Sage Thrasher
(*Oreoscoptes montanus*)

Introduction

Sage thrasher (*Oreoscoptes montanus*) appears to be stable or increasing in much of its range. Sage thrashers can likely persist with moderate grazing and other land management activities that maintain sagebrush cover, tall vigorous shrubs, and the quality and integrity of native vegetation. Sage thrashers are vulnerable where sagebrush habitats are severely degraded or converted to annual grasslands or to other land uses.

There is a high probability of sustaining sage thrashers wherever native sagebrush habitats are maintained with high shrub vigor, tall shrubs, horizontal shrub patchiness, and an open understory of bare ground and native bunchgrasses and forbs.

Life History and Habitat Requirements

Life History

Diet

Sage thrashers forage on the ground for a variety of insect prey, especially ants, ground beetles, and grasshoppers (Vander Haegen 2003). Birds may also eat other arthropods, berries, and plant material (Reynolds *et al.* 1999). All foraging activity occurs during the day. Little information is available on the importance of access to free water (Reynolds *et al.* 1999). Sage thrashers may occasionally predate nests of other shrubsteppe bird species (Vander Haegen *et al.* 2002).

Reproduction

Sage thrasher clutch size is four to seven (usually three to five). The incubation period is about 15 days, by both sexes. Sage thrasher nestlings are altricial and downy. Sage thrashers can probably raise two broods per season, but probably only one brood per year in British Columbia (Cannings 1992). In Oregon, reproductive parameters were not associated with climatic variation (Rotenberry and Wiens 1989).

Chicks fledge when 10 - 11 days of age (Howe 1992; Reynolds 1999). Both parents brood and feed the young. Juveniles continue to be fed by parents for about a week after fledging, during which time they remain close to the nest (Reynolds *et al.* 1999).

Nesting

In Idaho, nest success (number of nests producing 1 fledgling) averaged 46 percent. The mean number of young fledged per successful nest varied from an average of 2.2 - 3.5 (Reynolds and Rich 1978; Reynolds 1981; Howe 1992). In eastern Washington, nest success is 38 percent (Altman and Holmes 2000).

Females usually lay one clutch per breeding season but will lay a replacement clutch if the first nest is predated (Reynolds and Rich 1978). In Washington, egg laying commences in early April (Reynolds *et al.* 1999). A five-year study of sage thrashers in central Oregon found significant differences in clutch size among years (Rotenberry and Wiens 1989).

Migration

Sage thrasher populations in Washington are migratory. Birds arrive in late March to establish breeding territories and leave in August - September. Territory size averaged 0.96 ha (2.4 ac) and ranged from 0.6 to 1.6 ha (1.5 - 4.0 ac) in south central Idaho (Reynolds and Rich 1978).

Mortality

Little information is available regarding sage thrasher survivorship or longevity. Snakes, particularly gopher snakes (*Pituophis melanoleucus*) and Townsend's ground squirrels (*Spermophilus townsendi*) are known nest predators (Rotenberry and Wiens 1989). Presumed nest predators include common ravens (*Corvus corax*), loggerhead shrike (*Lanius ludovicianus*), and long-tailed weasels (*Mustela frenata*) (Rotenberry and Wiens 1989; Reynolds *et al.* 1999).

Habitat Requirements

Sage thrashers are considered a shrubsteppe obligate species and are dependent upon areas of tall, dense sagebrush (*Artemisia tridentata*) within large tracts of shrubsteppe habitat (Knock and Rotenberry 1995; Paige and Ritter 1999; Vander Haegen 2003). In shrubsteppe communities in eastern Washington, sage thrashers are more abundant on loamy and shallow soils than areas of sandy soils, and on rangelands in good and fair condition than those of poor condition (Vander Haegen *et al.* 2000; Vander Haegen 2003). The presence of sage thrashers is positively associated with percent shrub cover and negatively associated with increased annual grass cover (Dobler *et al.* 1996). Total shrub cover and abundance of shrub species, especially sage brush are important habitat features for sage thrashers. Occurrence of sage thrashers in sagebrush habitat has been correlated with increasing sagebrush, shrub cover, shrub patch size, and decreasing disturbance (Knick and Rotenberry 1995).

Nesting

Sage thrasher nests are constructed either in or under sagebrush shrubs. Twenty-one of 34 (62 percent) nests located in south central Idaho were constructed on the ground. Elevated nests were constructed 4-16 in. above ground in sagebrush 30-45 in. tall while ground nests were constructed under sagebrush 22-35 in. tall (Reynolds and Rich 1978). Sagebrush shrubs selected for nesting are usually taller, and have greater crown height and width than random (Reynolds *et al.* 1999). In Washington, nests are usually located in tall sagebrush shrubs, average height 40 inches. (Vander Haegen 2003).

Breeding

Sage thrashers breed in sagebrush plains, primarily in arid or semi-arid situations, rarely around towns (AOU 1998). The birds usually breed between 1,300 and 2,000 meters above sea level (Reynolds and Rich 1978). In eastern Washington, sage thrashers showed the strongest correlation to the amount of sagebrush cover of all shrubsteppe birds and were most abundant where sagebrush percent cover was 11 percent, which is similar to estimated historic sagebrush cover (Dobler 1992, Dobler *et al.* 1996). In northern Great Basin, the sage thrasher breeds and forages in tall sagebrush/bunchgrass, juniper/sagebrush/bunchgrass, mountain mahogany/shrub, and aspen/sagebrush/bunchgrass communities (Maser *et al.* 1984).

Sage thrashers are positively correlated with shrub cover, shrub height, bare ground, and horizontal heterogeneity (patchiness). They are negatively correlated with spiny hopsage, budsage, and grass cover (Rotenberry and Wiens 1980, Wiens and Rotenberry 1981). In Idaho, sage thrashers are more likely to occur in sites with higher sagebrush cover and greater spatial similarity within a one-kilometer radius (Knick and Rotenberry 1995). In Nevada, sage thrashers are found most often on plots with taller, denser sagebrush (Medin 1992).

Sage thrashers usually nests within 1 meter of the ground in a fork of shrub (almost always sagebrush) and sometimes nest on the ground (Harrison 1978; Reynolds 1981; Rich 1980). In southeastern Idaho, sage thrashers nested in clumps of tall big sagebrush, with dense foliage overhead, invariably a depth of 0.5 meter from nest to shrub crown, and nests tending to be on the southeast side of the shrub (Petersen and Best 1991). Reynolds (1981) recorded a mean nest shrub height of 89 cm, a mean nest height 18 cm, and a mean distance between nest and shrub crown of 58 cm. For nests placed within shrubs, Rich (1980) observed a mean nest shrub

height of 83 cm, a mean nest height of 23 cm, and a mean distance between nest and shrub crown of 60 cm (n = 114 nests). The distance between nest and shrub crown is nearly always the same (58 to 60 cm) whether the nest is placed on the ground or within a shrub, presumably for optimum shading and shelter (Reynolds 1981; Rich 1980).

Non-Breeding

In winter, sage thrashers use arid and semi-arid scrub, brush and thickets.

Population and Distribution

Population

Historic

The only historic population estimate found was Jewett *et al.* (1953) given by Kennedy (1914: 252) who estimated there were 5 pairs/mi^2 through the Yakima Valley.

Current

Breeding density rarely exceeds 30 per km^2 (Rotenberry and Wiens 1989). In eastern Washington sagebrush shrubsteppe, mean breeding densities were reported at 0.09-0.2 individuals/ha (Dobler *et a.l* 1996). Medin (1990) reported breeding densities of 0.05 individuals/ha or less in shadscale habitat in eastern Nevada. Territory size in eastern Idaho averaged 8 territories/1.86 ha in one year, and 11 territories/1.14 ha the following year (Reynolds 1981).

On the Yakima Training Center density estimates ranged from 17-31 birds/km^2 in sagebrush habitat (Shapiro and Associates 1996), whereas Schuler *et al.* (1993) on Hanford Reservation, reported density from 0.17-0.23 birds/km^2.

The relative abundance of sage thrashers is significantly positively correlated with the following species in the western U.S., based on North American Breeding Bird Survey data (T.D. Rich, unpubl. data): Brewer's sparrow (*Spizella breweri*) ($r = 0.87$, $P < 0.001$), sage sparrow (*Amphispiza belli*) ($r = 0.73$, $P < 0.001$), gray flycatcher (E*mpidonax wrightii*) ($r = 0.73$, $P < 0.001$), sage grouse (*Centrocercus urophasianus*) ($r = 0.71$, $P < 0.001$), rock wren (*Salpinctes obsoletus*) ($r = 0.61$, $P < 0.001$), vesper sparrow (*Pooecetes gramineus*) ($r = 0.53$, $P < 0.001$), prairie falcon (*Falco mexicanus*) ($r = 0.53$, $P < 0.001$), and green-tailed towhee (*Pipilo chlorurus*) ($r = 0.51$, $P < 0.001$).

Distribution

Historic

Jewett *et al.* (1953) described the distribution of the sage thrasher as a summer resident at least from March to August irregularly through the sagebrush of the Upper Sonoran Zone in eastern Washington. They describe its summer range as north to Soap Lake, Almira, St. Andrews and Withrow; east to Sprague and Spokane; south to Bickleton, Wallula, Horse Heaven, and Kiona; and west to Ellensburg and Yakima Valley. Jewett *et al.* (1953) also note that Snodgrass observed none in the desert of Franklin and western Walla Walla counties, but found it rather numerous on the west side of the Columbia River between White Bluffs and Yakima, a few inhabiting tree-covered area along the Yakima River, and abundant in the arid Horse Heaven country. They note that the species has been reported as far east as Sprague and Riverside. Hudson and Yocom (1954) described the sage thrasher as uncommon and locally distributed summer resident in sagebrush areas. They note it presence was recorded by Taylor around Spokane and also that one record exits near Pullman.

Sage thrashers inhabited large, lowland areas of southeast Washington when it consisted of shrubsteppe habitat. Conversion of shrub-step to agricultural use has greatly reduced the

habitat available to the sage thrasher, resulting in localized populations associated with existing sagebrush habitat in eastern Walla Walla and northeast Asotin counties (Smith *et al.* 1997).

Current

Sage thrashers are a migratory species in the state of Washington; birds are present only during the breeding season. Confirmed breeding evidence has been recorded in Douglas, Grant, Lincoln, Adams, Yakima, and Kittitas counties. Core habitats also occur in Okanogan, Chelan, Whitman, Franklin, Walla Walla, Benton, Klickitat, and Asotin counties (Smith *et al.* 1997).

Estimates of sage thrasher density in eastern Washington during 1988-89 was 0.5 birds/ac (Dobler *et al.* 1996).

Breeding

During the breeding season, sage thrashers are found in southern British Columbia, central Idaho, and south-central Montana south through the Great Basin to eastern California, northeastern Arizona, and west-central and northern New Mexico (AOU 1983; Reynolds *et al.* 1999). Sage thrashers breed at least irregularly in southern Alberta and southern Saskatchewan (Cannings 1992) (Figure 1).

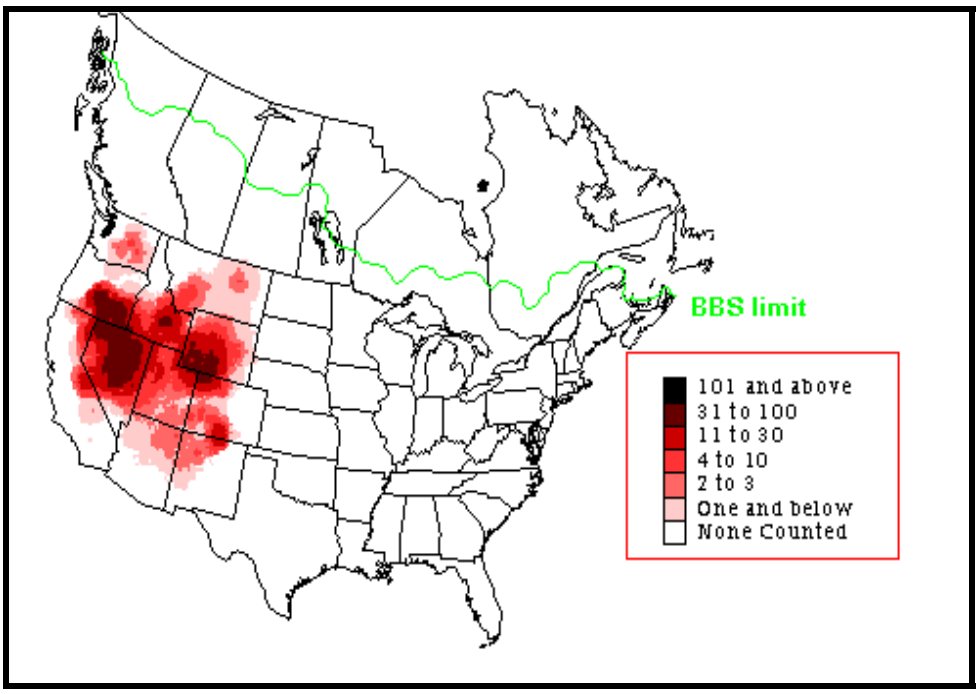

Figure 1. Sage thrasher breeding season abundance from BBS data (Sauer *et al*. 2003).

Non-Breeding

Sage thrashers are found in central California, southern Nevada, northern Arizona, central New Mexico, and central Texas south to southern Baja California, northern Sonora, Chihuahua, Durango, Guanajuato, northern Nuevo Leon, and northern Tamaulipas (AOU 1983; Reynolds *et al.* 1999) (Figure 2).

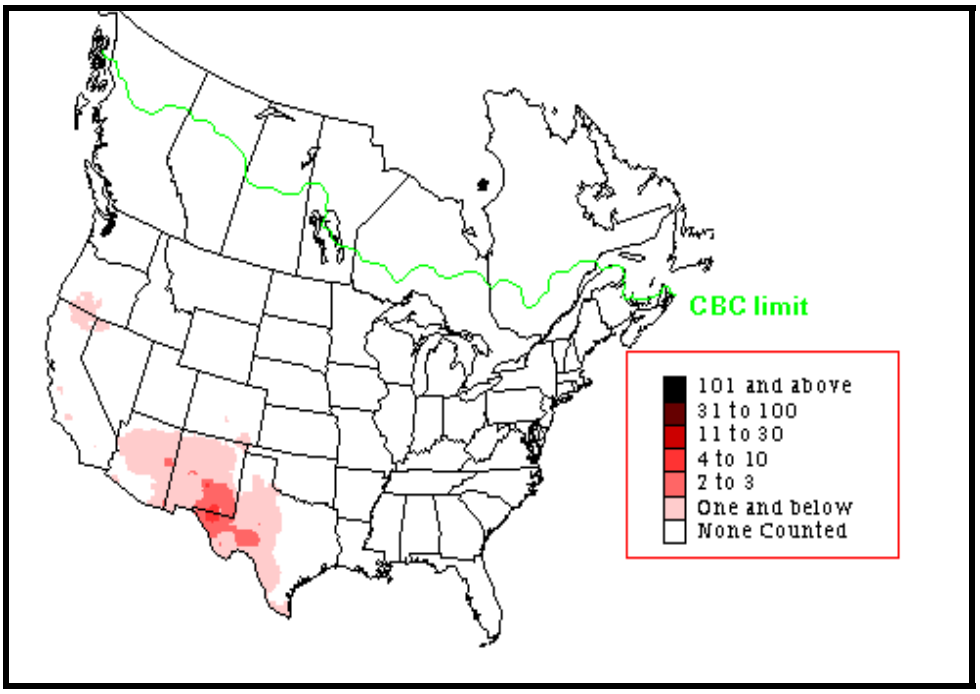

Figure 2. Sage thrasher winter season abundance from CBC data (Sauer *et al*. 2003).

Status and Abundance Trends

Status

The sage thrasher is considered a 'state candidate' species by the Washington Department of Fish and Wildlife. In Canada, sage thrashers are on the British Columbia Environment Red List (review for endangered and threatened status). They are considered a priority species by the Oregon-Washington Chapter of Partners in Flight and are on the Audubon Society Watch List for Washington State. Sage thrashers are listed as a species of high management concern by the Interior Columbia River Basin Ecosystem Management Project (Saab and Rich 1997).

Trends

North American Breeding Bird Survey (BBS) data (1966-1996) show a non-significant sage thrasher survey-wide increase (n = 268 survey routes) (Figure 3). There have been increasing trends in all areas except Idaho (-1.0 average decline per year, non-significant, n = 29) and the Intermountain Grassland physiographic region (-4.0 average decline per year, significant, n = 26) for 1966-1996. BBS data indicate a significant decline in Intermountain Grassland for 1980-1996 (-8.8 average per year decrease, n = 22). Significant long-term increases in sage thrashers are evident in Colorado (4.4 percent average per year, n = 24) and Oregon (2.6 percent average per year, n = 28), 1966-1996. The sample sizes are small or trends are not significant in other states. The BBS data (1966-1996) for the Columbia Plateau are illustrated in Figure 4.

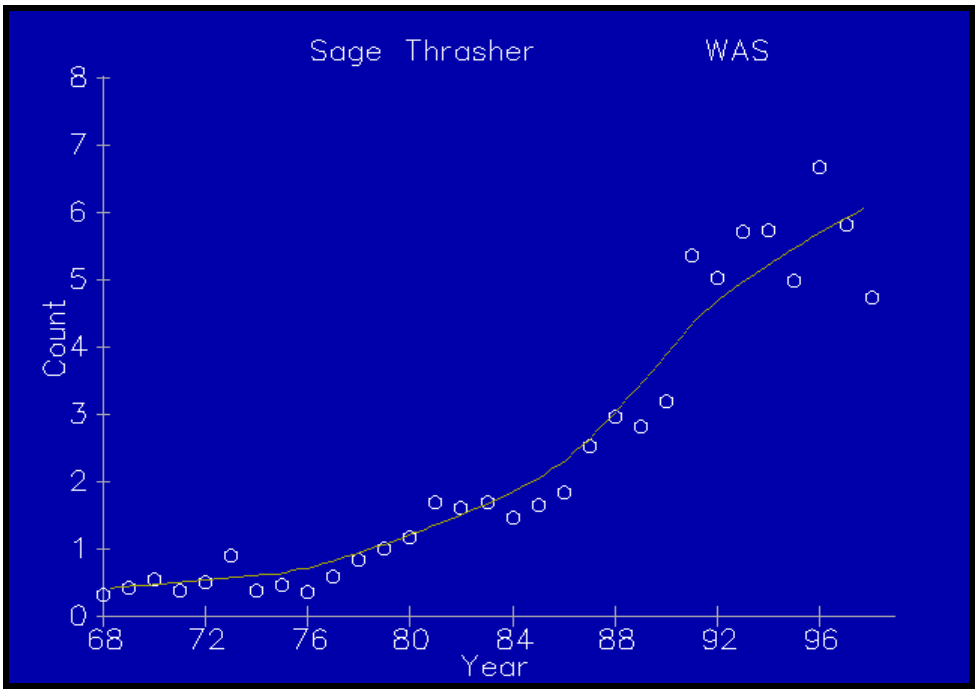

Figure 3. Sage thrasher trend results from BBS data, Washington (Sauer *et al.* 2003).

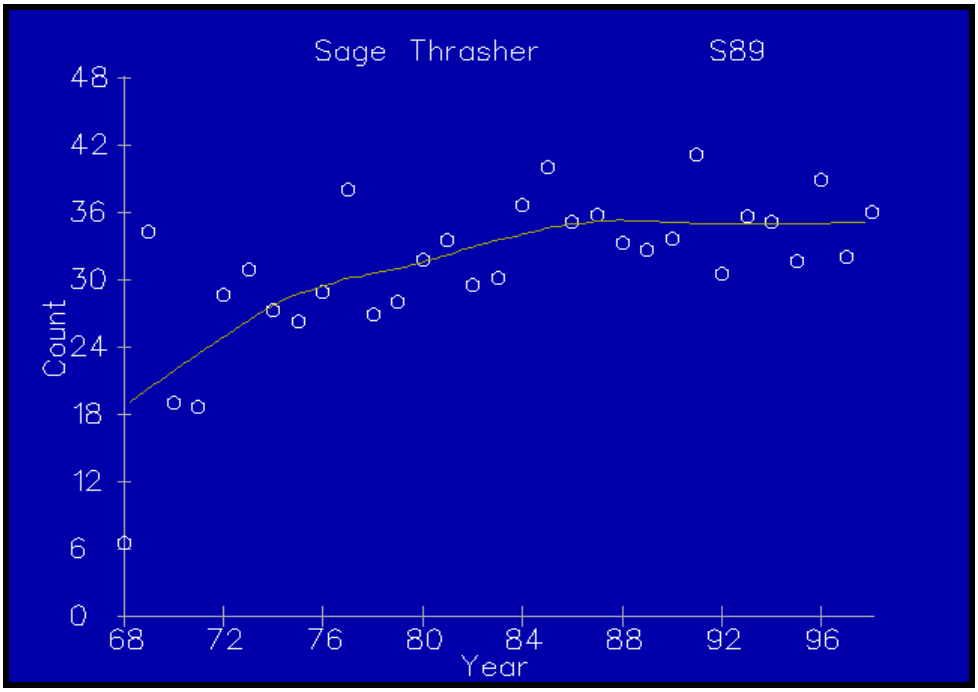

Figure 4. Sage thrasher trend results from BBS data, Columbia Plateau (Sauer *et al.* 2003).

Christmas Bird Count (CBC) show stable trends for the period 1959-1988 (0.0 percent average annual change, n = 161 survey circles) survey-wide, but a significant decline in Texas (-2.8 percent average annual decline, n = 59) and a significant increase in New Mexico (2.4 percent average per year, n = 19). Sage thrasher winter abundance is highest in west Texas and southeastern New Mexico (Sauer *et al.* 1996).

Sage thrasher is positively correlated with the presence of Brewer's sparrow, probably due to similarities in habitat relations (Wiens and Rotenberry 1981), and does not exhibit the steep and widespread declines evident from BBS data for Brewer's sparrow (see Sauer *et al.* 1997).

Factors Affecting Sage Thrasher Population Status

Key Factors Inhibiting Populations and Ecological Processes

Habitat Loss and Fragmentation

Removal of sagebrush and conversion to other land uses is detrimental (Castrale 1982). Large-scale reduction and fragmentation of sagebrush habitats is occurring in many areas due to land conversion to tilled agriculture, urban and suburban development, and road and powerline right-of-ways. Range management practices such as mowing, burning, herbicide treatments, and residential and agricultural development have reduced the quantity and quality of sagebrush habitat (Braun *et al.* 1976, Cannings 1992, Reynolds *et al.* 1999). Range improvement programs remove sagebrush (particularly once grazed sagebrush becomes overly dense) by burning, herbicide application, and mechanical treatment, replacing sagebrush with annual grassland to promote forage for livestock. Burning can result in longer-lasting sagebrush control than chaining (Castrale 1982).

In Washington, the conversion of native shrubsteppe to agriculture has resulted in a 50 percent loss in historic breeding habitat. Concomitant with habitat loss has been fragmentation of remaining shrubsteppe. Research in Washington suggests that sage thrashers may be less sensitive to habitat fragmentation than other shrubsteppe obligates as birds were found to nest in shrubsteppe patches <10 ha (24 ac) (Vander Haegen *et al.* 2000). However, birds nesting in small habitat fragments may experience higher rates of nest predation than birds nesting in larger areas of contiguous habitat (Vander Haegen 2003).

Recommended habitat conditions for sage thrashers include areas of shrubsteppe >16 ha (40 ac) where average sagebrush cover is 5-20 percent and height is >80 cm (31 in), sagebrush should be patchily distributed rather than dispersed, and mean herbaceous cover 5-20 percent with <10 percent cover of non-native annuals (Altman and Holmes 2000).

According to the ICBEMP terrestrial vertebrate habitat analyses, historical source habitats for sage thrasher occurred throughout most of the three ERUs within our planning unit (Wisdom *et al.* in press). Declines in source habitats were moderately high in the Columbia Plateau (40 percent), but relatively low in the Owyhee Uplands (15 percent) and Northern Great Basin (5 percent). However, declines in big sagebrush (e.g., 50 percent in Columbia Plateau ERU), which is likely higher quality habitat, are masked by an increase in juniper sagebrush (>50 percent in Columbia Plateau ERU), which is likely reduced quality habitat. Within the entire Interior Columbia Basin, over 48 percent of watersheds show moderately or strongly declining trends in source habitats for this species (Wisdom *et al.* in press) (from Altman and Holmes 2000).

Grazing

Although sage thrashers are found on grazed range land, the effects of long-term grazing by livestock are not known. The response by sage thrashers to grazing is mixed as studies have reported both positive and negative population responses to moderate grazing of big sage/bluebunch wheatgrass communities (Saab *et al.* 1995). There is some evidence that sage thrasher density may be lower in grazed habitats as the average distance between neighboring nests was found to be significantly lower in ungrazed vs. grazed shrubsteppe habitats in south-central Idaho, 64 m (209 ft) and 84 m (276 ft) respectively (Reynolds and Rich 1978). Altman and Holmes (2000) suggest maintaining >50 percent of annual vegetative growth of perennial bunchgrasses through the following growing season.

Grazing can increase sagebrush density, positively affecting thrasher abundance. Dense stands of sagebrush, however, are considered degraded range for livestock and may be treated to reduce or remove sagebrush. Grazing may also encourage the invasion of non-native grasses, which escalates the fire cycle and converts shrublands to annual grasslands. West (1988, 1996) estimates less than 1 percent of sagebrush steppe habitats remain untouched by livestock; 20 percent is lightly grazed, 30 percent moderately grazed with native understory remaining, and 30 percent heavily grazed with understory replaced by invasive annuals. The effects of grazing in sagebrush habitats are complex, and depend on intensity, season, duration and extent of alteration to native vegetation.

Invasive Grasses

Cheatgrass readily invades disturbed sites, and has come to dominate the grass-forb community of more than half the sagebrush region in the West, replacing native bunchgrasses (Rich 1996). Cheatgrass can create a more continuous grass understory than native bunchgrasses. Dense cheatgrass cover can possibly affect foraging ability for ground foragers, and more readily carries fire than native bunchgrasses. Crested wheatgrass and other non-native annuals have also altered the grass-forb community in many areas of sagebrush shrubsteppe.

Fire

Cheatgrass has altered the natural fire regime on millions of acres in the western range, increasing the frequency, intensity, and size of range fires. Fire kills sagebrush and where non-native grasses dominate, the landscape can be converted to annual grassland as the fire cycle escalates (Paige and Ritter 1998).

Predation

Sage thrashers are preyed upon by loggerhead shrikes (*Lanius ludovicianus*); predation can be a major factor in breeding success of sagebrush birds (Reynolds 1979).

Brood Parasitism

Sage thrashers coexist with brown-headed cowbirds (*Molothrus ater*) at various points throughout their range and have been observed to reject cowbird eggs by ejecting eggs from the nest (Rich and Rothstein 1985).

Out-of-Subbasin Effects and Assumptions

No data could be found on the migration and wintering grounds of the sage thrasher. It is a short distance migrant, wintering in the southwestern U.S. and northern Mexico, and as a result faces a complex set of potential effects during it annual cycle. Habitat loss or conversions is likely happening along its entire migration route (H. Ferguson, WDFW, pers. comm., 2003). Management requires the protection shrub, shrubsteppe, desert scrub habitats, and the elimination or control of noxious weeds. Migration routes, corridors, and wintering grounds need to be identified and protected just as its breeding areas.

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Brewer's Sparrow
(*Spizella breweri*)

Introduction

Although not currently listed, Brewer's sparrows have significantly declined across their breeding range in the last 25 years, a cause for concern because this species is one of the most widespread and ubiquitous birds in shrubsteppe ecosystems (Saab *et al.* 1995). Brewer's sparrow is a sagebrush obligate where sagebrush cover is abundant (Altman and Holmes 2000). However, in recent decades many of the shrubsteppe habitats in Washington have changed as a result of invasion by exotic annuals, especially cheatgrass. Cheatgrass-dominated areas have an accelerated fire regime that effectively eliminates the sagebrush shrub component of the habitat, a necessary feature for Brewer's sparrows (Vander Haegen *et al.* 2000).

Conservation practices that retain deep-soil shrubsteppe communities, reduce further fragmentation of native shrubsteppe, and restore annual grasslands and low-productivity agricultural lands are all important (Vander Haegen *et al.* 2000). A patchy distribution of sagebrush clumps is more desirable than dense uniform stands. Removal of sagebrush cover to <10 percent has a negative impact on populations (Altman and Holmes 2000). Recommended habitat objectives include the following: patches of sagebrush cover 10-30 percent, mean sagebrush height > 64cm (24 in), high foliage density of sagebrush, average cover of native herbaceous plants > 10 percent, bare ground >20 percent (Altman and Holmes 2000).

Life History and Habitat Requirements

Life History

Diet

Brewer's sparrows forage by gleaning a wide variety of small insects from the foliage and bark of shrubs. Occasionally, seeds are taken from the ground. They will drink free-standing water when available but are physiologically able to derive adequate water from food and oxidative metabolism (Rotenberry *et al.* 1999). Lepidopterans (butterflies and moths, 90 percent larvae), araneans (spiders), hemipterans (bugs), and homopterans (hoppers, aphids, etc.) make up 72 percent of the nestling diet (Petersen and Best 1986).

Reproduction

Breeding begins in mid-April in the south to May or early June in the north. Clutch size is usually three to four. Nestlings are altricial. Brewer's sparrow reproductive success is correlated with climatic variation and with clutch size; success increasing in wetter years (Rotenberry and Wiens 1989, 1991).

Brewer's sparrows are able to breed the first year following hatch and may produce two broods a year. In southeastern Idaho, the probability of nest success was estimated at 9 percent (n = 7; Reynolds 1981). In eastern Washington 31 of 59 (53 percent) pairs were unsuccessful, 25 (42 percent) fledged one brood, 3 (5 percent) fledged two broods (Mahony *et al.* 2001). The probability of nest success was an estimated 39 percent for 495 nests monitored in eastern Washington; reproductive success was lower in fragmented landscapes (M. Vander Haegen unpubl. data in Altman and Holmes 2000). The number of fledglings produced/nest varies geographically and temporally. The average number of fledglings/nest range from 0.5-3.4 but may be zero in years with high nest predation (Rotenberry *et al.* 1999).

Nesting

Brewer's sparrow pair bonds are established soon after females arrive on breeding areas, usually in late March but pair formation may be delayed by colder than average spring weather. Not all males successfully acquire mates. In Washington, 51 percent of 55 males monitored in

the breeding season were observed incubating eggs, especially during inclement weather (Mahony *et al.* 2001). Pairs may start a second clutch within 10 days after fledging the young from their first brood (Rotenberry *et al.* 1999).

Brown-headed cowbirds (*Molothrus ater*) are known to lay eggs in Brewer's sparrow nests; parasitized nests are usually abandoned (Rich 1978, Biermann *et al.* 1987, Rotenberry *et al.* 1999). Parasitism of Brewer's sparrows nest by cowbirds is only about 5 percent in eastern Washington (Altman and Holmes 2000).

Both parents feed the nestlings, 90 percent of foraging trips are less than 164 feet from the nest site. Fledglings are unable to fly for several days after leaving the nest and continue to be dependent upon the parents. During this period they remain perched in the center of a shrub often less than33 feet from the nest and quietly wait to be fed (Rotenberry *et al.* 1999).

Migration

Brewer's sparrow is a neotropical migrant. Birds breed primarily in the Great Basin region and winter in the southwestern U.S., Baja, and central Mexico. North-south oriented migration routes are through the Intermountain West. Brewer's sparrows are an early spring migrant. Birds arrive in southeastern Oregon by mid-late March. The timing of spring arrival may vary among years due to weather conditions. Birds generally depart breeding areas for winter range in mid-August through October (Rotenberry *et al.* 1999).

Mortality

Nest predators include gopher snake (*Pituophis catenifer*), western rattlesnake (*Crotalus viridis*), common raven (*Corvus corax*), black-billed magpie (*Pica pica*), loggerhead shrike (*Lanius ludovicianus*), long-tailed weasel (*Mustela frenata*), Townsend's ground squirrel (*Spermophilus townsendii*), and least chipmunk (*Tamias minimus*). Predators of juvenile and adult birds include loggerhead shrike, American kestrel (*Falco sparverius*), sharp-shinned (*Accipiter striatus*) and Cooper's (*A. cooperi*) hawks (Rotenberry 1999).

Habitat Requirements

In eastern Washington, abundance of Brewer's sparrows (based on transect surveys) was negatively associated with increasing annual grass cover; higher densities occurred in areas where annual grass cover was <20 percent (Dobler 1994). Vander Haegen *et al.* (2000) determined that Brewer's sparrows were more abundant in areas of loamy soil than areas of sandy or shallow soil, and on rangelands in good or fair condition than those in poor condition. Additionally, abundance of Brewer's sparrows was positively associated with increasing shrub cover. In southwestern Idaho, the probability of habitat occupancy by Brewer's sparrows increased with increasing percent shrub cover and shrub patch size; shrub cover was the most important determinant of occupancy (Knick and Rotenberry 1995).

Nesting

Brewer's sparrows construct an open cup shaped nest generally in a live big sagebrush shrub (Petersen and Best 1985, Rotenberry *et al.* 1999). In southeastern Idaho, mean sagebrush height (54 cm, 21 in) and density (29 percent cover) were significantly higher near Brewer's sparrow nest sites than the habitat in general while herbaceous cover (8 percent) and bare ground (46 percent) were significantly lower (Petersen and Best 1985). The average height of nest shrubs in southeastern Idaho was 69 cm (27 in). Ninety percent (n = 58) of Brewer's sparrows nests were constructed at a height of 20-50 cm (8-20 in) above the ground (Petersen and Best 1985).

Breeding

Brewer's sparrow is strongly associated with sagebrush over most of its range, in areas with scattered shrubs and short grass. They can also be found to a lesser extent in mountain mahogany, rabbit brush, bunchgrass grasslands with shrubs, bitterbrush, ceonothus, manzanita and large openings in pinyon-juniper (Knopf *et al.* 1990; Rising 1996; Sedgwick 1987; USDA Forest Service 1994). In Canada, the subspecies *taverneri* is found in balsam-willow habitat and mountain meadows.

The average canopy height is usually < 1.5 meter (Rotenberry *et al.* 1999). Brewer's sparrow is positively correlated with shrub cover, above-average vegetation height, bare ground, and horizontal habitat heterogeneity (patchiness). They are negatively correlated with grass cover, spiny hopsage, and budsage (Larson and Bock 1984; Rotenberry and Wiens 1980; Wiens 1985; Wiens and Rotenberry 1981). Brewer's sparrows prefer areas dominated by shrubs rather than grass. They prefer sites with high shrub cover and large patch size, but thresholds for these values are not quantified (Knick and Rotenberry 1995). In Montana, preferred sagebrush sites average 13 percent sagebrush cover (Bock and Bock 1987). In eastern Washington, Brewer's sparrow abundance significantly increased on sites as sagebrush cover approached historic 10 percent level (Dobler *et al.* 1996). Brewer's sparrows are strongly associated throughout their range with high sagebrush vigor (Knopf *et al.* 1990).

Adults are territorial during the breeding season. Territory size is highly variable among sites and years. In central Oregon and northern Nevada, territory size was not correlated with 17 habitat variables but was negatively associated with increasing Brewer's sparrow density. The average size of territories ranges from 0.5-2.4 ha (1.2-5.9 ac, n = 183) in central Oregon. The reported territory size in central Washington is much lower, 0.1 ha (0.2 ac) (Rotenberry *et al.* 1999).

Non-Breeding

In migration and winter, Brewer's sparrows use low, arid vegetation, desert scrub, sagebrush, creosote bush (Rotenberry *et al.* 1999).

Population and Distribution

Population

Historic

No data are available.

Current

Brewer's sparrows can be abundant in sagebrush habitat and will breed in high densities (Great Basin and Pacific slopes), but densities may vary greatly from year to year (Rotenberry *et al.* 1999). Dobler *et al.* (1996) reported densities of 50-80 individuals/km^2 in eastern Washington. In the Great Basin, density usually ranged from 150-300/km^2, sometimes exceeding 500/km^2 (Rotenberry and Wiens 1989). Brewer's sparrow breeding density ranges from 0.08 to 0.10 individuals/ha in shadscale habitat in eastern Nevada (Medin 1990). Breeding territory usually averages between 0.6-1.25 hectares and will contract as densities of breeding birds increase (Wiens *et al.* 1985).

In southeastern Oregon, densities have ranged from 390 to 780/mi^2 but can exceed 500/km^2 (1,295/mi^2) (Weins and Rotenberry 1981, Rotenberry and Weins 1989).

Distribution

Historic

Jewett *et al.* (1953) described the distribution of the Brewer's sparrow as a fairly common migrant and summer resident at least from March 29 to August 20, chiefly in the sagebrush of

the Upper Sonoran Zone in eastern Washington. They describe its summer range as north to Brewster and Concully; east to Spokane and Pullman; south to Walla Walla, Kiona, and Lyle; and west to Wenatchee and Yakima. Jewett *et al.* (1953) also noted that Snodgrass (1904: 230) pointed out its rarity in Franklin and Yakima counties. Snodgrass also reported that where the vesper sparrow was common, as in Lincoln and Douglas counties, the Brewer's sparrow was also common (Jewett *et al.* 1953). Hudson and Yocom (1954) described the Brewer's sparrow as an uncommon summer resident and migrant in open grassland and sagebrush.

Undoubtedly, the Brewer's sparrow was widely distributed throughout the lowlands of southeast Washington when it consisted of vast expanses of shrubsteppe habitat. Large scale conversion of shrubsteppe habitat to agriculture has resulted in populations becoming localized in the last vestiges of available habitat (Smith *et al.* 1997). A localized population existed in small patches of habitat in northeast Asotin County. Brewer's sparrow may also occur in western Walla Walla County, where limited sagebrush habitat still exists.

Current

Washington is near the northwestern limit of breeding range for Brewer's sparrows. Birds occur primarily in Okanogan, Douglas, Grant, Lincoln, Kittitas, and Adams counties (Smith *et al.* 1997).

There is high annual variation in breeding season density estimates. A site may be unoccupied one year and have densities of up to 150 birds/km^2 the next. Because of this variation, short-term and/or small scale studies of Brewer's sparrow habitat associations must be viewed with caution (Rotenberry *et al.* 1999).

Breeding

The subspecies *breweri* is found in southeast Alberta, southwestern Saskatchewan, Montana, and southwestern North Dakota, south to southern California (northern Mojave Desert), southern Nevada, central Arizona, northwestern New Mexico, central Colorado, southwestern Kansas, northwestern Nebraska, and southwestern South Dakota (AOU 1983, Rotenberry *et al.* 1999) (Figure 1). The subspecies *taverneri* is found in southwest Alberta, northwest British Columbia, southwest Yukon, and southeast Alaska (Rotenberry *et al.* 1999).

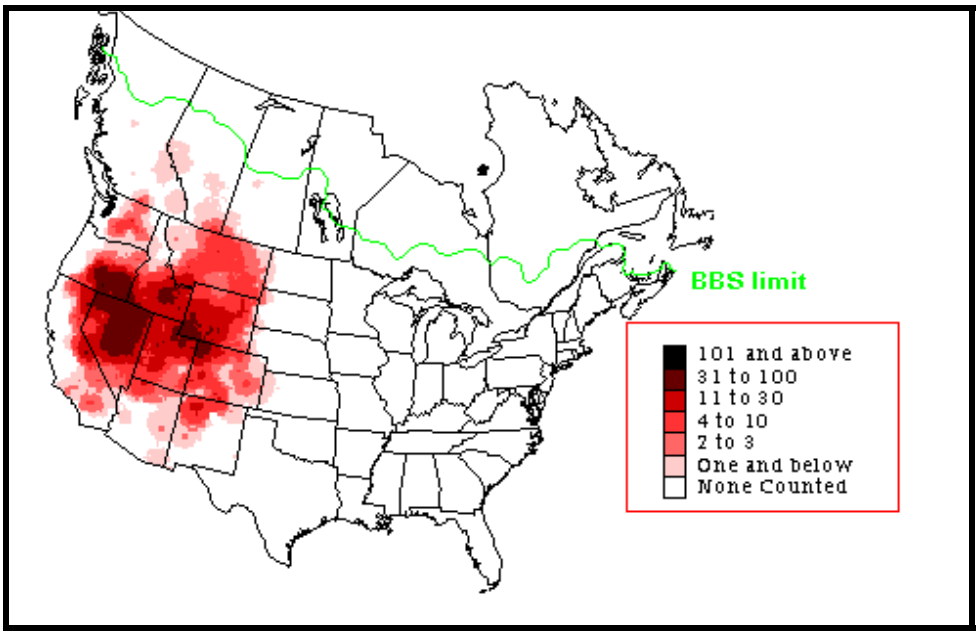

Figure 1. Brewer's sparrow breeding season abundance from BBS data (Sauer *et al.* 2003).

Non-Breeding

During the non-breeding season, Brewer's sparrows are found in southern California, southern Nevada, central Arizona, southern New Mexico, and west Texas, south to southern Baja California, Sonora, and in highlands from Chihuahua, Coahuila, and Nuevo Leon south to northern Jalisco and Guanajuato (Terres 1980, AOU 1983, Rotenberry *et al.* 1999).

Status and Abundance Trends

Status

Brewer's sparrow is often the most abundant bird species in appropriate sagebrush habitats. However, widespread long-term declines and threats to shrubsteppe breeding habitats have placed it on the Partners in Flight Watch List of conservation priority species (Muehter 1998). Saab and Rich (1997) categorize it as a species of high management concern in the Columbia River Basin.

Considered a shrubsteppe obligate, the Brewer's sparrow is one of several species closely associated with landscapes dominated by big sagebrush (*Artemisia tridentate*) (Rotenberry 1999, Paige and Ritter 1999). Historically, the Brewer's sparrow may have been the most abundant bird in the Intermountain West (Paige and Ritter 1999) but Breeding Bird Survey trend estimates indicate a range-wide population decline during the last twenty-five years (Peterjohn *et al.* 1995). Brewer's sparrows are not currently listed as threatened or endangered on any state or federal list. Oregon-Washington Partners in Flight consider the Brewer's sparrow a focal species for conservation strategies for the Columbia Plateau (Altman and Holmes 2000).

Trends

Breeding Bird Survey (BBS) data for 1966-1996 show significant and strong survey-wide declines averaging -3.7 percent per year (n = 397 survey routes) (Figure 2). The BBS data (1966-1996) for the Columbia Plateau are illustrated in Figure 3. Significant declines in Brewer's sparrow are evident in California, Colorado, Montana, Nevada, Oregon, and Wyoming, with the steepest significant decline evident in Idaho (-6.0 percent average per year; n = 39). These negative trends appear to be consistent throughout the 30-year survey period. Only Utah shows an apparently stable population. Sample sizes for Washington are too small for an accurate estimate. Mapped BBS data show centers of summer abundance in the Great Basin and Wyoming Basin (Sauer *et al.* 1997).

Christmas Bird Count (CBC) data for the U.S. for the period 1959-1988 indicate a stable survey-wide trend (0.2 percent average annual increase; n = 116 survey circles), and a significantly positive trend in Texas (6.7 percent average annual increase; n = 33). Arizona shows a non-significant decline (-1.4 percent average annual decline; n = 34). Mapped CBC data show highest wintering abundances in the U.S. in the borderlands of southern Arizona, southern New Mexico, and west Texas (Sauer *et al.* 1996).

Note that although positively correlated with presence of sage thrashers (*Oreoscoptes montanus*), probably due to similarities in habitat relations (Wiens and Rotenberry 1981), thrashers are not exhibiting the same steep and widespread declines evident in BBS data (see Sauer *et al.* 1997).

According to the ICBEMP terrestrial vertebrate habitat analyses, historical source habitats for Brewer's sparrow occurred throughout most of the three ERUs within our planning unit (Wisdom *et al.* in press). Declines in source habitats were moderately high in the Columbia Plateau (39 percent), but relatively low in the Owyhee Uplands (14 percent) and Northern Great Basin (5 percent). However, declines in big sagebrush (e.g., 50 percent in Columbia Plateau ERU), which is likely higher quality habitat, are masked by an increase in juniper sagebrush (>50 percent in Columbia Plateau ERU), which is likely reduced quality habitat. Within the entire

Interior Columbia Basin, over 48 percent of watersheds show moderately or strongly declining trends in source habitats for this species (Wisdom *et al.* in press) (from Altman and Holmes 2000).

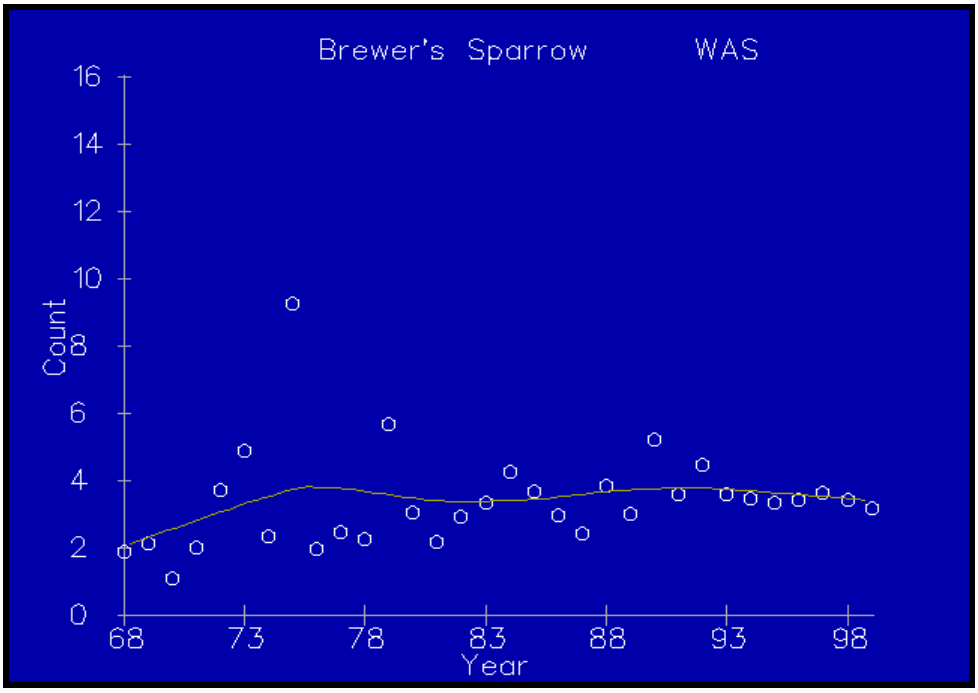

Figure 2. Brewer's sparrow trend results from BBS data, Washington (Sauer *et al.* 2003).

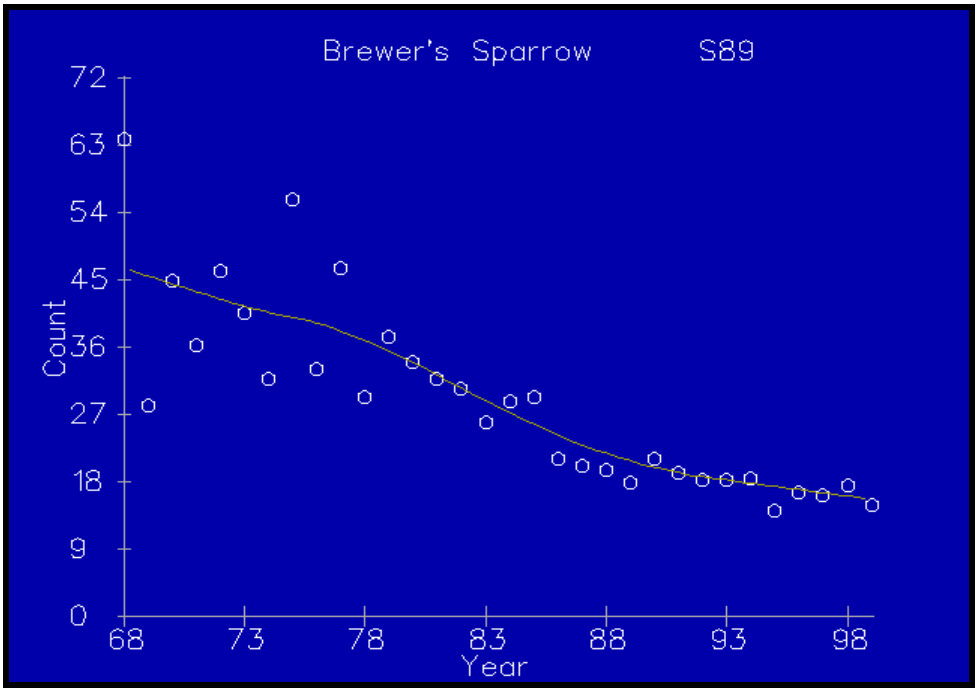

Figure 3. Brewer's sparrow trend results from BBS data, Columbia Plateau (Sauer *et al.* 2003)..

Factors Affecting Brewer's Sparrow Population Status

Key Factors Inhibiting Populations and Ecological Processes

Habitat Loss and Fragmentation

Large scale reduction and fragmentation of sagebrush habitats occurring due to a number of activities, including land conversion to tilled agriculture, urban and suburban development, and road and power-line rights of way. Range improvement programs remove sagebrush by burning, herbicide application, and mechanical treatment, replacing sagebrush with annual grassland to promote forage for livestock.

Grazing

Rangeland in poor condition is less likely to support Brewer's sparrows than rangeland in good and fair condition. Grazing practices that prevent overgrazing, reduce or eliminate invasion of exotic annuals, and restore degraded range are encouraged (Vander Haegen *et al.* 2000). Brewer's sparrow response to various levels of grazing intensity is mixed. Brewer's sparrows respond negatively to heavy grazing of greasewood/great basin wild rye and low sage/Idaho fescue communities; they respond positively to heavy grazing of shadscale/Indian ricegrass, big sage/bluebunch wheatgrass, and Nevada bluegrass/sedge communities; they respond negatively to moderate grazing of big sage/bluebunch wheatgrass community; and they respond negatively to unspecified grazing intensity of big sage community (see review by Saab *et al.* 1995).

Grazing can trigger a cascade of ecological changes, the most dramatic of which is the invasion of non-native grasses escalating the fire cycle and converting sagebrush shrublands to annual grasslands. Historical heavy livestock grazing altered much of the sagebrush range, changing plant composition and densities. West (1988, 1996) estimates less than 1 percent of sagebrush steppe habitats remain untouched by livestock; 20 percent is lightly grazed, 30 percent moderately grazed with native understory remaining, and 30 percent heavily grazed with understory replaced by invasive annuals. The effects of grazing in sagebrush habitats are complex, depending on intensity, season, duration and extent of alteration to native vegetation.

Invasive Grasses

Cheatgrass readily invades disturbed sites, and has come to dominate the grass-forb community of more than half the sagebrush region in the West, replacing native bunchgrasses (Rich 1996). Crested wheatgrass and other non-native annuals have also fundamentally altered the grass-forb community in many areas of sagebrush shrubsteppe, altering shrubland habitats.

Fire

Cheatgrass has altered the natural fire regime in the western range, increasing the frequency, intensity, and size of range fires. Fire kills sagebrush and where non-native grasses dominate, the landscape can be converted to annual grassland as the fire cycle escalates, removing preferred habitat (Paige and Ritter 1998).

Brood Parasitism

Brewer's sparrow nests are an occasional host for brown-headed cowbird (*Molothrus ater*); nests usually abandoned, resulting in loss of clutch (Rotenberry *et al.* 1999). Prior to European-American settlement, Brewer's sparrows were probably largely isolated from cowbird parasitism, but are now vulnerable as cowbird populations increase throughout the West and where the presence of livestock and pastures, land conversion to agriculture, and fragmentation of shrublands creates a contact zone between the species (Rich 1978, Rothstein 1994). Frequency of parasitism varies geographically; the extent of impact on productivity unknown (Rotenberry *et al.* 1999). In Alberta, in patchy sagebrush habitat interspersed with pastures and riparian habitats, a high rate of brood parasitism reported. Usually abandoned parasitized nests

and cowbird productivity was lower than Brewer's (Biermann *et al.* 1987). Rich (1978) also observed cowbird parasitism on two nests in Idaho, both of which were abandoned.

Predators

Documented nest predators (of eggs and nestlings) include gopher snake (*Pituophis melanoleucus*), Townsend's ground squirrel (*Spermohpilus townsendii*); other suspected predators include loggerhead shrike (*Lanius ludovicianus*), common raven (*Corvus corax*), black-billed magpie (*Pica pica*), long-tailed weasel (*Mustela frenata*), least chipmunk (*Eutamias minimus*), western rattlesnake (*Crotalus viridis*), and other snake species. Nest predation significant cause of nest failure. American kestrel (*Falco sparverius*), prairie falcon (*Falco mexicanus*), coachwhip (*Masticophis flagellum*) reported preying on adults (Rotenberry *et al.* 1999). Wiens and Rotenberry (1981) observed significant negative correlation between loggerhead shrike and Brewer's sparrow density.

Pesticides/Herbicides

Aerial spraying of the herbicide 2,4-D did not affect nest success of Brewer’s sparrows during the year of application. However, bird densities were 67 percent lower one year, and 99 percent lower two years, after treatment. Birds observed on sprayed plots were near sagebrush plants that had survived the spray. No nests were located in sprayed areas one and two years post application (Schroeder and Sturges 1975).

Out-of-Subbasin Effects and Assumptions

No data could be found on the migration and wintering grounds of the Brewer’s sparrow. It is a short-distance migrant, wintering in the southwestern U.S. and northern Mexico, and as a result faces a complex set of potential effects during it annual cycle. Habitat loss or conversions is likely happening along its entire migration route (H. Ferguson, WDFW, pers. comm., 2003). Management requires the protection shrub, shrubsteppe, desert scrub habitats, and the elimination or control of noxious weeds. Wintering grounds need to be identified and protected just as its breeding areas. Migration routes and corridors need to be identified and protected.

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Rocky Mountain Mule Deer
(*Odocoileus hemionus hemionus*)

Introduction

Mule deer have been an important member of eastern Washington's landscape, serving as a food and clothing source for Native Americans prior to settlement by Euro-Americans. Today mule deer remain an important component of the landscape, providing recreational opportunities for hunters and wildlife watchers, and tremendous economic benefits to local communities and the state of Washington. Mule deer range throughout southeast Washington, occupying various habitats from coniferous forest at 6,000 feet in the Blue Mountains, to the farmlands and shrub steppe/grassland habitats along the breaks of the Snake River.

Life History and Habitat Requirements

Life History

Mule deer fawns are born from late May through mid June following a gestation of approximately 203 days, with does having 1 to 2 fawns. Does require nutritious forage and water while nursing fawns. Fawns need good hiding cover to protect them from predators. The breeding season occurs in the late fall and early winter (Novemer –early December) across eastern Washington, with mule deer becoming sexually mature as yearlings. During the fall season, high quality forage should be available to allow does to recover from the rigors of nursing fawns and prepare for the leaner winter months. In southeast Washington, late summer/fall rains that create a greenup are very important for mule deer. The fall greenup provides the nutrition necessary to improve body condition for the coming winter, and maintain the fertility of does that breed in late fall. A late summer/fall drought can result in increased winter mortality of adults and fawns, lower fertility rates for does, and poor fawn production and survival. Good spring range conditions are important because they provide the first opportunity for mule deer to reverse the energy deficits created by low quality forage and winter weather. Winter is a difficult time for mule deer; forage quality and availability are limited, and does that are carrying developing fetuses are under significant stress. Ideally, mule deer winter range should be free of disturbance and contain abundant, high quality forage. Poor winter range conditions and sever winter weather in the form of deep snow and cold temperatures can result in high mortality, especially among the old and young.

Diet

Mule deer diets are as varied as the landscapes they inhabit. Kufeld *et al*. (1973) have identified 788 plant species that have been eaten by mule deer; this list includes 202 trees and shrubs, 484 forbs, and 84 grasses, rushes, and sedges. Diets vary by season, age, and sex. Mule deer occupying the farmlands and breaks of the Snake River in southeast Washington rely heavily on the fall greenup of winter wheat and cheatgrass to improve body condition for the winter months, and to provide forage during the winter.

Reproduction

Mule deer in eastern Washington typically mate between late October and December with the peak of the rut occurring in mid November. Bucks are polygamous. Following a gestation of approximately 203 days, single or twin fawns are born (Zeigler. 1978). Mule deer become sexually mature as yearlings. In 1990, a three point regulation and nine day season was implemented in an effort to s improve post-season buck/doe ratios and increase the number of adult bucks available for breeding. From 1990 to 1998, the percentage of adult mule deer bucks in the post-hunt population increased by 600%, compared to the pre-three point era (Bender, 1999).

Migration

Most mule deer that summer at high elevation in the Cascades and Okanogan Highlands migrate to lower elevations to winter (Zeigler 1978). Some mule deer have been observed to migrate considerable distances (up to 80 km) between summer and winter ranges. Mule deer in the Blue Mountains of Washington do not normally migrate long distances to winter range, but move from higher elevations (6,000 ft) to the foothills to winter. Some migration from the foothills or farmland areas to the Snake River breaks may also occur, but no research has been conducted to verify this movement.

Mortality

Observed deaths of mule deer have resulted from a variety of sources. These include legal hunting, poaching, predation by cougars, bobcats, coyotes, and black bears, disease and parasites, starvation, automobiles, and other accidents (Zeigler 1978).

Harvest

The general deer season in the Blue Mountains was historically limited to antlered bucks. In the late 1980's (1987-89) the season length was reduced to nine days in an effort to improve buck survival and post-season buck/doe ratios. After three years of a nine day season, post-season buck/doe ratios did not improve. Three options were developed for improving buck survival; including 1) permit control; 2) spike/two points legal, three point+ by permit; and 3) a general, three point regulation. After considerable study and debate, the three point regulation was adopted in 1990 along with the short nine day season.

Antlerless hunting has generally been restricted by special permit and by Game Management Unit for modern firearm hunters. Archers have only been restricted in areas that may not have general rifle permits, but are allowed to take an antlerless deer during the early and late seasons in most GMUs (WDFW 2002).

Historic

Mule deer were killed by Native Americans but the level of harvest is unknown. Over the last 75 years, mule deer harvests have varied but were probably greater than current harvest levels. Harvest restrictions, which effect harvest levels, for state licensed hunters have varied over the years. There were periods when hunters could harvest mule deer of any sex in areas where mule deer where causing damage to orchards or other agricultural crops. The general season harvest was restricted to bucks with visible antlers, while the antlerless harvest was generally regulated by special permit. Harvests of mule deer have declined throughout much of eastern Washington's mule deer range including eastern Okanogan, Ferry, Stevens, Chelan, and Pend Orielle Counties. In 1990, the general season "any antlered buck" regulation was changed in southeast Washington and hunters were required to harvest mule deer bucks with three or more antler points on one side. This regulation was implemented in order to improve buck surivival and post-season buck to doe ratios. Although the harvest in southeast Washington declined for a couple of years after the three point regulation was implemented, current harvest levels have increased to near historic levels (Table 1) (WDFW 2002).

Current

Current mule deer harvests are limited to bucks with at least 3 antler points on one side. Some antlerless mule deer are being harvested by special permits. The current season in eastern Washingotn ranges from 9-14 days in length. These restrictive seasons are the result of deer managers responding to declining numbers of mule deer across much of eastern Washington, and low post-season buck to doe ratios. There are exceptions to the current, widespread decline, most notably, herds in southeastern Washington and portions of Grant, Douglas, Spokane, and Whitman Counties.

Table 1. Mule deer harvest summary, Blue Mountains (1990 – 2002).

Year	Antlered	Antlerless	Total	% > 4 point*	Antlerless deer:100 Antlered
1990	1209	771	1980	34%	64
1991	1317	1088	2405	38%	64
1992	1588	875	2463	47%	55
1993	2012	766	2778	50%	38
1994	2231	1252	3483	46%	56
1995	1451	930	2381	43%	64
1996	2332	816	3148	52%	35
1997	2418	768	3186	51%	32
1998	2366	591	2957	54%	25
1999	2484	791	3275	53%	32
2000	2750	827	3577	50%	30
2001	2399	1127	3526	50%	47
2002	2599	1150	3749	47%	44

The general buck season in southeast Washington was re-structured in 1990 by combining the nine-day season with a three-point regulation for mule deer. This regulation was implemented for mule deer across eastern Washington in 1997. The three point regulation was expanded to include white-tailed deer in 1991. The objective of this regulation was to improve buck survival and increase the post-season buck to doe ratio, which was extremely low (2-5 bucks/100 does in S.E. Wash.) in many areas. Buck survival and post-season buck ratios for both mule deer and white-tailed deer have improved significantly since the implementation of this regulation.

Mandatory hunter reporting replaced the hunter questionnaire for determining the deer harvest in 2001. From 1994 to 2000, the District 3 buck harvest averaged 2,290 bucks/year and compares favorably with the 1985-89 (pre three-point) average of 2,340 bucks/year. The 2002 buck harvest was 13% above the 1994-2001 average (2304) at 2599 bucks (Table 1).

Three user groups have general seasons in the Blue Mountains, archery, muzzleloader, and modern rifle. Over the last three years, modern firearm hunter numbers have averaged 9,375 for the general season, with an average harvest of 2,251 bucks. Modern firearm hunters harvested 2,382 bucks and 981 antlerless deer in 2002. General season hunters had a success rate of 28%.

Muzzleloader hunter numbers are increasing annually since the general season was established in 2000. The first year, only 118 hunters participated in the new season, but by 2002 that number increased to 372 hunters. The buck harvest increased from 24 in 2000 to 113 in 2002. Muzzleloader hunters also harvested 26 antlerless deer in 2002. Muzzleloaders have the highest success rate of all user groups, at 37%. A success rate this high will definitely result in more interest and increasing numbers of ML hunters.

Archery hunter numbers range between 800 and 1300, and average 1030. Archers harvest an average of 111 bucks per year in the Blue Mountains. In 2002, 900 archers harvested 94 bucks and 143 antlerless deer, for a success rate of 26%, which is almost equal to general season modern firearm hunters (28%).

Species composition of the harvest changes little from year to year, with the 2002 buck harvest consisting of 61% mule deer and 39% white-tailed deer, which is comparable to the long term trend (60% mule deer; 40% white-tailed deer). However, three factors contribute to a higher percentage of white-tailed bucks in the harvest than they occur in the deer population. One, approximately twice as many yearling white-tail bucks are legal under the three-point regulation, compared to yearling mule deer bucks. Two, the permit controlled, late white-tail hunts add

approximately 8-10% to the white-tailed buck harvest (Table 2). Three, a change in the late white-tail regulation in 2001 and 2002, allowed hunters to harvest “any white-tail” and increased the percentage of sub-legal (yearling) bucks in the harvest. The whitetail deer population has also increased over the last 10 years, which provides for a higher number of white-tailed bucks in the harvest.

Table 2. Post-hunt mule deer surveys, Blue Mountains, Washington (1989 – 2002).

Year	Bucks		Does	Fawns	Total	Per 100 Does Fawns:100:Bucks
	Adults	Yearlings				
1989	6	23	790	234	1053	30:100:4
1990	15	111	1358	544	2028	40:100:9
1991	17	133	943	455	1548	48:100:16
1992	40	153	1231	431	1868	35:100:17
1993	45	119	995	559	1718	56:100:17
1994	20	163	879	381	1443	43:100:21
1995	43	69	693	264	1069	38:100:16
1996	51	85	993	697	1826	70:100:14
1997	47	157	822	489	1515	60:100:25
1998	81	117	705	460	1363	65:100:28
1999	72	180	1316	796	2364	61:100:19
2000	8	20	98	52	78	53:100:29
2001	71	109	876	471	1529	53:100:21
2002	77	158	1651	581	2465	35:100:14

The antlerless deer harvest fluctuates according to permit levels, and hunter success rates. From 1994 to 2001, the antlerless harvest in southeast Washington averaged 888 per year. Antlerless permits were increased for the 2002 season from 2,685 to 2,835, which resulted in a harvest of 917 antlerless deer. The permit controlled harvest, and general season antlerless harvests totaled 1,150 antlerless deer, which is 30% above the 1994-2001 average (888). Antlerless deer were harvested at a rate of 44 antlerless per 100 bucks. The overall success rate for antlerless permits was 59%, with general permits (mule deer/white-tailed deer) averaging 62%, and “whitetail only” permit success averaging 49%. Approximately 25% of the antlerless permit holders did not hunt (WDFW 2003).

Habitat Requirements

Mule deer need the same basic elements for life as other organisms. However, mule deer occupy a variety of cover types across eastern Washington. Consequently, habitat requirements vary with vegetative and landscape components contained within each herd range. Forested habitats provide mule deer with forage as well as snow intercept, thermal, and escape cover. Mule deer occupying mountain-foothill habitats live within a broad range of elevations, climates, and topography which includes a wide range of vegetation; many of the deer using these habitats are migratory. Mule deer are found in the deep canyon complexes along the major rivers and in the channeled scablands of eastern Washington; these areas are dominated by native bunch grasses or shrub-steppe vegetation. Mule deer also occupy agricultural areas which once where shrub-steppe.

In southeast Washington, the largest populations of mule deer occur in the foothills of the Blue Mountains, farmlands areas, and along the breaks of the Snake River. Agricultural lands are important for mule deer in these areas because croplands and CRP lands provide both food and cover. Since 1986, approximately 284,251 acres of croplands have been converted to CRP land, which has greatly enhanced habitat for mule deer and other wildlife in southeast Washington: County breakdown of CRP land includes Walla Walla 157,298 acres; Columbia 46,095 acres; Garfield 51,225 acres; Asotin 29,633 acres (USDA 2003).

Population and Distribution

Population

Mule deer are distributed throughout southeast Washington, from higher eleveations (6000 ft.) in the mountains, to the lowland farming areas and breaks of the Snake River.

Mule deer populations are at management objective along the breaks of the Snake River and in the foothills of the Blue Mountains. Mule deer populations in the mountains are still depressed, but are improving. Five years of mild winters contributed to low over winter deer mortality, although fall drought is having an impact on fawn production in arid areas along the breaks of the Snake River.

Mule deer populations in the lowlands and along the breaks of the lower Snake River have increased over the last 10 years. Populations have probably peaked and will probably decline slightly if summer/fall drought conditions continue, and winter weather is severe.

Between 1990 and 2001, winter fawn/doe ratios ranged from a low of 35 fawns/100 does to a high of 70 fawns/100 does, and averaged 51 fawns/100 does. Late summer and fall drought has a negative impact on mule deer fawn production and survival. Southeast Washington has been plagued by a late summer/fall drought for the last two years, which has resulted in lower fawn ratios; 2002- 35 fawns/100 does, 2003- 47 fawns/100 does. Lower fawns ratios result from a decline in fertility rates for does the previous fall, and higher fawn mortality due to poor physical condition in does and fawns.

Historic

Historic population levels are unknown but are generally thought to be higher than current mule deer numbers.

Current

No current population estimates are available.

Distribution

Historic

Mule deer were generally thought to have occupied much of what is known as eastern Washington.

Current

Mule deer can be found in every county within eastern Washington.

Status and Abundance Trends

Status

Mule deer populations along the Snake River and in the foothills of the Blue Mountains are at management objective. Mule deer populations south of Clarkston in GMU 181 and in the mountains are improving.

Several factors have contributed to improved deer populations in southeast Washington. Five mild winters contributed to good fawn production and survival, and over 400,000 acres of CRP lands have improved habitat conditions, providing forage, escape cover, and hiding cover for adults and fawns. However, late summer/fall drought is starting to impact fawn production and survival.

Increased hunting opportunity and lower fawn survival along the breaks of the Snake River is putting significant pressure on the mule deer buck population. Lower fawn production/survival in 2002 will result in fewer antlered bucks recruited into the population in 2003, which will result in

a lower buck harvest for future hunting seasons. Post-hunt mule deer buck ratios in 2002 declined to 14 bucks per 100 does, which falls below the minimum listed in the Game Management Plan. The average post-hunt ratio for mule deer in 2000 and 2001 was 25 bucks/1100 does. The 10 year average (1992-2001) post-hunt buck ratio for mule deer ranged between 14 – 29 bucks/100 does, and averaged 20.7 bucks/100 does (Table 2).

Trends

Most mule deer herds are currently thought to be stable or declining across much of eastern Washington. There are exceptions to the current, widespread decline, most notably, herds in southeastern Washington and portions of Grant, Douglas, Spokane, and Whitman Counties.

Mule deer populations in southeast Washington vary by Game Management Unit. Along the breaks of the Snake River in GMUs 145 and 149 (Lower Snake), mule deer populations have peaked and may start declining over the next few years, especially if summer/fall drought conditions continue to prevail. Mule deer populations in the mountains have declined significantly over the last 15 years, but appear to be slowly improving. The mule deer population along the breaks of the Snake River in GMU 181 Couse and GMU-186 Grande Ronde have declined from historic levels, and have not improved significantly over the last 15 years. Two factors may be responsible for the lack of recovery in these mule deer populations; noxious weeds and predation. Noxious weeds (yellow-starthistle) have inundated thousands of acres of prime mule deer habitat along the breaks of the Snake and Grande Ronde Rivers. At the same time, mountain lion populations have also increased, putting additional pressure on the mule deer population.

Factors Affecting Mule Deer Population Status

Key Factors Inhibiting Populations and Ecological Processes

Mule deer and their habitats are being impacted in a negative way by dam construction, urban and suburban developement, road and highway construction, over-grazing by livestock, inappropriate logging operations, competition by other ungulates, drought, fire, over-harvest by hunters, predation, disease and parasites.

Weather

Weather conditions can play a major role in the productivity and abundance of mule deer. Drought conditions can have a severe impact on mule deer because forage does not replenish itself on summer or winter range, and nutritional quality is low. Drought conditions during the summer and fall can result in low fecundity in does, and poor physical condition going into the winter months. Severe winter weather can cause result in high mortality depending on severity. Severe weather can result in mortality of all age classes, but the young, old, and mature bucks usually sustain the highest mortality. If mule deer are subjected to drought conditions in the summer and fall, followed by a severe winter, the result can be high mortality rates and low productivity the following year.

Habitat

Habitat conditions in southeast Washington have deteriorated in some areas and improved dramatically in others.

The conversion of shrubsteppe and grassland habitat to agricultural croplands has resulted in the loss of hundreds of thousands of acres of deer habitat in southeast Washington. However, this has been mitigated to some degree by the implementation of the Conservation Reserve Program. Approximately 400,000 acres have been converted to CRP in southeast Washington. Noxious weeds have invaded many areas of southeast Washington resulting in a tremendous loss of good habitat for mule deer. Yellow starthistle has invaded the breaks of the Snake River from Asotin to the Oregon border, greatly reducing the ability of this area to support mule deer

populations at historic levels. Yellow starthistle is also a major problem in the Tucannon and Touchet river watersheds.

Fire Suppression

Fire suppression has resulted in a decline of habitat conditions in the mountain and foothills of the Blue Mountains. Browse species need to be regenerated by fire in order to maintain availability and nutritional value to big game. Lack of fire has allowed many browse species to grow out of reach for mule deer (Leege 1968; 1969; Young and Robinette 1939).

Development

Mule deer habitat in the foothills of the Blue Mountains east of Walla Walla has experienced a significant level of land development over the last 20 years. Subdivisions have resulted in the loss of thousands of acres of habitat and mule deer populations in those areas have declined accordingly.

Conservation Reserve Program (CRP)

Approximatley 284,251 acres of CRP have been created in the farmlands of southeast Washington by converting cropland to grassland; Walla Walla, Columbia, Garfield, and Asotin Counties. This has resulted in an improvement in habit for mule deer. CRP lands provide both food and cover where little existed before Conservation Reserve Program was created.

Predation

Mountain lion populations have increased significantly in the Blue Mountains over the last 20 years (P. Fowler, WDFW, personal communication, 2003). During this period, the mule deer population in the mountains has declined to a fraction of historic levels. Cougar predation on mule deer in the mountains could be a major factor contributing to the population decline in that area. Coyote predation on fawns can have a significant impact on the deer population when coyote populations are high, and fawn productivity is low.

Harvest

The deer harvest by licensed hunters is restricted to bucks with a minimum of three points on one side, while the antlerless harvest is generally regulated by special permit. This system allows for harvesting deer at optimum levels, while preventing overharest. However, in order to maintain buck survival at management objective, hunting opportunity needs to be strictly regulated.

Hydroelectric Dams

Four dams were constructed on the lower Snake River during the 1960s and early 1970s; Ice Harbor, Lower Monumental, Little Goose, and Lower Granite. The reservoirs created by these dams inundated thousands of acres of prime, riparian habitat that supported many species of wildlife, including mule deer. This riparian zone provided high quality habitat (forage/cover), especially during the winter months. The loss of this important habitat and the impact it has had on the mule deer population along the breaks of the Lower Snake River may never be fully understood.

Agricultural Damage

Mule deer populations in GMUs 145 and 149 have reached levels where landowners are complaining about too many deer on their winter wheat. In response, the WDFW has increased antlerless permits, and in some cases authorized “hotspot” hunts to reduce damage and complaints from landowners.

Competition

White-tailed deer populations have increased in areas where mule deer populations have declined. This is especially true in the foothills of the Blue Mountains from Walla Walla to the Tucannon River. Along the breaks of the Snake River and lowland agricultural areas, whitetail populations fluctuate, but are controlled by disease (P. Fowler, WDFW, personal communication, 2003). Every three to five years, conditions exist that result in an outbreak of Epizootic Hemmoragic Disease (EHD). Whitetail deer are extremely susceptible to EHD and mortality rates can be very high under certain conditions; high population density. As a result of the periodic die-offs created by EHD, whitetail populations are not a significant threat to mule deer in those areas. Although mule deer can contract EHD, they are not as susceptible to this disease as white-tailed deer and the mortality rate for mule deer is usually low.

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White-headed Woodpecker
(*Picoides albolarvatus*)

Introduction

The white-headed woodpecker (*Picoides albolarvatus*) is a year round resident in the Ponderosa pine (*Pinus ponderosa*) forests found at the lower elevations (generally below 950m). White-headed woodpeckers are particularly vulnerable due to their highly specialized winter diet of ponderosa pine seeds and the lack of alternate, large cone producing, pine species.

Nesting and foraging requirements are the two critical habitat attributes limiting the population growth of this species of woodpecker. Both of these limiting factors are very closely linked to the habitat attributes contained within mature open stands of ponderosa pine. Past land use practices, including logging and fire suppression, have resulted in significant changes to the forest structure within the Ponderosa pine ecosystem.

Life History and Habitat Requirements

Life History

Diet

White-headed woodpeckers feed primarily on the seeds of large ponderosa pines. This is makes the white-headed woodpecker quite different from other species of woodpeckers who feed primarily on wood boring insects (Blood 1997; Cannings 1987 and 1995). The existence of only one suitable large pine (ponderosa pine) is likely the key limiting factor to the white-headed woodpecker's distribution and abundance.

Other food sources include insects (on the ground as well as hawking), mullein seeds and suet feeders (Blood 1997; Joe *et al.* 1995). These secondary food sources are used throughout the spring and summer. By late summer, white-headed woodpeckers shift to their exclusive winter diet of ponderosa pine seeds.

Reproduction

White-headed woodpeckers are monogamous and may remain associated with their mate throughout the year. They build their nests in old trees, snags or fallen logs but always in dead wood. Every year the pair bond constructs a new nest. This may take three to four weeks. The nests are, on average 3m off the ground. The old nests are used for overnight roosting by the birds.

The woodpeckers fledge about 3-5 birds every year. During the breeding season (May to July) the male roosts in the cavity with the young until they are fledged. The incubation period usually lasts for 14 days and the young leave the nest after about 26 days. White-headed woodpeckers have one brood per breeding season and there is no replacement brood if the first brood is lost. The woodpeckers are not very territorial except during the breeding season. They are not especially social birds outside of family groups and pair bonds and generally do not have very dense populations (about 1 pair bond per 8 ha).

Nesting

Generally large ponderosa pine snags consisting of hard outer wood with soft heartwood are preferred by nesting white-headed woodpeckers. In British Columbia 80 percent of reported nests have been in ponderosa pine snags, while the remaining 20 percent have been recorded in Douglas-fir snags. Excavation activities have also been recorded in Trembling Aspen, live Ponderosa pine trees and fence posts (Cannings *et al.* 1987).

