 acres were treated and 598 hours hand pulling
2005- Approximately 121 acres were treated and 550 hours hand pulling

Control is slowly reducing densities with little or no change in affected area. Due to the variety of landscapes present at Chesaw, accessibility to remote areas with herbicides is difficult. Populations of the seed head weevil are stable and in some areas on the increase. As stated above this weevil only provides adequate control early in the season.

SCOTCH THISTLE CONTROL PLAN

Scientific name: *Onopordum acanthium*

Common name: Scotch Thistle

DESCRIPTION: Scotch thistle is a branched, robust biennial (or sometimes annual) that often grows 8 feet or more in height and 6 feet in width. Main stems may be up to 4 inches wide at the base. Stems have vertical rows of prominent, spiny, ribbon-like leaf material or "wings" that extend to the base of the flower heads. Leaves, which are armed with sharp, yellow spines, are up to 2 feet long and 1 foot wide. Upper and lower leaf surfaces are covered with a thick mat of cotton-like or woolly hairs, which give the foliage a gray-green appearance. Plants flower in mid-summer. The globe-shaped flower heads are borne in groups of 2 or 3 on branch tips. Flower heads are up to 2 inches in diameter, with long, stiff, needle-like bracts at the base. Flowers range from dark pink to lavender. Seeds are smooth, slender, and plumed (Dewey 1991; Callihan and Miller 1998).

Scotch thistle is usually a biennial, although it can behave as a winter or summer annual or a short-lived perennial under certain situations (Piper 1984; Hooper et al. 1970). As a biennial, Scotch thistle typically lives for two growing seasons. Seeds usually germinate in the late fall, but germination can occur at other times, as well. Seedlings that appear in late autumn behave as true biennials, but seedlings produced during late summer or early autumn behave as annuals. During its first year, Scotch thistle produces a rosette with a taproot that may extend down 1 foot or more. Early in the second year, the plant bolts (Piper 1984). Flowering occurs July to September (Hitchcock et al. 1955). Plants produce 8,400 to 40,000 seeds (Young and Evans 1969 cited in Sindel 1991). Reports on seed longevity in the soil vary from unknown (Groves et al. 1990 cited in Sindel 1991) to up to 20+ years (Joley et al. 1998). Seeds are dispersed locally by wind; humans, water, livestock, and wildlife are involved in longer-distance dispersal (Piper 1984). Seeds are sensitive to light. While some seeds will germinate in the dark, studies indicate that most germination occurs with alternating light/dark cycles, with 8 hours being the optimal day length (Young and Evans 1972).

Scotch thistle is a weed problem on western rangeland that produces significant economic losses for ranches (Cargill et al. 1998). Infestations of Scotch thistle reduce forage production and virtually prohibit land utilization for livestock. Dense stands of the large, spiny plants constitute a barrier to livestock movement, almost totally excluding animals from grazing and access to water (Hooper et al. 1970; Sindel 1991). Scotch thistle can spread rapidly. For example, it was first found in Utah in 1963. By 1981, it covered approximately 6070 hectares in 17 counties. Eight years later, it had spread to cover more than 22,540 hectares in 22 counties (Dewey 1991).

In the western U.S., Scotch thistle infests wet meadows and pastures, as well as more arid big sagebrush (*Artemisia tridentata* Nutt.) sites (Hooper et al. 1970). Scotch thistle is often associated with waste places, as well as rivers, streams, canals, or other waterways. It can also be abundant in dry pastures, fields, and rangeland (Dewey 1991). In particular, the plant thrives in light, well-drained, and sandy or stony soils (Piper 1984). Temperature and moisture, rather than soil nutrient concentrations determine the ecological performance of *Onopordum* species (Austin et al. 1985 cited in Sindel 1991).

