Appendix C: Additional information about Wildlife, Fish and Botanical species of interest

Wildlife

Threatened, Endangered and Sensitive (TES), and Survey and Manage Species

Species discussed here include federally listed species, and federal candidate species (USDI Fish and Wildlife Service 1996), and sensitive species, or species listed on the Regional Forester's Sensitive Species List (Sensitive). These species are collectively referred to as TES species throughout this section.

The analysis presented here provides brief general descriptions of the species' life history, threats, conservation measures and their occurrence in the analysis area. More detailed accounts to federally listed species can be found in the Biological Assessment in the project file and Biological Assessment prepared for the Regional Invasive Plant Program (USDA Forest Service 2005c), which is incorporated by reference. Effects to R6 sensitive species have been evaluated and the results are documented in this analysis. This analysis serves as the Biological Evaluation (BE) for sensitive species.

Federally Listed Species

One species listed as "endangered" and four species listed as "threatened" under the Endangered Species Act of 1973 (as amended) (ESA), are found on the Forest. One U.S. Fish and Wildlife Service (USFWS) "proposed species" occurs or is suspected to occur on the Forest as well (see Table C-1). Proposed species are those proposed in the Federal Register to be listed under Section 4 of the Endangered Species Act.

Table C-1 Federally Listed and Proposed Species and their occurrence on the Okanogan-Wenatchee National Forest

Common Name	Scientific Name	Status[2]	Occurrence		Designated Critical Habitat
			Okanogan	Wenatchee	
Gray wolf	*Canis lupus (outside the Northern Rocky Mtn. DPS)*[1]	E	Yes	Yes	No
Canada lynx	*Lynx canadensis*	T	Yes	Yes	Yes
Grizzly bear	*Ursus arctos*	T	Yes	Yes	No
Northern spotted owl	*Stix occidentalis caurina*	T	Yes	Yes	Yes
Marbled murrelet	*Brachyramphus marmoratus*	T	No	Suspect	No

Common Name	Scientific Name	Status²	Occurrence		Designated Critical Habitat
			Okanogan	Wenatchee	
Pacific fisher	*Pekania pennanti pacifica (west coast DPS)*	PT	Suspect	No	No

¹ In Washington State, west of U.S Highway 97 and State Highway 17; DPS= Distinct Population Segment

² **E =** Endangered **T** = Threatened **PT**= Proposed Threatened

The bald eagle, peregrine falcon and gray wolf (east of U.S Highway 97 and State Highway 17 in Washington State) have been removed from the endangered species list (delisted). As per Forest Service policy, they have been included on the Regional Forester's Sensitive Species List. The greater sage-grouse (*Centrocercus urophasianus*) is not included in this list because it is not believed to be found on the Forest.

Gray Wolf

In 2011, wolves in the eastern third of Washington were removed from federal protection under the ESA; considered to be part of the Northern Rocky Mountain Distinct Population Segment (DPS). Wolves in the western two-thirds of Washington (outside the Northern Rocky Mountain DPS) are classified as an endangered species under federal law. Portions of Methow Valley, Tonasket and Chelan Ranger District are within in the Northern Rocky Mountain DPS; where gray wolves are considered to be sensitive species. For all other district on the forest the gray wolf is considered to be a Federally Endangered species.

Effects analyses and determination for Gray Wolf, including the Northern Rocky Mountain DPS (sensitive status) will be discussed under this section and not within the "R6 Sensitive Species" section.

Life History

The wolf is a habitat generalist inhabiting a variety of plant communities, typically containing a mix of forested and open areas with a variety of topographic features (Verts and Carraway 1998, Witmer et al. 1998). Security habitat for wolves is defined as areas with open road and motorized trail densities less than one mile per square mile (Gaines et al. 2003). Gray wolves have extensive home ranges and both denning and rendezvous sites are often characterized by having nearby forested cover, remote from human disturbance (Mech et al. 1991, Meaney and Beauvais 2004). Wolves prey on a variety of large mammals, including elk, deer, and livestock, and will eat carrion. Occasionally, small mammals may be taken.

Wolves are social animals and live in established packs. Gray wolves give birth to pups in April or May, and then move pups to a series of rendezvous sites for the remainder of the summer. Pups become very

mobile by fall. Prior to pups becoming mobile, wolves may be sensitive to disturbance in the vicinity of their den and rendezvous sites (Mech et al. 1991, Meaney and Beauvais 2004). Wolves are strongly territorial; defending an area of 75-150 square miles. They primarily defend their territory from other canids (including coyotes, wolves, foxes, domestic dogs etc.). Home range size and location is determined primarily by the abundance of prey. Young wolves may disperse large distances from their maternal pack's territory and dispersal movements of 800 km (500 miles) have been documented.

Analysis Area Information

During the 1980s, Laufer and Jenkins (1989) documented several reports of gray wolves in Washington State, and in the 1990s gray wolves were documented at several sites, including two sites with pups (Fritts 1992, Gaines et al. 1995). Wolves historically inhabited and currently inhabit the Okanogan-Wenatchee National Forest (Gaines et al. 1995, Gaines et al. 2000). There are currently three known, established wolf packs on the Forest. In 2008 a confirmed wolf pack, Lookout Pack, was discovered on the Methow Valley Ranger District. In spring 2011 a second confirmed wolf pack, Teanaway Pack, was discovered on the Cle Elum Ranger District (Wiles et al. 2014). The Wenatchee Pack, on the Wenatchee River Ranger District, was discovered in 2013 (USDA Forest Service 2013). Through DNA, it was determined, that the Lookout pair originated from coastal British Columbia. DNA also revealed the Teanaway alpha female to be a direct descendant of the Lookout Pack. The female from the Wenatchee Pack was determined to be a two (2) year old female from the Teanaway Pack.

Two adult wolves from the Lookout Pack were trapped and fitted with VHF radio collars in July 2008 and an adult from the pack was fitted with a VHF radio collar in 2014 (Wiles et al. 2014). These radio collared adults were tracked from July 2008 through July 2009 and again in 2014. Through this effort, a pack range, (summer and winter activity use area) was determined for the Lookout Pack. The pack's range occurs within the Methow Valley area, north of Lake Chelan. Three wolf dens and five rendezvous sites have been documented for the Lookout Pack on the Forest. One adult female from the Teanaway Pack was fitted with a GPS radio collar June 2011. A pack range was also determined for the Teanaway Pack using the information gathered from the telemetry work. Four wolf dens and no known rendezvous sites have been documented for the Teanaway Pack on the Forest. No animals from the Wenatchee Pack have been fitted with collars as of spring 2015. Therefore home range has not been determined for the Wenatchee Pack. There are no den or rendezvous sites for the Wenatchee Pack as this is a not a reproducing pair.

For the Lookout Pack, there are 55 acres of plant mapped polygons and 6 infested acres within 1 mile of any known den sites and approximately 61 acres of mapped polygons and 2 infested acres within 0.5 miles of known rendezvous sites. Approximately 2,412 acres of the packs' home ranges occur within mapped polygons. For the Teanaway Pack, there are 33 acres of plant mapped polygons and 3 infested acres within 1 mile of any known den sites. Approximately 554 acres of the packs' home ranges occur within mapped polygons.

Table C-2 Infested acres within the wolf pack's home range on the Forest

Pack Range	Plant "Mapped Polygons" within Pack Range	Mapped Polygons/Infested Acres within 0.5 mi. of Rendezvous sites	Mapped Polygons/Infested Acres within 1.0 mi of Den sites
LOOKOUT PACK			
224,835 ac (private and FS lands)	2,412 ac (<1% of documented use area or range)	61 ac mapped polygon/2 ac infested acres	55 ac mapped polygon/6 ac infested acres
TEANAWAY PACK			
168,568 ac (private and FS lands)	554 ac (<1% of documented use area or range)	0 (no known rendezvous sites)	33 ac mapped polygon/3 ac infested acres
WENATCHEE PACK			
NA	NA	NA	NA

Risks and Conservation Measures

Invasive plants have not been identified as a threat to gray wolves. However, invasive plants may have adversely affected the habitat of their prey and may have contributed to changes in elk distribution and densities (USDA Forest Service 2005a, p166). This could influence the population level and/or distribution of wolves within the action area.

There are no designated recovery areas for gray wolves in the state of Washington, but there are guidelines applying consideration of potential impacts to known denning habitat or rendezvous sites. The Wolf Conservation and Management Plan of Washington State were finalized in December 2011 (Wiles et. al. 2011). While no official Forest Service guidance for gray wolves currently exist, project effects that are generally considered during consultation include potential disturbance, effects to security habitat and effects to prey base. Dens are frequently used repeatedly and thus den sites represent a significant habitat element for wolves (Meaney and Beauvais 2004). The proposed invasive plant treatment project will have no effect to security habitat. The proposed invasive plant treatment project has the potential to cause disturbance to the gray wolf, affect their health, as well as affect the quality of prey habitat. Therefore disturbance, affects to prey habitat, and the potential for herbicide exposure, will be used as key metrics to assess effects of this project on the gray wolf. Potential for disturbance will be determined using the mapped polygon acres near rendezvous and den sites and potential for herbicide exposure will be measured using infested acres near rendezvous and den sites. For discussion of effects to prey habitat, refer to deer and elk discussion under Management Indicator Species below.

Canada Lynx

Life History

Lynx inhabit moist, conifer forests that have cold, snowy winters and provide a prey base of snowshoe hare (*Lepus americanus*) (Quinn and Parker 1987, Koehler and Aubry 1994, Ruediger et al. 2000). Both snow conditions and vegetation types are important factors in defining lynx habitat. In the west, these habitats are represented, primarily by subalpine fir (*Abies lasiocarpa*), Engelmann spruce (*Picea engelmannii*) and lodgepole pine (Aubry et al. 2000, Ruediger et al. 2000, Koehler et al. 2008, Squires, et al. 2010, Interagency Lynx Biology Team 2013). On the Okanogan-Wenatchee National Forest, these habitats are generally above 4,000 feet elevation. Kittens are born May through June and female lynx stay in the den site 21 to 38 days (Interagency Lynx Biology Team 2013).

Lynx prey primarily on snowshoe hares (Koehler and Aubry 1994, Mowat et al. 2000, von Kienast 2003, Maletzke et al. 2008, Squires et al. 2010); and select for habitats where hares are most abundant (Squires and Ruggiero 2007). Primary forest types that support snowshoe hare are subalpine fir, Engelmann spruce, Douglas-fir, and lodgepole pine (Hodges 2000, Walker 2005, Koehler et al. 2008, Maletzke et al. 2008). Landscapes with various age classes, primarily mid to advanced successional stages resulting after burns or clearcuts that support dense understory vegetation, are more likely to support high snowshoe hare populations (Poole et al. 1996). Koehler (1990) and Wolfe et al. (1982) suggested that snowshoe hares avoid openings and very young vegetation, and prefer areas with dense protective understories composed of edible shrubs and trees. Hares feed on deciduous shrubs and leafy greens during spring and summer. Hares switch to woody browse (branches, twigs, small stems, and evergreen needles) during the winter in response to changes in available food source (Hodges 2000, Interagency Lynx Biology Team 2013)

The U. S. Fish and Wildlife Service (2005) developed a detailed "Recovery Plan Outline" for Canada lynx in September 2005. Recommendations included stratifying lynx habitat into 3 categories: core (existing or recent [within the past 20 years] lynx population/reproduction documentation), secondary (areas with current or historical records but no recent evidence of population persistence or reproduction), and peripheral (areas with limited and sporadic historical records, records closely tied to population crashes in Canada).

> A Conservation Agreement (CA) between the U. S. Forest Service and U. S. Fish and Wildlife Service was signed in February 2000 and amended in 2005. The CA applies to all occupied lynx habitat on National Forest System lands. The Forest Service agreed to use the most current science, including the Lynx Conservation Assessment and Strategy and Ecology and Conservation of Lynx in the United States (LCAS), as the basis for making effects determinations on projects in lynx habitat. The LCAS was revised 2013 (Interagency Lynx Biological Team 2013). If it was determined a project could adversely affect lynx, and was not a third party project, the project would be revised so the effects would be lessened or deferred until the Forest Plans could be revised to include lynx conservation. In 2005, the CA was revised to apply to only "occupied" lynx habitat (a forest with at least two verifiable lynx reports or documented reproduction since 1999).

Analysis Area Information

Surveys and research since the 1980's, have documented a persistent reproducing population of lynx in northern Okanogan County (Koehler et al. 2008). Winter track surveys for lynx have been conducted sporadically on the forest from 1993-2011. Lynx surveys following the national protocol (McDaniel et al. 2000) were conducted during the summers of 1998-2003. Lynx presence has been documented west of

the Okanogan River, north of Lake Chelan, and east of Ross Lake, using the national lynx survey (Aubry et al. 2002) and winter snow tracking (Von Kienast 2003, Maletzke 2004). There are 5,610 acres of invasive plant mapped polygons within potential lynx habitat. Refer to table below for infested acres by habitat category.

Canada Lynx Critical Habitat

Critical habitat on the Okanogan-Wenatchee National Forest has been identified as the subalpine fir plant association above 4,100 feet and encompassing approximately 1,836 mi^2. The area includes lynx habitat on National Forest System lands north of Lake Chelan, east of the Cascade Mountains crest, south of the Canada border, and west of the Okanogan River, totaling 1.4 million acres. There are 193 infested acres within lynx critical habitat and 196 infested acres within lynx core area.

The Primary Constituent Elements (PCEs) for lynx critical habitat are boreal forest landscapes supporting snowshoe hares, winter snow conditions that are "deep and fluffy", sites for denning, and matrix habitat. The PCEs include matrix habitat described as patches of boreal forest landscape (e.g. hardwood forest, dry forest, non-forest or other non-snowshoe hare habitat) that occur between patches of boreal forest in close juxtaposition (within the scale of a lynx home range) such that lynx are likely to travel through (USDI Fish and Wildlife Service 2008d; Ruggiero et al. 2000). Boreal forests in the western United States are dominated largely by firs, spruce and lodgepole pines (Hodges 2000, Interagency Lynx Biology Team 2013).

Table C-3 Lynx habitat as defined in the LCAS (Ruediger et al. 2000) and the lynx detailed recovery outline (USDI Fish and Wildlife Service 2005), and infested acres within potential lynx habitat.

Lynx Habitat Category	Total Potential Lynx Habitat (acres)	Potential Lynx Habitat	
		Acres within Mapped Plant Polygons	Infested Acres
Total CORE Area	774,413	1,720	196
Critical Lynx Habitat (included in CORE Area; overlaps with CORE Area acres)	(702,224)	1,455	193
SECONDARY Area	255,227	1,819	197
PERIPHERAL Area	391,838	2,071	654
Total Area (with no overlap)	**1,421,478**	**5,609**	**1,047**

Risks and Conservation Measures

Lynx were listed as threatened under the Endangered Species Act because of a lack of adequate regulatory mechanisms (U.S. Fish and Wildlife Service 2000). "Risk factors" identified by Ruediger et al. (2000), were grazing, timber harvest, fire suppression, highways and winter recreation. Invasive plants are thought to have no impacts on lynx or lynx habitat (Interagency Lynx Biological Team 2013). There is some evidence that lynx tolerate some level of human disturbance (U.S. Fish and Wildlife Service, 2000). The

primary effect the proposed invasive plant treatments could have on the lynx is possible disturbance and herbicide exposure (to lynx and their prey). Potential for disturbance, effects to habitat (lynx and prey), and potential for herbicide exposure for lynx and their prey will be used as key metrics to assess effects of this project on the Canada lynx. Potential for disturbance will be determined using the mapped polygon acres within occupied lynx habitat and potential for herbicide exposure will be measured using infested acres within potential lynx habitat.

Grizzly Bear

Life History

Grizzly bears are opportunistic omnivores (U. S. Fish and Wildlife Service 2011b). They can have a varied diet of vegetation, fruits, insects, nuts, carrion, or animals depending upon a given year, season of the year, and availability (Schwartz et al. 2003). Prey base for grizzly bears include ungulates (during fawning/calving), salmon (during spawning periods), carrion, and to a lesser extent small mammals. Vegetation is a key food source during spring emergence. Plant species such as glacier lily bulb, camas, and lush vegetation including grasses attract grizzly bears during late spring through early summer (USDI Fish and Wildlife Service 2011b). In the fall, prior to hibernation, huckleberries are a prime food source in the North Cascades (USDI Fish and Wildlife Service 1993). Female home ranges in western U. S. average 150 sq. mi. and males average 309 sq. mi. (LeFranc et al. 1987). The search for food has a primary influence on grizzly bear movements. Upon emergence from the den they seek the lower elevations, drainage bottoms, avalanche chutes, and ungulate winter ranges where their food requirements can be met. From late spring to early summer they follow plant green-up back to the higher elevations. In late summer and fall, bears transition to fruits and nuts as a food source (USDA Forest Service 2005c).

Grizzly bears hibernate in the winter and excavate dens in which to hibernate. Denning habitat is typically in higher elevation areas with snow cover, in remote areas away from human disturbance. There are no known grizzly bear dens on or near the Okanogan-Wenatchee National Forest (USDI Fish and Wildlife Service 1993). Mating occurs from late May through mid-July and cubs are born in February (USDI Fish and Wildlife Service 2011b).

Analysis Area Information

Grizzly bears occur in five recovery areas in four states (Idaho, Montana, Wyoming and Washington). Grizzly bears in Alaska are not federally listed. The grizzly bear is listed as a Threatened species, with a determination of warranted for Endangered status in the North Cascades (USDI Fish and Wildlife Service 1975, 1998, 2011b). The portion of the Okanogan-Wenatchee National Forest north of the I-90 corridor and west of the Okanogan and Columbia rivers is located within the North Cascades Grizzly Bear Recovery Zone (NCGBRZ). There are 23 Bear Management Units (BMUs) on the Okanogan-Wenatchee National Forests (Table A-4 below). BMUs are generally large enough to provide a variety of seasonal habitats. Currently, management direction includes guidelines for reducing the potential for bears becoming habituated to human foods and an interim “no-net-loss” of core area. Core areas are defined as an area that is greater than 500 meters (~1640 feet) from an open road, motorized trail or high use non-motorized trail (Gaines et al 2003). For this analysis, acres of core were obtained from the Forest Cooperate layer; grizzly bear BMU layer (2015).

Although the grizzly bear is considered present in the 9,565 square mile North Cascades Grizzly Bear Recovery Zone, the population is likely less than 50 (Almack et al. 1993) and may be as low as 6 (Romain-Bondi et al. 2004). The most recent confirmed report (Class I) of a grizzly bear in the Recovery Zone was near Cascade Pass in the North Cascades National Park in 2011 (USDA Forest Service 2013).

Grizzly Bear CORE area totals 1.9 million acres on the Forest of which less than 1% occurs within plant mapped polygons and less than 0.5% having infested acres.

Table C-4 Acres of Grizzly Bear Core Area, invasive plan mapped polygons and infested acres by Bear Management Units (BMUs)

BMU	Grizzly Bear CORE Area	Acres of core habitat within Mapped Polygons	Infested Acres
Ashnola	163,876	0	0
Chiwawa	81,764	0	0
Cle Elum	70,363	5	2
Granite Creek	135,177	0	0
Icicle	98,403	0	0
Libby Creek	65,217	28	<1
Lower Chelan	121,135	1,226	107
Lower Chewuch	79,040	17	<1
Lower Entiat	31,767	156	12
Lower Wenatchee	71,075	73	42
Middle Methow	22,733	35	3
Pasayten	176,228	0	0
Peshastin	48,087	0	0
Salmon	21,719	79	9
Swauk	38,387	0	0
Upper Chelan	202,525	114	17
Upper Chewuch	157,902	4	<1
Upper Entiat	49,693	0	0
Upper Methow	138,596	0	0
Upper Stehekin River	91,595	0	0
Upper Twisp River	100,184	13	2
Upper Wenatchee	87,862	0	0
Total	**1,965,147**	**1,750 <0.5%)**	**195 (<0.5%)**

Risks and Conservation Measures

Human-caused mortality, disturbance, and habitat loss are the primary threats to grizzly bears. Specific examples of risk to grizzly bears include road and trail construction in previously secure habitat, human use of existing roads, logging, grazing, power line corridors, poaching, backcountry recreation, energy and mineral exploration and extraction, nontarget mortality during black bear hunting season, availability of human foods/garbage and residential development. Several studies have documented displacement of grizzly bears from trails (motorized and non-motorized) and roads (Archibald et al. 1987, Mattson et al. 1987, McLellan and Shackleton 1988, 1989; Kasworm and Manley 1990; Mace and Waller 1996, 1998; Mace et al. 1996, 1999, Ciarniello et al. 2007). Factors related to human access include increased potential for poaching, collisions with vehicles, and chronic negative human interactions (Claar et al. 1999, Wisdom et al. 2000, Ciarniello et al. 2007). Human access is managed by assessing the quality and quantity of seasonal habitat within core areas (IGBC 1998).

Hawkweeds have been known to displace the grass and bulbs used by grizzly bears in the spring, and invasive plants are approaching measurable impacts to grizzly bear habitat in some areas in the Region (USDA Forest Service 2005a).

Northern Spotted Owl

Life History

Spotted owls rely on older forested habitats that contain structures and characteristics required for nesting, roosting, foraging, and dispersal. Relatively heavy canopy with a semi-open understory is essential for effective hunting and movement. Forested stands with high canopy closure also provide thermal cover. Spotted owls may use younger, managed forests where key habitat components (e.g., large live and dead trees with cavities) are available. These younger forests can provide dispersal habitat for owls and foraging habitat where they are near nesting or roosting habitat (Buchanan 1991, Buchanan et al. 1995, Everett et al. 1997, USDI Fish and Wildlife 1990).

The spotted owl's primary prey items vary geographically and by forest type. The primary prey species for owls on the Okanogan-Wenatchee National Forest include the northern flying squirrel, bushy-tailed woodrat, deer mouse, and voles (Richards 1989, Forsman et al. 2001). Woodrat and flying squirrel densities in local dry and mesic forests are among the highest measured within the range of the northern spotted owl (Lehmkuhl et al. 2006a, b). Nesting activities begin in early March with incubation of approximately 30 days (Forsman et al., 1984). Feeding and care of the young occurs from April through August, and then juveniles disperse from nesting areas in August and September. Site specific monitoring on the Okanogan-Wenatchee National Forest has shown that within the Eastern Washington Cascades Province, after July 31, spotted owl young are mobile and generally considered to be able to move from disturbance (USDA Forest Service 2013).

Spotted Owl Critical Habitat

Primary constituent elements for owl critical habitat consist of habitat features that support nesting, roosting, foraging and dispersal (USDI Fish and Wildlife Service 1992 and 2012). The attributes of nesting and roosting habitat include moderate to high canopy closure (60 to 80 percent); multi-layered, multi-species canopy with large (>30 inches dbh) overstory trees, a high incidence of large trees with

various deformities; large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for spotted owls to fly (Thomas et al. 1990).

Foraging habitat varies across the range of the owl and contains attributes similar to those of nesting and roosting habitat, but may also include more open fragmented habitat (USDI Fish and Wildlife Service 1992). Dispersal habitat provides linkages between Late Successional Reserves/Mananaged Late successional Areas LSRs/MLSAs for owl movement, but does not contain the structural attributes, such as canopy closure, large trees, and snags, associated with nesting, roosting and foraging habitats. In general, dispersal habitat is composed of single or multi-layered forests with moderate sized trees (10-15 inches dbh), and a canopy closure of greater than 40 percent. Dispersal habitat provides protection from avian predators and at least minimal foraging opportunities.