In general, nesting locations in the South Okanagan, British Columbia have ranged between 450 - 600m (Blood 1997), with large diameter snags being the preferred nesting tree. Their nesting cavities range from 2.4 to 9 m above ground, with the average being about 5m. New nests are excavated each year and only rarely are previous cavities re-used (Garrett *et al.* 1996).

Migration

The white-headed woodpecker is a non-migratory bird.

Habitat Requirements

Breeding

White-headed woodpeckers live in montane, coniferous forests from British Columbia to California and seem to prefer a forest with a relatively open canopy (50-70 percent cover) and an availability of snags (a partially collapsed, dead tree) and stumps for nesting. The birds prefer to build nests in trees with large diameters with preference increasing with diameter. The understory vegetation is usually very sparse within the preferred habitat and local populations are abundant in burned or cut forest where residual large diameter live and dead trees are present.

Highest abundances of white-headed woodpeckers occur in old-growth stands, particularly ones with a mix of two or more pine species. They are uncommon or absent in monospecific ponderosa pine forests and stands dominated by small-coned or closed-cone conifers (e.g., lodgepole pine or knobcone pine).

Where food availability is at a maximum such as in the Sierra Nevadas, breeding territories may be as low as 10ha (Milne and Hejl 1989). Breeding territories in Oregon are 104 ha in continuous forest and 321 ha in fragmented forests (Dixon 1995b). In general, open Ponderosa pine stands with canopy closures between 30 - 50 percent are preferred. The openness however, is not as important as the presence of mature or veteran cone producing pines within a stand (Milne and Hejl 1989). In the South Okanagan, British Columbia, Ponderosa pine stands in age classes 8 -9 are considered optimal for white-headed woodpeckers (Haney 1997). Milne and Hejl (1989) found 68 percent of nest trees to be on southern aspects, this may be true in the South Okanagan as well, especially, towards the upper elevational limits of Ponderosa pine (800 - 1000m).

Population and Distribution

Population

Historic

No data are available.

Current

No data are available.

Distribution

Historic

No data are available.

Current

These woodpeckers live in montane, coniferous forests from southern British Columbia in Canada, to eastern Washington, southern California and Nevada and Northern Idaho in the United States. The exact population of the white-headed woodpecker is unknown but there are thought to be less than 100 of the birds in British Columbia. See Figures 1-3 for current distribution.

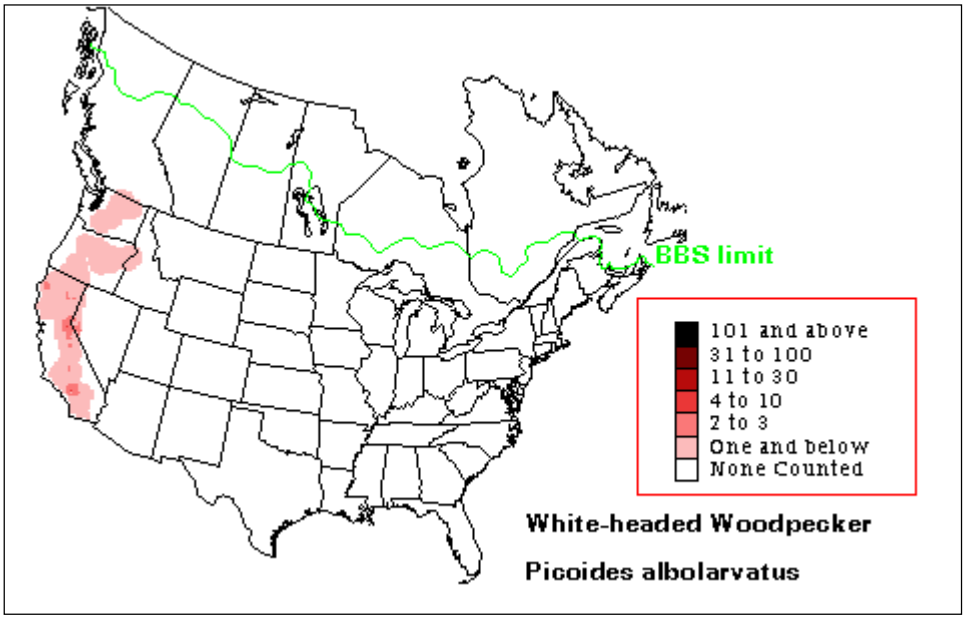

Figure 1. White-headed woodpecker year-round range (Sauer *et al*. 2003).

Woodpecker abundance appears to decrease north of California. They are uncommon in Washington and Idaho and rare in British Columbia. However, they are still common in most of their original range in the Sierra Nevada and mountains of southern California. The birds are non-migratory but do wander out of their range sometimes in search of food.

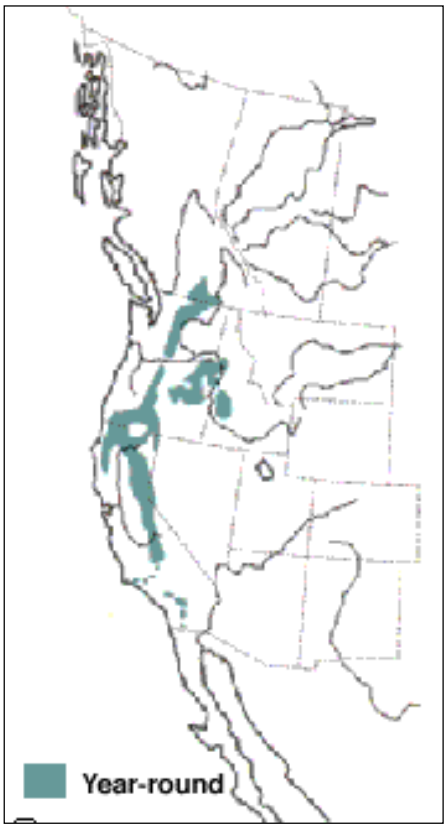

Figure 2. White-headed woodpecker breeding distribution (from BBS data) (Sauer *et al.* 2003).

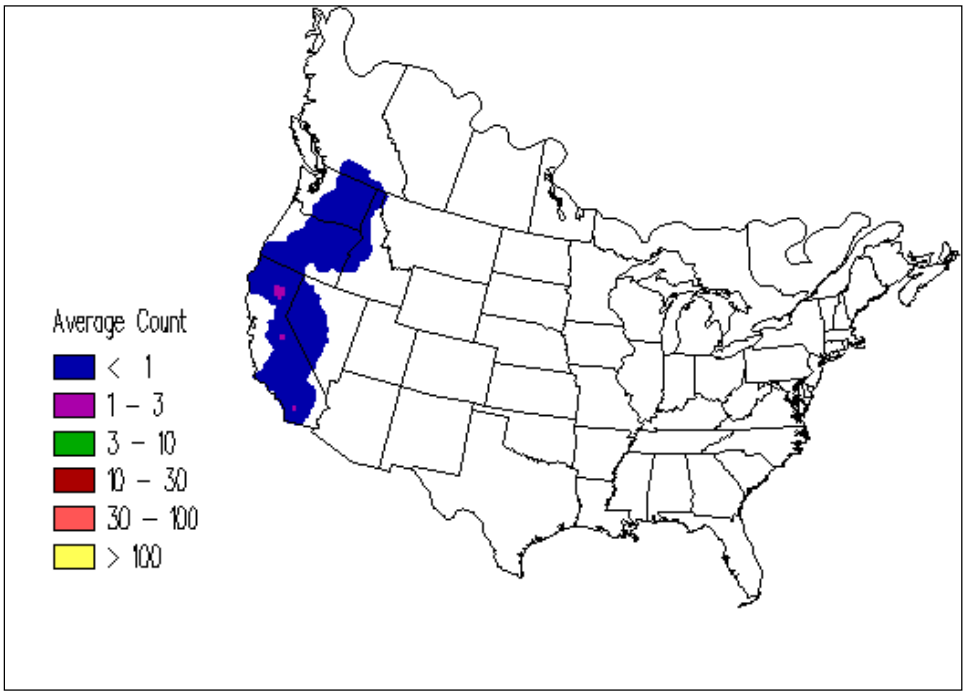

Figure 3. White-headed woodpecker winter distribution (from CBC data) (Sauer *et al.* 2003).

Status and Abundance Trends

Status

Although populations appear to be stable at present, this species is of moderate conservation importance because of its relatively small and patchy year-round range and its dependence on mature, montane coniferous forests in the West. Knowledge of this woodpecker's tolerance of forest fragmentation and silvicultural practices will be important in conserving future populations.

Trends

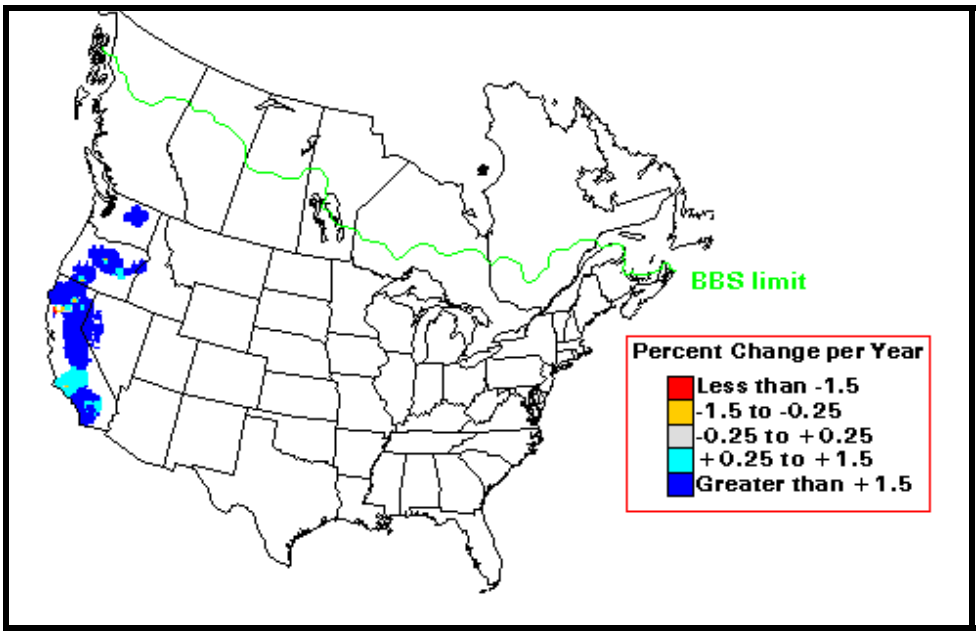

Figure 4. White-headed woodpecker BBS population trend: 1966-1996 (Sauer *et al.* 2003).

Factors Affecting White-headed Woodpecker Population Status

Key Factors Inhibiting Populations and Ecological Processes

Logging

Logging has removed much of the old cone producing pines throughout the South Okanagan. Approximately 27, 500 ha of ponderosa pine forest remain in the South Okanagan and 34.5 percent of this is classed as old growth forest (Ministry of Environment Lands and Parks 1998). This is a significant reduction from the estimated 75 percent in the mid 1800s (Cannings 2000). The 34.5 percent old growth estimate may in fact be even less since some of the forest cover information is incomplete and needs to be ground truthed to verify the age classes present. The impact from the decrease in old cone producing ponderosa pines is even more exaggerated in the South Okanagan because there are no alternate pine species for the white-headed woodpecker to utilize. This is especially true over the winter when other major food sources such as insects are not available. Suitable snags (DBH>60cm) are in short supply in the South Okanagan.

Fire Suppression

Fire suppression has altered the stand structure in many of the forests in the South Okanagan. Lack of fire has allowed dense stands of immature ponderosa pine as well as the more shade tolerant Douglas-fir to establish. This has led to increased fuel loads resulting in more severe stand replacing fires where both the mature cone producing trees and the large suitable snags are destroyed. These dense stands of immature trees has also led to increased competition for nutrients as well as a slow change from a Ponderosa pine climax forest to a Douglas-fir dominated climax forest.

Predation

There are a few threats to white-headed woodpeckers such as predation and the destruction of its habitat. Chipmunks are known to prey on the eggs and nestlings of white-headed woodpeckers. There is also predation by the great horned owl on adult white-headed woodpeckers. However, predation does not appreciably affect the woodpecker population.

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Flammulated Owl
(*Otus flammeolus*)

Introduction

The flammulated owl is a Washington State Candidate species. Limited research on the flammulated owl indicates that its demography and life history, coupled with narrow habitat requirements, make it vulnerable to habitat changes. The flammulated owl is a species dependent on large diameter Ponderosa pine forests (Hillis *et al.* 2001). The mature and older forest stands that are used as breeding habitat by the flammulated owl have changed during the past century due to fire management and timber harvest.

Life History and Habitat Requirements

Life History

Diet

Flammulated owls are entirely insectivores; nocturnal moths are especially important during spring and early summer (Reynolds and Linkhart 1987). As summer progresses and other prey become available, lepidopteran larvae, grasshoppers, spiders, crickets, and beetles are added to the diet (Johnson 1963; Goggans 1986). The flammulated owl is distinctively nocturnal although it is thought that the majority of foraging is done at dawn and dusk.

Reproduction

Males arrive on the breeding grounds before females. In Oregon, they arrive at the breeding sites in early May and begin nesting in early June (Goggans 1986; E. Bull, personal communication). They call to establish territories and to attract arriving females. Birds pair with their mates of the previous year, but if one does not return, they often pair with a bird from a neighboring territory. The male shows the female potential sites from which she selects the one that will be used, usually an old pileated woodpecker or northern flicker hole.

Nesting

The laying of eggs happens from about mid-April through the beginning of July. Generally 2 - 4 eggs are laid and incubation requires 21 to 24 days, by female and fed by male. The young fledge at 21 -25 days, staying within about 100 yards of the nest and being fed by the adults for the first week. In Oregon, young fledge in July and August (Goggans 1986; E. Bull, personal communication). The young leave the nest around after about 25 days but stay nearby. In Colorado, owlets dispersed in late August and the adults in early October (Reynolds and Linkhart 1987).Sometimes the brood divides, with each parent taking one or two of the young. Adults and young stay together for another month before the young disperse.

Migration

The flammulated owl is one of the most migratory owls in North America. Flammulated owls are presumed to be migratory in the northern part of their range (Balda *et al.* 1975), and winter migrants may extend to neotropical areas in Central America. Flammulated owls can be found in Washington only during their relatively short breeding period. They migrate at night, moving through the mountains on their way south but through the lowlands in early spring.

Mortality

Although the maximum recorded age for a wild owl is only 8 years, 1 month, their life span is probably longer than this.

Habitat Requirements

General

The flammulated owl occurs mostly in mid-level conifer forests that have a significant Ponderosa pine component (McCallum 1994b) between elevations of 1,200 feet to 5,500 feet in the north, and up to 9,000 feet in the southern part of its range in California (Winter 1974). Flammulated owls are typically found in mature to old, open canopy yellow pine (Ponderosa pine [*Pinus ponderosa*] and Jeffrey pine [*Pinus jeffreyi*]), Douglas-fir (*Pseudotsuga menziesii*), and grand fir (*Abies grandis*) (Bull and Anderson 1978; Goggans 1986; Howie and Ritchie 1987; Reynolds and Linkhart 1992; Powers *et al.* 1996). In central Colorado, Linkhart and Reynolds (1997) reported that 60 percent of the habitat within the area defended by territorial males consisted of old (200-400 year) Ponderosa pine/Douglas-fir forest.

Flammulated owls are obligate secondary cavity nesters (McCallum 1994b), requiring large snags in which to roost and nest.

Nesting

Flammulated owls nest in habitat types with low to intermediate canopy closure (Zeiner *et al.* 1990). The owls selectively nest in dead Ponderosa pine snags, and prefer nest sites with fewer shrubs in front than behind the cavity entrance, possibly to avoid predation and obstacles to flight. Flammulated owls will nest only in snags with cavities that are deep enough to hold the birds, and far enough off the ground to be safe from terrestrial predators. The cavity is typically unlined, 11 to 12 in. deep with the average depth being 8.4 in. (McCallum and Gehlbach 1988). California black oak may also provide nesting cavities, particularly in association with ridge tops and xeric mid-slopes, with two layered canopies, tree density of 1270 trees/2.5 acres, and basal area of 624 feet^2/2.5acres (McCallum 1994b). The nest is usually 3-39 feet above the ground (Zeiner *et al.* 1990) with 16 feet being the average height of the cavity entrance (McCallum and Gehlbach 1988).

Territories most consistently occupied by breeding pairs (>12 years) contained the greatest (>75 percent) amount of old Ponderosa pine/Douglas-fir forest. Marcot and Hill (1980) reported that California black oak (*Quercus kellogii*) and Ponderosa pine occurred in 67 percent and 50 percent, respectively, of the flammulated owl nesting territories they studied in northern California. In northeastern Oregon, Bull and Anderson (1978) noted that Ponderosa pine was an overstory species in 73 percent of flammulated owl nest sites. Powers *et al.* (1996) reported that Ponderosa pine was absent from their flammulated owl study site in Idaho and that Douglas-fir and quaking aspen (*Populus tremuloides*) accounted for all nest trees.

The owls nest primarily in cavities excavated by flickers (*Colates spp*.), hairy woodpeckers (*Picoides villosus*), pileated woodpeckers (*Dryocopus pileatus*), and sapsuckers (*Sphyrapicus spp*.) (Bull *et al.* 1990; Goggans 1986; McCallum 1994b). Bull *et al.* (1990) found that flammulated owls used pileated woodpecker cavities with a greater frequency than would be expected based upon available woodpecker cavities. There are only a few reports of this owl using nest boxes (Bloom 1983). Reynolds and Linkhart (1987) reported occupancy in 2 of 17 nest boxes put out for flammulated owls.

In studies from northeastern Oregon and south central Idaho, nest sites were located 16-52 feet high in dead wood of live trees, or in snags with an average diameter at breast height (DBH) of >20 in. (Goggans 1986; Bull *et al.* 1990; Powers *et al.* 1996). Most nests were located in snags. Bull *et al.* (1990) found that stands containing trees greater than 20 in. DBH were used more often than randomly selected stands. Reynolds and Linkhart (1987) suggested that stands with trees >20 in. were preferred because they provided better habitat for foraging due to the open nature of the stands, allowing the birds access to the ground and tree crowns. Some stands

containing larger trees also allow more light to the ground that produces ground vegetation, serving as food for insects preyed upon by owls (Bull *et al.* 1990).

Both slope position and slope aspect have been found to be important indicators of flammulated owl nest sites (Goggans 1986, Bull *et al.* 1990). In general, ridges and the upper third of slopes were used more than lower slopes and draws (Bull *et al.* 1990). It has been speculated that ridges and upper slopes may be preferred because they provide gentle slopes, minimizing energy expenditure for carrying prey to nests. Prey may also be more abundant or at least more active on higher slopes because these areas are warmer than lower ones (Bull *et al.* 1990).

Breeding

Breeding occurs in mature to old coniferous forests from late April through early October. Nests typically are not found until June (Bull *et al.* 1990). The peak nesting period is from mid-June to mid-July (Bent 1961). Mean hatching and fledging dates in Idaho were 26 June and 18 July, respectively (Powers *et al.* 1996).

In Oregon, individual home ranges averaged about 25 acres (Goggans 1986). Territories are typically found in core areas of mature timber with two canopy layers present (Marcot and Hill 1980). The uppermost canopy layer is formed by trees at least 200 years old. Core areas are near, or adjacent to clearings of 10-80 percent brush cover (Bull and Anderson 1978, Marcot and Hill 1980). Linkhart and Reynolds (1997) found that flammulated owls occupying stands of dense forest were less successful that owls whose territories contain open, old pine/fir forests.

Foraging

Flammulated owls prefer to forage in older stands that support understories, and need slightly open canopies and space between trees to facilitate easy foraging. The open crowns and park-like spacing of the trees in old growth stands permit the maneuverability required for hawk and glean feeding tactics (USDA 1994a).

In Colorado, foraging occurred primarily in old Ponderosa pine and Douglas-fir with an average tree age of approximately 200 years (Reynolds and Linkhart 1992). Old growth Ponderosa pine was selected for foraging, and young Douglas-firs were avoided. Flammulated owls principally forage for prey on the needles and bark of large trees. They also forage in the air, on the ground, and along the edges of clearings (Goggans 1986; E. Bull, personal communication; R. Reynolds, personal communication). Grasslands in and adjacent to forest stands are thought to be important foraging sites (Goggans 1986). However, Reynolds (personal communication) suggests that ground foraging is only important from the middle to late part of the breeding season, and its importance may vary annually depending upon the abundance of ground prey. Ponderosa pine and Douglas-fir were the only trees selected for territorial singing in male defended territories in Colorado (Reynolds and Linkhart 1992).

A pair of owls appear to require about 2-10 acres during the breeding season, and substantial patches of brush and understory to help maintain prey bases (Marcot and Hill 1980). Areas with edge habitat and grassy openings up to 5 acres in size are beneficial to the owls (Howle and Ritcey, 1987) for foraging.

Population and Distribution

Population

Historic

No data are available.

Current

There is only one recognized race of flammulated owl. There are several races described although they have not been verified. Some of these that may come about are: the longer winged population in the north part of the range, separated as *idahoensis*, darker birds from Guatemala as rarus, (winter specimen thus invalid), *meridionalis* from S. Mexico and Guatemala, *frontalis* from Colorado and borealis from central British Columbia to northeastern California.

Distribution

Historic

No data are available

Current

Flammulated owl distribution is illustrated in Figure 1. Flammulated owls are uncommon breeders east of the Cascades in the ponderosa pine belt from late May to August. There have been occasional records from western Washington, but they are essentially an east side species. Locations where they may sometimes be found include Blewett Pass (straddling Chelan and Kittitas Counties), Colockum Pass area (Kittitas County), and Satus Pass (Klickitat County) (Figure 2).

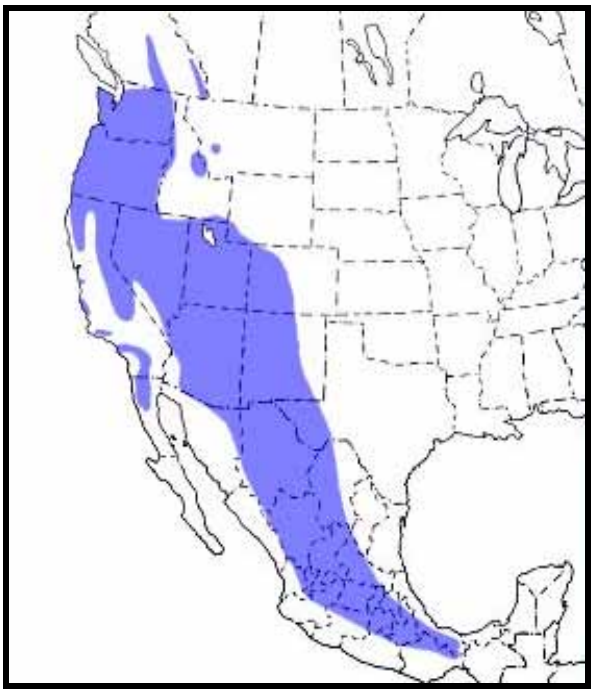

Figure 1. Flammulated owl distribution (Kaufman 1996).

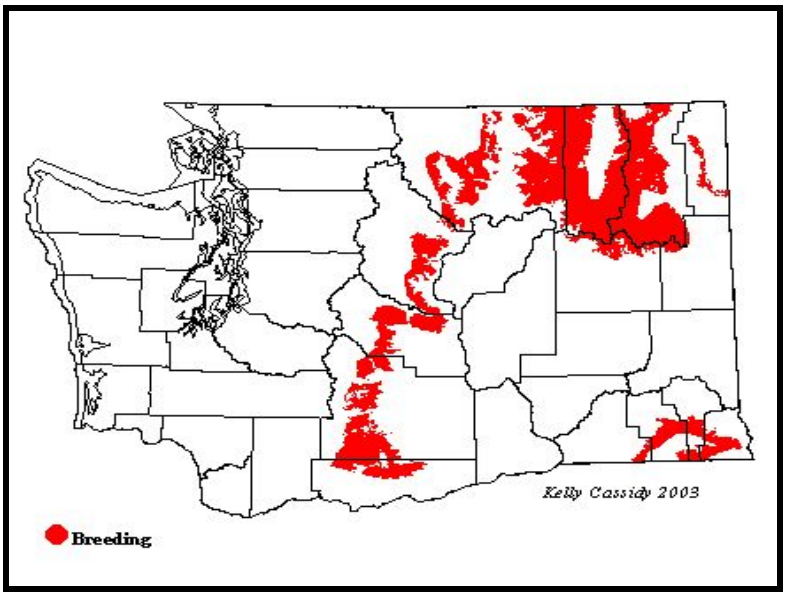

Figure 2. Flammulated owl distribution, Washington (Kaufman 1996).

Except for migration, this species is restricted to montane elevations with seasonally temperate climates. Climate may influence the distribution of the species indirectly through the prey base, (primarily nocturid moths) rather than directly through thermoregulatory abilities as this species tends to forage at night when the temperatures are lowest for the day (McCallum 1994b).

This owl species is present throughout the northern Blue Mountains above 700 meters and below 1,400 meters on dryer south and west facing slopes with a mix of mature ponderosa pine and a mosaic pattern of dense small diameter stem stands of ponderosa pine and larch.

These owls are first detected in May as insect numbers increase and nocturnal temperatures moderate. In Columbia, Garfield, and Asotin Counties, these owls nest in cavities in dead and living mature ponderosa pine and larch.

Status and Abundance Trends

Status

Flammulated owls are candidates for inclusion on the Washington Department of Fish and Wildlife endangered species list and are considered a species-at-risk by the Washington GAP Analysis and Audubon-Washington.

Because old-growth ponderosa pine is rarer in the northern Rocky Mountains than it was historically, and little is known about the local flammulated owl distribution and habitat use, the USFS has listed the flammulated owl as a sensitive species in the Northern Region (USDA 1994b). It is also listed as a sensitive species by the USFS in the Rocky Mountain, Southwestern, and Intermountain Regions, and receives special management consideration in the States of Montana, Idaho, Oregon, and Washington (Verner 1994).

Trends

So little is known about flammulated owl populations that even large scale changes in their abundance would probably go unnoticed (Winter 1974). Several studies have noted a decline in flammulated owl populations following timber harvesting (Marshall 1939; Howle and Ritcey 1987). However, more and more nest sightings occur each year, but this is most likely due to the increase in observation efforts.

Factors Affecting Flammulated Owl Population Status

Key Factors Inhibiting Populations and Ecological Processes

Disturbance

The owls have been shown to prefer late seral forests, and logging disturbance and the loss of breeding habitat associated with it has a detrimental effect on the birds (USDA 1994a). Timber harvesting is often done in preferred flammulated owl habitat, and some of the species' habitat and range may be declining as a result (Reynolds and Linkart 1987b, Bull *et al.* 1990). Several studies have shown a decline in flammulated owl numbers following timber harvesting (Marshall 1957; Howle and Ritcey 1987).

A main threat to the species is the loss of nesting cavities as this species cannot create its own nest and relies on existing cavities. Management practices such as intensive forest management, forest stand improvement, and the felling of snags and injured or diseased trees (potential nest sites) for fire wood effectively remove most of the cavities suitable for nesting (Reynolds *et al.* 1989). However, the owls will nest in stands that have been selectively logged, as long as they contain residual trees (Reynolds *et al.* 1989).

The suppression of wildfires has allowed many ponderosa pines to proceed to the more shade resistant fir forest types, which is less suitable habitat for these species (Marshall 1957; Reynolds *et al.* 1989). Encroachment of conifers along ridgetops can also negatively impact the black oak component in the stand through competition of resources and shading resulting in loss of potential nest cavities for flammulated owls in live hardwood trees. Roads and fuelbreaks are often placed on ridgetops and the resultant removal of snags and oaks for hazard tree removal can result in the loss of existing and recruitment nest trees.

Flamulated owls are most susceptible to disturbance during the peak of their breeding season (June and July), which corresponds to the time when they are the most vocal. Clark (1988) cautions against the extensive use of taped calls, stating that they can disrupt coutship behavior. McCallum (1994b) mentions that owls are tolerant of humans, nesting close to occupied areas and tolerating observation by flashlight at night while feeding young. Wildlife viewing, primarily bird watching and nature photography has the potential to disrupt species activity and increase their risk of exposure to predation especially during the nesting season (Knight and Gutzwiller 1995) when birds are most vocal and therefore easier to locate.

The effects of mechanical disturbance have not been assessed, but moderate disturbance may not have an adverse impact on the species. Whether a nesting pair would tolerate selective harvesting during the breeding season is not known, however, mechanical disturbance that flushes roosting birds may be a threat to adult survival in October when migrating accipiters may be more common than in June, when the possibility of lost reproduction is greater (McCallum 1994b).

Pesticides

Aerial spraying of carbaryl insecticides to reduce populations of forest insect pests may affect the abundance of non-target insects important in the early spring diets of flammulated owls (Reynolds *et al.* 1989). Although flamulated owls rarely take rodents as prey, they could be at risk, like other raptors, of secondary poisoning by anticoagulant rodenticides. Possible harmful doses could cause hemmorhaging upon the ingestion of anticoagulants such as Difenacoum, Bromadiolone, or Brodifacoum (Mendenhall and Pank 1980).

Predators/Competitors

Predators include spotted and other larger owls, accipiters, long-tailed weasels (Zeiner *et al.* 1990), felids and bears (McCallum 1994b). Nest predation has also been documented by northern flying squirrel in the Pacific Northwest (McCallum 1994a).

As flammulated owls come late to breeding grounds, competitors may limit nest site availability (McCallum 1994b). Saw-whet owls, screech owls, and American kestrels compete for nesting sites, but flammulated owls probably have more severe competition with non-raptors, such as woodpeckers, other passerines, and squirrels for nest cavities (Zeiner *et al.* 1990, McCallum 1994b). Birds from the size of bluebirds upward are potential competitors. Owl nests containing bluebird eggs and flicker eggs suggest that flammulated owls evict some potential nest competitors (McCallum 1994b). Any management plan that supports pileated woodpecker and northern flicker populations will help maintain high numbers of cavities, thereby minimizing this competition (Zeiner *et al.* 1990).

Flammulated owls may compete with western screech-owls and American kestrels for prey (Zeiner *et al.* 1990) as both species have a high insect component in their diets. Common poorwills, nighthawks, and bats may also compete for nocturnal insect prey especially in the early breeding season (April and May) when the diet of the owls is dominated by moths. (McCallum 1994b).

Exotic Species

Flicker cavities are often co-opted by European starlings, reducing the availability of nest cavities for both flickers and owls (McCallum 1994a). Africanized honey bees will nest in in tree cavities (Merrill and Visscher 1995) and may be a competitor where natural cavities are limiting, particulary in southern California where the bee has expanded its range north of Mexico.

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Rocky Mountain Elk
(*Cervus elaphus nelsoni*)

Introduction

The Blue Mountains are located in the southeast Washington and northeast Oregon. The Blue Mountains elk herd in Washington is distributed over an area of approximately 900 square miles. The primary elk range is divided into ten Game Management Units (GMUs) (Figure 1).

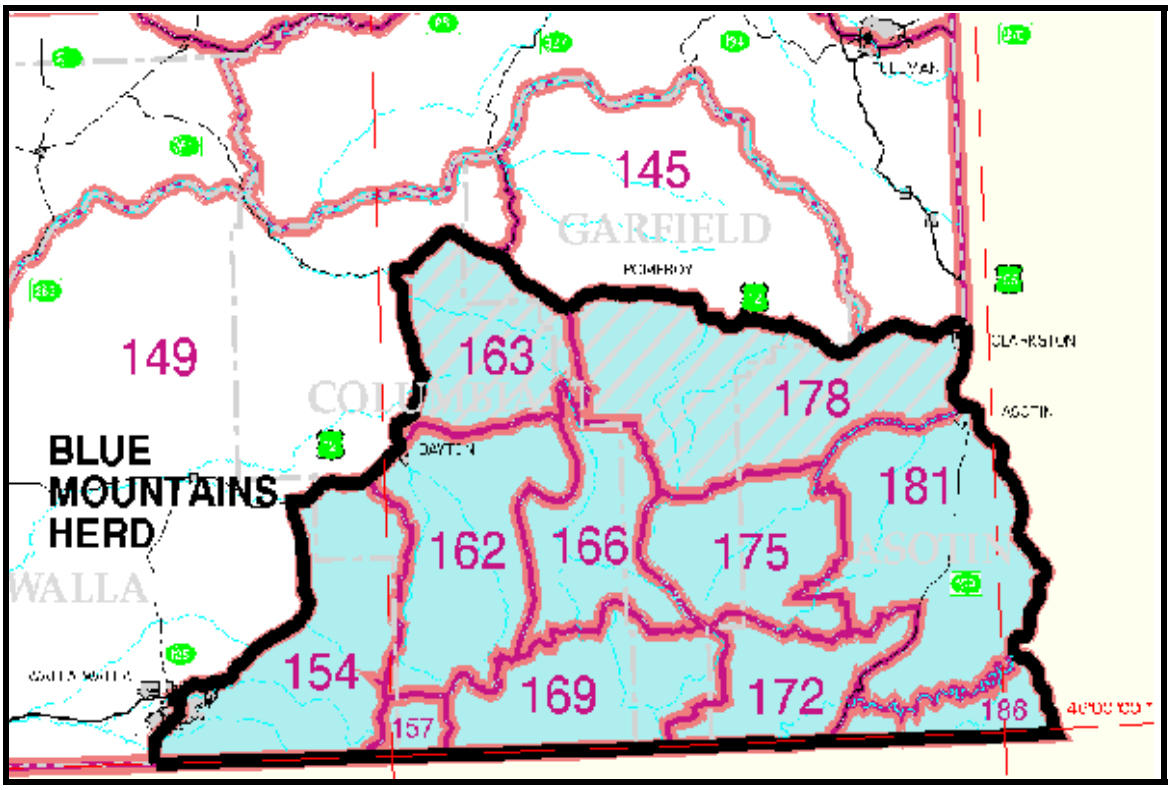

Figure 1. Game Management Units, Blue Mountains, Washington (Fowler 2001).

Ownership between public and private lands varies by GMU, but approximately 63% (565 mi^2) of the elk range is public land, whereas 37% (335 mi^2) of the area is private land.

Rocky Mountain elk are a common game species associated with forested habitats in the foothills and mountainous areas of the Blue Mountains of Washington and Oregon. Much discussion has occurred about the origin of the Blue Mountains elk herd. Elk have been present in the Columbia Basin and Blue Mountains for at least 10,000 years, and were an important source of food for Native Americans. Unregulated subsistence and market hunting by Euro-American immigrants, along with habitat changes resulting from livestock grazing and land cultivation, nearly extirpated elk from the Blue Mountains by the late 1880's (McCorquodale 1985, ODFW 1992). Transplants of elk from Yellowstone Park in the early 1900s, and changing habitat conditions allowed the Blue Mountains elk population to grow, providing a tremendous amount of consumptive and non-consumptive recreation, and economic benefits for the people of Washington and Oregon (Bolon 1994).

Life History and Habitat Requirements

Life History

Elk calves are born from mid-May to mid-June after a gestation period of 8-8.5 months. Calves weigh approximately 29-32 pounds at birth. Single calves are the norm, with twins being very

rare. Cows usually calve in the transition zone between summer and winter range, and usually select brushy draws adjacent to grassy areas and water. The cows re-group 3-4 weeks after calving, and can form groups as large 150 elk.

On the summer range, adult bulls can usually be found alone or in small groups. Antler growth is usually complete by mid-August, and the velvet is shed from the antlers at that time. The breeding season, or rut, starts in early September. Prime age bulls form harems of cows and defend them against other adult and sub-adult bulls. The breeding season peaks in the third week of September and is usually complete by the second week of October, although some cows may breed later if they do not conceive during the first estrus. After the rut, adult bulls separate from the cows to regain weight lost during the rut, and prepare for the rigors of winter. During winter bulls may be found in bachelor groups of up to 20 in number (Schmidt *et al*. 1978).

Elk form winter herds in late fall as snow and weather drive them onto the winter range. Winter herds normally consist of cows, calves, and yearling bulls, and can hold as many as 150-200 elk, but usually range from 10-50. Adult bulls usually form small groups of from 2-20 bulls, and normally winter in areas separate from cow calf groups. In late winter (Feb.-March), elk tend to concentrate on areas where forage is beginning to green up.

Diet

Elk are herbivores and year around main food sources can be categorized into three basic plant types; browse, grasses, and forbs. On predominately grass ranges, up to 90% of the summer diet can consist of grasses or grass like plants, (Boyd 1970). In agricultural areas, elk are fond of peas, wheat, garbonzo beans, and oats, causing problems for farmers and wildlife personnel.

Reproduction

The elk rut, or breeding season, occurs in September to early October, with the peak of breeding in healthy populations occurring about the third week of September. Adult bull elk form harems and defend them against other adult and sub-adult bulls.

The gestation period for cow elk lasts from 245-262 days, with most calves born between mid-May and mid-June. Cow elk leave the main herds in early May and tend to select transitional range between the spring and summer range for calving. In years of abnormal weather cow elk may calve above or below their traditional calving areas. Cow elk normally select areas in the ecotone, where escape cover is available, and water is within 400 feet. Areas selected by cows are usually gentle (20-30%) slopes, with adequate brush, trees, or ground debris to provide hiding cover the calf (Thomas *et al.* 1982).

In the Blue Mountains of Washington, low pregnancy rates (65-68%) were recorded in the late-1980s and may have been the result of few adult bulls in the population and low bull ratios (2-5 bulls:100 cows) and poor physical condition in cow elk as a result of drought (Fowler 1988). In 1989, a new harvest management strategy was implemented allowing hunters to harvest only spike bull elk, and the hunting of branch-antlered bulls was controlled by permit. The goal of this strategy was to increase post-season bull ratios to a minimum of 15 bulls:100 cows and to improve breeding effectiveness by increasing the number of adult bulls in the population (Noyes *et al*.1996). Within 2 years, post-season bull ratios increased to 16 bulls:100 cows, and pregnancy rates measured in 1992-1993 had increased to an average of 90% (P. Fowler, WDFW, personal communication, 2003).

Breeding effectiveness improved dramatically as adult bull numbers increased in the elk population. Earlier breeding, smaller harem size, and more intense rutting activity were observed as the number of adult bulls increased in the elk population (Fowler per.com.). Prior to

the increase in adult bulls, average mean conception dates occurred later than normal; September 30 in 1987 and October 9 in 1988, respectively. By 1992 and 1993, the average conception date for cow elk in the Blue Mountains occurred one to two weeks earlier; September 24, and September 18, respectively (Figure 2). The date of conception is important because calves that are born early have a greater chance of surviving (Thorne *et al*. 1976).

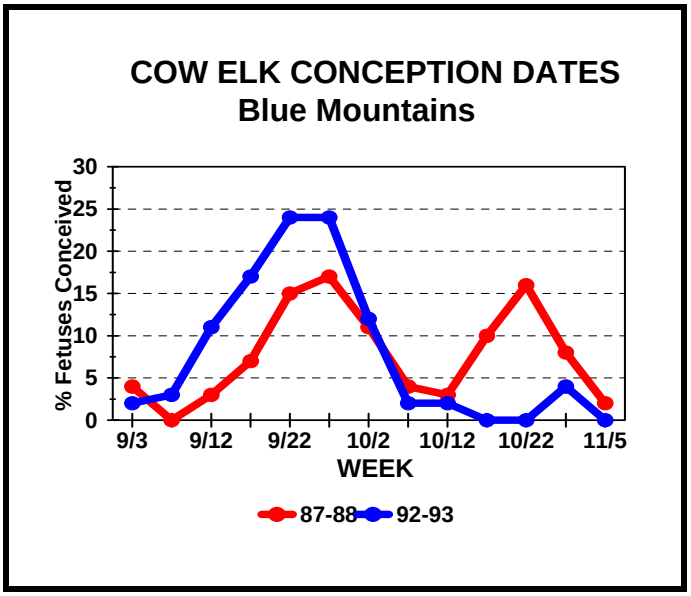

Figure 2. Cow elk conception date distribution before and after adult bull numbers were increased (Fowler 1988, 1993).

Although pregnancy rates, conception dates, and early summer calf ratios have improved to 50+ calves\100 cows, annual calf survival remains below management objective, mostly due to heavy predation by mountain lion and black bear. Survival of adult cows is also crucial for maintenance of the Blue Mountains elk herd.

Migration

Elk in the Blue Mountains of Washington do not migrate great distances. Most of the migratory elk within the east and west Blue Mountains sub-herds occur on public land, and have a short migration from summer to winter range at lower elevations (1400-4,000 feet), which may only be 2-10 air miles. Elk that spend much of their time on private land tend to be resident or semi-migratory (Myers *et. al.* 1999).

Mortality

The majority of adult elk mortality is a result of hunting. Of the known mortalities 50% of all adult mortality is due to hunting by both state licensed and Native Americans hunters. Predation accounted for 16% of the deaths, and poaching accounted for 8%. Twenty two percent of the adult elk deaths could not be classified to cause. (Myers *et al.*1999).

Mortality of calf elk during the first year of life has been a great concern to wildlife managers and the public over the last 15 years. Investigations into calf mortality were conducted between 1992-1998. Annual calf elk survival rates averaged 47% from 1993-1998, with a minimum of 78% of the mortality due to predation (Myers *et al.* 1999)

Harvest

The first hunting season for elk in the Blue Mountains of Washington was opened in 1927 for branched antlered bulls, and the first either-sex hunt was held in 1934. A combination of hunting

season strategies has occurred over time, from bull only seasons, to either-sex hunts on private land. Generally, hunting seasons have consisted of bull only general seasons, with the antlerless harvest regulated by permit. In 1989, the general bull elk season was changed from “any bull” to “spike only” in order to increase the number of adult bulls in the elk population. The non-tribal elk harvest has ranged from a high of 2500 in 1974, to a low of 209 in 1998 (Table 1).

Table 1. Elk harvest history – Blue Mountains, Washington (WDFW 2001).

Year	Bulls	Cows	Total	Hunters	Days
1960	760	802	1562		
1961	731	699	1430		
1962	760	690	1450		
1963	626	530	1156		
1964	1062	641	1703		
1965	1009	673	1682		
1966	935	1297	2232		
1967	817	970	1787		
1968	1052	730	1782		
1969	925	760	1685		
1970	981	331	1312		
1971	1068	333	1401		
1972	1226	434	1660		
1973	1320	1040	2360		
1974	1278	1230	2508		
1975	1065	710	1775		
1976	1230	890	2120		
1977	1200	770	1970		
1978	1280	770	2050		
1979	1240	660	1900		
1980	1610	535	2145		
1981	1451	710	2161		
1982	1176	606	1782		
1983	1032	562	1594		
1984	813	548	1361	11506	48217
1985	831	391	1222	13452	51857
1986	701	436	1137	11763	51439
1987	799	688	1487	12581	53717
1988	614	481	1095	12131	51586
1989	358	583	941	10174	41291
1990	307	436	743	9602	NA
1991	242	281	523	9395	41386
1992	356	243	599	10023	39664
1993	269	212	481	9583	40996
1994	305	167	472	9788	36290
1995	235	15	250	6265	24586
1996	208	107	315	6463	23226
1997	380	57	437	6151	26053

Year	Bulls	Cows	Total	Hunters	Days
1998	148	61	209	5501	21769
1999	208	28	236	6039	29269
2000	243	30	273	5097	24694
2001	222	122	344	3707	17965

Two Native American tribes (Nez Perce and Umatilla Tribes) have hunting rights in the Blue Mountains of Washington. The Nez Perce Tribe holds hunting rights in ceded areas east of the Tucannon River. The Umatilla Tribe holds hunting rights in ceded areas west of the Tucannon River. The Nez Perce Tribe maintains a hunting season year around with no bag limit for tribal members. The Umatilla Tribe establishes hunting seasons for tribal members, with various restrictions on the sex and age of elk that can be taken by hunters during specific time periods. No harvest information is available from the Tribes.

Historic

Historically, the non-tribal general hunting season has been for any bull elk, with antlerless harvest by permit only. During some years, when agricultural damage was extensive, large numbers of anlterless permits were issued, or hunters were allowed to harvest either-sex elk on private lands to alleviate the problem. Some of these hunts had a significant impact on the elk population in those areas.

Current

The general bull elk hunting season was changed to a spike-only management program in 1989 after research determined conception rates for cow elk were lower than normal (65%), and post-season bull to cow ratios were 2 to 5 bulls:100 cows. Only 2% of the bull population consisted of bulls > 4 years of age prior to spike-only management. Few adult bulls existed in the population. The program was designed to improve breeding efficiency by increasing the number and age of adult bulls in the post-hunt population.

The bull harvest has declined approximately 67 % since 1985. Hunters harvested 831 bull elk in 1985, compared to a five-year average bull harvest of 243 since 1995. The reduction in the bull harvest is due to a marked decline in elk populations in GMUs 166, 169, 172, and 175, and poor calf survival, which results in fewer yearling bulls available for harvest. Low calf survival and very cold conditions during the hunting season contributed to the decline in the bull harvest.

Adult bulls are harvested under permit control. Only 28 permits were issued in 2002 for rifle, muzzleloader, and archery hunters. Permit holders harvested 15 bulls, for any overall success rate of 68%; rifle-91%, ML-50%, archery-43%. Bull permit holders can still look forward to a very high quality hunt. Six point or larger bulls comprised 87% of the 2002 harvest (P. Fowler, WDFW, personal communication, 2003) Nez Perce Tribe does not restrict the hunting of adult bulls, and tribal hunters harvest adult bulls in GMU-175 and the eastern portion of GMU-166, but no harvest data is available. The Umatilla Tribe closed GMU-162 to hunting of branched antlered bulls in 2002, in cooperation with the Washington Dept. of Fish and Wildlife, in order maintain adult bull numbers.

Habitat Requirements

The vegetative communities of the Blue Mountains are a mixture of forests and bunch-grasses on the ridges. The lowlands comprise mostly agricultural crops and range land. This combination of habitats is very attractive to elk. The Blue Mountains in Washington consist of the following forest types as described by Kuchler (1964) for the United States: Western spruce (*Picea* spp.)-fir (*Abies* spp.) forest, western ponderosa (*Pinus ponderosa*) forest, and grand fir (*A. grandis*)-Douglas fir (*Pseudotsuga menziesii*) Forest.

Two major soil types, vitrandepts and argixerolls, cover the area. Vitrandepts are of volcanic origin and are found at moderate to high elevations; these soils are formed under forested vegetation. Argixerolls are developed from loess and igneous rock and are found at lower elevations. Argixerolls support grassland, mainly bunch grasses (*Agropyron* spp.), and shrub/grass vegetation. Vegetative associations have been previously described by Daubenmire and Daubenmire (1968), Daubenmire (1970), and Franklyn and Dyrness (1973). Higher elevations are characterized by heavy conifer forests on the north slopes and in the canyons, whereas south slopes are open with scattered conifers and patches of brush. As elevation decreases, the steppe habitat type becomes more prominent and south slopes are more open, with bunch grass and low shrubs comprising the dominant vegetation. Riparian zones are dominated by deciduous trees and shrubs.

Elk are highly adaptable animals, occupying variable habitats throughout western North American, from deserts in some areas to mountains at over 10,000 feet in elevation. In the Blue Mountains of Washington, elk inhabit the foothills and mountainous regions, ranging in elevation from approximately 1,400 feet to over 6,400 feet.

As with most species, elk require food, water, and cover. Thomas (1979) defined various habitat components and how they should be managed to maximize elk use. Optimum elk habitat is arranged in such a way that forage and cover receive the maximum proper use of the maximum possible area (forage/cover ratio). In optimum habitat, cover/forage ratios should be arranged in such a way that elk make maximum use of the area in an efficient manner.

Optimum elk habitat consists of a forage cover ratio of 60% forage area and 40% cover (Thomas *et al.* 1979). Cover quality is defined in two ways; satisfactory and marginal. Satisfactory cover consists stands of coniferous trees that are > 40 feet tall, with a canopy closure of > 70%. Marginal cover is defined as coniferous trees > 10 feet tall with a canopy closure of > 40%. Cover provides protection from weather and predators. Forage areas are all areas that do not fall into the definition of cover. Optimal elk use of forage areas occurs within 600 feet of cover areas (Reynolds 1962; Harper 1969; Kirsch 1962; Hershey and Leege 1976; Pedersen 1974; Leckenby 1984).Proper spacing of forage and cover areas is very important in order to maximize use of these areas by elk (Thomas *et al.* 1979).

Land managers should strive to meet the habitat needs of elk, and do so by following guidelines that will provide good forage/cover ratios that allow elk to maximize use of the area, and to maintain or improve cover and forage conditions to optimal levels.

In order for elk to maximize use of available habitat, the area must be secure from frequent human disturbance. Elk use of good habitat can be greatly reduced by human activity (Perry *et al.* 1977) (Lyndecker 1994). Areas of good habitat should be secure from high levels of human disturbance, especially during sensitive periods, such as breeding areas in September, winter ranges, and calving areas. Several area closures have been implemented on winter ranges and calving areas in the Blue Mountains of Washington.

Population and Distribution

Population

Between 1993-2002, the Blue Mountains elk population in Washington averaged 4,500 elk (range: 4,300 - 4,700 90% C.I.). This estimate is based on the number of elk observed (n = 3652), adjusted for sightability (Unsworth *et al*.1994). Surveys in 2003 produced a population estimate of 4750 elk. Based upon estimated habitat carrying capacity and historic population levels, the elk population management objective for the Blue Mountains of Washington is 5,600 (WDFW 2001).

Three major sub populations have been identified in the Blue Mountains of Washington. These sub herds are located in the eastern Blue Mtns. (GMUs 172, 175, 181, 186, and that portion of the Tucannon unit east of the Tucannon River), west Blue Mtns. (GMUs 154, 157, 162, and 166 west of the Tucannon River), and the Wenaha-Tucannon Wilderness. Six sub-populations were identified within the east and west Blue Mountains sub-herds (Myers. *et. al*. 1999).

In GMU 154-Blue Creek (Walla Walla sub-basin), elk migrate into Washington from Oregon during periods of severe weather, which causes the wintering elk population in Washington to fluctuate dramatically. Elk from GMU 157-Watershed also winter in GMU 154. The number of elk counted during surveys over the last ten years (1994-2003) has ranged from 623 to 1063, and averaged 843. In 2003, 669 elk counted in GMU's 154 and 157.

The number elk counted during surveys of GMU 162-Dayton (Walla Walla subbasin) over the last ten years has ranged from 591 to 1028, and averaged 782. In 2003, 751 elk were counted in GMU-162. Antlerless permits have been increased dramatically to alleviate agricultural damage problems on private land, and as a result the population on private land is declining. The number of elk counted during surveys in GMU 166-Tucannon (Tucannon subbasin) over the last ten years has ranged from 369 to 521, and averaged 431. In 2003, 444 elk were counted. Adult bull survival in the Tucannon herd has also declined significantly over the last six years, due to poaching and treaty hunting by the Nez Perce Tribe.

The elk population north of the Wenaha River in GMU 169 Wenaha (Grande Ronde subbasin) has declined by approximately 1500 elk since the 1980's. Surveys conducted in the mid-1980s documented 2,500 elk wintering north of the Wenaha; only 500 elk were estimated (453 elk counted-ODFW) based on spring surveys in 2003. Several factors are thought to have contributed to the observed decline in elk numbers, including: documented low calf survival for many years; and, harvest of cow elk during antlerless hunts in adjacent units of Oregon and Washington (GMU 172). Changes in the vegetative communities resulting from fire suppression within the Wenaha Wilderness may have reduced the carrying capacity for elk, causing elk to move further south into Oregon to find adequate winter range. This exposed them to late-season antlerless hunts in Oregon. Between 1995 and 1999 Oregon responded by reducing and/or eliminating antlerless permits in units that are below management objectives.

The number of elk counted during surveys over the last ten years in GMU 172-Mountain View (Grande Ronde subbasin) has ranged from 290 to 671, and averaged 425 elk. In 2003, 671 elk were counted in GMU 172. However, the 2003 count may have been inflated by approximately 250 elk due to intense shed antler hunting activity in GMU 169, which may have re-distributed elk into GMU 172. The population decline that occurred in the mid 1990s was a direct result of low calf survival and cow elk lost to antlerless permits issued for damage control prior to 1995. Since 1995, management action was taken to reduce the loss of cow elk to damage control.

The number of elk counted during surveys over the last ten years in GMU 175 Lick Creek (Asotin subbasin) has ranged from 539 to 791, and averaged 661. In 2003, 701 elk counted in GMU 175. Low calf survival and the loss of antlerless elk from the population have been identified as factors that negatively impact this elk herd. Adult bull survival in GMU 175 is the lowest of any GMU in the Blue Mountains at 1ad.bull/100 cows, compared to an average of 10 ad.bulls/100 cows for all other units. Adult bull survival in the Lick Creek herd has never improved, while herds in other GMU's have shown significant improvement.

While GMU 178 Peola (Tucannon subbasin) is not managed to encourage elk, poor maintenance of the elk fence and a continuous loss of elk to damage control prior to 1997 contributed significantly to declining elk numbers in adjacent elk units (GMUs 166, 175). The

installation of one-way gates in the elk fence has greatly reduced the loss of elk to damage control in this unit.

Neither GMU 181 Couse nor GMU 186 Grande Ronde contain major elk populations. Elk numbers in GMU 181 have ranged from 10-150 during surveys. The resident elk population in GMU 186 varies between 50 and 150 elk. Elk from Oregon move into GMU 186 during the winter months, increasing the elk population by 250 to 550 elk, depending on the severity of winter conditions.

Historic

Historically, elk were common throughout the Blue Mountains and Columbia Basin, but were almost extirpated during the late 1800s and early 1900s. Transplants from Yellowstone Park in the early 1900s provided breeding stock to supplement the low density populations that existed at that time. The transplants, along with habitat changes that occurred through the mid 1900s allowed the elk population to grow to approximately 6,500 head in Washington (McCorquodale 1985; ODFW 1992).

Current

Elk are distributed throughout the foothills and higher elevations of the Blue Mountains. The density of the elk population in the Blue Mountains of Washington varies among the ten Game Management Units (GMUs). Major wintering populations occur in GMUs 154, 157, 162, 166, 169, 172, and 175. Smaller populations occur in GMUs 178, 181, and 186. The lowland areas and portions of the foothills have been taken over by agriculture, and conflicts occur when elk move into these areas.

Transplants/Introductions

Several transplants of elk have occurred in the Blue Mountains, three in the early 1900s, and one in 2000.

Historic

The elk population in the Blue Mountains was at a very low level in the early 1900s. To help recover the elk population, farmer-ranchers-sportsmen's groups in southeast Washington initiated transplants of elk from Yellowstone National Park. Twenty-eight elk were released from Pomeroy in 1911; 50 elk from Walla Walla in 1919; and 26 elk from Dayton 1931 (Urness 1960). The first season for branched-antlered bull elk was held in 1927, and the first either-sex season in 1934 to reduce elk numbers and control damage on private lands in the Charley (Asotin Creek drainage) and Cummings Creek (Tucannon drainage) drainages.

Current

On March 7 and 8, 2000, seventy-two elk from the Hanford Site (DOE) were released in GMU-175 Lick Creek (Asotin subbasin) in an effort to improve productivity and increase the population to management objective. Approximately 80% of the elk released migrated to the north and west, leaving the unit within three months. As a result, small groups of elk have established themselves in lowland agricultural areas, which may pose a major problem in the near future (P. Fowler, WDFW, personal communication, 2003).

Status and Abundance Trends

Status

Elk populations in the Blue Mountains have declined by approximately 1500-2000 animals since 1985. Aerial surveys are conducted annually in March to determine herd composition and population trend (Table 2). Since 1995, the elk population has remained fairly stable, ranging from a low of 3,902 to a high of 4750. The 2003, late winter elk population is estimated at 4,750. Sub-populations in GMU 169 Wenaha, GMU 175 Lick Creek, the eastern portion of GMU 166

Tucannon, and GMU 172 Mt. View are below population management objectives by approximately 1,000 elk. The goal is to increase elk populations that are below management objective in units containing primarily public land, with an overall population management objective of 5,600 elk (WDFW 2001).

Table 2. Elk composition and-population trend surveys for the Blue Mountains, March 1987-2003 (WDFW 2002).

Year	Bulls:100 Cows	Adult Bulls:100 Cows	Calves:100 Cows	Sample Size
1987	7	2	35	2060
1988	6	1	32	2962
1989	5	3	22	4196
1990	8	3	25	3706
1991	11	7	28	4072
1992	16	10	18	3560
1993	13	8	19	4092
1994	14	10	18	3161
1995	17	13	20	3689
1996	14	11	15	3656
1997	13	9	24	3405
1998	11	8	23	3118
1999	13	10	23	3615
2000	12	9	17	3628
2001	10	7	21	3874
2002	13	7	21	3795
2003	12	9	29	3740

Trends

Table 3. Elk survey trends (1993-2000) and population objectives (WDFW 2001)

GMU	Mean No. Elk Counted 1993-2000	Population Objective	Average Bull Ratio 1993-2000	Bull Ratio Objective
154-157 Blue Creek-Watershed	813	800	15	15
162 -Dayton	757	800	14	15
166 -Tucannon	423	700	11	15
169 -Wenaha	476	1,400	24	20
172 -Mountain View	404	700	20	15
175 -Lick Creek	623	1,000	6	15
178 -Peola	N\A	30	—	—
181 -Couse	35	≤50	—	—
186 -Grande Ronde	62	≤150	—	15
Total	**3,593**	**5,600**	**—**	**—**

Factors Affecting Population Status

Key Factors Inhibiting Populations and Ecological Processes

Recent studies (Myers *et. al.* 1999) have documented how road densities, forage:cover ratios, stand composition, amount of edge, and opening size influence seasonal elk use, especially in the eastern Blue Mountains. In some units of National Forest land, elk face problems from high road densities, and habitat deterioration from long term fire suppression and past logging practices. Many habitat improvement projects have been developed and completed by WDFW, USFS, RMEF, and Blue Mountain elk Initiative to improve habitat for elk on National Forest lands, and reduce elk damage on private lands.

Habitat Deterioration

Fire suppression has reduced long-term habitat effectiveness on National Forest land by reducing the quality of the elk habitat in many areas of the Blue Mountains, and especially in GMUs 157, 162, 166, 169, 172, and 175. Lack of fire has allowed timber stands to accumulate fuel (dead, down trees) loads that inhibit forage growth and movement by elk. Browse species, such as Mtn. Maple grow to heights that prevent elk from utilizing browse as forage. Fire prevents fuel levels and blow downs from accumulating and keeps browse species regenerating at levels that provide forage for elk and other big game. The USFS's new Fire Management Policy will improve habitat conditions for elk through the use of prescribed and controlled natural fires. This policy will affect the National Forest lands within the Pomeroy Ranger District (Walla Walla, Tucannon, Asotin subbasins), and will hopefully allow fire to play its natural role in maintaining habitat conditions in this area. WDFW will work with USFS to improve habitat conditions through the use of fire.

Road Densities

The use of off-road vehicles on developed trail systems on USFS land in GMUs 162 and 166 could result in increased harassment of elk and decreased use by elk in prime habitat areas. This problem is especially acute when trails are constructed through known elk calving areas and high-use summer habitat. WDFW will continue to work closely with the USFS on Travel and Access Management Plans in order to minimize this impact.

WDFW and USFS have initiated motorized access closures on winter range to reduce harassment to wintering elk. Area closures have also been implemented around major elk calving areas. Violations of the closures continue to be an ongoing problem. WDFW has worked closely with the USFS to improve habitat effectiveness for elk by reducing road densities in important elk habitat. In GMU 162, road closures have been initiated on the Walla Walla and Pomeroy Ranger Districts. However, some of these closures allow ATV (4-wheeler-motorcycle) use, which is incompatible with the objective of increasing elk use of these areas. In GMU 166, increased road building is a problem, and a road closure program has been implemented on the Pomeroy Ranger District; however, better enforcement and control of firewood cutting is needed to improve elk utilization in many areas. Increased vehicle traffic due to firewood cutting from summer-fall reduces elk use of areas near roads (Perry and Overly 1977).

In GMU 175 (Lick Creek), high road densities on USFS land combined with uncontrolled firewood cutting reduce summer range habitat effectiveness for elk. A winter range closure and calving area closures have been initiated in this unit. However, based on field observations, violations of these closures appear to be increasing.

Noxious Weeds

The spread of noxious weeds continues to be a major problem in many areas; noxious weeds can out-compete and replace plant communities used by elk, resulting in a reduction in available elk forage. WDFW has implemented weed control programs on its lands, and continues to work with USFS to identify and control noxious weeds on USFS lands. In GMU 166, noxious weeds

are a problem on elk winter range. A weed control program was initiated on the Wooten Wildlife Area in GMU 166; however, noxious weeds on adjacent private lands threaten to compromise weed control efforts on the Wildlife Area. Habitat conditions on private lands in GMUs 154, 157, and 162 continue to deteriorate due to noxious weeds, such as the yellow starthistle.

In GMU 162 (Dayton) forage enhancement and water development projects involving the RMEF have been completed on Robinette and Eckler mountains (Rainwater Wildlife Area –CTUIR Lands). These projects have been successful in attracting elk onto these areas, and should be maintained.

Silvicultural Practices

Silvicultural treatment, especially clear cutting adjacent to open roads, has impacted elk habitat in many areas in the Blue Mountains. Numerous clear cuts reduce the amount of security and thermal cover available for elk, and associated road development increases vulnerability. Elk have shown preference for areas with large tracts providing security cover, smaller sized openings, and edge areas (Myers *et al.*1999). In GMUs 166 and 175, increased logging, open roads, and uncontrolled firewood cutting have contributed to declining elk use in areas of important summer habitat.

Grazing

In GMU 172 (Mountain View), range conditions on USFS lands appear to be good, but many private land parcels appear to be over-grazed, a condition that dramatically increases the risk of a noxious weed problem. Habitat conditions on public land in GMU 186 (Grande Ronde) are fair. Trespass cattle on the Chief Joseph Wildlife Area continue to be an annual nuisance. Grazing permits on the Asotin Wildlife Area have been terminated, with the exception of the Weatherly parcel. Forage enhancement projects, controlled burns, water developments, and area closures have been initiated in the Blue Mountains.

Development

The sale and sub-division of large tracts of land also contributes to the loss of elk habitat in some areas. Habitat conditions in GMU 154 continue to deteriorate due to subdividing of land into smaller parcels for residential construction.

Agricultural Damage

Elk damage to crops and fences is a continuing problem on the lowlands of the Blue Mountains elk herd area. The WDFW Enforcement Program has maintained recent records of damage complaints and claims for damage (Table 4). Elk damage complaints reported to WDFW in 1995, 1998 and 1999 ranged between 36 and 47. Elk damage appears to occur more frequently during the period April through September. During winters with heavy snowfall, damage to hay stacks may also be a problem.

Agricultural damage and landowner intolerance continue to be a significant elk management problem in GMU 154 (Blue Creek). However, the development and implementation of the Blue Mountains Elk Control Plan (Fowler *et al.* 1991) has improved landowner/WDFW relations.

In GMU 162 (Dayton), agricultural damage is historical on northern Robinette Mountain and in the upper Hately Gulch-Patit areas of Eckler Mountain. The use of hot-spot hunts and landowner preference permits have improved landowner/WDFW relations, but complaints of elk damage continue.

Within GMU 172 (Mountain View), landowner/elk conflicts occur on both agricultural crop lands and private range land because elk compete with domestic livestock on native range. This has forced the WDFW to maintain elk numbers below their potential. In GMU 172, a program

Table 4. Elk damage claims (1996-1999), Blue Mountains, Washington (WDFW 2001).

County	Date	Species	Crop	Claim	Paid	Status
Asotin	10-01-96	Elk	Unk.	Unk.	N/A	Rejected
Garfield	11-24-96	Elk	wheat	$620.50	.10.50	Paid
Asotin	1-24-97	Elk	hay stack	$200.00	$150.00	Paid
Asotin	1-27-97	Elk-Deer	hay stack	$216.00	$216.00	Paid
Asotin	1-25-97	Elk	barley	$3,750.40	$2,800.00	Paid
Asotin	8-28-97	Elk	barley	$454.50	$454.50	Paid
Asotin	10-20-97	Elk	wheat	$364.12	$331.12	Paid
Asotin	10-14-97	Elk	hay	$103.68	$103.68	Paid
Columbia	9-12-97	Elk-Deer	wheat	$29,600.00	$1,872.00	Paid
Columbia	9-12-97	Elk-Deer	wheat	$10,800.00	$8,075.68	Paid
Columbia	7-25-97	Elk-Deer	peas	$6,360.24	$6,360.24	Paid
Columbia	7-25-97	Elk-Deer	peas	$990.18	$990.18	Paid
Garfield	9-29-97	Elk	wheat	$1,185.00	$1,185.00	Paid
Walla Walla	11-3-97	Elk	wheat	$6,868.00		Rejected
Walla Walla	11-3-97	Elk	peas	$8,300.00		Rejected
Asotin	3-18-98	Elk-Deer	alfalfa	$1,000.00	$427.50	Paid
Columbia	8-17-98	Elk-Deer	wheat	$200.00	$200.00	Paid
Columbia	8-26-98	Elk	wheat	$500.00	$500.00	Paid
Columbia	8-31-98	Elk	wheat-oat	$2,500.00	$2,037.80	Paid
Columbia	8-31-98	Elk	barley	$1,000.00	$407.74	Paid
Columbia	10-08-98	Elk	Unk.	Unk.		Rejected
Walla Walla	9-13-98	Elk	barley	$266.66	$206.66	Paid
Walla Walla	8-28-98	Elk				Rejected
Asotin	9-10-99	Elk	hay	$543.00		
Columbia	8-02-99	Elk	wheat	Unk.		Rejected
Columbia	8-02-99	Elk	barley	Unk.		Rejected
Columbia	8-16-99	Elk	peas	$4,985.79		
Columbia	9-20-99	Elk-Deer	wheat	$5,000.00		
Columbia	9-20-99	Elk-Deer	barley	$3,000.00		
Garfield	9-27-99	Elk	wheat	$1,304.60		
Garfield	9-06-99	Elk	wheat	$1,914.00	$1,914.00	
Walla Walla	9-03-99	Elk-Deer	wheat	$3,000.00		
Walla Walla	8-23-99	Elk	peas	$4,125.00		

involving land purchases, forage enhancement programs, and landowner compensation is needed to increase landowner tolerance of elk.

A 27-mile long elk fence forms the entire southern border of GMU 178 (Peola). The fence extends from the Wooten Wildlife Area on the Tucannon Road, east to USFS land on the Mountain Road, then east to the edge of the Asotin Wildlife Area on Tam Tam Ridge in GMU175. This fence was designed to prevent large numbers of elk from moving north onto agricultural lands in GMU 178. However, elk damage complaints from a few landowners have been a continuous problem for many years. Failure to adequately maintain the elk fence and the inadequate length of the fence has resulted in large numbers of elk accessing private land and causing damage. Approximately 1,206 cow elk have been harvested in this unit using either-sex seasons between 1975-1994. From 1994 to 1997, permits have been issued to control the harvest of elk in this unit. Excessive kills in this unit provides a major drain on elk numbers in GMUs 166 and 175 and is one of the reasons these populations are below population management objectives.

The solution to damage problems in GMU 178 lies in the implementation of several programs. In fall 1997, 12 one-way gates were placed at strategic points along the fence to allow elk that

are outside the fence to cross back through, thus eliminating the loss of large numbers of elk trapped outside the fence. These one-way gates appear to be working, allowing elk trapped outside the elk fence in GMU 178 to move back through the fence into GMU's 166 and 175. In addition, the elk fence must receive higher priority in the capital budget and a maintenance schedule must be implemented that maintains and repairs the fence throughout the year. The elk fence should be extended for approximately two miles along its eastern boundary to stop elk from going around the fence during the winter. Lastly, the Program with damage control responsibilityshould prioritize at least $3,000/year for helicopter time to herd elk back inside the fence when necessary.

The elk in the Schumaker Grade-Ten Mile area in GMU 181 (Couse) tend to cause landowner damage complaints if numbers exceed 25-50 elk. The number of elk wintering in this unit has increased dramatically from1992 to elk in 1996, with as many as 150 elk moving into the area. This shift in elk distribution is due to two factors. First, a late cow hunt in GMU 172 was held from 1989 to 1994 to address landowner complaints but was terminated in 1995 due to declining elk numbers. Hunter pressure from this season forced elk to move westward into GMU 181 to avoid hunting pressure, causing a redistribution of elk over time. Second, range conditions in GMU 172 are poor due to overgrazing by domestic livestock, which contributes to elk moving to the west, across the Rattlesnake Grade, during periods of severe weather. Early- and late-muzzleloader seasons were implemented in 1997 to encourage these elk to stay east of the Rattlesnake Grade. Only 26 cow elk have been harvested during this muzzleloader season, and the number of elk counted in GMU-181 Couse during post-season surveys has dropped from 150 in 1996, to 26 in 1997, to zero in 1998. The number of elk counted in GMU-172 Mountain View during this same period has increased by 119.

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Yellow Warbler
(*Dendroica petechia*)

Introduction

The yellow warbler (*Dendroica petechia*) is a common species strongly associated with riparian and wet deciduous habitats throughout its North American range. In Washington it is found in many areas, generally at lower elevations. It occurs along most riverine systems, including the Columbia River, where appropriate riparian habitats have been protected. The yellow warbler is a good indicator of functional subcanopy/shrub habitats in riparian areas.

Life History and Habitat Requirements

Life History

Diet

Yellow warblers capture and consume a variety of insect and arthropod species. The species taken vary geographically. Yellow warblers consume insects and occasionally wild berries (Lowther *et al.* 1999). Food is obtained by gleaning from subcanopy vegetation; the species also sallies and hovers to a much lesser extent (Lowther *et al.* 1999) capturing a variety of flying insects.

Reproduction

Although little is known about yellow warbler breeding behavior in Washington, substantial information is available from other parts of its range. Pair formation and nest construction may begin within a few days of arrival at the breeding site (Lowther *et al.* 1999). The reproductive process begins with a fairly elaborate courtship performed by the male who may sing up to 3,240 songs in a day to attract a mate. The responsibility of incubation, construction of the nest and most feeding of the young lies with the female, while the male contributes more as the young develop. In most cases only one clutch of eggs is laid; renesting may occur, however, following nest failure or nest parasitism by brown-headed cowbirds (Lowther *et al.* 1999). The typical clutch size ranges between 4 and 5 eggs in most research studies of the species (Lowther *et al.* 1999). Egg dates have been reported from British Columbia, and range between 10 May and 16 August; the peak period of activity there was between 7 and 23 June (Campbell *et al.* in press). The incubation period lasts about 11 days and young birds fledge 8-10 days after hatching (Lowther *et al.* 1999). Young of the year may associate with the parents for up to 3 weeks following fledging (Lowther *et al.* 1999).

Nesting

Results of research on breeding activities indicate variable rates of hatching and fledging. Two studies cited by Lowther *et al.* (1999) had hatching rates of 56 percent and 67 percent. Of the eggs that hatched, 62 percent and 81 percent fledged; this represented 35 percent and 54 percent, respectively, of all eggs laid. Two other studies found that 42 percent and 72 percent of nests fledged at least one young (Lowther *et al.* 1999); the latter study was from British Columbia (Campbell *et al.* in press).

Migration

The yellow warbler is a long-distance neotropical migrant. Spring migrants begin to arrive in the region in April. Early dates of 2 April and 10 April have been reported from Oregon and British Columbia, respectively (Gilligan *et al.* 1994, Campbell *et al.* in press). Average arrival dates are somewhat later, the average for south-central British Columbia being 11 May (Campbell *et al.* in press). The peak of spring migration in the region is in late May (Gilligan *et al.* 1994). Southward migration begins in late July, and peaks in late August to early September; very few migrants remain in the region in October (Lowther *et al.* 1999).

Mortality

Little has been published on annual survival rates. Roberts (1971) estimated annual survival rates of adults at 0.526 ±0.077 SE, although Lowther *et al.* (1999) felt this value underestimated survival because it did not account for dispersal. The oldest yellow warbler on record lived to be nearly 9 years old (Klimkiewicz *et al.* 1983).

Yellow warblers have developed effective responses to nest parasitism by the brown-headed cowbird (*Molothrus ater*). The brown-headed cowbird is an obligate nest brood parasite that does not build a nest and instead lays eggs in the nests of other species. When cowbird eggs are recognized in the nest the yellow warbler female will often build a new nest directly on top of the original. In some cases, particularly early in the incubation phase, the female yellow warbler will bury the cowbird egg within the nest. Some nests are completely abandoned after a cowbird egg is laid (Lowther *et al.* 1999). Up to 40 percent of yellow warbler nests in some studies have been parasitized (Lowther *et al.* 1999).

Habitat Requirements

The yellow warbler is a riparian obligate species most strongly associated with wetland habitats and deciduous tree cover. Yellow warbler abundance is positively associated with deciduous tree basal area, and bare ground; abundance is negatively associated with mean canopy cover, and cover of Douglas-fir (*Pseudotsuga menziesii*), Oregon grape (*Berberis nervosa*), mosses, swordfern (*Polystuchum munitum*), blackberry (*Rubus discolor*), hazel (*Corylus cornuta*), and oceanspray (*Holodiscus discolor*) (Rolph 1998).

Partners in Flight have established biological objectives for this species in the lowlands of western Oregon and western Washington. These include providing habitats that meet the following definition: >70 percent cover in shrub layer (<3 m) and subcanopy layer (>3 m and below the canopy foliage) with subcanopy layer contributing >40 percent of the total; shrub layer cover 30-60 percent (includes shrubs and small saplings); and a shrub layer height >2 m. At the landscape level, the biological objectives for habitat included high degree of deciduous riparian heterogeneity within or among wetland, shrub, and woodland patches; and a low percentage of agricultural land use (Altman 2001).

Nesting

Radke (1984) found that nesting yellow warblers occurred more in isolated patches or small areas of willows adjacent to open habitats or large, dense thickets (i.e., scattered cover) rather than in the dense thickets themselves. At Malheur National Wildlife Refuge, in the northern Great Basin, nest success 44 percent (n = 27), however, cowbird eggs and young removed; cowbird parasitism 33 percent (n = 9) (Radke 1984).

Breeding

Breeding yellow warblers are closely associated with riparian hardwood trees, specifically willows, alders, or cottonwood. They are most abundant in riparian areas in the lowlands of eastern Washington, but also occur in west-side riparian zones, in the lowlands of the western Olympic Peninsula, where high rainfall limits hardwood riparian habitat. Yellow warblers are less common (Sharpe 1993). There are no BBA records at the probable or confirmed level from subalpine habitats in the Cascades, but Sharpe (1993) reports them nesting at 4000 feet in the Olympics. Numbers decline in the center of the Columbia Basin, but this species can be found commonly along most rivers and creeks at the margins of the Basin. A local breeding population exists in the Potholes area.

Non-Breeding

Fall migration is somewhat inconspicuous for the yellow warbler. It most probably begins to migrate the first of August and is generally finished by the end of September. The yellow warbler

winters south to the Bahamas, northern Mexico, south to Peru, Bolivia and the Brazilian Amazon.

Population and Distribution

Population

Historic

No historic data could be found for this species.

Current

No current data could be found for this species.

Distribution

Historic

Jewett *et al.* (1953) described the distribution of the yellow warbler as a common migrant and summer resident from April 30 to September 20 in the deciduous growth of Upper Sonoran and Transition Zones in eastern Washington and in the prairies and along streams in southwestern Washington. They describe its summer range as north to Neah Bay, Blaine, San Juan Islands, Monument 83; east to Conconully, Swan Lake, Sprague, Dalkena, and Pullman; south to Cathlamet, Vancouver and Bly, Blue Mts., Prescott, Richland, and Rogersburg; and west to Neah Bay, Grays Harbor, and Long Beach. Jewett *et al. (*1953) also note that the yellow warbler was common in the willows and alders along the streamsof southeastern Washington and occurs also in brushy thickets. They state that its breeding range follows the deciduous timber into the mountains, where it porbably nests in suitable habitat to 3,500 or perhaps even to 4,000 feet – being common at Hart Lake in the Chelan region around 4,000 feet. They noted it was a common nester along the Grande Ronde River, around the vicinity of Spokane, around Sylvan Lake, and along the shade trees along the streets of Walla Walla.