Scotch Thistle is a state-listed class B-Designate

MANAGEMENT INFORMATION:

Response to Mechanical Control Methods: Small areas can be eradicated by digging. Plants must be cut off below the soil, leaving no leaves attached (Julian and Rife). Mowing has limited effectiveness for controlling Scotch thistle. It usually only prevents seed production if done either immediately prior to flowering or when plants are just starting to flower. When mowing is conducted too early, it may only delay flowering. However, when plants are cut too late in the flowering process, viable seed may still develop in the capitula following cutting. Because there can be a wide variety in the maturity of plants, a single mowing is unlikely to provide satisfactory control (Sindel 1991).

Response to Cultural Control Methods: Establishing and maintaining dense, vigorous, competitive pasture can effectively prevent Scotch thistle establishment. Healthy pasture is particularly important in the autumn, when most Scotch thistle seeds germinate. Thistle invasion is unlikely to occur in ungrazed pasture. Goats will graze Scotch thistle, reducing plant numbers and preventing seed production (Sindel 1991).

Response to Herbicides: Picloram, dicamba, 2,4-D, dicamba + 2,4,-D, and metsulfuron are effective for controlling Scotch thistle (Beck 1991; Cargill et al. 1998). Application rates vary depending on stand density and environmental conditions. Herbicides should be applied in the spring before Scotch thistle bolts, or in the fall to rosettes (Beck 1991). . For chemical control recommendations, refer to the *Pacific Northwest Weed Control Handbook*, an annually revised publication available from Washington State University Cooperative Extension.

There are currently not biological control insects available to date.

CURRENT DISTRIBUTION ON THE SITE

Scotch Creek Wildlife Area

Scotch Thistle infestations are extremely sparse. Currently there are three small infestations, which consist of 10 or less plants in the Honey Lake section of the WLA. A large infestation occurs just north of the headquarters on Silver hill and includes a part of DNR managed lands. Dual ownership of this infestation will make control difficult.

ACRES AFFECTED BY WEED: ~ 1

WEED DENSITY: Low

GOALS

Control expanding and current populations
Continue to detect and prevent occurrences

OBJECTIVES

Survey and map existing populations
More accurately calculate the acres affected by Scotch Thistle
Treat all plants that can be reached by ATV before they produce seed
Survey nearby units for pioneering infestations

ACTIONS PLANNED

In 2006, all infestations will be treated with herbicides and monitored closely. Adjacent lands will also be monitored.

CONTROL SUMMARY AND TREND

2002- Approximately 1 acres were treated

2003- Approximately 1 acres were treated

2004- Approximately 1 acres were treated

2005- Approximately 1 acres were treated

Plant densities of the three infestations in the honey lake section have remained the same for the past three years. The infestation on Silver hill will be a focus of control in 2006.

GENERAL WEEDS CONTROL PLAN

Scientific name: *Many*

Common name: General Weeds

DESCRIPTION: General weeds describe mixed vegetation that interferes with maintenance, agricultural, or restoration activities. Examples of general weeds may include vegetation occurring along roadsides, parking areas, trails, and structures and include species like blackberry, cheatgrass, sandbur, puncturevine etc. General weeds may also occur in agricultural fields, or comprise the dominant vegetation at a site identified for habitat restoration and includes species like Jim Hill mustard, reed canarygrass, bindweed, Russian thistle, jointed goatgrass, prostrate knotweed, bursage.

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 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 units have general weeds to some extent.

ACRES AFFECTED BY WEED: ~100
depending on site and weed.

WEED DENSITY: Low to High

GOALS

- Control expanding populations
- Prevent new occurrences
- Restore agricultural fields

OBJECTIVES

- Treat high public use areas with residual herbicide to prevent seed production.
- Continue treating infestations with a combination of mechanical control and appropriate use of herbicide

ACTIONS PLANNED

In 2006, areas will be surveyed and treated with appropriate methods.

CONTROL SUMMARY AND TREND

- 2004- Approximately 50 acres were treated.
- 2005- Approximately 47 acres were treated.

The acreage of general weeds treated in any one year will vary depending on the number, size and restoration stage of former agricultural fields. "General weeds" occurring along roadsides and higher use areas are treated during spraying operations for diffuse knapweed and Dalmatian toadflax. Most commonly these types of weeds are treated mechanically.