Spotted owl critical habitat was designated based on the identification of large blocks of suitable habitat that were well distributed across the range of the spotted owl, although not all critical habitat acres were or are suitable habitat. CHUs were intended to identify a network of habitats that provided the functions considered important to maintaining stable self-sustaining, and interconnected populations over the range of the spotted owl, with each CHU having a local, provincial, and range-wide role in spotted owl conservation. Most CHUs were expected to provide suitable habitat for population support, some were designated primarily for connectivity, and others were designated to provide for both population support and connectivity (USDI Fish and Wildlife Service 2012). About 70% of the critical habitat is located within LSR and 2% in MLSA.

Analysis Area Information

All of the Okanogan-Wenatchee National Forest is included within the range of the northern spotted owl except for eastern portions of the Methow Valley Ranger District and all of the Tonasket Ranger District. Northern spotted owls use late-successional forest habitat primarily in the western hemlock, grand fir, and Douglas fir forested vegetation zones of the eastern Washington Cascades. The upper elevation limit (roughly 5,000 feet) at which spotted owls occur corresponds to the transition to subalpine forest, characterized by relatively simple structure and severe winter weather (Forsman 1975; Forsman et al. 1984).

Protocol surveys have been conducted within approximately 85% of the suitable habitat on the Forest and approximately 230 pairs had been located prior to 1997(USDA Forest Service 2008b). Of these, about 65% were located within LSRs/MLSAs, and 33% within the Snoqualmie Pass Adaptive Management Area (AMA) (USDA Forest Service 2008b). Monitoring of spotted owls on the Okanogan-Wenatchee National Forest has indicated a declining population (Forsman et al. 1996, Franklin et al. 1999, Anthony et al. 2006, Forsman et al. 2008). In the Wenatchee and Cle Elum long-term study areas, population declines range from 40 to 60 percent during the study period of 1990 to 2003 (Anthony et al. 2006) and as great as 70 percent decline in 2008 (Forsman et al. 2008). Applying this rate of decline, the 230 activity centers believed to occur in 1996 may be as few as 92 to 149 activity centers in 2006 and as few as 69 activity centers in 2008. Decreases in apparent adult survival rates were an important factor contributing to decreasing population trends (USDA Forest Service 2008b).

Approximately 828,372 acres of northern spotted owl nesting, roosting and foraging (NRF) habitat, within the range of the northern spotted owl, exists on the Okanogan-Wenatchee National Forest (figure was obtained from the Forest Plan Revision NSO layer 2010. There are approximately 3,823 acres of NRF within invasive plant mapped polygons (less than1 percent of the total NRF on the Forest); of which 1,520 acres occur within ¼ mile of closed system roads. Approximately 1,181 infested acres within NRF habitat occurs on the Forest of which 412 acres occur within ¼ mile of closed system roads.

A total of 231 acres of mapped polygons or 141 infested acres occur within ¼ mile of spotted owl activity centers. There are 77 spotted owl activity centers located within 0.25 mile of current invasive plant infestations. Invasive plant treatments along open roads are considered not to create noise above ambient forest levels and cause disturbance. Therefore these acres were not included in the above acreage.

Critical Habitat in the Analysis Area

The FWS designated approximately 2,918,067 ac in 4 units and 26 subunits of spotted owl critical habitat in Washington (USDI Fish and Wildlife Service 2012). Unit 7: East Cascades North (ECN) contains 1,345,523ac and 9 subunits and completely encompasses the Okanogan-Wenatchee National Forest (sub-units ENC 1-5). A total of 880,466 acres of the Okanogan-Wenatchee National Forest is designated as Critical Habitat for the Northern Spotted Owl (USDA Forest Service 2013). No critical habitat is located on the eastern portions of the Methow or any of the Tonasket Ranger Districts. Approximately 14,481 acres of mapped plant polygons occur within spotted owl critical habitat of which 5,831 acres are infested plant acres.

Risks and Conservation Measures

The northern spotted owl was listed as threatened throughout its range "due to loss and adverse modification of suitable habitat as a result of timber harvesting and exacerbated by catastrophic events such as fire, volcanic eruption, and wind storms" (USDI Fish and Wildlife Service 1990. The Revised Recovery Plan for the Northern Spotted Owl (USDI Fish and Wildlife Service 2011a) listed competition with barred owls as one of the most important range-wide threats to the spotted owl.

The greatest challenges to maintaining spotted owl habitat on the Forest are fire, insects and disease. Preliminary data on the Okanogan-Wenatchee National Forest suggests that over 36,000 acres of suitable habitat for the spotted owl have been affected by wildfire since 1994. During that time, 8,797 acres have been removed or downgraded due to prescribed vegetation management actions (Krupka 2008).

Spotted owls are somewhat sensitive to disturbance caused by noise above ambient levels during certain times of the year. Limited research has been conducted on the effects of noise disturbances to spotted owls. Wasser et al. (1997) found that stress hormone levels were substantially higher in male northern spotted owls (but not females) when they were located less than 0.41 km from a major logging road, compared to northern spotted owls >0.41 km from a logging road. Disturbance to nesting spotted owls can potentially resulting in missed feedings or the adults to flush, leaving young susceptible to predation and weather (USDA Forest Service, 2013). After July 31, spotted owlets are no longer completely dependent upon the adults and are able to adjust their own body temperature, fly, and forage on their own, reducing the susceptibility to disturbance-related effects.

Invasive plants are not known to affect the northern spotted owl NRF or dispersal habitat (USDA Forest Service 2005a). The dense canopy forests used by spotted owls are not generally infested by invasive plants, except along road shoulders. The primary risks the proposed invasive plant treatments could have on the northern spotted owl is the potential to cause disturbance to breeding and nesting spotted owls by using mechanized treatments. Some mechanical treatments could create noise above ambient forest levels, depending upon site-specific conditions. Noise created by motorized vehicles and equipment used to treat invasive weeds along open system roads are considered to be within normal ambient forest levels. Motorized access and mechanical treatment on presently closed and/or gated Forest Service system roads (Maintenance Level I) are considered to be above normal ambient noise levels. Therefore potential disturbance within ¼ mile of spotted owl nest sites and suitable spotted owl habitat along Maintenance

Level 1 roads will be used as key metrics to assess effects of this project on the northern spotted owl. The potential for herbicide exposure will also be used as a key metric to assess effects.

A Programmatic Wildlife Biological Assessment (Programmatic BA) for the Okanogan-Wenatchee National Forest (USDA Forest Service 2013) identified breeding, nesting and rearing season limited operating periods near northern spotted owl activity centers. Table C-5 below lists the disturbance and disruption distanced for nesting spotted owls. If disturbance-causing activities occur farther away from nesting spotted owls than the disturbances specified in Table C-5, then no adverse effect would occur. Nesting period is from March 1 through July 31.

Table C-5 Disturbance for northern spotted owl within which adverse effects may occur, as specified by FWS office in Wenatchee, Washington (USDA Forest Service 2013).

Activity	Dates	Distance
Activities that create noise above ambient forest levels	March 1 – July 31	0.25 mile of an active nest or activity center whose current status is unknown, or any unsurveyed nesting habitat

Late Successional Reserves (LSR) and Managed Late Successional Areas (MLSA) (Late-Successional Habitat)

The Northwest Forest Plan (USDA Forest Service and USDI Bureau of Land Management 1994a,b) identified a series of Late Successional Reserves (LSR) and Managed Late Successional Areas (MLSA) to protect and enhance habitat conditions for late-successional and old-growth related species, including the northern spotted owl. There are ten MLSA's (Natapoc, Eagle, Tumwater, Camas, Sand Creek, Crow, Milk Creek, Haystack, Russell Ridge, and Lost Lake); and nineteen LSR's (Upper Methow, Nice, Twisp River, Sawtooth, Hunter Mountain, Lucerne, Sawtooth, Shady Pass, Chiwawa, Lake Wenatchee, Deadhorse, Icicle, Teanaway, Swauk, Manastash, Bumping, Upper Nile, Rattlesnake and Tieton) on the Okanogan-Wenatchee National Forest. Approximately 310,250 acres of late-successional habitat exists within LSR's/MLSA's on the Okanogan-Wenatchee National Forest (Forest Plan Revision late-successional layer 2010). There are approximately 3,957 acres of late-successional habitat within LSRs/MLSAs that occur within the invasive plant mapped polygons (less than 1 percent of the total on the Forest); of this approximately 494 acres are invasive plant infested acres. Approximately 1,779 acres of late-successional habitat within LSRs/MLSAs occurs in mapped plant polygons that are within ¼ mile of closed system roads of which 248 acres are infested plant acres.

Risks

Invasive plants are not known to affect late-successional habitat (USDA Forest Service 2005a). The dense canopy forests used species associated with late-successional habitat are not generally infested by invasive plants, except along road shoulders.

Marbled Murrelet

Life History

The marbled murrelet uses coastal coniferous forest, primarily late-successional forests as nesting habitat. Nests in the Pacific Northwest are typically in the largest diameter trees available in a stand; many nest trees are in declining conditions and had multiple defects (Hamer and Nelson 1995). Marbled murrelet nesting begins in mid-late March and extends until the end of August (Hamer and Nelson 1995). In California, Oregon, Washington, and British Columbia, murrelets nested in low elevation old-growth and mature coniferous forests, with multi-layered canopies (>2), a high composition of low elevation conifer trees (mean =91%) and, on the lower two-thirds of forested slopes, with moderate gradients (mean = 23% slope). Stand canopy closure was often low (mean =50%), suggesting use of canopy openings for access to nest platforms. Nests in the Pacific Northwest were typically in the largest diameter old-growth trees available in a stand (mean = 83 in); many nest trees were in declining conditions and had multiple defects (Hamer and Nelson 1995). Management guidance for the marbled murrelet can be found in the NWFP (USDA Forest Service 2013). Marbled murrelets have a life history strategy unique among seabirds. Although they feed on fish and invertebrates primarily in nearshore marine waters, they nest as far as 55 miles inland from the marine environment, on large limbs of mature conifers (USDA Forest Service 2013).

Analysis Area Information

There are no confirmed marbled murrelet nest sites on the Okanogan-Wenatchee National Forest. However, most of the potential murrelet nesting habitat on the Forest has not been surveyed. The marbled murrelet recovery plan (U.S. Fish and Wildlife Service, 1997) identified six recovery zones for the marbled murrelet. The Okanogan-Wenatchee National Forest is included in Zones 1 and 2. Approximately 320,700 acres of the Okanogan-Wenatchee Forest is located within daily flying distances (55 miles) of marine environments in Puget Sound. This area is located within the western portions of the Cle Elum, Wenatchee River, and Naches Ranger Districts. There are approximately 107,573 acres of potential murrelet nesting habitat on the Forest. Potential murrelet nesting habitat was generated using late-successional habitat (Forest Plan Revision late-successional layer 2015) within the 55 mile flight distance zone. The majority of proposed treatment acres, within potential murrelet habitat, are roadside treatments. Approximately 218 acres of potential murrelet habitat occurs within mapped polygons and of these approximately 96 acres occur and within 1/4 mile of closed system roads. It is highly unlikely marbled murrelets are present on the Forest due to the distance and flight factors needed to access the Forest (flight over the Cascade Crest). There is no Designated Critical Habitat for the marbled murrelet on the Okanogan-Wenatchee National Forest.

Risks and Conservation Measures

Threats to murrelets include habitat loss from fires and stand-replacing events, timber harvest on non-federal lands, low fecundity, nest predation, disease, oil spills, and by-catch from gill net fishing. Since listing in 1992, several threats have decreased (McShane et al. 2004). The rate of annual habitat loss has declined due to protection of Federal land. Roughly 80% of the murrelet's critical habitat is in Late-Successional Reserves in the range of the Northwest Forest Plan. New gill-netting regulations in northern California and Washington have reduced the threat to murrelets. Project effects that are generally considered during consultation include potential disturbance during nesting and effects to nesting habitat.

A Programmatic Wildlife Biological Assessment (Programmatic BA) for the Okanogan-Wenatchee National Forest (USDA Forest Service 2013) identifies breeding, nesting and rearing season limited operating periods near marbled murrelet active nest sites. Table C-6 below lists the disturbance and disruption distance for an active marbled murrelet nest site or activity center. If disturbance-causing activities occur farther away from nesting marbled murrelets than the disturbances specified in Table C-6,

then no adverse effects will occur. The breeding, nesting and rearing period is from April 1 through September 15.

Table C- 6 Disturbance distances for marbled murrelet within which adverse effects may occur, as specified by FWS office in Wenatchee, Washington (USDA Forest Service 2008b).

Activity	Dates	Distance
Activities that create noise above ambient forest levels	April 1 – September 15	0.25 mile of an active nest or activity center whose current status is unknown, or any unsurveyed nesting habitat

Pacific Fisher

Carnivore surveys by the Forest Service have been conducted sporadically across the Okanogan-Wenatchee National Forest from 1993-2010 using baited camera sets, snow tracking and track plates. There were no verified detections of fishers from these surveys. From 1995-1997, Washington Department of Fish and Wildlife conducted carnivore surveys using camera stations in potential fisher habitat throughout the state. No fishers were detected (Hayes and Lewis 2006). Pacific fisher populations in Washington are thought to be extirpated, or contain only remnant scattered individuals (Aubry and Lewis 2003, Lewis and Stinson 1998). In 2008 fishers were translocated to Olympic National Park in western Washington and that population persists to date (Lofroth et al. 2010). Fisher on the Okanogan-Wenatchee National Forest are believed to be currently absent" (USDA Forest Service 2015). Therefore this project will have no effect on the fisher and will not be discussed further in this document.

R6 Sensitive Species

Wildlife species found on the Okanogan-Wenatchee National Forest included on the Regional Forester's Sensitive Species List are listed below (revised 12/18/2014). Sensitive species are those identified as species at potential risk of loss of viability. The primary objectives of the Sensitive Species program are to ensure species viability throughout their geographic ranges and to preclude trends toward endangerment that would result in a need for Federal listing. Species identified by the USFWS as "candidates" for listing under the ESA, and meeting the Forest Service's criteria for protection, are included on the Sensitive Species Lists. Some of the sensitive species below are also Northwest Forest Plan Survey and Manage Species.

Table C-7 Sensitive Wildlife Species documented or suspected to occur on the Okanogan-Wenatchee National Forest

Common Name	Scientific Name	Occurrence	
		Okanogan	Wenatchee
Mammals			
Gray wolf	*Canis lupis (Northern Rocky Mtn. DPS)*	D	NA
Wolverine	*Gulo gulo*	D	D
Cascade Red Fox	*Vulpes vulpes cascadensis*	S	D
Western Gray Squirrel	*Sciurus griseus*	D	D
Townsend's Big-eared Bat	*Corynorhinus townsendii*	D	D
Little Brown Myotis	*Myotis lucifugus*	D	D
Bighorn Sheep	*Ovis canadensis*	D	D
Mountain Goat	*Oreamnos americanus*	D	D
Birds			
Northern Goshawk	*Accipiter gentilis*	D	D
Bald Eagle	*Haliaeetus leucocephalus*	D	D
American Peregrine Falcon	*Falco peregrinus anatum*	D	D
Great Gray Owl	*Strix nebulosa*	D	D
Gray Flycatcher	*Empidonax wrightii*	D	D
White-headed Woodpecker	*Picoides albolarvatus*	D	D
Lewis' Woodpecker	*Melanerpes lewis*	D	D
Sandhill Crane	*Grus canadensis*	D	D
Harlequin Duck	*Histrionicus histrionicus*	D	D

Common Name	Scientific Name	Occurrence	
		Okanogan	Wenatchee
Common Loon	*Gavia immer*	D	D
Sharp-tailed Grouse	*Tymphanuchus phasianellus*	S	no
Amphibians			
Larch Mountain Salamander	*Plethodon larselli*	no	D
Reptiles			
Western Pond Turtle	*Actinemys marmorata*	no	S
Striped Whipsnake	*Coluber taeniatus*	no	S
Mollusk			
Puget Oregonian	*Cryptomastix devia*	no	D
Insects			
Grand Coulee Mountainsnail	*Oreohelix juni*	D	no
Shiny Tightcoil	*Pristiloma wascoense*	S	D
Blue-gray Taildropper	*Prophysaon coeruleum*	no	S

Western bumblebee	*Bombus occidentalis*	D	D
Meadow Fritillary	*Boloria bellona*	D	no
Astarte Fritillary	*Boloria astarte*	D	no
Freija Fritillary	*Boloria freija*	D	no
Great Basin Fritillary	*Speyeria egleis*	S	no
Labrador Sulphur	*Colias nastes*	D	no
Lustrous Copper	*Lycaena cupreus*	D	no
Melissa Arctic	*Oeneis melissa*	D	no
Mardon Skipper	*Polites mardon*	no	D
Peck's Skipper	*Polites peckius*	D	no
Tawny-edged Skipper	*Polites themistocles*	D	no
Subarctic Darner	*Aeshna subarctica*	no	S
Zigzag Darner	*Aeshna sitchensis*	D	D
Subarctic Bluet	*Coenagrion interrogatum*	S	no

D = Documented – an organism that has been verified to occur in or reside on an administrative unit.

S = Suspected – an organism that is thought to occur, or that may have suitable habitat, on National Forest System land or a particular administrative unit, but presence or occupation has not been verified.

Gray wolf (Northern Rocky Mountain DPS) life history and effects analysis discussed under the "Federally Listed Species" section

Gray Wolf (Northern Rocky Mountain DPS)

In May, 2011, the Fish and Wildlife Service published a final rule delisting gray wolves east of U.S. Highway 97 and State Highway 17 in Washington State. This includes portions of the Tonasket Ranger District. The gray wolf Northern Rocky Mountain DPS has been included on the Regional Forester's Sensitive Species List. Effects analyses and determination for the Northern Rocky Mountain Distinct Population Segment (DPS) will be covered under the Gray Wolf "Federally Listed Species" section.

Wolverine

Life History

Wolverines are uncommon inhabitants of subalpine habitats in western mountain ranges in the lower 48 United States (Aubry et al. 2007). Recent research on wolverines in the Rocky Mountains of British Columbia (Krebs et al. 2007) and the United States (Copeland 1996, Copeland et al. 2007, Squires et al. 2007) indicates that wolverines are wide-ranging, and inhabit remote areas near timberline. Wolverines do not appear to specialize on specific vegetation or geological habitat aspects, but instead select areas that are cold and receive enough winter precipitation to reliably maintain deep persistent snow late into the warm season (Copeland et al. 2010). Wolverine denning habitat and suitable habitat as described by Magoun and Copeland (1998), Krebs (1999) and Kelsall, in Ruggerio, et al. (1994) is probably "best defined in terms of adequate food supplies in large, sparsely inhabited wilderness areas". Another recent study has shown that wolverines restrict themselves to higher elevation habitats where spring snow cover persists until May or June, even when they are dispersing (Parks 2009, Schwartz et al. 2009).

Wolverines are opportunistic scavengers that consume a wide variety of plant and animal food, with carrion (especially large ungulates) serving as the mainstay of this species' winter diet. Surplus food is often cached for later use. Wolverines are sensitive to human disturbance at natal and maternal den sites and have been documented abandoning dens due to disturbance (Copeland et al. 2007, Squires et al. 2007).

Analysis Area Information

The Washington's North Cascades wolverine population appears to be a part of a larger population that includes portions of British Columbia and possibly, Alberta (Aubry et al. 2011). A recent 10-year wolverine study was completed on the Okanogan-Wenatchee National Forest on the Methow Valley Ranger District. Wolverine live traps were put in place the winters of 2005/06 thru 2010/11. Fourteen wolverines were captured on 43 occasions (Aubry et al. 2011). A second study was initiated through the Cascades Carnivore Project on the south end of the Forest (Atkins 2010). Although no wolverines were documented on the Forest through this study efforts, lone wolverines were documented north of Mount Adams and in the Goat Rocks Wilderness area on the Gifford Pinchot National Forest (Gunnell 2015). Recent efforts to detect wolverines on the Forest have resulted in confirmed sighting on the Entiat Ranger District 2011 through 2015; Lake Wenatchee and Cle Elum Ranger Districts in 2013 through 2015. A breeding population, in Washington State has been documented north of I-90 (Gunnell 2015).

There is one known den site on the Okanagan-Wenatchee National Forest. On the Okanogan-Wenatchee National Forest, wolverines are frequently found in high elevation wilderness and roadless areas (Aubry et al. 2011). There are approximately 109,425 acres of denning (high elevation) habitat on the forest; of which 16 of these acres are within mapped polygons and approximately 0.5 are infested acres. Acres of wolverine denning habitat were obtained from the wolverine habitat layer created for the Forest Plan Revision 2010.

Risks

Due to their preference for high elevation remote habitat, and considering this species is strongly associated with low levels of population density and roads (Carroll et al. 2001), wolverines and their habitat are not typically impacted by invasive plants. Denning usually occurs in deep snow January through mid-May (Copeland et al. 2010); outside the time period weed would be treated at high elevations.

Cascade red fox

Life History

The Cascade red fox is endemic to Washington where it inhabits the higher elevation alpine and subalpine forests; including parklands and meadows of the Cascade Range (Aubry 1984, Swanson et al. 2005, Washington Department of Fish and Wildlife 2012). Historically, it was distributed throughout the Washington Cascade Range; however it now appears to be limited to a few isolated, high-elevation populations at Mount Rainier National Park and surrounding areas (Aubry 1983, Akins 2014). Foxes have been documented eating northern pocket gophers, snowshoe hares, songbirds and huckleberries (Akins 2012).

Analysis Area Information

Cascade red fox surveys have been conducted sporadically across the Cascade Range of Washington and Oregon by the Cascade Carnivore Project (CCP) 2008-2014. Numerous detections of Cascade red fox have been documented in the Cascade Range by photographs at baited stations and by DNA analysis of collected scats resulting in the identification of less than 50 individuals (Akins 2014). On the Naches Ranger District, thirteen scat samples were verified to be native Cascade red fox (Akins 2013). Preliminary genetic results suggest serious declines in abundance and distributions.

There are no known den sites on the Okanagan-Wenatchee National Forest. There are approximately 660,751 acres of high elevation habitat (forest, subalpine parklands, and alpine meadows) on the forest; of which 78 of these acres are within mapped polygons and approximately 4 are infested acres. Cascade red fox habitat was created using the Forest vegetation layer 2015.

Risks

The Washington Department of Fish and Wildlife identified isolated populations (genetic health), canine diseases, increasing human activities, climate change, competition and predation by other canines as the most apparent threats to the Cascade red fox. Due to their preference for high elevation remote habitat, (Aubry 1984), Cascade red fox and their habitat are not typically impacted by invasive plants.