Current

The yellow warbler breeds across much of the North American continent, from Alaska to Newfoundland, south to western South Carolina and northern Georgia, and west through parts of the southwest to the Pacific coast (AOU 1998). Browning (1994) recognized 43 subspecies; two of these occur in Washington, and one of them, *D.p. brewsteri*, is found in western Washington. This species is a long-distance migrant and has a winter range extending from western Mexico south to the Amazon lowlands in Brazil (AOU 1998). Neither the breeding nor winter ranges appear to have changed (Lowther *et al.* 1999).

The yellow warbler is a common breeder in riparian habitats with hardwood trees throughout the state at lower elevations. It is a locally common breeder along rivers and creeks in the Columbia Basin, where it is declining in some areas. Core zones of distribution in Washington are the forested zones below the subalpine fir and mountain hemlock zones, plus steppe zones other than the central arid steppe and canyon grassland zones, which are peripheral. Figure 1 shows the distribution of the yellow warbler in Washington (Smith *et al.* 1997).

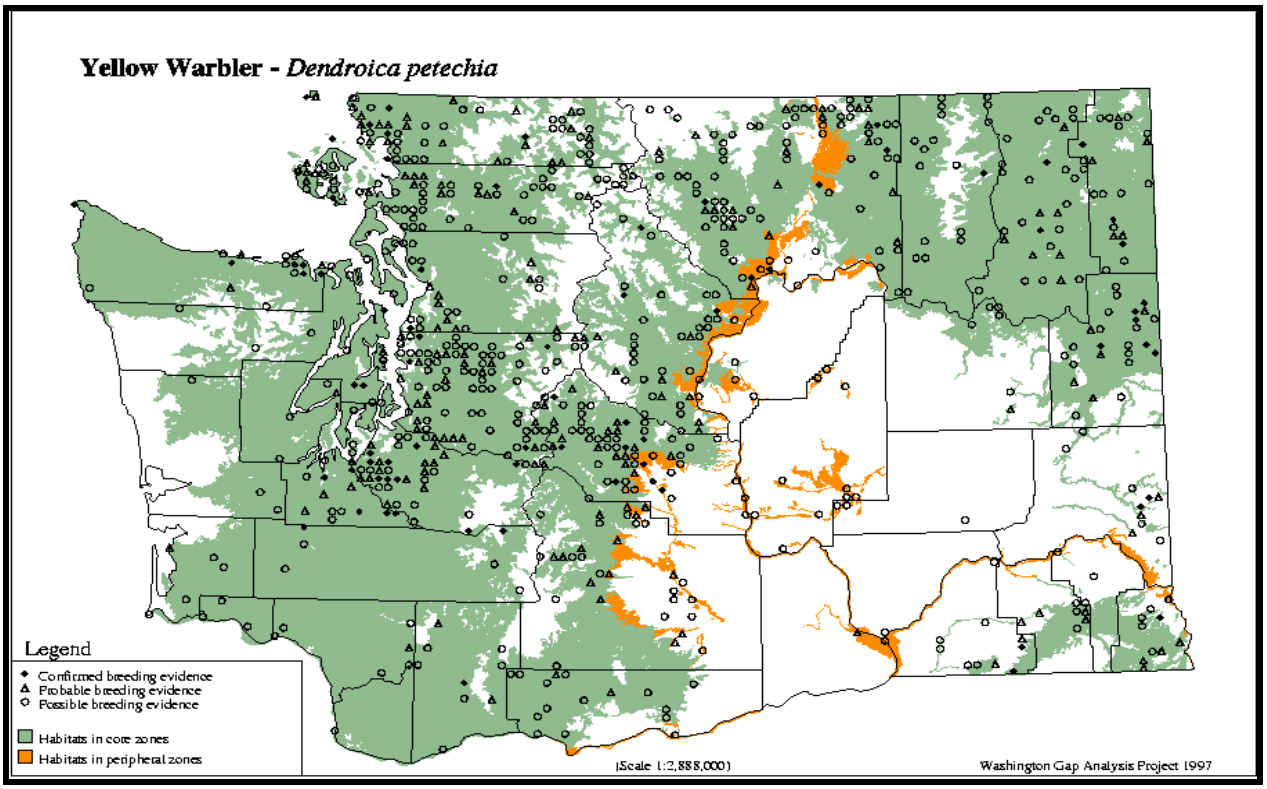

Figure 1. Breeding bird atlas data (1987-1995) and species distribution for yellow warbler (Washington GAP Analysis Project 1997).

Breeding

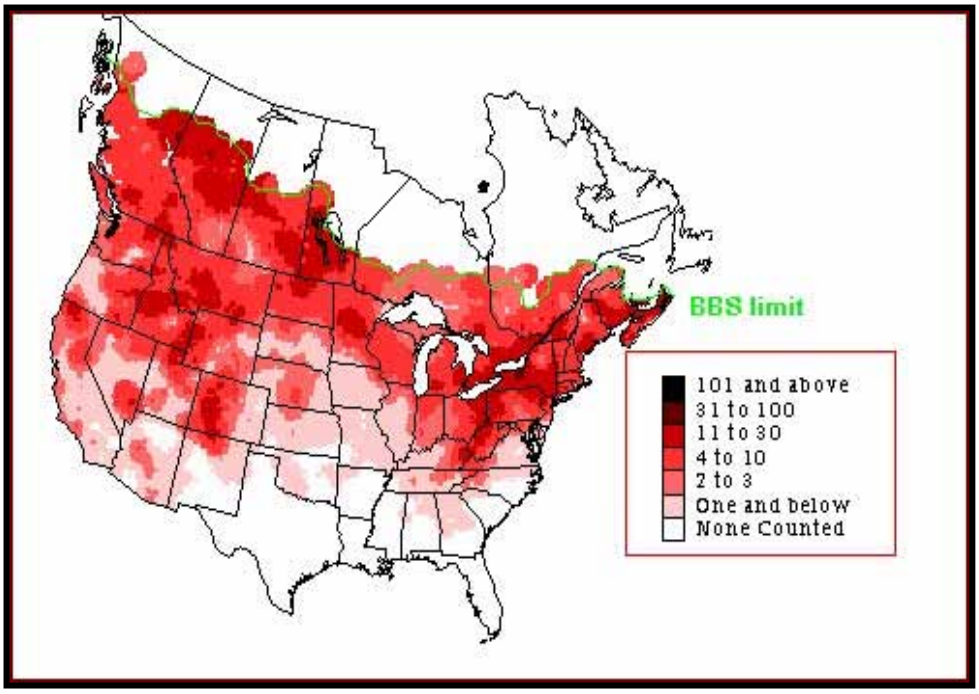

Figure 2 Yellow warbler breeding season abundance from BBS data (Sauer *et al.* 2003).

The yellow warbler breeds across much of the North American continent, from Alaska to Newfoundland, south to western South Carolina and northern Georgia, and west through parts of the southwest to the Pacific coast (AOU 1998) (Figure 2).

Non-Breeding

This data is not readily available; however, the yellow warbler is a long-range neotropical migrant. Its winter range is from Northern Mexico south to Northern Peru.

Status and Abundance Trends

Status

Yellow warblers are demonstrably secure globally. Within the state of Washington, yellow warblers are apparently secure and are not of conservation concern (Altman 1999).

Trends

Yellow warbler is one of the more common warblers in North America (Lowther *et al.* 1999). Information from Breeding Bird Surveys indicates that the population is stable in most areas. Some subspecies, particularly in southwestern North America, have been impacted by degradation or destruction of riparian habitats (Lowther *et al.* 1999). Because the Breeding Bird Survey dates back only about 30 years, population declines in Washington resulting from habitat loss dating prior to the survey would not be accounted for by that effort (Figure 3).

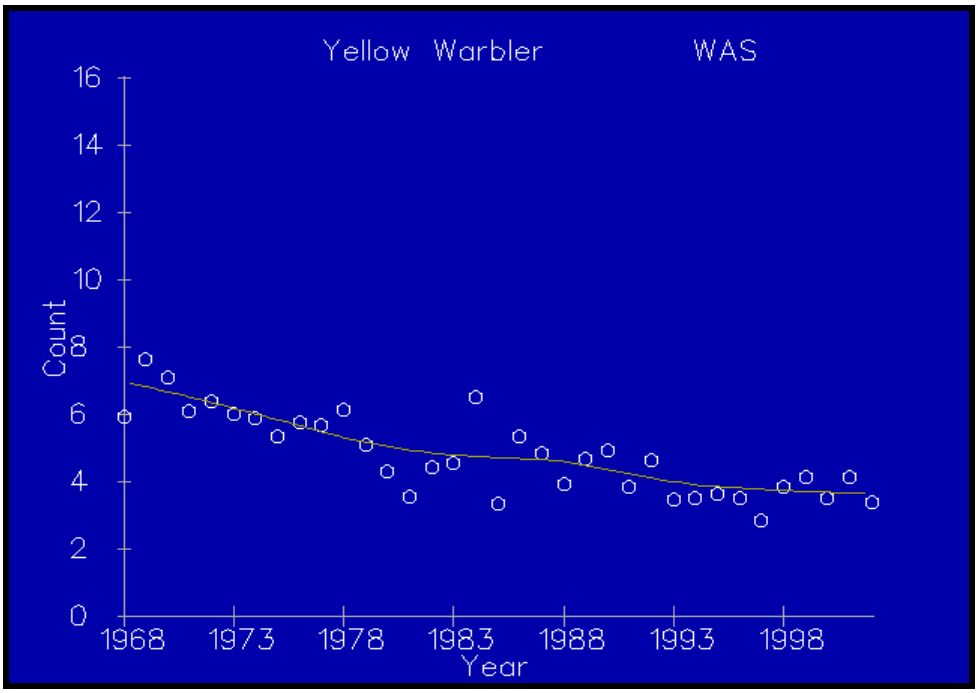

Figure 3. Yellow warbler population trend from BBS data (1966 – 1991) (Peterjohn 1991).

Factors Affecting Yellow Warbler Population Status

Key Factors Inhibiting Populations and Ecological Processes

Habitat loss due to hydrological diversions and control of natural flooding regimes (e.g., dams) resulting in reduction of overall area of riparian habitat, conversion of riparian habitats, inundation from impoundments, cutting and spraying for ease of access to water courses, gravel mining, etc.

Habitat degradation from: loss of vertical stratification in riparian vegetation, lack of recruitment of young cottonwoods, ash, willows, and other subcanopy species; stream bank stabilization

(e.g., riprap) which narrows stream channel, reduces the flood zone, and reduces extent of riparian vegetation; invasion of exotic species such as reed canary grass and blackberry; overgrazing which can reduce understory cover; reductions in riparian corridor widths which may decrease suitability of the habitat and may increase encroachment of nest predators and nest parasites to the interior of the stand.

Hostile landscapes, particularly those in proximity to agricultural and residential areas, may have high density of nest parasites (brown-headed cowbird) and domestic predators (cats), and be subject to high levels of human disturbance.

Recreational disturbances, particularly during nesting season, and particularly in high-use recreation areas.

Increased use of pesticide and herbicides associated with agricultural practices may reduce insect food base.

Out-of-Subbasin Effects and Assumptions

No data could be found on the migration and wintering grounds of the yellow warbler. It is a long-distance migrant and as a result faces a complex set of potential effects during it annual cycle. Habitat loss or conversions is likely happening along its entire migration route (H. Ferguson, WDFW, pers. comm. 2003). Riparian management requires the protection of riparian shrubs and understory and the elimination of noxious weeds. Migration routes, corridors and wintering grounds need to be identified and protected just as its breeding areas. In addition to loss of habitat, the yellow warbler, like many wetland or riparian associated birds, faces increased pesticide use in the metropolitan areas, especially with the outbreak of mosquito born viruses like West Nile Virus.

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American Beaver
(*Castor canadensis*)

Introduction

The American beaver (*Castor canadensis*) is a large, highly specialized aquatic rodent found in the immediate vicinity of aquatic habitats (Hoffman and Pattie 1968). The species occurs in streams, ponds, and the margins of large lakes throughout North America, except for peninsular Florida, the Arctic tundra, and the southwestern deserts (Jenkins and Busher 1979). Beavers construct elaborate lodges and burrows and store food for winter use. The species is active throughout the year and is usually nocturnal in its activities. Adult beavers are nonmigratory.

Life History and Habitat Requirements

Life History

Diet

Beavers are exclusively vegetarian in diet. A favorite food item is the cambial, or growing, layer of tissue just under the bark of shrubs and trees. Many of the trees that are cut are stripped of bark, or carried to the pond for storage under water as a winter food cache. Buds and roots are also consumed, and when they are needed, a variety of plant species are accepted. The animals may travel some distance from water to secure food. When a rich food source is exploited, canals may be dug from the pond to the pasture to facilitate the transportation of the items to the lodge.

Much of the food ingested by a beaver consists of cellulose, which is normally indigestible by mammals. However, these animals have colonies of microorganisms living in the cecum, a pouch between the large and small intestine, and these symbionts digest up to 30 percent of the cellulose that the beaver takes in. An additional recycling of plant food occurs when certain fecal pellets are eaten and run through the digestive process a second time (Findley 1987).
Woody and herbaceous vegetation comprise the diet of the beaver. Herbaceous vegetation is a highly preferred food source throughout the year, if it is available. Woody vegetation may be consumed during any season, although its highest utilization occurs from late fall through early spring. It is assumed that woody vegetation (trees and/or shrubs) is more limiting than herbaceous vegetation in providing an adequate food source.

Denney (1952) summarized the food preferences of beavers throughout North America and reported that, in order of preference, beavers selected aspen (*Populus tremuloides*), willow (*Salix spp.*), cottonwood (*P. balsamifera*), and alder (*Alnus spp*.). Although several tree species have often been reported to be highly preferred foods, beavers can inhabit, and often thrive in, areas where these tree species are uncommon or absent (Jenkins 1975). Aspen and willow are considered preferred beaver foods; however, these are generally riparian tree species that may be more available for beaver foraging but are not necessarily preferred over all other deciduous tree species (Jenkins 1981). Beavers have been reported to subsist in some areas by feeding on coniferous trees, generally considered a poor quality source of food (Brenner 1962; Williams 1965). Major winter foods in North Dakota consisted principally of red-osier dogwood (*Cornus stolonifera*), green ash (*Fraxinus pennsylvanica*), and willow (Hammond 1943). Rhizomes and roots of aquatic vegetation also may be an important source of winter food (Longley and Moyle 1963; Jenkins pers. comm.). The types of food species present may be less important in determining habitat quality for beavers than physiographic and hydrologic factors affecting the site (Jenkins 1981).

Aquatic vegetation, such as duck potato (*Sagittaria spp.),* duckweed (*Lemna spp.),* pondweed (*Potamogeton spp.),* and water weed (Elodea spp.), are preferred foods when available (Collins 1976a). Water lilies (Nymphaea spp.), with thick, fleshy rhizomes, may be used as a food source throughout the year (Jenkins 1981). If present in adequate amounts, water lily rhizomes

may provide an adequate winter food source, resulting in little or no tree cutting or food caching of woody materials. Jenkins (1981) compared the rate of tree cutting by beavers adjacent to two Massachusetts ponds that contained stands of water lilies. A pond dominated by yellow water lily (*y. variegatum*) and white water lily (*N. odorata*), which have thick rhizomes, had low and constant tree cutting activity throughout the fall. Conversely, the second pond, dominated by watershield (*Brasenia schreberi*), which lacks thick rhizomes, had increased fall tree cutting activity by beavers.

Reproduction

The basic composition of a beaver colony is the extended family, comprised of a monogamous pair of adults, subadults (young of the previous year), and young of the year (Svendsen 1980). Female beavers are sexually mature at 2.5 years old. Females normally produce litters of three to four young with most kits being born during May and June. Gestation is approximately 107 days (Linzey 1998). Kits are born with all of their fur, their eyes open, and their incisor teeth erupted.

Dispersal of subadults occurs during the late winter or early spring of their second year and coincides with the increased runoff from snowmelt or spring rains. Subadult beavers have been reported to disperse as far as 236 stream km (147 mi) (Hibbard 1958), although average emigration distances range from 8 to 16 stream km (5 to 10 mi) (Hodgdon and Hunt 1953; Townsend 1953; Hibbard 1958; Leege 1968). The daily movement patterns of the beaver centers around the lodge or burrow and pond (Rutherford 1964). The density of colonies in favorable habitat ranges from 0.4 to 0.8/km2 (1 to 2/mi2) (Lawrence 1954; Aleksiuk 1968; Voigt *et al.* 1976; Bergerud and Miller 1977 cited by Jenkins and Busher 1979).

Home Range

The mean distance between beaver colonies in an Alaskan riverine habitat was 1.59 km (1 mi) (Boyce 1981). The closest neighbor was 0.48 km (0.3 mi) away. The size of the colony's feeding range is a function of the interaction between the availability of food and water and the colony size (Brenner 1967). The average feeding range size in Pennsylvania, excluding water, was reported to be 0.56 ha (1.4 acre). The home range of beaver in the Northwest Territory was estimated as a 0.8 km (0.5 mi) radius of the lodge (Aleksiuk 1968). The maximum foraging distance from a food cache in an Alaskan riverine habitat was approximately 800 m (874 yds) upstream, 300 m (323 yds) downstream, and 600 m (656 yds) on oxbows and sloughs (Boyce 1981).

Mortality

Beavers live up to 11 years in the wild, 15 to 21 years in captivity (Merritt 1987, Rue 1967). Beavers have few natural predators. However, in certain areas, beavers may face predation pressure from wolves (*Canis lupus*), coyotes (*Canis latrans*), lynx (*Felis lynx*), fishers (*Martes pennanti*), wolverines (*Gulo gulo*), and occasionally bears (*Ursus spp*.). Alligators, minks (*Mustela vison*), otters (*Lutra canadensis*), hawks, and owls periodically prey on kits (Lowery 1974, Merritt 1987, Rue 1967).

Beavers often carry external parasites, one of which, *Platypsylla castoris*, is a beetle found only on beavers.

Harvest

Historic

Because of the high commercial value of their pelts, beavers figured importantly in the early exploration and settlement of western North America. Thousands of their pelts were harvested annually, and it was not many years before beavers were either exterminated entirely or reduced to very low populations over a considerable part of their former range. By 1910 their

populations were so low everywhere in the United States that strict regulation of the harvest or complete protection became imperative. In the 1930s live trapping and restocking of depleted areas became a widespread practice which, when coupled with adequate protection, has made it possible for the animals to make a spectacular comeback in many sections.

Current

Trapping was terminated by initiative in Washington. No commercial or recreational trapping of beaver occurs in southeast Washington. Between 1991 and 1999, the beaver harvest in the four counties of southeast Washington ranged from 56 to 162/year, and averaged 107/year. Since the initiative to ban trapping, the beaver harvest has declined 95%, and has averaged about 5/year for southeast Washington. As a result of the declining harvest, populations appear to be increasing along with complaints from landowners. Beavers have become a problem in some tributaries, damming farm irrigation and causing problems for fish passage.

Harvest trends will not indicate population trend, because the price of beaver pelts often determines the level of harvest. The higher the pelt price, the higher the harvest because trappers put more effort into trapping beaver. If pelt prices are low, little effort is expended to trap beaver, regardless of population size.

Habitat Requirements

All wetland cover types (e.g., herbaceous wetland and deciduous forested wetland) must have a permanent source of surface water with little or no fluctuation in order to provide suitable beaver habitat (Slough and Sadleir 1977). Water provides cover for the feeding and reproductive activities of the beaver. Lakes and reservoirs that have extreme annual or seasonal fluctuations in the water level will be unsuitable habitat for beaver. Similarly, intermittent streams, or streams that have major fluctuations in discharge (e.g., high spring runoff) or a stream channel gradient of 15 percent or more, will have little year-round value as beaver habitat. Assuming that there is an adequate food source available, small lakes [< 8 ha (20 acres) in surface area] are assumed to provide suitable habitat. Large lakes and reservoirs [> 8 ha (20 acres) in surface area] must have irregular shorelines (e.g., bays, coves, and inlets) in order to provide optimum habitat for beaver.

Beavers can usually control water depth and stability on small streams, ponds, and lakes; however, larger rivers and lakes where water depth and/or fluctuation cannot be controlled are often partially or wholly unsuitable for the species (Murray 1961; Slough and Sadleir 1977). Rivers or streams that are dry during some parts of the year are assumed to be unsuitable beaver habitat. Beavers are absent from sizable portions of rivers in Wyoming, due to swift water and an absence of suitable dwelling sites during periods of high and low water levels (Collins 1976b).

In riverine habitats, stream gradient is the major determinant of stream morphology and the most significant factor in determining the suitability of habitat for beavers (Slough and Sadleir 1977). Stream channel gradients of 6 percent or less have optimum value as beaver habitat. Retzer *et al.* (1956) reported that 68 percent of the beaver colonies recorded in Colorado were in valleys with a stream gradient of less than 6 percent, 28 percent were associated with stream gradients from 7 to 12 percent, and only 4 percent were located along streams with gradients of 13 to 14 percent. No beaver colonies were recorded in streams with a gradient of 15 percent or more. Valleys that were only as wide as the stream channel were unsuitable beaver habitat, while valleys wider than the stream channel were frequently occupied by beavers. Valley widths of 46 m (150 ft) or more were considered the most suitable. Marshes, ponds, and lakes were nearly always occupied by beavers when an adequate supply of food was available.

Foraging

Beavers are generalized herbivores; however, they show strong preferences for particular plant species and size classes (Jenkins 1975; Collins 1975a; Jenkins 1979). The leaves, twigs, and bark of woody plants are eaten, as well as many species of aquatic and terrestrial herbaceous vegetation. Food preferences may vary seasonally, or from year to year, as a result of variation in the nutritional value of food sources (Jenkins 1979).

An adequate and accessible supply of food must be present for the establishment of a beaver colony (Slough and Sadleir 1977). The actual biomass of herbaceous vegetation will probably not limit the potential of an area to support a beaver colony (Boyce 1981). However, total biomass of winter food cache plants (woody plants) may be limiting. Low marshy areas and streams flowing in and out of lakes allow the channelization and damming of water, allowing access to, and transportation of, food materials. Steep topography prevents the establishment of a food transportation system (Williams 1965; Slough and Sadleir 1977). Trees and shrubs closest to the pond or stream periphery are generally utilized first (Brenner 1962; Rue 1964). Jenkins (1980) reported that most of the trees utilized by beaver in his Massachusetts study area were within 30 m (98.4 ft) of the water's edge. However, some foraging did extend up to 100 m (328 ft). Foraging distances of up to 200 m (656 ft) have been reported (Bradt 1938). In a California study, 90 percent of all cutting of woody material was within 30 m (98.4 ft) of the water's edge (Hall 1970).

Woody stems cut by beavers are usually less than 7.6 to 10.1 cm (3 to 4 inches) DBH (Bradt 1947; Hodgdon and Hunt 1953; Longley and Moyle 1963; Nixon and Ely 1969). Jenkins (1980) reported a decrease in mean stem size cut and greater selectivity for size and species with increasing distance from the water's edge. Trees of all size classes were felled close to the water's edge, while only smaller diameter trees were felled farther from the shore.

Beavers rely largely on herbaceous vegetation, or on the leaves and twigs of woody vegetation, during the summer (Bradt 1938, 1947; Brenner 1962; Longley and Moyle 1963; Brenner 1967; Aleksiuk 1970; Jenkins 1981). Forbs and grasses comprised 30 percent of the summer diet in Wyoming (Collins 1976a). Beavers appear to prefer herbaceous vegetation over woody vegetation during all seasons of the year, if it is available (Jenkins 1981).

Cover

Lodges or burrows, or both, may be used by beavers for cover (Rue 1964). Lodges may be surrounded by water or constructed against a bank or over the entrance to a bank burrow. Water protects the lodges from predators and provides concealment for the beaver when traveling to and from food gathering areas and caches.

The lodge is the major source of escape, resting, thermal, and reproductive cover (Jenkins and Busher 1979). Mud and debarked tree stems and limbs are the major materials used in lodge construction although lesser amounts of other woody, as well as herbaceous vegetation, may be used (Rue 1964). If an unexploited food source is available, beavers will reoccupy abandoned lodges rather than build new ones (Slough and Sadleir 1977). On lakes and ponds, lodges are frequently situated in areas that provide shelter from wind, wave, and ice action. A convoluted shoreline, which prevents the buildup of large waves or provides refuge from waves, is a habitat requirement for beaver colony sites on large lakes.

Population and Distribution

Population

Historic

Historically, beaver populations were more expansive until populations were reduced by unregulated trapping, as they were throughout much of the western United States (P. Fowler, WDFW, personal communications, 2003).

Current

Beaver populations exist in all major watersheds in the Blue Mountains. In the Walla Walla subbasin, beaver can be found in the Walla Walla and Touchet River drainages; Mill Creek, Coppei Creek, North Touchet, South Touchet. Beaver can be found in the Tucannon subbasin in the Tucannon River and its tributaries. Beaver can be found in the Asotin watershed, Asotin Creek and its tributaries. Beaver also occur in the Snake River.

Distribution

Historic

No data are available.

Current

The beaver is found throughout most of North America except in the Arctic tundra, peninsular Florida, and the Southwestern deserts (Figure 1) (Allen 1983; VanGelden 1982; Zeveloff 1988).

Figure 1. Geographic distribution of American beaver (Linzey and Brecht 2002).

Status and Abundance Trends

Status

Status is generally unknown, but beaver populations appear to be stable or increasing slightly in southeast Washington (P. Fowler, WDFW, personal communication, 2003).

Trends

Trend information is not available. No population data is available for southeast Washington.

Factors Affecting American Beaver Population Status

Key Factors Inhibiting Populations and Ecological Processes

Agriculture

Riparian habitat along many water ways has been removed in order to plant agricultural crops, thus removing important habitat and food sources for beaver in southeast Washington.

Agricultural Conflict

Beaver may be removed when complaints are received from farmers about blocked irrigation canals or pumps.

Conflict with Fisheries

Beaver sometimes create dams that restrict fish passage, and are removed in order to restore fish passage. Beaver cutting tree planted to improve riparian habitat have also been removed.

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Great Blue Heron
(*Ardea herodias*)

Introduction

The great blue heron (*Ardea herodias*) is the largest, most widely distributed, and best known of the American herons (Henny 1972). Great blue herons occur in a variety of habitats from freshwater lakes and rivers to brackish marshes, lagoons, mangrove areas, and coastal wetlands (Spendelow and Patton in prep.).

Life History and Habitat Requirements

Life History

Diet

Fish are preferred food items of the great blue heron in both inland and coastal waters (Kirkpatrick 1940; Palmer 1962; Kelsall and Simpson 1980), although a large variety of dietary items has been recorded. Frogs and toads, tadpoles and newts, snakes, lizards, crocodilians, rodents and other mammals, birds, aquatic and land insects, crabs, crayfish, snails, freshwater and marine fish, and carrion have all been reported as dietary items for the great blue heron (Bent 1926; Roberts 1936; Martin *et al.* 1951; Krebs 1974; Kushlan1978). Fish up to about 20 cm in length dominated the diet of herons foraging in southwestern Lake Erie (Hoffman 1978). Ninety-five percent of the fish eaten in a Wisconsin study were 25 cm in length (Kirkpatrick 1940).

Great blue herons feed alone or occasionally in flocks. Solitary feeders may actively defend a much larger feeding territory than do feeders in a flock (Meyerriecks 1962; Kushlan 1978). Flock feeding may increase the likelihood of successful foraging (Krebs 1974; Kushlan 1978) and usually occurs in areas of high prey density where food resources cannot effectively be defended.

In southeast Washington, blue herons are often seen hunting along rivers and streams. In the winter months they are often seen hunting rodents in alfalfa fields (P. Fowler, WDFW, pers. comm. 2003).

Reproduction

The great blue heron typically breeds during the months of March - May in its northern range and November through April in the southern hemisphere. The nest usually consists of an egg clutch between 3-7 eggs, with clutch size increasing from south to north. Chicks fledge at about two months.

Nesting

Great blue herons normally nest near the tree tops. Usually, nests are about 1 m in diameter and have a central cavity 10 cm deep with a radius of 15 cm. This internal cavity is sometimes lined with twigs, moss, lichens, or conifer needles. Great blue herons are inclined to renest in the same area year after year. Old nests may be enlarged and reused (Eckert 1981).

The male gathers nest-building materials around the nest site, from live or dead trees, from neighboring nests, or along the ground, and the female works them into the nest. Ordinarily, a pair takes less than a week to build a nest solid enough for eggs to be laid and incubated. Construction continues during almost the entire nesting period. Twigs are added mostly when the eggs are being laid or when they hatch. Incubation, which is shared by both partners, starts with the laying of the first egg and lasts about 28 days. Males incubate during the days and females at night.

Herons are particularly sensitive to disturbance while nesting. Scientists suggest as a general rule that there should be no development within 300 m of the edge of a heron colony and no disturbance in or near colonies from March to August.

Mortality

The great blue heron lives as long as 17 years. The adult birds have few natural enemies. Birds of prey occasionally attack them, but these predators are not an important limiting factor on the heron population. Draining of marshes and destruction of wetland habitat is the most serious threat. The number of herons breeding in a local area is directly related to the amount of feeding habitat.

Mortality of the young is high: both the eggs and young are preyed upon by crows, ravens, gulls, birds of prey, and raccoons. Heavy rains and cold weather at the time of hatching also take a heavy toll. Pesticides are suspected of causing reproductive failures and deaths, although data obtained up to this time suggest that toxic chemicals have not caused any decline in overall population levels.

Habitat Requirements

Minimum Habitat Area

Minimum habitat area is defined as the minimum amount of contiguous habitat that is required before a species will live and reproduce in an area. Minimum habitat area for the great blue heron includes wooded areas suitable for colonial nesting and wetlands within a specified distance of the heronry where foraging can occur. A heronry frequently consists of a relatively small area of suitable habitat. For example, heronries in the Chippewa National Forest, Minnesota, ranged from 0.4 t o 4.8 ha in size and averaged 1.2 ha (Mathisen and Richards 1978). Twelve heronries in western Oregon ranged from 0.12 t o 1.2 ha in size and averaged 0.4 ha (Werschkul *et al.* 1977).

Foraging

Short and Cooper (1985) provide criteria for suitable great blue heron foraging habitat. Suitable great blue heron foraging habitats are within 1.0 km of heronries or potential heronries. The suitability of herbaceous wetland, scrub-shrub wetland, forested wetland, riverine, lacustrine or estuarine habitats as foraging areas for the great blue heron is ideal if these potential foraging habitats have shallow, clear water with a firm substrate and a huntable population of small fish. A potential foraging area needs to be free from human disturbances several hours a day while the herons are feeding. Suitable great blue heron foraging areas are those in which there is no human disturbance near the foraging zone during the four hours following sunrise or preceding sunset or the foraging zone is generally about 100m from human activities and habitation or about 50m from roads with occasional, slow-moving traffic.

A smaller energy expenditure by adult herons is required to support fledglings if an abundant source of food is close to the nest site than if the source of food is distant. Nest sites frequently are located near suitable foraging habitats. Social feeding is strongly correlated with colonial nesting (Krebs 1978), and a potential feeding site is valuable only if it is within “commuting” distance of an active heronry. For example, 24 of 31 heronries along the Willamette River in Oregon were located within 100m of known feeding areas (English 1978). Most heronries along the North Carolina coast were located near inlets, which have large concentrations of fish (Parnell and Soots 1978). The average distance from heronries to inlets was 7.0 to 8.0 km. The average distance of heronries to possible feeding areas (lakes 140 ha in area) varied from 0 to 4.2 km and averaged 1.8 km on the Chippewa National Forest in Minnesota (Mathisen and Richards 1978). Collazo (1981) reported the distance from the nearest feeding grounds to a

heronry site as 0.4 and 0.7 km. The maximum observed flight distance from an active heronry to a foraging area was 29 km in Ohio (Parris and Grau 1979).

Great blue herons feed anywhere they can locate prey (Burleigh 1958). This includes the terrestrial surface but primarily involves catching fish in shallow water, usually 150m deep (Bent 1926; Meyerriecks 1960; Bayer 1978).

Thompson (1979b) reported that great blue herons along the Mississippi River commonly foraged in water containing emergent or submergent vegetation, in scattered marshy ponds, sloughs, and forested wetlands away from the main channel. He noted that river banks, jetties, levees, rip-rapped banks, mudflats, sandbars, and open ponds were used to a lesser extent. Herons near southwestern Lake Erie fed intensively in densely vegetated areas (Hoffman 1978).

Other studies, however, have emphasized foraging activities in open water (Longley 1960; Edison Electric Institute 1980). Exposed mud flats and sandbars are particularly desirable foraging sites at low tides in coastal areas in Oregon (Bayer 1978), North Carolina (Custer and Osborn 1978), and elsewhere (Kushlan 1978). Cooling ponds (Edison Electric Institute 1980) and dredge spoil settling ponds (Cooper *et al.* in prep.) also are used extensively by foraging great blue herons.

Water

The great blue heron routinely feeds on soft animal tissues from an aquatic environment, which provides ample opportunity for the bird to satisfy its physiological requirements for water.

Cover

Cover for concealment does not seem to be a limiting factor for the great blue heron. Heron nests often are conspicuous, although heronries frequently are isolated. Herons often feed in marshes and areas of open water, where there is no concealing cover.

Reproduction

Short and Cooper (1985) describe suitable great blue heron nesting habitat as a grove of trees at least 0.4 ha in area located over water or within 250m of water. These potential nest sites may be on an island with a river or lake, within a woodland dominated swamp, or in vegetation near a river or lake. Trees used as nest sites are at least 5m high and have many branches at least 2.5 cm in diameter that are capable of supporting nests. Trees may be alive or dead but must have an “open canopy” that allows an easy access to the nest. The suitability of potential heronries diminishes as their distance from current or former heronry sites increases because herons develop new heronries in suitable vegetation close to old heronries.

A wide variety of nesting habitats is used by the great blue heron throughout its range in North America. Trees are preferred heronry sites, with nests commonly placed from 5 to 15 m above ground (Burleigh 1958; Cottrille and Cottrille 1958; Vermeer 1969; McAloney 1973). Smaller trees, shrubs, reeds (*Phragmites communis*), the ground surface, rock ledges along coastal cliffs, and artificial structures may be utilized in the absence of large trees, particularly on islands (Lahrman 1957; Behle 1958; Vermeer 1969; Soots and Landin 1978; Wiese 1978). Most great blue heron colonies along the Atlantic coast are located in riparian swamps (Ogden 1978). Most colonies along the northern Gulf coast are in cypress - tupelo (*Taxodium Nyssa*) swamps (Portnoy 1977). Spendelow and Patton (in prep.) state that many birds in coastal Maine nest on spruce (*Picea spp*.) trees on islands. Spruce trees also are used on the Pacific coast (Bayer 1978), and black cottonwood (*Populus trichocarpa*) trees frequently are used as nest sites along

the Willamette River in Oregon (English 1978). Miller (1943) stated that the type of tree was not as important as its height and distance from human activity. Dead trees are commonly used as nest sites (McAloney 1973). Nests usually consist of a platform of sticks, sometimes lined with smaller twigs (Bent 1926; McAloney 1973), reed stems (Roberts 1936), and grasses (Cottrille and Cottrille 1958).

Heron nest colony sites vary, but are usually near water. These areas often are flooded (Sprunt 1954; Burleigh 1958; English 1978). Islands are common nest colony sites in most of the great blue heron's range (Vermeer 1969; English 1978; Markham and Brechtel 1979). Many colony sites are isolated from human habitation and disturbance (Mosely 1936; Burleigh 1958). Mathisen and Richards (1978) recorded all existing heronries in Minnesota as at least 3.3 km from human dwellings, with an average distance of 1.3 km to the nearest surfaced road. Nesting great blue herons may become habituated to noise (Grubb 1979), traffic (Anderson 1978), and other human activity (Kelsall and Simpson 1980). Colony sites usually remain active until the site is disrupted by land use changes.

A few colony sites have been abandoned because the birds depleted the available nest building material and possibly because their excrement altered the chemical composition of the soil and the water. Heron exretia can have an adverse effect on nest trees (Kerns and Howe 19667; Wiese 1978).

Population and Distribution

Population

Historic

In the past, herons and egrets were shot for their feathers, which were used as cooking utensils and to adorn hats and garments, and they also provided large, accessible targets. The slaughter of these birds went relatively unchecked until 1900 when the federal government passed the Lacey Act, which prohibits the foreign and interstate commercial trade of feathers. Greater protection was afforded in 1918 with the Migratory Bird Treaty Act, which empowered the federal government to set seasons and bag limits on the hunting of waterfowl and waterbirds. With this protection, herons and other birds have made dramatic comebacks.

In southeast Washington, few historical colonies have been reported. The Foundation Island colony is the oldest, but has been taken over by cormorants. It appears blue herons numbers in the colony have declined significantly.

One colony was observed from a helicopter in 1995 on the Touchet River just upriver from Harsha, but that colony appears to have been destroyed by a wind storm (trees blown down), and no current nesting has been observed in the area (Fowler per. com.)

Current

The great blue heron breeds throughout the U.S. and winters as far north as New England and southern Alaska (Bull and Farrand 1977). The nationwide population is estimated at 83,000 individuals (NACWCP 2001).

In southeast Washington, three new colonies have been discovered over the last few years. One colony on the Walla Walla River contains approximately 24 nests. This colony has been active for approximately 12 years. Two new colonies were discovered in 2003, one on a railroad bridge over the Snake River at Lyons Ferry, and one near Chief Timothy Park on the Snake River. The Lyons Ferry colony contained approximately 11 nests, and the Chief Timothy colony 5 nests (P. Fowler, WDFW, personal communication, 2003).

Distribution

Two known heron rookeries occur within the Walla Walla subbasin, one on the Walla Walla and one on the Touchet River (NPPC 2001). The Walla Walla River rookery contains approximately 13 active nests. The Touchet River rookery contains approximately 8-10 active nests. Blue herons are observed throughout the lowlands of southeast Washington near rivers or streams (P. Fowler, WDFW, personal communication, 2003).

Historic

No data are available.

Current

Figures 1-3 illustrate summer, breeding, and winter distributions of great blue herons.

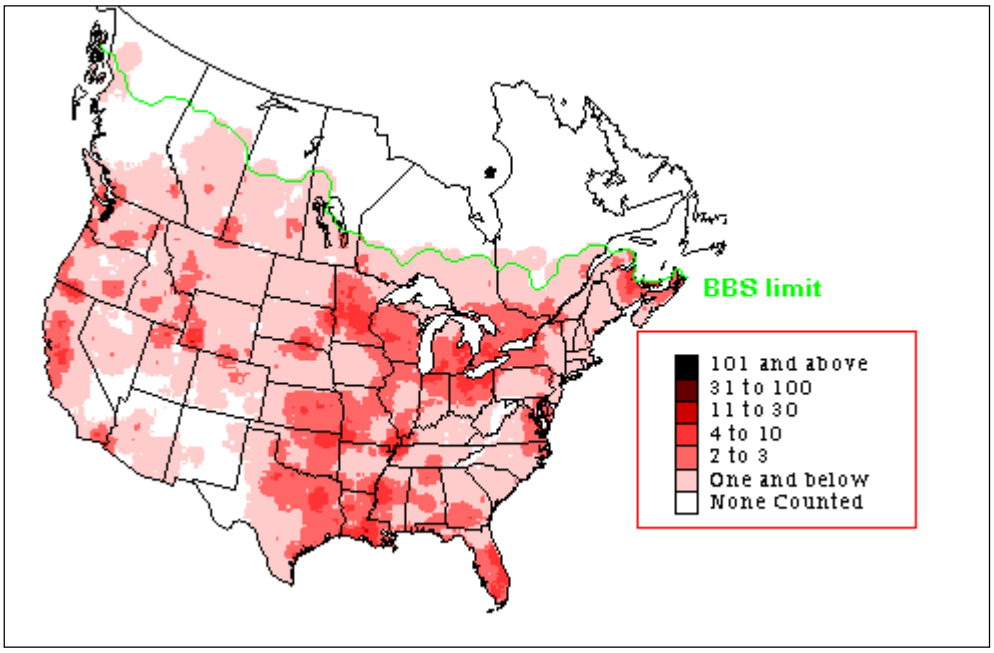

Figure 1. Great blue heron summer distribution from Breeding Bird Survey (BBS) data (Sauer *et al.* 2003).

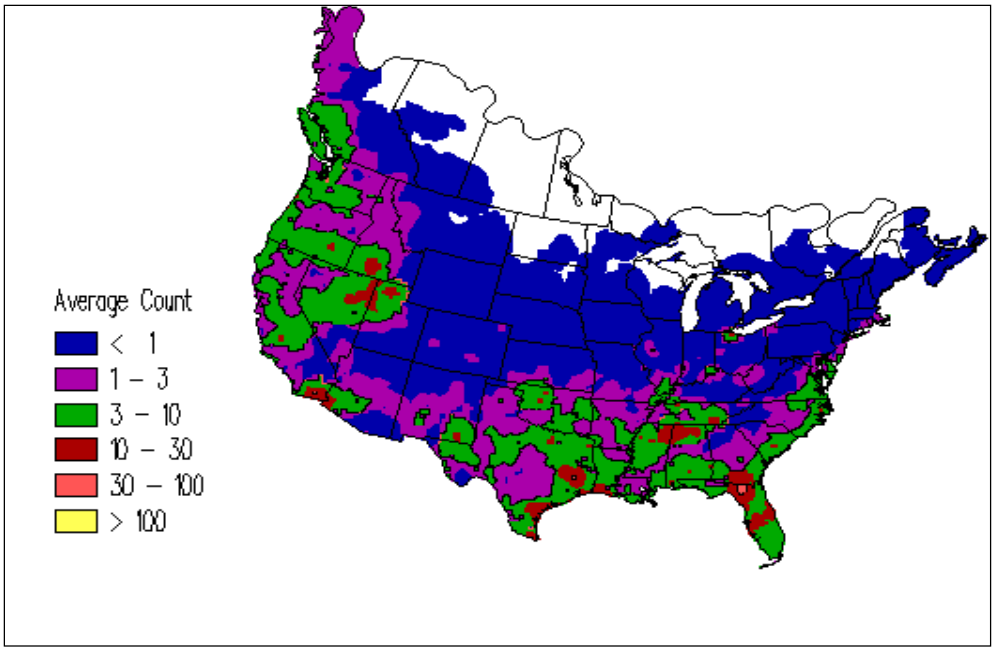

Figure 2. Great blue heron breeding distribution from Breeding Bird Survey (BBS) data (Sauer *et al.* 2003).

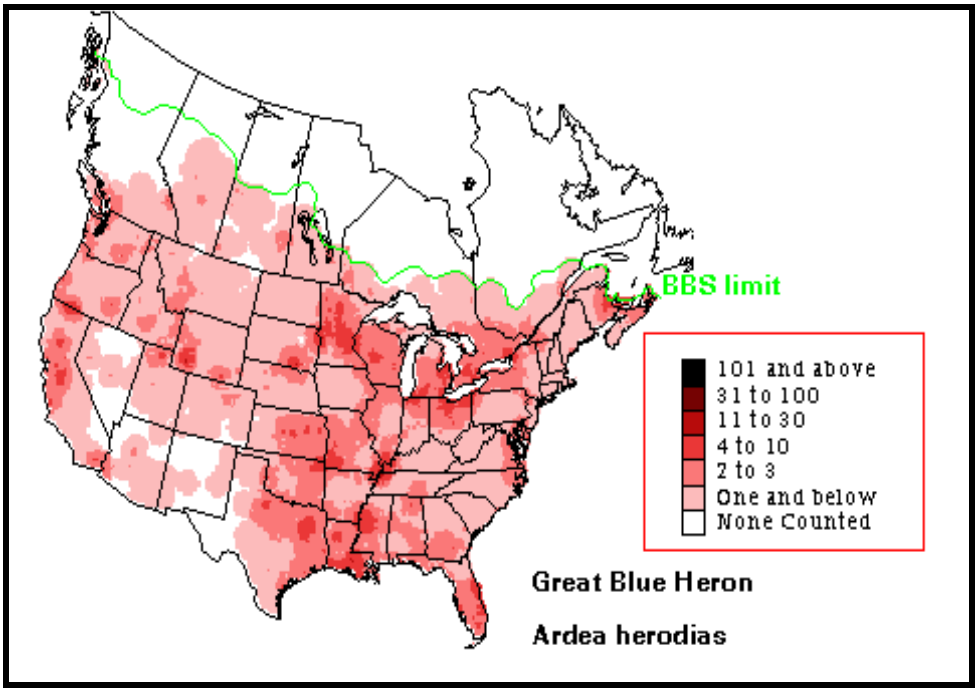

Figure 3. Great blue heron winter distribution from CBC data (Sauer *et al.* 2003).

Status and Abundance Trends

Status

Surveys of blue heron populations are not conducted. However, populations appear to be stable and possibly expanding in some areas. Two new nesting colonies have been found in on the Lower Snake River (P. Fowler, WDFW, personal communication, 2003).

Trends

Populations in southeast Washington appear to be stable, and may actually be increasing.

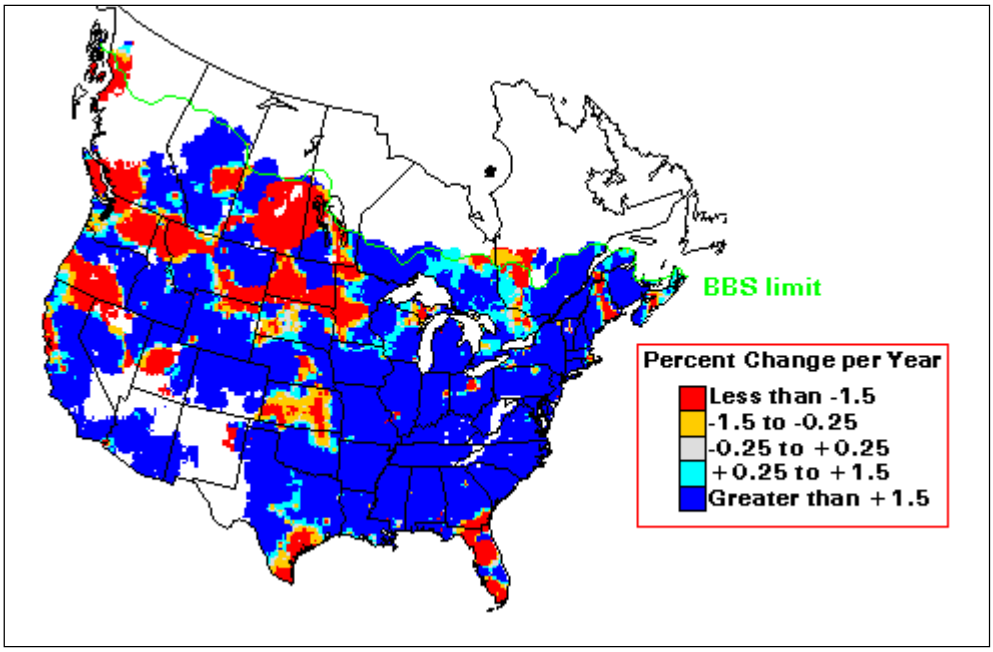

Figure 4. Great blue heron Breeding Bird Survey (BBS) trend results: 1966-1996 (Sauer *et al.* 2003).

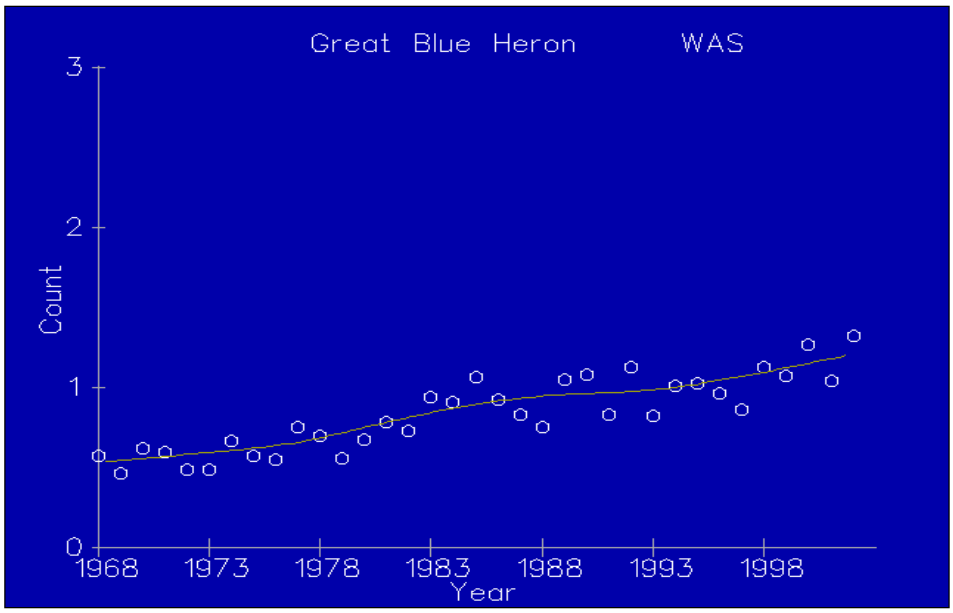

Figure 5. Great blue heron Breeding Bird Survey (BBS) Washington trend results: 1966-2002 (Sauer *et al.* 2003).

Factors Affecting Great Blue Heron Population Status

Key Factors Inhibiting Populations and Ecological Processes

Habitat destruction and the resulting loss of nesting and foraging sites, and human disturbance probably have been the most important factors contributing to declines in some great blue heron populations in recent years (Thompson 1979a; Kelsall and Simpson 1980; McCrimmon 1981).

Habitat Loss

Natural generation of new nesting islands, created when old islands and headlands erode, has decreased due to artificial hardening of shorelines with bulkheads. Loss of nesting habitat in certain coastal sites may be partially mitigated by the creation of dredge spoil islands (Soots and Landin 1978). Several species of wading birds, including the great blue heron, use coastal spoil islands (Buckley and McCaffrey 1978; Parnell and Soots 1978; Soots and Landin 1978). The amount o f usage may depend on the stage of plant succession (Soots and Parnell 1975; Parnell and Soots 1978), although great blue herons have been observed nesting in shrubs (Wiese 1978), herbaceous vegetation (Soots and Landin 1978), and on the ground on spoil islands.

Water Quality

Poor water quality reduces the amount of large fish and invertebrate species available in wetland areas. Toxic chemicals from runoff and industrial discharges pose yet another threat. Although great blue herons currently appear to tolerate low levels of pollutants, these chemicals can move through the food chain, accumulate in the tissues of prey and may eventually cause reproductive failure in the herons.

Several authors have observed eggshell thinning in great blue heron eggs, presumably as a result of the ingestion of prey containing high levels of organochlorines (Graber *et al.* 1978; Ohlendorf *et al.* 1980). Konermann *et al.* (1978) blamed high levels of dieldrin and DDE use for reproductive failure, followed by colony abandonment in Iowa. Vermeer and Reynolds (1970) recorded high levels of DDE in great blue herons in the prairie provinces of Canada, but felt that reproductive success was not diminished as a result. Thompson (1979a) believed that it was too early to tell if organochlorine residues were contributing to heron population declines in the Great Lakes region.

Human Disturbance

Heronries often are abandoned as a result of human disturbance (Markham and Brechtel 1979). Werschkul *et al.* (1976) reported more active nests in undisturbed areas than in areas that were being logged. Tree cutting and draining resulted in the abandonment of a mixed-species heronry in Illionois (Bjorkland 1975). Housing and industrial development (Simpson and Kelsall 1979) and water recreation and highway construction (Ryder *et al.* 1980) also have resulted in the abandonment of heronries. Grubb (1979) felt that airport noise levels could potentially disturb a heronry during the breeding season.

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Appendix G: Changes in Key Ecological Functions

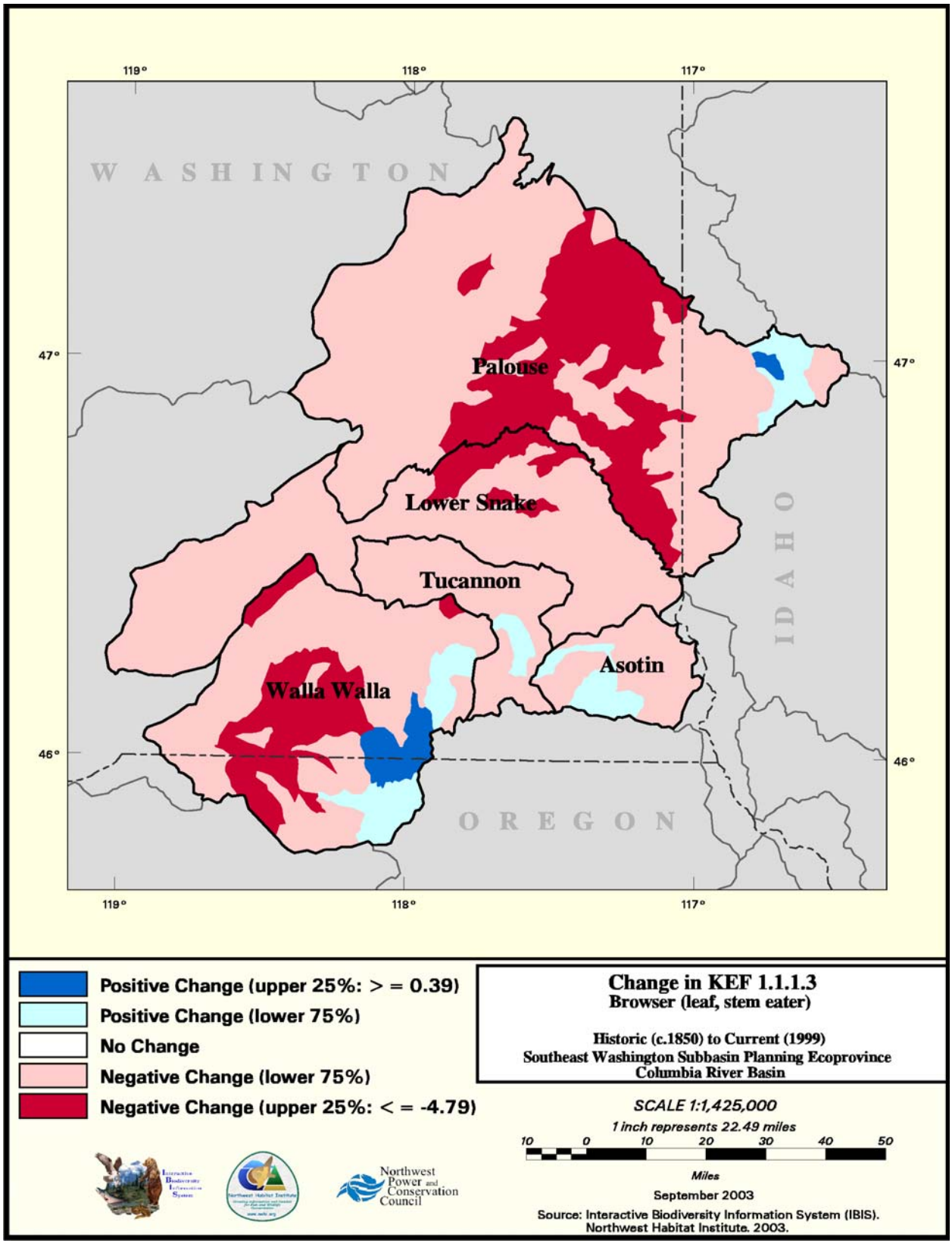

Figure G-1. Change in KEF 1.1.1.3 in the Southeast Washington Subbasin Planning Ecoregion (IBIS 2003).

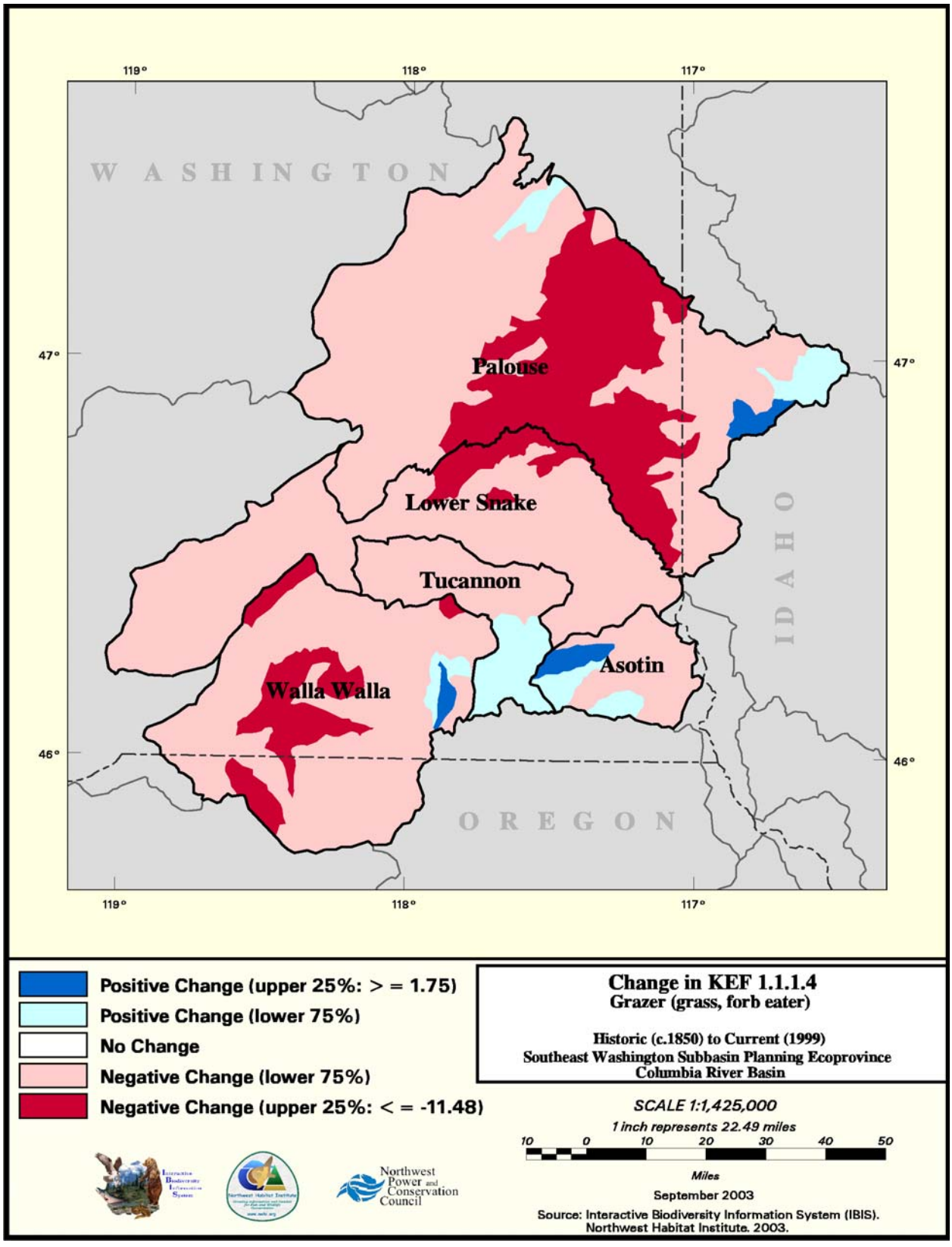

Figure G-2. Change in KEF 1.1.1.4 in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

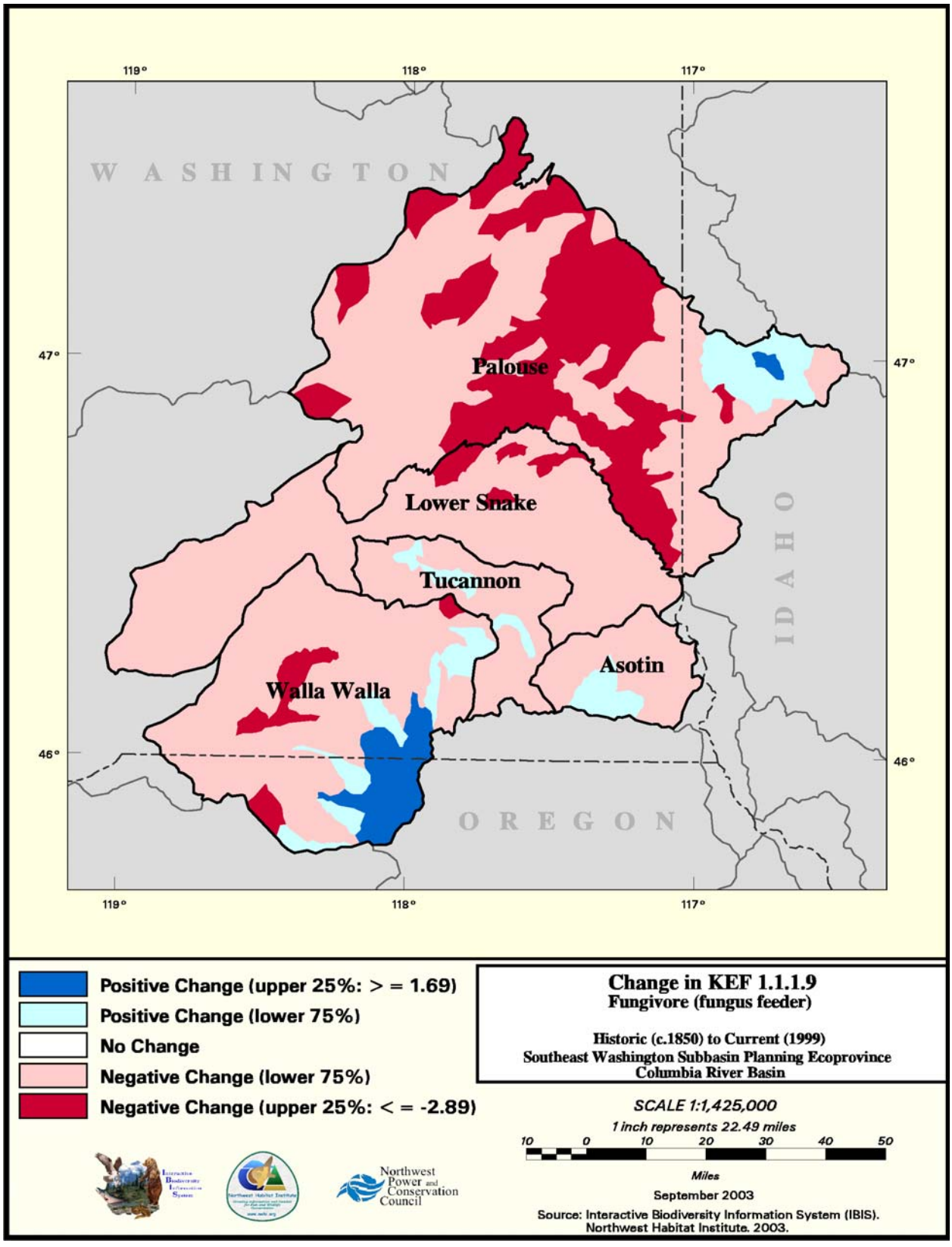

Figure G-3. Change in KEF 1.1.1.9 in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

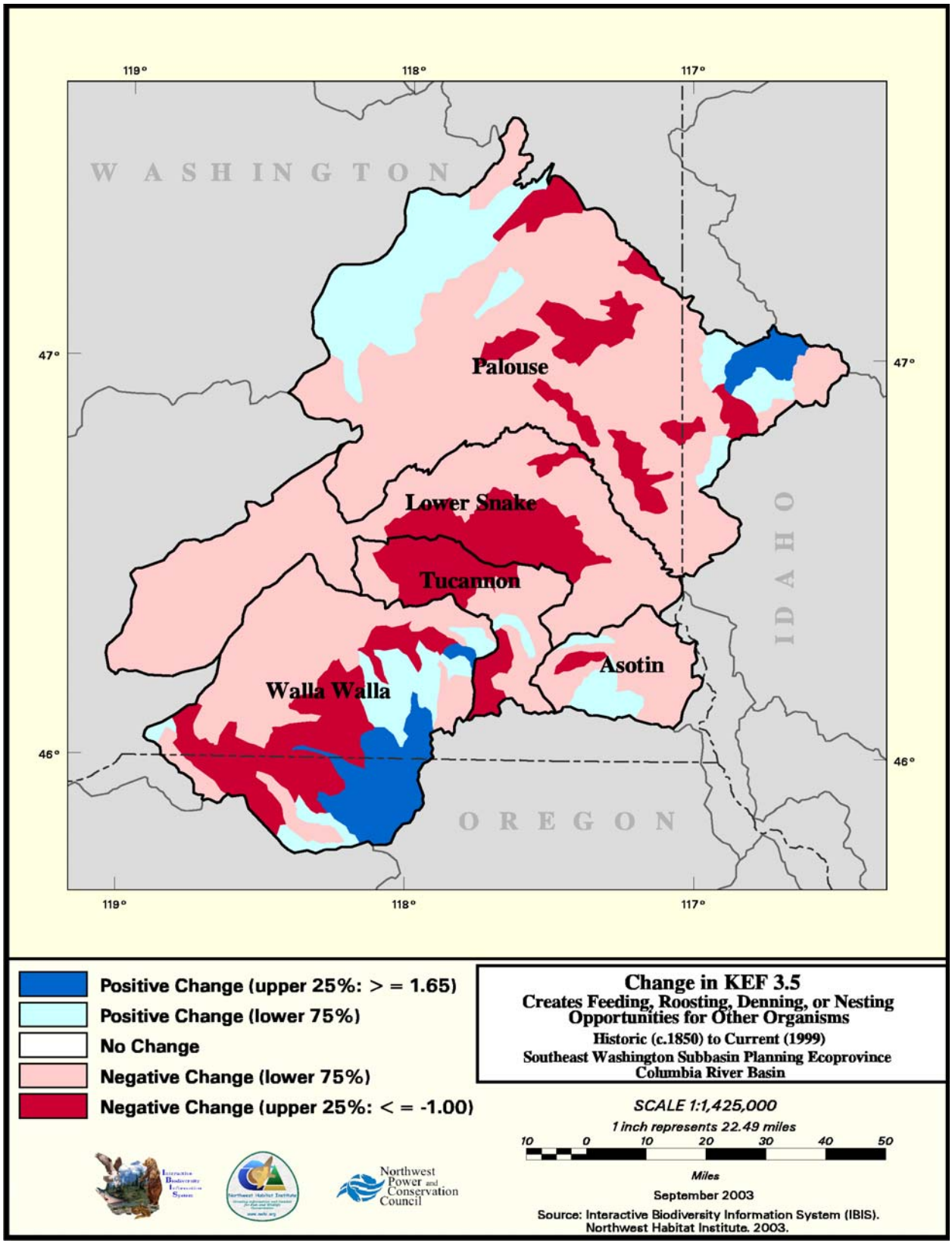

Figure G-4. Change in KEF 3.5 in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

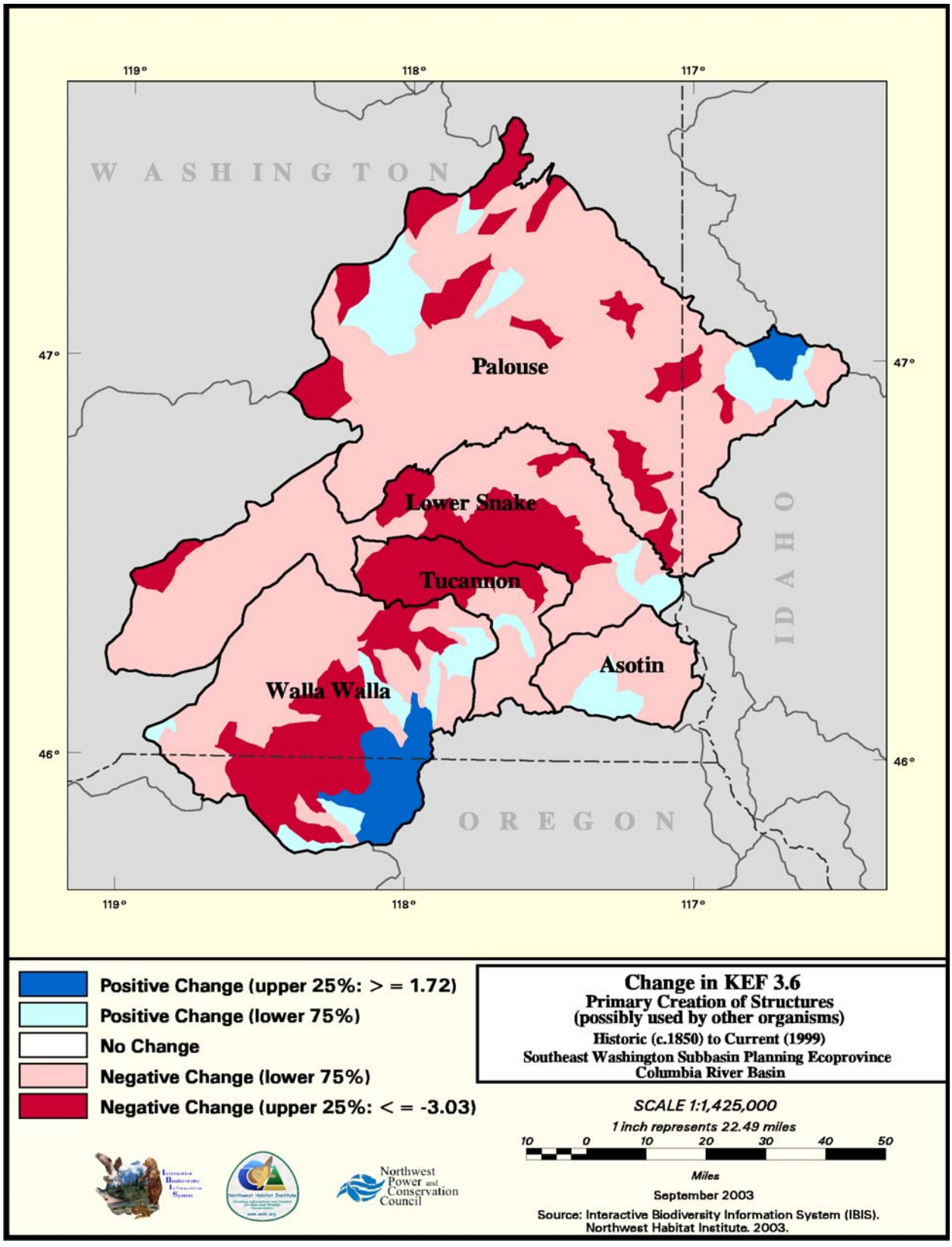

Figure G-5. Change in KEF 3.6 in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

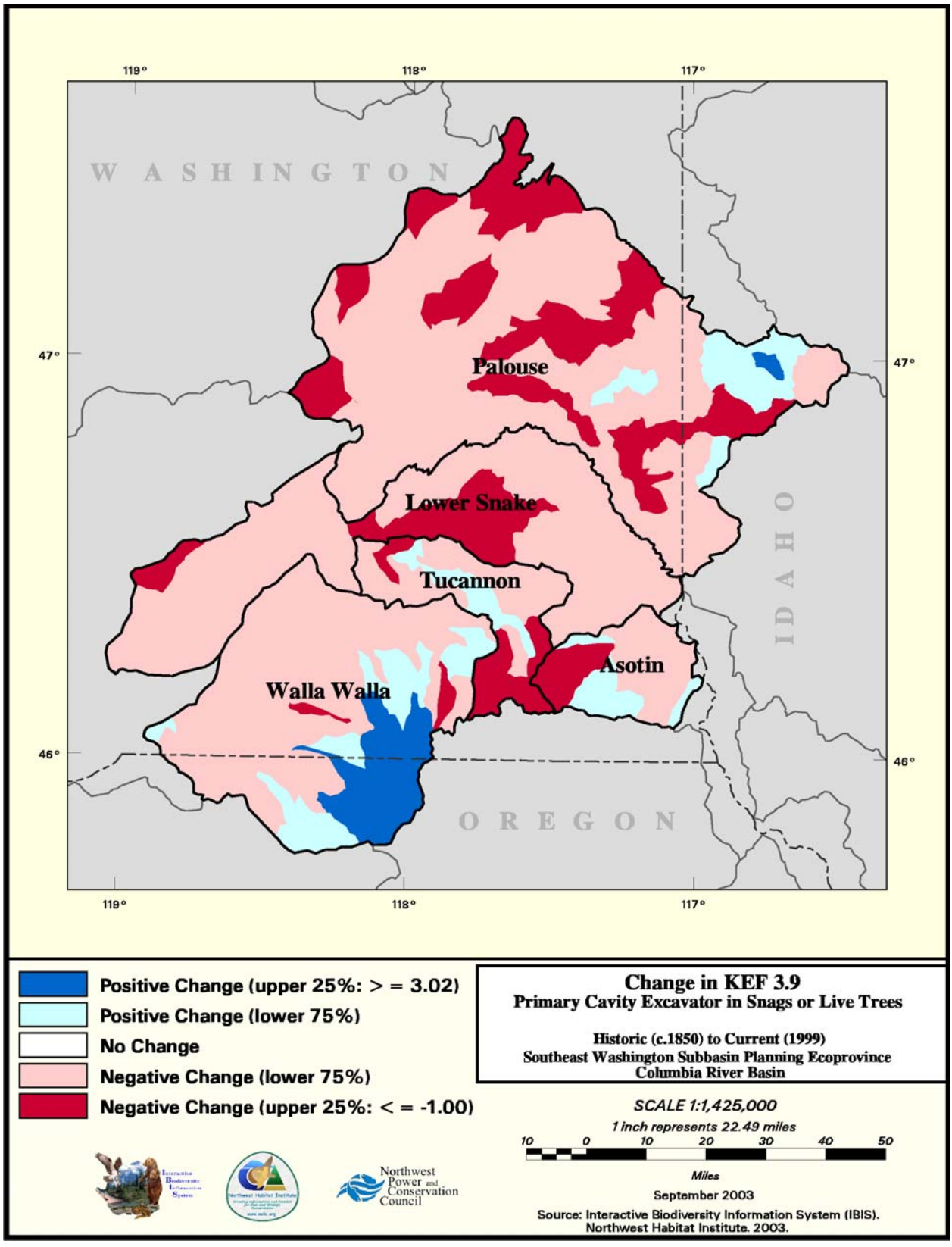

Figure G-6. Change in KEF 3.9 in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