APPENDIX 3: Fire Control

The Scotch Creek Wildlife Area maintains fire protection contracts with one local fire district: Okanogan County #9 of Conconully. The district is paid an annual fee based on the assessed value of the Wildlife Area within their district. The wildlife area staff is in the process of setting up an additional contract with the Molson/Chesaw district.

It is the Departments policy that Wildlife Area staffs are not firefighters and should not fight fires. Wildlife Area staff are trained in fire fighting and fire behavior, however, the training is in order to provide support and information regarding critical habitat values to the Incident Commander of the responding fire district.

Wildlife Habitat Concerns: The Scotch Creek Wildlife Area contains fire sensitive habitat that is critical to the survival of the Columbian sharp-tailed grouse. Deciduous trees and shrubs provide critical winter habitat and the cover associated with tall bunchgrasses provide needed hiding and escape cover for sharp-tailed grouse. Due to the very low numbers of prairie grouse in the basin, WDFW requests 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 habitat concerns.

Aerial Support: The WDFW recommends that fire-fighting entities suppress fires on the wildlife area as rapidly as possible. WDFW requests the incident commander to seek aerial support if needed to extinguish a fire on its land promptly. If, in the professional judgment of the Incident Commander, a fire on lands adjacent to the Scotch Creek Wildlife Area causes an immediate threat to the area, WDFW requests that he/she seeks aerial support as possible.

The following pages list telephone numbers of Department staff in order of calling priority.

Fire on the Area or threatening the area: Report any fire on or adjacent to all units of the Scotch Creek Wildlife Area by contacting the DNR Dispatch Office in Colville (Northeast district; phone number: 509-684-7474). 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.

SCOTCH CREEK WILDLIFE AREA EMERGENCY TELEPHONE NUMBERS

Fire Districts – DIAL 911

NAME	TELEPHONE	CELL
Okanogan Co. District 9, Omak (Tyson Woodward)	422-3642	
Okanogan Co. District 12, Molson/Chesaw		

Department of Fish and Wildlife - contact in order listed

NAME	TELEPHONE	PRIVATE TELEPHONE	CELL
Jim Olson, Scotch Creek Manager	509-826-4430	509-846-8108	509-429-0796

Brian Dupont, WA assistant manager	509-826-4430	509-322-4771	509-322-4771
Mike Nelson, Chesaw WLA	509-485-2082		
John Danielson, Wildlife Agent, Omak	509-422-7206 (Ok. Co Sheriff (Dispatch)		
Jim Brown – Sergeant, Omak Office	509-826-7371		
Regional Office - Ephrata	509-754-4624		
Regional Program Manager – Matt Monda	509-754-4624 (16)		
Scott Fitkin, District Biologist	509-996-4373		
Jeff Heinlen, Field Biologist	509-826-7372	509-486-0970	
State Patrol Dispatch	911		

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

NAME	TELEPHONE
DNR Dispatch (Colville)	509-684-7474
DNR Omak field office	509-826-7316