Western Gray Squirrel

Life History

Arboreal (living in trees) and generally solitary in their habits, western gray squirrels forage on the ground, but rarely stray far from trees (Foster 1992). They avoid large openings, instead using arboreal routes for escape, cover, and access to nest trees (Foster 1992). Rice (1977) found that they were sensitive to human disturbance and generally sought areas secluded from noise and human activity. Truffles (hypogeous fungi), pine nuts, acorns, seeds, green vegetation and fruit are the main components of the western gray squirrel diet (Linders and Stinson 2007). They cache their food for the winter. Western gray squirrels remain active throughout the year. Throughout their range, western gray squirrels are most frequently associated with pine trees and oak trees that provide nesting cover and a food source, (Hammer et al. 2005). Large diameter and interconnected crowns of pine and/or oak are particularly important. Habitat quality in Washington is thought to be relatively poor compared to other parts of the species' range due to a lower number of large-seeded, mast (nut)-bearing tree species (Linders and Stinson 2007). Western gray squirrels in Washington are patchily distributed in three geographically

isolated populations (Linders and Stinson 2007). Only one of these populations is located on the Okanogan-Wenatchee National Forest.

Analysis Area Information

A portion of one population in Washington State, known as the North Cascades, occurs on the Okanogan-Wenatchee National Forest. The majority of the occupied western gray squirrel habitat in the Okanogan population occurs on private lands (51%) and National Forest System (35%) lands, with the remainder managed by WADNR and BLM (Linders and Stinson 2007). Reproducing western gray squirrel populations occur on the Forest along the north and south shores of Lake Chelan and in southwestern Okanogan County, on the Chelan, Entiat and Methow Valley Ranger Districts.

Approximately 731,254 acres of potential western gray squirrel habitat exists on the Okanogan-Wenatchee National Forest. Approximately 11,795 acres of western gray squirrel habitat occurs within mapped plant polygons, of which 1,248 are of infested acres. Potential western gray squirrel habitat for the Forest was determined using the Washington Department of Fish and Wildlife broad scale habitat layer delineated in 2010. The WDFW determined potential habitat based on western gray squirrel ecology and recent occurrences. This assessment only addresses potential habitat that occurs on the Okanogan-Wenatchee National Forest including Okanogan and north Chelan Counties.

Risks

Major risks identified in the Washington Department of Fish and Wildlife recovery plan for the western gray squirrel were a decline of available habitat as a result of urban/suburban development, fire suppression and forest practices; diseases such as mange; and introduced competitors such as the Merriam's turkey, and eastern gray squirrel (Linders and Stinson 2007).

Townsend's Big-eared Bat

Life History

Townsend's big-eared bats inhabit a wide variety of habitats from old-growth forests to extreme desert (Nagorsen and Brigham 1993). Although it has been found roosting in buildings, caves, mines, rock crevices, and bridges; its presence is strongly correlated with the availability of caves or cave-like roosting habitat such as old mines, bridges, buildings and other man-made structures and rarely in tree cavities (WDFW 2005b, Kerwin 2007). In Washington buildings appear to be the most commonly reported nursery sites and caves and mines are most commonly use as places to hibernate (hibernacula)(Perkins 1990, WDFW 2005). This bat feeds primarily on moths, but will also eat beetles and flies (Dalton et al. 1986, WDFW 2005b). It captures prey in flight or by gleaning from foliage (Kerwin 2007, Csuti et al. 2001).

Analysis Area Information

Hibernacula and nursery roost sites for the Townsend's big-eared bat have been documented on the Okanogan-Wenatchee National Forest. Surveys have been limited and additional surveys are required to determine its distribution and status. Three nursery roost sites and 2 hibernacula occur within 1 mile of mapped plant polygons. There are 120 acres of mapped polygons within 1 mile of known hibernacula and 5 acres of mapped polygons within 1 mile of known nursery roost sites. Of these mapped polygon acres 3 infested acres are within 1 mile of known hibernacula and 0.09 are infested acres within 1 mile of known nursery roost sites.

Risks

These bats are very intolerant of human disturbance at either winter hibernacula or summer roosts (Csuti et al. 1997). Pesticide contamination may also threaten this species in agricultural areas (Geluso et al.

1976). Substantial declines in total number of animals and average colony size have been documented. Pierson (1988) found one-third of historic roost sites no longer being used.

Little Brown Myotis

Life History

The little brown myotis is a habitat generalist that uses a broad range of habitats from arid grassland to boreal forest (Nagorsen and Brigham 1993, Hayes and Wiles 2013). Summer roosts are in buildings and other man-made structures, tree cavities, rock crevices, caves and under tree bark (WDFW 2005b, Kerwin 2007, Hayes and Wiles 2013). Maternity roosts are commonly large diameter snags and trees with cavities in patches of older forest (Hayes and Wiles 2013). They hibernate in caves and mines (Nagorsen and Brigham 1993, WDFW 2005). Hibernation generally occurs between September until April (Hayes and Wiles 2013). Aquatic insects are their major prey, although beetles, moths and non-aquatic flies are also taken (Nagorsen and Brigham 1993). Foraging is often concentrated over or near water (Hayes and Wiles 2013).

Analysis Area Information

One known little brown myotis hibernacula site has been documented for the Forest. Nursery roost sites are not known on the Forest. Surveys have been limited and additional surveys are required to determine its distribution and status. The one hibernaculum occurs within 1 mile of mapped plant polygons.

Risks

Hayes and Wiles (2013) identified snag loss, use of pesticides, destruction of caves, mine blockage,use of cyanide in mining and disease as potential threats to the little brown myotis. They have been severely affected by white-nose syndrome in the eastern U.S. (Hayes and Wiles 2013). Despite this severe recent population collapse in the northeastern U.S., this species remains one of the most common and widespread bats elsewhere in North America. It is one of the most common species along the Cascades (Hayes and Wiles 2013, Nagorsen and Brigham 1993).

Mountain Goat

Life History

Mountain goats inhabit open country with steep rocky cliffs, talus slopes, and meadows for foraging (Wilson and Ruff 1999 as cited in USDA Forest Service 2011a). The mountain goat ranges across the mountains of northwestern North America and inhabits high alpine and subalpine zones. They spend the majority of their time on or directly adjacent to cliffy escape terrain (USDA Forest Service 2011a).

Analysis Area Information

Mountain goats occur throughout the Okanogan-Wenatchee National Forest in their preferred habitat. Surveys are conducted regularly by the WDFW ((WDFW 2010). Approximately 246,776 acres of mountain goat habitat exists on the Okanogan-Wenatchee National Forest, of which 178 acres are in mapped plant polygons and 30 are infested acres. Acres of mountain goat habitat were obtained from the mountain goat habitat layer created for the Forest Plan Revision 2010.

Risks

Fire suppression policies and natural forest succession continues to degrade critical mountain goat foraging habitat (WDFW 2010 as cited to in USDA Forest Service 2011a). Invasive plants do not generally occur in mountain goat habitat, however if infestations expand, the quality and quantity of available forage could be reduced. The primary effects the proposed invasive plant treatments could have

on mountain goats are changes to foraging habitat, possible herbicide exposure and disturbance. Invasive plant treatments in mapped mountain goat habitat will be used as key metrics to assess effects.

California Bighorn Sheep

Life History

Bighorn sheep generally inhabit the shrub-steppe community; occupying the open areas of rocky slopes, ridges, rim rocks, cliffs, and canyon walls with adjacent grasslands or meadows, and few trees (Verts and Carraway 1998). Dense forest communities are avoided. Their primary diet consists of bunchgrass, but also includes substantial amounts of forbs and shrubs during the growing season. In the winter and spring they will also utilize cheatgrass (*Bromus tectorum*), which is an invasive annual plant. Forage habitat is largely determined by the availability of escape terrain; most bighorn sheep forage within 0.5 mile of escape terrain and generally are not seen farther than 1.0 mile from escape terrain. Escape terrain is typically defined as steep terrain (>60% slope), with high visibility (<40% crown closure) and in proximity to surface water (<2 mi from water source) (Cassirer et al. 1997).

Analysis Area Information

California bighorn sheep are found on the Okanogan-Wenatchee National Forest two herds are located on the Naches RD, one each on the Entiat, Tonasket and Chelan Ranger Districts. Using the habitat layer created for the revised Forest Plan, a total of approximately 243,017 acres of potential bighorn sheep habitat occurs on the Forest. Approximately 7,412 acres of potential bighorn sheep habitat occurs within the mapped polygons, of which approximately 1,269 are infested acres. As of 2011, approximately 755 of these acres were occupied by bighorn sheep herds on the Forest (refer to Table A-8 below). Although cheatgrass is not a priority invasive plant in this document, some sites may be treated if they are associated with other infestations treated within the scope of this document. Widespread cheatgrass infestations may be included in the treatment plan for some areas, such as Wilderness and important wildlife habitat (C2-p7).

Table C-8 Bighorn sheep (BHS) habitat and herd information, and acres of invasive plant infestations that exist on the Forest. Bighorn sheep habitat and range data was obtained from the BHS layer created for the Forest Plan Revision 2010.

BHS Herd Range (by name)	Total Potential BHS Habitat (acres)	Within Potential BHS Habitat		Within Entire BHS Herd Range	
		Acres w/in Mapped Polygons	Infested acres	Acres w/in Mapped Polygons	Infested acres
Tieton		40	42	99	105
Cleman Mountain		13	10	266	195
Swakane		994	423	6,047	1,370
Manson Chelan Butte		1,742	248	9,026	1,267
Mt Hull		1,446	32	3,149	82

Total (w/in BHS herd ranges)		4,235	**755**	18,587	3,019
Potential BHS Habitat not within a herd range		3,177	514	-----	------
Total (w/in and outside of herd ranges)	243,017	7,412	1,269	----	---

Risks

Although bighorn sheep will forage on cheatgrass, it is less nutritious than bunchgrass and is not available year round. Over time, cheatgrass invasion can degrade bighorn sheep habitat by altering fire cycles in shrub-steppe ecosystems; converting bunchgrass habitat to rangeland dominated by an annual exotic grass (deVos et al. 2003). Although cheatgrass is an invasive plant that can negatively affect bighorn sheep forage, it is considered a non-priority species in this analysis because it is so widespread (Ch. 2). It is likely that there are many undiscovered infestations of cheatgrass and that mapped acres in the NRIS database do not reflect the entire level of infestation. As such, not all acres of cheatgrass infestations have not been included in the NRIS 2011 mapped polygons or infested acres. Therefore effects of invasive plants on bighorn sheep are most likely underestimated in this analysis.

Dalmatian toadflax and knapweed are currently degrading bighorn sheep habitat on the forest. These species are highly competitive and quickly crowd out native and desirable plants, dramatically reducing available forage for wildlife (Washington State Noxious Weed Control Board 2007).

Northern Goshawk

Life History

The northern goshawk typically selects mature or old forest habitat (late-successional) for nesting and in Washington nest almost exclusively in coniferous forest (Desimone and Hays 2004). The nest area (or nest stand) is usually occupied by breeding goshawks from March until September. In Washington grouse and snowshoe hare account for the majority of prey biomass consumed (Desimone and Hays 2004).

Analysis Area Information

Nesting habitat for the northern goshawk occurs throughout the Forest. Approximately 616,201 acres of goshawk nesting habitat exists on the Okanogan-Wenatchee National Forest (figure was obtained from the Forest Plan Revision late-successional habitat layer 2010). There are approximately 13,358 acres mapped polygons that occur within nest habitat; of which 1,399 acres are infested. Approximately 6,579 acres of habitat occur within ¼ mile of closed system roads and within mapped invasive plant polygons; of which 706 are infested acres.

Risks

Desimone and Hays (2004) found the two most significant limiting factors to the long-term productivity and survival of goshawks are the availability of suitable prey and nesting. Invasive plants are not known to affect the northern goshawk nesting habitat. The dense canopy forests used by goshawks are not generally infested by invasive plants, except along road shoulders.

Bald Eagle

Life History

Bald eagle populations have made substantial recoveries in recent years. Formerly listed as endangered in 1978, the bald eagle was down-listed to threatened status in the lower-48 states in 1995 and delisted on July 9, 2007 (USDI Fish and Wildlife Service 2007a). Along with the Region 6 sensitive species status and it is also a state species of concern.

Bald eagles are most common along coasts, major rivers, lakes and reservoirs and require accessible prey and trees for suitable nesting and roosting habitat (U.S. Fish and Wildlife Service 1986). Bald eagles feed primarily on fish during the breeding season, and waterfowl, seabirds and carrion during the winter (U.S. Fish and Wildlife Service 1995). Bald eagles usually nest in trees near water, but are known to nest on cliffs and (rarely) on the ground. Adults tend to use the same breeding areas year after year, and often the same nest, though a breeding area may include one or more alternative nests (U.S. Fish and Wildlife Service 1999a). Bald eagle nesting period generally occurs between January 1 through August 15 and wintering period is generally October 31 through March 31 (Brown and Stevens 1997, Stalmaster and Kaiser 1997, Brown et al. 1999, Steidl and Anthony 2000).

Analysis Area Information

A bald eagle species management guide was written for the Wenatchee National Forest in 1989 (Rees 1989). Thirty-three "potential territories" were identified on the Wenatchee National Forest. Eight of these were designated as "recovery territories." Two of these territories were "active recovery territories": Reservoir West on the Naches Ranger District and Lake Wenatchee on the Wenatchee River Ranger District. Active recovery territories are territories that have occupied bald eagle nest sites. Currently the Okanogan-Wenatchee National Forest has eight active territories. Two of the bald eagle active territories are located on the Naches Ranger District both in close proximity to Rimrock Reservoir, one located on Cle Elum Ranger District, four located on Wenatchee River Ranger District and one on Tonasket Ranger District. Nest sites are monitored periodically. Nest success varies by site and year.

One communal winter roost is located in territory #15 (Columbia River) on the Entiat Ranger District. Bald eagles do roost in various other places on the Forest during winter months. These roost sites vary from year to year. Yearly winter bird count surveys occur along the Tieton, Naches and Yakima Rivers. Bald eagle winter numbers have increased steadily through the years to fairly moderate levels. Bald eagle migration and winter sightings on the Forest occur along the Tieton, Naches, Cle Elum, Wenatchee, Icicle, Methow and Yakima Rivers and the shores of Lake Chelan.

Approximately 38 mapped polygon acres occur within 450 meters of known bald eagle nest sites of which 9.5 are infested acres (NRIS 2011). There are 3 known bald eagle nest sites within 450 meters of treatment areas. All sites will involve the presence of operators or crews. The majority of infested acres are along road sides. Approximately 4,527 acres of plant mapped polygons occur within 450 meters of bald eagle nest habitat; of which 1,822 acres are infested. Most of this habitat has not been surveyed to determine occupancy. Only 2.6 acres of the 1,822 infested acres are known to be occupied by nesting bald eagles. Bald eagle nest habitat was obtained from Forest vegetation layer created for the Forest Plan Revision 2010.

Risks

The main threats to bald eagles identified in the Cascades recovery zone are habitat loss resulting from logging and fire, disturbance resulting from increased recreation development, housing and illegal shooting (U.S. Fish and Wildlife Service 1986). Human disturbance can flush eagles from a nest and can

cause failure if disturbance is frequent (U.S. Fish and Wildlife Service 1999a). Nest failure consists of adults abandoning nest and ultimately young not successfully fledged from site.

American Peregrine Falcon

Life History

Peregrine falcons were delisted August 25, 1999 and the FWS has committed to monitor populations nationwide five times at three-year intervals and report results (USDI Fish and Wildlife Service 1999b). In October 2006, the FWS released the results from the first post-delisting monitoring effort conducted in 2003. This report found that there were 3,005 nesting pairs of peregrines in the United States, Canada, and Mexico, compared to 1,705 pairs at the time of delisting (USDI Fish and Wildlife Service 2006).

Peregrine falcons inhabit cliffs located within approximately 0.5 mile of riparian habitat (an important source of prey Hunter et al. 1988). Peregrines are aerial predators who feed mostly on birds. Much of the prey consists of species the size of pigeons and doves; however, avian prey ranges in size from hummingbirds to Aleutian Canada geese (Pagel, unpub. data). Peregrines nest on ledges clear of rock rubble, located approximately 40 - 80 percent of total cliff height.

Peregrines lay 2-4 eggs in March-May, and commence incubation after the clutch is complete. Eggs hatch after an incubation period of 31-33 days. Fledging occurs when the young are between 37 and 56 days of age. Juveniles continue to be fed and protected by the adults until they disperse, which can range from 3 weeks to 3 months (Pagel unpublished data).

Analysis Area Information

Aerial surveys of cliff habitat and historic eyries were conducted on the Wenatchee National Forest in the late 1980's and early 1990's by the Washington Department of Wildlife (USDA Forest Service 1996). These aerial surveys were used to determine suitable locations of "hack boxes" for peregrine falcon re-introduction efforts. A "hack box" is a man-made structure that prepares captive raised young falcons to become independent hunters, and allows them to successfully fledge into the wild. Peregrine falcons were re-introduced on the Forest (Naches Ranger District) from 1988 through 1993 (Burnham et al 1988-1993). Nest site surveys were conducted on the Okanogan-Wenatchee National Forest from the 1990's to present (NRIS 2011). Suitable habitat continues to be intermittently and informally surveyed. There are currently 8 known peregrine falcon eyries on the Okanogan-Wenatchee National Forest.

There are 4 documented peregrine nest sites located within 0.5 mile of mapped polygons. All sites will involve the presence of operators or crews. The proposed treatments are along roads. There are 34 infested acres within 0.5 mile of known peregrine falcon nest sites.

Approximately 35,298 acres of plant mapped polygons are located within 1.5 miles of potential peregrine nesting habitat and of these acres approximately 6,877 acres are infested. Peregrine falcon nesting habitat was obtained from a layer created for the Forest Plan Revision 2009.

Risks

Peregrine falcons are most affected by bioaccumulation of contaminants and by direct disturbance by human activity during the nesting season (Pagel unpublished data). Hexachlorobenzene (HCB), the contaminant in Picloram, and to a lesser extent Clopyralid, does bioaccumulate in animal tissue.

Great Gray Owl

Life History

Great gray owls are associated with mature forested habitat associated with meadows or openings. Mixed conifer/lodgepole pine/mountain hemlock communities associated with meadows are considered the

preferred habitat for this species. Studies in the Blue Mountains (Bull and Henjum 1990, Bull et al. 1988) have shown that owls will inhabit habitat adjacent to openings created by timber harvest activities, especially those that mimic natural gaps.

Great gray owls hunt from perches and can detect prey by sound which allows capture of prey beneath the snow. They prey primarily on pocket gophers and voles. Great gray owls forage in openings, along forest edges, or in open understory stands. Bull and Henjum (1990) found them utilizing forested stands with less than 59% canopy cover in eastern Oregon while Goggans and Platt (1992) found the birds using recent regeneration harvest units (0-10 years) on the west-slope of the Cascades until these sites became too dense. This habitat is ephemeral in nature but it may allow occupancy of habitat due to the proximity to suitable nesting habitat. Bryan and Forsman (1987) found habitat where snow persisted beyond mid-April was not occupied. This finding may suggest that great gray owl habitat is more likely to be found in the mid to lower elevations of the project area (3,000-4,000 feet). Bull and Henjum (1990) found great gray owls in their study areas around 4,500 feet.

They do not build their own nests and are dependent on structures built by other species (i.e. ravens, red-tailed hawks, goshawk and Cooper's hawks) or existing substrate like broken top snags or mistletoe platforms. Great gray owls in this region show a high site fidelity to their nest site and exhibit only short seasonal movements (NRIS 2011). Bull and Henjum (1990) found that great gray owls prefer to nest in mature and old stands with a fairly open understory and a dense overstory. However, the availability of nest sites and suitable foraging habitat and their proximity to one another seem to dictate use by great gray owls (Bull and Henjum 1990). Breeding and nesting season runs March 1 through July 31st.

Analysis Area Information

Great gray owl surveys have been conducted throughout the Okanogan-Wenatchee National Forest starting in 1995 using the survey protocol developed by the Regional Interagency Executive Committee. In 2005 the Okanogan-Wenatchee National Forest leadership team, upon the recommendations of the forest wildlife biologists, determined that surveys were only required and management would occur within the range of breeding great gray owl populations (USDA Forest Service 2005d). Breeding range on the Forest was described as the area between the Canadian Border south to State Highway 20 and the eastern half of the Methow Valley Ranger District and the entire Tonasket Ranger District. There are three known great gray owl nests on the Forest and they all occur on the Tonasket Ranger District. All three nest sites are located within ¼ mile of plant mapped polygons. There are 22 mapped polygon acres within ¼ mile of known nest sites; of which 3 of these acres are infested acres.

Risks

Invasive plant species are not known to impact great gray owl nesting habitat. However invasive plants can degrade foraging habitat. In meadows, shallow rooted invasive plants increase soil instability and erosion and reduce wildlife habitat value by decreasing diversity and resiliency of the meadow system (National Fish and Wildlife Foundation 2010).

Gray Flycatcher

Life History

Gray flycatchers are uncommon in Oregon and Washington, but may be fairly common in specific locations (Marshall et al. 2003). In the Okanogan Valley of northcentral Washington, the habitat used by gray flycatchers is fairly specific: dry open ponderosa pine stands with extensive bitterbrush and bunchgrasses understory. Tree size ranges from small (6" diameter breast height) to large (40 inches diameter breast height) (Kent Woodruff, personal communication). The common factors of gray

flycatcher sites in Oregon and Washington are scattered vertical structure of evergreen trees over an extensive shrub and grass understory (savannah). They are migratory and spend winters in Arizona and Mexico, leaving breeding grounds by the end of September (Csuti et al. 2001). Gray flycatchers nest in trees; not in close proximity to the ground. They take insects on the wing as well as by foraging on the ground. Their diet includes a variety of species ranging from small beetles to butterflies.

Analysis Area Information

Gray flycatchers have been documented on the Okanogan-Wenatchee National Forest; nesting pairs are located in the Okanogan Valley, Wenatchee River and Tonasket Ranger Districts (Kent Woodruff, personal communication). On the Tonasket Ranger District, gray flycatchers are using lodgepole pine stands with bitterbrush understory (Kent Woodruff, personal communication). Approximately 31,981 acres of gray flycatcher habitat exists on the Forest. Approximately 3,979 acres of mapped plant polygon acres occur in gray flycatcher habitat; of which 217 acres are infested with invasive plants. The gray flycatcher habitat used in this analysis was created from the Forest Vegetation layer (2015).

Risks

Invasive plants, such as cheatgrass, can alter fire regimes, increasing the frequency and intensity of wildfires in shrubland communities (de Vos et al. 2003). Rapidly-recurring fires have the potential to change habitat structure and prevent the re-establishment of shrub communities (Labbe 2008) which can negatively impact the gray flycatcher.

White-headed Woodpecker

Life History and Analysis Area Information

White-headed woodpeckers inhabit mainly open ponderosa pine or mixed-conifer forests dominated by ponderosa pine; usually old-growth or stands with old-growth components. They excavate cavities in snags and also in stumps, logs, and dead tops of live trees. Their diet varies seasonally and includes pine seeds, invertebrates, and sap; primarily foraging on tree branches and trunks and occasionally on the ground (Kozma 2010). It is the only woodpecker species to rely heavily on ponderosa pine seed for food (Kozma 2010).

Surveys and studies of white-headed woodpeckers have occurred throughout the Okanogan-Wenatchee National Forest. Sightings occur on every district in low numbers and there are few documented nests on the Forest (NRIS). They have been found in second growth with remnant large pine, in mature stands of ponderosa pine, and dry mixed conifer forests with fairly open crowns (40% or less canopy closure) (Kozma 2010).