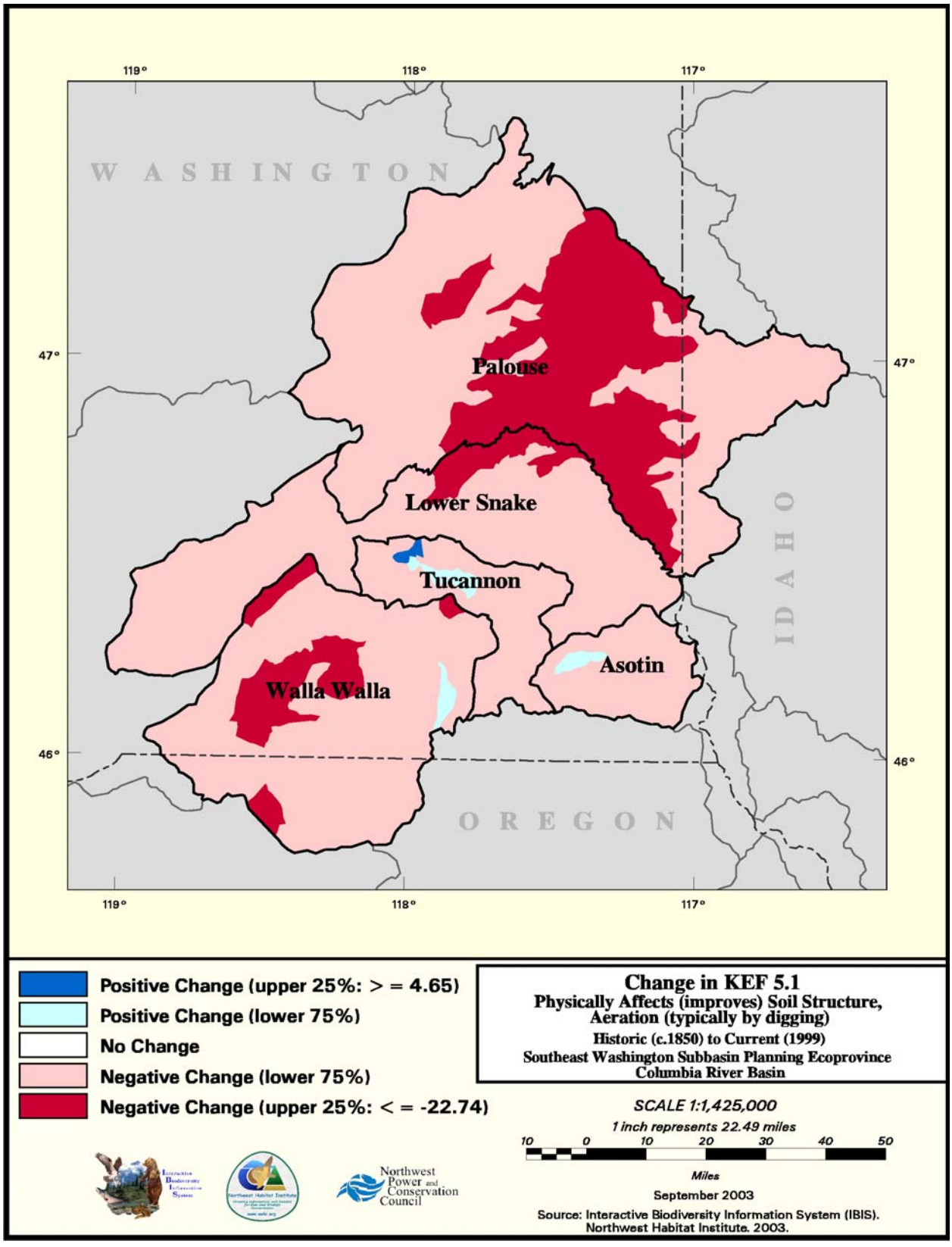

Figure G-7. Change in KEF 1.1.1.3 in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

Appendix H: Changes in Functional Redundancy

Table H-1. Summary of changes in key ecological function in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

SHP-KEF	Current Total KEF Value	Historic Total KEF Value	Percent Change	SHP-KEF	Current Total KEF Value	Historic Total KEF Value	Percent Change
1	99.92	167.81	-40.45	3.15	1.73	2.42	-28.54
1.1	99.92	167.81	-40.45	3.16	4.12	5.71	-27.83
1.1.1	57.67	88.93	-35.15	3.2	10.54	18.64	-43.42
1.1.1.1	12.39	22.43	-44.78	3.3	0.80	1.41	-43.49
1.1.1.10	4.43	6.51	-32.01	3.4	39.81	56.89	-30.03
1.1.1.11	8.73	17.14	-49.08	3.4.1	1.94	2.37	-18.48
1.1.1.12	2.73	6.91	-60.53	3.4.2	0.44	0.26	70.31
1.1.1.13	0.90	1.49	-39.82	3.4.4	10.22	15.56	-34.33
1.1.1.2	37.20	52.67	-29.37	3.4.5	28.43	40.99	-30.65
1.1.1.3	3.26	6.12	-46.73	3.4.6	9.22	12.12	-23.94
1.1.1.4	10.78	17.42	-38.07	3.5	1.69	1.50	12.57
1.1.1.5	24.56	35.13	-30.10	3.5.1	1.69	1.50	12.57
1.1.1.6	1.88	1.04	81.36	3.5.1.1	0.33	0.26	25.91
1.1.1.7	1.81	2.87	-36.92	3.5.2	0.71	0.13	464.55
1.1.1.8	0.56	0.58	-4.50	3.6	9.08	10.59	-14.23
1.1.1.9	5.10	6.55	-22.14	3.6.1	7.90	9.78	-19.19
1.1.2	88.06	147.05	-40.11	3.6.2	1.00	0.40	150.19
1.1.2.1	78.55	128.54	-38.89	3.6.3	0.30	0.53	-43.90
1.1.2.1.1	73.46	121.39	-39.49	3.7	4.69	6.46	-27.44
1.1.2.1.2	19.80	29.23	-32.27	3.7.1	1.86	2.40	-22.68
1.1.2.1.3	1.05	2.26	-53.58	3.7.2	1.68	2.86	-41.20
1.1.2.2	32.44	55.31	-41.35	3.7.3	1.17	1.24	-5.99
1.1.2.2.1	6.06	10.37	-41.56	3.8	8.15	11.94	-31.71
1.1.2.3	8.24	9.90	-16.82	3.8.1	1.01	1.04	-3.45
1.1.3	2.56	5.97	-57.21	3.8.2	7.15	10.90	-34.41
1.1.4	8.87	16.27	-45.46	3.9	1.81	2.14	-15.38
1.1.5	1.31	2.95	-55.76	4	15.30	28.97	-47.20
1.1.6	1.07	2.76	-61.25	4.1	11.52	20.26	-43.14
1.1.7	0.01	0.01	120.00	4.2	0.02	0.05	-51.20
1.1.7.1	0.01	0.01	120.00	4.3	8.78	16.76	-47.60
1.2	73.68	118.46	-37.80	5	12.11	26.14	-53.68
1.2.1	73.68	118.46	-37.80	5.1	12.11	26.14	-53.68
2	9.64	20.48	-52.92	6	4.42	7.64	-42.21
3	81.66	134.88	-39.46	6.1	4.03	6.73	-40.07
3.1	13.01	24.15	-46.11	6.2	1.83	2.79	-34.40
3.10	8.43	8.66	-2.64	7	0.55	1.12	-50.94
3.11	12.42	23.68	-47.57	7.1	0.13	0.13	0.08
3.11.1	3.32	7.26	-54.22	7.2	0.55	1.12	-50.94
3.11.2	9.09	16.42	-44.63	8	3.88	7.36	-47.31
3.12	15.86	31.27	-49.27	8.1	0.74	1.38	-46.68

3.13	6.42	12.02	-46.61		8.2	1.94	4.20	-53.89
3.14	9.03	15.60	-42.10		8.3	2.49	4.85	-48.63
13 KEFs have changed more than – 50%								

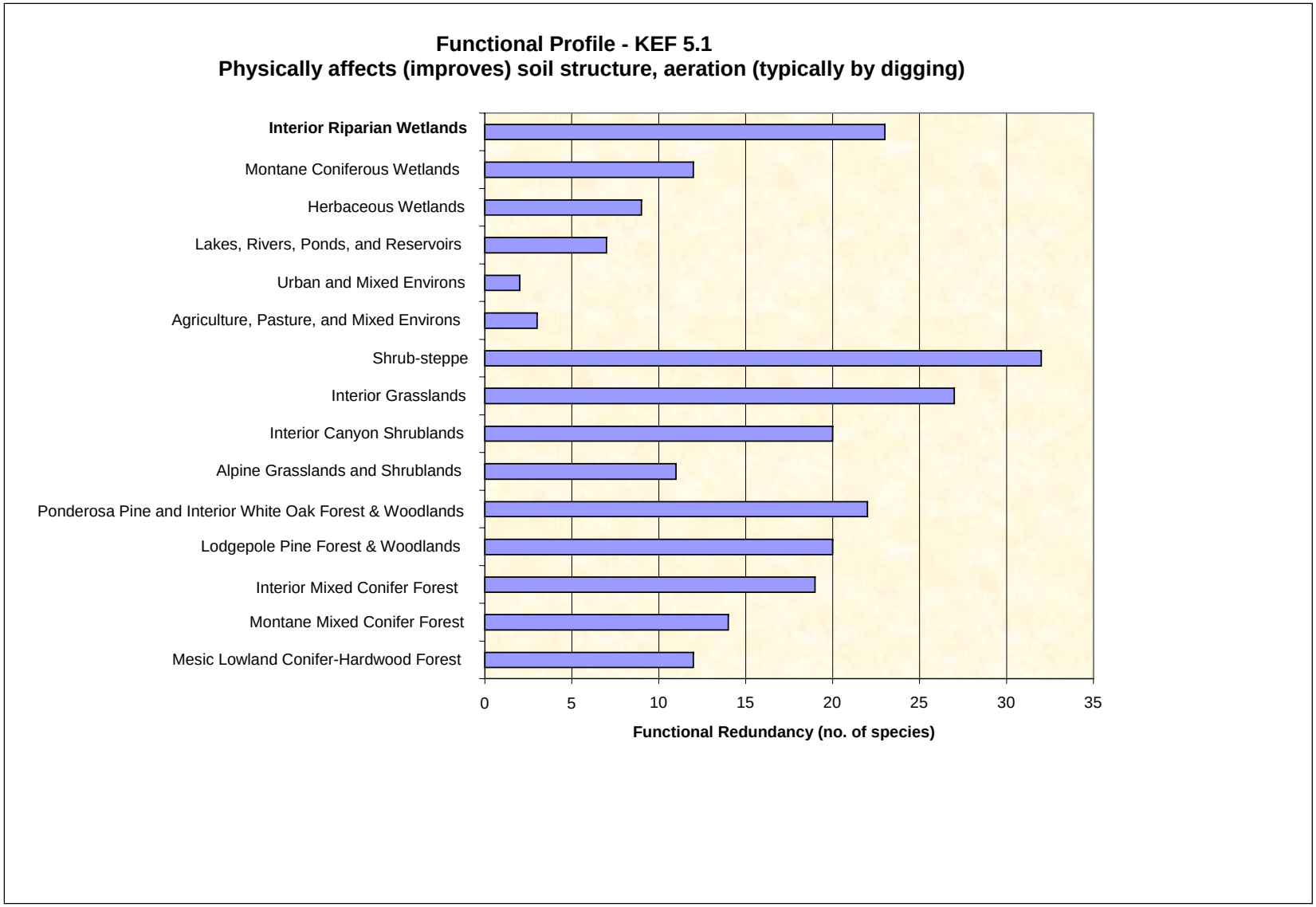

Figure H-1. Functional redundancy of KEF 5.1 for all wildlife habitat types in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

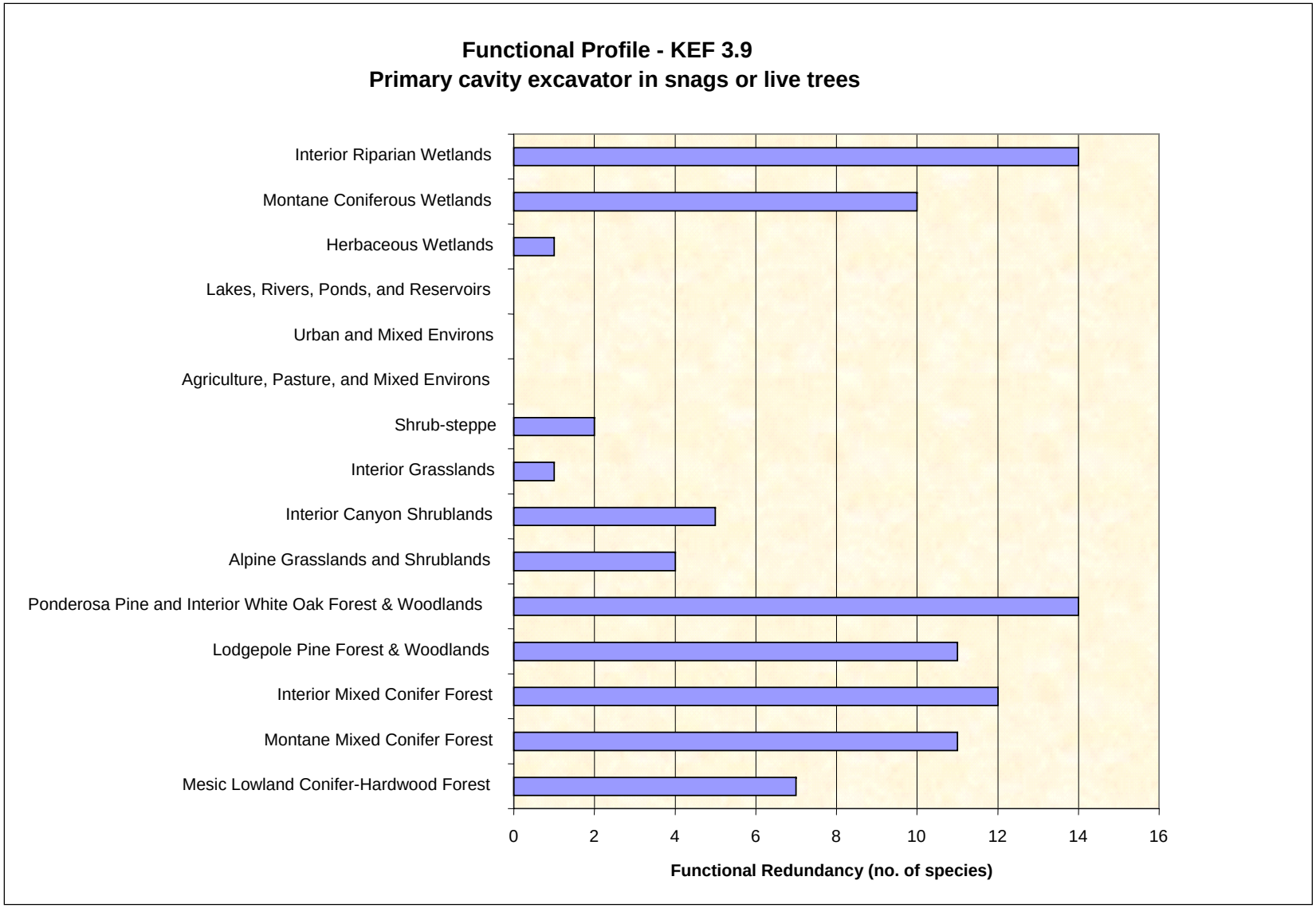

Figure H-2. Functional redundancy of KEF 3.9 for all wildlife habitat types in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

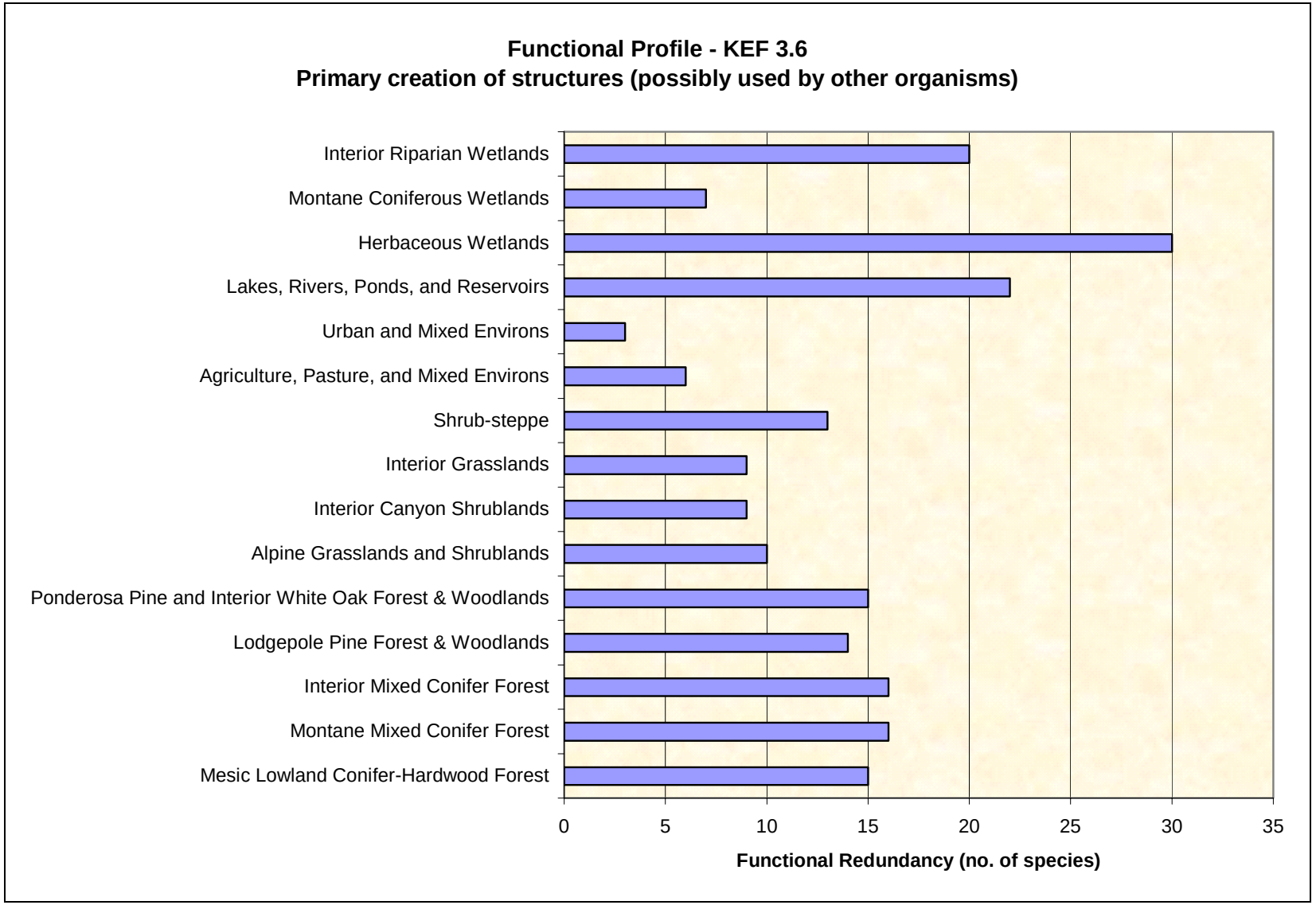

Figure H-3. Functional redundancy of KEF 3.6 for all wildlife habitat types in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

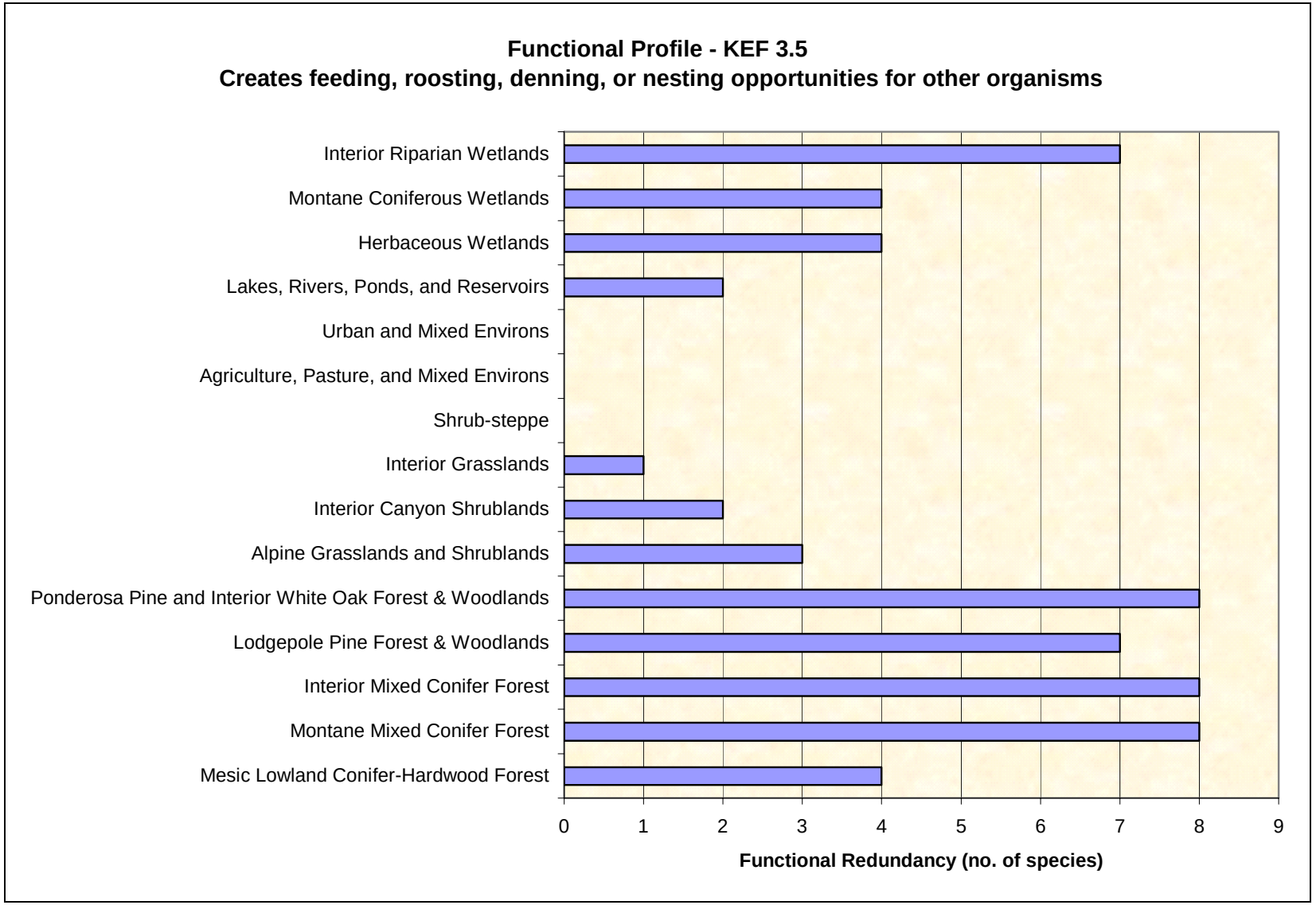

Figure H-4. Functional redundancy of KEF 3.5 for all wildlife habitat types in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

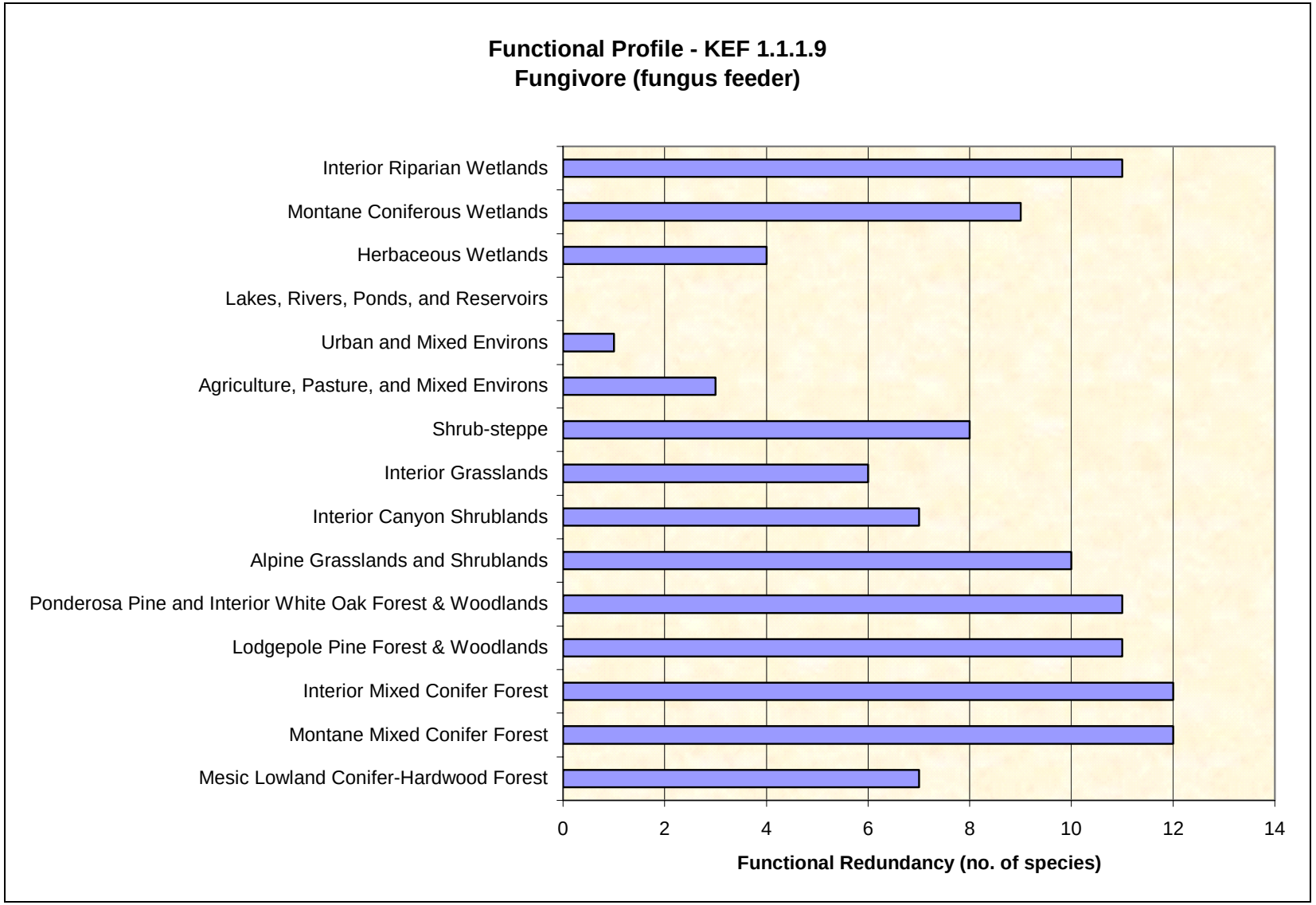

Figure H-5. Functional redundancy of KEF 1.1.1.9 for all wildlife habitat types in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

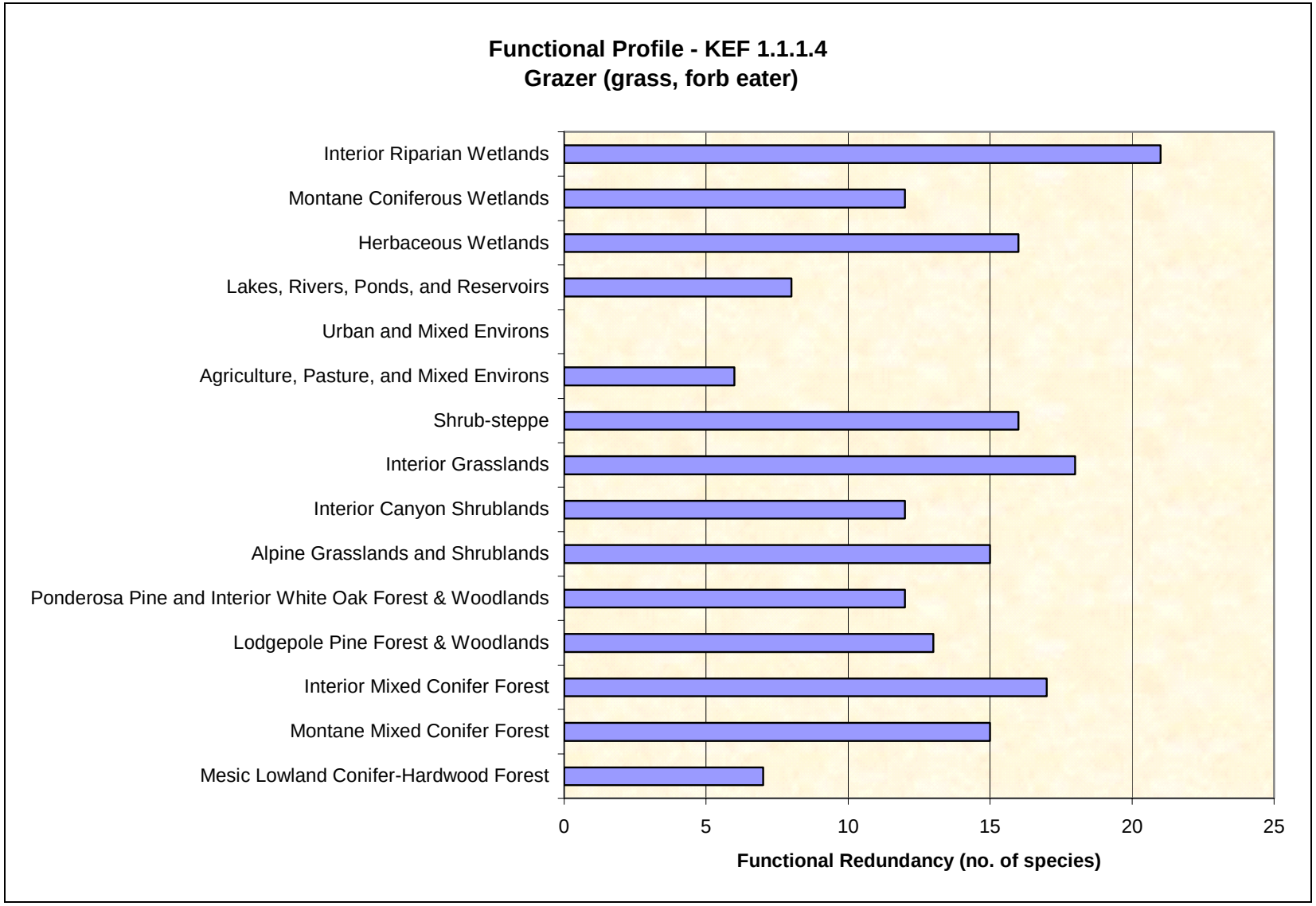

Figure H-6. Functional redundancy of KEF 1.1.1.4 for all wildlife habitat types in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

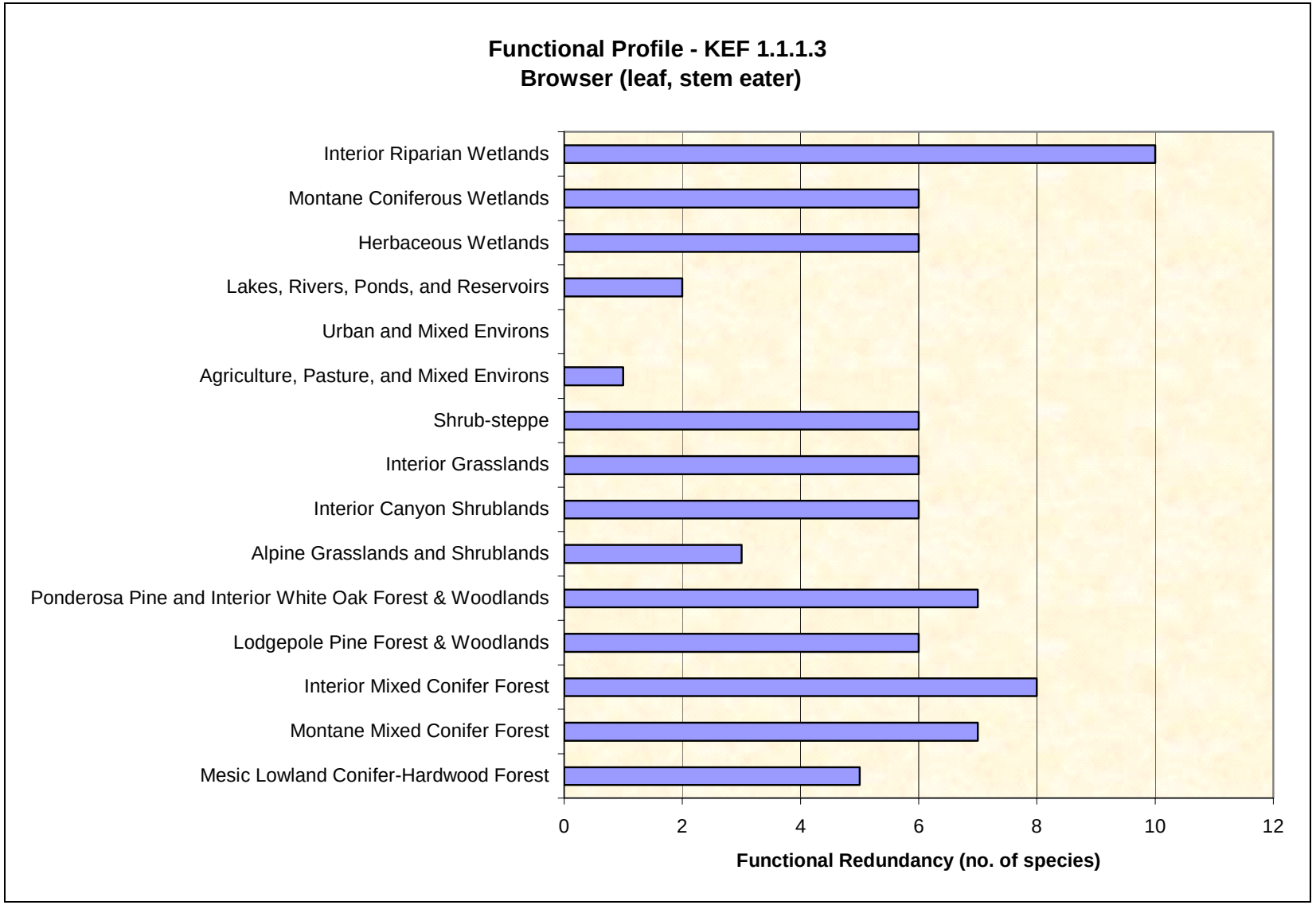

Figure H-7. Functional redundancy of KEF 1.1.1.3 for all wildlife habitat types in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

Appendix I: Aquatic Key Environmental Correlates

4. Freshwater Riparian and Aquatic Bodies Habitat Elements or KECs.
Includes selected forms and characteristics of any body of freshwater.

4.1 *Water Characteristics.* Includes various freshwater attributes. Ranges of continuous attributes that are key to the queried species, if known, will be in the comments.

4.1.1 *Dissolved Oxygen.* Amount of oxygen passed into solution.

4.1.2 *Water Depth.* Distance from the surface of the water to the bottom substrate.

4.1.3 *Dissolved Solids.* A measure of dissolved minerals in water

4.1.4 *Water pH.* A measure of water acidity or alkalinity.

4.1.5 *Water Temperature.* Water temperature range that is key to the queried species; if known, it is in the comments field.

4.1.6 *Water Velocity.* Speed or momentum of water flow.

4.1.7 *Water Turbidity.* Amount of roiled sediment within the water.

4.1.8 *Free Water.* Water derived from any source.

4.1.9 *Salinity and Alkalinity.* The presence of salts.

4.2 *Rivers and streams.* Various characteristics of streams and rivers.

4.2.1 *Oxbows.* A pond or wetland created when a river bend is cut off from the main channel of the river.

4.2.2 *Order and class.* Systems of stream classification.

4.2.2.1 *Intermittent.* Streams/rivers that contain non-tidal flowing water for only part of the year; water *may* remain in isolated pools.

4.2.2.2 *Upper Perennial.* Streams/rivers with a high gradient, fast water velocity, no tidal influence; some water flowing throughout the year, substrate consists of rock, cobbles, or gravel with occasional patches of sand; little floodplain development.

4.2.2.3 *Lower Perennial.* Streams/rivers with a low gradient, slow water velocity, no tidal influence; some water flowing throughout the year, substrate consists mainly of sand and mud; floodplain is well developed.

4.2.3 *Zone.* System of water body classification based on the horizontal strata of the water column.

4.2.3.1 *Open Water.* Open water areas not closely associated with the shoreline or bottom.

4.2.3.2 *Submerged/Benthic.* Relating to the bottom of a body of water, includes the substrate and the overlaying body of water within 3.2 feet (1 m) of the substrate.

4.2.3.3 *Shoreline.* Continually exposed substrate that is subject to splash, waves, and/ or periodic flooding. Includes gravel bars, islands, and immediate near-shore areas.

4.2.4 *In-stream Substrate.* The bottom materials in a body of water.

4.2.4.1 *Rocks.* Rocks >10 inches (256mm) in diameter.

4.2.4.2 *Cobble/Gravel.* Rocks or pebbles, .1-10 inches (2.5-256mm) in diameter, substrata may consist of cobbles, gravel, shell, and sand with no substratum type >70% cover.

4.2.4.3 *Sand/Mud.* Fine substrata <.01 inch (l mm) in diameter, little gravel present, may be mixed with organics.

4.2.5 *Vegetation.* Herbaceous plants.

4.2.5.1 *Submergent vegetation.* Rooted aquatic plants that do not emerge above the water surface.

4.2.5.2 *Emergent Vegetation.* Rooted aquatic plants that emerge above the water surface.

4.2.5.3 *Floating Mats.* Unrooted plants that form vegetative masses on the surface of the water.

4.2.6 *Coarse Woody Debris.* Any piece of woody material (debris piles, stumps, root wads, fallen trees) that intrudes into or lies within a river or stream.

4.2.7 *Pools.* Portions of the stream with reduced current velocity, often with water deeper than surrounding areas.

4.2.8 *Riffles.* Shallow rapids where the water flows swiftly over completely or partially submerged obstructions to produce surface agitation, but where standing waves are absent.

4.2.9 *Runs/Glides.* Areas of swiftly flowing water, without surface agitation or waves, which approximates uniform flow and in which the slope of the water surface is roughly parallel to the overall gradient of the stream reach.

4.2.10 *Over Hanging Vegetation.* Herbaceous plants that cascade over stream and river banks and are <3.2 feet (1m) above the water surface.

4.2.11 *Waterfalls.* Steep descent of water within a stream or river.

4.2.12 *Banks.* Rising ground that borders a body of water.

4.2.13 *Seeps or Springs.* A concentrated flow of ground water issuing from openings in the ground.

4.3 *Ephemeral Pools.* Pools that contain water for only brief periods of time usually associated with periods of high precipitation.

4.4 *Sandbars.* Exposedareas of sand or mud substrate.

4.5 *Gravel Bars.* Exposed areas of gravel substrate.

4.6 *Lakes/Ponds/Reservoirs.* Various characteristics of lakes, ponds, and reservoirs.

4.6.1 *Zone.* System of water body classification based on the horizontal strata of the water column.

4.6.1.1 *Open Water.* Open water areas not closely associated with the shoreline or bottom substrates.

4.6.1.2 *Submerged/Benthic.* Relating to the bottom of a body of water, includes the substrate and the overlaying body of water within one meter of the substrate.

4.6.1.3 *Shoreline.* Continually exposed substrate that is subject to splash, waves, and/ or periodic, flooding. Includes gravel bars, islands, and immediate near-shore areas.

4.6.2 *In-Water Substrate.* The bottom materials in a body of water.

4.6.2.1 *Rock.* Rocks >10 inches (256rnrn) in diameter.

4.6.2.2 *Cobble/Gravel.* Rocks or pebbles, .1-10 inches (2.5-256mm) in diameter, substrata may consist of cobbles, gravel, shell, and sand with no substratum type exceeding 70%cover.

4.6.2.3 *Sand/Mud.* Fine substrata <.1 inch (2.5 mm) in diameter, little gravel present, may be mixed with organics.

4.6.3 *Vegetation.* Herbaceous plants. 4.6.3.1 *Submergent vegetation.* Rooted aquatic plants that do not emerge above the water surface.

4.6.3.2 *Emergent Vegetation.* Rooted aquatic plants that emerge above the water surface.

4.6.3.3 *Floating Mats.* Unrooted plants that from vegetative masses on the surface of the water.

4.6.4 *Size.* Refers to whether or not the species is differentially associated with water bodies based on their size.

4.6.4.1 *Ponds.* Bodies of water <5 acre (2 ha).

4.6.4.2 *Lakes.* Bodies of water .2.5acre (2 ha).

4.7 Wetlands/Marshes/Wet Meadows/ Bogs and Swamps. Various components and characteristics related to any of these systems.

4.7.1 *Riverine wetlands.* Wetlands found in association with rivers.

4.7.2 *Context.* When checked, indicates that the setting of the wetland, marsh, wet meadow, bog, or swamp is key to the queried species.

4.7.2.1 *Forest.* Wetlands within a forest.

4.7.2.2 *Non-forest.* Wetlands that are not surrounded by forest.

4.7.3 *Size.* When checked, indicates that the queried species is differentially associated with a wetland, marsh, wet meadow, bog, or swamp based on the size of the water body.

4.7.4 *Marshes.* Frequently or continually inundated wetlands characterized by emergent herbaceous vegetation (grasses, sedges, reeds) adapted to saturated soil conditions.

4.7.5 *Wet Meadows.* Grasslands with waterlogged soil near the surface but without standing water for most of the year.

4.8 *Islands.* A piece of land made up of either rock and/or unconsolidated material that projects above and is completely surrounded by water.

4.9 *Seasonal Flooding.* Flooding that occurs periodically.

Appendix J: Draft Walla Walla Subbasin Wildlife Assessment and Inventory

Draft

Walla Walla Subbasin

Wildlife Assessment and Inventory

Paul R. Ashley

Stacey H. Stovall

2004

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1.0 Physical Features

1.1 Land Area

The 1,126,198-acre (1,760 mi^2) Walla Walla subbasin (Subbasin) is located in Walla Walla, Columbia, Umatilla, Union, and Wallowa Counties in both Washington and Oregon (Figure 1 and Figure 2). The Subbasin comprises 22 percent of the Southeast Washington Subbasin Planning Ecoregion (Ecoregion) and is the second largest subbasin in the Ecoregion (Table 1).

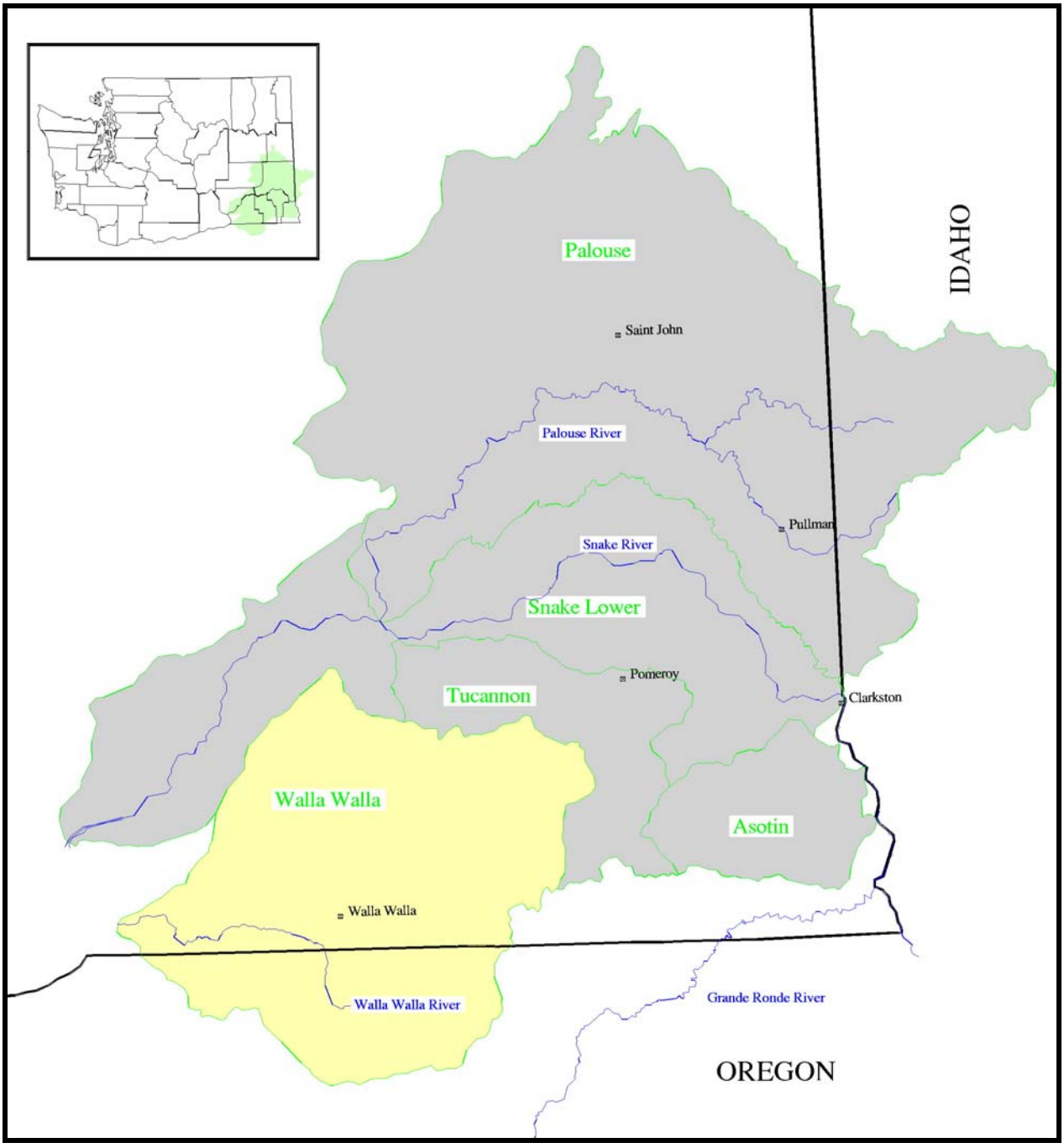

Figure 72. Location of the Walla Walla subbasin.

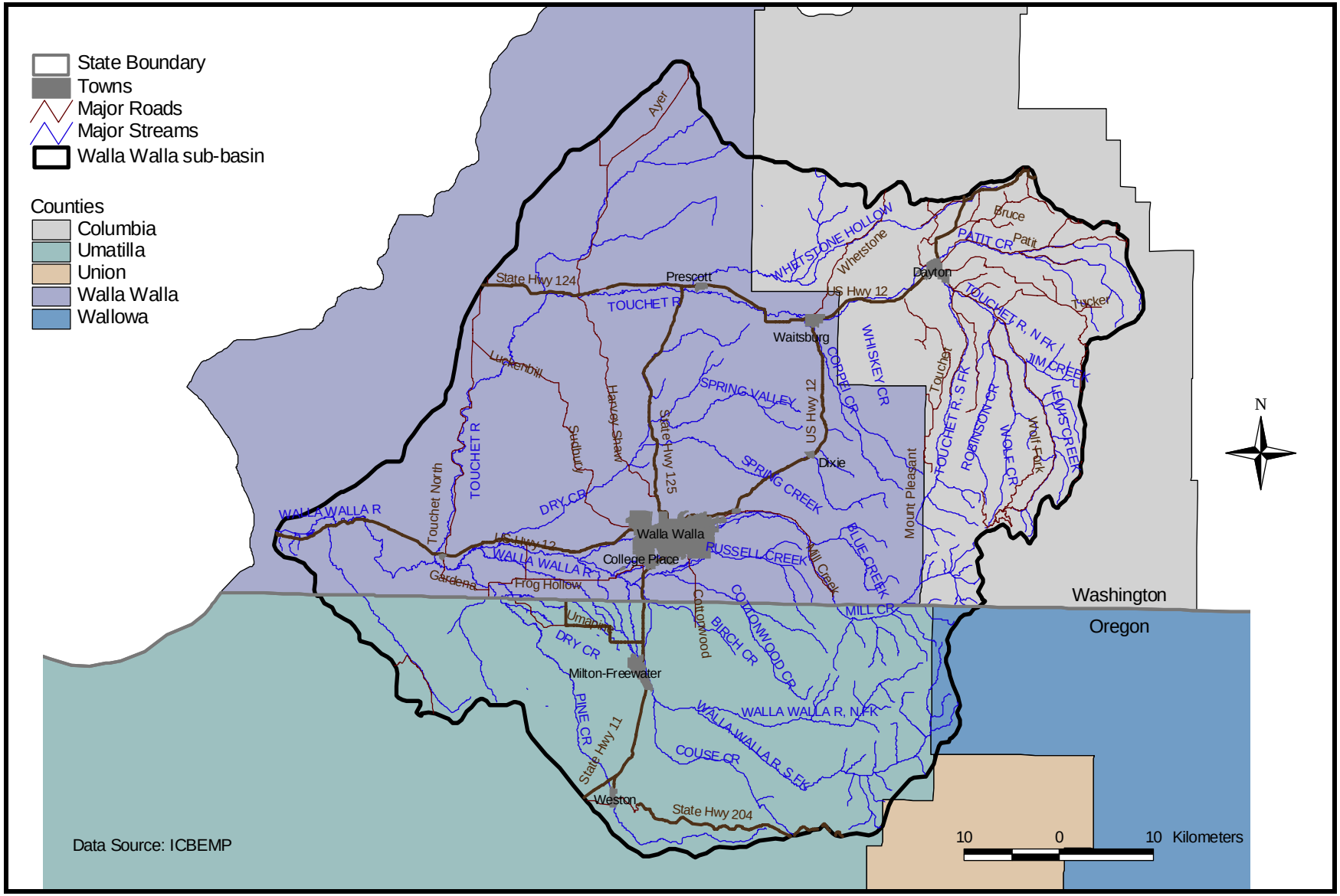

Figure 73. Counties of the Walla Walla subbasin (NPPC 2001).

Table 59. Subbasin size relative to the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

Subbasin	Size		Percent of Ecoregion
	Acres	Mi^2	
Palouse	2,125,841	3,322	44
Lower Snake	1,059,935	1,656	22
Tucannon	326,185	510	7
Asotin	246,001	384	5
Walla Walla	1,126,198	1,760	22
Total (Ecoregion)	**4,884,160**	**7,631**	**100**

1.2 Physiography

The Subbasin encompasses two major physiographic features: the Blue Mountains and valley lowlands (Newcomb 1965 in NPPC 2001). The Blue Mountains dominate the eastern portion of the Subbasin with an average elevation of 5,000 feet. The highest point is 6,000 feet at Table Mountain (Figure_3). The topography of the Blue Mountains consists of flat-topped ridges and steep stair-stepped valley walls formed by thousands of feet of Miocene basalt flows that engulfed the folded, faulted, and uplifted granitic core of the mountains. As mountains were uplifted, streams and glaciers carved canyons through the basalt layers. Valley lowlands extend from the center of the basin north to the divide between the Touchet and Snake Rivers and south to the Horse Heaven Hills.

The dominant bedrock across the region consists of a series of basalt flows known as the Columbia River basalt that are stacked like a layer cake across much of eastern Washington, eastern Oregon, and southern Idaho. The basalt is divided into formations, each an aggregation of individual flows sharing similar flow histories and geochemistry. The three major formations that occur in the Subbasin are the Saddle Mountains, Wanapum, and Grande Ronde. The flow thickness ranges from five feet to as much as 150 feet, and collectively is estimated to be hundreds to thousands of feet thick (Newcomb 1965 in NPPC 2001). The topography of the basin is directly related to the folding, faulting, and erosion of these formations, creating a regional structure that dips westward from the Blue Mountains, southward down the Touchet Slope, northward from Horse Heaven Ridge, and eastward from a dividing ridge in the lower Walla Walla Valley (Newcomb 1965 in NPPC 2001).

Fertile soils formed from Pleistocene silt and sand blanket the subbasin. During the Pleistocene ice ages, the region underwent severe change as the continental glaciers advanced and retreated to the north, and valley glaciers carved channels in the higher elevations. The oldest of the Pleistocene deposits washed down from the canyons of the Blue Mountains and are referred to locally as the “old gravels and clays” (Newcomb 1965 in NPPC 2001). These deposits filled the structural troughs formed by the folding of the basalt layers in the Subbasin. Massive floods swept through the Columbia basin periodically through the quaternary era, bringing vast amounts of sediment into the region. Wind, intensified by the expanse of glacial ice, piled the sand and silt known as loess into dunes that spread across much of central and southeastern Washington. These dunes characterize the region known as the Palouse, and can be seen throughout the Subbasin. The Touchet beds are another reflection of Pleistocene glaciation and climate. They represent cyclic slow water deposits laid down when massive floods resulting from the breaching of an ice dam located near Missoula, Montana scoured the area and backed up into the mouth of the Walla Walla River (Alwin 1970 in NPPC 2001).

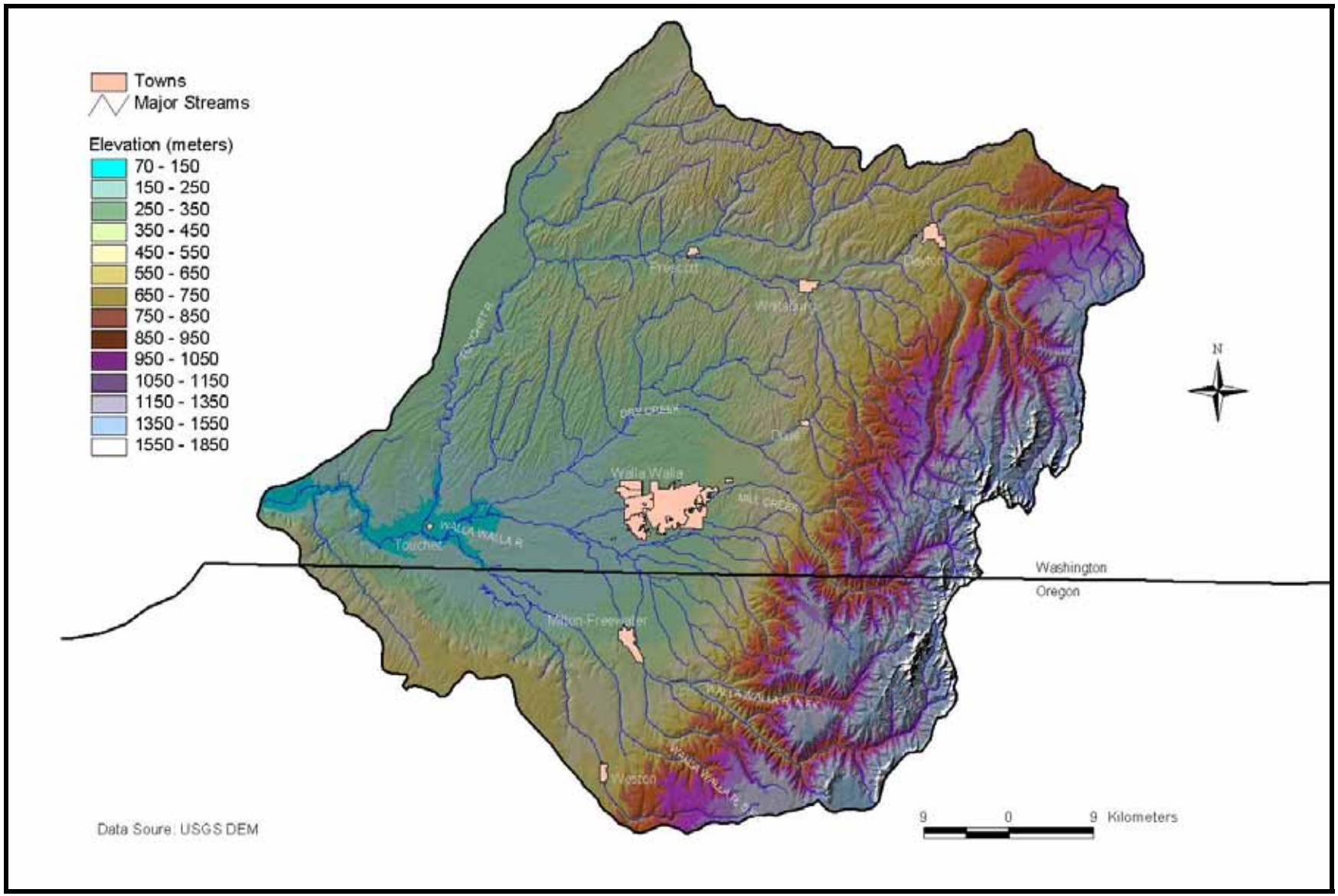

Figure 74. Elevation and topography of the Walla Walla subbasin (NPPC 2001).

2.0 Socio-Political Features

2.1 Land Ownership

Approximately 11 percent of the Subbasin is in federal, state, tribal and local government ownership, while the remaining 89 percent is privately owned or owned by non-governmental organizations (Figure_4). Private lands in the Subbasin comprise 21 percent of the entire Ecoregion (Table_2).

Table 60. Land ownership in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

Land Ownership	Subbasin					
	Palouse	**Lower Snake**	**Tucannon**	**Asotin**	**Walla Walla**	**Total**
Federal Lands[1]	68,778	24,542	78,417	64,684	102,100	**338,521**
Native American Lands	0	0	0	0	8,500	**8,500**
State Lands[2]	79,890	35,432	19,111	16,742	16,634	**167,809**
Local Government Lands	0	139	0	31	595	**765**
NGO Lands	49	0	0	0	0	**49**
Private Lands	1,977,093	999,816	228,657	164,544	998,369	**4,368,479**
Water	31	6	0	0	0	**37**
Total	**2,125,841**	**1,059,935**	**326,185**	**246,001**	**1,126,198**	**4,884,160**

[1] Includes lands owned by the U.S .Forest Service, U.S. Fish and Wildlife Service, Bureau of Reclamation, and the U.S. Army Corps of Engineers.
[2] Includes lands owned by WDFW, Washington State Parks, University, and the Washington Department of Natural Resources.

The Subbasin has the most acres under public ownership in the Ecoregion, but the third highest relative percentage of land under public ownership. Only the Tucannon and Asotin subbasins have more government ownership (33 percent and 30 percent, respectively).

Federal land management entities include the USFS (Umatilla National Forest) and BLM. All lands managed by the USFS and BLM are located in the Blue Mountains. The Umatilla National Forest forms the eastern border of the subbasin and extends into both Washington and Oregon.

State management entities in the subbasin include WDFW), Oregon Department of Fish and Wildlife (ODFW), Oregon Department of Forestry (ODF), Washington Department of Forestry (WDF), WDNR, Oregon Department of Environmental Quality (ODEQ), WDOE, and the Oregon Water Resources Department (OWRD).

2.2 Land Use

Land use in the Subbasin includes agriculture, timber production, livestock grazing, and urban development. The Walla Walla region is one of the most productive agricultural areas in the world. Wheat, barley, peas, and fruit are the principle crops grown in the subbasin. Irrigated lands primarily occur in the narrow lowland portions of the Subbasin, representing the largest use of surface and groundwater in the Subbasin. Non-irrigated grain crops account for about half of the 133,000 acres in the Oregon portion of the Subbasin. Green peas take up approximately 17,600 dryland acres, spanning from Milton-Freewater to Walla Walla. An estimated 11,800 acres of fruit is grown primarily north of Milton-Freewater (BOR 1999).

The majority of timber harvest on federally managed lands occurs in the high-elevation portions of the Subbasin, while privately owned timber is generally harvested on mid-elevation lands.

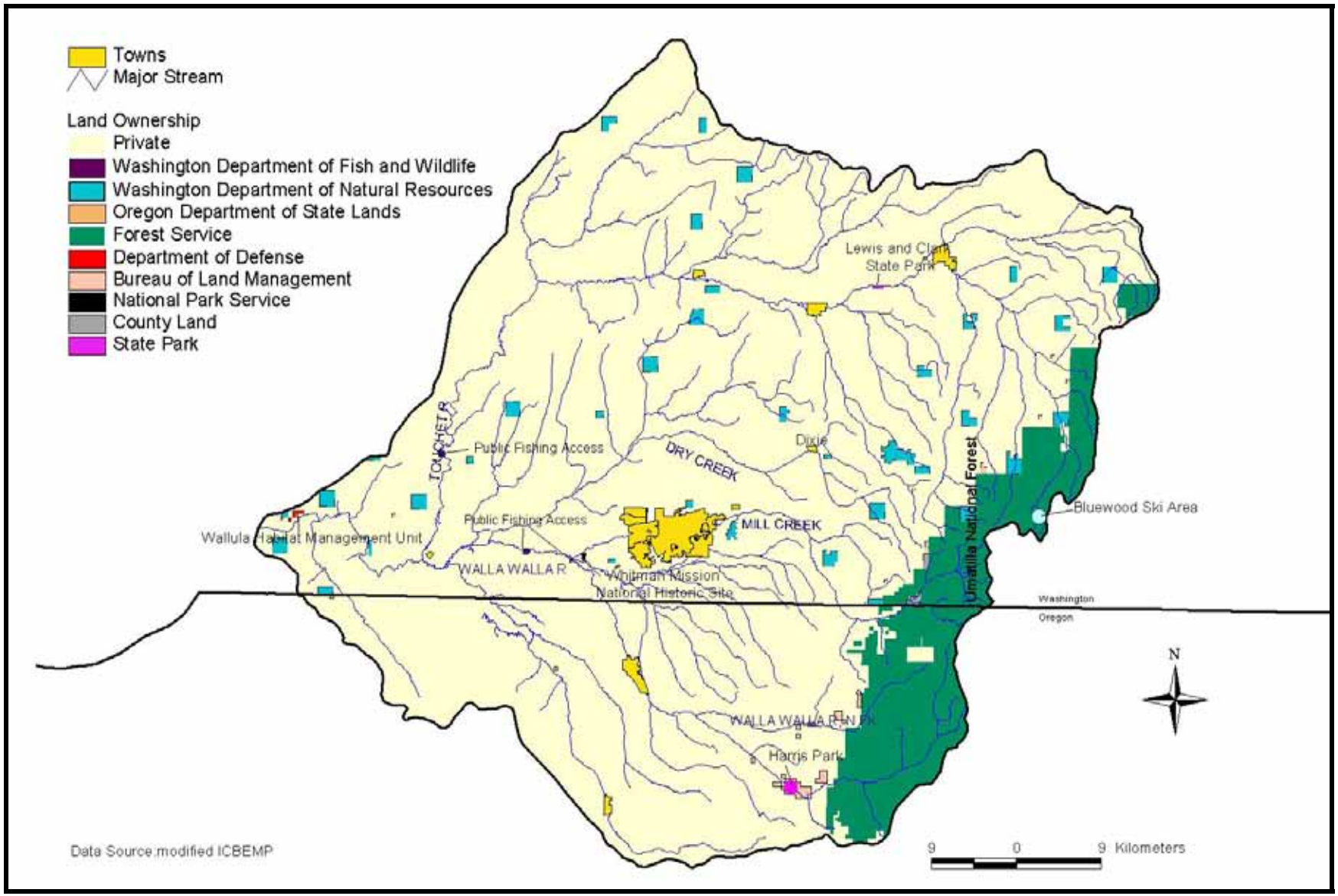

Figure 75. Land ownership in the Walla Walla subbasin (NPPC 2001).

Little livestock grazing occurs on federal lands in the North and South Fork Walla Walla watersheds because of steep slopes. Livestock grazing does occur, however, in the upper portions of the subbasin, while dairies are southwest of Walla Walla in the Umapine area (NPPC 2001).

Numerous towns are located within the Subbasin, many of which are incorporated. Urban development has resulted in a growing number of ranchettes, subdivisions, subdivided cropland, and floodplain encroachments. General land use is illustrated in Figure 5. For more information about the effects on wildlife habitat from changes in land use from circa 1850 to today, see section 3.2 in Ashley and Stovall (unpublished report 2004).

2.3 Protection Status

An estimated 0.7 percent (8,211 acres) of the Subbasin is permanently protected from conversion of natural land cover and has a mandated management plan in operation to maintain a natural state (Priority Status 1: high protection) (Figure 6). The majority of Priority Status 1 lands in the Subbasin are associated with the Wenaha -Tucannon Wilderness Area. Conversely, no lands within the Subbasin receive Priority 2 protection status. The vast majority of state and federal lands, in both Washington and Oregon, fall under Priority Status 3, while most privately owned lands receive no protection (Table 3).

Table 61. GAP protection status in the Walla Walla subbasin (NHI 2003).

Subbasin	GAP Protection Status	Acres	Percent
Walla Walla	High Protection	8,211	1
	Medium Protection	8,500	1
	Low Protection	124,645	11
	No Protection	984,842	87

The Subbasin ranks third within the Ecoregion in terms of the amount of unprotected land (Figure 7). Medium, low, and no protection status lands (Priority Status 2, 3, and 4, respectively) show similar trends throughout the Ecoregion, except for the Walla Walla subbasin, which has no lands in the medium protection status category (Figure 8). Protection status priorities are defined in section 3.3 in Ashley and Stovall (unpublished report, 2004).

Additional habitat protection, primarily on privately owned lands, is provided through the Conservation Reserve Program (CRP) and the Conservation Reserve Enhancement Program (CREP). The Conservation Reserve Program is intended to reduce soil erosion on upland habitats through re-establishment of perennial vegetation on former agriculture lands. Similarly, CREP conservation practices reduce stream sedimentation and provide protection for riparian wetland habitats through establishment of stream corridor buffer strips comprised of herbaceous and woody vegetation.

Both programs provide short-term (CRP-10 years; CREP-15 years), high protection of habitats. The U.S. Congress authorizes program funding/renewal, while the USDA determines program criteria. Program enrollment eligibility and sign-up is decentralized to state and local NRCS offices (R. Hamilton, FSA, personal communication, 2003).

Conservation Reserve Program acreage figures for each county in the Ecoregion are summarized by cover practice (CP) in Table 4 (CP data are not available for Oregon). Conservation Reserve Enhancement Program acreages are compared in Table 5 for both

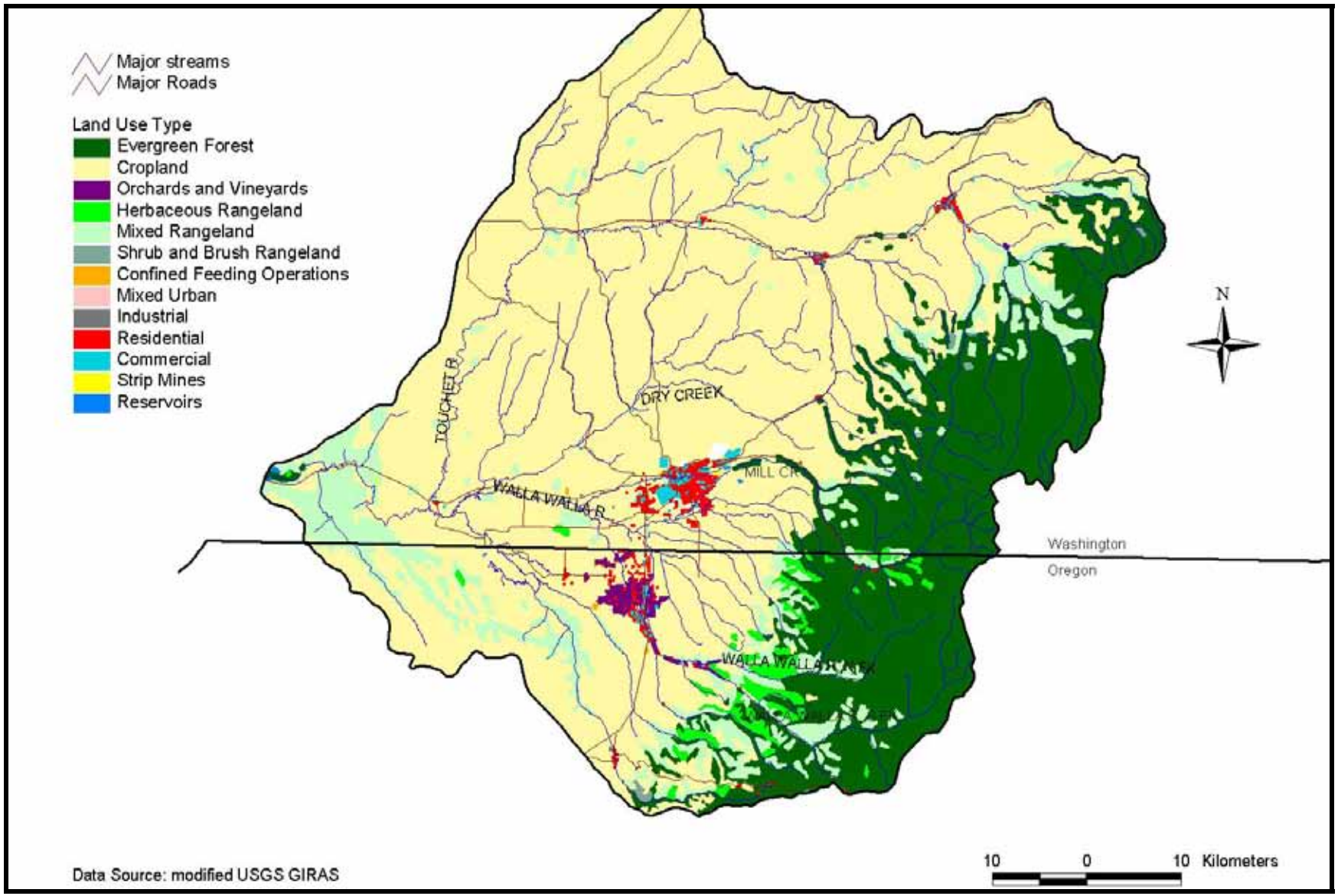

Figure 76. Land use in the Walla Walla subbasin (NPPC 2001).

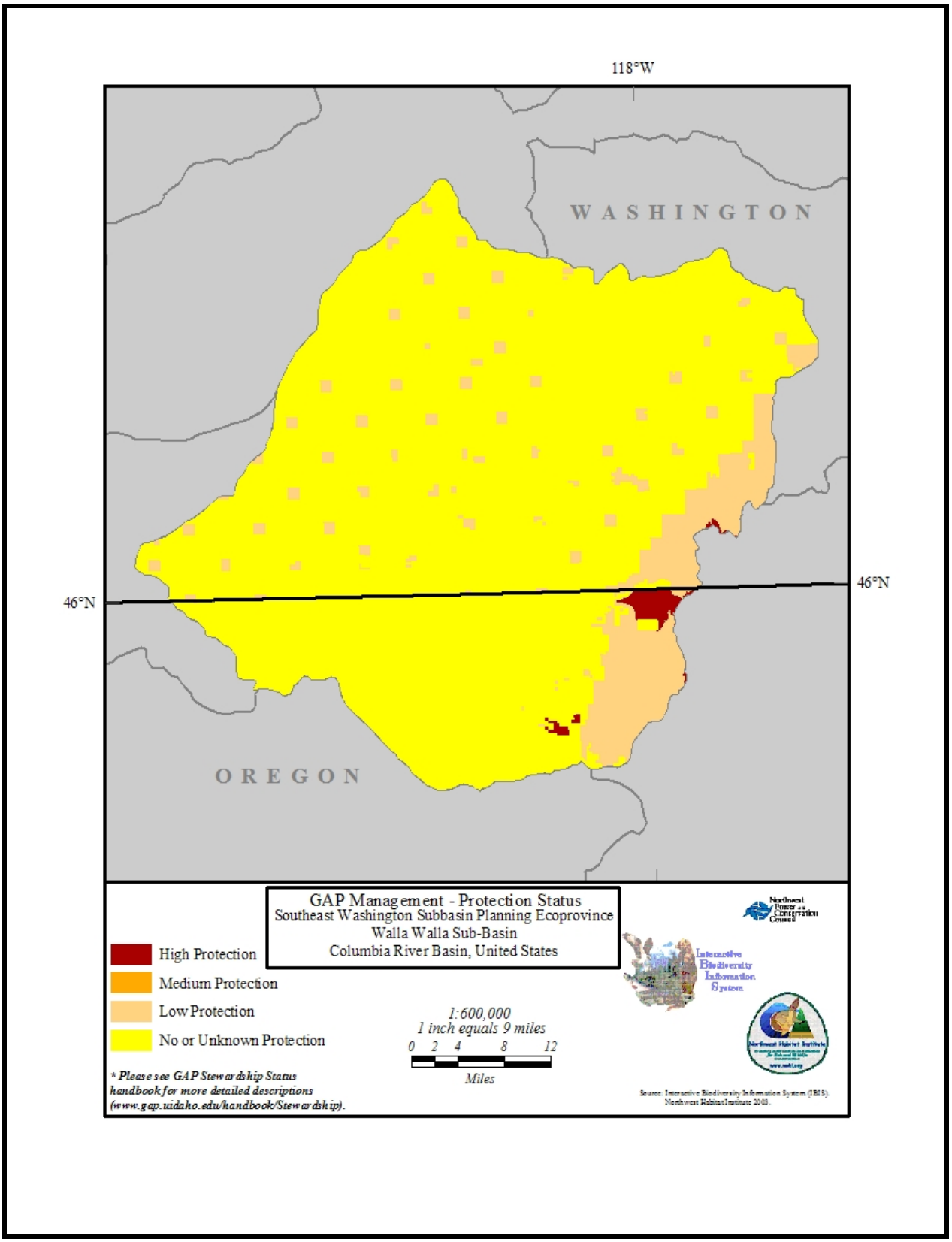

Figure 77. GAP protection status lands in the Walla Walla subbasin (NHI 2003).

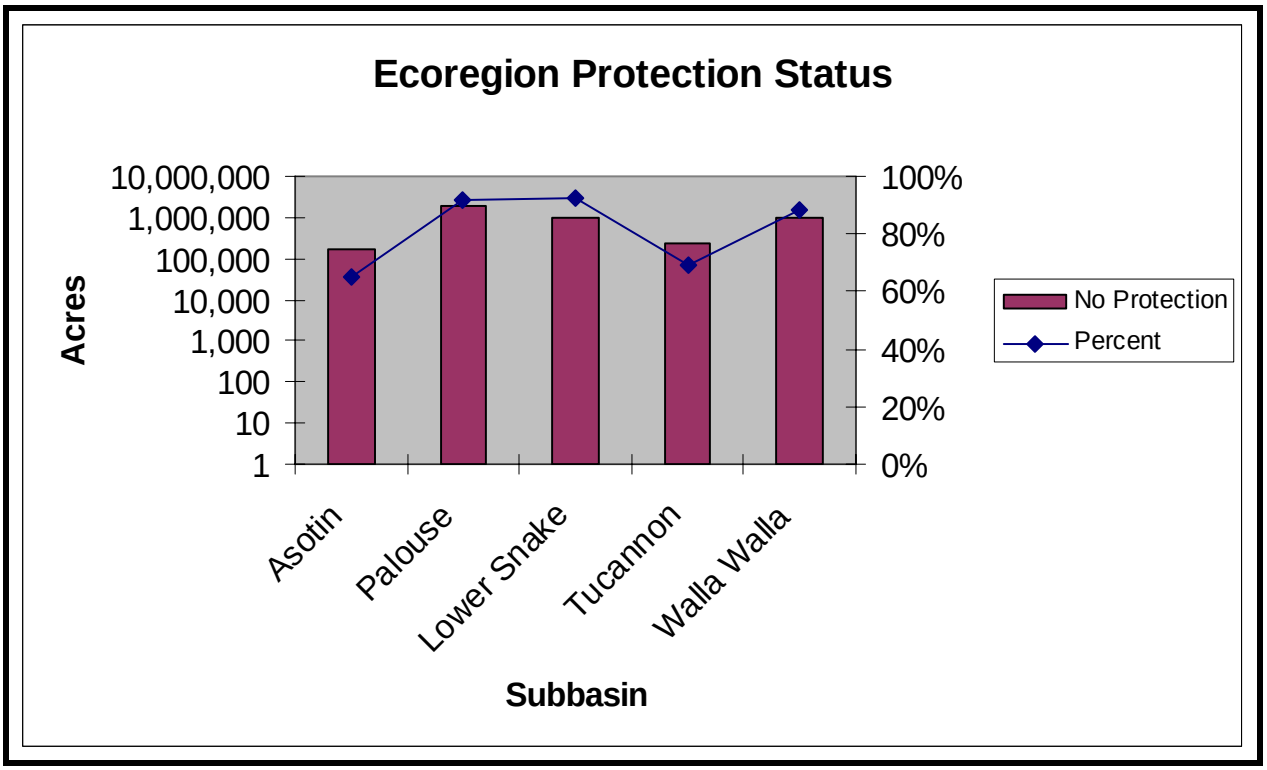

Figure 78. Comparison of GAP unprotected status lands by subbasin (NHI 2003).