APPENDIX 4: Water Rights

Scotch Creek Wildlife Area-Water Rights

File #	Cert #	Status	Doc	Priority Date	Purpose	Qi	UOM	Qa	IR Acres	WRIA	County	TRS	QQ/Q	1stSrc
S4-097644CL		A	Claim L	1/1/1886	ST,IR		CFS		20.00	49	Okanogan	35.0N 25.0E 16		SCOTCH CREEK
S4-097643CL		A	Claim L	6211	ST,IR	2.00	CFS		10.00	49	Okanogan	35.0N 25.0E 22		SCOTCH CREEK
G4-*01230CWRIS	1981	A	Cert	18156	IR	100.00	GPM	56.00	14.00	49	Okanogan	35.0N 25.0E 23	NW/SE	WELL
G4-*04093CWRIS	3368	A	Cert	20327	IR	300.00	GPM	184.00	46.00	49	Okanogan	35.0N 25.0E 23		WELL
S4-150356CL		A	Claim L		ST					60	Okanogan	40.0N 29.0E 24	E1/2	MARY ANN CR
S4-150397CL		A	Claim L		ST					60	Okanogan	40.0N 30.0E 06	SE/SW	SMALL LAKE
S4-150398CL		A	Claim L		ST					60	Okanogan	40.0N 30.0E 06	SW/SW	SPRING
S4-150395CL		A	Claim L		ST					60	Okanogan	40.0N 30.0E 08	SW	LAKE
S4-150400CL		A	Claim L		ST					60	Okanogan	40.0N 30.0E 08	NE/SW	SPRING
S4-150359CL		A	Claim L		ST					60	Okanogan	40.0N 30.0E 17	NE/SE	SPRING
S4-150360CL		A	Claim L		ST					60	Okanogan	40.0N 30.0E 17	NE/SE	SPRING
S4-150362CL		A	Claim L		ST					60	Okanogan	40.0N 30.0E 17	SE/SW	SPRING
S4-150399CL		A	Claim L		ST					60	Okanogan	40.0N 30.0E 17	SW/NE	SPRING
S4-150368CL		A	Claim L		ST					60	Okanogan	40.0N 30.0E 18	SW/SE	LAKE
S4-150401CL		A	Claim L		ST					60	Okanogan	40.0N 30.0E 18	SW/NE	SPRING
S4-*47022ALJWRI S		A	Adj Cert	367	DS,ST					60	Okanogan	40.0N 30.0E 30	NE/NW	MARY ANN CR
											Okanogan	40.0N 30.0E 19	NE/NW	MARY ANN CR
S4-150354CL		A	Claim L		ST					60	Okanogan	40.0N 30.0E 20	SE/NW	SPRING
S4-150357CL		A	Claim L		ST					60	Okanogan	40.0N 30.0E 20	SW/NE	SPRING
S4-150364CL		A	Claim L		ST					60	Okanogan	40.0N 30.0E 20	NE/NW	SPRING
S4-150365CL		A	Claim L		DG					60	Okanogan	40.0N 30.0E 20	NW/SE	SPRING
S4-150366CL		A	Claim L		DG					60	Okanogan	40.0N 30.0E 20	NW/SE	SPRING
S4-150367CL		A	Claim L		DG					60	Okanogan	40.0N 30.0E 20	NW/SE	SPRING