Analysis Area Information

Approximately 3,307 mapped polygon acres occur in white-headed woodpecker habitat; of which 469 acres are infested. The white-headed woodpecker habitat used in this analysis was obtained from the Forest Plan Revision data layer 2011.

Risks

Invasive plants are not known to impact white-headed woodpeckers or their habitat (USDA Forest Service 2011b).

Lewis' Woodpecker

Life History

In Washington, the Lewis' woodpecker is only locally abundant as a breeding bird, and its range has contracted within the last half of this century to include only habitats east of the Cascade crest (Lewis et al. 2004). The Lewis' woodpecker prefers a forested habitat with an open canopy and shrubby understory, and snags available for nest sites and hawking perches (Bock 1970). Breeding populations of Lewis' woodpecker in Washington are locally distributed in colonies and occur frequently in burned forest (Lewis et al. 2004). Riparian areas dominated by cottonwoods and oak woodlands are major breeding habitats, as are open or park-like ponderosa pine forests (Lewis et al. 2004). Lewis' woodpeckers are located throughout the Okanogan-Wenatchee Forest in their preferred habitat.

Analysis Area Information

The Forest has approximately 1,030 acres of Lewis' woodpecker habitat. Approximately 158 acres of mapped plant polygons occur within Lewis' woodpecker habitat; of which 11 acres are infested by invasive plants. The Lewis' woodpecker habitat used in this analysis was created from the Forest Vegetation layer (2015).

Risks

This species is vulnerable to the loss of snag habitat, and to habitat loss as a result of fire suppression and brush control (Saab and Vierling 2001). Invasive plants are not known to impact Lewis' woodpeckers or their habitat (USDA Forest Service 2011b).

Sandhill Crane

Life History and Analysis Area Information

In the West, greater sandhill cranes occupy breeding territories in wetlands adjacent to river systems, closed drainage basins at the base of desert mountain ranges, and isolated mountain meadows. Most pairs select sites rather isolated from human activity. Sandhill cranes have been listed as an endangered species by the state of Washington (Littlefield and Ivey. 2002). There are 6 recognized subspecies of sandhill cranes but only the greater sandhill crane breeds in Washington. A small number of greater sandhills breed in Klickitat and Yakima Counties and several thousand lesser sandhills stop in eastern Washington during migration (Littlefield and Ivey. 2002).

Sandhill cranes that nest in Washington winter in California (Littlefield and Ivey 2002). Crane numbers had been severely reduced due to widespread habitat destruction concurrent with human settlement, and unregulated hunting (Littlefield and Ivey. 2002). Sandhill cranes have been documented but are uncommon on the Okanogan-Wenatchee National Forest (NRIS 2011). Nesting sandhill cranes have not been documentation on the Forest. The few sightings reported were of spring migrating birds that consisted of a few individuals.

Risks

No foreseeable impacts to sandhill cranes are expected from the proposed project. Sandhill cranes do not use the Okanogan-Wenatchee National Forest during the time period invasive plant treatments occur. Therefore, the sandhill crane will not be discussed further in this document.

Harlequin Duck

Life History

Harlequin ducks are an oceanic species that nest inland along swift flowing rivers and streams in the Cascade Range of Oregon and Washington. They winter along rocky ocean coastlines. They require streams with clear water, loafing sites, and dense bank vegetation (Larsen et al. 2004). Nests are generally scooped depressions lined with down, and are located on exposed shelves of logs or root wads or on natural ledges on slopes or cliffs near water (Marshall et al. 2003). Harlequin ducks forage heavily on caddisflies, and will also eat some mayflies and stoneflies (Marshall et al. 2003). They rarely eat fish. Harlequin ducks are known to nest throughout the Okanogan-Wenatchee National Forest on fast moving streams such as the Tieton, Naches Mainstem, Little Naches, American, Bumping, and Chewuch Rivers as well as the Rattlesnake, Icicle, Peshastin and Rock Creeks to name a few (NRIS 2011).

Analysis Area Information

Approximately 662 mapped polygon acres occur within harlequin duck habitat; of which 535 acres are infested. The majority of infested acres are along roadsides that border fast moving streams. Harlequin duck habitat was obtained from the Forest Plan Revision data layer, 2010.

Risks

Key metrics used to assess effects to the harlequin duck will be potential for herbicide exposure and disturbance to nesting harlequin ducks during implementation.

Common Loon

Life History

The common loon primarily breeds in Canada. Migrant loons arrive from the north to winter along Washington's coast, the Columbia and Snake Rivers, and on lakes in northeastern Washington. Summer populations are very small. Single breeding pairs have been confirmed on lakes in King, Whatcom, Chelan, Ferry and Okanogan Counties (Larsen 2004). Nesting loons have been documented on the Okanogan-Wenatchee National Forest primarily on the Tonasket and Lake Chelan Ranger District. Inland Washington spring migration likely peaks in April; while fall migration appears to peak in mid November (Merrifield 2003). There are occasional reports of single spring migrating birds on the Wenatchee River and Naches Ranger Districts. Loons feed primarily on small fish, but also eat crustaceans (including crayfish), amphibians, insects and mollusk (Merrifield 2003). Nesting loons on the Forest are generally using mid to high elevation lakes. Invasive plants generally occur at lower numbers around these high elevation lakes; resulting in little impacts on loon nesting habitat.

Analysis Area Information

Approximately 454 mapped polygon acres occur within 100 feet of lakes that are occupied by loons; of which 65 of these are infested acres.

Risks

Nesting loons are easily disturbed by humans. Loon abundance and reproductive success is dependent upon the availability of undisturbed shoreline or island nesting sites. Protection of forage base and water quality is essential. Key metrics used to assess effects to the common loon will be potential for herbicide exposure and potential for disturbance during nesting.

Sharp-tailed Grouse

Life History and Analysis Area Information

The current range of sharp-tailed grouse in Washington is restricted to eight small, isolated populations in the north-central portion of the state (Larsen 2004). Sharp-tailed grouse habitat includes grasslands, prairies, mountain meadows, and, to a certain extent, sagebrush or woodlands with a grass understory. This species seeks cover in brushy draws or riparian thickets. Major threats to the species are habitat conversion and degradation (Schroeder et al. 2000).

Analysis Area Information

The most suitable habitat available for sharp-tailed grouse on the Forest occurs in the Methow and upper Okanogan Valleys. They are a potential visitor to the Forest. There are no documented sightings on Okanogan-Wenatchee National Forest however they are known to occur adjacent to the Forest on state and private lands in Okanogan County. They have been found on the open shrub steppe habitat interfaced with brushy forested draws. There are approximately 588,298 acres of sharp-tailed grouse habitat on the Forest. Approximately 5,192 acres of mapped weed polygons occur within sharp-tailed grouse habitat; of which 302 acres are infested by invasive plants. The sharp-tailed grouse habitat used in this analysis was created from the Forest Vegetation layer (2015).

Risks

Implementing the proposed invasive plant treatments has the risk of exposing sharp-tailed grouse to herbicides. Therefore potential exposure to herbicides will be used as key metrics to assess effects of this project on the sharp-tailed grouse.

Larch Mountain Salamander

Life History

Larch Mountain salamander is one of the rarest species of amphibians in the Pacific Northwest (Leonard et al. 1993). This species is endemic to Washington and Oregon. In Washington, the species occurs in the West and East Cascades Ecoregions. The main distribution is along a 38 mile stretch of the Columbia River Gorge with additional, isolated populations in the Cascade Range. They have been documented in Clark, Skamania, Lewis, King, Klickitat and Kittitas Counties (Hallock and McAllister 2010). Population distribution within the range is patchy.

Most of the Larch Mountain salamander's life is spent in the subterranean environment and it is surface-active only about 20 to 90 days a year, depending on location and conditions. Surface activity is triggered whenever moisture and temperature regimes are appropriate, primarily in the spring and fall. In the Cascade Range, the activity period is approximately April through late June and late September to late November (Crisafulli 1999). Ideal conditions are when temperatures are between 4 degrees and 14 degrees C (39 to 57 degrees F) and soil is saturated to a depth of about 30 cm (12") (Crisafulli 1999). Breeding takes place in the autumn and spring months. Mites and springtails have been found to be common prey (Crisafulli 1999).

Larch Mountain salamanders are associated with talus, scree, gravelly soils and other areas of accumulated rock where interstitial spaces exist between the rock and soil (Crisafulli 1999). Steep slopes are also an important habitat feature. They inhabit a diverse range of forested and non-forested habitat. Occupied rocky substrates in non-forested areas are usually north facing and nonvascular plants, especially mosses, dominate the ground cover (Crisafulli 1999). In some areas of the Cascade Mountains, Larch Mountain salamanders inhabit old-growth coniferous forests without substantial exposed rocky areas. In all of these habitats, important microhabitats include woody debris, leaf litter and rocks.

Analysis Area Information

Potential habitat occurs on the Naches, Cle Elum and Wenatchee River Ranger Districts. Surveys conducted for the Larch Mountain salamander began on portions of these three districts in the fall 1999 to the present. Inventories for these species on the Forest are incomplete; not all potential habitats have been surveyed. Potential Larch Mountain salamander habitat has not been delineated for the Forest as the vegetation data layer lacks the specifics needed to determine potential habitat. It is highly likely that un-surveyed, potential Larch Mountain salamander habitat exists within or near infested acres; since forested blocks, and talus areas occur along proposed roadside treatments on the Naches, Cle Elum and Wenatchee River Ranger Districts. There are eight documented Larch Mountain salamander sites on the Forest located on the Cle Elum Ranger District. All eight sites are between 3,000 feet and 4,200 feet in elevation; occurred in the annual precipitation zone above 60 inches; and in talus adjacent to old forest. There are no documented Larch Mountain salamander sites within 100 feet of infested acres.

Risks

Any ground-disturbing activity or land use that changes the moisture regimes and permeability of inhabited rocky substrates, such as overstory tree removal and gravel removal, may threaten populations. Chemical applications (i.e., herbicides, pesticides, fertilizers) may affect Larch Mountain salamanders directly due to toxicity or indirectly due to loss of prey-base (Hallock and McAllister 2010, Crisafulli 1999). Key metrics used to assess effects to the Larch Mountain salamander will be potential for herbicide exposure, effects to habitat, and ground disturbance at known sites.

Western Pond Turtle

Life History and Analysis Area Information

Western pond turtles inhabit both permanent and intermittent waters, including ponds, lakes, marshes, and the slow-moving portions of creeks and rivers. A few records have been reported east of the Cascade Mountains, but these may have been based on introduced individuals (Brown et al. 1995). In Washington they range up to 1,000 feet in elevation (Brown et al. 1995). This species is primarily aquatic, but strays from water to lay eggs (Brown et al. 1995). Pond turtles spend a great deal of time basking on logs and other supporting structures at the surface on ponds. Their diet includes algae, lily pads, cattail roots, insects, crayfish and other aquatic invertebrates. There are approximately 110,577 acres of potential habitat (rivers, ponds and lakes at or below 2,000 feet elevation) on the Forest. Approximately 46 acres of mapped plant polygon acres occur in western pond turtle habitat; of which 12 acres are infested by invasive plants. The western pond turtle habitat was created from the Forest Vegetation layer (2015).

Risks

The western pond turtle is an unlikely visitor to the Forest. They are suspect; no documented occurrences on the Okanogan-Wenatchee National Forest. Habitat is limited to the eastern fringe of the Forest. Key metrics used to assess effects to the western pond turtle will be potential for herbicide exposure.

Striped Whipsnake

Life History and Analysis Area Information

In Washington the striped whipsnake occurs in the Columbia Basin at elevations up to 1,585 feet in elevation (Brown et al. 1995, Hallock and McAllister 2010). It is an arid area species, inhabiting grasslands, sagebrush flats, rocky stream courses, canyon bottoms, and open pine-oak forests. Striped whipsnakes eat lizards, insects, other snakes, small mammals, and young birds (Hallock and McAllister 2010). The female will lay three to ten eggs in June or July and young hatch out in August or September.

They use abandoned rodent burrows for communal nest sites. This snake is diurnal (active during the day) during warm months and hibernates in the winter. Striped whipsnakes have been documented in Washington only 26 times. In the last decade, only 3 observations have been reported (Hallock and McAllister 2010). Habitat on the Forest is limited to the southeastern edge of the Naches Ranger District. Approximately 324 acres of habitat occurs on the Forest. Fourteen acres of mapped invasive plant polygons occur in striped whipsnake habitat; of which 2 acres are infested. The striped whipsnake habitat used in this analysis was created from the Forest Vegetation layer (2015).

Risks

There are no documented occurrences on the Forest. Habitat is limited to the southeastern fringe of the Forest. Key metrics used to assess effects to the striped whipsnake will be potential for herbicide exposure.

Puget Oregonian

Life History and Analysis Area Information

This snail's habitat consists of mature to late successional moist forest and riparian zones, springs, and seeps where canopy cover is generally high. The Puget Oregonian hides under logs, moss, leaf litter, and/or talus; often under, near, or on large (greater than 20 inches dbh) big-leaf maple (*Acer macrophyllum*) and vine maple (*Acer circinatum*) (Applegarth 1999).

Inventory for this species on the Forest are incomplete; not all suitable habitat has been surveyed. There is one documented Puget Oregonian site on the Okanogan-Wenatchee National Forest (Cle Elum Ranger District). This site is not within 100 feet of mapped plant polygons. There is potential for the Puget Oregonian to occur on the Naches, Cle Elum and Wenatchee River Ranger Districts where the conditions are most like the west-side Cascades (greater than 60 inches precipitation). On the Forest, it has been found in habitat similar to the Larch Mountain salamander. Potential Puget Oregonian habitat has not been delineated for the Forest, as the vegetation data layer lacks the specifics needed to determine potential habitat. It is highly likely though, that un-surveyed, potential habitat occurs on the Naches, Cle Elum and Wenatchee River Ranger Districts.

Risks

Key metrics used to assess effects to the Puget Oregonian will be potential for herbicide exposure and ground disturbance, effects to habitat, and ground disturbance at known sites.

Grand Coulee Mountainsnail

Life History and Analysis Area Information

The Grand Coulee mountainsnail a terrestrial snail adapted to arid climates; found in Washington State only; from Grand Coulee and a portion of the mainstem Columbia River valley from Wenatchee to Okanogan, and Grant County (Frest and Johannes 1995). This species is most active April-May and September-October when conditions are warmer but moist. They forage on plant and rock surfaces for "organic matter and microscopic fungi, plants and animals" (Frest and Johannes 1995, Duncan 2008). They are only on the surface when conditions are moist such as mornings after a dew or frost. This snail may be adapted to frequent, low intensity fires, so conditions that cause unusually high intensity fires may negatively affect this species (Frest and Johannes 1995). It is found at lower elevations along major river valleys on basalt talus and rocky outcrops. These sites are associated with springs/seeps surrounded by sagebrush (Frest and Johannes 1995).

Using the habitat layer created from the revised forest plan, an estimated 10,020 acres of potential Grand Coulee mountainsnail habitat (rated high and moderate) occurs within plant mapped polygons, and of these acres 1,146 are infestation. Known infestations are primarily along roadsides. There are numerous documented sites on the Forest in Okanogan and Chelan Counties (Frest and Johannes 1995). However, no known sites occur within mapped plant polygons.

Risks

Duncan (2008) identified the largest threat to the Coulee mountainsnail is large-scale wildfires. Invasive plant species, such as knapweed, tend to dry out sites more than native vegetation and degrade habitat. Key metrics used to assess effects to the Grand Coulee mountainsnail will be potential for herbicide exposure, effects to habitat, and ground disturbance at known sites.

Shiny Tightcoil

Life History and Analysis Area Information

The shiny tightcoil is a terrestrial snail that feeds on algae, yeast, and bacteria, on rock, wood, and plant surfaces. They use talus and other sites that provide a higher humidity and constant temperature. In Washington, it is documented on the Gifford Pinchot, Mt. Baker-Snoqualmie and Okanogan-Wenatchee National Forests (on the Chelan, Cle Elum, and Wenatchee River Ranger Districts) and Mount Ranier National Park (Frest and Johannes 1995, Tom Burke, personal communication). There are nine confirmed sites on the Forest. This species is found at moderate to high elevations primarily under deciduous trees such as quaking aspen (Burke 2013). There are no mapped polygons within 100 feet of known shiny tightcoil sites. Potential shiny tightcoil habitat has not been delineated for the Forest, as the vegetation data layer lacks the specifics needed to determine potential habitat. It is likely that un-surveyed, potential habitat occurs on the Naches, Cle Elum, Wenatchee River Ranger and Chelan Districts.

Risks

Invasive plant species that tend to dry out sites more than native vegetation may degrade habitat. Invasive plants in riparian zones that do not alter soil moisture or the substrate preferred by these snails may not affect their habitat. Key metrics used to assess effects to the shiny tightcoil will be potential for herbicide exposure, effects to habitat and ground disturbance at known sites.

Blue-gray Taildropper

Life History and Analysis Area Information

The blue-gray taildropper is found from Puget Sound south through the western Cascade Range and Oregon Coast Range to northern California with a disjunct population around Lake Coeur d' Alene (Burke 2013). This species is common in Oregon but very rare in Washington. In Washington, they have not been documented east of the Cascades. It inhabits a wide range of moist and mixed forests. In open forests, the blue-gray tail-dropper is usually located in sites with higher shade and moisture levels. Found in forest floor litter in association with Douglas-fir logs and other woody debris (Burke 2013).

Risks

The blue-gray taildropper is suspect; no documented occurrences on the Okanogan-Wenatchee National Forest. They are unlikely to occur on the Forest since habitat is limited and the Forest is located outside its present range. No further discussion will occur within this document for the blue-gray taildropper.

Western Bumblebee

Life History and Analysis Area Information

The western bumblebee has declined from 50% of its historic range (Jepsen 2013). In Oregon and Washington, populations of this bumblebee are currently largely restricted to high elevation sites (Jepsen 2013), and no longer found in the western portion of the state (Cameron et al. 2011a). There are fifteen documented sightings on the Okanogan-Wenatchee National Forest. Bumblebee habitat on the Forest is primarily within flower-rich meadows of forests and subalpine zones (Jepsen 2012). The colony's life cycle is from early February to late November with hibernation during the winter months (Jepsen 2013). The western bumblebee primarily nests underground in abandoned rodent burrows (Hobbs 1968, MacFarlane et al. 1994). They are general foragers; visiting a wide variety of flowering plants to feed on nectar and collect pollen (Jepsen 2013). Western bumblebee habitat cannot be delineated for the Forest as the vegetation data layer lacks the specifics needed to determine potential habitat. High elevation habitat on the Forest is not generally impacted by invasive plant species. Approximately 2 acres of mapped plant polygons occurs within 100 feet of known sites on the Forest; of which 0.15 acre is infested by invasive plants.

Risks

The primary threats to the western bumblebee identified by Jepsen (2013) included pathogens from other bees, impacts from reduced genetic diversity, habitat alterations (resulting from fire suppression, grazing and logging). Other threats include pesticide use, fire, agricultural, urban development and climate change. Herbicides can pose serious threats to bumblebees by the removal of floral resources. Key metrics used to assess effects to the western bumblebee will be potential for herbicide exposure, effects to habitat and ground disturbance at known sites.

Meadow Fritillary

Life History and Analysis Area Information

The one Oregon record and the few records in eastern Washington (Okanogan Highlands, Kettle Range, and Blue Mountains), represent the westernmost range for this species (Miller and Hammon 2007). The most recent records in Washington of the meadow fritillary are all from northern Okanogan and Columbia River (Xerces Society 2011a). On the Forest, there are two sites on the Tonasket Ranger Distict, (Beaver Creek and Lost Lake) one of which is historic, and one site on the Methow Valley Ranger District (Bear Mountain). In Oregon and Washington, it is strictly associated with intact, natural meadows and clearings at high elevations. Adults fly in two generations from May to June, and in late July and August. Larvae feed on violets (Acorn and Sheldon 2006, Flekenstein 2006b). The meadow fritillary is considered imperiled in Washington (NatureServe 2010). Meadow fritillary habitat cannot be delineated for the Forest as the vegetation data layer lacks the specifics needed to determine potential habitat. There are no mapped invasive plant polygons that are within 100 feet of known sites on the Forest.

Risks

Since invasive plant treatment will not occur in known meadow fritillary sites and PDFs are in place to effectively protect this species and its habitat, no foreseeable impacts are expected from the proposed project. Therefore, the meadow fritillary will not be discussed further in this document.

Astarte Fritillary

Life History and Analysis Area Information

Although the range of the Astarte fritillary is broad it is uncommon and may be quite rare in parts of its range. It distribution covers most of Alaska stretching into far eastern Russia and patchily through the western mountains of North America (Xerces 2010a). Washington records are from Whatcom, Chelan, and Okanogan counties (Xerces 2010a). Numerous sighting occur on the Forest; Tonasket, Methow Valley, Chelan and Wenatchee River Ranger Districts (Xerces 2010a, NRIS 2015). Habitat of this species is arctic-alpine rock slides, windswept ridges and scree slopes, usually south-facing and above the tree-line, at elevation of at least 7000 feet (Opler and Wright 1999, Pyle 2002 as cited by Xerces 2010a).

Risks

This high elevation habitat is not impacted by invasive plants. There are no infested acres within Astarte fritillary habtiat; therefore the proposed invasive plant treatments will have no threat to this species. No further discussion will occur for the Astarte Fritillary.

Freija Fritillary

Life History and Analysis Area Information

Freija fritillary is widely distributed throughout northern Eurasia and North America (NatureServe 2010). In Washington, this species occurs only in a small area of northern Okanogan County where it is known from six sites in the North Cascades Mountains (Pyle 2002). It has been documented on the Okanogan-Wenatchee National Forest at high elevations (Pyle 2002) on the Tonasket and Methow Valley Ranger Districts. Typical habitat for this species is high elevation willow bogs, moist arctic-alpine tundra slopes, and occasionally forest meadows (Pyle 2002).

Risks

This high elevation habitat is not impacted by invasive plants. There are no infested acres within Freija fritillary habitat therefore the proposed invasive plant treatments will have no threat to this species. No further discussion will occur for the Freija fritillary.

Great Basin Fritillary

Life History and Analysis Area Information

This species occurs in Washington east to North Dakota and south to California and Colorado. In Washington there are 16 locations, known sites are in Okanogan Highlands, Palouse Hills and southern Cascades (Hinchliff 1996). This species inhabit montane meadows, rocky ridges and forest openings at high elevations (Pyle 2002). Two historic records occur on the Forest in Bear Canyon on the Naches Ranger District (NRIS 2015).

Risks

This high elevation habitat is not impacted by invasive plants. There are no infested acres within great basin fritillary habitat therefore the proposed invasive plant treatments will have no threat to this species. No further discussion will occur for the great basin fritillary.

Labrador Sulphur

Life History and Analysis Area Information

Labrador sulphur is found on tundra across northern regions of Eurasia and North America. In Washington, this species is only known to inhabit a narrow strip along the Canadian border in the western Okanogan Highlands; it is documented to occur on the Okanogan-Wenatchee National Forest, on the Tonasket and Methow Valley Ranger Districts (Pyle 2002). This species inhabits high elevation windswept tundra ridges, including sites in Washington at 7,000 to 8,300 feet. It is found in screes, and on summits, often where red heather grows (Pyle 2002).