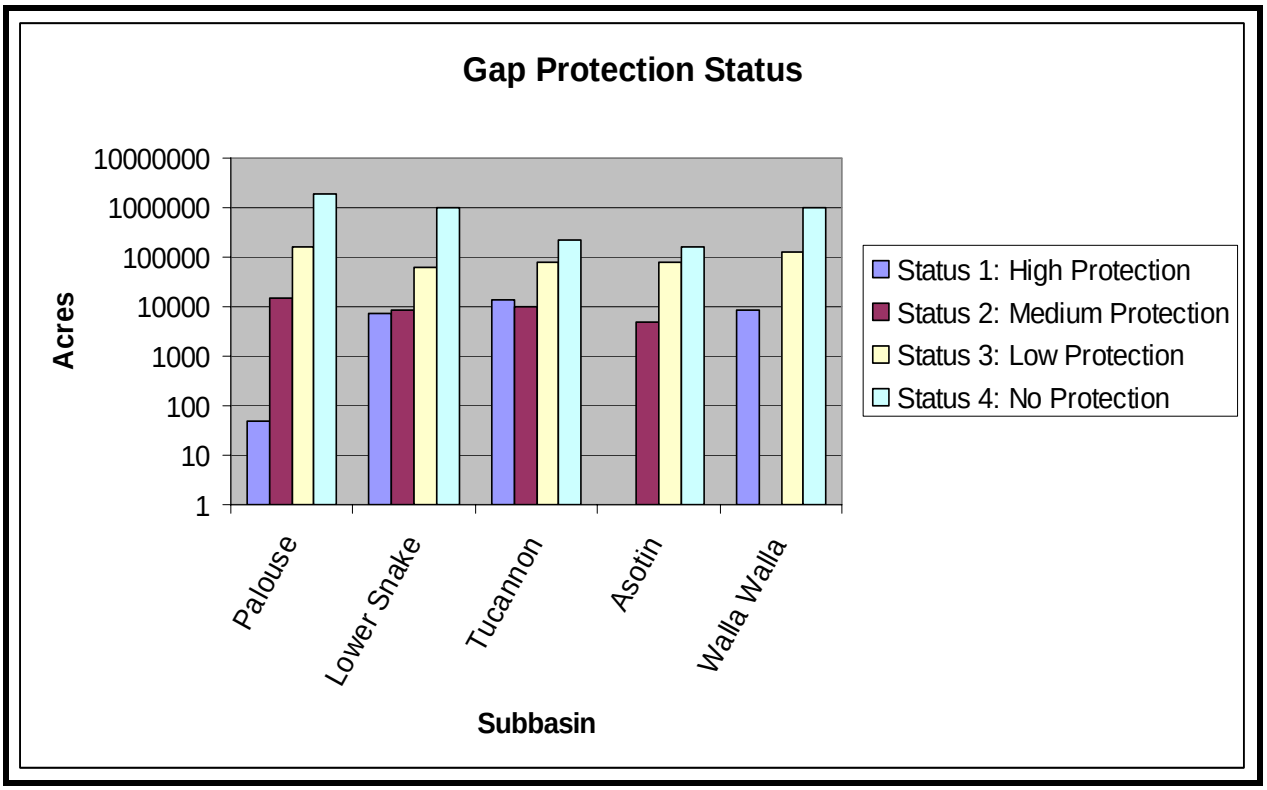

Figure 79. GAP protection status for all habitat types by subbasin (NHI 2003).

Table 62. CRP protected acres by county within the Southeast Washington Subbasin Planning Ecoregion (FSA, unpublished data, 2003).

County	Introduced Grasses (CP1)	Native Grasses (CP2)	Tree Plantings (CP3)	Wildlife Habitat (CP4)	Grass (CP10)	Trees (CP11)	Contour Grass (CP15)	Total Acres
Asotin	7,812	9,591	35	7,450	3,367	19	0	28,274
Columbia	5,991	20,162	581	5,929	10,839	355	28	43,885
Garfield	4,545	13,328	0	19,911	7,428	0	2,414	47,626
Umatilla	4,501	3,989	777	1,219	3,276	385	N/A	14,147
Walla Walla	44,955	95,555	129	0	11,735	166	0	152,540
Whitman	67,804	142,625	1,522	34,509	36,645	925	2,442	286,472

Table 63. The number of acres protected through CREP by county (FSA, unpublished data, 2003).

County	Acres
Asotin	1,339
Columbia	1,972
Garfield	2,535
Umatilla	52
Walla Walla	1,922
Whitman	1,052
Umatilla (Oregon)	61

Washington and Oregon Counties. The Farm Service Administration (FSA) provided the CRP and CREP data, which are available only at the county level.

2.4 Ecoregional Conservation Assessment Priorities and Public Land Ownership

Subbasin ECA priorities and public land ownership are compared in Figure 9 and Figure 10. ECA designated areas include USFS, private, and other state and federal managed lands. All ECA designated lands in the Subbasin (Washington State) are Class 2 priority. Class 2 lands are critical wildlife habitats that usually have some measure of protection such as public ownership.

In addition to identifying links between existing public lands and ECA conservation priorities, it is important to recognize how ECA priorities relate to focal habitat types. ECA priority areas encompass conifer forest (including ponderosa pine), steppe grassland habitats, and agricultural lands (Figure 11). Shrubsteppe habitat is not an ECA conservation priority in this subbasin. ECA is further discussed in section 4.2 in Ashley and Stovall (unpublished report, 2004).

3.0 Ecological Features

3.1 Vegetation

Subbasin vegetation, wildlife habitat descriptions, and changes in habitat extent, distribution, abundance, and condition are summarized in the following sections. Landscape level vegetation information is derived from the Washington GAP Analysis Project (Cassidy 1997) and NHI data (2003).

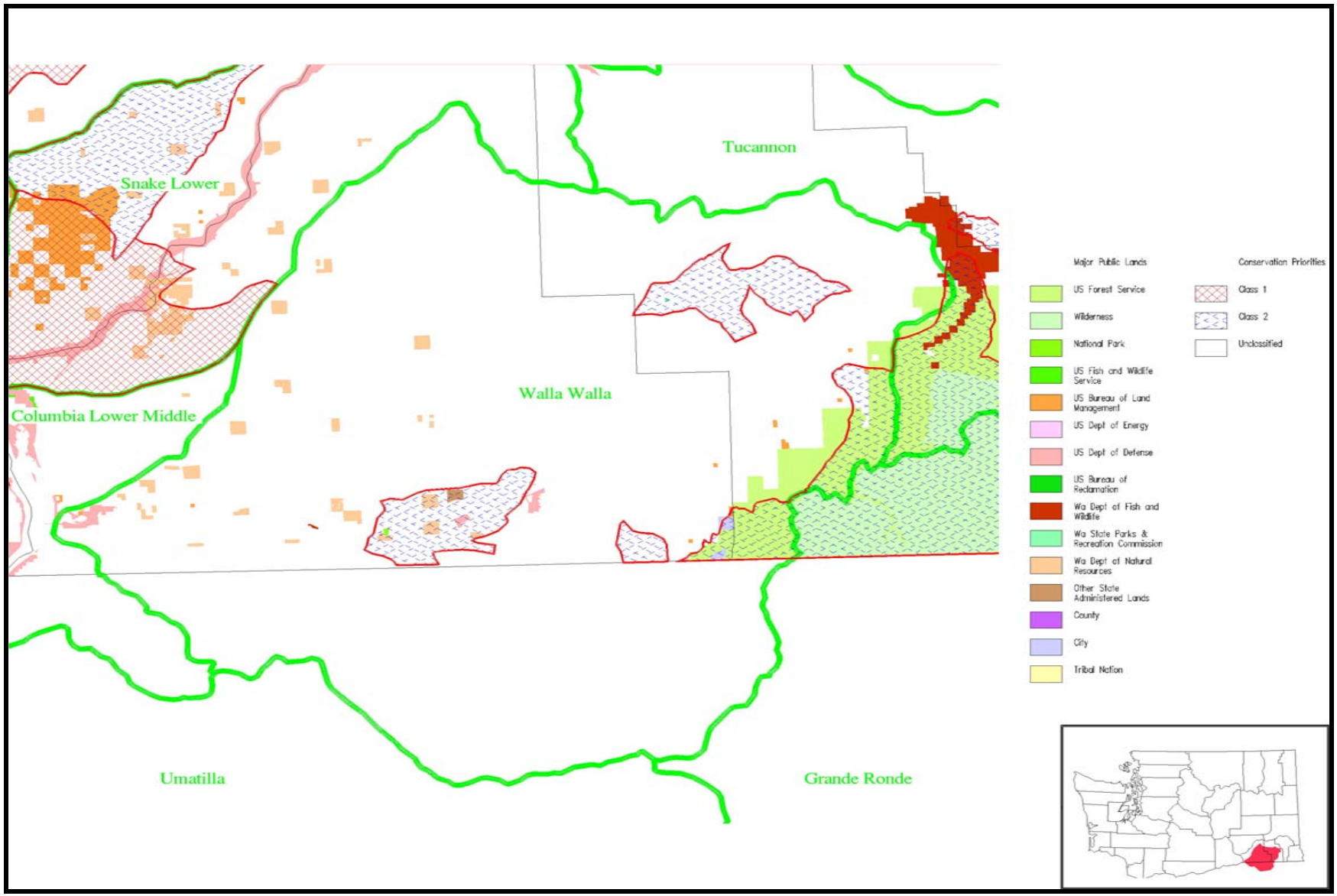

Figure 80. Washington State ECA designations and public land ownership in the Walla Walla subbasin (ECA 2003).

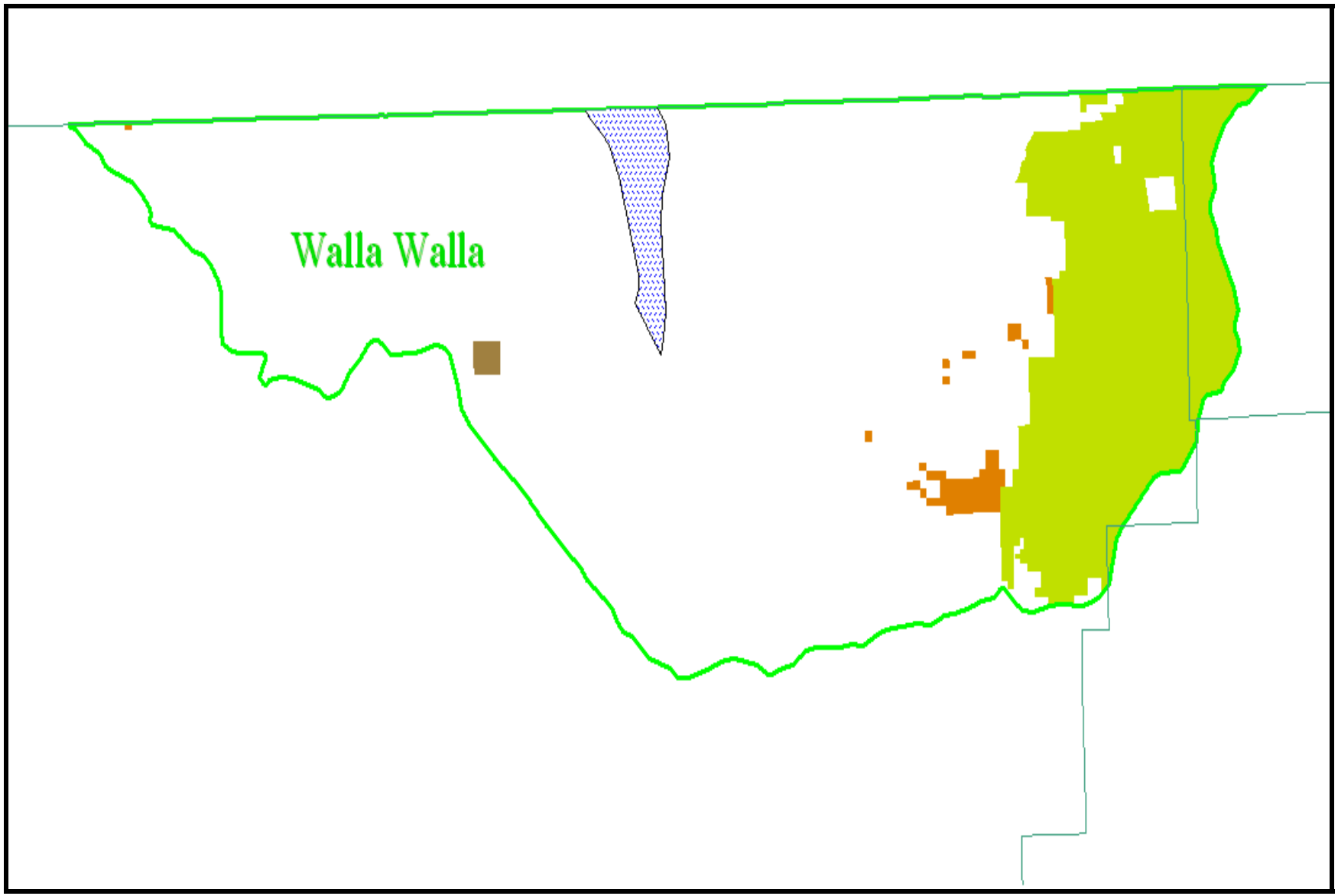

Figure 81. Oregon State ECA designations and public land ownership in the Walla Walla subbasin (ECA 2003).

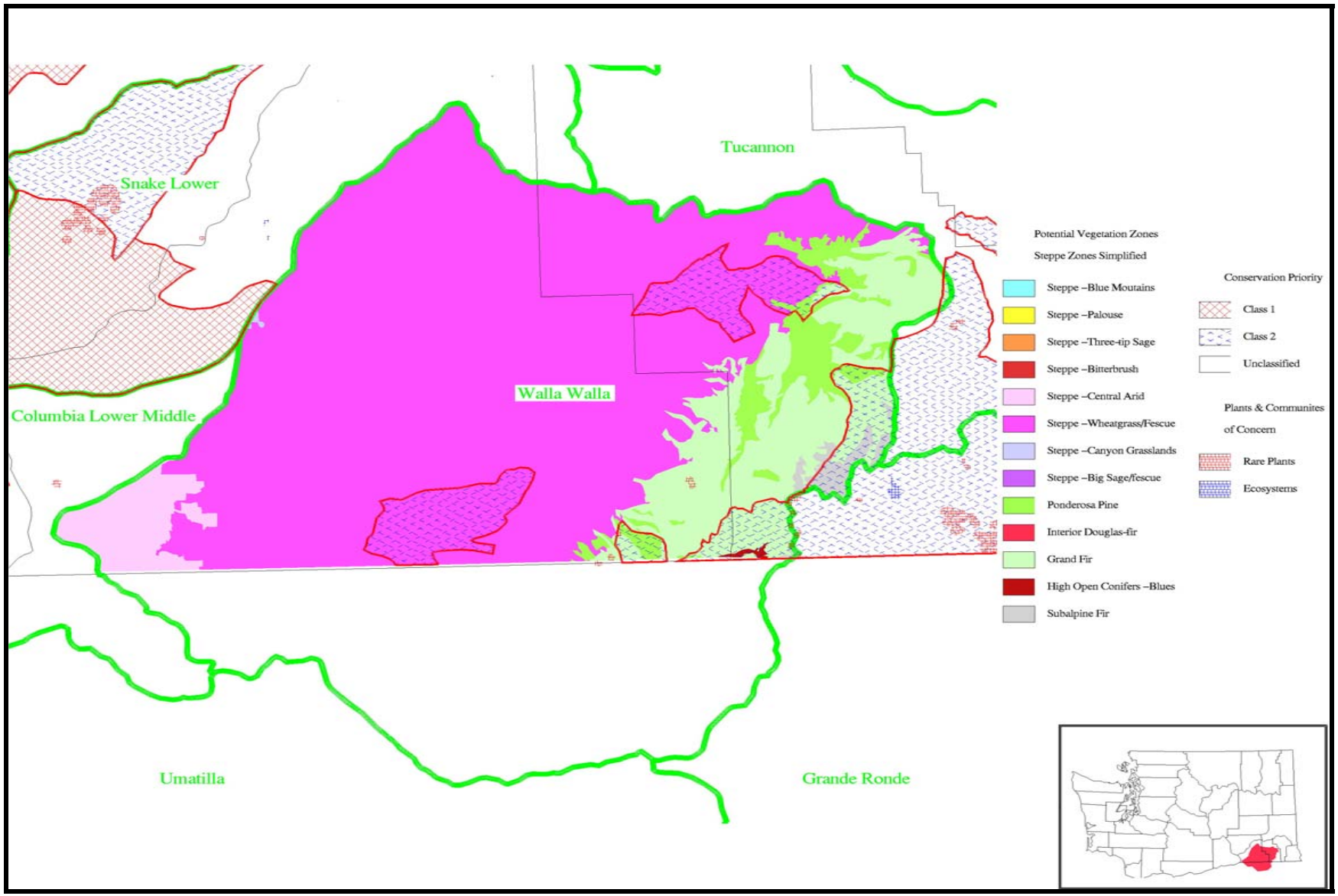

Figure 82. Washington State ECA priority areas and focal habitat types (WDFW 2004).

3.1.1 Rare Plant Communities

The Subbasin contains eight rare plant communities (Table 6). Approximately 35 percent of the rare plant communities are associated with grassland habitat, 15 percent with wetland habitats, and 50 percent with upland forest habitat. General locations of rare plant occurrence and plant communities of concern, disturbance factors, and ECA priority areas are illustrated in Figure 12 (Washington State only – Oregon data not provided). Rare plant sites are located primarily within forest and grassland ecotypes.

Table 64. Known high quality or rare plant communities and wetland ecosystems of the Walla Walla subbasin in Washington State (WNHP 2003).

Scientific Name	Common Name
POPULUS TREMULOIDES) / CRATAEGUS DOUGLASII / HERACLEUM MAXIMUM SHRUBLAND	(QUAKING ASPEN) / BLACK HAWTHORN / COW PARSNIP
ABIES GRANDIS / VACCINIUM MEMBRANACEUM FOREST	GRAND FIR / BIG HUCKLEBERRY
LARIX OCCIDENTALIS COVER TYPE	WESTERN LARCH FOREST
PINUS MONTICOLA / CLINTONIA UNIFLORA FOREST	WESTERN WHITE PINE / QUEEN'S CUP
POPULUS BALSAMIFERA SSP. TRICHOCARPA / CICUTA DOUGLASII FOREST	BLACK COTTONWOOD / WESTERN WATER HEMLOCK
ERIOGONUM NIVEUM / POA SECUNDA DWARF-SHRUB HERBACEOUS VEGETATION	SNOW BUCKWHEAT / SANDBERG'S BLUEGRASS
PSEUDOROEGNERIA SPICATA - FESTUCA IDAHOENSIS CANYON HERBACEOUS VEGETATION	BLUEBUNCH WHEATGRASS - IDAHO FESCUE CANYON
PSEUDOROEGNERIA SPICATA - POA SECUNDA HERBACEOUS VEGETATION	BLUEBUNCH WHEATGRASS - SANDBERG'S BLUEGRASS

3.1.2 Noxious Weeds

Changes in biodiversity have been closely associated with changes in land use. Grazing, agriculture, and accidents have introduced a variety of exotic plants, many of which are vigorous enough to earn the title "noxious weed." Twenty-six species of noxious weeds occur in the Subbasin (Table 7).

Disturbance of grass and shrubland ecosystems by livestock has contributed to the spread of introduced grasses and weeds including cheatgrass and yellow starthistle (NPPC 2001). These invader species are native to the Mediterranean but thrive in the Subbasin due to similarities in climate (Quigley and Arbelbide 1997). All 55 transects sampled by WDFW in shrubsteppe ecosystems in the Columbia Basin contained exotic annual grasses and exotic forbs species (Dobler *et al.* 1996). Introduced vegetation species in the Subbasin often displace and/or compete with native plant species for available moisture, nutrients, and solar radiation; thus, reducing wildlife habitat suitability (Quigley and Arbelbide 1997).

Weed surveys conducted by the Columbia County Weed Board (2000) in the Touchet watershed found that 85 percent of upland range habitat was infested with yellow starthistle. Yellow starthistle displaces native plant communities and reduces plant diversity. It can accelerate soil erosion and surface runoff. Yellow starthistle forms solid stands that drastically reduce forage production for wildlife.

Spotted knapweed is another noxious weed increasing in prominence within the Subbasin. This noxious weed also reduces wildlife forage. Spotted knapweed infestations decreased

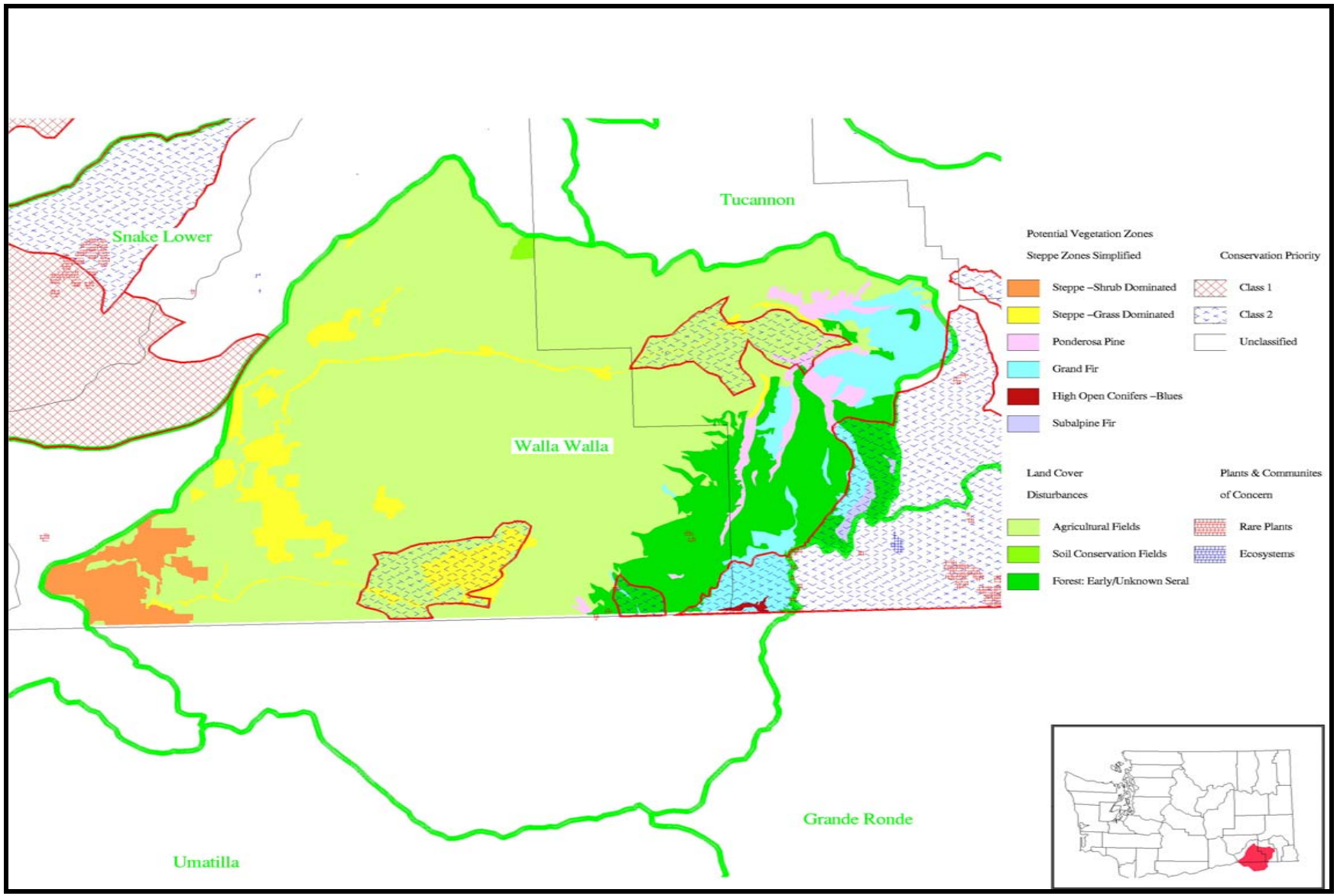

Figure 83. Rare plant occurrence in the Walla Walla subbasin (WNHP 2003).

Table 65. Noxious weeds in the Walla Walla subbasin (Callihan and Miller 1994).

Common Name	Scientific Name	Origin
Field bindweed	*Convolvulus arvensis*	Eurasia
Buffalobur nightshade	*Solanum rostratum*	Native to the Great Plains of the U.S
Pepperweed whitetop	*Cardaria draba*	Europe
Common crupina	*Crupina vulgaris*	Eastern Mediterranean region
Jointed goatgrass	*Aegilops cylindrica*	Southern Europe and western Asia
Meadow hawkweed	*Hieracium caespitosum*	Europe
Orange hawkweed	*Hieracium aurantiacum*	Europe
Poison hemlock	*Conium maculatum*	Europe
Johnsongrass	*Sorghum halepense*	Mediterranean
White knapweed	*Centaurea diffusa*	Eurasia
Russian knapweed	*Acroptilon repens*	Southern Russia and Asia
Spotted knapweed	*Centaurea bibersteinii*	Europe
Purple loosestrife	*Lythrum salicaria*	Europe
Mat nardusgrass	*Nardus stricta*	Eastern Europe
Silverleaf nightshade	*Solanum elaeagnifolium*	Central United States
PunctureVine	*Tribulus terrestris*	Europe
Tansy ragwort	*Senecio jacobaea*	Eurasia
Rush skeletonweed	*Chondrilla juncea*	Eurasia
Wolf's milk	*Euphorbia esula*	Eurasia
Yellow star thistle	*Centaurea solstitialis*	Mediterranean and Asia
Canadian thistle	*Cirsium arvense*	Eurasia
Musk thistle	*Carduus nutans*	Eurasia
Scotch cottonthistle	*Onopordum acanthium*	Europe
Dalmatian toadflax	*Linaria dalmatica*	Mediterranean
Yellow toadflax	*Linaria vulgaris*	Europe

bluebunch wheatgrass by 88 percent. Elk use was reduced by 98 percent on range dominated with spotted knapweed compared to bluebunch-dominated sites (Columbia County Weed Board 2000). Other problem exotic plant species in the Subbasin include rush skeletonweed, spikeweed (*Hemizonia pungens*), and perennial pepperweed (*Lepidium latifolium*).

Control of exotic plant species is critical to the maintenance of native shrubsteppe and grassland habitats, productive livestock rangelands, and the preservation of native wildlife species. The diversity of terrestrial birds was positively correlated with plant diversity. Surveys of shrubsteppe ecosystems conducted by WDFW showed that sage thrasher, sage sparrow, and white crowned sparrow occurrence was negatively correlated with percent cover of annual grass. None of the 15 bird and small mammal species in the study showed a positive correlation with percent annual grass cover (Dobler *et al.* 1996). Columbian sharp-tailed grouse prefer eating native vegetation rather than introduced species, although cultivated grains supplement their diet (Hays *et al.* 1998).

3.1.3 Vegetation Zones

Cassidy (1997) identified six historic (potential) vegetation zones (i.e., high open conifers, grand fir, sub-alpine fir, ponderosa pine, wheatgrass/fescue steppe, and shrub dominated central arid steppe) that occurred within the Washington State portion of the Subbasin (Figure 13). The ponderosa pine, central arid steppe (shrub dominated), and wheatgrass/fescue steppe vegetation zones are described in detail in section 4.1.7.3 in Ashley and Stovall (unpublished report, 2004). Three of the vegetation zones comprise focal habitat types (ponderosa pine, wheatgrass/fescue steppe, and central arid steppe). The eastside (interior) grassland focal habitat type corresponds to the wheatgrass/fescue steppe vegetation zone while the shrubsteppe focal habitat type is analogous to the central arid steppe vegetation zone.

Nearly 91 percent of the wheatgrass/fescue vegetation zone in Washington State is in agricultural production with most non-farmed areas grazed by livestock for at least a portion of the year. Considerably less (less than 3 percent) of the ponderosa pine vegetation zone has been converted to agriculture. Similarly, approximately 1 percent of the central arid steppe and grand fir vegetation zones are farmed (Figure 14). Although other vegetation zones are not currently in agriculture, grazing occurs in canyon grassland steppe, ponderosa pine, and other forested vegetation zones. In addition, much of the forested vegetation zones are in an early or unknown seral condition (Figure 14). Vegetation zone status is summarized in Table 8.

A comparison between acreage figures derived from Washington GAP data (Cassidy 1997) and NHI data (2003) is not possible because corollary GAP data from Oregon are not available. This data gap will be addressed in the near future as additional GIS support in both Oregon and Washington becomes available.

3.1.4 Wildlife Habitats

Thirteen habitat types are present in the Subbasin and are briefly described in Table 9 (NHI data include both Washington and Oregon). NHI data suggests that upland aspen forest (5,934 acres) and lodgepole pine forest and woodland (742 acres) habitat types historically occurred in the Subbasin, but are no longer present due largely to changes in seral forest communities. Detailed descriptions of habitat types are located in Appendix B in Ashley and Stovall (unpublished report, 2004).

3.1.5 Changes in Wildlife Habitat

Dramatic changes in wildlife habitat have occurred throughout the Subbasin since pre-European settlement (circa 1850). In addition to agriculture and urban environments, conifer forest and shrubsteppe habitat types have increased significantly from historic levels.

Mixed conifer forest types have increased primarily because early seral forest communities have replaced logged forests, and fire protection measures have fostered conditions that allow development of dense forest understory and encroachment of conifers onto grassland habitats (USDA 1979). Similarly, fire control measures and plant community response to livestock grazing are primarily responsible for the significant increase in shrubsteppe habitat that has occurred since 1850. Habitat changes are illustrated in Figure 15 and Figure 16 (NHI 2003).

NHI (2003) data clearly documents the change (84 percent loss) in eastside (interior) grasslands due largely to conversion to agriculture (Figure 14). Upland lodgepole forest/woodlands and upland aspen forests have disappeared completely from the landscape over the preceding 150 years (NHI 2003). In both cases, periodic fires were

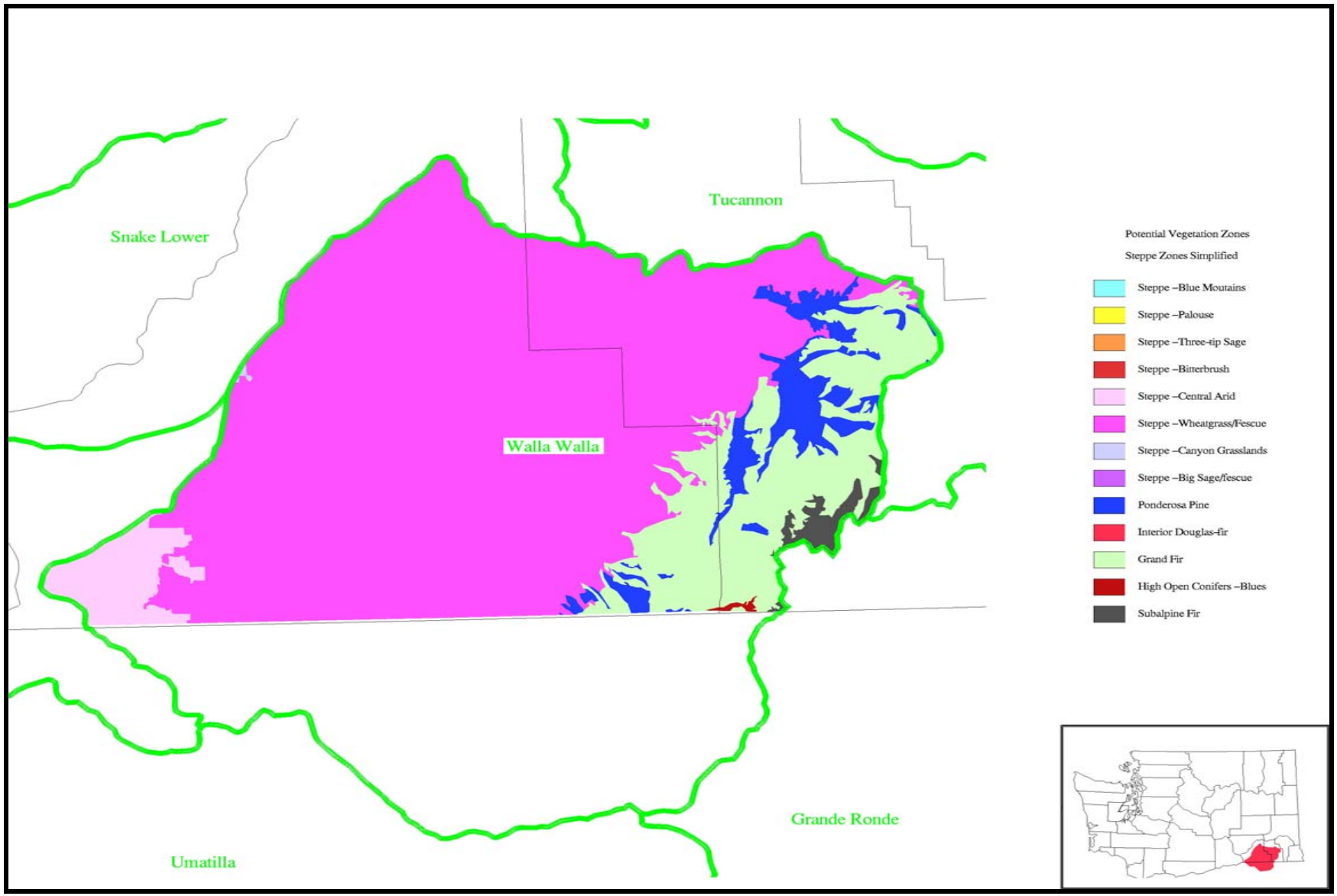

Figure 84. GAP vegetation zones in the Walla Walla subbasin (Cassidy 1997).

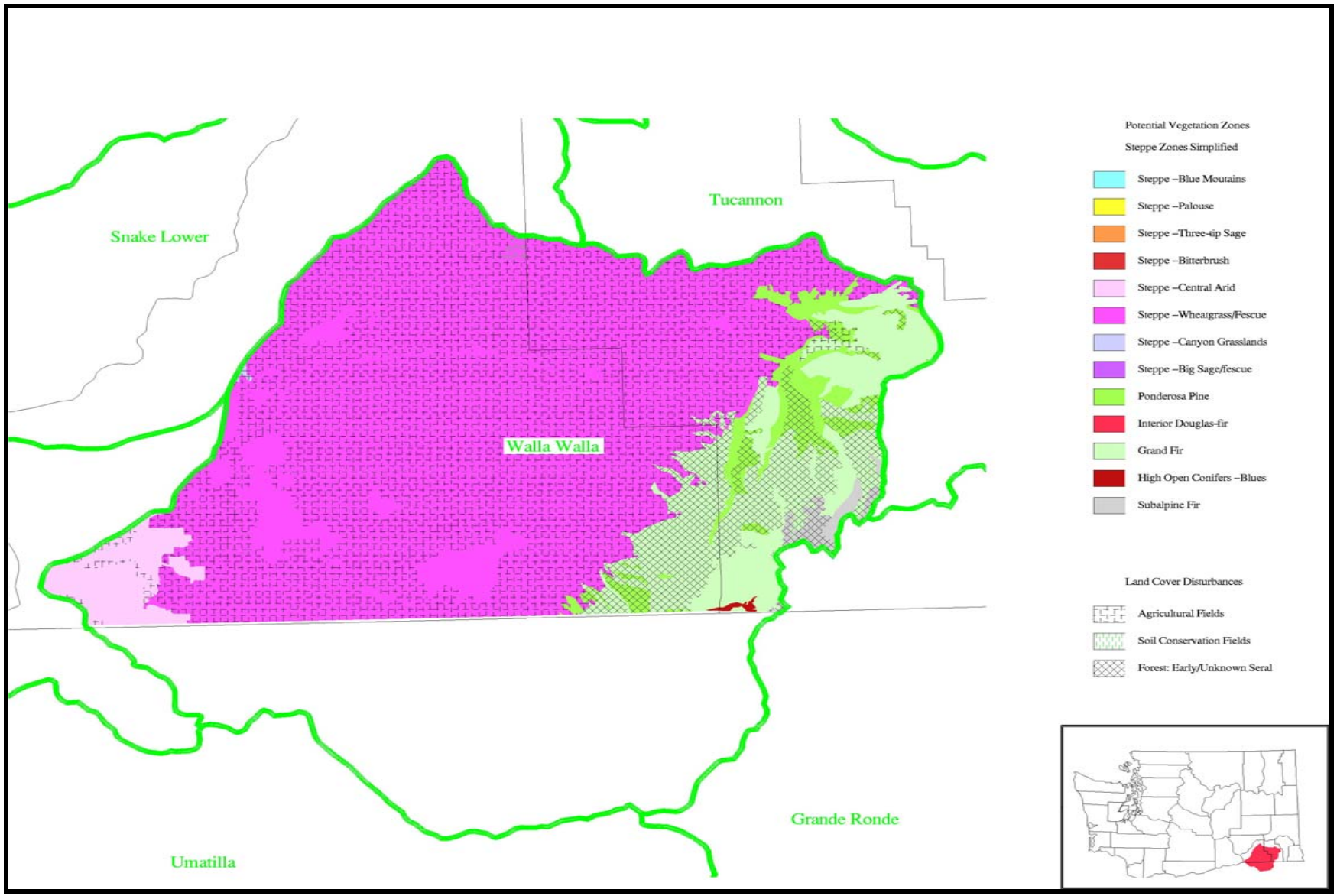

Figure 85. Relationship between vegetation zones and agriculture in the Walla Walla subbasin, Washington (Cassidy 1997).

Table 66. Historic and current extent of vegetation zones in the Walla Walla subbasin (Cassidy 1997).

Status	Vegetation Zone						
	Grand Fir (Acres)	High Open Conifers (Acres)	Subalpine Fir (Acres)	Ponderosa Pine (Acres)	Central Arid Steppe (Acres)	Wheatgrass Fescue Steppe (Acres)	Total (Acres)
Historic (potential)	118,943	710	9,379	40,569	31,533	606,971	808,105
Agriculture	-1,698	-0	-0	-940	-3,782	-551,056	-557,476
Current	117,245	710	9,379	39,629	27,751	55,915	250,629
Note: This table includes Washington State data only – Oregon data not available.							

Table 67. Wildlife habitat types in the Walla Walla subbasin (NHI 2003).

Habitat Type	Brief Description
Montane Mixed Conifer Forest	Coniferous forest of mid-to upper montane sites with persistent snowpack; several species of conifer; understory typically shrub-dominated
Eastside (Interior) Mixed Conifer Forest	Coniferous forests and woodlands; Douglas-fir commonly present, up to 8 other conifer species present; understory shrub and grass/forb layers typical; mid-montane.
Ponderosa Pine and Interior White Oak Forest and Woodland	Ponderosa pine dominated woodland or savannah, often with Douglas-fir; shrub, forb, or grass understory; lower elevation forest above steppe, shrubsteppe.
Alpine Grasslands and Shrublands	Grassland, dwarf-shrubland, or forb dominated, occasionally with patches of dwarfed trees.
Eastside (Interior) Canyon Shrublands	A mix of tall to medium deciduous shrublands in a mosaic with bunchgrass or annual grasslands.
Eastside (Interior) Grasslands	Dominated by short to medium height native bunchgrass with forbs, cryptogam crust.
Shrubsteppe	Sagebrush and/or bitterbrush dominated; bunchgrass understory with forbs, cryptogam crust.
Agriculture, Pasture, and Mixed Environs	Cropland, orchards, vineyards, nurseries, pastures, and grasslands modified by heavy grazing; associated structures.
Urban and Mixed Environs	High, medium, and low (10-29 percent impervious ground) density development.
Open Water – Lakes, Rivers, and Streams	Lakes, are typically adjacent to Herbaceous Wetlands, while rivers and streams typically adjoin Eastside Riparian Wetlands and Herbaceous Wetlands
Herbaceous Wetlands	Generally a mix of emergent herbaceous plants with a grass-like life form (graminoids). Various grasses or grass-like plants dominate or co-dominate these habitats.
Montane Coniferous Wetlands	Occurs along stream courses, as patches, or adjacent to other wetlands; >30 percent tree cover dominated by conifers; shrubs-devil's club, stink currant, salmon berry, red-osier dogwood, spirea, alder etc.
Eastside (Interior) Riparian Wetlands	Shrublands, woodlands and forest, less commonly grasslands; often multi-layered canopy with shrubs, graminoids, forbs below.

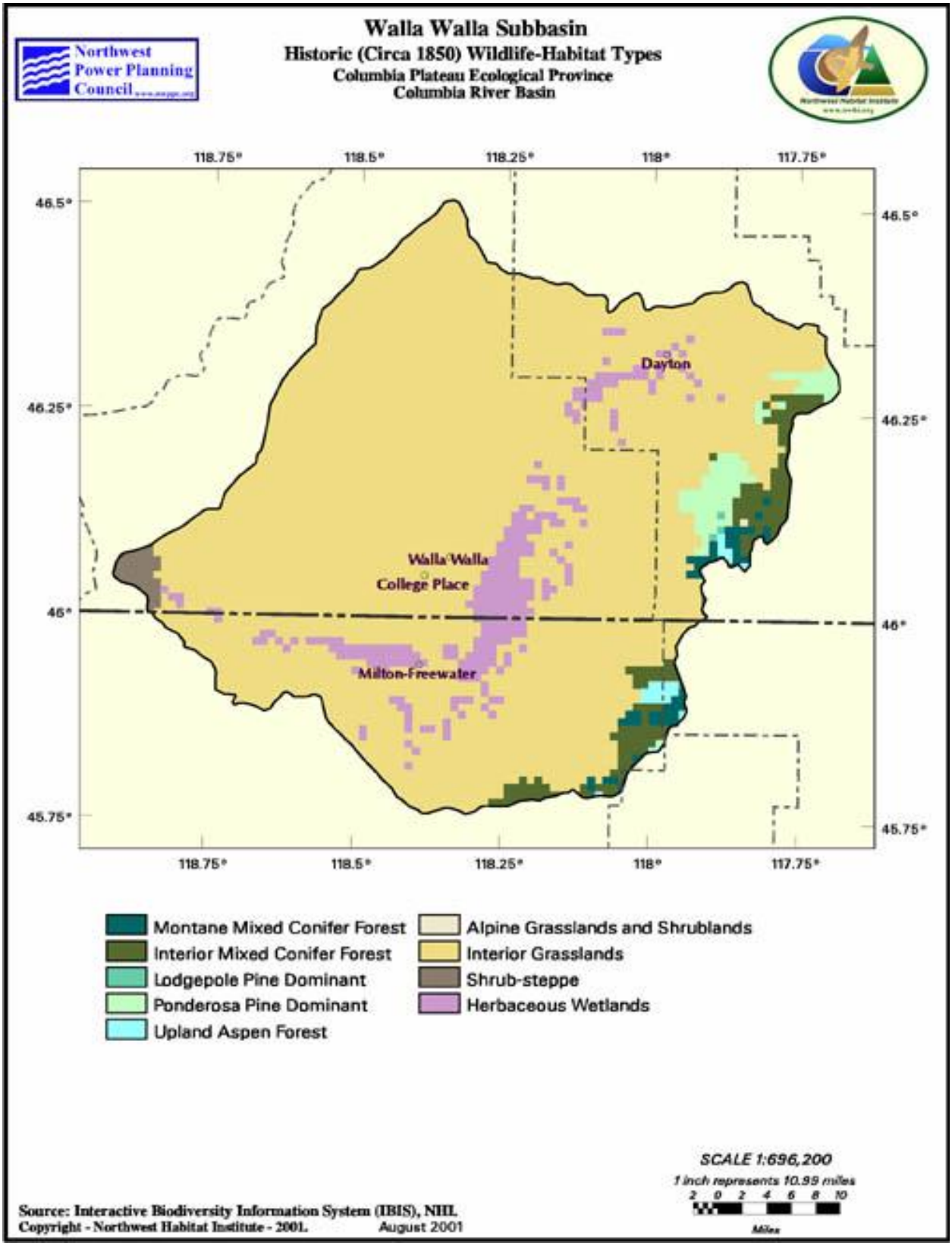

Figure 86. Historic wildlife habitat types of the Walla Walla subbasin (NHI 2003).

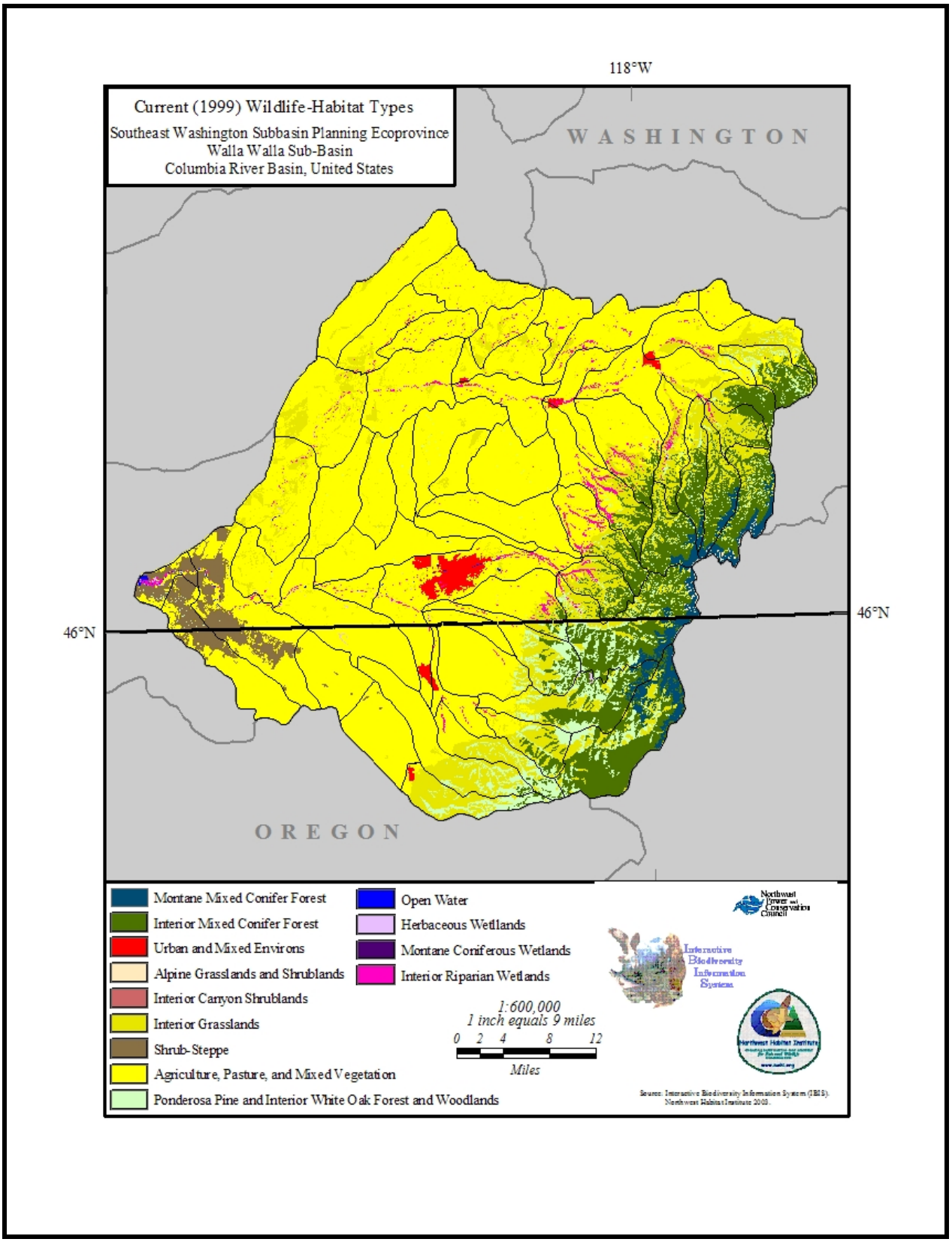

Figure 87. Current wildlife habitat types of the Walla Walla subbasin (NHI 2003).

necessary to regenerate and/or maintain stands. Fire suppression is likely the biggest contributor to the demise of these habitat types (Crawford and Kagen 2001). Quantitative changes in all Subbasin wildlife habitat types are listed in Table_10 and illustrated in Figure_17.

Ecoregion and subbasin planners believe that NHI (2003) herbaceous wetlands data and historic acreage figures for eastside riparian wetland habitat are inaccurate as listed in Table_10. Therefore, these data are not applied to management decisions in this subbasin. In addition, herbaceous wetland habitat displayed in Figure_15 historically did not exist based on Washington GAP data and expert opinion. A more realistic depiction of historic generalized habitat types, derived from Washington GAP data, is shown in Figure_18.

General subbasin hydrology is depicted in Figure_19. Historically, most subbasin wetlands were associated with perennial and intermittent streams (versus herbaceous wetlands) that drained rolling hills, much like what exists today.

3.1.5 Focal Habitats

The focal habitat selection and justification processes are described in section 4.1.3 in Ashley and Stovall (unpublished report, 2004). Focal habitats selected for the Subbasin are identical to Ecoregion focal habitats [ponderosa pine, eastside (interior) grasslands, shrubsteppe, and eastside (interior) riparian wetlands]. The number of extant acres for each focal habitat type is compared by subbasin in Table_11.

Ponderosa pine, eastside (interior) grassland, and shrubsteppe focal habitat types and agriculture (a habitat of concern) are illustrated in Figure_20. As shown, agriculture has displaced significant amounts of native grassland habitat.

3.1.6 Focal Habitat Summaries

Focal wildlife habitat types are fully described in section 4.1.7 in Ashley and Stovall (unpublished report, 2004). Only subbasin-specific focal habitat type anomalies and differences are described in this section.

3.1.6.1 Ponderosa Pine

The ponderosa pine habitat type is described in section 4.1.7.1 in Ashley and Stovall (unpublished report, 2004). Changes in ponderosa pine distribution in the Washington portion of the Subbasin from circa 1850 to 1999 are illustrated in Figure_15 and Figure_16.

Historically (circa 1850), the ponderosa pine habitat type covered approximately 23,000 acres in the foothills of the Blue Mountains (NHI 2003). Since ponderosa pine is a valuable timber resource, large mature stands were among the first to be harvested after European settlement (USFS 1990). The thick bark of ponderosa pine allows it to withstand ground fires better than the thin-barked true firs, giving it an advantage in areas with a short fire return interval. Fire suppression has allowed the shade-tolerant fir species time to establish in the understory of ponderosa pine forest. Fir will eventually become dominant when the canopy becomes dense enough that the shade-intolerant ponderosa pine seedlings cannot survive (Johnson 1994). Extant ponderosa pine habitat within the Subbasin currently covers a wide range of seral conditions.

Today, more than twice the historical amount (nearly 50,000 acres) of ponderosa pine habitat occurs in the Subbasin with the vast majority located in Oregon (NHI 2003). Forest management and fire suppression have led to the replacement of old-growth ponderosa pine forests by younger forests with a greater proportion of Douglas-fir than ponderosa pine (Habeck

Table 68. Changes in wildlife habitat types from circa 1850 (historic) to 1999 (current) in the Walla Walla subbasin (NHI 2003).

Subbasin	Status	Montane Mixed Conifer Forest	Interior Mixed Conifer Forest	Lodgepole Pine Forest & Woodlands	Ponderosa Pine	Upland Aspen Forest	Alpine Grasslands and Shrublands	Interior Canyon Shrublands	Eastside (Interior) Grasslands	Shrub-steppe	Agriculture, Pasture, and Mixed Environs	Urban and Mixed Environs	Lakes, Rivers, Ponds, and Reservoirs	Herbaceous Wetlands (1)	Montane Coniferous Wetlands	Eastside (Interior) Riparian Wetlands
Walla Walla	Historic	13,351	43,515	742	23,241	5,934	247	0	962,275	6,676	0	0	0	70,217	0	22,283
	Current	22,003	120,484	0	49,904	0	872	544	154,619	29,252	719,877	11,473	768	1,135	51	15,217
	Change (acres)	+8,652	+76,969	-740	+26,663	-5,934	+625	+544	-807,656	+22,576	+719,877	+11,473	+768	-68,083	51	-7,066
	Change (%)	+65	+177	-100	+115	-100	+253	999	-84	+338	999	999	999	-98	999	-32
Note: Values of 999 indicate a positive change from historically 0 (habitat not present or not mapped in historic data). (1). No confidence in data. NHI eastside (interior) riparian wetland data are inaccurate, so StreamNet data (2003) were used.																

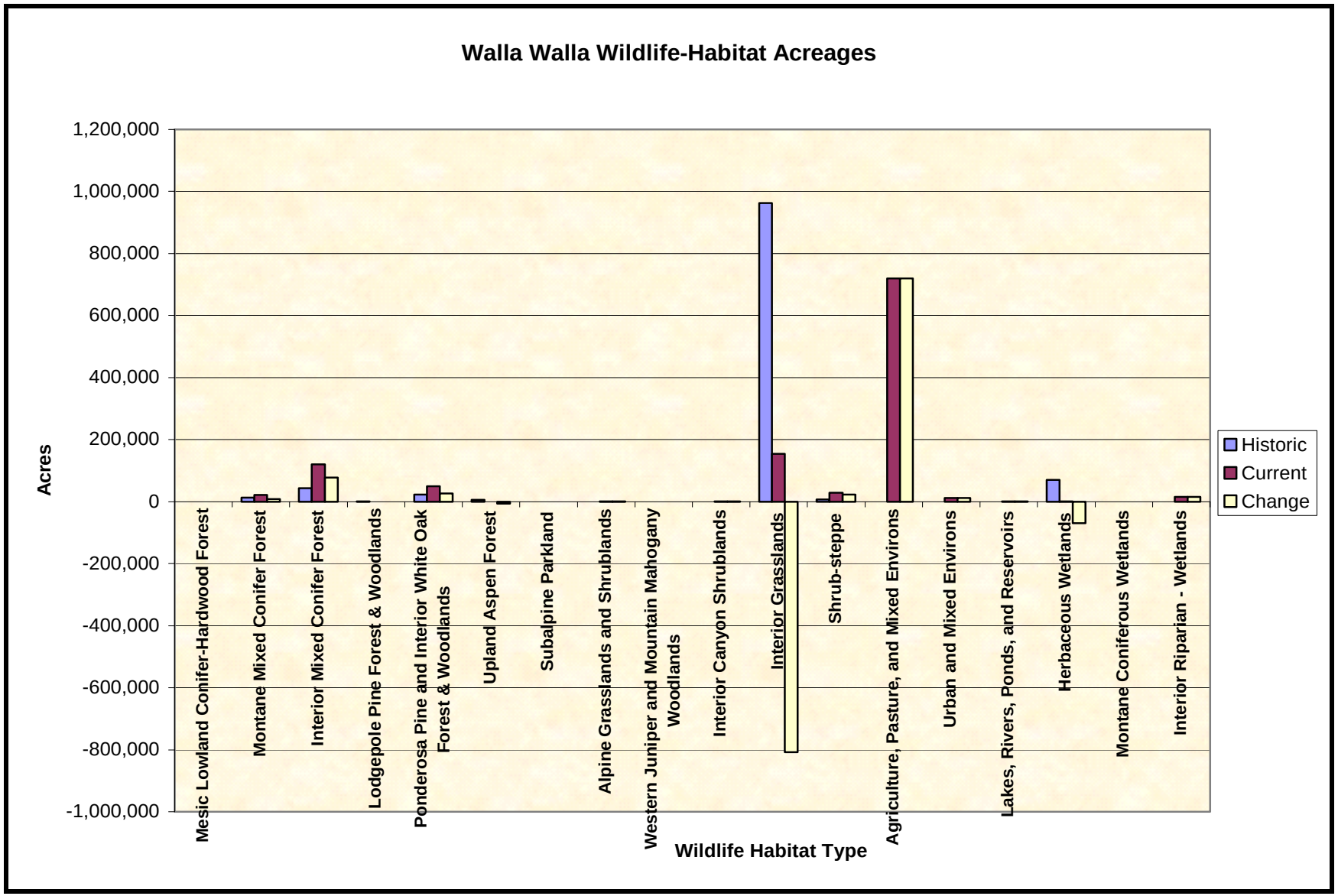

Figure 88. Wildlife habitat acreage and associated change in the Walla Walla subbasin (NHI 2003).

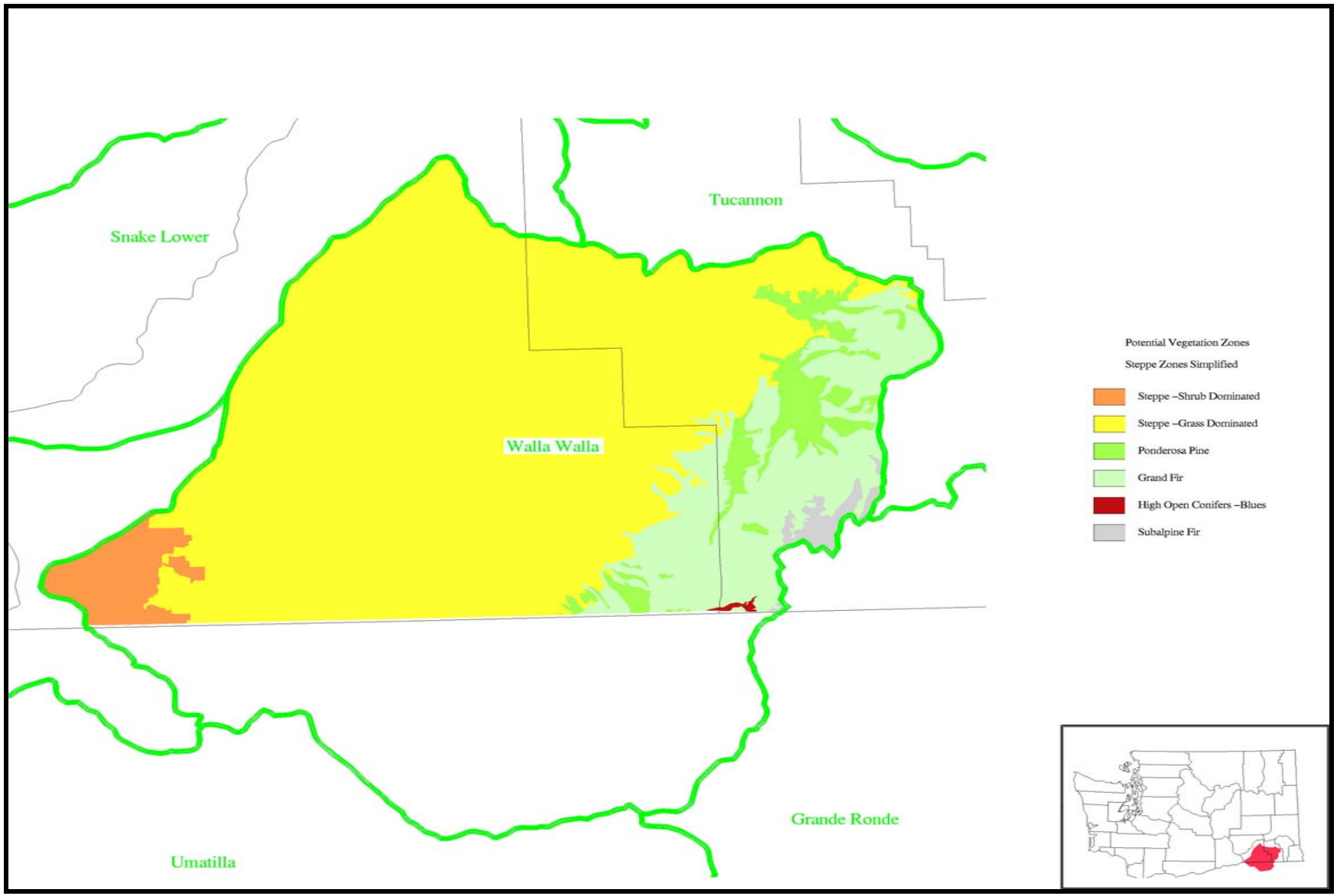

Figure 89. Historic (potential) habitat types, based on Washington GAP data (Cassidy 1997).

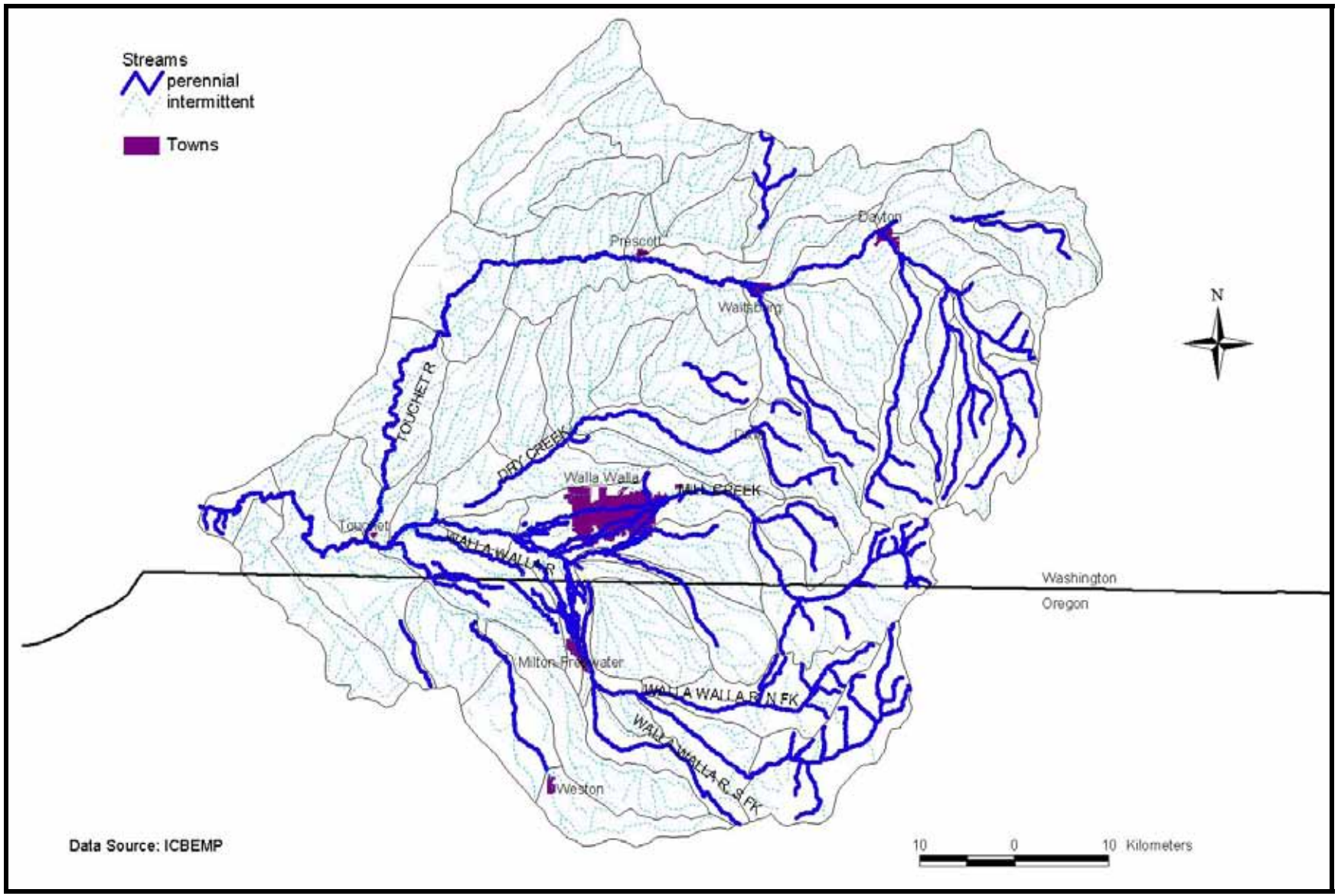

Figure 90. Walla Walla subbasin hydrology (NPPC 2001).

Table 69. A subbasin comparison of the current extent of focal habitat types in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003, StreamNet 2003).

Subbasin	Focal Habitat			
	Ponderosa Pine (Acres	Shrubsteppe (Acres)	Interior Grassland (Acres)	Riparian Wetland (Acres)
Asotin	14,997	0	134,789	1,687
Palouse	48,343	159,305	356,638	7,923
Lower Snake	1,014	6,505	416,207	3,180
Tucannon	9,918	0	114,263	4,512
Walla Walla	49,904	29,252	154,619	15,217

1990). Clear-cut logging and subsequent reforestation have converted many older stands of ponderosa pine/Douglas-fir forest to young structurally simple ponderosa pine stands (Wright and Bailey 1982).

Moreover, introduced annuals, especially cheatgrass, and invading shrubs under heavy grazing pressure (Agee 1993), have replaced native herbaceous understory species. Four exotic knapweed species are spreading rapidly through the ponderosa pine zone and threatening to replace cheatgrass as the dominant increaser after grazing (Roche and Roche 1988). Dense cheatgrass stands eventually change the fire regime of these stands often resulting in stand replacing, catastrophic fires. Bark beetles, primarily of the genus *Dendroctonus* and *Ips*, kill thousands of pines annually and are the major mortality factor in commercial saw timber stands (Schmid 1988 in Howard 2001).

The Subbasin clearly supports the most positive change in ponderosa pine habitat within the Ecoregion as illustrated in Figure_21. Flammulated owls are one of the many species dependent on mature ponderosa pine forests. Their current population status is unknown; however, wildlife biologists suspect that populations have declined as the vast majority of ponderosa pine habitat is in an early seral stage. *From and Ecoregion perspective, strategies that protect intact ponderosa pine habitats, foster mature ponderosa pine forest conditions, and reduce competition from fir trees should be pursued by wildlife/land managers.*

Current and historic acreages and percent change for the ponderosa pine habitat type are compared by subbasin in Figure_22. Ponderosa pine habitat has increased more than 100 percent in the Walla Walla and Lower Snake subbasins since 1850 while the Tucannon, Asotin, and Palouse subbasins have experienced a significant loss (greater than 50 percent) of ponderosa pine habitat (NHI 2003).

3.1.6.1.1 Protection Status

The protection status of the ponderosa pine habitat type for Ecoregion subbasins is compared in Figure_23. The protection status of remaining ponderosa pine habitats in all subbasins fall primarily within the “low” to “no protection” status categories. As a result, this habitat type will likely suffer further degradation, disturbance, and/or loss in all Ecoregion subbasins. Protection status of ponderosa pine habitat within the Subbasin is listed in Table_12.

3.1.6.1.2 Factors Affecting Ponderosa Pine Habitat

Factors affecting ponderosa pine habitat are described in section section 4.1.7.1 in Ashley and Stovall (unpublished report, 2004) and summarized below.

- Timber harvesting, particularly at low elevations, has reduced the amount of old growth forest and associated large diameter trees and snags

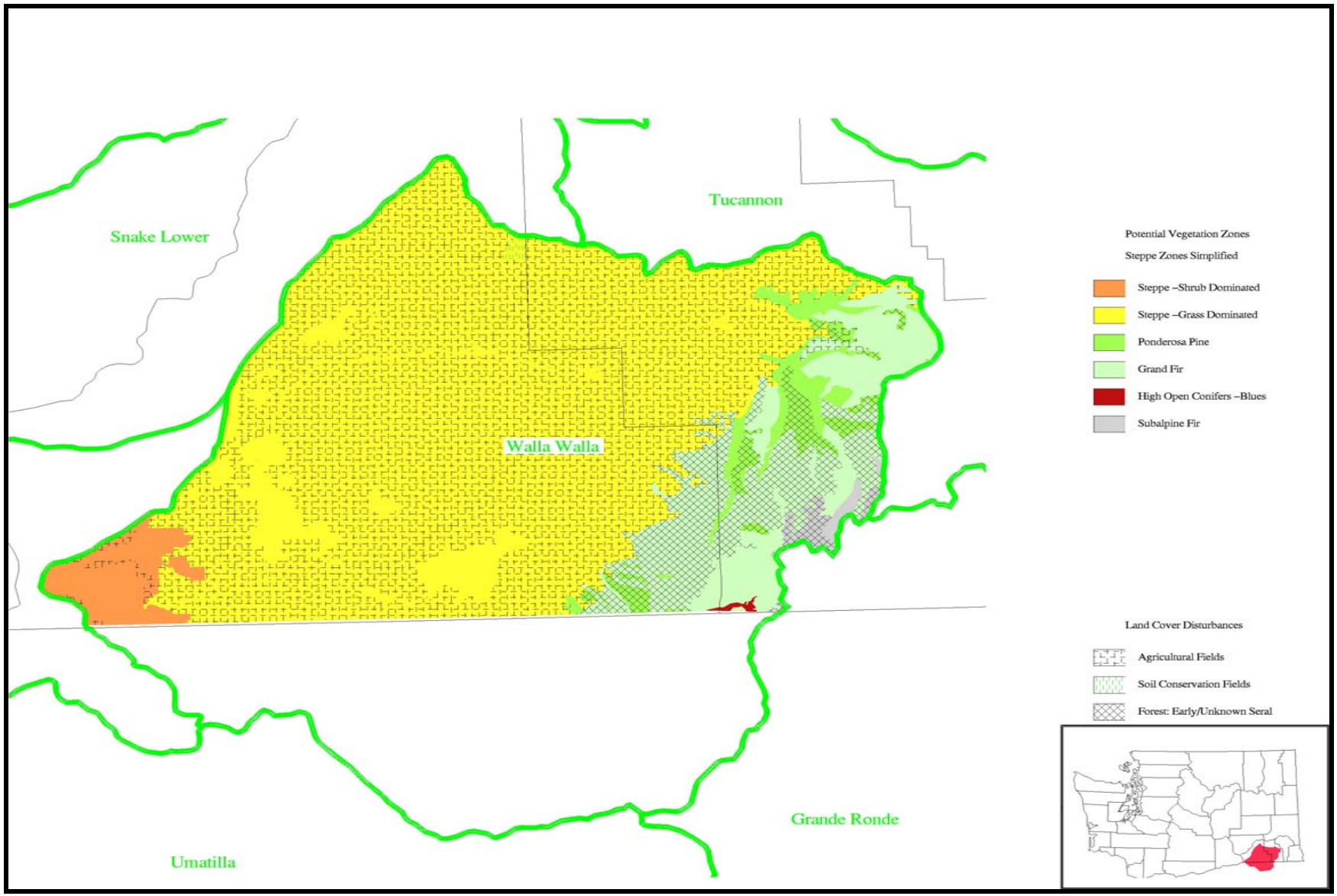

Figure 91. Ponderosa pine, grassland, and shrubsteppe habitat types and land cover disturbances in the Walla Walla subbasin, Washington (Cassidy 1997).

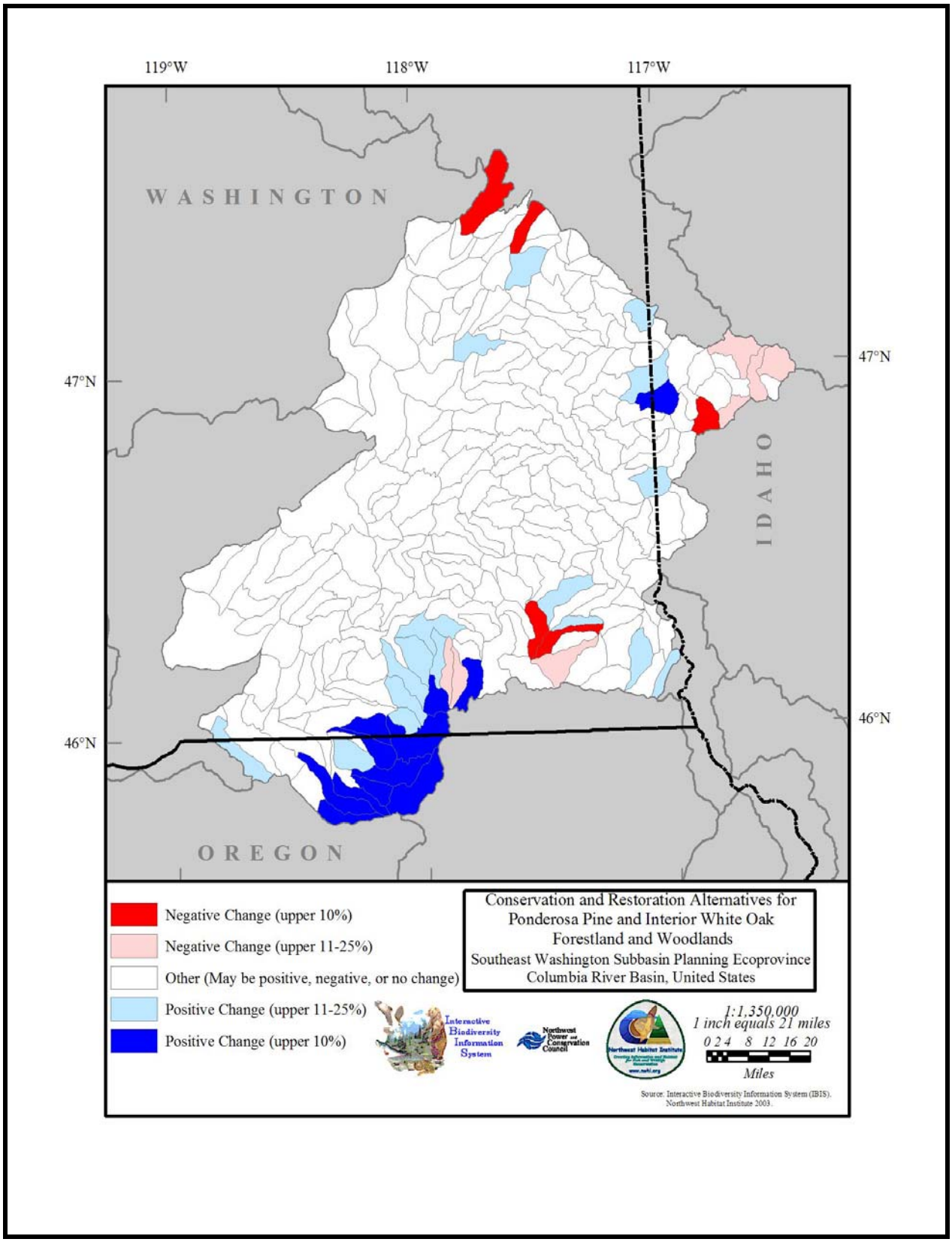

Figure 92. Ponderosa pine habitat change in the Ecoregion (NHI 2003).