G4- *0412PWRIS		I	Permit	20418	IR	500.00	GPM	400.00	100.00	49	Okanogan	35.0N 25.0E 22		WELL
G4- *03061CWRIS	5964	A	Cert	19429	IR	600.00	GPM	260.00	65.00	49	Okanogan	35.0N 25.0E 23		WELL
G4- 07464PWRIS		I	Permit	23761	IR	800.00	GPM	320.00	80.00	49	Okanogan	35.0N 25.0E 23		WELL
S4-117618CL		A	Claim L	42736	ST	4.60	CFS	5.20		49	Okanogan	35.0N 25.0E 12		SPRING
S4-117613CL		A	Claim L	42736	ST	1.00	CFS	2.00		49	Okanogan	35.0N 25.0E 14		SPRING
S4-117614CL		A	Claim L	42736	ST	15.00	CFS	3.00		49	Okanogan	35.0N 25.0E 14		SPRING
S4-117615CL		A	Claim L	42736	ST	15.00	CFS	3.00		49	Okanogan	35.0N 25.0E 14		SPRING
G4-117609CL		A	Claim L	14793	DG	3.00	GPM	2.00		49	Okanogan	35.0N 25.0E 15		WELL
S4-117610CL		A	Claim L	42736	ST	7.00	CFS	4.00		49	Okanogan	35.0N 25.0E 15		SPRING
S4-117611CL		A	Claim L	42736	ST	3.00	CFS	6.00		49	Okanogan	35.0N 25.0E 15		SPRING
S4-117612CL		A	Claim L	42736	ST	1.50	CFS	3.00		49	Okanogan	35.0N 25.0E 15		SPRING
S4-097644CL		A	Claim L	1/1/1886	IR, ST	2.12	CFS	470.00		49	Okanogan	35.0N 25.0E 16		SPRING
G4-117606CL		A	Claim L	14793	DG	3.00	GPM	2.00		49	Okanogan	35.0N 25.0E 21		WELL
G4-117607CL		A	Claim L	24289	DG	3.00	GPM	2.00		49	Okanogan	35.0N 25.0E 22		WELL
G4-117608CL		A	Claim L	24289	DG	3.00	GPM	2.00		49	Okanogan	35.0N 25.0E 22		WELL
S4-097643CL		A	Claim L	42736	IR,ST	2.00	CFS	450.00		49	Okanogan	35.0N 25.0E 23		SCOTCH CREEK
S4-117617CL		A	Claim L	6211	DG, ST	3.25	CFS	3.00		49	Okanogan	35.0N 25.0E 24		SPRING
G4-117622CL		A	Claim L	43831	DG, ST	5.00	GPM	3.00		49	Okanogan	35.0N 25.0E 27		WELL
G4-117623CL		A	Claim L	42736	ST	2.00	CFS	0.50		49	Okanogan	35.0N 25.0E 33		SPRING
G4-117624CL		A	Claim L	42736	ST	1.00	CFS	0.17		49	Okanogan	35.0N 25.0E 33		SPRING
G4-117620CL		A	Claim L	14611	ST	2.00	CFS	4.00		49	Okanogan	35.0N 25.0E 35		WELL
G4-117621CL		A	Claim L	42736	DG, ST	4.50	GPM	3.00		49	Okanogan	35.0N 25.0E 35		WELL
S4-117625CL		A	Claim L	42736	ST	1.50	CFS	0.25		49	Okanogan	35.0N 24.0 10		SPRING

Abbreviations:

A, Active; CI, Commercial Industrial; DG, domestic Ground; DS, Single Domestic; FR, Fire Protection; IR, Irrigation; Qa, Annual quantity; Qi, Instantaneous quantity; SR, Storage; ST, Stock; WL, Wildlife

APPENDIX 5 Management Plan Comments & Responses

Washington State Department of Fish and Wildlife, February 2007

The following individuals commented during the management plans public comment period.

Comment Author	Organization	Location
Dick Finch	Okanogan Wildlife Council	Okanogan

Abbreviations: USFWS-United States Fish and Wildlife Services, etc.

Comments received on the Scotch Creek Wildlife Area Plan are presented below. A response for each comment is included. Where appropriate, changes were incorporated into the management plan to address public comments.

Commenter	Comment	Response
	General Support	
Dick Finch	<p>You have managed the Scotch Creek Wildlife Area for 15 years now. And you have made great progress. Your brush and shrub plantings are doing well, especially those along Scotch Creek. Less weeds. Good ground cover resulting in little erosion. Game birds, at least those I can chase, are plentiful. Some comments I would like you to consider follow:</p> <p>Page 21: Strategy A calls for maintaining springs and guzzlers for upland birds and other species. I must say I am real disappointed on how quickly the guzzlers installed after Scotch Creek was purchased fell apart. Due to some bum "treated" posts. But then are they needed? I've seen little sign of use by upland birds. They seem more popular with coyotes and bear than birds. Page 22: 6. C. Strategy--Calls for using fire on the Tunk Valley Unit. You need also to consider using fire on certain grasslands on Scotch Creek. I noticed you mowed some of the bottom lands along Scotch Creek east of the Fire Hall parking area. The grass was mowed and NOT BALED. That creates a lot of thatch. Worst kind of obstacle course for hatchlings. Add rain and you have a death trap for young birds. The best way to improve habitat in sod-forming grasses is an early Spring burn. You could disk up a fire break between your plantings and the bottom lands to burn. On the north side of the creek use the</p>	<p>Very good comments, and much appreciated. PAGE 21, MAINTAINING SPRINGS AND GUZZLERS. Other comments from DFW also had this same concern for the need of artificial water structures for Sharp-tailed grouse. The literature states that these prairie grouse can receive all their water requirements through the vegetation they eat. Even though free water is not required, I have observed Sharp-tails at the Honey Lake shoreline drinking water. I agree the need for guzzlers is not needed for Sharp-tailed grouse and they appear to be used more for coyotes than any other wildlife species. They also provide a vector for mosquitoes and the water quality is very poor. We will attempt to remove the guzzlers as time allows. PAGE 22, FIRE: Fire is a tool to improve grasslands and will be used on all units as funding, and other issues such as liability and smoke management can be satisfactorily addressed. MOWING: The areas mentioned that were mowed in 2006 were done so to allow better herbicide penetration for late fall spraying on Russian Knapweed. Annual mowing is not planned unless it is part of a weed control program, or on first and second year grass seeding. PAGE 25,</p>