Risks

This high elevation habitat is not impacted by invasive plants. There are no infested acres within Labrador sulphur habitat; therefore the proposed invasive plant treatments will have no threat to this species. No further discussion will occur for the Labrador sulphur.

Lustrous Copper

Life History and Analysis Area Information

The lustrous copper is listed as "imperiled" in the State of Washington by NatureServe (NatureServe 2010). The lustrous copper has been recorded only at the far northern edge of the state, on Slate Peak (Pyle 2002); documented on the Okanogan-Wenatchee National Forest on the Methow Valley Ranger District. Extensive potential habitat exists within the Pasayten Wilderness (Fleckenstein 2006a). The lustrous copper is a small butterfly that is found in alpine habitats, grasslands, rock/talus areas, and mountain meadows (Pyle 2002). In Washington this species is found at elevations of approximately 6,500 to 7,500 feet.

Risks

This high elevation habitat is not impacted by invasive plants. There are no infested acres within lustrous copper habitat; therefore the proposed invasive plant treatments will have no threat to this species. No further discussion will occur for the lustrous copper.

Melissa Arctic

Life History and Analysis Area Information

The Melissa Arctic is considered secure in Washington (NatureServe 2010). There are eight known sites in Washington, and "all are in the high Cascades, east of the divide, north of Lake Chelan and west of the Okanogan River" (Fleckenstein 2006c). It is documented on the Okanogan-Wenatchee National Forest, on the Tonasket, Methow Valley and Chelan Ranger Districts. This species preferred habitat is rocky tundra above timberline at the highest elevations in the mountains. The habitat in Washington includes dry exposed sites, tundra, scree, and talus with scattered plants above 7,000 feet (Fleckenstein 2006c). Larvae feed on grasses and sedges and adults fly in July and August (Pyle 2002).

Risks

This high elevation habitat is not impacted by invasive plants. There are no infested acres within Melissa Arctic habitat: therefore the proposed invasive plant treatments will have no threat to this species. No further discussion will occur for the Melissa Arctic.

Mardon Skipper

Life History and Analysis Area Information

Mardon skipper is a rare butterfly found in four disjunct populations. It is considered imperiled in Washington (NatureServe 2010). Its range on the Forest extends north to Rimrock Lake on the Naches Ranger District. Surveys have been extensive on the Naches District; successfully covering the majority of available Mardon skipper habitat. There are currently 36 documented sites (St. Hilaire et al. 2010). Mardon skippers occupy grassland habitats, the characteristics of which appear to vary by region. In the southern Washington Cascades they seem to be restricted to short sedges and grass species such as fescue and oatgrass dominated meadows with adequate nectar sources for adults. Adults use a variety of flowers for nectar sources. The Okanogan-Wenatchee National Forest sites range in elevation from 3,260 feet to 5,340 feet. They are found in dry and mesic grand-fir forest types, within grassland intrusions and in small (<1/2 acre) to larger meadow complexes (St. Hilaire et al. 2010). Approximately 6 acres of mapped polygon acres occur in occupied mardon skipper habitat; of which 1 acre is infested by invasive plant species.

Risks

Current risks to the habitat and butterflies include forest and invasive weed encroachment, development, recreational activities, grazing, agricultural practices, roadside and grassland maintenance including herbicide application (Kerwin 2011, Potter et al. 1999). In general, invasive plants may threaten persistence of individual sites (Kerwin 2011). Invasive plant species do not provide egg-laying or larval food plants. Herbicides can pose threats to the mardon skipper by the removal of floral resources. Key metrics used to assess impacts to the Mardon skipper will be potential for herbicide exposure, and effects to habitat at known sites.

Peck's Skipper

Life History and Analysis Area Information

Peck's skippers are found across much of northern United States and Canada. In Washington, this species is documented on the Colville National Forest and the Okanogan-Wenatchee National Forest at elevations of approximately 2000 to 5000 feet (Foltz 2010a). On the Forest they have been documented on the Tonasket Ranger District at 3 sites; Mount Hull, Cockle Springs and Lost Creek. In the Pacific Northwest, they inhabit mountain meadows, marshy edges of potholes, and roadsides (Pyles 2002). Riparian habitats (e.g., wet grassy meadows) are preferred (Warren 2005). Peck's skipper habitat cannot be delineated for the Forest as the vegetation data layer lacks the specifics needed to determine potential habitat. Approximately 2 acres of mapped plant polygons occurs within 100 feet of known sites on the Forest; of which 0.1 acre is infested by invasive plants.

Risks

This species may be threatened by an introduced European skipper (Foltz 2010a). Grazing poses an additional threat to this species, particularly at the Mt. Hull site on the Okanogan-Wenatchee National Forest (Foltz 2010a). Some species of invasive plants may degrade the skipper's meadow habitat. Key metrics used to assess impacts to the Peck's skipper will be potential for herbicide exposure, and effects to habitat at known sites.

Tawny-edge Skipper

Life History and Analysis Area Information

In Washington, this species is documented on the Colville and Okanogan-Wenatchee National Forests (Pyle 2002). On the Forest they are documented on the Tonasket Ranger District at 4 sites near Mount Hull; Mud Lake, Tonasket Creek, Cockle Springs and Haley Canyon (NRIS 2015). In the Cascades, the habitat is limited to moister areas in higher elevations, such as pond and marsh meadows, moist meadows,

and stream margins (Foltz 2010b). Known records are from elevations of 2500 to 4000 ft. (Evergreen Aurelians 2010). In Washington, the species flight period occurs from late May to early August (Foltz 2010b). Tawny-edge skipper habitat cannot be delineated for the Forest as the vegetation data layer lacks the specifics needed to determine potential habitat. It is likely that un-surveyed, potential habitat occurs within the Treatment Areas on the Forest. Approximately 2 acres of mapped invasive plant polygons occur within 100 feet of known sites; of which 0.07 acres are infested.

Risks

This species may be threatened by an introduced European skipper (*Thymelicus lineola*) (Foltz 2010b). Grazing poses an additional threat to this species (Foltz 2010b). Some species of invasive plants may degrade the skipper's meadow habitat. Key metrics used to assess impacts to the tawny-edge skipper will be potential for herbicide exposure, and effects to habitat.

Subarctic Darner

Life History and Analysis Area Information

Subarctic Darner are found in peatlands dominated by aquatic moss – sphagnum bogs and fens. Larvae require submerged vegetation. Adults fly from mid-June to early October. Larvae feed on aquatic animals, including invertebrates and possibly small vertebrates. Species spend the winter as larvae (Fleckenstein 2006f).

The main part of this species range is in Canada. There are two known sites in Washington and one of the sites is located on the Okanogan-Wenatchee National Forest. The site at Fish Lake, on the Wenatchee River Ranger District, was discovered in 2000 (Fleckenstein 2006f, NRIS 2015). In 2013 and 2014 the Forest conducted odonate (dragonfly) surveys at 16 sites (bogs, fens, and shallow ponds) for the purpose of documenting the presence of sensitive dragonfly species. The subartic darner was not found (Rohrer 2014). Approximately 19 infested plant acres are within 100 feet of Fish Lake. Subarctic darner habitat cannot be delineated for the Forest as the vegetation data layer lacks the specifics needed to determine potential habitat.

Risks

The greatest long-term threat is drought or global warming (NatureServe 2010, Fleckenstein 2006f). The subarctic darner is threatened by peat mining, grazing, manipulation of water level, and recreation and recreational development. Invasive plants such as reed canarygrass and yellow loosestrife are present and threaten the long-term habitat integrity at Fish Lake (Lamquest, pers. com.). Key metrics used to assess effects to the subartic darner will be potential for herbicide exposure, ground disturbance and effects to habitat at known sites.

Zigzag Darner

Life History and Analysis Area Information

The distribution of this species covers Canada and most of the northern United States (NatureServe 2010). In Washington this species is known to inhabit Ferry, Okanogan, Pend Oreille, Chelan and Skamania Counties, mostly at high elevations on Forest Service land (Xerces 2010d). The zigzag darner was found at 5 of the 16 sites surveyed during the 2013 and 2014 Forest odonate surveys (Rohrer 2014). On the Forest this species is documented on the Wenatchee River, Tonasket and Methow Valley Ranger Districts (NRIS 2015). This species is found in wet sedge meadows, fens, bogs, and very shallow peated ponds

(Xerces 2010d). Zigzag darner habitat cannot be delineated for the Forest as the vegetation data layer lacks the specifics needed to determine potential habitat. Although the NRIS data base shows no invasive plants within 100 feet of known zigzag darner sites, Lamquest (pers. com) did note that invasive plants such as reed canarygrass and yellow loosestrife are present and threaten the long-term habitat integrity at Fish Lake (one of the known zigzag darner sites).

Risks

Drought caused by global climate change is considered the primary threat to this species (Xerces 2010d). Habitat alteration and degradation may also threaten this species at some sites (Xerces 2010d). Key metrics used to assess effects to the zigzag darner will be potential for herbicide exposure, ground disturbance and effects to habitat at known sites.

Subarctic Bluet

Life History and Analysis Area Information

Subartic Bluet is found throughout Canada and northern United States. In Washington, there are two known sites; the east side of Davis Lake in Ferry County and Bunchgrass Meadows in Pend Oreille County on the Colville National Forest. It is suspected to occur on the Forest. This species is lives in a variety of wetlands, but most common around floating aquatic moss. The Washington sites are in sedge marsh at 4,500 and 5,000 feet (Fleckenstein 2006e).

The Forest conducted odonate (dragonfly) surveys at 16 sites during 2013 and 2014 field season for the purpose of documenting the presence of sensitive dragonfly species. The subartic darner was not found (Rohrer 2014). There are no documented occurrences on the Okanogan-Wenatchee National Forest (Fleckenstein 2006e). Subarctic habitat cannot be delineated for the Forest as the vegetation data layer lacks the specifics needed to determine potential habitat.

Risks

Drought caused by global climate change is considered the primary threat to this species (Xerces 2010d). Habitat alteration and degradation may also threaten this species at some sites (Xerces 2010d). Since surveys have been conducted and no sites were found on the Forest, no foreseeable impacts are expected from the proposed project. Therefore, the subarctic bluet will not be discussed further in this document.

Northwest Forest Plan Survey and Manage Species

Using the 2003 Settlement Agreement Survey and Manage list (Pechman exemption), vertebrate and invertebrate species of interest within Northwest Forest Plan lands whose range includes the Okanogan-Wenatchee National Forest are: great gray owl, Larch mountain salamander, Puget Oregonian, masked duskysnail, Chelan mountainsnail, and blue-gray taildropper. Except for the Chelan mountainsnail and masked duskysnail, these species are discussed under sensitive species above.

Chelan Mountainsnail (*Oreohelix* n. sp. 1)

Life History and Analysis Area Information

Extensive Chelan mountainsnail surveys have occurred for the Forest on the Chelan and Okanogan Counties. The Chelan mountainsnail is a terrestrial snail known to occur only in northeastern Chelan County (Burke 1999b). Habitat for this species appears to be in arid transition forest. The Chelan mountainsnail has been found in two types of habitats; schist talus and in litter or under shrubs in and adjacent to open dry forest stands with pinegrass or elk sedge present (Burke 1999b). The typical site occurs within concave landforms that accumulate and maintain moisture more efficiently than the surrounding landscape. Elevations range from 1200 to 2600 feet (Burke 1999b).

The NatureServe global conservation status ranks the Chelan mountainsnail as "critically imperiled" in the State of Washington (NatureServe 2010). Known surviving populations of the Chelan mountainsail are rare; occurring in only two or three relative small areas within the restricted range of the species (Burke 1999b).

Using the habitat layer created from the revised forest plan, an estimated 10,020 acres of potential Chelan mountainsnail habitat (rated high and moderate) occurs within mapped plant polygons, and of these 1,146 are infestation acres. Known plant infestations are primarily along roadsides. Eight known Chelan mountainsnail sites are within mapped plant polygons.

Risks

Invasive plant species, such as knapweed, tend to dry out sites more than native vegetation and degrade habitat. Key metrics used to assess effects to the Chelan mountainsnail will be potential for herbicide exposure, effects to habitat, and ground disturbance at known sites.

Masked Duskysnail (*Lyogyrus* n. sp. 2)

Life History and Analysis Area Information

The masked duskysnail is also sometimes referred to as Washington duskysnail; is a small freshwater snail that inhabits kettle lakes and riparian associate. It lives on the mud substrate, and feeds on the algal and microbial film on aquatic macrophytes and likely on detritus (Monthey,1998).

This species has been identified at 4 sites on 2 lakes in Washington State: Curlew Lake in Ferry County, and Fish Lake in Chelan County. Curlew Lake does not occur on the Forest but Fish Lake site is partially within the Okanogan-Wenatchee National Forest, on the Wenatchee River RD. There are approximately 19 mapped polygon acres within 100 feet of Fish Lake. Masked duskysnail habitat cannot be delineated for the Forest as the vegetation data layer lacks the specifics needed to determine potential habitat.

Risks

The major concern for this species is loss of populations due to changing chemical, temperature or biological conditions in the lakes they inhabitat (Monthey 1998). Invasive plants, such as reed canarygrass, yellow loosetrife and knapweed are present and threaten the long-term habitat integrity at Fish Lake (Lamquest, pers. com.). Key metrics used to assess effects to the masked duskysnail will be potential for herbicide exposure and ground disturbance at known sites.

Management Indicator Species

Management Indicator Species (MIS) are selected species whose welfare is believed to be an indicator of the welfare of other species using the same habitat, or a species whose condition can be used to assess the impacts of management actions on a particular area (Thomas et al. 1979). The MIS approach is used in concert with other indicators to gauge the effects of management on wildlife. Table C-9 below lists the MIS species identified in the Wenatchee and Okanogan Forest Plans.

A detailed report of each MIS on the Forest describing baseline, preferred habitat, viability outcomes and risk factors, can be found in the Status of Management Indicator Species on the Okanogan and Wenatchee National Forests (USDA Forest Service 2011a), which is incorporated in this section by reference. Effects to habitat and potential herbicide exposure will generally be used as the key metrics to assess impacts of proposed invasive plant treatments.

Table C-9 Management Indicator Species and their associated habitat for the Okanogan-Wenatchee National Forest (habitat acres within this table were from USDA Forest Service 2011a)

Species	Indicators for: (source habitat)	Okanogan (habitat acres on the Forest)	Wenatchee (habitat acres on the Forest)	Mapped Polygon acres within Habitat	Species Present in the Treatment Area
Rocky Mountain elk	Big game species; with winter range identified as its limiting habitat	NA[1]	152,581	6,428	Documented
Mule Deer	Big game species; with winter range identified as its limiting habitat	321,775	152,581	18,222 OKA 6,428 WEN	Documented
Mountain Goat	Rockland, alpine, high elevation old-growth conifer habitat	NA[1]	218,446	96	Documented
Canada Lynx	Lodgepole pine habitat	63,847	NA[1]	1,720	Documented
Barred Owl	Mature and mixed conifer old-growth	170,799	NA[1]	339	Documented
Northern Spotted Owl	Mature and mixed conifer old-growth	82,116	621,105	3,823	Documented
Pileated Woodpecker	Mature and old growth conifer (medium-large trees/cool/moist forest groups	66,237	58,861	11,395	Documented
Three-toed Woodpecker/	Mature and old growth habitat in lodgepole pine types (including subalpine fir) on the OKA and mature or old-	783,357	973,135	1,597	Documented

Species	Indicators for: (source habitat)	Okanogan (habitat acres on the Forest)	Wenatchee (habitat acres on the Forest)	Mapped Polygon acres within Habitat	Species Present in the Treatment Area
	growth habitat on the WEN				
American Marten	Mixed conifer old-growth and mature habitat (cold moist and cold dry forests)	30,262	166,310	1,599	Documented
Primary cavity excavators (10 species)	Dead & live defective standing trees/ dead & down tree habitat structure	X	X	Yes	Documented
Beaver	Riparian/deciduous forest habitat	NA[1]	177,118	3,859	Documented
Ruffed Grouse	Riparian/deciduous forest habitat	193,891	276,457	12,559	Documented
[1]Not a MIS on the Forest					

Additional discussions for the northern spotted owl and Canada lynx are in the Federally Listed Species section above and for the mountain goat in the R6 Sensitive Species section above.

Mule Deer (*Odocoileus hemionus*) and Rocky Mountain Elk (*Cervus elaphus*)

Life History and Analysis Area Information

Deer populations and habitat are widely distributed throughout the Forest and elk populations and habitat are widely distributed throughout the Naches and Cle Elum Ranger Districts and Wenatchee River Ranger District south of the Wenatchee River. The Okanogan and Wenatchee Forest Plans contain standards and guidelines relative to mule deer habitat and elk habitat on the Okanogan-Wenatchee National Forest, and require that habitat capability to support deer and elk is maintained or improved. Although the Known Infestations Analysis Area lies within mule deer and elk winter, transition, and summer ranges; winter range was identified as the limiting and key factor and used to evaluate the viability of mule deer and elk as MIS on the Okanogan-Wenatchee National Forest (USDA Forest Service 1989 and 1990). Therefore, this analysis will discuss effects primarily to winter range. Approximately 1,710 infested plant acres occur in deer and elk winter range on the Wenatchee National Forest and 2,235 infested plant acres occur in deer and elk winter range on the Okanogan National Forest.

Risks

Of the invasive plant species known to occur on the Forest, knapweed, oxeye daisy, leafy spurge, and Dalmatian toadflax are the species that grow on dry rangeland and shrubland (Washington State Noxious Weed Control Board 2007), which is typical deer and elk winter range on the Forest. These plant species are aggressive invaders; highly competitive. They quickly displace native vegetation and desirable forage plants, dramatically reducing available forage for wildlife (Washington State Noxious Weed Control Board 2007, Wright and Kelsey 1997). Because of their prolific nature, they have the potential to threaten long-term habitat integrity of deer and elk winter range on the Forest (deVos et al. 2003). Deer may

consume some invasive plant species, such as spotted knapweed, but usually under conditions that limit availability of preferred forage, such as heavy snow and high animal densities (Wright and Kelsey 1997).

Mountain Goat (*Oreamnos americanus*)

Life History and Analysis Area Information

Mountain goats were selected as a management indicator species on the Wenatchee National Forest because the population was divided into a number of sub-populations where management activities, or the lack of them, could potentially eliminate a sub-population and thus reduce distribution and potentially affect long-term viability. Mountain goats occur throughout the Wenatchee National Forest in their preferred habitat. Mountain goat populations and habitat are generally widely distributed, with some areas exhibiting lower abundance, but dispersal is still possible among subpopulations to allow for interactions within the metapopulation. Of the 96 acres of mapped polygons occurring in mountain goat habitat, approximately 25 are infested acres.

Risks

Invasive plants do not generally occur in mountain goat habitat, however if infestations expand, the quality and quantity of available forage could be reduced. The primary effects the proposed invasive plant treatments could have on mountain goats are changes to foraging habitat, and possible herbicide exposure. Changes to foraging habitat and potential for herbicide exposure will be used as key metrics to assess effects.

Canada Lynx (*Lynx Canadensis*)

Life History and Analysis Area Information

Habitat on the Forest is limited to higher elevations (> 4000 feet). A large block of habitat east of the Chewuch River and west of the Okanogan River provides the largest contiguous patch of habitat on the Forest. This habitat is contiguous with habitat in British Columbia and the populations interact. Patchy habitat is present throughout the Pasayten and Lake Chelan Sawtooth Wildernesses. However, the disjunct areas of suitable environments are typically large enough in size and close enough to each other to permit dispersal among subpopulations and to allow the species to potentially interact as a metapopulation. Exceptions to this may occur along identified “fracture zones”, or sizeable gaps in dispersal habitat (usually as a result of low elevations and human development) (USDA Forest Service 2011a). These “fracture zones” include the Upper Columbia-Pend Oreille, Southern Okanogan, Stevens Pass-Lake Chelan, and Okanogan Valley (Singleton et al. 2002). Approximately 1,720 mapped polygon acres occur within lynx core area; of which 196 acres are currently infested by invasive plants. These invasive plant locations are primarily along roadsides.

Risks

Invasive plants are thought to have no impacts on lynx or lynx habitat (Interagency Lynx Biological Team 2013). There is some evidence that lynx tolerate some level of human disturbance (U.S. Fish and Wildlife Service, 2000). The primary effect the proposed invasive plant treatments could have on the lynx is possible disturbance and herbicide exposure (to lynx and their prey). Potential for disturbance will be determined using the mapped polygon acres within occupied lynx habitat and potential for herbicide exposure will be measured using infested acres within potential lynx habitat.

Barred Owl (*Strix varia*)

Life History and Analysis Area Information

Barred owl use late successional habitat of mixed conifer, which is widely distributed on the Forest (USDA Forest Service 2011a). In North America, barred owls have a stable to increasing trend (Sauer et al. 2008). In western North America, numbers and range are expanding (Gutierrez et al. 2007). Of the 339 mapped plant polygons acres within barred owl habitat on the Okanogan National Forest, approximately 60 of those acres are currently infested by invasive plants. These infested acres are primarily roadside locations.

Risks

Invasive plants generally do not occur in late-successional habitat due to the high canopy and ground cover. Therefore invasive plants are suspected to have little effect on barred owl nesting habitat. Therefore potential for herbicide exposure and disturbance will be used as key metrics to assess effects.

Northern Spotted Owl (*Strix occidentalis caurina*)

Life History and Analysis Area Information

On the Okanogan National Forest, the range of the spotted owl only occurs on the west half of the Methow Valley Ranger District of the Forest, and suitable habitat is not widely distributed. On the Wenatchee National Forest, suitable habitat is broadly distributed, and the population is currently patchily distributed (USDA Forest Service 2011a). Demographic data from 14 study areas across the range of the northern spotted owl indicate an annual population decline (Anthony et al. 2006). Extensive spotted owl surveys and have occurred on the Forest within the range of the northern spotted owl (NRIS 2011). Of the 3,823 mapped polygon acres that occur in suitable owl habitat on the Forest, approximately 1,181 acres of are currently infested by invasive plants. These invasive plant locations are primarily along roadsides.

Risks

Invasive plants are not known to impact the northern spotted owl or its late-successional habitat (USFS 2005a; III-61). The primary effects the proposed invasive plant treatments could have on the northern spotted owl are possible herbicide exposure and disturbance. The potential for herbicide exposure and disturbance will be used as key metrics to assess effects.

Pileated Woodpecker (*Dyrocopus pileatus*)

Life History and Analysis Area Information

The pileated woodpecker is an indicator of mixed conifer old-growth and mature habitat in dry, mesic or cold moist forest (USDA Forest Service 2011a). Under historic conditions, pileated woodpeckers were likely well distributed throughout the Okanogan-Wenatchee National Forest. Currently they are likely not as well distributed, and source habitat is less abundant (USDA Forest Service 2011a). It is likely that other species in the medium-large trees/cool/moist forest group, may have experienced similar declines in suitable environments. Source habitat for the pileated woodpecker consists of late-successional stages of coniferous or deciduous forest, but they also use younger forest that have scattered, large snags (USDA Forest Service 2011a). They are rarely found in stands of pure ponderosa pine (USDA Forest Service 2011a). Pileated woodpeckers nest in cavities and feed on carpenter ants by foraging in snags and down wood. Approximately 11,395 acres of mapped plant polygons occur within pileated woodpecker habitat; of which approximately 1,618 acres of habitat are infested. These are primarily roadside acres.