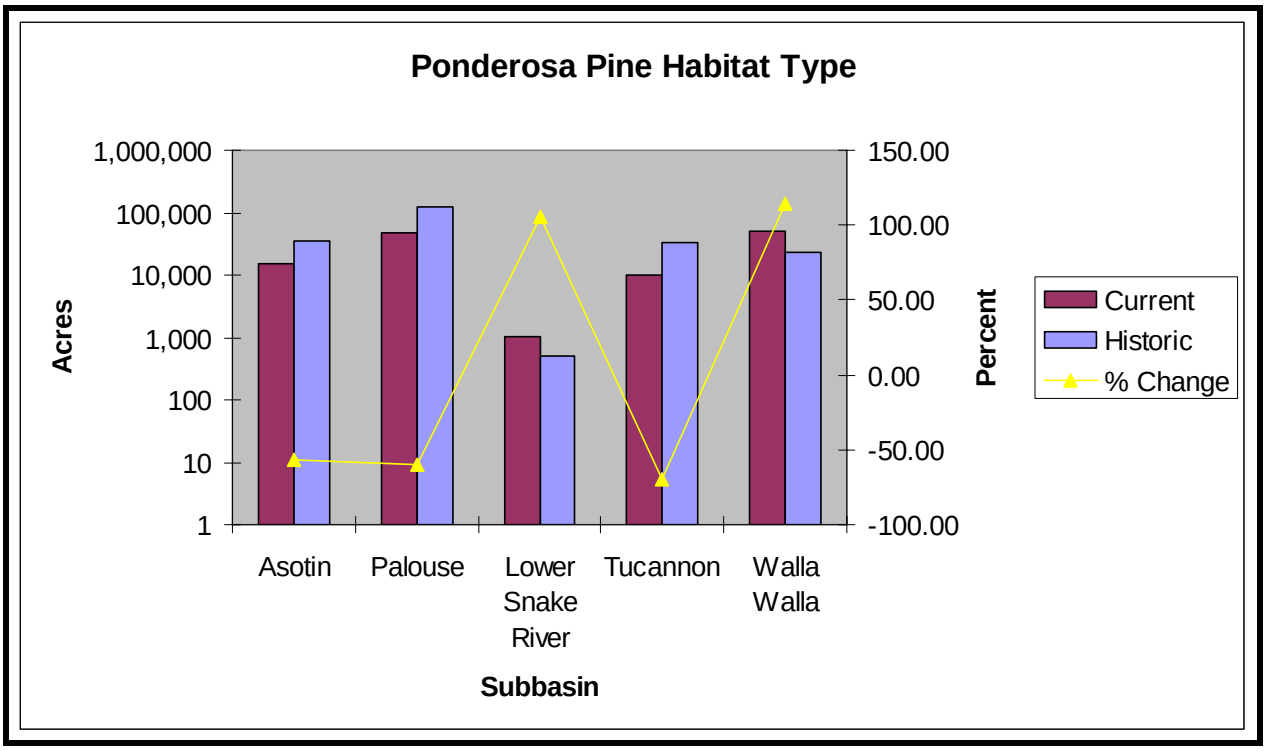

Figure 93. A subbasin comparison of the ponderosa pine habitat type in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

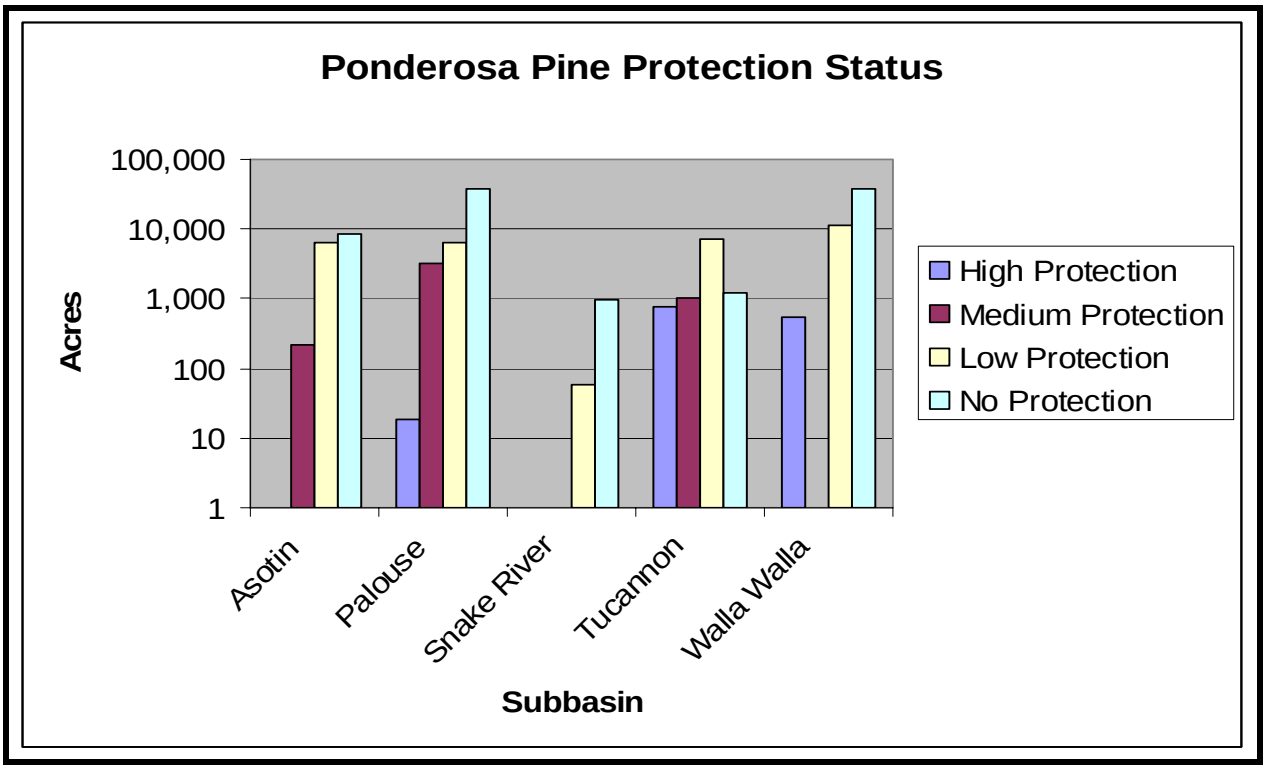

Figure 94. Ponderosa pine GAP protection status in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

Table 70. Ponderosa pine habitat GAP protection status in the Walla Walla subbasin (NHI 2003).

Gap Protection Status	Acres
High Protection	544
Medium Protection	0
Low Protection	11,229
No Protection	38,130

- Urban and residential development has contributed to loss and degradation of properly functioning ecosystems
- Fire suppression/exclusion has contributed towards habitat degradation, particularly declines in characteristic herbaceous and shrub understory from increased density of small shade-tolerant trees
- High risk of loss of remaining ponderosa pine overstories from stand-replacing fires due to high fuel loads in densely stocked understories
- Overgrazing has resulted in lack of recruitment of sapling trees, particularly pines
- Invasion of exotic plants has altered understory conditions and increased fuel loads
- Fragmentation of remaining tracts has negatively impacted species with large area requirements

3.1.6.1.3 Recommended Future Condition

Recommended future conditions are described in section 4.1.7.1.3 in Ashley and Stovall (unpublished report, 2004). Recommended conditions for the ponderosa pine habitat type are identical to those described for the Ecoregion and are summarized in the ensuing paragraphs.

Condition 1 – mature ponderosa pine forest: Large patches (greater than 350 acres) of open mature/old growth ponderosa pine stands with canopy closures between 10 and 50 percent and nesting stumps and snags greater than 31 inches DBH.

*Condition 2 – multiple canopy ponderosa pine mosaic: M*ultiple canopy, mature ponderosa pine stands or mixed ponderosa pine/Douglas-fir forest interspersed with grassy openings and dense thickets. Low to intermediate canopy closure, two-layered canopies, tree density of 508 trees/acre (9-foot spacing), basal area of 250 $ft.^2$/acre, and snags greater than 20 inches DBH 3-39 feet tall. At least one snag greater than 12 inches DBH/10 acres and 8 trees/acre greater than 21 inches DBH.

Condition 3 – Dense canopy closure ponderosa pine forest: Greater than 70 percent canopy closure of trees greater than 40 feet in height.

3.1.6.2 Eastside (Interior) Grassland

The eastside (interior) grassland habitat type is fully described in section 4.1.7.3 in Ashley and Stovall (unpublished report, 2004). Grassland habitat in the Subbasin is comprised of the wheatgrass/fescue vegetation zone (Figure 13). Oregon vegetation zones are included in Appendix A.

Dominant perennial grasses, on undisturbed sites, consist of bluebunch wheatgrass, Idaho fescue, and Sandberg bluegrass. The eastern lowlands of the subbasin receive more precipitation and were historically dominated by Idaho fescue (Clarke and Bryce 1997). Although limited, shrubs including rabbitbrush and sagebrush are scattered across the landscape. A large number of forbs are also present. Balsamroot, cinquefoil, and old man's

whiskers (*Geum triflorum*) are among those with the highest mean cover (Daubenmire 1970; Franklin and Dyrness 1973).

On disturbed grassland sites, agricultural crops replaced native grasslands. Livestock graze most of the historic grassland habitat not cultivated (NPPC 2001). Livestock overgrazing and competition from introduced weed species such as cheatgrass, knapweed, and yellow starthistle have dramatically altered native plant communities. Overgrazing leads to replacement of native vegetation by exotic annuals, particularly cheatgrass and yellow starthistle (Mack 1986; Roche and Roche 1988). A 1981 survey of vegetation zone conditions rated wheatgrass/fescue grasslands poor to fair (Aller *et al.* 1981; Harris and Chaney 1984).

Heavy grazing pressure, combined with little emphasis on range management, has seriously deteriorated rangeland condition (USDA 1991). Range transects conducted since the 1991 survey has confirmed the degraded condition of rangeland in the subbasin (C. Smith, NRCS, personal communication, 1995). Native bluebunch wheatgrass, Idaho fescue, and forbs that once dominated the landscape are largely displaced by introduced weed species. Today, perennial bunchgrass/shrub communities exist only on a few “eyebrows” on steep slopes surrounded by wheat fields, or in non-farmed canyon slopes and bottoms within agricultural areas (Figure 20).

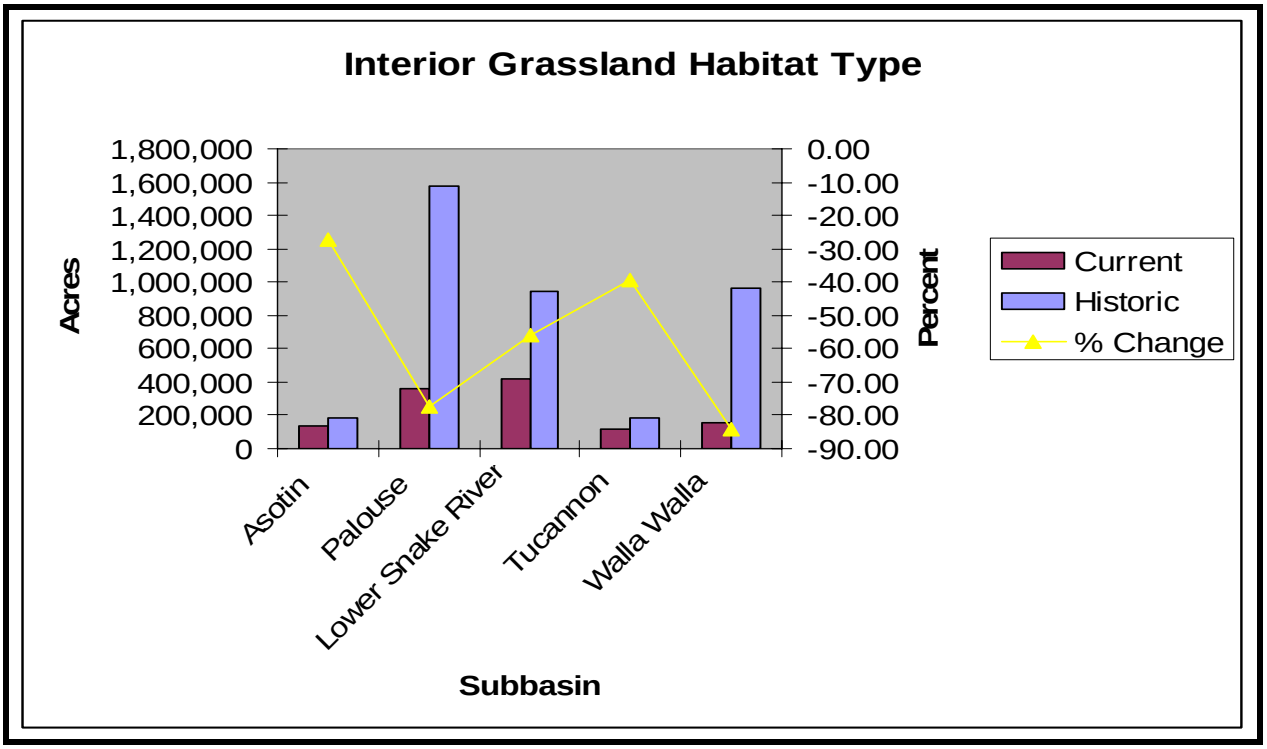

Figure 95. A subbasin comparison of the eastside (interior) grassland habitat type in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

Current and historic acreages and percent change for the eastside (interior) grassland habitat type are compared by subbasin in Figure 24. The extent of grassland habitat has declined in all Ecoregion subbasins. GAP data indicates nearly 91 percent of all grassland habitats within the Washington portion of the Subbasin are cultivated (Cassidy 1997). Similarly, NHI (2003) data suggest that grasslands throughout the entire Subbasin have declined by 84 percent due

primarily to conversion to agriculture. Although significant amounts of grassland habitat came under cultivation in the Palouse subbasin, the highest relative negative change within the entire Ecoregion occurred in the Walla Walla subbasin. Grassland habitats decreased the least in the Tucannon and Asotin subbasins largely because topoedaphic features including steep canyons and shallow soils made farming difficult and/or unprofitable.

Change in Ecoregion grassland habitats is graphically summarized in Figure_25. With exception of the Asotin and Tucannon subbasins, Ecoregion subbasins have experienced between a 50 percent and 100 percent loss in grassland habitats.

3.1.6.2.1 Protection Status

The protection status of the eastside (interior) grassland habitat type is compared by Ecoregion subbasin in Figure_26. The Subbasin has over 1,400 acres of grassland in high protection status. A similar amount of grassland is under high protection status in the Tucannon subbasin. In contrast, high protection status grasslands are non-existent in the Asotin and Palouse subbasins. While the extent of medium protection grasslands is similar for all Ecoregion subbasins except the Walla Walla, which has none, the vast majority of Ecoregion grassland habitat is not protected and is at risk for further degradation and/or conversion to other uses. The GAP protection status of grasslands in the Subbasin is listed in Table_13.

Grassland habitats established through CRP implementation receive short-term/high protection. The number of acres protected by CRP is compared by county in Figure_27 and listed in Table_5. The contribution of CRP relative to providing grassland structural conditions and wildlife habitat is significant at both the subbasin and Ecoregion levels.

Table 71. Eastside (interior) grassland GAP protection status in the Walla Walla subbasin (NHI 2003).

GAP Protection Status	Acres
High Protection	1,478
Medium Protection	0
Low Protection	16,457
No Protection	136,674

3.1.6.2.2 Factors Affecting Eastside (Interior) Grassland Habitat

Factors affecting grassland habitat are described in section 4.3.9.2 in Ashley and Stovall (2004) and summarized below:

- Extensive permanent habitat conversions of grassland habitats
- Fragmentation of remaining tracts of moderate to good quality grassland habitat
- Degradation of habitat from intensive grazing and invasion of exotic plant species, particularly cheatgrass, knapweed, and yellow-star thistle
- Degradation and loss of properly functioning grassland ecosystems resulting from the encroachment of urban and residential development and conversion to agriculture
- Conversion of Conservation Reserve Program (CRP) lands back to cropland
- Loss and reduction of cryptogamic crusts, which help maintain the ecological integrity of grassland communities
- Fire management, either suppression, wildfires, or over-use
- Invasion and seeding of crested wheatgrass and other introduced plant species that reduces wildlife habitat quality and/or availability

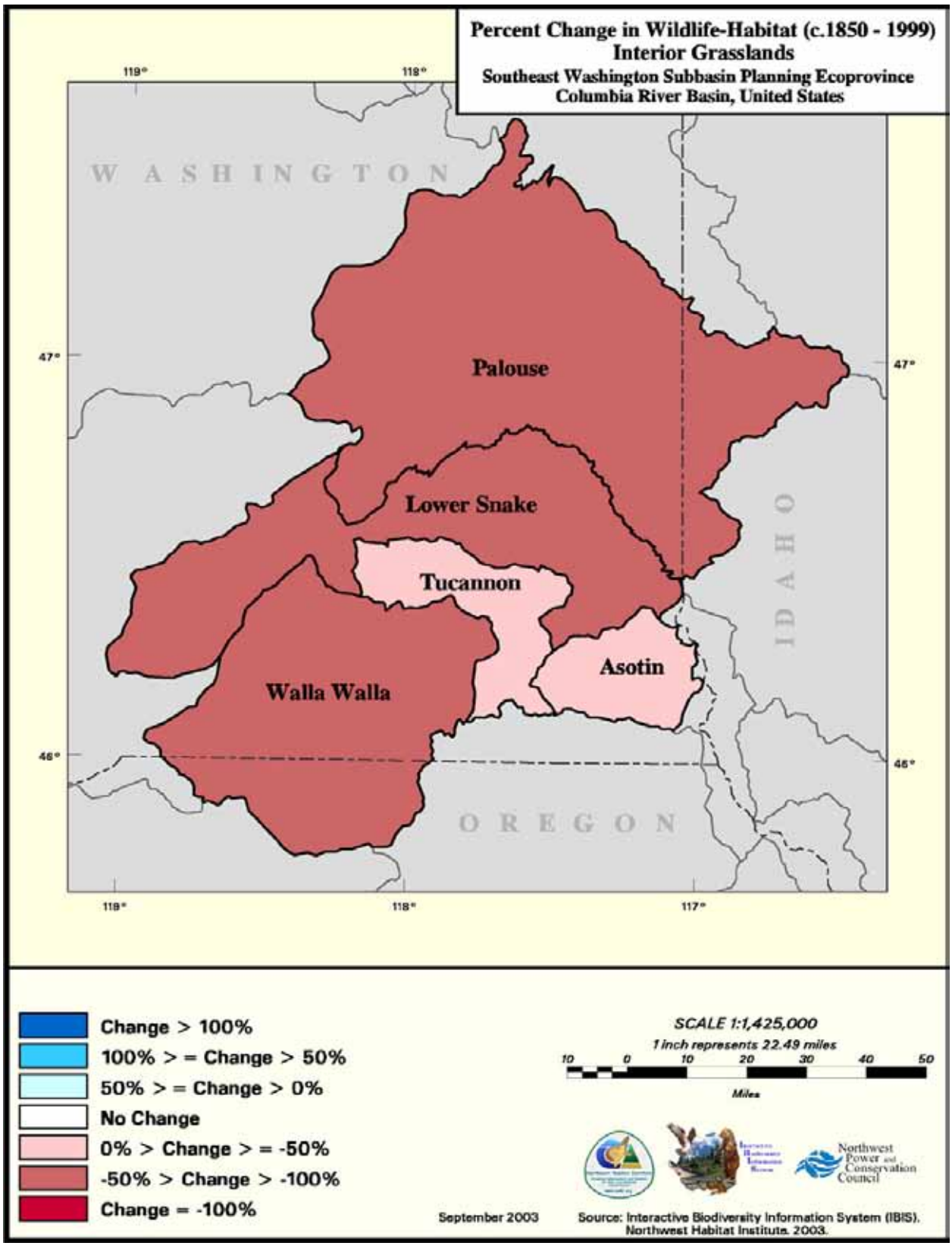

Figure 96. Changes in eastside (interior) grassland in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

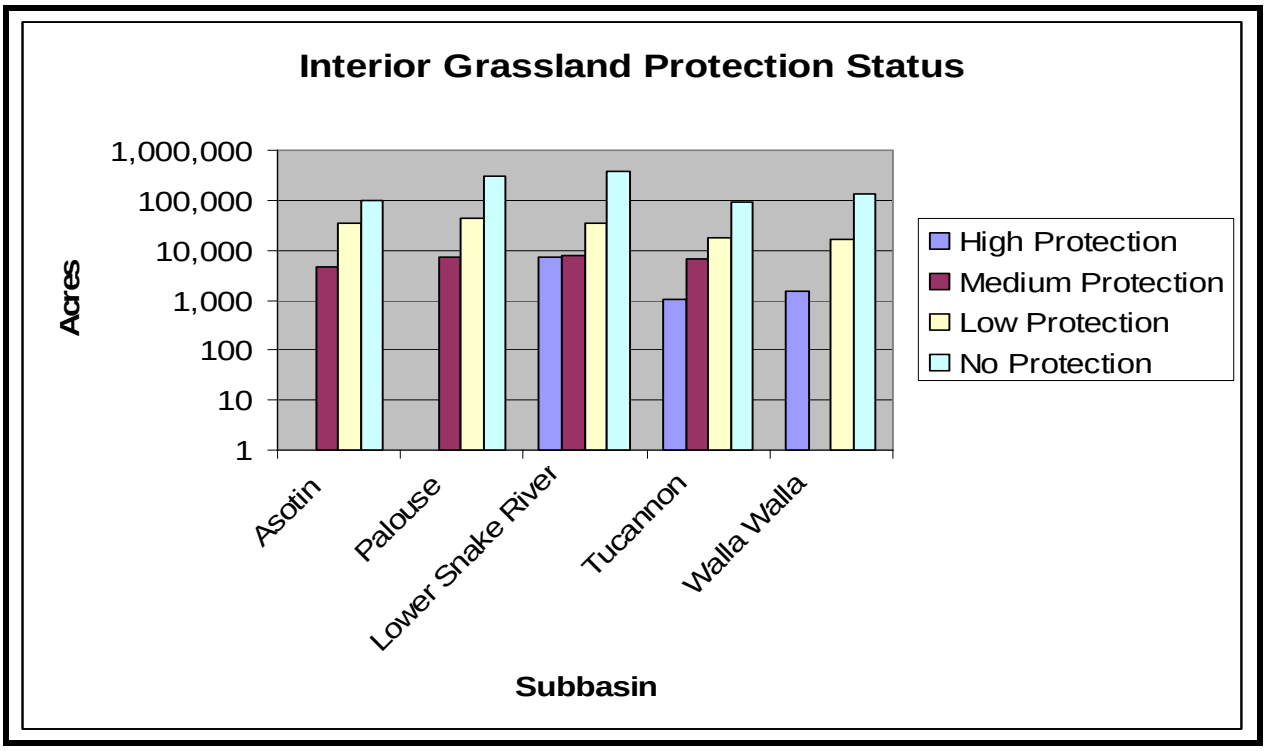

Figure 97. Eastside (interior) grassland GAP protection status in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

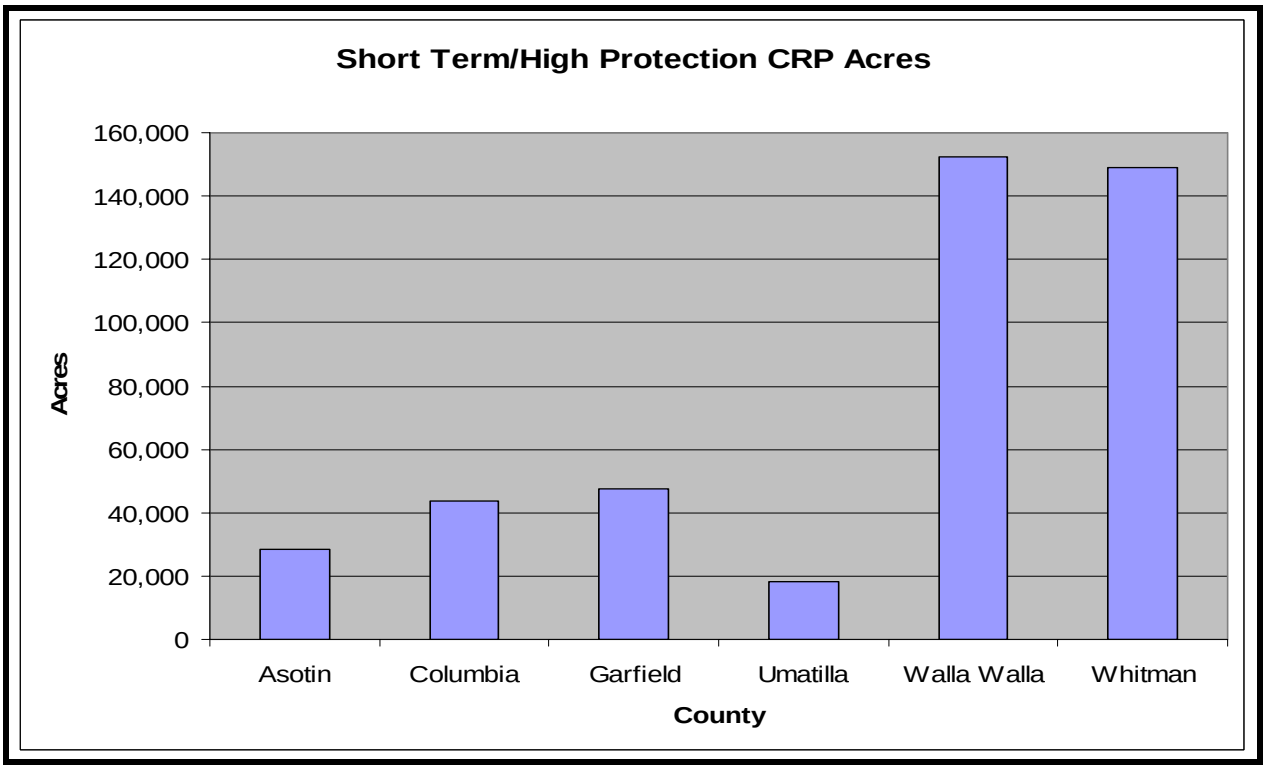

Figure 98. The number of acres of grassland habitat protected through CRP (FSA, unpublished data).

3.1.6.2.3 Recommended Future Condition

Recommended future conditions are described in detail in section 4.1.7.3.3 in Ashley and Stovall (unpublished report, 2004). General recommended conditions for eastside (interior) grassland habitat in the Subbasin include contiguous tracts of native bunchgrass and forbs plant communities with less than 5 percent shrub cover and less than 10 percent exotic vegetation. In xeric, brittle environments and sites dominated by shallow lithosols soils, areas between bunchgrass culms should support mosses and lichens (cryptogamic crust). In contrast, mesic (greater than 12 inches annual precipitation), deep soil sites could sustain dense stands (greater than 75 percent cover) of native grasses and forbs (conclusions drawn from Daubenmire 1970). Specific recommendations for management of grassland habitat include:

- Native bunchgrass greater than 40 percent cover
- Native forbs 10 percent to 30 percent cover
- Herbaceous vegetation height greater than 10 inches
- Visual obstruction readings (VOR) at least 6 inches
- Native non-deciduous shrubs less than 10 percent cover
- Exotic vegetation/noxious weeds less than 10 percent cover
- Multi-structured fruit/bud/catkin producing deciduous trees and shrubs dispersed throughout the landscape (at least 10 percent of the total area)

3.1.6.3 Shrubsteppe

The Shrubsteppe habitat type is fully described in section section 4.1.7.2 in Ashley and Stovall (unpublished report, 2004). Shrubsteppe habitat in the Washington portion of the Subbasin is comprised entirely of the central arid steppe vegetation zone (Figure 13).

Only a small percentage of the central arid steppe vegetation zone occurs in the Ecoregion (Walla Walla, Lower Snake, and Palouse subbasins). See Figure 22 in Ashley and Stovall (unpublished report, 2004). Historically (circa 1850), approximately 12,252 acres of central arid steppe occurred in the Washington portion of the Subbasin, while another 30,923 acres extended into the Lower Snake subbasin. Cassidy (1997) further estimated there was 6 acres of central arid steppe in the Palouse subbasin.

Big sagebrush, bluebunch wheatgrass, and Sandberg bluegrass dominate shrubsteppe climax vegetation (Daubenmire 1970). Other grass species occur in much smaller amounts including needle-and-thread, Thurbers needlegrass, Cusick's bluegrass, and/or bottlebrush squirreltail grass. Forbs play a minor role. A cryptogamic crust of lichens and mosses grows between the dominant bunchgrasses and shrubs. Without disturbance, particularly trampling by livestock, the cryptogamic crust often completely covers the space between vascular plants.

In areas with a history of heavy grazing and fire suppression, true shrublands are common and may even be the predominant cover on non-agricultural land. Most of the native grasses and forbs are poorly adapted to heavy grazing and trampling by livestock. Grazing eventually leads to replacement of the bunchgrasses with cheatgrass, Nuttall's fescue, eight flowered fescue, and Indian wheat (Harris and Chaney 1984). Several highly invasive knapweeds have become increasingly widespread. Yellow starthistle is particularly widespread, especially along and near major watercourses (Roche and Roche 1988). A 1981 assessment of range conditions rated most shrubsteppe rangelands to be in poor to fair range condition, but ecological condition is usually worse than range condition (Harris and Chaney 1984).

Most of the remaining shrubsteppe habitats occur on shallow soils or near rock outcroppings where farming is difficult. Shrubsteppe habitat is usually privately owned, relatively small, disjunct fragments of land surrounded by agriculture (Dobler *et al.* 1996). These small

shrubsteppe remnants are particularly prominent in the southern part of the Subbasin between Athena and the Washington State border (Kagan *et al.* 2000). Fragmentation compounds the negative effect of habitat loss on the shrubsteppe obligate species of the subbasin, as many areas are too small or isolated to support viable populations (NPPC 2001) and may be population sinks for some obligate species.

Current and historic acreages and percent change for shrubsteppe habitat are compared by subbasin in Figure 28. The Walla Walla subbasin is the only subbasin where shrubsteppe habitat has increased beyond historic amounts. This increase is likely the result of encroachment of shrubs due to fire suppression and changes in grassland plant communities following heavy, prolonged livestock grazing and invasion of introduced herbaceous species.

The shrubsteppe habitat type historically did not occur, nor is it present today in the Asotin or Tucannon subbasins (NHI 2003). Note that shrubsteppe habitat has decreased more than 50 percent in the other subbasins where it occurred historically (Figure 29).

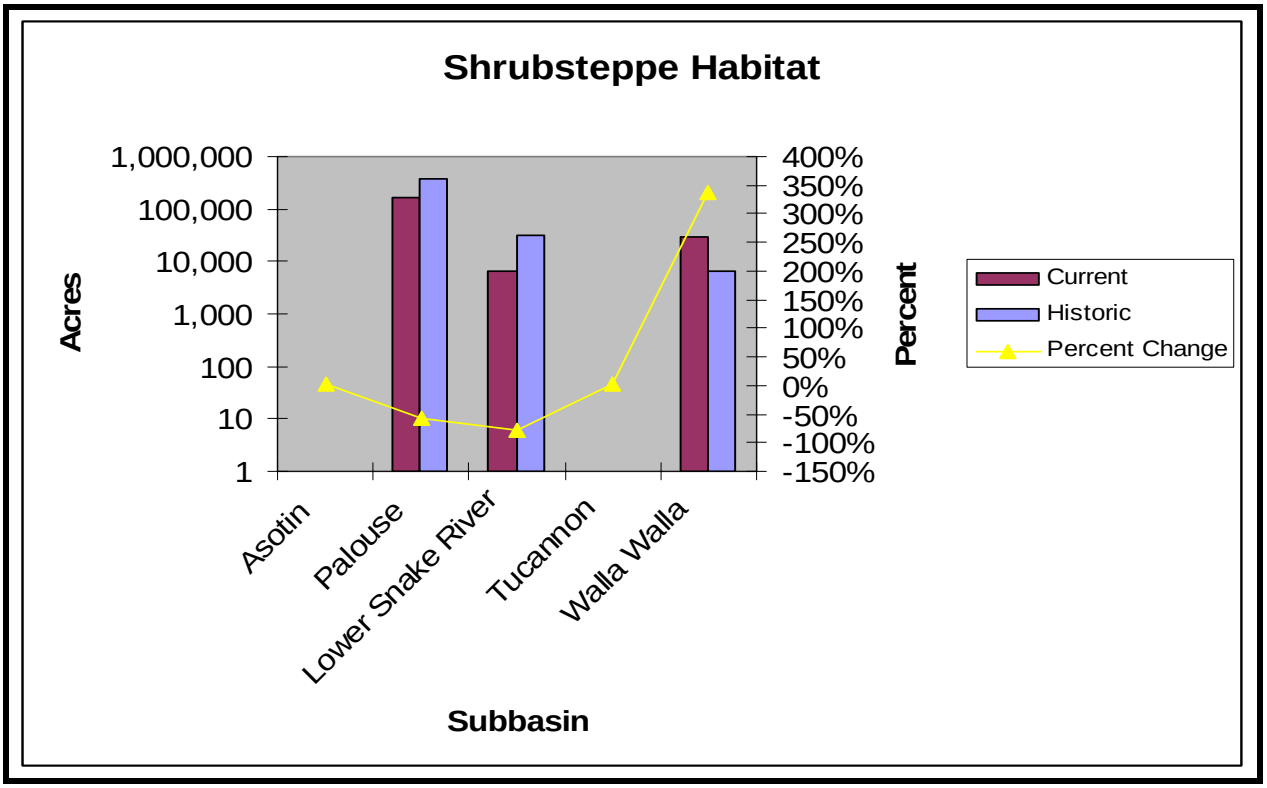

Figure 99. A subbasin comparison of shrubsteppe habitats and percent change in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

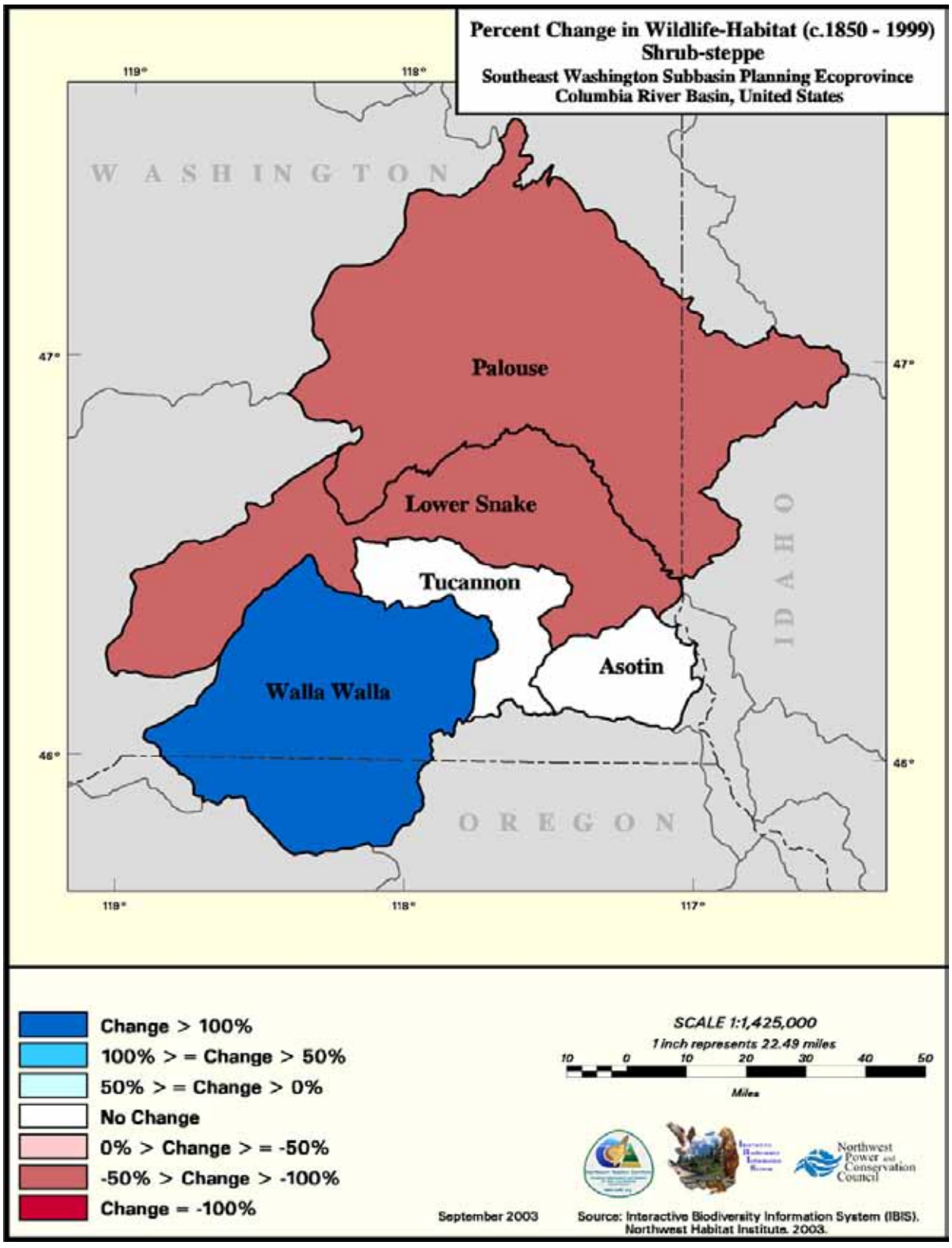

Figure 100. Change in shrubsteppe habitat in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

3.1.6.2.1 Protection Status

The GAP protection status of Ecoregion shrubsteppe habitats is compared in Figure 30. Shrubsteppe habitat in the high protection status category does not exist in the Ecoregion. In contrast, shrubsteppe habitat in the medium protection status category occurs only in the Lower Snake subbasin, primarily along the Snake River corridor. The vast majority of shrubsteppe habitat throughout the entire Ecoregion is designated low or no protection status and is at risk for further degradation and/or conversion to other uses. The protection status of shrubsteppe habitat in the Subbasin is summarized in Table 14.

Shrubsteppe habitats may be re-established directly through implementation of the Conservation Reserve Program i.e., by application of specific cover practices, or passively through protection of shrubs that invade CRP grasslands from adjacent areas. As in grasslands, CRP provides short-term/high protection to shrubsteppe habitats. The current number of CRP acres in shrubsteppe habitat is unknown and is a data gap; however, CRP grasslands may potentially provide additional shrubsteppe habitat if allowed to reach climax community conditions over time. CRP acreage is compared by county in Figure 27 and listed in Table 5.

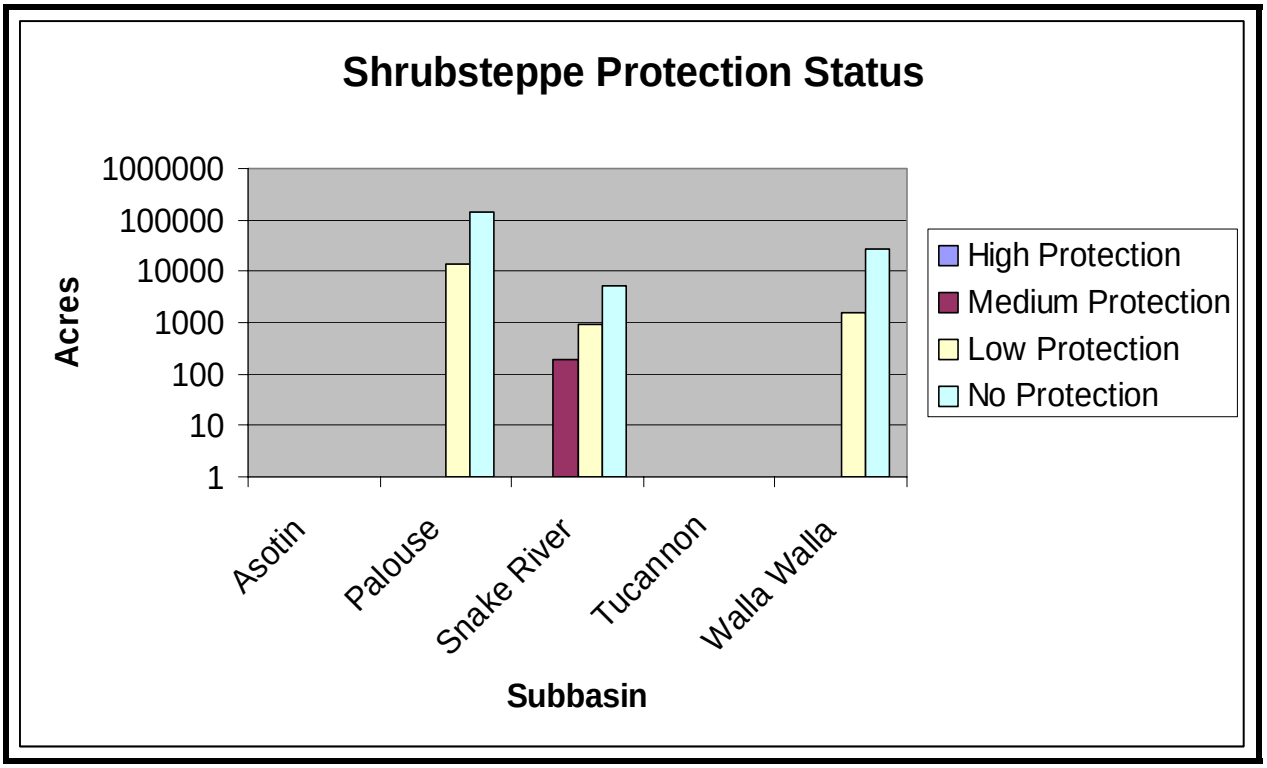

Figure 101. Shrubsteppe GAP protection status in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

Table 72. Shrubsteppe GAP protection status in the Walla Walla subbasin (NHI 2003).

GAP Protection Status	Acres
High Protection	0
Medium Protection	0
Low Protection	1,555
No Protection	27,691

3.1.6.2.2 Factors Affecting Shrubsteppe Habitat

Factors affecting shrubsteppe habitat are almost identical to factors described for grassland habitats. For more information, see section 4.3.9.2 in Ashley and Stovall (unpublished report, 2004). Disturbance factors are summarized below:

- Extensive permanent habitat conversions of shrubsteppe habitats
- Fragmentation of remaining tracts of moderate to good quality shrubsteppe habitat
- Degradation of habitat from intensive grazing and invasion of exotic plant species, particularly cheatgrass, knapweed, and yellow-star thistle
- Degradation and loss of properly functioning shrubsteppe ecosystems resulting from the encroachment of urban and residential development and conversion to agriculture
- Conversion of Conservation Reserve Program (CRP) lands back to cropland
- Loss and reduction of cryptogamic crusts, which help maintain the ecological integrity of shrubsteppe communities
- Fire management, either suppression, wildfires, or over-use
- Invasion and/or inter-seeding of crested wheatgrass and other introduced plant species that reduces wildlife habitat quality and/or availability

3.1.6.2.3 Recommended Future Condition

Recommended future conditions are described in detail in section 4.1.7.2.3 in Ashley and Stovall (unpublished report, 2004). Recommended conditions for shrubsteppe habitat are identical to those described for the Ecoregion and are summarized below.

Recommended future conditions include expansive contiguous areas of high quality multi-structured sagebrush patches with a diverse understory of native grasses and forbs (non-native herbaceous vegetation less than 10 percent), and shrub cover between 10 and 30 percent with mosses and lichens forming cryptogamic crust in areas between taller plants. The following shrubsteppe habitat conditions/guidelines will be used to develop habitat protection and restoration objectives and measures.

Condition 1 – Sagebrush dominated shrubsteppe habitat: Sagebrush dominated habitat comprised of tall sagebrush within large tracts of shrubsteppe habitat. Suitable habitat conditions include 5 to 20 percent sagebrush cover greater than 2.5 feet in height, 5 to 20 percent native herbaceous cover, and less than 10 percent non-native herbaceous cover.

Condition 1a - Sagebrush-dominated sites supporting a patchy distribution of sagebrush clumps 10 to 30 percent cover, lower sagebrush height (between 20 and 28 inches, native grass cover 10 to 20 percent, non-native herbaceous cover less than 10 percent, and bare ground greater than 20 percent.

Condition 2 – Diverse shrubsteppe habitat: Diverse, dense (30 to 60 percent shrub cover less than 5 feet tall) comprised of bitterbrush, big sagebrush, rabbitbrush, and other shrub species with a herbaceous understory exceeding 30 percent cover.

3.1.6.4 Eastside (Interior) Riparian Wetlands

The eastside (interior) riparian wetlands habitat type refers only to riverine and adjacent wetland habitats in both the Ecoregion and individual subbasins. For more information, see section 4.3.9.3 in Ashley and Stovall (unpublished report, 2004). Other wetland habitat types that occur within the subbasin were not included as focal habitat types because of limited extent, although equally important.

Historic (circa 1850) and, to a lesser degree, current data concerning the extent and distribution of riparian wetland habitat are a significant data gap at both the Ecoregion and subbasin scales. The lack of data is a major challenge as Ecoregion and subbasin planners attempt to quantify habitat changes from historic conditions and develop strategies that address limiting factors and management goals and objectives.

The principal challenge is to estimate the historic extent of riparian habitat. To accomplish this, Ecoregion planners obtained approximations of linear stream miles for each Ecoregion subbasin based on StreamNet data provided by WDFW staff (M. Hudson, WDFW, personal communication, 2003). Ecoregion planners conservatively estimated the average width of the historic riparian habitat buffer at 50 feet. The average width was multiplied by an estimated 3,653 linear miles of stream in the Subbasin and then converted to acres (Figure 31).

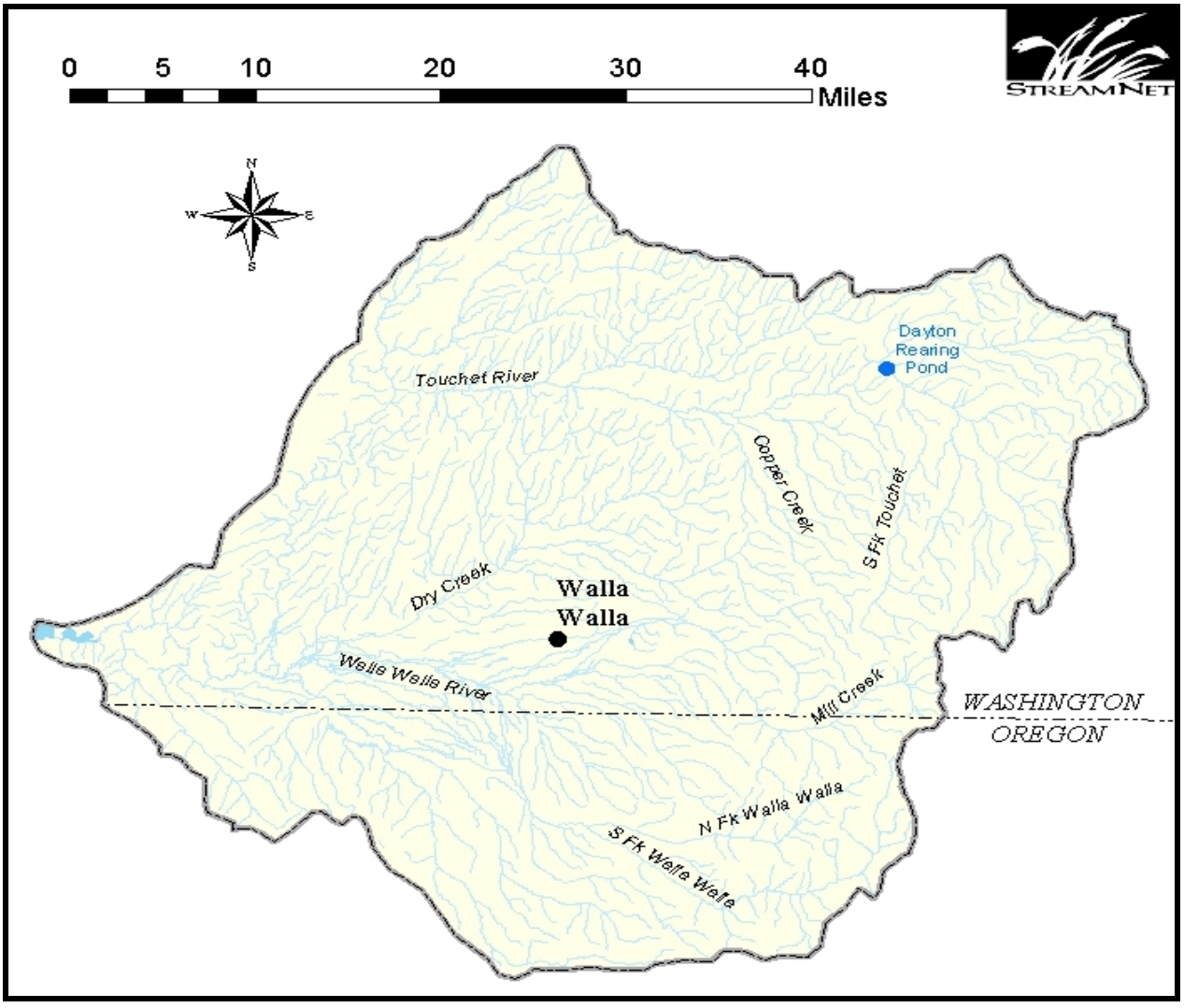

Figure 102. Perennial and intermittent streams and rivers in the Walla Walla subbasin (StreamNet 2003).

Using this method, Ecoregion planners estimate at least 22,283 acres of riparian wetland habitat historically occurred in the Subbasin. The change in extent of riparian habitat is significant (Table_15).

Table 73. Estimated historic and current acres and percent change in riparian wetland habitat in the Walla Walla subbasin (StreamNet 2003; NHI 2003).

Historic Acres	Current Acres	Change Acres	Percent Change
22,283	15,217	-7,066	-32
Note: Current acreage includes some, but not all, riparian/riverine habitats re-established/protected through CREP. FSA reports CREP acreage by county only making extrapolation to subbasins extremely time consuming and difficult.			

Although Ecoregion planners believe that historic estimates generated through the use of StreamNet data are more accurate than NHI-based amounts, estimates derived from StreamNet are still of low confidence value. The actual number of acres or absolute magnitude of the change is less important than recognizing that the trend is loss of riparian habitat and the lack of permanent protection continues to place this habitat type at further risk.

Historically, riparian wetland habitat was characterized by a mosaic of plant communities occurring at irregular intervals along streams and dominated singularly, or in some combination by grass-forbs, shrub thickets, and mature forests with tall deciduous trees. Beaver activity and natural flooding are two ecological processes that affected the quality and distribution of riparian wetlands.

Today, riparian wetland areas contain the most biologically diverse habitats in the Subbasin because of their variety of structural features, including live and dead vegetation and the close proximity of riparian areas to water bodies. This combination of habitat features provides a wide array of habitats for numerous terrestrial species. Common deciduous trees and shrubs in riparian areas include cottonwood, alder, willow, and red osier dogwood (USFS and BLM 2000). Riparian vegetation is used by more species than any other habitat (Quigley and Arbelbide 1997).

Cottonwood, white alder, and willow dominate the riparian community in the lowlands (USACE 1997). These species also occur in the riparian zone of the uplands, where coniferous species increase in prominence. Both the extent and quality of riparian vegetation in the Subbasin has been severally degraded (NPPC 2001). Only 37 percent of the Touchet River riparian zone remains in native riparian vegetation (USACE 1997). Along the Oregon portion of the Walla Walla River, 70 percent of the existing riparian zone is in poor condition (USACE 1997).

Agricultural conversion, livestock grazing, altered stream channel morphology, and water withdrawal have played significant roles in changing the character and function of streams and associated riparian wetlands throughout the Subbasin. Riparian wetlands have been altered, fragmented, and/or lost because of agricultural development (Ashley and Stovall, unpublished report, 2004). Moreover, grazing has suppressed woody vegetation while introduction of Kentucky bluegrass, reed canarygrass, and other weed species has significantly changed native plant communities. The largest remaining expanse of relatively high quality riparian habitat exists on the 1,525-acre USACE-managed Wallula Habitat Management Unit, located at the confluence of the Walla Walla River and Lake Wallula, behind McNary Dam (USACE 1997).

3.1.6.4.1 Protection Status

The protection status of riparian habitat is compared by subbasin in Figure_32. Unlike CREP, naturally occurring riparian wetland habitats are not provided high protection status anywhere in the Ecoregion. The Subbasin has the most unprotected riparian wetland habitat in the Ecoregion. The vast majority of Ecoregion riparian wetland habitat is designated low or no protection status and is at risk for further degradation and/or conversion to other uses. The GAP protection status of riparian wetland habitat in the Subbasin is listed in Table_16.

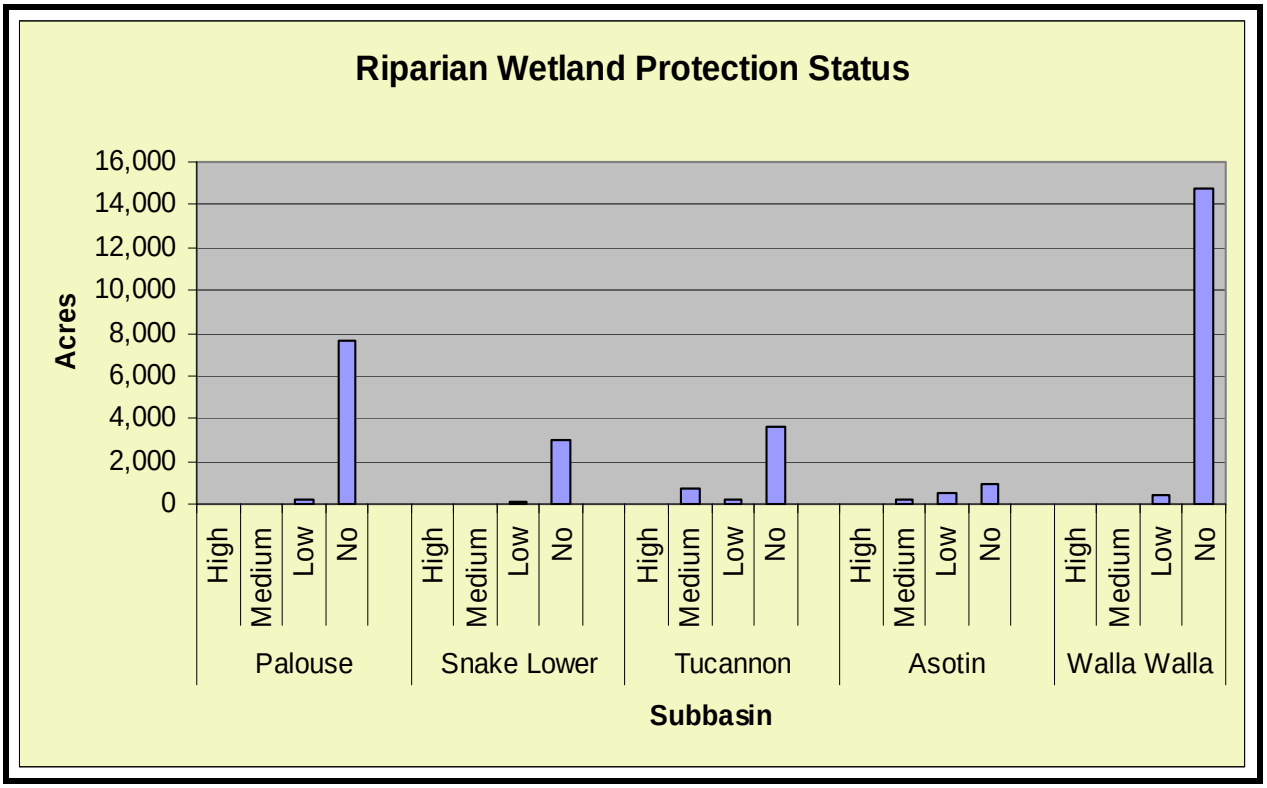

Figure 103. Eastside (interior) riparian wetlands GAP protection status in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

Table 74. Eastside (interior) riparian wetlands GAP protection status in the Walla Walla subbasin (NHI 2003).

GAP Protection Status	Acres
High Protection	8,211
Medium Protection	8,500
Low Protection	124,645
No Protection	993,342

Additional short-term high protection of riparian habitat is provided by CREP (CP22). The number of acres enrolled in CREP is compared by county in Figure_33 and listed in Table_6. CREP is considered an additive value in this assessment and is not included in historic and current riparian wetland data derived from NHI (2003) and/or StreamNet (2003) data.

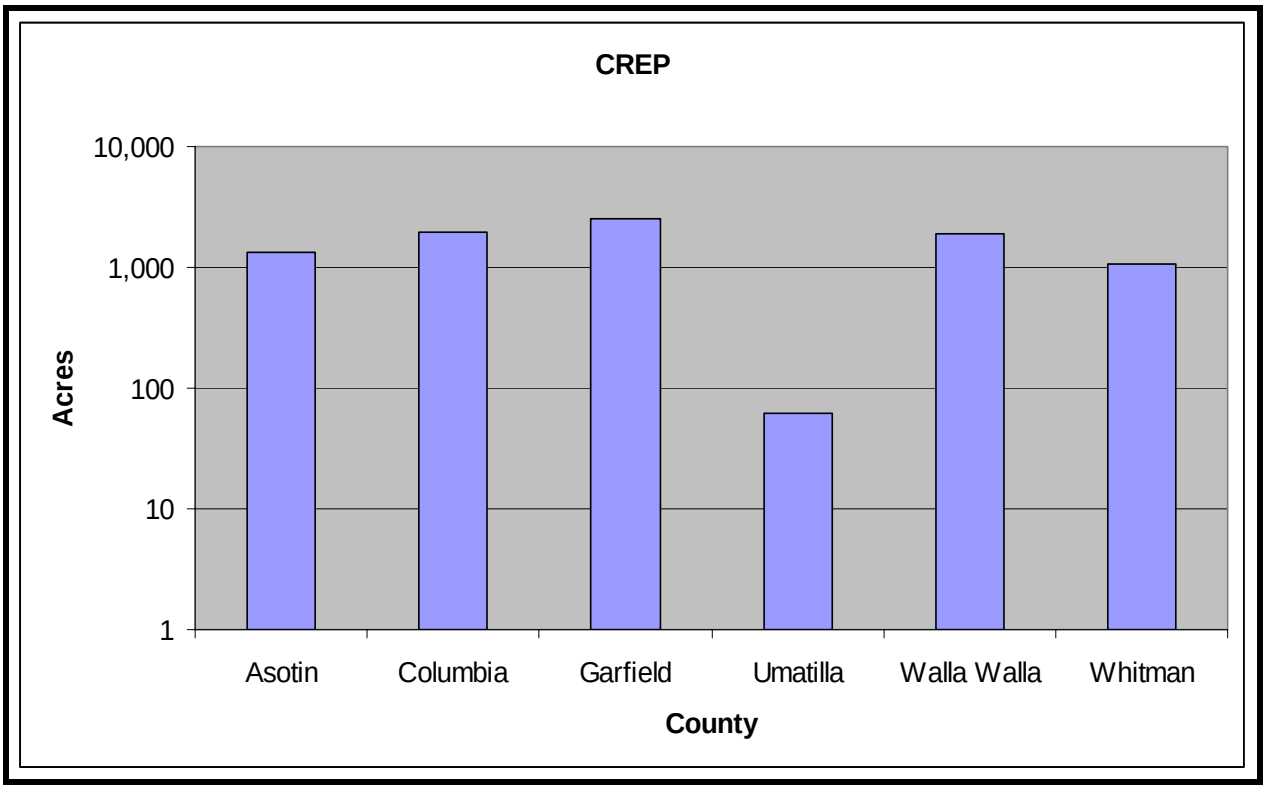

Figure 104. A county comparison of acreage protected by the Conservation Reserve Enhancement Program/CP22 (FSA, unpublished data, 2003).

3.1.6.3.2 Factors Affecting Eastside (Interior) Riparian Wetland Habitat

Factors affecting riparian wetland habitat are explained in detail in section 4.3.9.3 in Ashley and Stovall (unpublished report, 2004) and summarized below:

- Riverine recreational developments and cutting and spraying of riparian vegetation
- vertical stratification in riparian vegetation, and lack of recruitment of young cottonwoods, ash, and willows
- Hydrological diversions and control of natural flooding regimes (e.g., dams, diking) resulting in reduced stream flows and reduction of extent of riparian habitat, loss of
- Water rights/withdrawals have the potential to negatively impact the extent and quality of riparian vegetation by significantly altering the hydrology on over allocated streams and rivers
- Stream bank stabilization activities and incising which narrows stream channels, reduces/alters the flood plain, and reduces extent of riparian vegetation
- Livestock overgrazing which can widen channels, raise water temperatures, reduce understory cover, etc.
- Conversion of native riparian shrub and herbaceous vegetation to invasive exotics such as reed canary grass, purple loosestrife, perennial pepperweed, salt cedar, thistle, knapweeds, and Russian olive
- Catastrophic flood events resulting in near complete removal of riparian vegetation and scouring of hydric soils (complicated by the inability of altered upland sites/vegetation to absorb/slow runoff)
- Fragmentation and loss of linear contiguous tracts of riparian habitat

3.1.6.3.3 Recommended Future Condition

Recommended future conditions are described in detail in section 4.1.7.4.3 in Ashley and Stovall (unpublished report, 2004). Recommended conditions for riparian wetland habitat are identical to those described for the Ecoregion and are summarized in the following paragraphs.

Current riparian conditions within the Subbasin range from optimal to poor with most falling below "fair" condition (H. Ferguson, WDFW, personal communication, 2003). Recognizing the variation between extant riparian habitat and the dynamic nature of this habitat type, Ecoregion planners recommend the following range of conditions for the specific riparian wetland habitat attributes described below.

- Greater than 40 percent tree canopy closure (cottonwood and other hardwood species)
- Multi-structure/age tree canopy (includes trees less than 6 inches DBH and mature/decadent trees)
- Woody vegetation within 328 feet of shoreline (where applicable)
- Tree groves greater than 1 acre within 800 feet of water (where applicable)
- Forty to 80 percent native shrub cover (greater than 50 percent comprised of hydrophytic shrubs)
- Multi-structured shrub canopy greater than 3 feet in height
- Minimal disturbance within 800 feet of habitat type

3.1.6.5 Agriculture (Habitat of Concern)

Farming operations in the Subbasin include dryland/irrigated agricultural crops, fruit orchards, and irrigated and non-irrigated pasture (alfalfa and hay). Cultivated crops are primarily annual grains such as wheat, oats, barley, and rye. Wheat and barley are produced on upland and rolling hilly terrain without irrigation throughout much of the Subbasin. Irrigation is used, however, to produce crops wherever feasible.

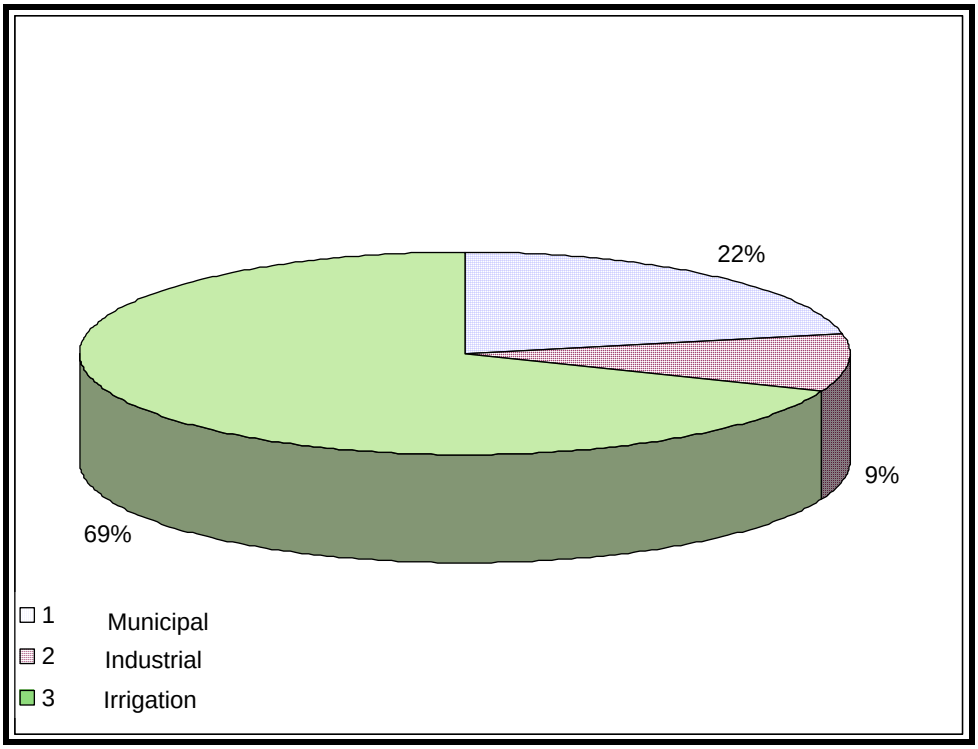

Figure 105. Water use in the Walla Walla subbasin (USACE 1997).

The Walla Walla River valley is extensively and intensively irrigated (Figure 34 and Figure 35). Irrigated lands occur in the narrow lowland portions of the Subbasin, representing the largest use of surface and groundwater in the Subbasin. The proportion of surface water versus groundwater allocated for irrigation currently represents a data gap. The BOR (1999) estimated that in Oregon there are 14,000 acres irrigated from surface flows and shallow wells and about 2,000 acres irrigated from deep wells. An in-depth, basin wide study examining respective volumes of surface and groundwater used for irrigation purposes is warranted (NPPC 2001).

There has been a steady increase in the acres of irrigated croplands in the Subbasin since the mid 1900s. The estimated area of irrigated land in Walla Walla County in 1987 was 75,333 acres, compared to 97,136 acres a decade later (National Agricultural Statistics Service 1997, 1999). The vicinities of Touchet, Gardena Farms, Walla Walla, and College Place hold the largest proportions of alfalfa and wheat, the Subbasin's dominant irrigated crops. The primary water sources include the Touchet and Walla Walla Rivers, East-West Canal, Gardena Canal, Lowden Canals, gravel aquifers, and the basalt system.

In addition to irrigated grain crops, fruit crops such as orchards and vineyards, represent a growing portion of irrigated agriculture in the Subbasin. Irrigated orchard acreage in Walla Walla County, for example, has increased from 6,910 acres in 1992 to 8,003 acres in 1997 (National Agricultural Statistics Service 1997). Irrigated orchard acreage in Oregon (Umatilla County) has essentially remained unchanged between 1992 and 1997 (4,984 acres vs. 4,743 acres respectively). Other irrigated crops include asparagus, beans, onions, pasture, and potatoes (James *et al.* 1991).

Conversion of native habitats to agriculture altered and/or destroyed vast amounts of grassland habitat and fragmented riparian/floodplain habitats throughout much of the Subbasin. The loss of grassland and riparian wetland habitats has resulted in the decline of wildlife populations that are dependent on this habitat type (NPCC 2001).

Although the conversion of native habitats to agriculture severely affected native wildlife species such as the sharp-tailed grouse, agriculture did provide new habitat niches quickly filled by introduced wildlife species including the ring-necked pheasant, chukar, and gray partridge. Introduced parasitic wildlife species such as European starlings also thrived as more land was converted to agriculture.

Native ungulate and waterfowl populations took advantage of new food sources provided by croplands and either expanded their range or increased in number (J. Benson, WDFW, personal communication, 1999). Indigenous wildlife species and populations that adapted to and/or thrived on "edge" habitats increased with the introduction of agriculture except in areas where "clean farming" practices and crop monocultures dominated the landscape.

In addition to crops, agricultural lands provide and support hunting and wildlife viewing opportunities, which promotes local economic growth. Conversely, crop depredation by elk and deer is an issue in some areas of the subbasin with a number of landowners desiring reductions in ungulate herds.

The Subbasin has the highest relative percentage of land dedicated to agriculture within the Ecoregion (Figure 36). Farming generally occurs wherever steep topography, shallow soils, and/or federal, state, and/or public land ownership does not preclude it.

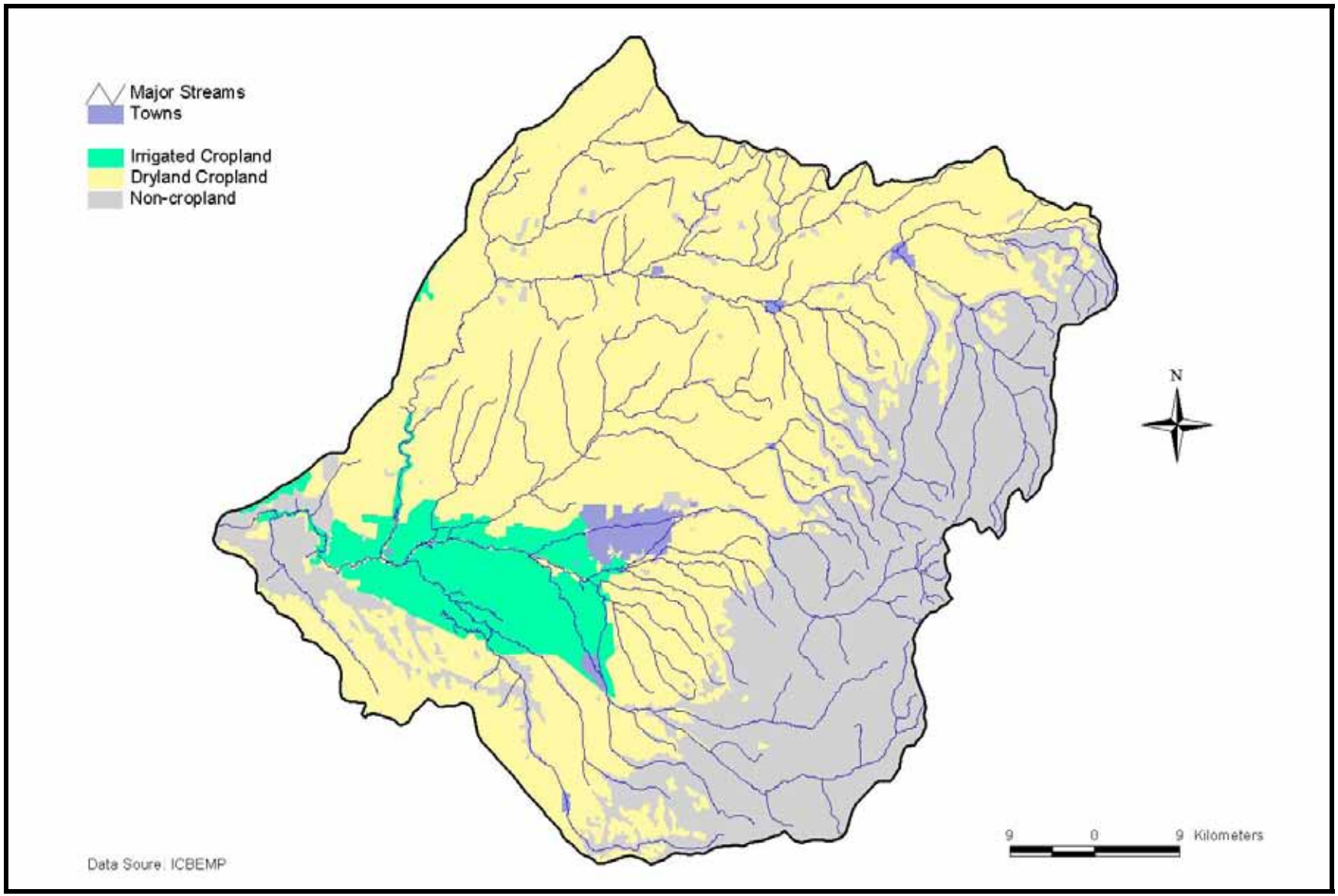

Figure 106. Irrigated and non-irrigated cropland in the Walla Walla subbasin (NPPC 2001).

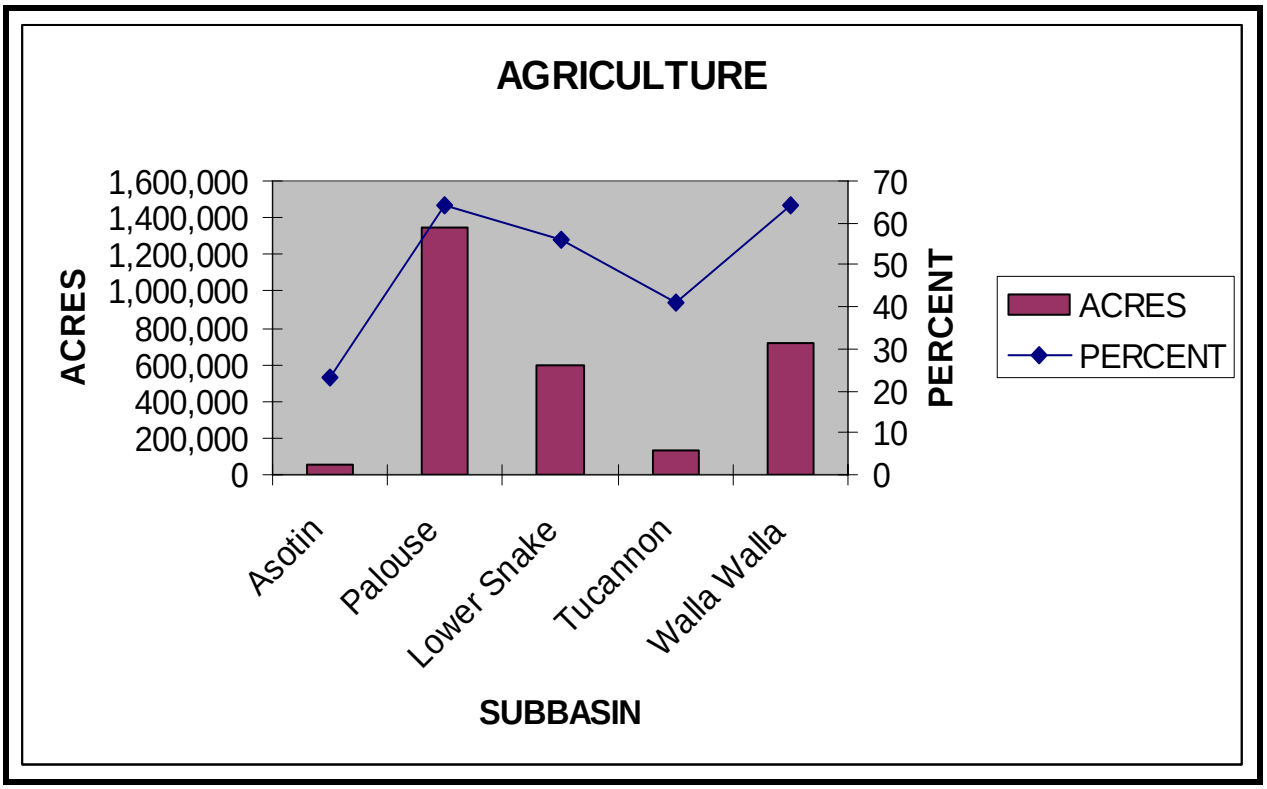

Figure 107. Ecoregion agricultural land use comparison (NHI 2003).

3.1.6.4.1 Protection Status

The protection status of agricultural habitat is compared by subbasin in Figure 36. NHI (2003) data clearly indicate that nearly all of this cover type has no protection status across the Ecoregion. Small amounts of agricultural lands, however, receive low and medium protection status. Low and medium protection is limited to lands enrolled in conservation easements, or under other development restrictions such as county planning ordinances and university controlled experimental stations. The GAP protection status of agricultural habitat in the Subbasin is listed in Table 17.

3.1.6.6 Summary of Changes in Focal Wildlife Habitats

Changes in the extent of focal habitats within the Subbasin are summarized in Table 18 and compared to other Ecoregion subbasins in Figure 38. For additional information regarding habitat changes throughout the Ecoregion, see section 4.1.6 in Ashley and Stovall (unpublished report, 2004).

The extent of both ponderosa pine and shrubsteppe habitat types has increased more than 100 percent from historic estimates. Similarly, the amount of ponderosa pine habitat in the Lower Snake subbasin has increased significantly (greater than 100 percent). Shrubsteppe habitat, on the other hand, has increased only in the Walla Walla subbasin. Agricultural conversion accounts for nearly 100 percent of the total change (loss) in eastside (interior) grassland habitats in the Subbasin and throughout the Ecoregion (NHI 2003).

Riparian wetland habitat data are incomplete and limited in value. As a result, riparian wetlands are not well represented in NHI (2003) map products and databases. Accurate habitat type maps and data sets, especially those detailing historic riparian wetland habitats, are needed

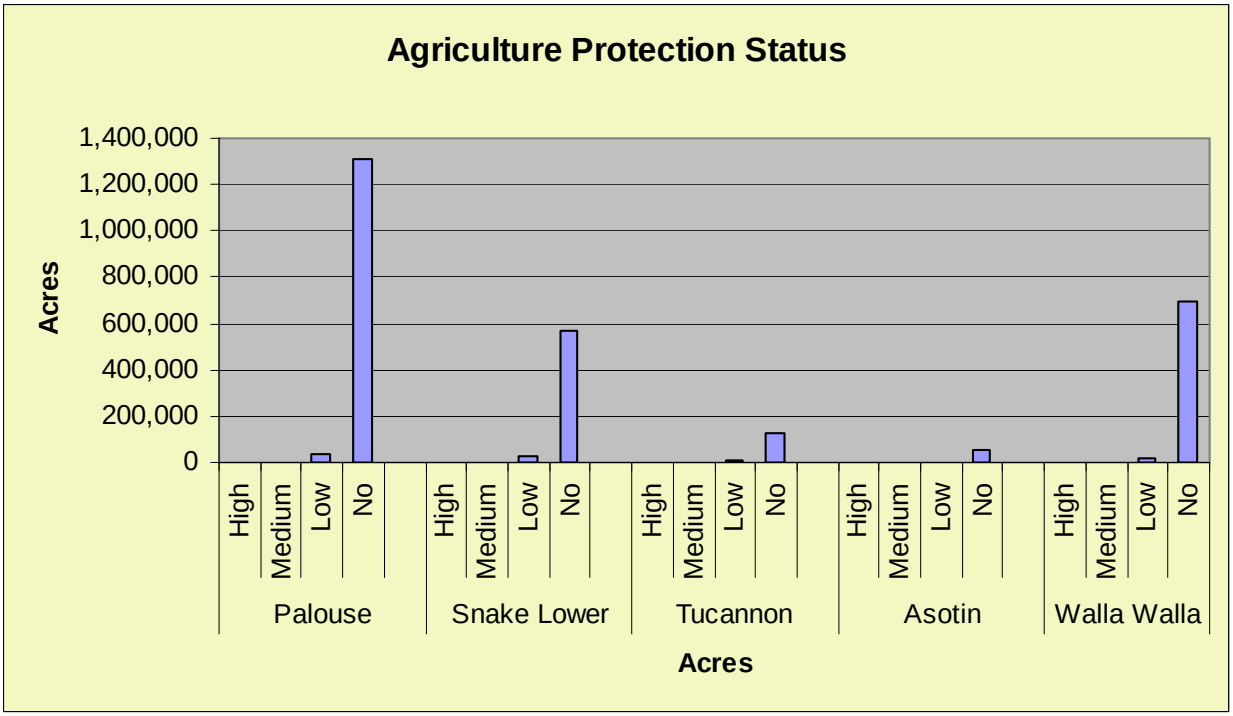

Figure 108. Agriculture GAP protection status in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

Table 75. Agriculture GAP protection status in the Walla Walla subbasin (NHI 2003).