	<p>road that heads east into Scotch Creek basin as the north fire break. Burn the bottom and all the area now covered with reed canary grass. Burn about 1/3 of the area every March and it will be nicely greened up by the time the birds start hatching in late May. Other areas with sod forming grass could benefit from burning too. Page 25. C. Calls for providing access to Pogue Mountain. Great goal. Little public use now. One can now access the Pogue Mountain. area via State and Federal lands only off Salmon Creek Road near the irrigation diversion dam and from WDFW lands near Green Lake. Both long hard routes. You need to come up with a consistent boundary signing program. When the sign marking the Wildlife Area boundary has a "Private Property" on the reverse you seem to get it "right". Now by right, I mean posting the signs like one does with "no trespassing" signs--facing outward. Maybe you should change the wording to something like: BOUNDARY LINE THE LAND BEHIND THIS SIGN BELONGS TO THE WASHINGTON DEPARTMENT OF FISH AND WILDLIFE There should be no doubt which way you would post such a sign</p>	<p>POGUE MOUNTAIN ACCESS. An attempt was made in 2006 to contact one private landowner adjacent to the Pogue Mountain unit for an access easement or purchase. The appropriate DNR manager was also approached, however no favorable response was received from either landowner or manager. The next approach is to develop a trail from the west, originating on WDFW land near Green Lake. A reasonable, yet long trail route has been scouted and will require an agreement with the BLM. This was discussed at the district team meeting in Feb 07 and generally accepted as the next alternative to getting better access to the unit. We will work on this in 2007. BOUNDARY SIGNS, Indeed the posting of wildlife area boundary signs has not been consistent due to many different staff, WCC crew, volunteers and jail inmates assigned to the job. We will attempt as boundary fence repair is occurring to face all boundary signs away from DFW lands as suggested.</p>
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APPENDIX 6 Climate Data

Conconully, Washington (451666)-Monthly Climate Summary
(Period of Record: 6/ 2/1948 to 10/31/2003)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	30.6	38.5	47.0	57.9	67.5	74.1	81.9	81.2	72.6	57.8	41.1	31.7	56.8
Average Min. Temperature (F)	13.4	19.6	26.0	33.8	41.7	47.9	53.0	52.5	44.9	35.0	25.3	16.8	34.2
Average Total Precipitation(in.)	1.54	1.36	1.24	1.03	1.44	1.54	0.85	0.97	0.63	0.96	1.60	1.73	1.24
Average Total Snowfall (in.)	14.1	4.8	3.8	0.3	0.0	0.0	0.0	0.0	0.0	0.2	3.6	11.8	3.2
Average Snow Depth (in.)	8	6	2	0	0	0	0	0	0	0	0	3	1.75

Percent of possible observations for period of record.

Max. Temp.: 91% Min. Temp.: 90.8% Precipitation: 91.1% Snowfall: 78.3% Snow Depth:
71.4%

Check [Station Metadata](#) or [Metadata graphics](#) for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

REFERENCES

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)

Priority Habitat and Species List (<http://wdfw.wa.gov/hab/phslist.htm>)

Priority Habitat and Species Recommendations (<http://wdfw.wa.gov/hab/phsreccs.htm>)

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