Risks

Risks to the pileated woodpecker are declines in densities of large snags and down wood and old-growth habitat (USDA Forest Service 2011a). Invasive plants generally do not occur in late-successional habitat due to the high canopy and ground cover.

Three-toed Woodpecker (*Picoides trydactylus*)

Life History and Analysis Area Information

Three-toed woodpeckers nest in cavities and eat bark beetles and larvae obtained by foraging in trees. Three-toed woodpeckers occur throughout the forest in their preferred habitat. The three-toed woodpecker is an indicator of old-growth and mature habitat in lodgepole pine (including subalpine fir) Forest. Populations and habitat for the three-toed woodpecker on the Forest is widely distributed, but highly dispersed with some areas exhibiting lower abundance (USDA Forest Service 2011a). This outcome determination was based on provisions of: a large system of late-successional reserves; standards and guidelines for riparian reserves; and retention of green trees, snags, and coarse woody debris within matrix (USDA Forest Service 2011a). Approximately 1,597 acres of mapped plant polygons occur within three-toed woodpecker habitat: of which 175 acres of habtat are infested by invasive plants. These are primarily roadside locations.

Risks

Risks to the three-toed woodpecker are declines in densities of large snags and down wood. Invasive plants generally do not impact in late-successional habitat due to the high canopy and ground cover. Therefore invasive plants are suspected to have little effect on three-toed woodpecker habitat. The primary effects the proposed invasive plant treatments could have on three-toed woodpeckers are possible herbicide exposure. The potential for herbicide exposure; directly and indirectly (prey) will be used as key metrics to assess effects.

American Marten (*Martes Americana*)

Life History and Analysis Area Information

The American marten is an indicator of mixed conifer old-growth and mature habitat in cold moist and cold dry forest (subalpine fir, grand fir, Pacific silver fir, Engelman spruce, western hemlock, mountain hemlock and western cedar). Martens prefer riparian habitat throughout their range and habitats near water (USDA Forest Service 2011a). The analysis completed in the Status of Management Indicator Species on the Okanogan and Wenatchee National Forests (USDA Forest Service 2011a), indicated that 89 percent of the watersheds on the Forest provide habitat for marten. However 75 percent of the watersheds with habitat were well below historic levels of source habitat. Under historical conditions there was a high probability that viable populations of American martens and other species associated with the cool/moist forests group in the medium/large trees family were well distributed throughout the planning area. The effects of development and habitat change across the Okanogan-Wenatchee National Forest has led to a lower probability that populations of American martens and all other species associated with marten source habitat are viable and are likely well-distributed in only a portion of the forest (USDA Forest Service 2011a, Wisdome et al 2000). At broad scale, the American marten is considered secure through most of its North American range and is listed as secure in Washington State (NatureServe 2010). Approximately 1,599 mapped plant polygon acres occur within marten habitat; of which 328 acres are infested plant acres. These invasive plant locations are primarily along roadsides. Marten's diet includes bird eggs, nestlings, insects, fish, small mammals, berries and fruit. The marten is strongly arboreal (living in trees) and subnivean (living under the snow) (USDA Forest Service 1994).

Risks

Reduction and fragmentation of old forest habitats is the major risk to marten (USDA Forest Service 1994, 2011b). Invasive plants generally do not occur in old-growth or mature habitat due to the high canopy and ground cover. Therefore invasive plants are suspected to have little effect on American marten habitat. The possible effects the proposed invasive plant treatments could have on the American marten is herbicide exposure. The potential for herbicide exposure; both directly and indirectly (prey) will be used as key metrics to assess effects.

Primary Cavity Excavators

The Okanogan and Wenatchee National Forest Plans use a group of woodpeckers (Primary Cavity Excavators-PCEs) as indicators for dead and defective trees (USDA Forest Service 1989:III-77, 1990:III-48). Included in this group are species that have been discussed above (pileated woodpecker and three-toed woodpecker), as well as the species listed in the table below.

Life History and Analysis Area Information

The table below provides information on habitat and diet for other dead and defective tree indicator species.

Table C-10 Other Dead and Defective Tree Indicator Species

The following information is taken from Marshall et al. (2003), Wisdom et al. (2000), Wahl et al. (2005), USDA Forest Service (1989: III-78-79) and USDS Forest Service (2011b).

Species	Preferred Habitat	Diet	Threats
Black-backed woodpecker	Source habitat is old-forest stages of subalpine, montane, lodgepole, lower montane, and riparian forests. Use snags for nesting and foraging. Recently burned or bark-beetle killed forests.	Larvae of wood-boring beetles	Removal of fire-killed or insect-infected trees. Decline in availability of medium to large snags infected with heart rot.
Downy woodpecker	Deciduous riparian woodlands and lowland deciduous forest (alder, cottonwood, willow, aspen, and oaks). Nest primarily in dead trees.	Scale insects (coccids), beetles, and ants	Replacement of hardwood habitat with coniferous habitats.
Hairy woodpecker	Dry and wet coniferous forests at low to mid-elevations. Also use deciduous forest and riparian areas adjacent to coniferous forest. Use all ages of forest stands. Nest primarily in moderately decayed snags.	Beetles and ants	Invader bird species usurping nests.
Lewis's Woodpecker	Source habitat includes oak woodlands, pine-oak habitat, old-forest in ponderosa pine vegetation types, cottonwood groves and burned forest.	Flycatches or gleans insects; eats carpenter ants, bees, wasps, mayflies, beetles and grasshoppers	Loss of large pines and cottonwoods, loss of large, soft snags. Overgrazing in riparian habitats.

Species	Preferred Habitat	Diet	Threats
Northern flicker (common flicker)	Habitat generalists, though most abundant in open forest or forest edges. Use coniferous and deciduous forest, riparian woodlands, and urban areas. Nests in large snags.	Ants, crickets, beetles, berries, and seeds	Loss of large soft to moderate snags.
Red-naped sapsucker[1]	Riparian habitats, especially aspen, cottonwoods, alders and pine. Typically nest in conifer snags or live aspen with heart rot	Tree sap, cambium, and insects attracted to sap	Loss of large aspen snags and trees.
White-headed woodpecker	Mature and old-growth ponderosa pine forests; nests in snags or dead portions of live trees. Weak cavity excavator needing soft wood	Pine tree sap, insects and pine seeds	Habitat degradation; loss of large pines and snags.
Williamson's sapsucker	Source habitat is open, late-seral stages of montane and lower montane forest (Douglas-fir, western larch, grand fir and white fir, and ponderosa pine) and aspen and cottonwood stands. Weak cavity excavator needing soft wood	Conifer tree sap, cambium, and insects	Reduction in late-seral forest habitat and the numbers of large snags.
[1] The yellow-bellied sapsucker listed in the Okanogan Forest Plan (USFS 1989:III-78), was taxonomically split into three species in 1983: red-naped, red-breasted, and yellow-bellied sapsuckers (AOU 1983, Walters et al. 2002); only the red-naped sapsucker occurs in Eastern Washington.			

The above PCE occur throughout the forest in their preferred habitat. For preferred habitat by species refer to previous table. Habitat is of sufficient quality, distribution, and abundance on the Okanogan-Wenatchee National Forest to allow the species population to stabilize, well distributed across federal lands (USDA Forest Service 2011a). This is true for the above listed PCE except for the black-backed woodpecker. Habitat for the black-backed is broadly distributed and of high abundance, but there are gaps where suitable environments are absent or only present in low abundance. However this species is likely well-distributed throughout the Forest.

Several PCE are closely associated with late-successional and old-growth forest, with occurrence of large snags necessary for optimal habitat (USDA and USDI 1994a). Densities of large-diameter snags (>21 inches dbh), which are important habitat components for cavity nesters and excavators, have declined basin-wide from historical to current levels (Wisdom et al. 2000, Korol et al. 2002 as cited in USDA Forest Service 2011a). On the east half of the Methow Valley Ranger District and all of the Tonasket Ranger District, the Forest has been implementing Regional Forester Amendment #2 since 1995. This amendment requires the adequate retention of late-successional habitat and prohibits the cutting of trees over 21" dbh. On the rest of the Okanogan-Wenatchee National Forest, it has been implementing the NWFP and monitoring late-successional habitat trends since 1994. The 10-year monitoring report states "…it appears the status and trends in abundance, diversity, and ecological functions of older forests are generally consistent with the expectations of the Plan (Haynes et al. 2006 as cited in USDA Forest Service

2011a). The total area of late-successional and old-growth forest (older forests) has increased at a rate that is somewhat higher than expected, and losses from wildfires are in line with what was anticipated."

Risks

Invasive plants are not known to affect primary cavity excavators or their habitat (USDA Forest Service 2011b). The possible effects the proposed invasive plant treatments could have on PCEs is herbicide exposure. The potential for herbicide exposure; both directly and indirectly (prey) will be used as key metrics to assess effects.

Beaver (*Castor canadensis*)

Life History and Analysis Area Information

The beaver is a management indicator species on the Wenatchee portion of the Forest, but occurs throughout the Forest in its preferred habitat. Their preferred habitat is low gradient streams, ponds, and small mud-bottomed lakes with dimmable outlets and deciduous tree and shrub present (USDA Forest Service 2011b). Beaver were selected as an indicator of deciduous and riparian ecosystems (USDA Forest Service 1990:III-48). They are a keystone species that alter the aquatic and riparian ecosystems they inhabit (USDA Forest Service 2011b). Populations and habitat are widely distributed, but highly dispersed with some areas exhibiting lower abundance, and isolation. There is opportunity for subpopulations on most of the Wenatchee National Forest to interact, but some subpopulations are so disjunct or of such low density that they are essentially isolated from other populations (USDA Forest Service 2011a). Approximately 3,859 mapped polygon acres occur within beaver habitat; of which 1,844 acres are infested.

Risks

Approximately 1% of the available beaver habitat on the Wenatchee National Forest is currently infested by invasive plants. The possible effects the proposed invasive plant treatments could have on beaver is herbicide exposure and disturbance. The potential for disturbance and herbicide exposure within beaver habitat will be used as key metrics to assess effects.

Ruffed Grouse (*Bonsa umbellus*)

Life History and Analysis Area Information

Ruffed grouse occur throughout the forest in their preferred habitat; riparian and early successional deciduous habitat (USDA Forest Service 2011b). Habitat is widely distributed and abundant. Since the ruffed grouse is considered a game bird by the State, viability is not a concern. Approximately 12,559 mapped polygon acres occur within ruffed grouse habitat; of which 3,085 acres are infested. Ruffed grouse's diet varies and includes herbs, buds, catkins, and twigs of trees and shrubs; fruits, acorns and seed.

Risks

Invasive plants such as purple and yellow loosestrife, and Japanese knotweed can adversely affect nesting and foraging habitat for some riparian species (Washington State Noxious Weed Control Board). Invasive plants have primarily impacted riparian habitat around ponds and lakes where the overstory tends to be more open. However, invasive plants are not known to affect deciduous shrubs and trees. The possible effects the proposed invasive plant treatments could have on ruffed grouse are herbicide exposure and disturbance. The potential for disturbance and herbicide exposure; both directly and indirectly (food) will be used as key metrics to assess effects.

Birds of Conservation Concern

In January 2001, President Clinton issued an executive order directing federal agencies to avoid or minimize the negative impact of their actions on migratory birds, and to take active steps to protect birds and their habitat. The USFWS developed the "Birds of Conservation Concern 2008" (BCC 2008) as the most recent means of implementing the order (USDI Fish and Wildlife 2008c). These are species, subspecies, and populations of migratory non-game birds that without additional conservation actions and may become candidates for listing under the Endangered Species Act. Bird Conservation Regions (BCRs) were developed based on similar geographic parameters. The Known Infestations Analysis Area falls in BCR 9 (Great Basin). Table C-11 below displays the BCR species for the Okanogan-Wenatchee National Forest, preferred habitat and whether suitable habitat is present on the Forest.

Life History, Analysis Area Information and Risks

Habitat and diet information for the bald eagle, peregrine falcon, Williamson's sapsucker, Lewis' woodpecker and white-headed woodpecker have been discussed previously in other sections. Information about the remaining species of conservation concern is shown in the table below (Marshall et al. 2003).

Table C-11 Bird Species of Conservation Concern that May Occur on the Forest* (Marshall et al 2003, Seattle Audubon Society 2011).

Species	Habitat	Diet
Calliope hummingbird	Open woodlands, scrubby vegetation, riparian	Plant nectar.
Flammulated owl	Open pine forest. Nests in tree/snag cavities	Crickets but will also take moths and beetles
Golden eagle	Open shrub habitat. Nests are primarily on cliffs and ledges, but tree nests are also used. Invasive plants are not known to be specifically affecting golden eagle habitat.	Rabbits and hares, squirrels, woodrats, salmon and medium to large birds.
Prairie falcon	Cliffs and outcrops provide opportunity for nesting; Grasslands are preferred habitat.	Small mammals, usually ground squirrels, but will also prey on birds, especially in winter
Willow Flycatcher	Riparian, shrubby area with water.	Flying insects
Black swift	Nests on cliff faces near or behind waterfalls, usually in deep canyons in wooded areas.	Flying insects
Loggerhead shrike	Open habitats of eastern Oregon and Washington. Uses elevated perches for hunting and singing, open grassy areas for hunting, and scattered shrubs or small trees for nesting (Holmes 2003).	Primarily insects during the breeding season and small vertebrates in the winter.

*Includes only species not discussed in previous sections.

Landbirds (Partners-in-Flight Conservation Strategy Species)

The Forest Service has prepared a Landbird Strategic Plan (January 2000) to maintain, restore, and protect habitats necessary to sustain healthy migratory and resident bird populations. Individuals from multiple agencies and organizations within the Oregon-Washington Chapter of Partners in Flight participated in developing publications that served as references for conserving landbirds in this region (Panjabi et al. 2005).

Two conservation strategies cover the Okanogan-Wenatchee National Forest. The majority of the Forest is covered in the "Conservation Strategy for Landbirds of the East-Slope of the Cascade Mountains in Oregon and Washington" (Altman 2000). This plan covers mid to high elevation forest types along the eastern slope of the Cascades and identifies primary management needs for birds in this forest zone and covers the majority of the Okanogan-Wenatchee National Forest. The principal issues affecting bird populations listed in this plan include habitat alteration from timber harvesting, changes in historic fire regimes, and grazing by livestock (Altman 2000).

The remainder of the forest is covered in the "Conservation Strategy for Landbirds in the Columbia Plateau of Eastern Oregon and Washington" (Altman and Holmes 2000), which discusses riparian, shrub-steppe, and juniper habitats. The principal issues affecting bird populations in the Columbia Plateau include habitat loss and fragmentation resulting from conversion to agriculture, and habitat degradation and alteration from livestock grazing, invasion of exotic vegetation, and alteration of fire regimes.

Both of these plans identify invasion by exotic plants as an important issue adversely affecting landbird populations. The Columbia Plateau plan states, "One of the most severe impacts in shrub-steppe has been the increased spread of exotic plants" such as cheatgrass (Altman and Holmes 2000). Although cheatgrass is not a priority invader species in this document, some sites may be treated if they are associated with other priority infestations treated within the scope of this document, or are part of priority project, such as improving important wildlife habitat.

These strategies identify groups of focal species and their associated habitat attributes that can be used to identify desired landscapes. The following tables (Table C-12 and C-13) list the priority habitat features and associated focal species for conservation from the respective plans. Conservation issues and strategies *relevant to invasive plant invasions or their treatments* from the respective plans are included after the habitat tables for each zone. No pesticide use involving insect control is included in the alternatives.

East Slope Cascades

Table C-12 Priority Habitat Features and Associated Focal Species for Conservation in Priority and Unique Habitats in the North Cascades subprovince of the East Slope of the Cascades (Altman 2000)

Habitat	Habitat Feature	Focal Species for North Cascades
Ponderosa Pine	Large patches of old forest with large snags	White-headed woodpecker
	Large trees	Pygmy nuthatch
	Open understory with regenerating pines	Chipping sparrow
	Patches of burned old forest	Lewis' woodpecker
Mixed Conifer (Late-Successional)	Large trees	Brown creeper
	Large snags	Williamson's sapsucker
	Grassy openings and dense thickets	Flammulated owl
	Multi-layered/dense canopy	Hermit thrush
	Edges and openings created by wildfire	Olive-sided flycatcher
Oak-Pine Woodland	Early-successional/dense understory regen	Nashville warbler
	Large oaks with cavities	Ash-throated flycatcher
	Large conifer trees and snags	Lewis' woodpecker
Lodgepole Pine	Old growth	Black-backed woodpecker
Whitebark pine	Old growth	Clark's nutcracker

Habitat	Habitat Feature	Focal Species for North Cascades
Meadows	Wet/dry	Sandhill Crane
Aspen	Large trees with regeneration	Red-naped sapsucker
Subalpine fir	Patchy presence	Blue Grouse

The following information is taken from the East-Slope Cascades conservation strategy (Altman 2000) and pertains to the "shrub-steppe", "riparian habitat" and "unique habitats" within the National Forest. Conservation issues and strategies not relevant to invasive plant management are not shown here.

Ponderosa Pine and Mixed Conifer

Conservation Issues

- Invasion of exotic plants contributing to alteration of understory conditions and increase in fuel loads

Conservation Strategies

Use of herbicides can reduce cover and indirectly affect insect food base.

- Encourage biological controls rather than chemical controls wherever possible.
- Applications should be done by hand if practical to target appropriate species (e.g. noxious weeds).
- Applications on lands adjacent to riparian areas should avoid environmental conditions where non-target plants in the riparian zone may be affected

Associated Species:

Ponderosa Pine Focal Species: There are no conservation strategies relevant to invasive plant management for white-headed woodpecker, pygmy nuthatch, chipping sparrow, or Lewis' woodpecker in this plan.

Mixed Conifer Focal Species: There are no conservation strategies relevant to invasive plant management for the brown creeper, Williamson's sapsucker, or hermit thrush, in this plan.

Flammulated Owl

- Loss of open understory because of invasion of exotics and fire intolerant species.

Oak-Pine Woodland

There are no conservation issues or strategies listed for oak-pine woodland. No conservation issues or strategies relevant to invasive plant management for the Nashville warbler, ash-throated flycatcher or Lewis' woodpecker are listed in this plan.

Unique Habitats

There are no conservation issues or strategies listed for unique habitats (lodgepole and whitebark pine old growth, wet and dry meadow, aspen, or subalpine fir). No conservation issues or strategies relevant to invasive plant management for the black-backed woodpecker, Clark's nutcracker, sandhill crane, red-naped sapsucker, or blue grouse are listed in this plan.

Columbia Basin Subprovince

Table C-13: Priority Habitat Features and Associated Focal Species for Conservation in Priority and Unique Habitats in the Columbia Basin Subprovince of Eastern Oregon and Washington (Altman and Holmes, 2000)

Habitat	Habitat Feature	Focal Species for Columbia Basin
Shrub-Steppe		
Steppe	Native bunchgrass cover	Grasshopper Sparrow
Steppe-Shrubland	Interspersion of tall shrubs and openings	Loggerhead Shrike
	Burrows	Burrowing Owl
	Deciduous trees and shrubs	Sharp-tailed Grouse
Riparian		
Woodland	Large snags (cottonwood)	Lewis' Woodpecker
	Large canopy trees	Bullock's Oriole
	Subcanopy foliage	Yellow Warbler
	Dense shrub layer	Yellow-breasted Chat
Shrub	Shrub density	Willow Flycatcher
Unique Habitats		
Aspen	Large trees and snags with regeneration	Red-naped Sapsucker
Cliffs and Rimrock	Undeveloped foraging areas	Prairie Falcon

The following information is taken from the Columbia Plateau conservation strategy (Altman and Holmes 2000) and pertains to the "shrub-steppe," "riparian habitat" and "unique habitats" within the National Forest. As with the previous plan, conservation issues and strategies not relevant to invasive plant management are not shown here.

Shrub-Steppe Habitats

The following conservation issues and strategies apply to some or all of the shrub-steppe type habitats included above. Available shrub-steppe habitats on the Okanogan-Wenatchee National Forest are extremely limited.

Conservation Issues

Habitat degradation has occurred from intensive grazing and invasion of exotics, particularly annual grasses such as cheatgrass and woody vegetation. The loss of big sagebrush communities to brush control and loss of habitat to fire management, either suppression or over-use has also occurred. Invasion and seeding of crested wheatgrass has reduces habitat availability

Conservation Strategies

- Conduct removal of exotic species at appropriate times (i.e., outside breeding season).
- Use of herbicides can reduce cover and indirectly affect the insect food base.
- Encourage biological controls rather than chemical controls wherever possible.
- Treatment should be followed by restoration activities.

Steppe:

The only focal species for this habitat is the Grasshopper Sparrow, so the conservation issues and strategies are the same for the habitat and the species. The grasshopper sparrow is extremely rare on the Okanogan-Wenatchee Forest.

Conservation Issues

The alteration of bunchgrass habitat has resulted from intensive grazing and exotic grass and forb invasions (Quigley et al. 1996 as cited in Altman and Holmes 2000). Shrub encroachment has occurred on grasslands from overgrazing and fire suppression

Conservation strategies

Where treatments are occurring in grasslands (e.g. mowing, and chemical applications) leave adjacent untreated areas to maintain a population of associated birds until treated areas become suitable habitat again. Revegetate whenever possible to native bunchgrass cover. Seek to provide the largest tracts of suitable habitat possible.

Steppe-Shrubland:

Loggerhead shrike, burrowing owl and sharp-tail grouse are the focal species for this habitat and are extremely rare on the Forest. Foraging sites for the shrike, particularly for young birds, need to have open ground, bare and/or cryptogamic crusts (thin layers of mosses, lichen, algae, and bacteria on the soil surface), or little vegetative cover (Leu 1995 as cited in Altman and Holmes 2000); invasion of exotic annual grasses, particularly cheatgrass, has been detrimental. Maintain sites with patches of tall shrubs and patches of open ground. Restore areas that were seeded in with crested wheatgrass. No relevant conservation issues or strategies are listed for the burrowing owl or sharp-tailed grouse.

Riparian Habitats:

The following conservation issues and strategies apply to some or all of the riparian type habitats included below.

Conservation Issues

Habitat degradation from conversion of native riparian shrub and herbaceous vegetation to invasive exotics such as reed canary grass, purple loosestrife.

Conservation Strategies

- Conduct removal of exotic species at appropriate times (i.e., outside breeding season).
- Use of herbicides can reduce cover and indirectly affect the insect food base.
- Encourage biological controls rather than chemical controls wherever possible.
- Applications should be by hand if practical to target appropriate invasive plant species.
- Applications on lands adjacent to riparian areas should avoid environmental conditions where the riparian zone may be threatened.
- Limit the application of herbicides in the riparian zone

Riparian Woodland

Species for this habitat type are Bullock's oriole, Lewis' woodpecker, yellow warbler, and yellow-breasted chat. No relevant conservation issues or strategies are listed for Bullock's oriole or Lewis' woodpecker.

Conservation strategies: Yellow warbler, yellow-breasted chat

Eliminate herbicide spraying in riparian zone (Taylor and Littlefield 1986 as cited in Altman and Holmes 2000).