GAP Protection Status	Acres
High Protection	0
Medium Protection	0
Low Protection	20,567
No Protection	699,316

Table 76. Changes in focal wildlife habitat types in the Walla Walla subbasin from circa 1850 (historic) to 1999 (current) (NHI 2003).

Focal Habitat Type	Historic (Acres)	Current (Acres)	Change (Acres)	Change (%)
Ponderosa Pine	23,241	49,904	+26,663	+115
Shrubsteppe	6,676	29,252	+22,576	+338
Eastside (Interior) Grassland	962,275	154,619	-807,656	-84
Eastside (Interior) Riparian Wetlands	22,283	15,217	-7,066	-32
Agriculture	0	719,625	+719,625	+100

to improve assessment quality and support management strategies/actions. Subbasin wildlife managers, however, believe that significant physical and functional losses have occurred to these important riparian habitats from hydroelectric facility construction and inundation, agricultural development, and livestock grazing.

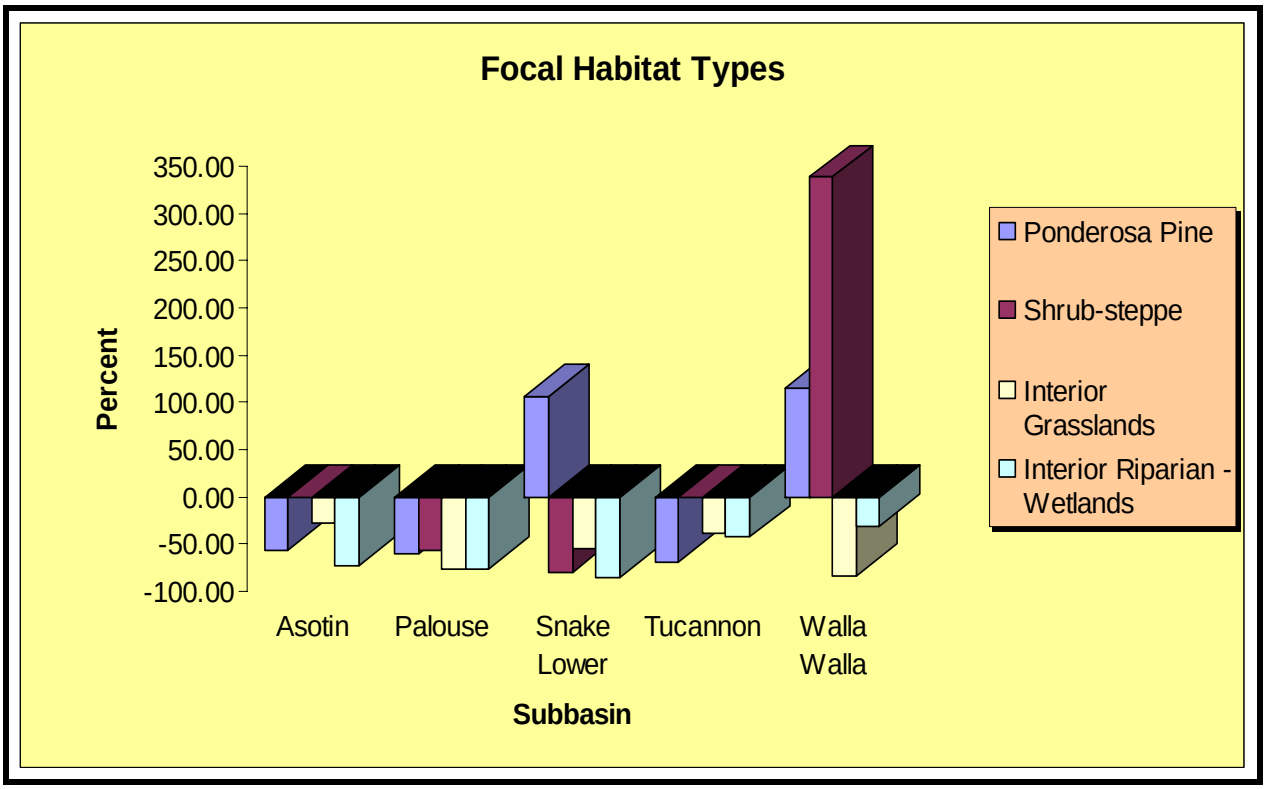

Figure 109. Changes in focal habitat types in the Southeast Washington Subbasin Planning Ecoregion (NHI 2003).

4.0 Biological Features

4.1 Focal Species/Assemblages

4.1.1 Focal Wildlife Species Assemblage Selection and Rationale

The focal species selection process is described in section 5.1 in Ashley and Stovall (unpublished report, 2004) while important habitat attributes are summarized in Table_31 (Ashley and Stovall, unpublished report, 2004). Ecoregion and subbasin planners identified focal species assemblages for each focal habitat type (Table_19).

Eight bird species and four mammalian species were selected to represent four focal habitats and one habitat type of interest (canyon grasslands) in the Subbasin (except as noted, species selected for this subbasin are identical to those for the Ecoregion). As a result of discussions by subbasin technical team staff, mule deer were added to the grassland species assemblage to capture the importance of CRP grasslands. WDFW biologists report that mule deer populations in all Ecoregion subbasins have responded positively to the addition of CRP (P. Fowler, WDFW, pers comm. 2004).

Similarly, ODFW and the Umatilla Tribe added bighorn sheep to represent canyon grassland habitat (a subset of interior grasslands). Bighorn sheep are culturally significant to the Umatilla Tribe and are an important managed species in Oregon (Appendix B_5).

Life requisite habitat attributes for each species assemblage were pooled to characterize a range of management conditions, to guide planners in development of habitat management strategies, goals, and objectives. Establishment of conditions favorable to focal species will benefit a wider group of species with similar habitat requirements. Wildlife species associated

with focal habitats including agriculture are listed in Table B-2. Stakeholders identified alkali bees as important to the agriculture community because it is a significant crop pollinator. A brief species account is included in Appendix B_6.

General habitat requirements, limiting factors, distribution, population trends, and analyses of structural conditions, key ecological functions, and key environmental correlates for individual focal species are included in section 5.2 in Ashley and Stovall (unpublished report, 2004). The reader is further encouraged to review additional focal species life history information in Appendix F in Ashley and Stovall (unpublished report, 2004).

Table 77. Focal species selection matrix for the Walla Walla subbasin.

Common Name	Focal Habitat[1]	Status[2]		Native Species	PHS	Partners in Flight	Game Species
		Federal	State				
White-headed woodpecker	Ponderosa pine	n/a	C	Yes	Yes	Yes	No
Flammulated owl		n/a	C	Yes	Yes	Yes	No
Rocky Mountain elk		n/a	n/a	Yes	Yes	No	Yes
Sage sparrow	Shrubsteppe	n/a	C	Yes	Yes	Yes	No
Sage thrasher		n/a	C	Yes	Yes	Yes	No
Brewer's sparrow		n/a	n/a	Yes	No	Yes	No
Mule deer		n/a	n/a	Yes	Yes	No	Yes
Yellow warbler	Eastside (Interior) Riparian Wetlands	n/a	n/a	Yes	No	Yes	No
American beaver		n/a	n/a	Yes	No	No	Yes
Great blue heron		n/a	n/a	Yes	Yes	No	No
Grasshopper sparrow	Eastside (Interior) Grassland	n/a	n/a	Yes	No	Yes	No
Mule Deer*		SC	T	Yes	Yes	Yes	No
Bighorn Sheep*							

[1] SS = Shrubsteppe; RW = Riparian Wetlands; PP = Ponderosa pine
[2] C = Candidate; SC = Species of Concern; T = Threatened; E = Endangered

*Per subbasin level discussions

4.2 Wildlife Species

An estimated 385 wildlife species occur in the Subbasin (Table B-1). Of these species, 138 are closely associated with wetland habitat and 86 consume salmonids during some portion of their life cycle. Fourteen species in the Subbasin are non-native. Nine wildlife species that occur in the subbasin are federally listed and 83 species are listed in Washington and Oregon as threatened, endangered, or candidate species (Table B-3). Seventy-eight bird species are listed as Washington or Oregon State Partners in Flight priority and focal species (Table B-4). Fifty-seven wildlife species are managed as game species in Washington and Oregon (Table_20).

Table 78. Wildlife game species of the Walla Walla subbasin (NHI 2003).

Common Name	Oregon Game Species	Washington Game Species
Bullfrog	Game Fish	Game Species
Greater White-fronted Goose	Game Bird	Game Bird
Snow Goose	Game Bird	Game Bird
Ross's Goose	Game Bird	Game Bird
Canada Goose	Game Bird	Game Bird
Wood Duck	Game Bird	Game Bird

Common Name	Oregon Game Species	Washington Game Species
Gadwall	Game Bird	Game Bird
Eurasian Wigeon	Game Bird	Game Bird
American Wigeon	Game Bird	Game Bird
Mallard	Game Bird	Game Bird
Blue-winged Teal	Game Bird	Game Bird
Cinnamon Teal	Game Bird	Game Bird
Northern Shoveler	Game Bird	Game Bird
Northern Pintail	Game Bird	Game Bird
Green-winged Teal	Game Bird	Game Bird
Canvasback	Game Bird	Game Bird
Redhead	Game Bird	Game Bird
Ring-necked Duck	Game Bird	Game Bird
Greater Scaup	Game Bird	Game Bird
Lesser Scaup	Game Bird	Game Bird
Harlequin Duck	Game Bird	Game Bird
Surf Scoter	Game Bird	Game Bird
Bufflehead	Game Bird	Game Bird
Common Goldeneye	Game Bird	Game Bird
Barrow's Goldeneye	Game Bird	Game Bird
Hooded Merganser	Game Bird	Game Bird
Common Merganser	Game Bird	Game Bird
Red-breasted Merganser	Game Bird	Game Bird
Ruddy Duck	Game Bird	Game Bird
Chukar	Game Bird	Game Bird
Gray Partridge	Game Bird	Game Bird
Ring-necked Pheasant	Game Bird	Game Bird
Ruffed Grouse	Game Bird	Game Bird
Sage Grouse	Game Bird	
Spruce Grouse	Game Bird	Game Bird
Blue Grouse	Game Bird	Game Bird
Wild Turkey	Game Bird	Game Bird
Mountain Quail	Game Bird	Game Bird
California Quail	Game Bird	Game Bird
Northern Bobwhite	Game Bird	Game Bird
American Coot	Game Bird	Game Bird
Wilson's Snipe	Game Bird	Game Bird
Band-tailed Pigeon	Game Bird	Game Bird
Mourning Dove	Game Bird	Game Bird
Eastern Cottontail		Game Mammal
Nuttall's (Mountain) Cottontail		Game Mammal
Snowshoe Hare		Game Mammal
White-tailed Jackrabbit		Game Mammal
Black-tailed Jackrabbit		Game Mammal
Muskrat	Game Mammal	
Black Bear	Game Mammal	Game Mammal
Mountain Lion	Game Mammal	Game Mammal

Common Name	Oregon Game Species	Washington Game Species
Rocky Mountain Elk	Game Mammal	Game Mammal
Mule Deer	Game Mammal	Game Mammal
White-tailed Deer (Eastside)	Game Mammal	Game Mammal
Moose		Game Mammal
Pronghorn Antelope	Game Mammal	Game Mammal
Rocky Mountain Bighorn Sheep	Game Mammal	Game Mammal

Ninety-six percent of the wildlife species that occur in the Ecoregion occur in the Subbasin (Table 21). Furthermore, 100 percent of the reptiles that occur in the Ecoregion are present in the Subbasin.

Table 79. Species richness and associations for the Walla Walla subbasin (NHI 2003).

Class	Walla Walla	% of Total	Total (Ecoregion)
Amphibians	10	77	**13**
Birds	280	99	**282**
Mammals	79	89	**89**
Reptiles	16	100	**16**
Total	**385**	**96**	**400**
Association			
Riparian Wetlands	81	98	**83**
Other Wetlands (Herbaceous and Montane Coniferous)	57	63	**90**
All Wetlands	138	80	**173**
Salmonids	86	91	**94**

5.0 Assessment Synthesis

Subbasin assessment conclusions are identical to those found at the Ecoregion level for focal habitat types and species. An assessment synthesis is included in section 6.0 in Ashley and Stovall (unpublished report, 2004)].

6.0 Inventory

This section includes information on current management activities, programs, regulatory measures, and plans designed to protect and/or restore wildlife habitats and populations within the Subbasin. Additional Inventory information is included in Appendix B 7. Although many government and non-governmental entities have an ardent interest in the Subbasin, the focus of this section is on the organizations and programs that have the greatest impact on addressing factors that affect wildlife habitats, limit wildlife populations, and support subbasin strategies, goals, and objectives. Additional inventory information is provided in the Subbasin *Walla Walla Subbasin Summary* (NPPC 2001).

6.1 Local Level

Local groups involved in fish and wildlife protection projects within the Subbasin include:

- Agricultural Community

6.1.1 Agricultural Community

Private landowners manage the vast majority of interior grassland and riparian wetland habitat in the Subbasin. Many landowners protect, enhance, and maintain privately owned/controlled grasslands and riparian habitats through active participation in CRP and CREP.

Most of the sediment delivered to the Walla Walla River and its tributaries comes from upland agricultural areas. Agriculturalists apply BMPs to croplands to reduce the amount of soil leaving these areas. The BMPs include: upland sediment basins designed to catch sediment; terraces to direct runoff to sediment basins or grassed waterways and filter strips; strip cropping; and direct seeding of crops reducing summer-fallow acres and reducing erosion by 95 percent on those acres. Landowners also control noxious weeds, which severely affect wildlife habitats and populations.

6.2 State Level

At the state level, many agencies are involved in protection of fish and wildlife habitats within the Subbasin including:

- Washington Department of Fish and Wildlife
- Washington Conservation Commission
- Washington Department of Natural Resources
- Washington Department of Ecology
- Oregon Department of Fish and Wildlife
- Oregon Department of Forestry
- Oregon Division of State Lands
- Oregon State Police
- Oregon Land Conservation and Development Commission
- Oregon Department of Transportation
- Oregon Department of Environmental Quality

6.2.1 Washington Department of Fish and Wildlife

The WDFW is responsible for protecting and enhancing Washington fish and wildlife and their habitats for present and future generations. Washington Department of Fish and Wildlife co-manages fish and wildlife resources with CTUIR and jointly implements the BPA-funded Walla Walla Subbasin Salmon and Steelhead Production Plan. Management of the harvest of fish and wildlife by non-Indians in the Washington portion of the Walla Walla River subbasin is the responsibility of WDFW. Habitat management for fish and wildlife is done collaboratively with private landowners, CTUIR, and public land management agencies.

6.2.1.1 Upland Restoration Program

Washington Department of Fish and Wildlife has worked with private landowners to restore habitat within the Subbasin since the early 1960s. The Habitat Development Program established small (0.5 to 3 acres) habitat plots for upland game birds on unfarmed areas usually on poor or rocky soils. In the 1980s, partnerships between WDFW, NRCS, conservation districts, and private landowners made possible habitat restoration projects at the watershed scale. Today, this multi-agency/private landowner partnership continues to enhance, protect, maintain, and increase wildlife habitat throughout the Subbasin (S. Gilmore, Resource Planning Unlimited, Inc, personal communication 2003).

Through cooperative agreements with private landowners, Upland Restoration Program biologists improve and restore riparian, upland, and shrubsteppe habitats used by both resident and migratory wildlife species. Projects typically include establishing riparian grass buffers, planting shrubs and trees for thermal and escapement cover, seeding wildlife food plots, developing water sources (e.g., guzzlers, ponds, spring developments), and maintaining winter game bird feeders.

The CRP has provided WDFW with another opportunity to work with local conservation agencies and landowners to improve wildlife habitat throughout the subbasin. Washington Department of Fish and Wildlife biologists assist landowners with selecting and/or planting herbaceous seed mixes, trees, and shrubs.

While habitat restoration is WDFW's main priority within the Subbasin, the Upland Restoration Program requires all cooperators to sign public access agreements in conjunction with habitat projects. Landowners voluntarily open their land to hunting, fishing, and/or wildlife viewing in return for habitat enhancements. *The Upland Restoration Program, in conjunction with CREP*

and CRP, has increased the extent and/or protection and enhancement of riparian wetlands, shrubsteppe, and grassland habitats within the Subbasin.

6.2.1.2 Species Management Plans

The Washington Department of Fish and Wildlife has several wildlife species management or recovery plans on file in the Olympia office, including the following:

- Blue Mountain Elk Herd Management Plan
- Statewide Elk Management Plan
- Bighorn Sheep Herd and Statewide Management Plan
- Black Bear Management Plan
- Ferruginous Hawk Recovery Plan
- Sharp-tailed Grouse Recovery Plan
- Bald Eagle Recovery Plan

6.2.1.3 Hydraulic Code (RCW 75.20.100-160)

This law requires that any person, organization, or government agency that conducts any construction activity in or near state waters must comply with the terms of a Hydraulic Project Approval permit issued by WDFW. State waters include all marine waters and fresh waters. The law's purpose is to ensure that needed construction is done in a manner that prevents damage to the state's fish, shellfish, and their associated habitat(s).

6.2.1.4 Strategy to Recover Salmon

The Strategy is intended to be a guide, and it articulates the mission, goals, and objectives for salmon recovery. The goal is to restore salmon, steelhead, and trout populations to healthy harvestable levels and improve those habitats on which the fish rely. The early action plan identifies specific activities related to salmon recovery that state agencies will undertake in the 1999-2001 biennium and forms the first chapter in a long-term implementation plan currently under development. The early actions are driven by the goals and objectives of the Strategy. Many of the expected outcomes from the early actions will directly benefit regional and local recovery efforts.

6.2.1.5 The Washington Priority Habitats and Species Program

This Program is a guide to management of fish and wildlife "critical areas" habitat on all State and private lands as they relate to the Growth Management Act of 1990. The recommendations address upland as well as riparian habitat and place emphasis on managing for the most critical species and its habitat.

6.2.2 Washington Conservation Commission

The Washington Conservation Commission (WCC) supports conservation districts in Washington; promoting conservation stewardship by funding natural resource projects. The WCC provides basic funding to conservation districts as well as implementation funds, professional engineering grants, and Dairy Program grants and loans to prevent the degradation of surface and ground waters. The Agriculture Fish and Wildlife Program is a collaborative process aimed at voluntary compliance. The AFWP involves negotiating changes to the existing NRCS *Field Office Technical Guide* and the development of guidelines for irrigation districts to enhance, restore, and protect habitat for endangered fish and wildlife species, and address state water quality needs. This two-pronged approach has developed into two processes, one involving agricultural interests and the second concerning irrigation districts across the state (S. Gilmore, Resource Planning Unlimited, Inc., personal communication, 2003).

6.2.3 Washington Department of Natural Resources

The Washington Department of Natural Resources (WDNR) manages state land throughout the Subbasin. These lands are generally located in sections 16 and 36 within each township. The main goal of the WDNR is to maximize monetary returns from state lands in order to fund school construction. This type of management often reduces the habitat value for wildlife on WDNR lands. The WDNR also enforces and monitors logging practices on private lands. The WDNR manages 2,394 acres of state land throughout the Subbasin.

6.2.4 Washington Department of Ecology

The Washington Department of Ecology (WDOE) is charged with managing water resources to ensure that the waters of the state are protected and used for the greatest benefit. The WDOE allocates and regulates water use within the Subbasin. Permits are required to divert surface water and ground water withdrawals in excess of 5,000 gallons per day. The WDOE also acts as trustee for instream trust water rights issued to the State of Washington and held in trust.

The WDOE regulates surface and ground water quality within the Subbasin. The 1972 Federal Clean Water Act authorizes and requires states to establish water quality standards for specific pollutants. Every two years, the WDOE is required to list in Section 303(d) of the Clean Water Act those water bodies that do not meet surface water quality standards. The WDOE utilizes data collected by agency staff as well as data from tribal, state, local governments, and industries to determine whether a water body is listed on the 303(d) list. Total Maximum Daily Loads (TMDLs) must be completed for every parameter that exceeds state water quality standards on listed water bodies.

The WDOE proposes several changes to surface water quality standards and the classification system. The revised standards must be applied so that they support the same uses covered under the current classification structure. Changes to the surface water quality standards will affect many programs, including monitoring, permits, TMDLs and the 303(d) list.

6.2.5 Oregon Department of Fish and Wildlife

The Oregon Department of Fish and Wildlife (ODFW) is responsible for protecting and enhancing Oregon fish and wildlife and their habitats for present and future generations. The ODFW co-manages fish and wildlife resources with the CTUIR and jointly implements the BPA-funded *Walla Walla River Subbasin Salmon and Steelhead Production Plan*. Fish and wildlife harvest by non-Indians in the Walla Walla subbasin is the responsibility of ODFW. Habitat management for fish and wildlife is done collaboratively with private landowners, CTUIR, and public land management agencies.

Oregon Department of Fish and Wildlife policies and plans applicable to the Subbasin include the Oregon Administrative Rules on wild fish management and natural production (ODFW 1990a, 1992a) and management plans for elk, mule deer, and cougar (ODFW 1990b, 1992c, 1993b). These plans present systematic approaches to conserving aquatic and wildlife resources and establish management priorities within the Subbasin.

6.2.6 Oregon Department of Forestry

The Oregon Department of Forestry enforces the Oregon Forest Practices Act (OFPA), which regulates commercial timber projection and harvest on state and private lands. The OFPA contains guidelines to protect fish bearing streams during logging and other forest management activities that address stream buffers, riparian management, road maintenance, and construction standards.

6.2.7 Oregon Division of State Lands

The Oregon Division of State Lands regulates the removal and filling of material in waterways. Permits are required for projects involving 50 cubic yards or more of material. Permit applications are reviewed by ODFW and may be modified or denied based on project impacts on fish populations.

6.2.8 Oregon State Police

The Oregon State Police patrols the Subbasin to enforce laws and regulations designed to protect fish and wildlife. Specific area and resource protection action plans are developed each year in consultation with ODFW.

6.2.9 Oregon Land Conservation and Development Commission

The Oregon Land Conservation and Development Commission regulates land use on a statewide level. County land use plans must comply with statewide land use goals, but enforcement against negligent counties appears minimal. Effective land use plans and policies are essential tools to protect against permanent fish and wildlife habitat losses and degradation, particularly excessive development along streams, wetlands, floodplains, and sensitive wildlife areas.

6.2.10 Oregon Department of Transportation

The Oregon Department of Transportation maintains highways that cross streams in the Subbasin. Under the initiative of the Oregon Plan for Salmon and Watersheds, efforts to improve protection and remediation of fish habitat impacted by state highways are ongoing.

6.2.11 Oregon Department of Environmental Quality

The Oregon Department of Environmental Quality (ODEQ) is responsible for implementing the Clean Water Act and enforcing state water quality standards for protection of aquatic life and other beneficial uses. The mission of the ODEQ is to lead in the restoration and maintenance of Oregon's quality of air, water and other environmental media. With regard to watershed restoration, ODEQ is guided by Section 303(d) of the Federal Clean Water Act and Oregon statute to establish Total Maximum Daily Loads (TMDLs) for pollutants and implement water quality standards as outlined in Oregon Administrative Rules 340-041. The ODEQ focuses on stream conditions and inputs and advocates for other measures in support of fish populations (D. Butcher, ODEQ, personal communication, 2001).

6.3 Federal Level

Many federal agencies are involved in protection of fish and wildlife resources including:

- Natural Resources Conservation Service
- Farm Services Agency
- U. S. Forest Service
- U.S. Bureau of Reclamation
- Bureau of Land Management
- U.S. Army Corps of Engineers
- U. S. Fish and Wildlife Service
- Bonneville Power Administration
- Columbia Basin Fish and Wildlife Authority
- Environmental Protection Agency

6.3.1 Natural Resource Conservation Service

One of the purposes of the NRCS is to provide consistent technical assistance to private land users, tribes, communities, government agencies, and conservation districts. The NRCS assists

in developing conservation plans, provides technical field-based assistance including project design, and encourages the implementation of conservation practices to improve water quality and fisheries habitat. Programs include the CRP, River Basin Studies, Forestry Incentive Program, Wildlife Habitat Improvement Program, the Environmental Quality Incentives Program, and Wetlands Reserve Program (S. Gilmore, Resource Planning Unlimited, Inc., personal communications). The USDA Farm Services Administration (FSA) and the NRCS administer and implement the federal CRP and Continuous CRP.

6.3.1.1 Conservation Reserve Program

The enrollment of agricultural land with a previous cropping history into CRP has removed highly erodible land from commodity production. The land is converted into permanent herbaceous or woody vegetation to reduce soil and water erosion. Conservation Reserve Program contracts are for a maximum of 10 years per sign-up period (the contracts may be extended) and have resulted in an increase in wildlife habitat.

CRP cover practices (CP) include planting introduced or native grasses, wildlife cover, conifers, filter strips, grassed waterways, riparian forest buffers, and field windbreaks. Not all CPs are equal, nor benefit wildlife to the same degree. For example, CP1 (permanent introduced grasses) usually equates to monocultures of crested wheatgrass with minimal wildlife value. In contrast, CP2 (permanent native grasses and legumes) provides much more habitat structural and floristic diversity, which clearly benefits wildlife more than introduced grass monocultures. Cover Practices are summarized and compared in Table_22.

Conservation Reserve Program contract approval is based, in part, on the types of vegetation landowners are willing to plant. Cover Practice planting combinations are assigned points based on the potential value to wildlife. For example, cover types more beneficial to wildlife are awarded higher scores. Seed mixes containing diverse native species generally receive the highest scores (FSA 2003).

Table 80. Cover practice descriptions (FSA 2003).

Cover Practice (CP)	Description
CP1 - Permanent Introduced Grasses and Legumes	Planting of 2 to 3 species of an introduced grass species, or mixture (minimum of 4 species) of at least 3 introduced grasses and at least 1 forbs or legume species best suited for wildlife in the area.
CP2 - Establishment of permanent native grasses	Mixed stand (minimum of 3 species) of at least 2 native grass species and at least 1 forbs or legume species beneficial to wildlife, or mixed stand (minimum of 5 species) of at least 3 native grasses and at least 1 shrub, forbs, or legume species best suited for wildlife in the area.
CP3 -Tree planting (general)	Northern conifers (softwoods) - Conifers/softwoods planted at a rate of 750 to 850 trees per acre depending upon the site index with 10 to 20 percent openings managed to a CP4D wildlife cover, or western pines (softwoods) planted at a rate of 550 to 650 per acre depending upon the site index with 10 to 20 percent openings managed to a CP4D wildlife cover.
CP4B - Permanent wildlife habitat (corridors), non-easement	Mixed stand (minimum of 4 species) of grasses, trees, shrubs, forbs, or legumes planted in mixes, blocks, or strips best suited for various wildlife species in the area. A wildlife conservation plan must be developed with the participant (more points awarded for a minimum of 5 species). Only native grasses are authorized.
CP4D - Permanent wildlife habitat	Mixed stand (minimum of 4 species) of either grasses, trees, shrubs, forbs, *or* legumes planted in mixes, blocks, or strips best suited for various wildlife species in the area. A wildlife conservation plan must be developed with the

	participant (additional points awarded for a minimum of 5 species). Only native grasses are authorized.
CP-10 - Vegetative cover: grass – already established	A solid stand of 1 to 3 species of introduced grasses, a solid stand of 1 to 3 species of native grasses, or mixed stand (minimum of 5 species) of at least 3 native grasses and at least 1 shrub, forbs, or legume species best suited to Wildlife in the area (native vegetation maximizes points).
CP11 – Vegetative cover: trees – already established	Solid stand of pine/softwood or solid stand of non-mast producing hardwood species, solid stand of a single hard mast producing species, or mixed stand (2 or more species) of hardwoods best suited for wildlife in the area. Pine/softwood established at, or thinned to provide 15 to 20 percent openings of native herbaceous cover and/or shrub plantings/ natural regeneration best suited for wildlife in the area is awarded additional points.
CP 15 – Contour grass strips	Contour grass strips to reduce erosion and control runoff.

FSA cover practice data, reported on a county basis, is compared for Washington State counties in Figure_39. Although more expensive and often harder to establish, landowners throughout the Ecoregion have chosen to apply cover practices such as CP2 and CP4 that significantly benefit wildlife over less beneficial practices like CP1.

Conservation Reserve Program and associated cover practices that emphasize wildlife habitat increase the extent of grassland habitats, provide connectivity/corridors between extant native grasslands and other habitat types, reduce habitat fragmentation, contribute towards control of noxious weeds, increase landscape habitat diversity and edge effect, reduce soil erosion and stream sedimentation, and provide habitat for a myriad of wildlife species.

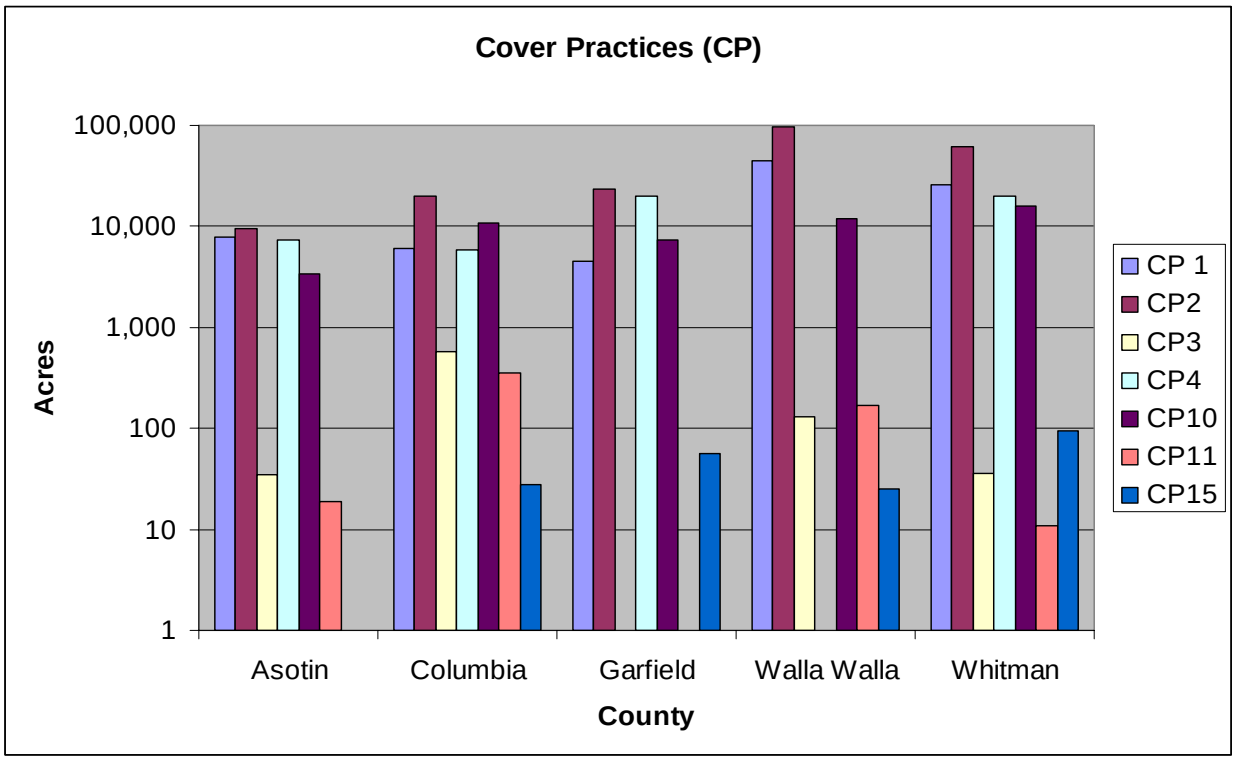

Figure 110. A county comparison of Conservation Reserve Program cover practices, Washington (FSA 2003).

6.3.1.2 Conservation Reserve Enhancement Program

The CREP, established in 1998, is a partnership between USDA and the States of Washington and Oregon and is administered by FSA and the WCC. The CREP provides incentives to restore and improve salmon and steelhead habitat on private land. Program participation is voluntary. Under 10 or 15-year contracts, landowners remove fields from production, remove grazing, and plant trees and shrubs to stabilize stream banks. This also provides wildlife habitat, reduces sedimentation, shades stream corridors, and improves riparian/riverine wetland function.

Landowners receive annual rent, incentive and maintenance payments, and cost share for practice installations. Payments made by FSA and WCC, can result in no cost to the landowner for participation. The number of acres enrolled in CREP is compared by county in Figure 40.

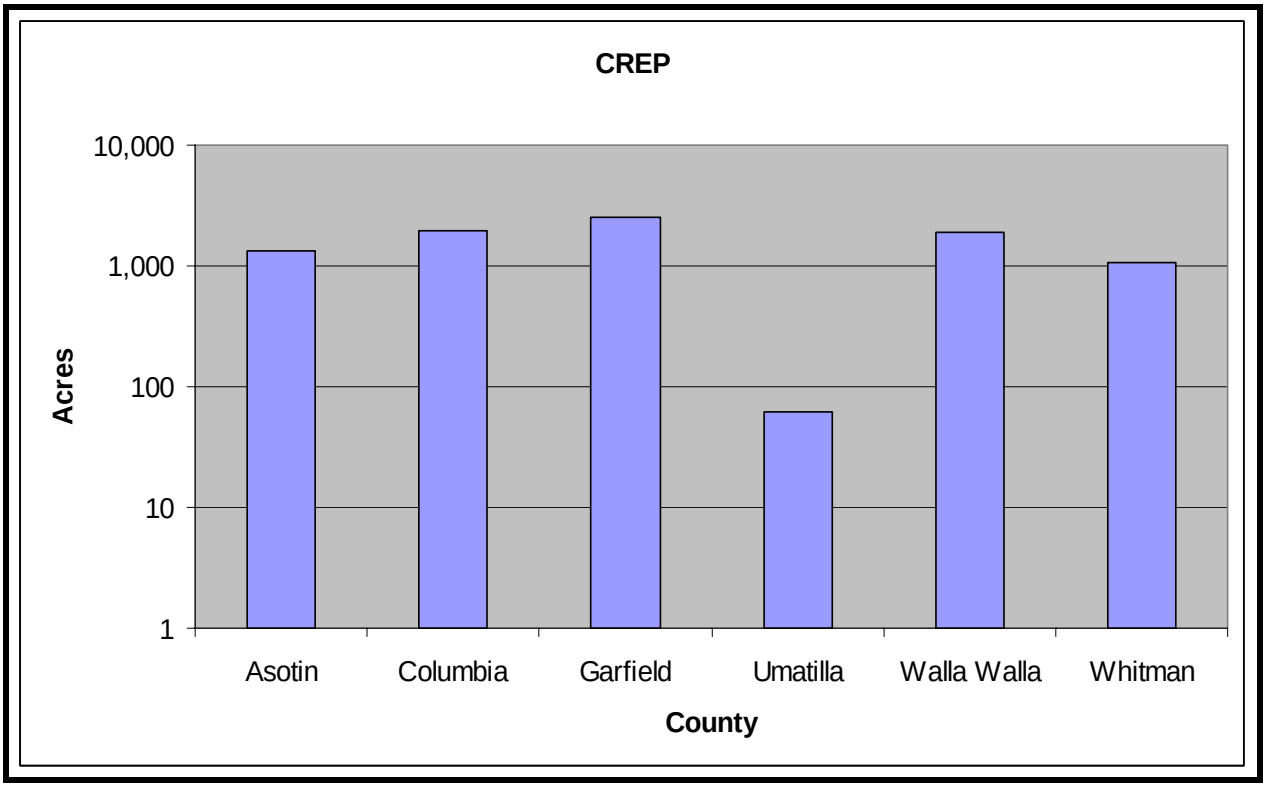

Figure 111. A county comparison of acreage protected by the Conservation Reserve Enhancement Program (FSA 2003).

CRP and CREP utilize herbaceous seedings, shrubs, and trees to accomplish conservation measures that provide short-term high protection for wildlife habitats. Program/protection acreage is summarized and compared by county for both programs in Figure 41.

6.3.1.3 Continuous Conservation Reserve Program

The CCRP focuses on the improvement of water quality and riparian areas. Practices include shallow water areas with associated wetland and upland wildlife habitat, riparian forest buffers, filter strips, grassed waterways and field windbreaks. Enrollment for these practices is not limited to highly erodible land, as is required for the CRP, and carries a longer contract period (10 - 15 years), higher installation reimbursement rate, and higher annual annuity rate.

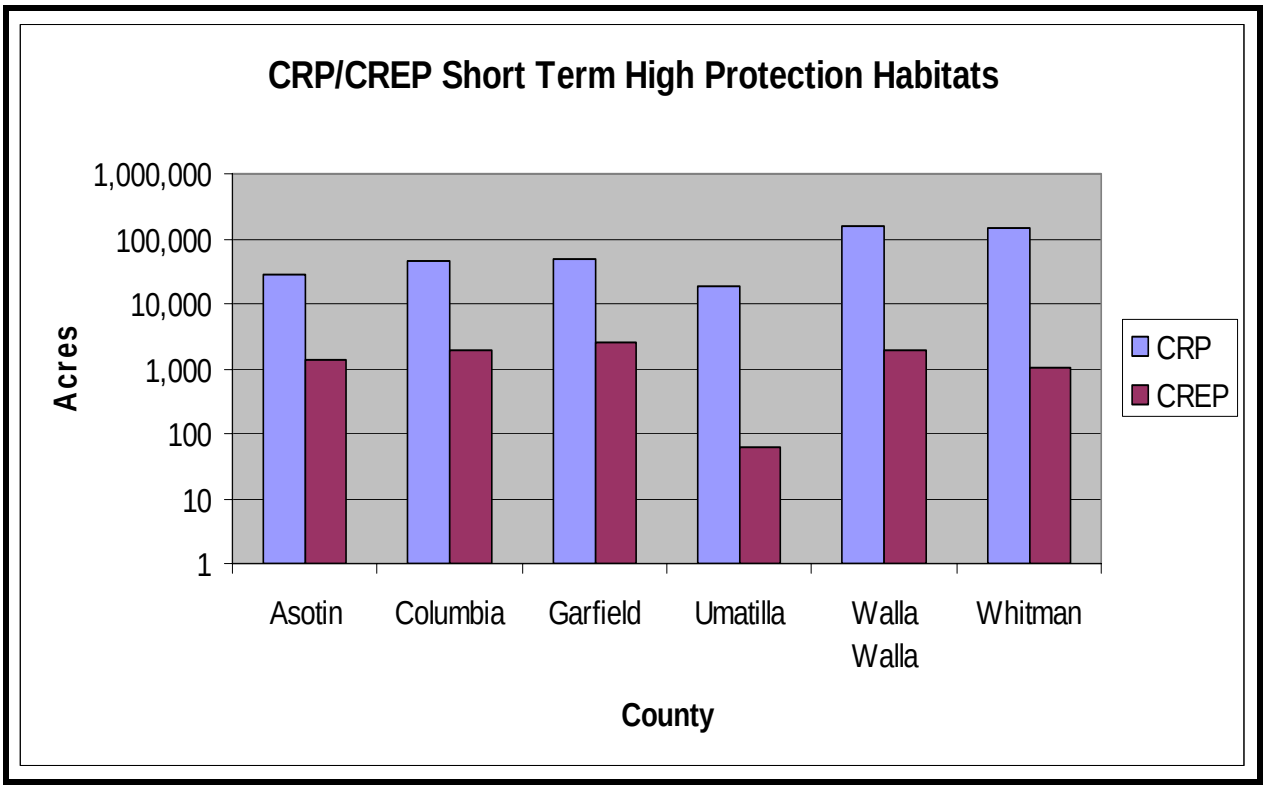

Figure 112. Short term/high protection CRP and CREP lands (FSA 2003).

6.3.1.4 Wildlife Habitat Incentive Program

The Wildlife Habitat Incentive Program (WHIP) is administered and implemented by NRCS and provides financial incentives to develop wildlife habitat on private lands. Participants agree to implement a wildlife habitat development plan and NRCS agrees to share the cost of assistance for the initial implementation of wildlife habitat development practices. The NRCS and program participants enter into a cost-share agreement for wildlife habitat development. This agreement generally lasts a minimum of 10 years.

6.3.1.5 Environmental Quality Incentives Program

The Environmental Quality Incentives Program is administered and implemented by the NRCS and provides technical, educational, and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. The program assists farmers and ranchers with federal, state, and tribal environmental compliance, and encourages environmental stewardship. The program is funded through the Commodity Credit Corporation.

Program goals and objectives are achieved through the implementation of a conservation plan that incorporates structural, vegetative, and land management practices on eligible land. Eligible producers commit to 5 to 10-year contracts. Cost-share payments are paid for implementation of one or more eligible structural or vegetative practices such as terraces, filter strips, tree planting, and permanent wildlife habitat. Furthermore, incentive payments are made for implementation of one or more land management practices such as nutrient management, pest management, and grazing land management.

6.3.1.6 Wetlands Reserve Program

This voluntary program is designed to restore wetlands. Participating landowners can establish permanent or 30-year conservation easements, or they can enter into restoration cost-share agreements where no easement is involved. In exchange for establishing a permanent easement, the landowner receives payment up to the agricultural value of the land and 100 percent of the restoration costs for restoring the wetlands. The 30-year easement payment is 75 percent of what would be provided for a permanent easement on the same site and 75 percent of the restoration cost. The voluntary agreements are a minimum of 10 years in duration and provide for 75 percent of the cost of restoring the involved wetlands. Easements and restoration cost-share agreements establish wetland protection and restoration as the primary land use for the duration of the easement or agreement.

6.3.2 Farm Service Administration

The Farm Service Administration (FSA) was set up when the USDA was reorganized in 1994. Functions similar to the FSA have been part of USDA programs since the 1930s. Federal farm programs are administered through local FSA offices. Farmers who are eligible to participate in these programs elect a committee of three to five representatives to review county office operations and make decisions on federal farm program application. Conservation program payments that FSA administers include CRP and EQIP. Technical assistance for these programs is provided by the NRCS.

6.3.3 U. S. Forest Service

The USFS is responsible for the management of all National Forests and National Grasslands in the United States. The multiple use mandate of the USFS was emphasized in the Multiple Use Sustained Yield Act of 1960. The forest planning process that has been in force for over the last 20 years was established under the Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974 and National Forest Management Act (NFMA) of 1976. The USFS land allocation, management standards, and guidelines for the Subbasin are specified in the Umatilla National Forest land and resource management plan (NPPC 2001).

6.3.4 U. S. Bureau of Reclamation

The primary activity of the BOR is to provide irrigation water. The BOR is involved with water management and irrigation in the Subbasin, as well as multiple use resource management on its lands and facilities, including recreation and wildlife conservation.

6.3.5 Bureau of Land Management

Lands administered by the Bureau of Land Management (BLM) consist primarily of dry grasslands and desert. These lands are currently managed for multiple-use under authority of the *Federal Land Policy and Management Act* (FLPMA) of 1976. Primary commodity uses of these lands are grazing and mining. Wildlife, wilderness, archaeological and historic sites, and recreation are also managed on BLM lands. The BLM is also responsible for mineral leasing on all public lands.

6.3.6 U. S. Army Corps of Engineers

The USACE is responsible for planning, designing, building and operating water resources and other civil works projects. The Federal Water Pollution Control Act of 1972 gave the USACE authority to enforce section 404 of the Act dealing with discharge of dredged or fill material into waters of the U. S., including wetlands. Amendments to the Act in 1977 exempted most farming, ranching, and forestry activities from 404 permit requirements (Dana and Fairfax 1980). The USACE is also responsible for flood protection by such means as building and maintaining levies, channelization of streams and rivers, and regulating flows and reservoir levels.

6.3.7 U. S. Fish and Wildlife Service

The U. S. Fish and Wildlife Service (USFWS) administers the Endangered Species Act for resident fish and wildlife species. The USFWS is also responsible for enforcing the *North American Migratory Bird Treaty Act and Lacey Act* (1900) to prevent interstate commerce in wildlife taken illegally. The USFWS distributes monies to state fish and wildlife departments raised through federal taxes on the sale of hunting and fishing equipment under the authority of the *Pitman-Robertson Federal Aid in Fish and Wildlife Restoration Act* (1937) and the *Dingle-Johnson Act*. The USFWS also manages a national system of wildlife refuges and provides funding that emphasizes restoration of riparian areas, wetlands, and native plant communities through the Partners in Wildlife Program.

The USFWS budgets for and administers the operation, maintenance, and evaluation of the Lower Snake River Fish and Wildlife Compensation Program (LSRFWCP) spring and fall chinook, steelhead, and rainbow trout programs in the Walla Walla subbasin. The LSRFWCP was authorized by the *Water Resources Development Act* of 1976, Public Law 94-587, to offset losses caused by the four Lower Snake River dam and navigation lock projects. The WDFW operates LSRFWCP facilities in the Subbasin and are co-managers with the CTUIR.

6.3.8 Bonneville Power Administration

The Bonneville Power Administration (BPA) is a federal agency established to market power produced by the federal dams in the Columbia River Basin. The BPA provides funding for fish and wildlife protection and enhancement to mitigate for the loss of habitat resulting from hydroelectric construction and operations.

6.3.9 Columbia Basin Fish and Wildlife Authority

The Columbia Basin Fish and Wildlife Authority (CBFWA) developed the *Columbia River Fish Management Plan* (Plan). The Plan is an agreement among the tribal, state and federal parties with jurisdiction over Pacific salmon originating in the Columbia River Basin. The Plan provides procedures whereby the parties co-manage anadromous fish harvest, production and habitat (CRITFC 1995). The Plan stems from the treaty fishing rights lawsuit, U. S. v. Oregon. Although the Plan expired in 1999, the co-managers are currently developing another plan. The interim, short-term agreements on managing the fisheries have been entered into prior to execution of the specific fishery (spring or fall). The Plan and further agreements emphasize the importance of artificial propagation actions to accomplish the goals of rebuilding natural salmon runs. Agreements struck in the U. S. v. Oregon forum often determine the number, purpose and location of fish released from various hatcheries.

6.3.10 Environmental Protection Agency

The Environmental Protection Agency (EPA) was formed in 1970 and administers the federal Air, Water, and Pesticide Acts. The EPA sets national air quality standards, an important provision of which requires states to prevent deterioration of air quality in rural areas below the national standards for that particular area (depending on its EPA classification). The EPA also sets national water quality standards (TMDLs) for water bodies that the states must enforce. These standards are segregated into “point” and “nonpoint” source water pollution, with point sources requiring permitting. Although controversial, most farming, ranching, and forestry practices are considered non-point sources and thus do not require permitting by the EPA. The EPA provides funding through Section 319 of the Clean Water Act for TMDL implementation projects. Section 319 funds are administered by WDOE by the ODEQ.

6.4 Native American Tribes

- The Confederated Tribes of the Umatilla Indian Reservation

6.4.1 The Confederated Tribes of the Umatilla Indian Reservation

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) is responsible for protecting and enhancing treaty fish and wildlife resources and habitats for present and future generations. Members of the CTUIR have federal reserved treaty fishing and hunting rights pursuant to the 1855 Treaty with the United States government. The CTUIR co-manages fish and wildlife resources with state fish and wildlife managers and individually and/or jointly implements restoration and mitigation activities throughout areas of interest and influence in northeast Oregon and southeast Washington. These lands include but are not limited to the entire Subbasin in which CTUIR held aboriginal title. CTUIR fish and wildlife activities relate to all aspects of management (habitat, fish passage, hatchery actions, harvest, research, etc.). CTUIR policies and plans applicable to Subbasin management include the Columbia Basin Salmon Policy (CTUIR 1995), Wy-Kan-Ush-Mi Wa-Kish-Wit: Spirit of the Salmon (CRITFIC 1996a, 1996b), and the CTUIR Wildlife Mitigation Plan for the John Day and McNary Dams (Childs *et al.* 1997).

7.0 References

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Appendix K: Oregon GAP Vegetation Zones

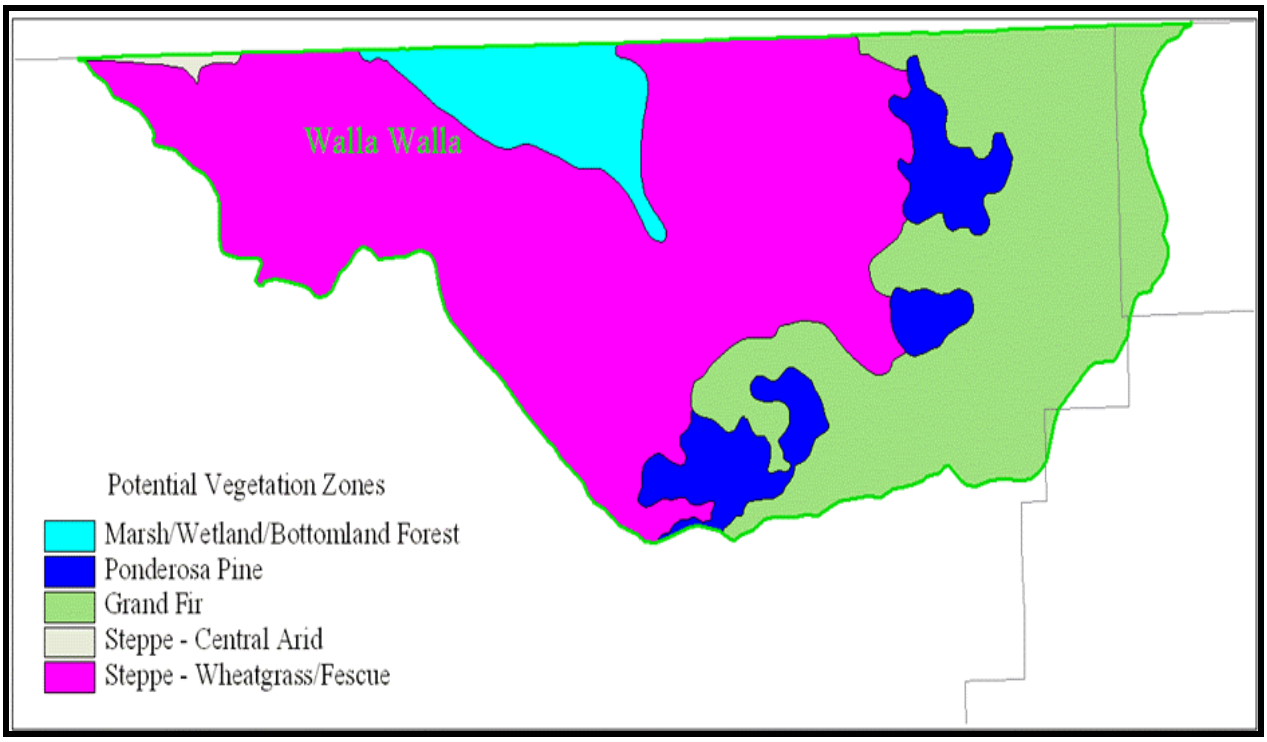

Figure A-1. Historic (potential) vegetation zones of the Southeast Washington Subbasin Planning Ecoregion, Oregon (Cassidy 1997).

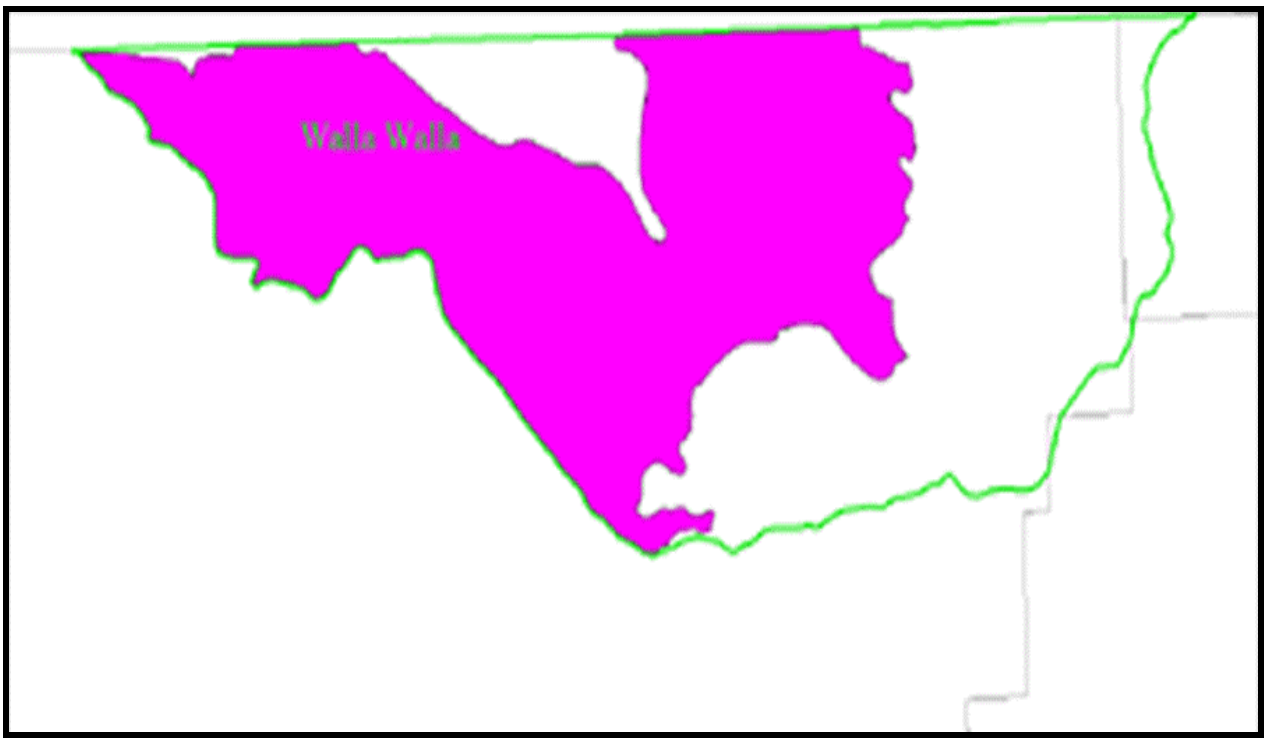

Figure A-2. Historic (potential) wheatgrass/fescue steppe vegetation zone in the Southeast Washington Subbasin Planning Ecoregion, Oregon (Cassidy 1997).

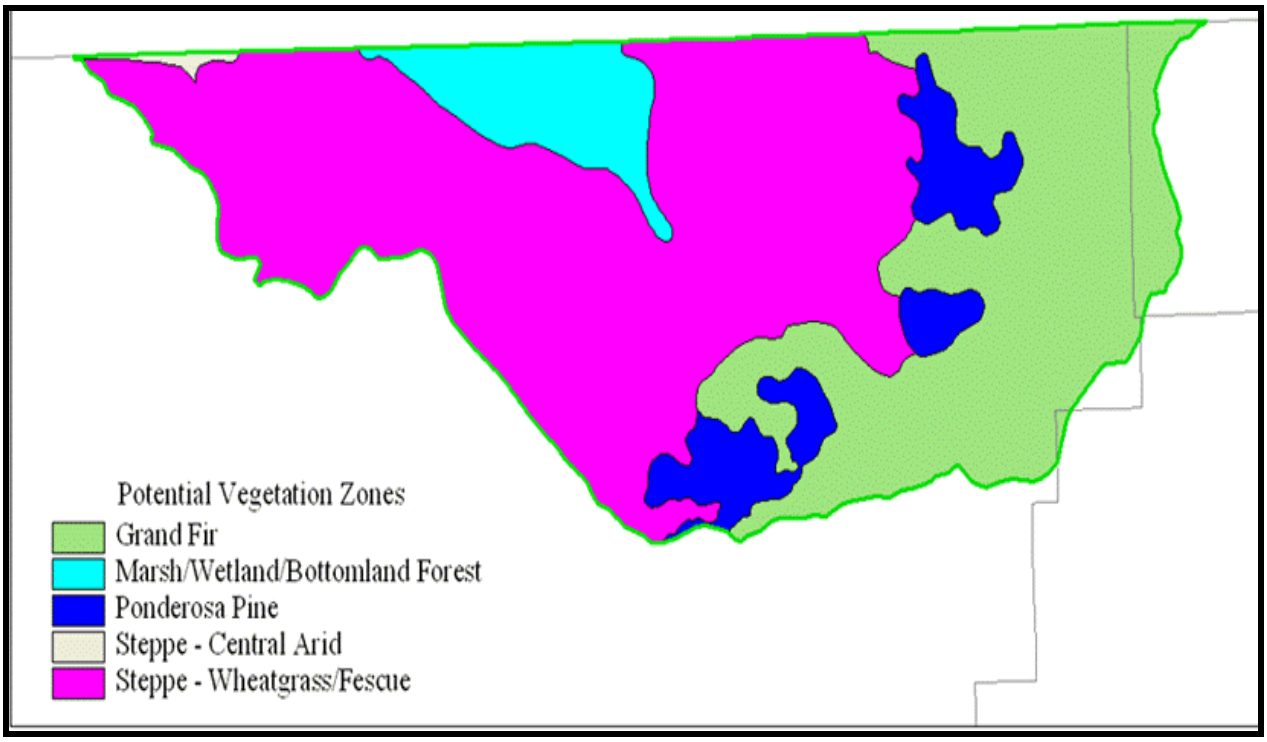

Figure A-3. Pre-agricultural vegetation zones of the Southeast Washington Subbasin Planning Ecoregion, Oregon (Cassidy 1997).

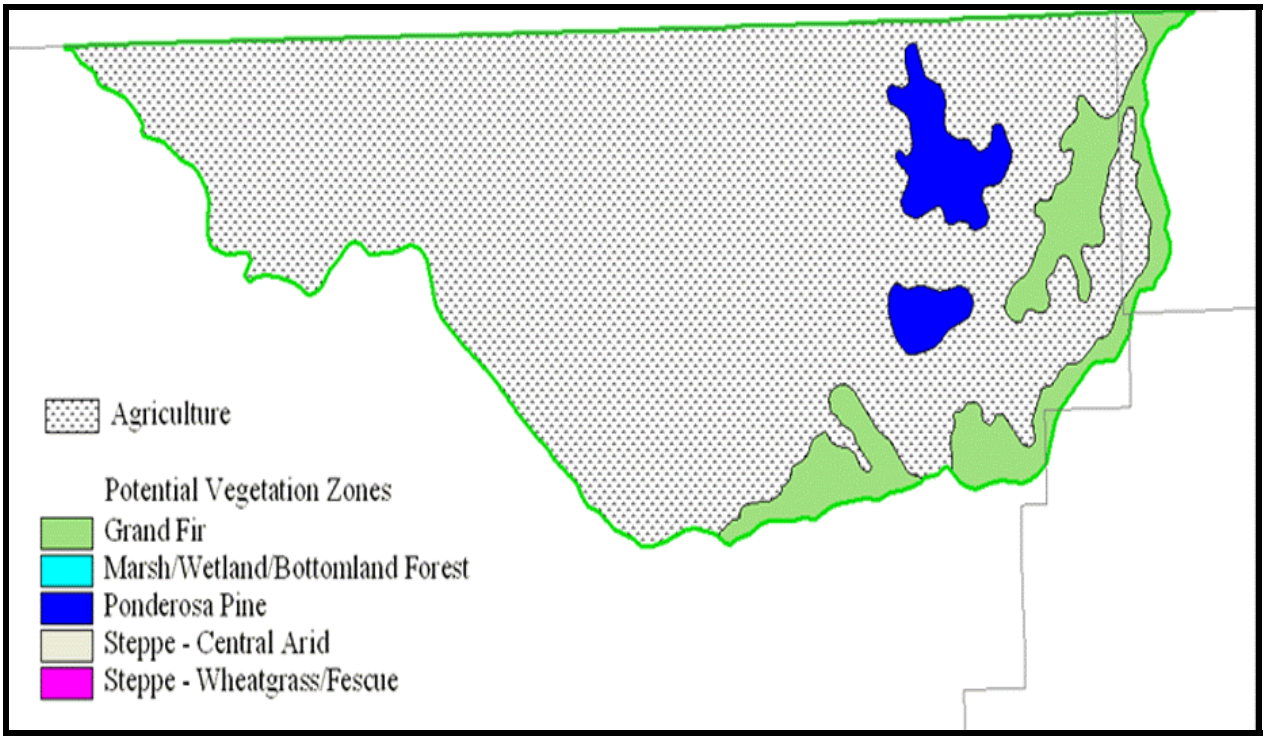

Figure A-4. Post-agricultural vegetation zones of the Southeast Washington Subbasin Planning Ecoregion, Oregon (Cassidy 1997).

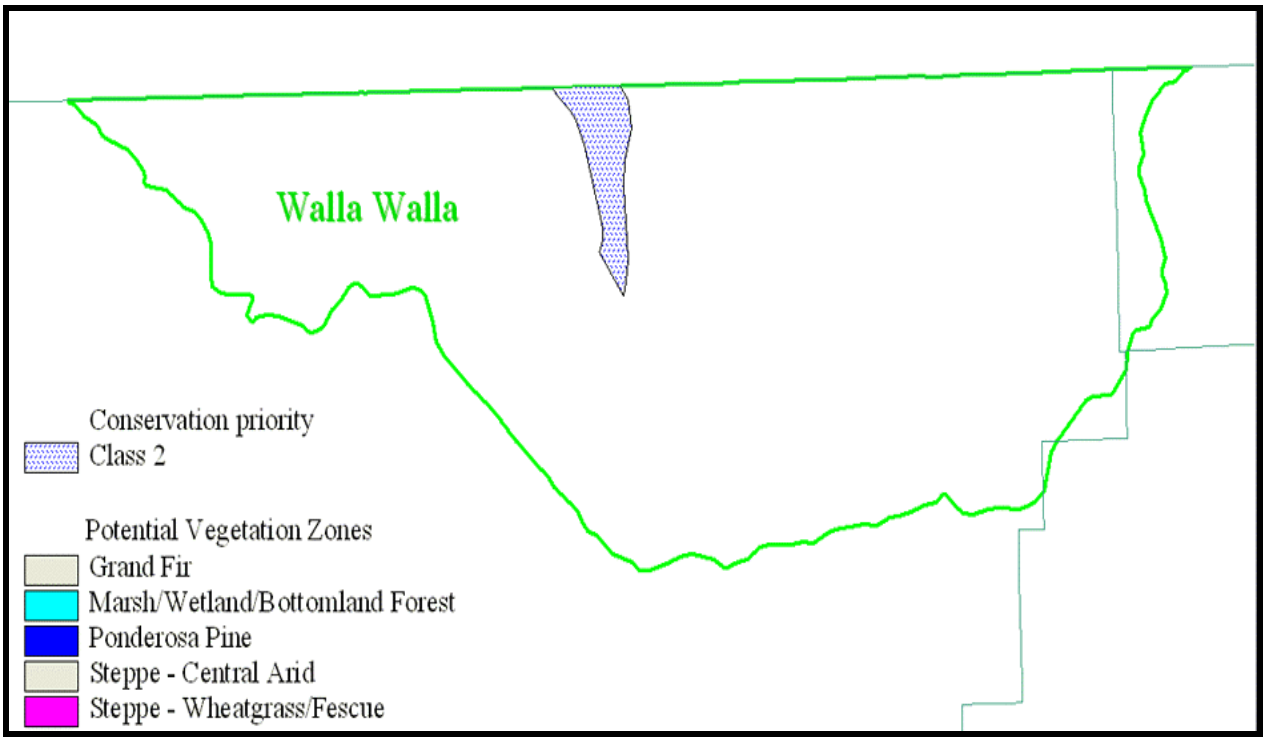

Figure A-5. ECA land classes in the Southeast Washington Subbasin Planning Ecoregion (Cassidy 1997).

Appendix L: Wildlife Species

Table B-1. Wildlife species occurrence for the Walla Walla subbasin (NHI 2003).

	Common Name	Scientific Name	Salmonid Relationship	Closely Associated with Riparian	Closely Associated with Wetlands
Amphibians					
	Tiger Salamander	*Ambystoma tigrinum*		Yes	Yes
	Long-toed Salamander	*Ambystoma macrodactylum*		Yes	Yes
	Tailed Frog	*Ascaphus truei*		Yes	
	Great Basin Spadefoot	*Scaphiopus intermontanus*		Yes	Yes
	Western Toad	*Bufo boreas*		Yes	Yes
	Woodhouse's Toad	*Bufo woodhousii*		Yes	Yes
	Pacific Chorus (Tree) Frog	*Pseudacris regilla*		Yes	Yes
	Columbia Spotted Frog	*Rana luteiventris*		Yes	Yes
	Northern Leopard Frog	*Rana pipiens*		Yes	Yes
Non-native	Bullfrog	*Rana catesbeiana*		Yes	Yes
	Total Amphibians:	**10** **Total:**	**0**	**10**	**9**
Birds					
	Common Loon	*Gavia immer*	Yes		Yes
	Pied-billed Grebe	*Podilymbus podiceps*	Yes		Yes
	Horned Grebe	*Podiceps auritus*	Yes		Yes
	Red-necked Grebe	*Podiceps grisegena*	Yes		Yes
	Eared Grebe	*Podiceps nigricollis*			Yes
	Western Grebe	*Aechmophorus occidentalis*	Yes		Yes
	Clark's Grebe	*Aechmophorus clarkii*	Yes		Yes
	American White Pelican	*Pelecanus erythrorhynchos*	Yes		
	Double-crested Cormorant	*Phalacrocorax auritus*	Yes	Yes	
	American Bittern	*Botaurus lentiginosus*			Yes
	Great Blue Heron	*Ardea herodias*	Yes	Yes	
	Great Egret	*Ardea alba*	Yes	Yes	
	Cattle Egret	*Bubulcus ibis*			
	Green Heron	*Butorides virescens*	Yes	Yes	
	Black-crowned Night-heron	*Nycticorax nycticorax*	Yes	Yes	
	Turkey Vulture	*Cathartes aura*	Yes		
	Greater White-fronted Goose	*Anser albifrons*			
	Snow Goose	*Chen*			

	Common Name	Scientific Name	Salmonid Relationship	Closely Associated with Riparian	Closely Associated with Wetlands
		Ccaerulescens			
	Ross's Goose	*Chen rossii*			
	Canada Goose	*Branta canadensis*			Yes
	Trumpeter Swan	*Cygnus buccinator*	Yes		Yes
	Tundra Swan	*Cygnus columbianus*			
	Wood Duck	*Aix sponsa*		Yes	
	Gadwall	*Anas strepera*			Yes
	Eurasian Wigeon	*Anas penelope*			
	American Wigeon	*Anas americana*			Yes
	Mallard	*Anas platyrhynchos*	Yes	Yes	Yes
	Blue-winged Teal	*Anas discors*			Yes
	Cinnamon Teal	*Anas cyanoptera*			Yes
	Northern Shoveler	*Anas clypeata*			Yes
	Northern Pintail	*Anas acuta*			Yes
	Green-winged Teal	*Anas crecca*	Yes		Yes
	Canvasback	*Aythya valisineria*	Yes		Yes
	Redhead	*Aythya americana*			Yes
	Ring-necked Duck	*Aythya collaris*		Yes	
	Greater Scaup	*Aythya marila*	Yes		
	Lesser Scaup	*Aythya affinis*			Yes
	Harlequin Duck	*Histrionicus histrionicus*	Yes	Yes	
	Surf Scoter	*Melanitta perspicillata*	Yes		
	Bufflehead	*Bucephala albeola*			
	Common Goldeneye	*Bucephala clangula*	Yes		
	Barrow's Goldeneye	*Bucephala islandica*	Yes		
	Hooded Merganser	*Lophodytes cucullatus*	Yes	Yes	
	Common Merganser	*Mergus merganser*	Yes	Yes	
	Red-breasted Merganser	*Mergus serrator*	Yes		
	Ruddy Duck	*Oxyura jamaicensis*			Yes
	Osprey	*Pandion haliaetus*	Yes		
	Bald Eagle	*Haliaeetus leucocephalus*	Yes		
	Northern Harrier	*Circus cyaneus*			
	Sharp-shinned Hawk	*Accipiter striatus*			
	Cooper's Hawk	*Accipiter cooperii*			
	Northern Goshawk	*Accipiter gentilis*			
	Swainson's Hawk	*Buteo swainsoni*			
	Red-tailed Hawk	*Buteo jamaicensis*	Yes		

	Common Name	Scientific Name	Salmonid Relationship	Closely Associated with Riparian	Closely Associated with Wetlands
	Ferruginous Hawk	*Buteo regalis*			
	Rough-legged Hawk	*Buteo lagopus*			
	Golden Eagle	*Aquila chrysaetos*	Yes		
	American Kestrel	*Falco sparverius*			
	Merlin	*Falco columbarius*			
	Gyrfalcon	*Falco rusticolus*	Yes		
	Peregrine Falcon	*Falco peregrinus*	Yes		
	Prairie Falcon	*Falco mexicanus*			
Non-native	Chukar	*Alectoris chukar*			
Non-native	Gray Partridge	*Perdix perdix*			
Non-native	Ring-necked Pheasant	*Phasianus colchicus*		Yes	
	Ruffed Grouse	*Bonasa umbellus*		Yes	
	Sage Grouse	*Centrocercus urophasianus*			
	Spruce Grouse	*Falcipennis canadensis*			
	Blue Grouse	*Dendragapus obscurus*		Yes	
	Sharp-tailed Grouse	*Tympanuchus phasianellus*			
Non-native	Wild Turkey	*Meleagris gallopavo*			
	Mountain Quail	*Oreortyx pictus*			
	California Quail	*Callipepla californica*			
Non-native	Northern Bobwhite	*Colinus virginianus*			
	Virginia Rail	*Rallus limicola*			Yes
	Sora	*Porzana carolina*			Yes
	American Coot	*Fulica americana*			Yes
	Sandhill Crane	*Grus canadensis*			Yes
	Black-bellied Plover	*Pluvialis squatarola*			
	Pacific Golden-Plover	*Pluvialis fulva*			
	Semipalmated Plover	*Charadrius semipalmatus*			
	Killdeer	*Charadrius vociferus*	Yes		
	Black-necked Stilt	*Himantopus mexicanus*			Yes
	American Avocet	*Recurvirostra americana*			Yes
	Greater Yellowlegs	*Tringa melanoleuca*	Yes		
	Lesser Yellowlegs	*Tringa flavipes*			
	Solitary Sandpiper	*Tringa solitaria*			
	Willet	*Catoptrophorus*			Yes

	Common Name	Scientific Name	Salmonid Relationship	Closely Associated with Riparian	Closely Associated with Wetlands
		semipalmatus			
	Spotted Sandpiper	*Actitis macularia*	Yes		
	Upland Sandpiper	*Bartramia longicauda*			
	Long-billed Curlew	*Numenius americanus*			
	Marbled Godwit	*Limosa fedoa*			
	Sanderling	*Calidris alba*			
	Semipalmated Sandpiper	*Calidris pusilla*			
	Western Sandpiper	*Calidris mauri*			
	Least Sandpiper	*Calidris minutilla*			
	Baird's Sandpiper	*Calidris bairdii*			
	Pectoral Sandpiper	*Calidris melanotos*			
	Dunlin	*Calidris alpina*			
	Stilt Sandpiper	*Calidris himantopus*			
	Short-billed Dowitcher	*Limnodromus griseus*			
	Long-billed Dowitcher	*Limnodromus scolopaceus*			
	Common Snipe	*Gallinago gallinago*			Yes
	Wilson's Phalarope	*Phalaropus tricolor*			Yes
	Red-necked Phalarope	*Phalaropus lobatus*			
	Bonaparte's Gull	*Larus philadelphia*	Yes		
	Mew Gull	*Larus canus*	Yes		
	Ring-billed Gull	*Larus delawarensis*	Yes		
	California Gull	*Larus californicus*	Yes		
	Herring Gull	*Larus argentatus*	Yes		
	Thayer's Gull	*Larus thayeri*	Yes		
	Glaucous-winged Gull	*Larus glaucescens*	Yes		
	Glaucous Gull	*Larus hyperboreus*	Yes		
	Caspian Tern	*Sterna caspia*	Yes		
	Common Tern	*Sterna hirundo*	Yes		
	Forster's Tern	*Sterna forsteri*	Yes		Yes
	Black Tern	*Chlidonias niger*			Yes
Non-native	Rock Dove	*Columba livia*			
	Band-tailed Pigeon	*Columba fasciata*		Yes	
	Mourning Dove	*Zenaida macroura*		Yes	
	Yellow-billed Cuckoo	*Coccyzus americanus*		Yes	
	Barn Owl	*Tyto alba*			
	Flammulated Owl	*Otus flammeolus*			
	Western Screech-owl	*Otus kennicottii*		Yes	

	Common Name	Scientific Name	Salmonid Relationship	Closely Associated with Riparian	Closely Associated with Wetlands
	Great Horned Owl	*Bubo virginianus*			
	Snowy Owl	*Nyctea scandiaca*	Yes		
	Northern Pygmy-owl	*Glaucidium gnoma*			
	Burrowing Owl	*Athene cunicularia*			
	Barred Owl	*Strix varia*			
	Great Gray Owl	*Strix nebulosa*			
	Long-eared Owl	*Asio otus*		Yes	
	Short-eared Owl	*Asio flammeus*			Yes
	Boreal Owl	*Aegolius funereus*			
	Northern Saw-whet Owl	*Aegolius acadicus*			
	Common Nighthawk	*Chordeiles minor*			
	Common Poorwill	*Phalaenoptilus nuttallii*			
	Black Swift	*Cypseloides niger*			
	Vaux's Swift	*Chaetura vauxi*			
	White-throated Swift	*Aeronautes saxatalis*			
	Black-chinned Hummingbird	*Archilochus alexandri*			
	Calliope Hummingbird	*Stellula calliope*			
	Broad-tailed Hummingbird	*Selasphorus platycercus*			
	Rufous Hummingbird	*Selasphorus rufus*			
	Belted Kingfisher	*Ceryle alcyon*	Yes	Yes	
	Lewis's Woodpecker	*Melanerpes lewis*			
	Williamson's Sapsucker	*Sphyrapicus thyroideus*			
	Red-naped Sapsucker	*Sphyrapicus nuchalis*		Yes	
	Red-breasted Sapsucker	*Sphyrapicus ruber*			
	Downy Woodpecker	*Picoides pubescens*			
	Hairy Woodpecker	*Picoides villosus*			
	White-headed Woodpecker	*Picoides albolarvatus*			
	Three-toed Woodpecker	*Picoides tridactylus*			
	Black-backed Woodpecker	*Picoides arcticus*			
	Northern Flicker	*Colaptes auratus*			
	Pileated	*Dryocopus pileatus*			