Riparian Shrub

The willow flycatcher is the focus species for this habitat type.

Conservation strategies

Eliminate herbicide spraying in riparian zone (Taylor and Littlefield 1986). Where herbicide control of riparian exotic shrubs and trees is occurring within known nesting habitat, consider the following actions:

- Conduct treatment outside the breeding season,
- treat patches on a staggered rotation to allow some habitat to remain for breeding; treat Remaining patches when treated patches approach habitat suitability,
- Let treated areas decompose naturally without mechanical assistance to maintain structure and allow for continued use, and
- Use mechanical removal in smaller areas of treated patches to assist in recolonization by desired species through planting/seedings.

Unique Habitats

There are no relevant conservation issues or strategies for aspen/red-naped sapsucker, and cliffs and rimrock/prairie falcon.

Amphibians

A number of studies have documented declines in amphibians, even in relatively undisturbed habitats (Drost and Fellers 1996, Lips 1998, 1999), while other studies have found some populations to be stable (Pechmann et al. 1991). However, detecting actual population declines in amphibian populations is difficult due to the extreme annual variation in populations caused by environmental factors, such as drought (Pechmann et al. 1991, Reed and Blaustein 1995).

Potential causes of amphibian declines investigated include habitat loss, non-native predators (Drost and Fellers 1996, Knapp and Matthews 2000), and disease (Muths et al. 2003, Berger et al. 1998, Berger et al. 1999), pesticides (Bridges and Semlitsch 2000, Hayes et al. 2006), climate change (Blaustein et al. 2001, Crump 2005), and ultraviolet radiation (Starnes et al. 2000, Adams et al. 2001). There is no "smoking gun" at the global scale and all the causes are implicated to some degree (Halliday 2005).

Honey Bees - Colony Collapse Disorder

Pesticides are one of several factors thought to possibly contribute to catastrophic losses of honey bees ("colony collapse disorder" or CCD) reported since 2006 (CCD Steering Committee 2007). Since this project proposes to use herbicides, a class of pesticides, a discussion of the possible connection of herbicide use and CCD is warranted.

The European honey bee (*Apis mellifera*) is not native to the United States (US), but was introduced by European settlers in the 1600s. It is widely distributed and commercially produced in US; with escaped feral colonies formerly present across most of the country. Parasitic mites have destroyed most of the feral colonies. (CCD Steering Committee 2007)].

In 2006-2007, commercial honey bees in North America and other parts of the world experienced alarming declines characterized by the disappearance of adult bees from the hives with no or few dead bees near the hive; healthy, capped brood; food reserves that have not been robbed; minimal evidence of wax moth or hive beetle damage; and a laying queen with immature bees and newly emerged attendants (CCD Steering Committee 2007; Winfree et al. 2007). This phenomenon has been termed "colony collapse disorder" (CCD). By 2007, almost 30 percent of beekeepers in the US reported losses of up to 90 percent of their colonies (Cox-Foster et al. 2007; Winfree et al. 2007). These levels of losses have continued through 2010 (CCD Steering Committee 2010). CCD has not been reported in wild native bees (Winfree et al. 2007).

In 2010, several independent studies showed that bees are exposed to a variety of pesticides and that some pesticides interact with bee pests and parasites (such as mites), bee viruses, and other pesticides to effect bee mortality (CCD Steering Committee 2010). The CCD steering committee concludes that these studies taken together support the hypothesis that CCD is a syndrome of stress caused by many different factors likely working in combination. The studies funded by the National Institute of Food and Agriculture's Coordinated Agricultural Project (CAP) found sub-lethal effects of neonicotinoids (nicotine based insecticides) and fungicides on bees, and hypothesized that these pesticides impair the bee's immune system, leaving bees more susceptible to three important bee viruses. Two common miticides, coumaphos and fluvalinate, which are pesticides registered for use in bee colonies to control varroa mites, are also suspect, either acting individually or in combination (CCD Steering Committee 2010).

No insecticides or fungicides, which are suspected in CCD, are proposed for use in this document. Herbicides have a low likelihood of being implicated in CCD, but cannot be completely ruled out. None of the herbicides included in the action alternatives exceeded toxicity values for honey bees at typical application rates. At highest application rates, only glyphosate caused any mortality, and this necessitated a direct spray of the honeybee at the highest rate. Glyphosate would only be used at the highest application rates using stem injection which is not likely to affect pollinators because Herbicides are not typically used directly on the agricultural crops (unless they are genetically engineered to be herbicide resistant) that honey bees pollinate because they would have a high likelihood of adversely affecting the agricultural crop (unlike on grass crops where selective herbicides are used on the crop directly). Herbicides are used near these crops to control weeds, however. The control of weeds in and around genetically engineered crops, which reduces flowering plants in the field, ditches and field edges, is thought to contribute to honey bee nutritional deficiencies, (Ellis, et. al. 2010). Well-nourished bees are less vulnerable to parasites (Eischen and Graham 2008). Unlike in agricultural settings, and especially around genetically engineered, herbicide resistant crops, the use of herbicide on Forest Service lands is likely to increase the diversity of food plants for bees because native plants would begin to recover. Healthy native plant communities contain much greater diversity than sites dominated by invasive plants.

Herbicides used in the action alternatives have a very low probability to cause any effect to honey bees or contribute to CCD because:

- Treatments on the forest are often in remote locations far from commercial bee hives;
- Treatments in the vicinity of bee hives would only entail treatment of patches of invasive plants and not a widespread application likely to expose honey bees;
- These herbicides have a low toxicity to honey bees;
- Effects to bees from these herbicides only occurred for one herbicide at the highest application rate, which is not applied in a spray application (highest application rates of glyphosate are used in wicking, wiping, or injection applications which are unlikely to expose bees), and
- No research to date has focused on any of the proposed herbicides as primary contributors to CCD.

In conclusion, neither of the action alternatives is likely to have adverse effects on honey bees or contribute to the potential cause(s) of CCD even through such effects cannot be completely ruled out.

Fish

Threatened, Endangered, Sensitive, and Okanogan-Wenatchee National Forest Management Indicator Fish Species Life History and Designated Critical Habitat

This section discusses Threatened, Endangered and Sensitive fish species and their habitat on the Okanogan-Wenatchee National Forest. The primary objectives of the Threatened, Endangered, and Sensitive Species Program are to recover federally listed and proposed species and, for Sensitive species, to ensure that actions do not contribute to a loss of viability, or cause a significant trend toward listing under the ESA. The basic concept of Management Indicator Species (MIS) is the selection of certain species found in specific habitat types to represent the habitat needs of a larger group of species requiring similar habitats.

Federally Listed fish species found on the Okanogan-Wenatchee National Forest are shown in Table C-14. Fish species listed on the Region 6 Forest Service Sensitive Species list, and MIS species designated on the Okanogan-Wenatchee National Forest are shown in Table C-14. Only MIS species that do not have a higher level of protection status (ie. ESA listed) are shown in Table C-15. Steelhead, and Chinook are under the regulatory jurisdiction of NOAA Fisheries, and bull trout are under US Fish and Wildlife Service.

Table C-14-Threatened, Endangered and Proposed Fish Species, and Critical Habitat

Species		Status	Listing Status	Critical Habitat
Steelhead (*Oncorhynchus mykiss)*	Upper Columbia DPS	Threatened	Listed Endangered 8/18/97; (62 FR 43937) Status Upgraded 6/18/09 by court decision (74 FR 42605)	09/02/05; (70 FR 52630)
	Middle Columbia River DPS	Threatened	Listed on 3/25/99; (64 FR 14517) Status Reaffirmed 1/05/06 (71 FR 834)	09/02/05; (70 FR 52630)
Chinook Salmon (*Oncorynchus tshawytscha*)	Upper Columbia River Spring- Run ESU	Endangered	Listed on 3/24/99; (64 FR 14308) Status Reaffirmed 6/28/05; (70 FR 37160)	9/2/05; (70 FR 52630)
Bull Trout (*Salvelinus confluentus)*	Columbia River DPS	Threatened	Listed on 6/10/98; (63 FR 31647)	10/06/04; (69 FR 59996) Revised 10/18/2010 (75 FR 63898)

	Coastal-Puget Sound DPS	Threatened	Listed on 11/01/1999 (64 FR 58909)	09/26/2005 (70 FR 56211) Revised 10/18/2010 (75 FR 63898)

Table C-15 Sensitive and Management Indicator Species (MIS)

Species	Designation
Pygmy Whitefish (*Prosopium coulteri*)	Sensitive
Umatilla Dace (*Rhinichthys umatilla*)	Senstive
River Lamprey (*Lampetra ayresiii*)	Senstive
Redband Trout (*Oncorhynchus mykiss gairdneri*)	MIS
Sockeye Salmon (*Oncorhyncus nerka*)	MIS
Chinook Salmon Spring/Summer-Run (Middle Columbia River DPS)	MIS
Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisi)*	MIS

MIS = Management Indicator Species - The Wenatchee and Okanogan National Forest LRMP's specify the use of Management Indicator Species (MIS) to evaluate the effects of proposed management activities upon fish and wildlife habitat (USDA 1990, 1989).

Upper Columbia Steelhead

Critical Habitat

Critical habitat was designated for Upper Columbia River steelhead on September 2, 2005 (70 FR 52630). Critical habitat is designated to include river and tributary reaches presently accessible to Upper Columbia River Steelhead in the Upper Columbia River basin. Designated critical habitat on the Okanogan-Wenatchee National Forest includes the stream channels in each designated reach, and a lateral extent as defined by the ordinary high water line (Sept. 2, 2005; 70 FR 52630). Migratory habitat in the Columbia River mainstem within this DPS is also included. NMFS designates critical habitat based on physical and biological features that are essential to the listed species. Essential features of designated critical habitat are: (1) substrate, (2) water quality, (3) water quantity, (4)water temperature, (5) water velocity, (6) cover/shelter, (7) food for juveniles, (8) riparian vegetation, (9) space, and (10) safe passage conditions (Sept. 2, 2005; 70 FR 52630). The three freshwater primary constituent elements of critical habitat are:

Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development;

Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks;

Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

The primary constituent elements essential for conservation of listed ESUs are those sites and habitat components that support one or more fish life stages, including freshwater spawning sites, freshwater rearing sites, and freshwater migration corridors.

Life History

The Upper Columbia Basin consists of six major subbasins, (Crab, Wenatchee, Entiat, Chelan, Methow, and Okanogan), several smaller watersheds and the mainstem Columbia River. Five steelhead populations are recognized within the Upper Columbia DPS (Wenatchee, Entiat, Methow, Okanogan and Crab Creek populations). Steelhead also exist within smaller tributaries to the Columbia River such as Squilchuck, Stemilt, Colockum, Tarpiscan, Tekison, Quilomene/Brushy, and Foster creeks, and the Chelan River tailrace. Steelhead in these smaller tributaries are not separate populations, but are included in the closest upstream population (Upper Columbia River Spring Chinook Salmon and Steelhead Recovery Plan (UCRSRP), 2007).

Steelhead adults return to the Columbia River in late summer and early fall. Unlike spring Chinook, most steelhead do not move upstream quickly to tributary spawning streams. A portion of the returning run overwinters in the mainstem reservoirs, passing over the Upper Columbia River dams in April and May of the following year. Spawning occurs in late spring of the calendar year following entry into the Columbia River. Currently, and for the past 20+ years, most steelhead spawning in the wild are hatchery fish. Juvenile steelhead generally spend one to three years rearing in freshwater before migrating (UCRSRP, 2007), but smolt age is dominated by two year olds (62 FR43937). Some of the oldest smolt ages for steelhead, up to 7 years, are reported in this DPS. Steelhead from the Wenatchee and Entiat Rivers return to fresh water after one year in the ocean, whereas Methow River steelhead are primarily two-ocean fish (62 FR43937). Upper Columbia steelhead have a relatively high fecundity, averaging between 5,300 and 6,000 eggs (UCRSRP, 2007).

Steelhead can residualize in tributaries and never migrate to sea, thereby becoming resident rainbow trout. Conversely, progeny of resident rainbow trout can migrate to sea and thereby become steelhead. Despite the apparent reproductive exchange between resident and anandromous *O. mykiss*, the two life forms remain separated physically, physiologically, ecologically, and behaviorally. Steelhead differ from resident rainbow physically in adult size and fecundity, physiologically by undergoing smoltification, ecologically in their preferred prey and principal predators, and behaviorally in their migratory strategy (UCRSRP, 2007).

Action Area Information

Approximately 76 percent of the Wenatchee subbasin is within Okanogan-Wenatchee National Forest. Several streams and rivers inside the National Forest contain steelhead major spawning areas, including the Wenatchee River, Chiwawa River, Nason Creek, and Peshastin Creek. Within National Forest land, approximately 16 miles of the Wenatchee River, 23 miles of the Chiwawa River, 10 miles of Nason Creek, and 6 miles of Peshastin Creek contains steelhead spawning and rearing habitat.

Approximately 83 percent of the Entiat subbasin is within Okanogan-Wenatchee National Forest. Two rivers inside the National Forest contain steelhead major spawning areas, including the Entiat and Mad Rivers. Within National Forest land, approximately 12 miles of the Entiat River, and approximately 7 miles of the Mad River contains steelhead spawning and rearing habitat.

Approximately 70 percent of the Lake Chelan subbasin is within Okanogan-Wenatchee National Forest. No anadromous fish enter Lake Chelan because natural barriers prevent their upstream migration in the Chelan River, consequently steelhead do not occupy habitat inside the National Forest within the Lake Chelan subbasin.

Approximately 84 percent of the Methow subbasin is within Okanogan-Wenatchee National Forest. Four rivers inside the National Forest contain steelhead major spawning areas, including the Twisp (14 miles), Chewuch (10 miles), Lost (3.5 miles), and Methow (1.5 miles).

Approximately 21 percent of the Okanogan subbasin (U.S. portion) is within Okanogan-Wenatchee National Forest. No steelhead major or minor spawning areas are within National Forest lands.

Middle Columbia River (MCR) steelhead (Threatened)

Critical Habitat

Critical habitat was designated for Middle Columbia River steelhead on September 2, 2005 (70 FR 52630). Migratory habitat in the Columbia River mainstem downstream of this DPS is also included. Physical and biological features of critical habitat essential to listed species and the three freshswater primary constituent elements of critical habitat are detailed under the Upper Columbia River Steelhead Critical Habitat discussion.

Recent designated critical habitat on the Okanogan-Wenatchee National Forest includes the stream channels in each designated reach, and a lateral extent as defined by the ordinary high water line (Sept. 2, 2005; 70 FR 52630).

The primary 5th field watersheds containing designated critical habitat on Okanogan-Wenatchee National Forest are Little Naches, Mainstem Naches River/Rattlesnake Creek, Tieton River, Middle Fork Teanaway River/Teanaway River, Taneum Creek-Yakima River, and Swauk/Naneum Creek.

Life History

Major subbasins in this ESU inclue the Deschutes, John Day, Umatilla, Walla-Walla, Yakima, and Klickitat Rivers. Almost all steelhead populations within this ESU are summer-run fish, the exceptions being winter-run components returning to the Klickitat and Fifteen Mile Creek watersheds. A balance between 1- and 2-year-old smolt emigrants characterizes most of the populations within this ESU. Adults return after 1 or 2 years at sea.

Most fish in this ESU smolt at two years and spend one to two years in salt water before re-entering fresh water, where they may remain up to a year before spawning. Age-2-ocean steelhead dominate the summer steelhead run in the Klickitat River, whereas most other rivers

with summer steelhead produce about equal numbers of both age-1- and 2-ocean fish. Juvenile life stages (i.e., eggs, alevins, fry, and parr) inhabit freshwater/riverine areas throughout the range of the ESU. Parr usually undergo a smolt transformation as 2-year-olds, at which time they migrate to the ocean. Subadults and adults forage in coastal and offshore waters of the North Pacific prior to returning to spawn in their natal streams. A non-anadromous form of O. mykiss (redband trout) co-occurs with the anadromous form in this ESU, and juvenile life stages of the two forms can be very difficult to differentiate. In addition, hatchery steelhead are also distributed within the range of this ESU.

Recent estimates of the proportion of natural spawners of hatchery origin range from low (Yakima, Walla Walla, and John Day Rivers) to moderate (Umatilla and Deschutes Rivers). Most hatchery production in this ESU is derived primarily from within-basin stocks.

Action Area Information

Approximately 22 percent of the Yakima subbasin is within Okanogan-Wenatchee National Forest. Several streams and rivers inside the National Forest contain steelhead major spawning areas. In the Naches River drainage this includes the Middle Naches River (11 miles), Bumping River (16.5 miles), Little Naches River (24 miles), and Rattlesnake Creek (8.5 miles). In the Upper Yakima River drainage this includes forks of the Teanaway River, Cle Elum River, Taneum Creek, Manastash Creek and Swauk Creek. Actual distribution of steelhead spawning and rearing in the Upper Yakima River drainage is not well documented.

Upper Columbia River spring-run Chinook salmon (Endangered)

Critical Habitat

Critical habitat was designated for Upper Columbia Spring Chinook salmon on September 2, 2005, (70 FR 5260). Physical and biological features of critical habitat essential to listed species and the three freshswater primary constituent elements of critical habitat are detailed under the Upper Columbia River Steelhead Critical Habitat discussion. Critical habitat for the listed ESU is designated to include river reaches presently accessible in the Upper Columbia River ESU, and does not include unoccupied habitat. Critical habitat includes the stream channels within designated stream reaches and includes a lateral extent defined by the ordinary high-water line (70 FR 5260). Critical habitat includes the areas defined within the Chief Joseph, Methow, Upper Columbia/Entiat, and Wenatchee subbasins.

Life History

Spring Chinook in the Upper Columbia Basin have similar life-history characteristics to spring Chinook runs originating in the Snake River system. Adults begin entering the the mouth of the Columbia River in early spring, with the run peaking in mid-May. Spring Chinook enter the Upper Columbia tributaries from April through July. After migration, they hold in freshwater tributaries until spawning occurs in late summer, peaking in mid to late August. Juvenile spring Chinook spend a year in freshwater before migrating to sea in the spring of their second year of life. Most upper Columbia spring Chinook return as adults after two to three years in the ocean. Some precocious males, or jacks, return after one winter at seas. A few males mature sexually in freshwater without migrating to the sea. However, four and five year old fish that have spent two and three years at sea, respectively, dominate the run. Fecundity ranges from 4,200 to 5,900 eggs, depending on the age of the female (UCRSRP, 2007).

Bull Trout (Threatened)

Critical Habitat

Critical habitat was designated by the FWS for the Columbia River DPS bull trout on October 6, 2004 (69 FR 59996), and for the Coastal-Puget Sound DPS on September 26, 2005 (70 FR 56211). Lands not designated as critical habitat for bull trout include those that do not meet the requirement of needing special management or protection and are excluded due to the exercise of the Secretary of Interior's Authority under section 4(b)(2) of the ESA.

On September 21, 2004, the FWS designated 2,812 km (1,748 mi) of streams and 24,781 ha (61,235 ac) of lakes in Oregon, Idaho, and Washington as critical habitat for bull trout. Within the Columbia River Basin, 1,136 km (706 mi) of streams in Oregon and 1,186 km (737 mi) of streams in Washington were designated as critical habitat (USFWS 2004b).

The FWS determined that PACFISH, INFISH, the Interior Columbia Basin Ecosystem Management Project (ICBMP) strategy, and the Northwest Forest Plan (NWFP) Aquatic Conservation Strategy (ACS) provide conservation, adequate protection and special management for the PCEs essential for bull trout. Protection is at least comparable to designating critical habitat. As a result, those lands were not designated critical habitat as they do not meet the statutory definition. In many specific ways these plans are superior to a designation in that they require enhancement and restoration of habitat, acts not required by the designation.

On January 14, 2010, FWS issued a proposed rule to revise critical habitat designation for bull trout in the coterminous United States (75 FR 2269), and on October 18, 2010, issued a final rule (75 FR 63898). The major change from the 2004 rule was to now include occupied bull trout habitat on public lands as designated critical habitat. The final rule designated 31,750 km (19,729 mi) of streams and 197,589 ha (488,251 ac) of lakes in Idaho, Montana, Oregon, and Washington, and 754 miles of shoreline as critical habitat for bull trout.

Life History and Habitat Description

Biology

Bull trout exhibit both resident and migratory life-history strategies (Rieman and McIntyre 1993). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear.

Migratory bull trout spawn in tributary streams where juvenile fish rear one to four years before migrating to either a lake (adfluvial form), river (fluvial form) (Fraley and Shepard 1989, Goetz 1989), or in certain coastal areas, to saltwater (anadromous) (Cavender 1978; McPhail and Baxter 1996). Resident and migratory life-history forms may be found together but it is unknown if they represent a single population or separate populations (Rieman and McIntyre 1993). Either form may give rise to offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993). The multiple life-history strategies found in bull trout populations represent important diversity (both spatial and genetic) that help protect these populations from environmental stochasticity.

The size and age of bull trout at maturity depends upon the life-history strategy and habitat limitations. Resident fish tend to be smaller than migratory fish at maturity and produce fewer eggs (Fraley and Shepard 1989; Goetz, 1989). Resident adults usually range from 150 to 300

millimeters (6 to 12 inches) total length (TL). Migratory adults however, having lived for several years in larger rivers or lakes and feeding on other fish, grow to a much larger size and commonly reach 600 millimeters (24 inches) TL or more (Pratt 1985; Goetz 1989).

The largest verified bull trout was a 14.6-kilogram (32-pound) adfluvial fish caught in Lake Pend Oreille, Idaho, in 1949 (Simpson and Wallace 1982). Size differs little between life-history forms during their first years of life in headwater streams, but diverges as migratory fish move into larger and more productive waters (Rieman and McIntyre 1993).

Ratliff (1992) reported that bull trout under 100 mm (4 inches) in length were generally only found in the vicinity of spawning areas, and that fish over 100 mm were found downstream in larger channels and reservoirs in the Metolius River Basin. Juvenile migrants in the Umatilla River were primarily 100-200 mm long (4 to 8 inches) in the spring and 200-300 mm long (8 to 12 inches) in October (Buchanan et al., 1997). The age at migration for juveniles is variable. Ratliff (1992) reported that most juveniles reached a size to migrate downstream at age 2, with some at ages 1 and 3 years. Pratt (1992) had similar findings for age-at-migration of juvenile bull trout from tributaries of the Flathead River. The seasonal timing of juvenile downstream migration appears similarly variable.

Bull trout normally reach sexual maturity in 4 to 7 years and may live longer than 12 years. The species is iteroparous (i.e., can spawn multiple times in their lifetime) and adults may spawn each year or in alternate years (Batt 1996). Repeat-spawning frequency and post-spawning mortality are not well documented (Leathe and Graham 1982; Fraley and Shepard 1989; Pratt 1992; Rieman and McIntyre 1996) but post-spawn survival rates are believed to be high.