	Common Name	Scientific Name	Salmonid Relationship	Closely Associated with Riparian	Closely Associated with Wetlands
	Woodpecker				
	Olive-sided Flycatcher	*Contopus cooperi*			
	Western Wood-pewee	*Contopus sordidulus*			
	Willow Flycatcher	*Empidonax traillii*	Yes	Yes	
	Least Flycatcher	*Empidonax minimus*			
	Hammond's Flycatcher	*Empidonax hammondii*			
	Gray Flycatcher	*Empidonax wrightii*			
	Dusky Flycatcher	*Empidonax oberholseri*			
	Pacific-slope Flycatcher	*Empidonax difficilis*			
	Cordilleran Flycatcher	*Empidonax occidentalis*		Yes	
	Say's Phoebe	*Sayornis saya*			
	Ash-throated Flycatcher	*Myiarchus cinerascens*			
	Western Kingbird	*Tyrannus verticalis*			
	Eastern Kingbird	*Tyrannus tyrannus*			
	Loggerhead Shrike	*Lanius ludovicianus*			
	Northern Shrike	*Lanius excubitor*			
	Cassin's Vireo	*Vireo cassinii*			
	Hutton's Vireo	*Vireo huttoni*			
	Warbling Vireo	*Vireo gilvus*		Yes	
	Red-eyed Vireo	*Vireo olivaceus*		Yes	
	Gray Jay	*Perisoreus canadensis*	Yes		
	Steller's Jay	*Cyanocitta stelleri*	Yes		
	Western Scrub-Jay	*Aphelocoma californica*			
	Pinyon Jay	*Gymnorhinus cyanocephalus*			
	Clark's Nutcracker	*Nucifraga columbiana*			
	Black-billed Magpie	*Pica pica*	Yes	Yes	
	American Crow	*Corvus brachyrhynchos*	Yes		
	Northwestern Crow	*Corvus caurinus*	Yes		
	Common Raven	*Corvus corax*	Yes		
	Horned Lark	*Eremophila alpestris*			
	Tree Swallow	*Tachycineta bicolor*	Yes	Yes	
	Violet-green	*Tachycineta*	Yes		

	Common Name	Scientific Name	Salmonid Relationship	Closely Associated with Riparian	Closely Associated with Wetlands
	Swallow	*thalassina*			
	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	Yes	Yes	
	Bank Swallow	*Riparia riparia*	Yes	Yes	
	Cliff Swallow	*Petrochelidon pyrrhonota*	Yes	Yes	
	Barn Swallow	*Hirundo rustica*	Yes	Yes	
	Black-capped Chickadee	*Poecile atricapillus*			
	Mountain Chickadee	*Poecile gambeli*			
	Chestnut-backed Chickadee	*Poecile rufescens*			
	Bushtit	*Psaltriparus minimus*			
	Red-breasted Nuthatch	*Sitta canadensis*			
	White-breasted Nuthatch	*Sitta carolinensis*			
	Pygmy Nuthatch	*Sitta pygmaea*		Yes	
	Brown Creeper	*Certhia americana*			
	Rock Wren	*Salpinctes obsoletus*			
	Canyon Wren	*Catherpes mexicanus*			
	Bewick's Wren	*Thryomanes bewickii*			
	House Wren	*Troglodytes aedon*			
	Winter Wren	*Troglodytes troglodytes*	Yes		
	Marsh Wren	*Cistothorus palustris*			Yes
	American Dipper	*Cinclus mexicanus*	Yes	Yes	
	Golden-crowned Kinglet	*Regulus satrapa*		Yes	
	Ruby-crowned Kinglet	*Regulus calendula*			
	Western Bluebird	*Sialia mexicana*			
	Mountain Bluebird	*Sialia currucoides*			
	Townsend's Solitaire	*Myadestes townsendi*			
	Veery	*Catharus fuscescens*		Yes	
	Swainson's Thrush	*Catharus ustulatus*			
	Hermit Thrush	*Catharus guttatus*			
	American Robin	*Turdus migratorius*	Yes		
	Varied Thrush	*Ixoreus naevius*	Yes		
	Gray Catbird	*Dumetella*		Yes	

	Common Name	Scientific Name	Salmonid Relationship	Closely Associated with Riparian	Closely Associated with Wetlands
		carolinensis			
	Northern Mockingbird	*Mimus polyglottos*			
	Sage Thrasher	*Oreoscoptes montanus*			
Non-native	European Starling	*Sturnus vulgaris*		Yes	
	American Pipit	*Anthus rubescens*			
	Bohemian Waxwing	*Bombycilla garrulus*			
	Cedar Waxwing	*Bombycilla cedrorum*		Yes	
	Orange-crowned Warbler	*Vermivora celata*			
	Nashville Warbler	*Vermivora ruficapilla*			
	Yellow Warbler	*Dendroica petechia*		Yes	
	Yellow-rumped Warbler	*Dendroica coronata*			
	Townsend's Warbler	*Dendroica townsendi*			
	American Redstart	*Setophaga ruticilla*		Yes	
	Northern Waterthrush	*Seiurus noveboracensis*		Yes	
	Macgillivray's Warbler	*Oporornis tolmiei*			
	Common Yellowthroat	*Geothlypis trichas*		Yes	Yes
	Wilson's Warbler	*Wilsonia pusilla*		Yes	
	Yellow-breasted Chat	*Icteria virens*		Yes	
	Western Tanager	*Piranga ludoviciana*			
	Green-tailed Towhee	*Pipilo chlorurus*			
	Spotted Towhee	*Pipilo maculatus*	Yes		
	American Tree Sparrow	*Spizella arborea*			
	Chipping Sparrow	*Spizella passerina*			
	Clay-colored Sparrow	*Spizella pallida*			
	Brewer's Sparrow	*Spizella breweri*			
	Vesper Sparrow	*Pooecetes gramineus*			
	Lark Sparrow	*Chondestes grammacus*			
	Sage Sparrow	*Amphispiza belli*			
	Savannah Sparrow	*Passerculus sandwichensis*			
	Grasshopper Sparrow	*Ammodramus savannarum*			

	Common Name	Scientific Name	Salmonid Relationship	Closely Associated with Riparian	Closely Associated with Wetlands
	Fox Sparrow	*Passerella iliaca*		Yes	
	Song Sparrow	*Melospiza melodia*	Yes		
	Lincoln's Sparrow	*Melospiza lincolnii*		Yes	Yes
	Swamp Sparrow	*Melospiza georgiana*			
	White-throated Sparrow	*Zonotrichia albicollis*			
	Harris's Sparrow	*Zonotrichia querula*			
	White-crowned Sparrow	*Zonotrichia leucophrys*			
	Golden-crowned Sparrow	*Zonotrichia atricapilla*			
	Dark-eyed Junco	*Junco hyemalis*			
	Lapland Longspur	*Calcarius lapponicus*			
	Snow Bunting	*Plectrophenax nivalis*			
	Black-headed Grosbeak	*Pheucticus melanocephalus*			
	Lazuli Bunting	*Passerina amoena*		Yes	
	Bobolink	*Dolichonyx oryzivorus*			
	Red-winged Blackbird	*Agelaius phoeniceus*			Yes
	Tricolored Blackbird	*Agelaius tricolor*			Yes
	Western Meadowlark	*Sturnella neglecta*			
	Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*			Yes
	Brewer's Blackbird	*Euphagus cyanocephalus*			
	Brown-headed Cowbird	*Molothrus ater*			
	Bullock's Oriole	*Icterus bullockii*		Yes	
	Gray-crowned Rosy-Finch	*Leucosticte tephrocotis*			
	Black Rosy-finch	*Leucosticte atrata*			
	Pine Grosbeak	*Pinicola enucleator*			
	Purple Finch	*Carpodacus purpureus*		Yes	
	Cassin's Finch	*Carpodacus cassinii*			
	House Finch	*Carpodacus mexicanus*			
	Red Crossbill	*Loxia curvirostra*			
	White-winged Crossbill	*Loxia leucoptera*			
	Common Redpoll	*Carduelis flammea*			

	Common Name	Scientific Name	Salmonid Relationship	Closely Associated with Riparian	Closely Associated with Wetlands
	Pine Siskin	*Carduelis pinus*			
	Lesser Goldfinch	*Carduelis psaltria*		Yes	
	American Goldfinch	*Carduelis tristis*			
	Evening Grosbeak	*Coccothraustes vespertinus*			
Non-native	House Sparrow	*Passer domesticus*			
	Total Birds:	**280** **Total:**	**66**	**50**	**40**
Mammals					
Non-native	Virginia Opossum	*Didelphis virginiana*	Yes		
	Preble's Shrew	*Sorex preblei*			
	Vagrant Shrew	*Sorex vagrans*	Yes		
	Montane Shrew	*Sorex monticolus*	Yes		
	Water Shrew	*Sorex palustris*	Yes	Yes	
	Merriam's Shrew	*Sorex merriami*			
	Coast Mole	*Scapanus orarius*			
	California Myotis	*Myotis californicus*			
	Western Small-footed Myotis	*Myotis ciliolabrum*		Yes	
	Yuma Myotis	*Myotis yumanensis*		Yes	
	Little Brown Myotis	*Myotis lucifugus*			
	Long-legged Myotis	*Myotis volans*		Yes	
	Fringed Myotis	*Myotis thysanodes*			
	Long-eared Myotis	*Myotis evotis*			
	Silver-haired Bat	*Lasionycteris noctivagans*			
	Western Pipistrelle	*Pipistrellus hesperus*		Yes	
	Big Brown Bat	*Eptesicus fuscus*		Yes	
	Hoary Bat	*Lasiurus cinereus*			
	Townsend's Big-eared Bat	*Corynorhinus townsendii*			
	Pallid Bat	*Antrozous pallidus*		Yes	
	American Pika	*Ochotona princeps*			
Non-native	Eastern Cottontail	*Sylvilagus floridanus*			
	Nuttall's (Mountain) Cottontail	*Sylvilagus nuttallii*			
	Snowshoe Hare	*Lepus americanus*		Yes	
	White-tailed Jackrabbit	*Lepus townsendii*			
	Black-tailed Jackrabbit	*Lepus californicus*			
	Least Chipmunk	*Tamias minimus*			
	Yellow-pine	*Tamias amoenus*			

	Common Name	Scientific Name	Salmonid Relationship	Closely Associated with Riparian	Closely Associated with Wetlands
	Chipmunk				
	Yellow-bellied Marmot	*Marmota flaviventris*			
	Merriam's Ground Squirrel	*Spermophilus canus*			
	Piute Ground Squirrel	*Spermophilus mollis*			
	Washington Ground Squirrel	*Spermophilus washingtoni*			
	Belding's Ground Squirrel	*Spermophilus beldingi*			
	Columbian Ground Squirrel	*Spermophilus columbianus*			
	Golden-mantled Ground Squirrel	*Spermophilus lateralis*			
Non-native	Eastern Fox Squirrel	*Sciurus niger*			
	Red Squirrel	*Tamiasciurus hudsonicus*			
	Northern Flying Squirrel	*Glaucomys sabrinus*	Yes		
	Northern Pocket Gopher	*Thomomys talpoides*			
	Great Basin Pocket Mouse	*Perognathus parvus*			
	Ord's Kangaroo Rat	*Dipodomys ordii*			
	American Beaver	*Castor canadensis*		Yes	Yes
	Western Harvest Mouse	*Reithrodontomys megalotis*		Yes	Yes
	Deer Mouse	*Peromyscus maniculatus*	Yes	Yes	Yes
	Northern Grasshopper Mouse	*Onychomys leucogaster*			
	Bushy-tailed Woodrat	*Neotoma cinerea*		Yes	
	Southern Red-backed Vole	*Clethrionomys gapperi*		Yes	
	Heather Vole	*Phenacomys intermedius*			
	Montane Vole	*Microtus montanus*			Yes
	Long-tailed Vole	*Microtus longicaudus*		Yes	Yes
	Water Vole	*Microtus richardsoni*		Yes	
	Sagebrush Vole	*Lemmiscus curtatus*			
	Muskrat	*Ondatra zibethicus*		Yes	Yes
Non-native	Norway Rat	*Rattus norvegicus*			

	Common Name	Scientific Name	Salmonid Relationship	Closely Associated with Riparian	Closely Associated with Wetlands
Non-native	House Mouse	*Mus musculus*			
	Western Jumping Mouse	*Zapus princeps*		Yes	
	Common Porcupine	*Erethizon dorsatum*			
	Coyote	*Canis latrans*	Yes		
	Red Fox	*Vulpes vulpes*	Yes		
	Black Bear	*Ursus americanus*	Yes		
	Grizzly Bear	*Ursus arctos*	Yes		
	Raccoon	*Procyon lotor*	Yes	Yes	
	American Marten	*Martes americana*	Yes		
	Ermine	*Mustela erminea*			
	Long-tailed Weasel	*Mustela frenata*	Yes		
	Mink	*Mustela vison*	Yes	Yes	
	American Badger	*Taxidea taxus*			
	Western Spotted Skunk	*Spilogale gracilis*			
	Striped Skunk	*Mephitis mephitis*	Yes		
	Northern River Otter	*Lutra canadensis*	Yes	Yes	Yes
	Mountain Lion	*Puma concolor*	Yes		
	Lynx	*Lynx canadensis*			
	Bobcat	*Lynx rufus*	Yes		
	Elk	*Cervus elaphus*			
	Mule Deer	*Odocoileus hemionus*			
	White-tailed Deer	*Odocoileus virginianus*			
	Pronghorn Antelope	*Antilocapra americana*			
	Mountain Goat	*Oreamnos americanus*			
	Bighorn Sheep	*Ovis canadensis*			
Total Mammals:		**79** **Total:**	**18**	**20**	**7**
Reptiles					
	Painted Turtle	*Chrysemys picta*			
	Long-nosed Leopard Lizard	*Gambelia wislizenii*			
	Short-horned Lizard	*Phrynosoma douglassii*			
	Sagebrush Lizard	*Sceloporus graciosus*			
	Western Fence Lizard	*Sceloporus occidentalis*			
	Side-blotched Lizard	*Uta stansburiana*			

	Common Name	Scientific Name		Salmonid Relationship	Closely Associated with Riparian	Closely Associated with Wetlands
	Western Skink	*Eumeces skiltonianus*				
	Rubber Boa	*Charina bottae*				
	Racer	*Coluber constrictor*				
	Ringneck Snake	*Diadophis punctatus*				
	Night Snake	*Hypsiglena torquata*				
	Striped Whipsnake	*Masticophis taeniatus*				
	Gopher Snake	*Pituophis catenifer*				
	Western Terrestrial Garter Snake	*Thamnophis elegans*		Yes		
	Common Garter Snake	*Thamnophis sirtalis*		Yes	Yes	Yes
	Western Rattlesnake	*Crotalus viridis*				
Total Reptiles:		**16**	**Total:**	**2**	**1**	**1**
Total Species:		**385**	**Total:**	**86**	**81**	**57**

Table B-2. Wildlife species occurrence by wildlife habitat type in the Walla Walla subbasin (NHI 2003).

Ponderosa Pine	Shrubsteppe	Eastside (Interior) Grassland	Eastside (Interior) Riparian Wetland	Agriculture
American Badger	American Avocet	Tiger Salamander	American Badger	Great Blue Heron
American Beaver	American Badger	Long-toed Salamander	American Beaver	Tundra Swan
American Crow	American Crow	Great Basin Spadefoot	American Crow	American Wigeon
American Goldfinch	American Goldfinch	Western Toad	American Dipper	Blue-winged Teal
American Kestrel	American Kestrel	Woodhouse's Toad	American Goldfinch	Cinnamon Teal
American Marten	American Robin	Pacific Chorus (Tree) Frog	American Kestrel	Swainson's Hawk
American Robin	Bald Eagle	Columbia Spotted Frog	American Marten	Red-tailed Hawk
Ash-throated Flycatcher	Bank Swallow	Northern Leopard Frog	American Redstart	Gray Partridge
Bald Eagle	Barn Owl	Bullfrog	American Robin	Ring-necked Pheasant
Band-tailed Pigeon	Barn Swallow	Painted Turtle	American Tree Sparrow	Sandhill Crane
Bank Swallow	Barrow's Goldeneye	Short-horned Lizard	American Wigeon	Killdeer
Barn Swallow	Belding's Ground Squirrel	Sagebrush Lizard	Ash-throated Flycatcher	Solitary Sandpiper
Barred Owl	Bewick's Wren	Western Fence Lizard	Bald Eagle	Long-billed Curlew
Big Brown Bat	Big Brown Bat	Side-blotched Lizard	Bank Swallow	Long-billed Dowitcher
Black Bear	Black Bear	Western Skink	Barn Owl	Wilson's Snipe
Black Swift	Black-billed Magpie	Rubber Boa	Barn Swallow	Rock Dove
Black-backed Woodpecker	Black-chinned Hummingbird	Racer	Barred Owl	Mourning Dove
Black-billed Magpie	Black-necked Stilt	Night Snake	Belted Kingfisher	Barn Owl
Black-capped Chickadee	Black-tailed Jackrabbit	Gopher Snake	Big Brown Bat	Short-eared Owl
Black-chinned Hummingbird	Blue Grouse	Western Terrestrial Garter Snake	Black Bear	Loggerhead Shrike
Black-headed Grosbeak	Bobcat	Common Garter Snake	Black Swift	Northern Shrike
Blue Grouse	Brewer's Blackbird	Western Rattlesnake	Black-backed Woodpecker	Black-billed Magpie
Bobcat	Brewer's Sparrow	Turkey Vulture	Black-billed Magpie	American Crow
Brewer's Blackbird	Brown-headed Cowbird	Canada Goose	Black-capped Chickadee	Barn Swallow
Brewer's Sparrow	Burrowing Owl	Gadwall	Black-chinned	European Starling

Ponderosa Pine	Shrubsteppe	Eastside (Interior) Grassland	Eastside (Interior) Riparian Wetland	Agriculture
			Hummingbird	
Brown Creeper	Bushy-tailed Woodrat	American Wigeon	Black-crowned Night-heron	American Pipit
Brown-headed Cowbird	California Myotis	Mallard	Black-headed Grosbeak	Vesper Sparrow
Bullfrog	Canada Goose	Blue-winged Teal	Blue Grouse	Savannah Sparrow
Bushtit	Canyon Wren	Cinnamon Teal	Bobcat	Grasshopper Sparrow
Bushy-tailed Woodrat	Chipping Sparrow	Northern Shoveler	Bobolink	Lazuli Bunting
California Myotis	Cliff Swallow	Northern Pintail	Bohemian Waxwing	Bobolink
California Quail	Columbia Spotted Frog	Green-winged Teal	Brewer's Blackbird	Western Meadowlark
Calliope Hummingbird	Columbian Ground Squirrel	Northern Harrier	Broad-tailed Hummingbird	Brewer's Blackbird
Canyon Wren	Common Garter Snake	Sharp-shinned Hawk	Brown Creeper	Brown-headed Cowbird
Cassin's Finch	Common Nighthawk	Cooper's Hawk	Brown-headed Cowbird	House Finch
Cassin's Vireo	Common Poorwill	Swainson's Hawk	Bufflehead	House Sparrow
Cedar Waxwing	Common Porcupine	Red-tailed Hawk	Bullock's Oriole	Virginia Opossum
Chipping Sparrow	Common Raven	Ferruginous Hawk	Bushtit	Big Brown Bat
Clark's Nutcracker	Cooper's Hawk	Rough-legged Hawk	Bushy-tailed Woodrat	Eastern Fox Squirrel
Cliff Swallow	Coyote	Golden Eagle	California Myotis	Northern Pocket Gopher
Coast Mole	Deer Mouse	American Kestrel	Calliope Hummingbird	Deer Mouse
Columbia Spotted Frog	Eastern Kingbird	Merlin	Canada Goose	Bushy-tailed Woodrat
Columbian Ground Squirrel	Ferruginous Hawk	Gyrfalcon	Canyon Wren	Montane Vole
Common Garter Snake	Fringed Myotis	Peregrine Falcon	Cassin's Finch	House Mouse
Common Nighthawk	Golden Eagle	Prairie Falcon	Cassin's Vireo	Raccoon
Common Poorwill	Golden-mantled Ground Squirrel	Chukar	Cattle Egret	White-tailed Deer (Eastside)
Common Porcupine	Gopher Snake	Gray Partridge	Cedar Waxwing	
Common Raven	Grasshopper Sparrow	Ring-necked Pheasant	Chipping Sparrow	
Cooper's Hawk	Gray Flycatcher	Sage Grouse	Cliff Swallow	
Coyote	Great Basin Pocket Mouse	Sharp-tailed Grouse	Coast Mole	
Dark-eyed Junco	Great Basin Spadefoot	Wild Turkey	Columbia Spotted Frog	
Deer Mouse	Great Horned Owl	Mountain Quail	Columbian	

Ponderosa Pine	Shrubsteppe	Eastside (Interior) Grassland	Eastside (Interior) Riparian Wetland	Agriculture
			Ground Squirrel	
Downy Woodpecker	Greater Yellowlegs	California Quail	Common Garter Snake	
Dusky Flycatcher	Green-tailed Towhee	Northern Bobwhite	Common Merganser	
Eastern Kingbird	Hoary Bat	Sandhill Crane	Common Nighthawk	
Ermine	Horned Lark	Killdeer	Common Porcupine	
European Starling	Killdeer	Black-necked Stilt	Common Raven	
Evening Grosbeak	Lark Sparrow	American Avocet	Common Redpoll	
Flammulated Owl	Least Chipmunk	Greater Yellowlegs	Common Yellowthroat	
Fox Sparrow	Lesser Yellowlegs	Lesser Yellowlegs	Cooper's Hawk	
Fringed Myotis	Little Brown Myotis	Solitary Sandpiper	Cordilleran Flycatcher	
Golden Eagle	Loggerhead Shrike	Spotted Sandpiper	Coyote	
Golden-crowned Kinglet	Long-billed Curlew	Upland Sandpiper	Dark-eyed Junco	
Golden-crowned Sparrow	Long-eared Myotis	Long-billed Curlew	Deer Mouse	
Golden-mantled Ground Squirrel	Long-eared Owl	Rock Dove	Double-crested Cormorant	
Gopher Snake	Long-legged Myotis	Mourning Dove	Downy Woodpecker	
Gray Flycatcher	Long-nosed Leopard Lizard	Barn Owl	Dusky Flycatcher	
Gray Jay	Long-tailed Vole	Great Horned Owl	Eastern Kingbird	
Great Basin Spadefoot	Long-tailed Weasel	Snowy Owl	Ermine	
Great Gray Owl	Long-toed Salamander	Burrowing Owl	Evening Grosbeak	
Great Horned Owl	Mallard	Long-eared Owl	Flammulated Owl	
Green-tailed Towhee	Merlin	Short-eared Owl	Fox Sparrow	
Grizzly Bear	Merriam's Ground Squirrel	Common Nighthawk	Fringed Myotis	
Hairy Woodpecker	Merriam's Shrew	Common Poorwill	Golden Eagle	
Hammond's Flycatcher	Mink	White-throated Swift	Golden-crowned Kinglet	
Hermit Thrush	Montane Vole	Lewis's Woodpecker	Golden-mantled Ground Squirrel	
Hoary Bat	Mountain Bluebird	Say's Phoebe	Gopher Snake	
House Finch	Mountain Quail	Western Kingbird	Gray Catbird	
House Wren	Mourning Dove	Eastern Kingbird	Gray Jay	
Killdeer	Mule Deer	Loggerhead Shrike	Great Basin Spadefoot	
Lark Sparrow	Nashville Warbler	Northern Shrike	Great Blue Heron	
Lazuli Bunting	Night Snake	Black-billed	Great Egret	

Ponderosa Pine	Shrubsteppe	Eastside (Interior) Grassland	Eastside (Interior) Riparian Wetland	Agriculture
		Magpie		
Least Chipmunk	Northern Flicker	American Crow	Great Horned Owl	
Least Flycatcher	Northern Goshawk	Common Raven	Greater Yellowlegs	
Lesser Goldfinch	Northern Grasshopper Mouse	Horned Lark	Green-tailed Towhee	
Lewis's Woodpecker	Northern Harrier	Northern Rough-winged Swallow	Green-winged Teal	
Little Brown Myotis	Northern Leopard Frog	Bank Swallow	Grizzly Bear	
Long-eared Myotis	Northern Pocket Gopher	Cliff Swallow	Hairy Woodpecker	
Long-eared Owl	Northern Rough-winged Swallow	Barn Swallow	Harlequin Duck	
Long-legged Myotis	Northern Shrike	Rock Wren	Heather Vole	
Long-tailed Vole	Nuttall's (Mountain) Cottontail	Canyon Wren	Hermit Thrush	
Long-tailed Weasel	Orange-crowned Warbler	Western Bluebird	Hoary Bat	
Long-toed Salamander	Ord's Kangaroo Rat	Mountain Bluebird	Hooded Merganser	
Macgillivray's Warbler	Osprey	Townsend's Solitaire	House Finch	
Merlin	Pacific Chorus (Tree) Frog	American Robin	House Wren	
Mink	Painted Turtle	Sage Thrasher	Killdeer	
Montane Vole	Pallid Bat	European Starling	Lazuli Bunting	
Mountain Bluebird	Peregrine Falcon	American Pipit	Least Chipmunk	
Mountain Chickadee	Piute Ground Squirrel	Green-tailed Towhee	Least Flycatcher	
Mountain Lion	Prairie Falcon	Chipping Sparrow	Lesser Goldfinch	
Mountain Quail	Preble's Shrew	Clay-colored Sparrow	Lesser Yellowlegs	
Mourning Dove	Pronghorn Antelope	Brewer's Sparrow	Lewis's Woodpecker	
Mule Deer	Racer	Vesper Sparrow	Lincoln's Sparrow	
Nashville Warbler	Red-tailed Hawk	Lark Sparrow	Little Brown Myotis	
Night Snake	Ringneck Snake	Sage Sparrow	Long-eared Myotis	
Northern Flicker	Rock Wren	Savannah Sparrow	Long-eared Owl	
Northern Flying Squirrel	Rocky Mountain Elk	Grasshopper Sparrow	Long-legged Myotis	
Northern Goshawk	Rough-legged Hawk	White-crowned Sparrow	Long-tailed Vole	
Northern Pocket Gopher	Rubber Boa	Lapland Longspur	Long-tailed Weasel	

Ponderosa Pine	Shrubsteppe	Eastside (Interior) Grassland	Eastside (Interior) Riparian Wetland	Agriculture
Northern Pygmy-owl	Sage Grouse	Snow Bunting	Long-toed Salamander	
Northern Rough-winged Swallow	Sage Sparrow	Bobolink	Macgillivray's Warbler	
Northern Saw-whet Owl	Sage Thrasher	Western Meadowlark	Mallard	
Olive-sided Flycatcher	Sagebrush Lizard	Brewer's Blackbird	Merlin	
Orange-crowned Warbler	Sagebrush Vole	Brown-headed Cowbird	Mink	
Osprey	Savannah Sparrow	American Goldfinch	Montane Shrew	
Pacific Chorus (Tree) Frog	Say's Phoebe	Preble's Shrew	Montane Vole	
Painted Turtle	Sharp-shinned Hawk	Vagrant Shrew	Mountain Bluebird	
Pallid Bat	Sharp-tailed Grouse	Merriam's Shrew	Mountain Chickadee	
Peregrine Falcon	Short-eared Owl	Coast Mole	Mountain Lion	
Pileated Woodpecker	Short-horned Lizard	California Myotis	Mountain Quail	
Pine Siskin	Side-blotched Lizard	Western Small-footed Myotis	Mourning Dove	
Pinyon Jay	Snow Bunting	Yuma Myotis	Mule Deer	
Prairie Falcon	Solitary Sandpiper	Little Brown Myotis	Muskrat	
Pronghorn Antelope	Spotted Sandpiper	Long-legged Myotis	Nashville Warbler	
Purple Finch	Striped Whipsnake	Fringed Myotis	Northern Flicker	
Pygmy Nuthatch	Swainson's Hawk	Long-eared Myotis	Northern Flying Squirrel	
Racer	Tiger Salamander	Silver-haired Bat	Northern Goshawk	
Red Crossbill	Townsend's Big-eared Bat	Western Pipistrelle	Northern Harrier	
Red Fox	Townsend's Solitaire	Big Brown Bat	Northern Leopard Frog	
Red Squirrel	Turkey Vulture	Hoary Bat	Northern Pocket Gopher	
Red-breasted Nuthatch	Vagrant Shrew	Townsend's Big-eared Bat	Northern Pygmy-owl	
Red-breasted Sapsucker	Vesper Sparrow	Pallid Bat	Northern River Otter	
Red-naped Sapsucker	Washington Ground Squirrel	Nuttall's (Mountain) Cottontail	Northern Rough-winged Swallow	
Red-tailed Hawk	Western Fence Lizard	White-tailed Jackrabbit	Northern Saw-whet Owl	
Ringneck Snake	Western Harvest Mouse	Black-tailed Jackrabbit	Northern Waterthrush	

Ponderosa Pine	Shrubsteppe	Eastside (Interior) Grassland	Eastside (Interior) Riparian Wetland	Agriculture
Ring-necked Pheasant	Western Kingbird	Yellow-bellied Marmot	Olive-sided Flycatcher	
Rock Wren	Western Meadowlark	Washington Ground Squirrel	Orange-crowned Warbler	
Rocky Mountain Elk	Western Pipistrelle	Belding's Ground Squirrel	Osprey	
Rough-legged Hawk	Western Rattlesnake	Columbian Ground Squirrel	Pacific Chorus (Tree) Frog	
Rubber Boa	Western Skink	Golden-mantled Ground Squirrel	Painted Turtle	
Ruby-crowned Kinglet	Western Small-footed Myotis	Northern Pocket Gopher	Pallid Bat	
Ruffed Grouse	Western Terrestrial Garter Snake	Great Basin Pocket Mouse	Peregrine Falcon	
Rufous Hummingbird	Western Toad	Ord's Kangaroo Rat	Pied-billed Grebe	
Sagebrush Lizard	White-crowned Sparrow	Western Harvest Mouse	Pileated Woodpecker	
Say's Phoebe	White-tailed Deer (Eastside)	Deer Mouse	Pine Siskin	
Sharp-shinned Hawk	White-tailed Jackrabbit	Northern Grasshopper Mouse	Prairie Falcon	
Short-horned Lizard	White-throated Swift	Montane Vole	Preble's Shrew	
Silver-haired Bat	Willet	Long-tailed Vole	Pronghorn Antelope	
Snowshoe Hare	Woodhouse's Toad	Sagebrush Vole	Pygmy Nuthatch	
Song Sparrow	Yellow-bellied Marmot	Western Jumping Mouse	Raccoon	
Spotted Towhee	Yuma Myotis	Coyote	Racer	
Steller's Jay		Black Bear	Red Crossbill	
Striped Skunk		Grizzly Bear	Red Fox	
Striped Whipsnake		Ermine	Red-breasted Nuthatch	
Tailed Frog		Long-tailed Weasel	Red-eyed Vireo	
Three-toed Woodpecker		Mink	Red-naped Sapsucker	
Tiger Salamander		American Badger	Red-tailed Hawk	
Townsend's Big-eared Bat		Bobcat	Red-winged Blackbird	
Townsend's Solitaire		Rocky Mountain Elk	Ring-necked Duck	
Townsend's Warbler		Mule Deer	Rocky Mountain Elk	
Tree Swallow		White-tailed Deer (Eastside)	Rough-legged Hawk	
Turkey Vulture		Pronghorn	Rubber Boa	

Ponderosa Pine	Shrubsteppe	Eastside (Interior) Grassland	Eastside (Interior) Riparian Wetland	Agriculture
		Antelope		
Vagrant Shrew		Rocky Mountain Bighorn Sheep	Ruby-crowned Kinglet	
Varied Thrush			Ruffed Grouse	
Vaux's Swift			Rufous Hummingbird	
Violet-green Swallow			Sandhill Crane	
Warbling Vireo			Savannah Sparrow	
Western Bluebird			Say's Phoebe	
Western Fence Lizard			Sharp-tailed Grouse	
Western Jumping Mouse			Silver-haired Bat	
Western Kingbird			Snowshoe Hare	
Western Pipistrelle			Solitary Sandpiper	
Western Rattlesnake			Song Sparrow	
Western Screech-owl			Southern Red-backed Vole	
Western Scrub-Jay			Spotted Sandpiper	
Western Skink			Spotted Towhee	
Western Small-footed Myotis			Steller's Jay	
Western Tanager			Striped Skunk	
Western Terrestrial Garter Snake			Swainson's Hawk	
Western Toad			Swainson's Thrush	
Western Wood-pewee			Tailed Frog	
White-breasted Nuthatch			Three-toed Woodpecker	
White-crowned Sparrow			Tiger Salamander	
White-headed Woodpecker			Townsend's Big-eared Bat	
White-tailed Deer (Eastside)			Townsend's Solitaire	
White-throated Swift			Townsend's Warbler	
Wild Turkey			Tree Swallow	
Williamson's Sapsucker			Turkey Vulture	
Willow Flycatcher			Vagrant Shrew	
Wilson's Warbler			Vaux's Swift	

Ponderosa Pine	Shrubsteppe	Eastside (Interior) Grassland	Eastside (Interior) Riparian Wetland	Agriculture
Yellow-bellied Marmot			Veery	
Yellow-pine Chipmunk			Violet-green Swallow	
Yellow-rumped Warbler			Warbling Vireo	
Yuma Myotis			Water Shrew	
			Water Vole	
			Western Bluebird	
			Western Harvest Mouse	
			Western Jumping Mouse	
			Western Pipistrelle	
			Western Rattlesnake	
			Western Screech-owl	
			Western Small-footed Myotis	
			Western Spotted Skunk	
			Western Tanager	
			Western Terrestrial Garter Snake	
			Western Toad	
			Western Wood-pewee	
			White-breasted Nuthatch	
			White-crowned Sparrow	
			White-headed Woodpecker	
			White-tailed Deer (Eastside)	
			White-tailed Jackrabbit	
			White-throated Swift	
			Williamson's Sapsucker	
			Willow Flycatcher	
			Wilson's Warbler	
			Winter Wren	
			Wood Duck	
			Woodhouse's Toad	

Ponderosa Pine	Shrubsteppe	Eastside (Interior) Grassland	Eastside (Interior) Riparian Wetland	Agriculture
			Yellow Warbler	
			Yellow-bellied Marmot	
			Yellow-billed Cuckoo	
			Yellow-breasted Chat	
			Yellow-pine Chipmunk	
			Yellow-rumped Warbler	
			Yuma Myotis	

Table B-3 Threatened and endangered species of the Walla Walla subbasin (NHI 2003).

Federal Species List	**Status**	
Common Name	**Oregon**	**Washington**
Oregon Spotted Frog	FC*	FC*
Columbia Spotted Frog	FC*	
Bald Eagle	FT	FT
Sage Grouse		FC*
Yellow-billed Cuckoo	FC*	FC*
Horned Lark	FC	FC
Washington Ground Squirrel	FC*	FC*
Gray Wolf		FE
Lynx	FT	FT
States Species List	**Status**	
Common Name	**Oregon**	**Washington**
Tiger Salamander	SS-US	
Tailed Frog	SS-V	
Western Toad	SS-V	SC
Woodhouse's Toad	SS-PN	
Oregon Spotted Frog	SS-C	SE
Columbia Spotted Frog	SS-US	SC
Northern Leopard Frog	SS-C	SE
Painted Turtle	SS-C	
Sagebrush Lizard	SS-V	
Striped Whipsnake		SC
Western Rattlesnake	SS-V	
Common Loon		SS
Horned Grebe	SS-PN	
Red-necked Grebe	SS-C	
Western Grebe		SC
American White Pelican	SS-V	SE
Harlequin Duck	SS-US	
Bufflehead	SS-US	
Barrow's Goldeneye	SS-US	
Bald Eagle	ST	ST
Northern Goshawk	SS-C	SC
Swainson's Hawk	SS-V	
Ferruginous Hawk	SS-C	ST
Golden Eagle		SC
Merlin		SC
Peregrine Falcon	SE	SS
Sage Grouse	SS-V	ST
Spruce Grouse	SS-US	
Sharp-tailed Grouse		ST
Mountain Quail	SS-US	
Sandhill Crane	SS-V	SE
Upland Sandpiper	SS-C	SE
Long-billed Curlew	SS-V	
Yellow-billed Cuckoo	SS-C	SC

Flammulated Owl	SS-C	SC
Northern Pygmy-owl	SS-C	
Burrowing Owl	SS-C	SC
Great Gray Owl	SS-V	
Boreal Owl	SS-US	
Common Nighthawk	SS-C	
Black Swift	SS-PN	
Vaux's Swift		SC
Lewis's Woodpecker	SS-C	SC
Williamson's Sapsucker	SS-US	
White-headed Woodpecker	SS-C	SC
Three-toed Woodpecker	SS-C	
Black-backed Woodpecker	SS-C	SC
Pileated Woodpecker	SS-V	SC
Olive-sided Flycatcher	SS-V	
Willow Flycatcher	SS-V/US	
Loggerhead Shrike	SS-V	SC
Horned Lark	SS-C	SC
Bank Swallow	SS-US	
White-breasted Nuthatch		SC
Pygmy Nuthatch	SS-V	
Western Bluebird	SS-V	
Sage Thrasher		SC
Yellow-breasted Chat	SS-C	
Vesper Sparrow	SS-C	SC
Black-throated Sparrow	SS-PN	
Sage Sparrow	SS-C	SC
Grasshopper Sparrow	SS-V/PN	
Bobolink	SS-V	
Western Meadowlark	SS-C	
Black Rosy-finch	SS-PN	
Merriam's Shrew		SC
Western Small-footed Myotis	SS-US	
Long-legged Myotis	SS-US	
Fringed Myotis	SS-V	
Long-eared Myotis	SS-US	
Silver-haired Bat	SS-US	
Townsend's Big-eared Bat	SS-C	SC
Pallid Bat	SS-V	
White-tailed Jackrabbit	SS-US	SC
Black-tailed Jackrabbit		SC
Washington Ground Squirrel	SE	SC
Northern Pocket Gopher		SC
Gray Wolf	SE	SE
American Marten	SS-V	
Fisher	SS-C	SE
Wolverine	ST	SC
Lynx		ST

Federal Status: FC = Federal Candidate; FT = Federal Threatened; FE = Federal Endangered
State Status: SC = Species of Concern; SE = State Endangered; SS = Sensitive Species; ST = State Threatened

Table B-4. Partners in Flight priority and focal species of the Walla Walla subbasin (NHI 2003).

Common Name		
Northern Harrier	Western Wood-pewee	American Pipit
Swainson's Hawk	Willow Flycatcher	Orange-crowned Warbler
Ferruginous Hawk	Hammond's Flycatcher	Nashville Warbler
American Kestrel	Gray Flycatcher	Yellow Warbler
Sharp-tailed Grouse	Dusky Flycatcher	Yellow-rumped Warbler
Band-tailed Pigeon	Pacific-slope Flycatcher	Townsend's Warbler
Yellow-billed Cuckoo	Ash-throated Flycatcher	Macgillivray's Warbler
Flammulated Owl	Loggerhead Shrike	Wilson's Warbler
Burrowing Owl	Hutton's Vireo	Yellow-breasted Chat
Great Gray Owl	Warbling Vireo	Western Tanager
Short-eared Owl	Red-eyed Vireo	Green-tailed Towhee
Common Poorwill	Clark's Nutcracker	Chipping Sparrow
Black Swift	Horned Lark	Brewer's Sparrow
Vaux's Swift	Bank Swallow	Vesper Sparrow
White-throated Swift	Bushtit	Lark Sparrow
Calliope Hummingbird	White-breasted Nuthatch	Black-throated Sparrow
Rufous Hummingbird	Brown Creeper	Sage Sparrow
Lewis's Woodpecker	House Wren	Grasshopper Sparrow
Williamson's Sapsucker	Winter Wren	Fox Sparrow
Red-naped Sapsucker	American Dipper	Lincoln's Sparrow
Red-breasted Sapsucker	Western Bluebird	Black-headed Grosbeak
Downy Woodpecker	Townsend's Solitaire	Western Meadowlark
White-headed Woodpecker	Veery	Bullock's Oriole
Black-backed Woodpecker	Swainson's Thrush	Purple Finch
Pileated Woodpecker	Hermit Thrush	Red Crossbill
Olive-sided Flycatcher	Varied Thrush	Lesser Goldfinch

B-5

Rocky Mountain Bighorn Sheep

Species Account

Walla Walla Sub-basin

1.0 Introduction:

At one time, bighorn sheep roamed much of the western portion of north America. They existed in several subspecies and occupied from the Canadian Rockies of Alberta south to the mountain ranges of Mexico including portions of Oregon and Washington. In the mid-1800's they were quite numerous with an estimated population between 1.5 and 2 million (Seton 1953, Buechner 1960). As a result of the expansion of civilization without management protection, by 1900 they had been reduced to thousands and were extirpated from much of their former range (Oregon Department of Fish and Wildlife, 2003)

Rocky Mountain bighorn sheep were extirpated from Oregon in the mid-1940's. As a result of transplant efforts, populations have been re-established. Currently they only occupy a small portion of their historic range in Northeast Oregon.

2.0 Life History, Habitat Requirements, Key Environmental Correlates:

2.1 Life History:

Rocky Mountain bighorns are the most abundant and largest bodied bighorn in North America. Rocky Mountain bighorns have large bodies, thick coats and comparatively small ears. Mature Rocky Mountain rams also have heavy robust horns with obvious brooming, bases 13–16 inches in circumference, and 36–40 inches in length. Exceptionally large ram horns will exceed 45 inches in length with basal circumference larger than 17 inches and be more than full curl. Ewe horns are typically 8–10 inches long. Ages are determined by counting growth rings on the horns. (Oregon Department of Fish and Wildlife, 2003).

Bighorn sheep are relatively long lived animals. Those surviving their first year commonly live 10–12 years. Ewes tend to live longer than rams even in the absence of ram hunting. In Oregon, The oldest known ram age is 15 ½ years old while the oldest known ewe age is 19 ½ years old. (Oregon Department of Fish and Wildlife, 2003).

Rocky mountain bighorn sheep are gregarious. However, adult rams typically do not co-mingle with ewe-lamb groups except during the rut. Adult rams tend to congregate together into "bachelor groups" and occupy separate areas for much of the year. Immature rams often associate with either ram or ewe-lamb groups (Oregon Department of Fish and Wildlife, 2003).

2.1.1 Reproduction:

Rocky Mountain bighorns breed in the late fall with lambs born in May. There is little interaction between males and females until breeding season or rut occurs. Like most ungulates, Rocky Mountain bighorn sheep are polygamous and only a few dominant males participate in the rut. Adult rams establish dominance over each other by conducting head butting rituals. The peak of the rut occurs in November in Oregon, but can begin as early as late October and end as late as early December (Oregon Department of Fish and Wildlife, 2003).

Gestation is approximately 180 days and a single lamb is usually born. The lambing season spans April–May. Shortly before lambing, ewes become solitary and seek a secluded place in rugged terrain. After about one week, the ewe and lamb join other ewes and newborn lambs to re-form the ewe-lamb-sub-adult groups they will associate with for most of the year **(Oregon Department of Fish and Wildlife, 2003).**

Ewes usually become reproductively active at two years old. However, in Oregon's highest quality habitats, there is evidence that some yearling ewes may breed. They remain reproductively active throughout their life span but are in their prime from ages 3–10 (Oregon Department of Fish and Wildlife, 2003).

2.1.2 Home Range:

Their range extends from British Columbia and Alberta south to New Mexico and Arizona. Rocky Mountain bighorns are generally found in sub-alpine to alpine habitats.

Of all the subspecies of bighorn sheep endemic to the western portion of North America, only two were native to Oregon, Rocky Mountain, and California (Bailey 1936, Figure 2). The Rocky Mountain bighorns inhabited northeast Oregon from the John Day-Burnt River divide north to the Snake River and the Oregon-Washington state line in Umatilla and Wallowa Counties (Oregon Department of Fish and Wildlife, 2003).

California bighorns historically were and still are the most abundant in Oregon (Toweill and Geist 1999). Subspecies ranges are separated by the Blue and Umatilla mountains. The Walla Walla sub-basin is in the Umatilla portion of bighorn sheep range (Oregon Department of Fish and Wildlife 1992, 2003). As a result, Rocky Mountain bighorn sheep are the only subspecies known to historically exist in the Walla Walla sub-basin in Oregon.

2.1.3 Diet:

Grasses are the major item in bighorn diets throughout most of the year. However, forbs and shrubs are seasonally important depending on type and availability. Bighorn sheep generally are not competitors for forage with domestic cattle and other big game species because they typically occupy rugged habitats not used by other big game species. Domestic sheep can compete with bighorn sheep for forage because open range operations frequently include trailing through remote, rugged habitat (Oregon Department of Fish and Wildlife, 2003).

2.1.4 Movements:

Rocky Mountain bighorn sheep adapt to area specific conditions when forming migration patterns. Some populations such as the Lostine herd migrate from high elevation alpine meadows near 8,000 feet of elevation where they spend the summer months down to steep grassland slopes between 4,500 and 7,500 feet in elevation. Other populations living year-round in canyon habitats often move in response to changing forage conditions, but do not migrate between classic summer and winter ranges. Sheep occupying canyon habitats migrate less often between summer and winter ranges than sheep occupying alpine habitats (Oregon Department of Fish and Wildlife, 2003).

2.1.5 Mortality:

Bighorn sheep can be moderately long lived. The oldest recorded bighorn ram in Oregon was 15 ½ years old and the oldest ewe was 19 ½. Like most wild ungulates, Rocky Mountain bighorn sheep suffer a higher mortality rate amongst lambs than adults under normal conditions. Lambs can suffer loss from predation, disease, malnutrition, and accidents.

Once recruited to the adult age classes, bighorn sheep typically have low mortality rates until they reach old age. However, occasional disease outbreaks from mingling with domestic sheep can cause catastrophic die-offs resulting in large numbers of adult mortality in addition to juvenile losses. Mountain lion predation has been shown to be the second highest source of adult mortality in one population in Hells Canyon on the Oregon side of the Snake River (Oregon Department of Fish and Wildlife, 2003).

2.1.6 Harvest:

Hunting currently and historically results in the greatest intended human caused form of mortality for Rocky Mountain bighorn sheep. Early harvest in the late 19th century didn't conform to any management constraints and harvest was often detrimental to a population. Since sheep were re-introduced to Oregon, harvest has been strictly targeted on rams. Limited hunting of ewes remains a possible tool to limit population growth in areas where a bighorn population has grown to the limits of its available habitat. However, to date, the Oregon Department of Fish and Wildlife has used trapping and transplanting as the primary tool to limit populations to available habitat constraints (Oregon Department of Fish and Wildlife, 2003).

The first Rocky Mountain bighorn hunt was authorized in 1978 on Hurricane Divide. Since that time, 181 rams have been harvested from 7 areas (Table 1).

Table 1. Rocky Mountain bighorn sheep ram harvest in Oregon, 1978-2002.

Hunt	Unit	Rams Harvested	Years Hunted	Boone & Crockett Score Range	Boone & Crockett Score Average
Hurricane Divide	Snake River, Minam, Imnaha, Pine	66	20	111 5/8 – 203 5/8	163 0/8
Lower Imnaha	Snake River	78	18	122 6/8 – 184 6/8	162 7/8
Sheep Mtn.	Pine	8	7	157 1/8 – 183 7/8	170 1/8
Lookout Mtn.	Lookout	2	2	162 5/8 – 181 4/8	172 1/8
Bear Creek	Minam	5	4	120 0/8 – 164 5/8	142 3/8
Chesnimnus-Sled Springs[a]	Chesnimnus, Sled Springs	10	8	159 2/8 – 200 6/8	182 3/8
Wenaha	Wenaha	12	6	124 2/8 – 184 0/8	157 4/8
		181		111 5/8 – 203 5/8	164 3/8

[a] Eight auction or lottery tags and four draw tagholders hunted area. (Oregon Bighorn Sheep and Rocky Mountain Goat Plan, 2003)

2.2 Habitat Requirements:

2.2.1 Characteristics:

Bighorn sheep habitat typically is comprised of rugged habitat that is used by the sheep for security from predation. This habitat can be in the form of Canyons characterized by rim rocks with grass interspersed in the steep slopes between the rocky outcrops, alpine habitat which can be high elevation lush meadows or rocky security cover, or steep grass covered slopes as winter habitat (Oregon Department of Fish and Wildlife, 2003).

Rocky Mountain bighorn sheep occupying alpine habitat generally use it for summer range and migrate to lower elevation grassy slopes or canyon habitat to winter. Bighorns living in canyon habitat most often occupy that same habitat year-round. In many cases, canyon habitat grasses dry out during August and September. As a result, sheep in these areas may become stressed for nutrition during autumns with little rainfall (Oregon Department of Fish and Wildlife, 2003).

2.2.2 Threats:

Rocky Mountain bighorn sheep habitat has come under threat from noxious weeds in recent years. Across their range in Oregon bighorn habitat has suffered encroachment from yellow star-thistle, knapweed, leafy spurge, and other plants which reduce forage quality and vigor. In the Walla Walla subbasin, yellow star-thistle, knapweed, and common crupina are all noxious weed threats to the Rocky Mountain bighorn sheep range between the forks of the Walla Walla River in Oregon.

In addition, historical overgrazing of Rocky Mountain bighorn sheep habitat has reduced range quality and increased competition for resources. Poor water distribution and

mineral deficiencies have also contributed to a lack of habitat quality (Oregon Department of Fish and Wildlife, 2003).

2.2.3 Enhancement:

In Oregon, habitat enhancement activities in Rocky Mountain bighorn sheep habitat have included 17 spring developments, 2 controlled burns treating 650 acres, and 2 seedings treating 85 acres (Oregon Department of Fish and Wildlife, 2003).

3.0 Population Distribution:

3.1 Population:

3.1.1 Historic:

In the mid-1800's when European settlers began to inhabit the western portion of North America, there were thought to be 1.5 to 2 million bighorn sheep of which, a portion were the Rocky Mountain subspecies (Seton 1953, Buechner 1960). Disease conflicts with domestic sheep and unmanaged harvest reduced the numbers to thousands by 1900 (Oregon Department of Fish and Wildlife, 2003).

3.1.2 Current:

In 1992 the population was estimated to be 460 animals (Table 2, Figure 2). In 2003 the Rocky Mountain bighorn population was estimated at 637 animals in 12 herds. Although the population has increased, several pasteurellosis related die-offs have reduced rates of population increase (Oregon Department of Fish and Wildlife, 2003).

3.2 Captive Breeding Programs, Transplants, Introductions:

Rocky Mountain bighorn sheep were extripated from Oregon in the mid-1940's. They were re-established exclusively with the use of transplant programs. Table 2 shows the transplants which have occurred to date (Oregon Department of Fish and Wildlife, 2003).

Table 2. Date, source, and origin of stock used for Rocky Mountain bighorn sheep transplant into Oregon, 1939–2002.

Date	Source	Origin	Release Site	County	#
1939	Montana	Not Known	Hart Mountain	Lake	23
4/71	Alberta, Canada	Jasper Park	Upr Hells Canyon	Wallowa	20
11/71	Alberta, Canada	Jasper Park	Lostine River	Wallowa	20
1/76	Lostine River	Jasper Park	Bear Creek	Wallowa	17
1/77	Lostine River	Jasper Park	Bear Creek	Wallowa	8
1/78	Lostine River	Jasper Park	Battle Creek	Wallowa	5
1/79	Lostine River	Jasper Park	Battle Creek	Wallowa	29
1/79	Salmon R., ID	Panther Cr.	Lwr. Imnaha	Wallowa	15
1/81	Lostine River	Jasper Park	Hass Ridge	Wallowa	10
1/83	Lostine River	Jasper Park	Wenaha Canyon	Wallowa	15
1/84	Sullivan L., WA	Waterton/T. Falls	Bear Creek	Wallowa	11
1/84	Salmon R., ID	Panther Creek	Hass Ridge	Wallowa	11
12/84	Salmon R., ID	Cove Creek	Wenaha WA	Wallowa	28
12/85	Salmon R., ID	Ebenezer	Minam River	Wallowa	12
1/90	Tarryall CO	Tarryall, CO	Sheep Mtn.	Baker	21
2/90	Cottonwood Cr., CO	Cottonwood Cr.	Sheep Mtn.	Baker	9
12/93	Wildhorse Is., MT	Sun River MT	Cherry Creek	Wallowa	9
12/93	Wildhorse Is., MT	Sun River MT	Fox Creek	Baker	12
2/94	Wildhorse Is., MT	Sun River MT	Downey Creek	Wallowa	14
2/94	Wildhorse Is., MT	Sun River MT	Fox Creek	Baker	12
2/95	Alberta, Canada	Cadomin	Joseph-Cottonwood Cr.	Wallowa	16
2/95	Alberta, Canada	Cadomin	Jim Cr.	Wallowa	22
2/95	Alberta, Canada	Cadomin	Sheep Mtn.	Baker	10
2/95	Lostine, Oregon	Waterton/Jasper	Sheep Mtn.	Baker	2
12/97	Spences Bridge, B.C.	Baniff N.P.	Muir Creek	Wallowa	13
1/98	Lostine, Oregon	Waterton/Jasper	McGraw	Wallowa	15
2/99	Alberta, Canada	Cadomin	Muir Creek	Wallowa	14
2/00	Alberta, Canada	Cadomin	Minam River	Wallowa	17
2/00	Alberta, Canada	Cadomin	Big Sheep Creek	Wallowa	19
12/01	Lostine, Oregon	Waterton/Baniff	Quartz Creek	Wallowa	15
	Total		Total		444

Originally, the impact of disease originating from domestic sheep was poorly understood and some of the early transplants were not successful. Once the relationship between disease and interaction of bighorn sheep with domestic sheep was understood, transplants were introduced in areas without domestic sheep nearby and success improved.

Currently there are 15 proposed transplant sites for Rocky Mountain bighorn sheep in Oregon (Table 3). One site in the Walla Walla Subbasin, the south fork of the Walla Walla River, is listed as a third priority site due to concerns over interaction with domestic sheep (Oregon Department of Fish and Wildlife, 2003, 1992). If domestic sheep were no longer a concern, the site would undoubtedly rise to a first priority site.

Table 3. Proposed transplant sites for Rocky Mountain bighorn sheep in Oregon. All Wallowa-Whitman National Forest sites are cleared.

Transplant Priority	Site Name	District	County	New or Supplement	Comments
1	Sluice/Rush Creek	Wallowa	Wallowa	New	
1	Sand/Yreka Creek	Wallowa	Wallowa	New	
1	Hat Point Plateau	Wallowa	Wallowa	Supplement	Summer Range Release
1	Minam	Wallowa	Wallowa	New	Predation, Non-Migratory
1	Deep Creek/Teaser Ridge	Wallowa	Wallowa	New	Domestic Goats, Private Land
1	Lone Pine	Wallowa	Wallowa	Supplement	
1	Quartz Cr/Two Corral	Wallowa	Wallowa	Supplement	
2	Big Sheep Creek	Wallowa	Wallowa	New	Domestic Sheep
3	Mid-Joseph Creek	Wallowa	Wallowa	Supplement	Domestic Sheep
3	Sheep Creek (G. Rhonde)	Union	Union	New	Domestic Sheep
3	Deadhorse Ridge	Wallowa	Wallowa	New	Domestic Sheep
3	Spring Creek	Wallowa	Wallowa	New	Domestic Sheep
3	S. Fork Walla Walla	Umatilla	Umatilla	New	Domestic Sheep
3	Mud Creek	Wallowa	Wallowa	New	Domestic Sheep
3	Jim Creek	Wallowa	Wallowa	New	Domestic Sheep, Disease

3.2 Distribution – Historic and Current:

Rocky Mountain bighorn sheep were once widely distributed in the mountains of northeast Oregon north of the John Day/Burnt River divide. Now they only occupy a small percentage of their former habitat (Figure 1) (Oregon Department of Fish and Wildlife 2003).

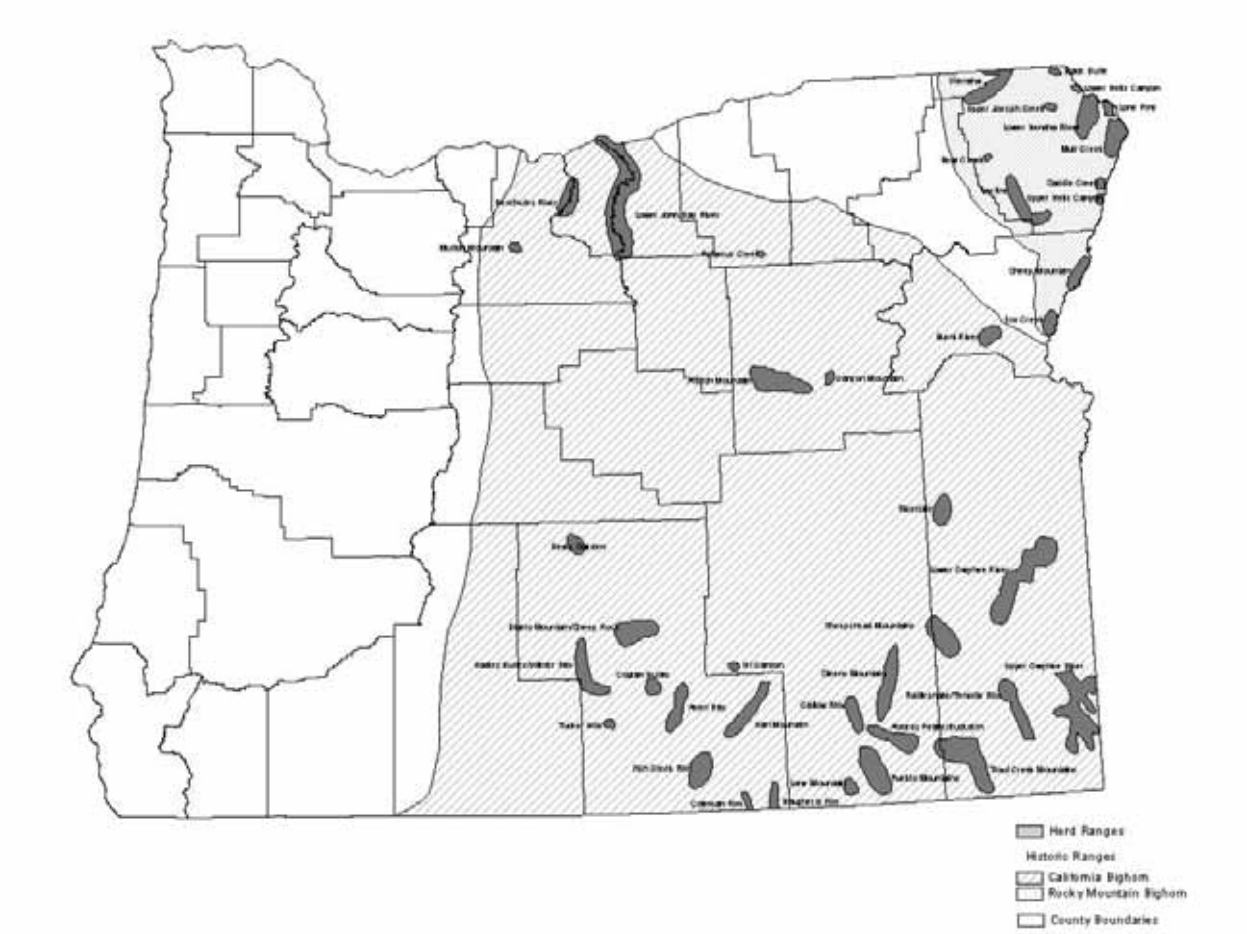

Figure 1. Historic and current distribution of Rocky Mountain and California bighorn sheep in Oregon (Adapted from Williams and Schommer 2001)(Oregon Department of Fish and Wildlife, 2003).

The current distribution of Rocky Mountain bighorn sheep is the result of transplants, which targeted areas with suitable habitat that lacked conflicts with domestic sheep. The last population estimate in 2003 was 637 Rocky Mountain bighorns in 12 herds (Oregon Department of Fish and Wildlife 2003).

4.0 Status and Abundance Trends:

4.1 Status:

Currently the Rocky Mountain bighorn sheep is classified in the state of Oregon as a game mammal and is under the administrative management of the Oregon Department of fish and wildlife.

4.2 Trend:

From the time of extirpation in the mid-1940's to present, the Rocky Mountain bighorn sheep has improved in population until the present day as the result of transplants conducted by the Oregon Department of Fish and Wildlife. However, population growth

has been hampered by repeated disease outbreaks as the result of contact with domestic sheep (Oregon Department of Fish and Wildlife 2003).

5.0 Factors Affecting Population Status

5.1 Key Factors Inhibiting Populations and Ecological Processes

5.1.1 Historical:

During the time when Rocky Mountain bighorn sheep were declining across their range, there was little or no wildlife management activity surrounding bighorn sheep. As a result, the relationship between diseases carried by domestic sheep and declines in bighorn sheep populations was not understood. However, it is generally accepted that the expansion of civilization to the western portion of North America and the domestic livestock that accompanied that settlement was a major factor in the decline and localized extirpation of Rocky Mountain bighorn sheep. In addition, unregulated harvest on bighorn sheep probably played a secondary role in the loss of Rocky Mountain bighorn sheep in many areas.

5.1.2 Current:

Currently, three key factors threaten the successful re-establishment of a population of Rocky Mountain bighorn sheep in the Walla Walla subbasin of Oregon. They are: 1) the continuing threat of disease transmission from domestic sheep and goats both in the high elevation areas of the subbasin and in the privately owned river bottom farmsteads that are oriented below the bighorn sheep habitat. 2) a large portion of the core bighorn sheep habitat not being in protected status and vulnerable to land management changes negative to bighorn sheep. 3) the continued threat of noxious weed invasion on core Rocky Mountain bighorn sheep habitat in the Walla Walla subbasin.

5.1.2.1 Disease:

Disease transmission from domestic sheep and goats has proven to be the largest threat to wild bighorn sheep populations in Oregon. The 2003 Oregon Bighorn Sheep and Rocky Mountain Goat Plans provide an explanation of the hazards of disease transmission in bighorn sheep. The following is quoted directly from that document:

Bighorn sheep are a big game species where disease is a management priority. Bighorns are susceptible to several diseases and parasites that have caused both acute and chronic herd reductions. Although most other big game species are susceptible to various diseases and parasites, they generally are not impacted to the level observed in bighorns.

When bighorn sheep encounter domestic sheep, bighorns usually die of pneumonia within 3-7 days of contact (Foryet et al. 1994, Martin et al. 1996, Schomer and Woolever 2001). Because exposed bighorns do not die immediately, infected individuals may return to their herd and infect other individuals, which can cause 70–100% of the herd to die. For this reason, the Oregon Department of Fish and Wildlife will not release

bighorns in locations where with a known potential to contact domestic sheep (Oregon Department of Fish and Wildlife, 2003).

The amount of separation necessary to protect bighorn sheep from interaction with domestic sheep is variable based on each location's specific circumstances. After a pasteurella dieoff in 1993 in an Aldrich Mountain California bighorn herd, trailing practices of a domestic sheep band were modified to provide 5 miles of separation in the spring and 20 miles of separation in the fall. This approach has protected that population of bighorns from any recurrence of pasteurella (Oregon Department of Fish and Wildlife, 2003). In Hells Canyon a 25 mile separation between Rocky Mountain bighorn sheep and domestic sheep has proven ineffective at insulating bighorns from pasteurella transmission (Schommer and Woolever, 2001).

Currently, the high elevation areas of the Walla Walla sub-basin of Oregon on both private and public land have domestic sheep grazing that occurs on a frequent basis. In addition, domestic sheep are kept sporadically in small quantities in the river bottoms of the Walla Walla River system which introduce a source of disease into the area. The Wenaha Rocky Mountain bighorn sheep herd occasionally is the source of individual dispersal of Rocky Mountain bighorn sheep to the Walla Walla sub-basin of Oregon (personal communication Mark Kirsch, ODFW, 2004). These individual bighorn sheep could encounter domestic sheep and become infected with pasteurellosis. At some point, there is a high probability they would return to their source herd. As a result, despite the fact, there is suitable habitat for Rocky Mountain bighorn sheep in the Walla Walla sub-basin, the Oregon Department of Fish and Wildlife pursues removal of these sheep when they are discovered in the sub-basin.

With the exception of lungworm and scabies, most diseases negatively effecting bighorns commonly occur in domestic sheep and disease prevalence in bighorns generally increases with contact between bighorns domestic sheep. Following is a brief description of Pasteurellosis, which is primarily responsible for negatively effecting bighorn sheep.

Pasteurellosis

Pasteurellosis refers to pneumonia, septicemia, and other infections caused by bacteria of the genus *Pasteurella*, and has proven devastating to bighorn sheep. Prior to 2000, bacteria causing pasteurellosis were all classified as *Pasteurella* spp. In 2000 *Pasteurella haemolytica*, which has been implicated as causing many bighorn die-offs, was reclassified as *Mannhaemia haemolytica.* Although there are now two genera of bacteria involved in bighorn pneumonia outbreaks, the disease is still commonly referred to as Pasteruellosis.

Pasteurellosis has played a significant role in bighorn population declines throughout western North America (Miller 2000). Occurrence of epidemics followed settlement and establishment of domestic sheep grazing, and may reflect the introduction of novel pathogens causing bacterial pneumonia into naïve bighorn populations (Miller 2000). Disease, along with habitat degradation and unregulated hunting, resulted in extirpation of wild sheep from Oregon. In modern times, pasteurellosis outbreaks have occurred in 1972, 1983–84, 1986–87, 1995–96 and 1999 in some Oregon Rocky Mountain bighorn

herds, and 1991 in the Aldrich Mountain California bighorn herd. Contact with domestic sheep or goats are the most likely source for these outbreaks. Ongoing research in Hells Canyon indicates pasteurellosis continues to be the leading cause of mortality in Oregon's Rocky Mountain bighorns.

Pneumonia outbreaks occur almost annually somewhere in the U.S. or Canadian bighorn range. Outbreaks range in severity from 100% mortality to only a few animals dying. Poor lamb survival generally follows. Studies in Hells Canyon indicate lambs contract pneumonia and the disease can spread through entire lamb groups. In all probability, lambs contract the disease from their mothers. Long term monitoring of the Lostine herd indicates surviving bighorns recover and eventually lamb survival increases.

Field treatment of pasteurellosis with antibiotics has had some success but prevention needs to be emphasized. The most effective prevention is separation between bighorns and domestic sheep or goats (Oregon Department of Fish and Wildlife, 2003).

5.1.2.2 Land in Protected Status:

As much as 75 percent of the bighorn sheep habitat in the Walla Walla subbasin is privately owned and not in protected status. As a result, any transplant of Rocky Mountain bighorn sheep into the Walla Walla subbasin would be constantly under threat of land sale or land management changes that could be detrimental to bighorn sheep. As a result, the Oregon Department of Fish and Wildlife will attempt no relocation of Rocky Mountain bighorn sheep to the Walla Walla subbasin until the habitat has come under protected status.

5.1.2.3 Noxious Weeds:

Noxious weeds continue to be a threat to the upland areas of the Walla Walla subbasin. Currently the bighorn sheep habitat in the Walla Walla subbasin is in good condition with populations of native bunch grass distributed throughout the habitat area, yellow-star thistle infestations to the north and west and common crupina to the south threaten to degrade the habitat (personal communication Mark Kirsch, ODFW, 2004). The Oregon Department has conducted several projects to control or eradicate yellow star-thistle and common crupina in the Walla Walla subbasin of Oregon a list of the projects is as follows in Table 4:

Table 4. Noxious weed control projects conducted by the Oregon Department of Fish and Wildlife

Year	Type of Project	Noxious Weed	Location	Acres Treated
1996	Chemical Application	yellow star-thistle	NF Walla Walla R.	425
1996	Chemical Application	yellow star-thistle	Cottonwood Creek	200
1996	Chemical Application	yellow star-thistle	SF Cottonwood Creek	150
1996	Chemical Application	yellow star-thistle	Cottonwood Creek	250
1996	Chemical Application	common crupina	Dry Creek	4,000
1997	Chemical Application	yellow star-thistle	Cup Gulch/NF Walla Walla	450
1997	Chemical Application	yellow star-thistle	Saddle Mountain	100
1997	Chemical Application	yellow star-thistle	Saddle Mountain	250
1997	Chemical Application	yellow star-thistle	NF Walla Walla	25
1997	Chemical Application	yellow star-thistle	Saddle Mountain	250
1997	Chemical Application	yellow star-thistle	NF Walla Walla	70
1997	Chemical Application	yellow star-thistle	Cup Gulch	15
1997	Chemical Application	common crupina	Dry Creek	4,000
1998	Chemical Application	yellow star-thistle	Cottonwood Creek	150
1998	Chemical Application	common crupina	Dry Creek	4,000
1999	Chemical Application	common crupina	Dry Creek	2,000
2000	Chemical Application	yellow star-thistle	Cup Gulch	57
2000	Chemical Application	yellow star-thistle	Cottonwood Creek	150
2000	Chemical Application	yellow star-thistle	Cottonwood Creek	600
TOTAL ACRES				17,142

Even if moved to protected status, bighorn sheep habitat in the Walla Walla subbasin would need to be monitored for incidence of noxious weeds and treated before infestations became large.

6.0 Citations

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ALKALI BEES

The following discussion is from Baird, et al (1991):
The alkali bee (*Nomia melanderi*) is a solitary ground nesting bee native to western North America used for pollination of alfalfa. As its name suggests, it can be found nesting in alkali soil. It prefers to nest in bare soil that remains moist but not wet, and dry on top. This occurs naturally in areas where a layer of hard pan exists in alkali soils. The alkali salts seal the top of the soil, holding in the moisture.

The following discussion is from Greer (1999):
Western scientists and farms attract this wild bee by building nests that simulate natural in-ground nests in alkaline soil. Although alkali bees are solitary, individuals nest near each other. Adults are black with metallic-colored bluish, greenish, or yellowish bands circling their abdomen. The larvae overwinter in their cells, then pupate and emerge from the soil in late spring or early summer, depending on temperature and moisture of the soil. They rarely use their stingers.

The alkali bee is an excellent pollinator of alfalfa and onion seed, and can also pollinate onions, clover, mint and celery (Baird et al. 1991; Greer 1999). They next underground in the Touchet area. Limiting factors include flooding in the Walla Walla Valley that can destroy their nests (Pierce 2002).

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Greer, L. 1999. Alternative Pollinators: Native Bees. Appropriate Techology Transfer for Rural Areas Horticultural Note.

Pierce, S. 2002. Alfalfa Seed Growing and Harvesting Practices in Walla Walla County, Washington. Whitman College. Downloaded March 23, 2004 from http://www.whitman.edu/environmental_studies/WWRB/agriculture/alfalfa.html

WDFW PLANS APPLICABLE TO SUB-BASINS

Status report: A status report includes a review of information relevant to the species' status in Washington and addresses factors affecting its status including, but not limited to: historic, current, and future population trends, natural history including ecological relationships, historic and current habitat trends, population demographics and their relationship to long-term sustainability, known and potential threats to populations, and historic and current species management activities.
Bald eagle, 2001
Burrowing owl, draft 2004
Common loon, 2000
Fisher, 1998
Lynx, 1993; 1999
Mountain quail, 1993
Northern leopard frog, 1999
Oregon spotted frog, 1997
Peregrine falcon, 2002
Sharp-tailed grouse, 1998
Streaked horned lark, draft 2004
Washington ground squirrel, draft 2004

Recovery/management plans: Recovery/management plans summarize the historic and current distribution and abundance of a species in Washington and describe factors affecting the population and its habitat. It prescribes strategies to recover the species, such as protecting the population, evaluating and managing habitat, and initiating research and education programs. Target population objectives and other criteria for reclassification are identified and an implementation schedule is presented.

Bald eagle, 1990, federal 1986
Bighorn sheep, 1995
Black bear, 1997
Cougar, 1997
Deer, 1997
Elk, 1997
Ferruginous hawk, 1996
Fisher, draft 2004
Furbearers, 1987-93
Gray wolf, federal
Grizzly bear, federal 1993
Lynx, 1993; 2001
Moose, 1997
Mountain quail, 1993
Oregon spotted frog, 1998
Sharp-tailed grouse, 1995
Waterfowl, 1997
Upland birds, 1997

Management recommendations (PHS): Each species account provides information on the species' geographic distribution and the rationale for its inclusion on the PHS list. The habitat

requirements and limiting factors for each species are discussed, and management recommendations addressing the issues in these sections are based on the best available science. Each species document includes a bibliography of the literature used for its development, and each has a key points section that summarizes the habitat requirements and management recommendations for the species.

Game Management Plan: The game management plan guides the Washington Department of Fish and Wildlife's management of hunted wildlife through June 2009. The plan focuses on the scientific management of game populations, harvest management, and other factors affecting game populations. The overall goals of the plan are to protect, sustain, and manage hunted wildlife, provide stable, regulated recreational hunting opportunity to all citizens, to protect and enhance wildlife habitat, and to minimize adverse impact to residents, other wildlife and the environment. The plan outlines management strategies for the following species or groups of species:

Volume III – Amphibians and Reptiles, 1997
Columbia spotted frogNorthern leopard frog
Oregon spotted frog
Striped whipsnake

Volume IV – Birds, 2003
American white pelican
Bald eagle
Black-backed woodpecker
Blue grouse
Burrowing owl
Cavity-nesting ducks
Chukar
Common loon
Flammulated owl
Golden eagle
Great blue heron
Harlequin duck
Lewis' woodpecker
Loggerhead shrike
Mountain quail
Northern goshawk
Peregrine falcon
Pileated woodpecker
Prairie falcon
Ring-necked pheasant
Sage sparrow
Sage thrasher
Sharp-tailed grouse
Shorebirds
Vaux's swift
Wild turkey
White-headed woodpecker

<u>Volume V – Mammals</u>
(currently in development)

Management Recommendations for
Washington's Priority Habitats and Species,
May 1991

Bighorn sheep
Elk
Fisher
Gray wolf
Grizzly bear
Lynx
Marten
Merriam's turkey
Moose
Osprey
Pygmy shrew
Rocky Mountain mule deer
Townsend's big-eared bat
Western bluebird
White-tailed deer
Yellow-billed cuckoo
Elk
Deer
Bighorn Sheep
Moose
Black Bear
Cougar
Waterfowl
Migratory Birds (e.g., Mourning Dove)
Wild Turkey
Mountain Quail
Forest Grouse
Upland Game Birds
Small game (e.g., rabbits)
Furbearers (e.g., beaver)
Unclassified Species (e.g. coyote)

Bighorn Sheep Plan: The Washington State management plan for bighorn sheep describes the geographical range, natural history, habitat requirements and status, population dynamics and status, and management activities and implementation for 16 herds statewide. The plan identifies goals and objections for managing bighorn sheep and addresses specific issues related to monitoring, recreation, enforcement, reintroductions, research, and disease. The plan was adopted in 1995 and fits within the umbrella of the Game Management Plan for 2003-2009.

Black Bear Plan: The Washington State management plan for black bear describes the geographical range, life history, habitat, population dynamics, and management direction for bears. The plan identifies goals and objections for managing black bear and addresses specific issues related to nuisance activity, recreation, enforcement, habitat protection, and education. The plan was adopted in 1997 and fits within the umbrella of the Game Management Plan for 2003-2009.

Elk Herd Plans: Washington state elk herd plans summarize historic and current distribution and abundance. The Department recognizes ten, distinct elk herds in the state. Five of the ten elk herd management plans have been completed. The plans address the major factors affecting abundance and persistence. Population management objectives, spending priorities, and management strategies are spelled out. Priorities for habitat enhancement are identified.

Blue Mountains Elk Herd Plan, February 2001

Interagency waterfowl management plans: Washington Department of Fish and Wildlife (WDFW) is a member of the Pacific Flyway Council, an organization of 11 western states that develops management recommendations for migratory waterfowl. Management plans developed by the Council include population objectives, harvest strategies, habitat recommendations, and basic biological information. The Council also participates in the development of nationwide management plans for waterfowl. The following is a list of interagency plans that deal with Washington's waterfowl resources:

Canada Geese
Western Tundra

Pacific Coast Band-tailed Pigeons

Mourning Doves

Related Plans
North American Waterfowl Management Plan
National Mourning Dove Plan

Joint Venture habitat plans: WDFW is an active participant in two joint ventures under the North American Waterfowl Management Plan, the Pacific Coast Joint Venture and the Intermountain West Joint Venture. The joint ventures include representatives of agencies from all levels of government and nonprofit organizations, who are interested in conservation and enhancement of habitat for migratory birds and related fish and wildlife resources. The joint ventures have developed strategic plans to guide conservation efforts of all the partners:

Pacific Coast Joint Venture Strategic Plan
Intermountain West Joint Venture Strategic Plan