Bull trout typically spawn from late August to November during periods of decreasing water temperatures (below 9 degrees Celsius/48 degrees Fahrenheit). Redds are often constructed in stream reaches fed by springs or near other sources of cold groundwater (Goetz 1989; Pratt 1992; Rieman and McIntyre 1996). Migratory bull trout frequently begin spawning migrations as early as April and have been known to move upstream as far as 250 kilometers (km) (155 miles) to spawning grounds in Montana (Fraley and Shepard 1989; Swanberg 1997). In Idaho, bull trout moved 109 km (67.5 miles) from Arrowrock Reservoir to spawning areas in the headwaters of the Boise River (Flatter 1998). In the Blackfoot River, Montana, bull trout began spring spawning migrations in response to increasing temperatures (Swanberg, 1997). Depending on water temperature, egg incubation is normally 100 to 145 days (Pratt 1992), and after hatching, juveniles remain in the substrate. Time from egg deposition to emergence of fry may surpass 220 days. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Pratt 1992; Ratliff and Howell 1992).

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy.

Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macro-zooplankton, and small fish (Boag 1987; Goetz 1989; Donald and Alger 1993). Adult migratory bull trout feed on various fish species (Leathe and Graham 1982; Fraley and Shepard 1989; Brown 1992; Donald and Alger 1993). In coastal areas of western Washington, bull trout feed on Pacific herring (Clupea pallasi), Pacific sand lance (Ammodytes hexapterus), and surf smelt (Hypomesus pretiosus) in the ocean.

Action Area Information

Bull trout are found on the Okanogan-Wenatchee National Forest within the following fifth field and sixth field watersheds by river basins:

- *Yakima River Basin*
- Tieton River-Naches River (Lower South Fork Tieton River, North Fork Tieton River, Upper Tieton River, Middle Tieton River, Tieton River)
- Rattlesnake Creek-Naches River (Upper Rattlesnake Creek, Lower Rattlesnake Creek, Nile Creek, Lost Creek-Naches River)
- Little NachesRiver (Upper, Lower and Headwaters Little Naches River, Crow Creek, Upper and Lower American River, Upper and Lower Bumping River, and Deep Creek)
- Kachess River-Yakima River (Stampede Creek-Yakima River, Headwaters Yakima River, Kachess River, and Little Creek-Yakima River)
- Cle Elum River (Lower Cle Elum River, Middle Cle Elum River, Upper Cle Elum, Headwaters Cle Elum River, and Cooper River)
- Middle Fork Teanaway River-Teanaway River (Lower North Fork Teanaway River, Upper North Fork Teanaway River)
- *Wenatchee River Basin*
- Wenatchee River (Tumwater Canyon-Wenatchee River, Beaver Creek-Wenatchee River, Chiwaukum Creek,
- Peshastin Creek (Lower Peshastin Creek, Ingalls Creek)
- Icicle Creek (Lower Icicle, Middle Icicle, Upper Icicle Creek, Eightmile Creek, Jack Creek, French Creek)
- Nason Creek (Lower Nason, Upper Nason Creek)
- White River-Little Wenatchee River (Lake Wenatchee, Lower Little Wenatchee River, Rainy Creek, Lower White River, Napeequa River, Panther Creek)
- Chiwawa River (Lower Chewawa River, Middle Chiwawa River, Upper Chiwawa River, Headwaters Chiwawa River, Big Meadow Creek, Chikamin Creek, Rock Creek, Phelps Creek)
- *Entiat River Basin*
- Entiat River – (Potato Creek-Entiat River, Preston Creek-Entiat River, Lake Creek-Entiat River)
- Mad River – (Lower Mad River, Upper Mad River, Tillicum Creek)
- *Methow River Basin*
- Lower Methow River – (Gold Creek)
- Middle Methow River – (Lower Beaver Creek, Upper Beaver Creek, Wolf Creek, Goat Creek
- Upper Methow River – (Early Winters Creek, Cedar Creek, Rattlesnake Creek-Methow River, West Fork Methow River, Robinson Creek)
- Lost River – (Lower Lost River, Upper Lost River, Eureka Creek)
- Twisp River – (Buttermilk Creek, South Creek, Upper Twisp River, Headwaters Twisp River)
- Lower Chewuch River – (Eight Mile Creek, Twenty Mile Creek, Doe Creek-Chewuch River)
- Upper Chewuch River – (Thirymile Creek-Chewuch River, Kay Creek-Chewuch River, Lake Creek, Andrews Creek)

- *Skagit River Basin*
- Ruby Creek – (Lower Granite Creek, Lower Canyon Creek, Upper Canyon Creek)

Pygmy Whitefish (Sensitive)

Pygmy whitefish are most commonly found in cool lakes and streams of mountainous regions. They inhabit streams of moderate to swift current, and may be silty or clear. In lakes, they are frequently found in deep unproductive waters, ranging in depth from 7 to 92 meters in Washington. In shallow lakes, they appear to be more vunerable to predation from exotic fish species. The introduction of exotic opredatoers into larger, deeper lakes such as Chelan and Cle Elum has not caused extirpation of pygmy whitefish (Hallock and Mongillo, 1998).

Pygmy whitefish spawn in streams or lakes from late summer to early winter, depending upon geographic location and elevation. They probably scatter their eggs over course gravel, as do other whitefish species. Historically, pygmy whitefish resided in at least 15 lakes in Washington. Currently they inhabit only nine. The status of the populations in these lakes is not known. Their demise in six lakes is attributed to piscicides, introduction of exotic fish species and/or declining water quality. In 1978, pygmy whitefish were collected in Lake Cle Elum, and in 1980, in Lake Kachess and Lake Kecheelus (Hallock and Mongillo, 1998).

As their name implies, this species does not reach a large size and is usually less than 6 inches long. The largest specimens from Lake Chester Morse were about 8 inches long. This species might serve as a main link in the food chain, from zooplankton and insects to forage for game species. In Lake Chester Morse even the largest pygmy whitefish were eaten by bull trout (Wydosky and Whitney, 1979).

Action Area Information

Pygmy whitefish are known to inhabit Chelan, Cle Elum, Kachess, and Kecheelus Lakes within the Okanogan-Wenatchee Forest.

Umatilla Dace (Sensitive)

The distribution of Umatilla dace within the Okanogan-Wenatchee National Forest is not well documented. According to natureserve.org, Umatilla dace occur within the Okanogan and Methow River subbasins, which lie partially within the Okanogan-Wenatchee National Forest.

River Lamprey (Sensitive)

The distribution of river lamprey within the Okanogan-Wenatchee National Forest is not well documented. According to natureserve.org, river lamprey occur within the upper Yakima River subbasin, which lies partially within the Okanogan-Wenatchee National Forest.

Interior Redband/Rainbow Trout (MIS)

There has been considerable confusion in regards to natural variability and historic distribution of interior redband rainbow trout in the Columbia basin. Inland redband trout are the same species as steelhead (*O. mykiss*) and juveniles cannot be distinguished phenotypically. It is likely

that in some streams, steelhead contribute to the genetic structure of “resident” rainbow populations and conversely, “resident” rainbow trout may be contributing to steelhead runs (Proebstel 1998). Non-native coastal steelhead have contributed to the gene pools of various hatchery stock in the Middle/Upper Columbia basin since the early 1900s, and have potentially impacted populations of native resident interior redband rainbow trout. The accurate identification of relict populations of interior redband rainbow trout in the Middle/Upper Columbia basin is confounded by likely genetic interaction with non-native hatchery steelhead, rainbow, and cutthroat trout stocks. Due to these factors, it is likely that few pure indigenous native redband rainbow trout populations remain (Proebstel 1998). Isolated populations of *O. mykiss* above long standing natural passage barriers (and barring hatchery introductions) may be reasonably assumed to be resident redbands.

Redband trout are sensitive to changes in water quality and habitat. Redband trout of interior Oregon basins are believed to be best adapted to cold (less than 21° C), clean water, but a few Great Basin populations possess a hereditary basis to function at high temperatures (Behnke 1992). Adult redband trout are generally associated with pool habitats, although various life stages require a wide array of habitats for rearing, hiding, feeding, and resting. Pool habitat is important refugia during low water periods.

Spawning success decreases as fine sediment increases. The quantity and quality of pool and interstitial habitat also decrease as fine sediment increases. Other important habitat features include healthy riparian vegetation, undercut banks, and LWD (large woody debris).

Spawning occurs during the spring, generally from March to June. Redds tend to be located where velocity, depth and bottom configuration induce water flow through the stream substrate, generally in gravels at the tailouts of pools. Water temperatures influence emergence of fry, which is typically from June through July.

In 1997, genetic samples were collected from rainbow trout within the Wenatchee and Yakima River basins to determine distributions of pure and hybrid trout populations in the mid-Columbia River area. In the Wenatchee watershed, 5 sites were sampled within 4 tributaries, while in the Yakima watershed, 13 sites within 9 different streams were sampled. In the Wenatchee watershed “essentially pure” redband trout were found at 3 sites. In the Yakima watershed “essentially pure” redband trout were found at 5 sites.

Redband/rainbow/steelhead trout occupy approximately 1,165 miles of stream habitat within the Okanogan-Wenatchee National Forest (Forest fish distribution database).

Action Area Information

According to Proebstel (1997 and 1998) and Small and Dean (Draft, 2006), essentially pure redband trout have been found on National Forest in the Yakima basin (Stafford, Rattlesnake, Little Rattlesnake, Crow, Wildcat Creeks), Wenatchee basin (Peshastin River, Sand, Icicle Creeks), Entiat basin (Roaring Creek), Methow basin (Little Bridge, West Fork Buttermilk, and Goat Creeks), and Sanpoil basin (Lost Creek).

Westslope Cutthroat Trout (MIS)

Westslope cutthroat trout inhabit small mountain streams, main rivers, and large natural lakes. They require cool, clean, well-oxygenated water and prefer large pools and slow velocity areas. Juveniles of migratory populations may spend 1-4 years in their natal streams, and then move

(usually in spring or early summer, and/or in fall in some systems) to a main river or lake where they remain until they spawn (Spahr et al. 1991, Rieman and McIntyre 1995). Many fry disperse downstream after emergence (McIntyre and Rieman 1995). Juveniles tend to overwinter in interstitial spaces in the substrate. Larger individuals congregate in pools in winter.

Westslope cutthroat trout spawn in small tributary streams on clean gravel substrate where mean water depth is 17-20 cm and mean water velocity is 0.3-0.4 m/sec. They tend to spawn in natal stream (see McIntyre and Rieman 1995). Adfluvial populations live in large lakes in the upper Columbia drainage and spawn in lake tributaries. Fluvial populations live and grow in rivers and spawn in tributaries. Resident populations complete the entire life history in tributaries. All three life-history forms may occur in a single basin (McIntyre and Rieman 1995). Migrants may spawn in the lower reaches of the same streams used by resident fishes. Maturing adfluvial fishes move into the vicinity of tributaries in fall and winter and remain there until they begin to migrate upstream in spring. Of migratory spawners, some remain in tributaries during summer months but most return to the main river or lake soon after spawning (Behnke 1992).

Westslope cutthroat trout are native to the upper Missouri River drainage in Montana, extreme northwestern Wyoming, and southern Alberta; the Salmon, Clearwater, and Spokane (including the Coeur d'Alene and St. Joe drainages) river drainages in Idaho; and the Clark Fork and Kootenai river drainages in Idaho, Montana, and British Columbia (Spahr et al. 1991); also westward to the Cascade Mountains as disjunct populations, for example, in the Lake Chelan drainage in Washington, the John Day River drainage in Oregon (where limited hybridization with redband trout apparently has occurred), and elsewhere in mid-Columbia tributaries (Behnke 1992), including the Methow, Entiat, Wenatchee, and Yakima River Basins in Washington (McIntyre and Rieman 1995, Duff 1996). The upper Yakima, Wenatchee, Methow, Lake Chelan, and Pend Oreille drainages, respectively, have the highest occupancy. A high percentage of cutthroat populations may be the result of introductions (Duff 1996). Stocking programs for westslope cutthroat trout in Washington date back to 1903, with the brood sources likely originating from Lake Chelan or the Wenatchee River drainage (Duff 1996). Much of the historic distribution of endemic westslope cutthroat trout in Washington is muddied because of the extensive stocking of alpine lakes and the subsequent colonization of tributary streams (Duff 1996).

In 1992 and 1993, Proesbstel sampled trout that were collected from 142 sites in the Methow, Wenatchee, and Entiat river basins to determine the distribution of pure and hybrid trout populations in the mid-Columbia River area. In the Methow watershed, 84 sites were sampled within 32 different tributaries and 4 lakes. In the Wenatchee watershed, 41 sites were sampled within 28 tributaries, while in the Entiat watershed, 17 sites within 11 different streams were sampled. “Pure or essentially pure” westslope cutthroat trout were found in 9 sites in the Methow, 10 sites of the Wenatchee, and 3 sites in the Entiat watersheds, respectively (Proebstel 1997). In the remaining sites with westslope cutthroat, specimens were questionable, suggesting that historic gene flow with other cutthroat trout races or, perhaps, rainbow trout has occurred (Proebstel 1997).

In 1997, samples were taken from the Wenatchee and Yakima River basins to determine the distribution of pure and hybrid trout populations in the mid-Columbia River area. In the Wenatchee watershed, 5 sites were sampled within 4 tributaries, while in the Yakima watershed, 13 sites within 9 different streams were sampled. In the Wenatchee watershed “essentially pure” westslope cutthroat trout were found at 2 sites. In the Yakima watershed “essentially pure” westslope cutthroat trout were found at 9 sites.

In 1998, Trotter et al (1999) sampled trout from 11 Yakima River Basin tributaries (10 cutthroat trout, and one rainbow trout population) to determine the distribution of pure and hybrid trout populations in the mid-Columbia River area. Five of the cutthroat trout populations were genetically pure westslope cutthroat. Three of those streams are on National Forest lands. Rainbow trout sampled from Cooke Creek (stream not on National Forest lands) contained a mixture of pure redband trout (75 percent of the sample) and coastal rainbow trout, with no hybrid individuals being found.

Cutthroat trout occupy approximately 1,353miles of stream habitat within the Okanogan-Wenatchee National Forest (Forest fish distribution database).

Action Area Information

According to Proebstel (1997 and 1998) and Trotter et al (1999), essentially pure westslope cutthroat trout on National Forest lands have been found in the: Yakima basin (Stafford, Naneum, Silver, Big, Cabin, Meadow, Cold, Oak, Rattlesnake, Little Rattlesnake, Wildcat, Crow Creeks); Wenatchee basin (Sand, Icicle, Phelps, Buck, Smith, Nason, Lost, Rainy, Snowy Creeks and Fish Lake Creek tributary, Peshastin and Little Wenatchee Rivers); Entiat basin (Cougar and Tommy Creeks); and Methow basin (Foggy Dew, Upper Eagle, North, Cutthroat, Robinson, Early Winters Creeks, Chewuch River, West Oval and Tungsten Lakes). The Lake Chelan basin was not sampled by Proebstel (1997), and may contain populations of bull trout, and westslope cutthroat trout (redband trout were not native above Chelan Falls).

Sockeye Salmon (MIS)

Lake-Type sockeye salmon typically spawn in inlet or outlet tributaries of lakes or along lake shorelines where upwelling of oxygenated water through gravel or sand occurs. In Washington, juveniles normally rear in lakes residence 1 or 2 years prior to migrating to the ocean. While in the lacustrine environment, fry and yearling feed primarily on copepods and insect larvae (Gustafson et. al, 1997).

Historical populations of sockeye salmon occurred in the Yakima, Wenatchee, and Okanogan Rivers. Populations that existed in the upper Yakima River (Keechelus, Cle Elum, and Kachess Lakes), and the upper Bumping River (Bumping Lake) were extirpated in the early 1900s after the construction of impassible storage dams on each of these natural lakes (Gustafson et. al, 1997). Currently, sockeye salmon occupy approximately 58 miles of stream/lake habitat within the Okanogan-Wenatchee National Forest (Forest fish distribution database).

The native population of sockeye in Lake Wenatchee was severely depleted during the early 1900s, with returns between 889 and 29 fish. Adult returns to Lake Wenatchee averaged approximately 19,000 fish annually between 1992-1996 (Gustafson et. al, 1997).

To preserve a portion of sockeye salmon stocks blocked by Grand Coulee Dam, the Grand Coulee Fish Maintenance Project trapped all sockeye salmon at Rock Island Dam between 1939 and 1943 and relocated them to Lakes Wenatchee or Osoyoos and to three national fish hatcheries for propagation. Numerous descendants of propagated sockeye salmon trapped at Rock Island and Bonnevilee Dams, together with progeny of Quinault Lake sockeye salmon, were stocked into Lakes Wenatchee and Osoyoos between 1940 and 1968. The current Wenatchee Lake population may consist of some mixture of native and non-native fish (Gustafson et. al, 1997).

During operation of the Grand Coulee Fish Maintenance Project, sockeye salmon fry and fingerlings were released in the Methow and Entiat Rivers, and currently small numbers of sockeye salmon are consistently seen each year in these rivers. Prior to this, the Washington Department of Fisheries stated that fluvial sockeye salmon populations were not present in these rivers (Gustafson et. al, 1997).

Action Area Information

Sockeye salmon are found on the Okanogan-Wenatchee National Forest within the following fifth field and sixth field watersheds by river basins:

- *Wenatchee River Basin*
- Wenatchee River (Tumwater Canyon-Wenatchee River, Beaver Creek-Wenatchee River, ,
- Icicle Creek (Lower Icicle)
- White River-Little Wenatchee River (Lake Wenatchee, Lower Little Wenatchee River, Lower White River, Upper White River, Napeequa River)

- *Entiat River Basin*
- Entiat River – (Potato Creek-Entiat River, Preston Creek-Entiat River, Lake Creek-Entiat River)

Plants

Table C-16 Region 6 Regional Forester's Special Status Species Documented or Suspected to Occur on the Okanogan-Wenatchee National Forest (2011) with habitats and risk from invasive plants. Includes some former Sensitive species documented on the Forest (SOLI – Species of Local Interest).

	Vascular Species				
Scientific Name Common name	**RFSSS Status**	**State Status**	**Presence on Forest**	**Risk**	**Habitat**
Agoseris elata Tall Agoseris	SOLI	Sensitive	Documented (D)	MID	Moist to dry meadows, open woods, and exposed rocky ridge tops on various aspects between 2900 and 7800'.
Agoseris lackschewitzii Pink Agoseris	SOLI	Review Group 2	D	MID	Moist to dry meadows, open woods, and exposed rocky ridge tops various aspects from 2900 and 7800'.
Agrostis mertensii Northern Bentgrass	Sensitive	Sensitive	D	LOW	Mainly alpine meadows above 7000' elevation. Mesic to moist meadow habitats near streams and wetlands.
Anemone nuttalliana Pasqueflower	SOLI	Threatened	D	MID	Prairies, open meadows, and mountain slopes mostly on well drained soil. 5700' to 6000'.
Antennaria parvifolia Nutall's Pussy-toes	Sensitive	Sensitive	D	HIGH	Dry, open places, openings in Ponderosa pine forests, on sand and gravel substrates, often riparian in the foothills of the Columbia basin.
Astragalus arrectus Palouse Milk-vetch	Sensitive	Threatened	D	HIGH	Regional endemic to Columbia basin, Palouse, and west-central ID. Grassy hillsides, sagebrush flats, river buffs to open PIPO forests.
Astragalus microcystis Least Bladdery Milk-vetch	Sensitive	Sensitive	Suspected (S)	HIGH	In eastern Washington, on gravelly to sandy areas from riverbanks to open woods from 1400' to 6200' elevation.
Botrychium ascendens Upward-lobed Moonwort	Sensitive/ Federal Species of Concern	Sensitive	D	MID	From 2100' to 6000' in moist microsites; meadows ,and moist deciduous and conifer forests,
Botrychium crenulatum Crenulate Moonwort	Sensitive/ Federal Species of Concern	Sensitive	D	MID	Moist riparian habitats from 3100' to 5800' in elevation. .
Botrychium hesperium Western Moonwort	Sensitive	Threatened	D	MID	Moist to dry meadows from low elevation prairies to alpine meadows. Documented at 6900'.
Botrychium lineare Slender Moonwort	Sensitive/ Federal Species of Concern	Threatened	S	MID	Associated with moist to dry meadows from low elevation prairies to alpine meadows.
Botrychium montanum Mountain Moonwort	SOLI	Watch List	D	MID	Moist shady forests of western red-cedar and spruce/ sub-alpine fir, red-osier dogwood thickets, riparian areas along streams, pond margins, and seeps. Also found along open canopy, grassy Meadows and trail edges.
Botrychium paradoxum	Sensitive/	Threatened	D	MID	Associated with dry meadows in floodplains in gentle to flat terrain between 5600' and 6450' elevation. In other areas of the state it is found

	Vascular Species				
Scientific Name Common name	**RFSSS Status**	**State Status**	**Presence on Forest**	**Risk**	**Habitat**
Twin-spiked Moonwort	Federal Species of Concern				between 2800' and 6550' elevation in a variety of habitats which include sagebrush (Artemisia) habitat, dry meadow communities associated with floodplains and stream terraces, and moist coniferous forests in association with western red cedar (THPL), western hemlock, (TSHE), and grand fir (ABGR).
Botrychium pedunculosum Stalked Moonwort	Sensitive/ Federal Species of Concern	Sensitive	S	MID	Known sites in the state occur between 2460' and 6200' elevation in moist riparian areas, and moist to dry meadows.
Carex atrosquama (C. atrata var. atrosquama) Blackened Sedge	Strategic	Review Group 1	D	LOW	Wet to moist soils along outlet streams, in wet subalpine and alpine meadows above 6100'.
Carex capillaris Hair-like Sedge	Sensitive	Sensitive	D	LOW	Moist meadows along sandy lake shores from 3800' to 6500'. Also stream banks and wet ledges in moderate to high elevations up to about treeline.
Carex chordorrhiza Cordroot Sedge	Sensitive	Sensitive	D	LOW	Wetland at 4480' in the Subalpine fir forest zone.
Carex comosa Bristly Sedge	Sensitive	Sensitive	D	LOW	Associated with floating mats of vegetation in muck and peat wetlands. Marshes, lake-shores, and wet meadows from 50' to 2000' elevation.
Carex gynocrates Yellow Bog Sedge	Sensitive	Sensitive	D	LOW	Sphagnum bogs, forested wetlands and other wet marshy places between 2600' and 3800'.
Carex heteroneura var. *epapillosa* Blackened Sedge	Sensitive	Sensitive	D	MID	Stream margins in open forests and moist meadows in the subalpine to alpine zones.
Carex macrochaeta Large-awned Sedge	Sensitive	Threatened	S	LOW	Moist or wet, open places, seepage areas, around waterfalls, in wet meadows, and along streams and lakes.
Carex magellanica ssp. irrigua Poor Sedge	Sensitive	Sensitive	D	LOW	Fens, bogs, shady wet meadows, shrub wetlands, and marshes, often growing in peat soil, at 1640 to 7000 ft (500 to 2134 m) elevation.
Carex media (C. norvegica) Intermediate Sedge	Sensitive	Sensitive	D	LOW	Wet stream banks, subalpine and alpine rich moist forb meadows. .
Carex pauciflora Few-flowered Sedge	Sensitive	Sensitive	S	LOW	Associated with Western hemlock, Mt Hemlock, Western red cedar, and Pacific silver fir.
Carex proposita Great Smokey Mt. Sedge	Sensitive	Threatened	D	LOW	Rocky alpine and subalpine habitats often at treeline.
Carex rostrata Beaked Sedge	Sensitive	Sensitive	S	LOW	Around ponds and swampy meadows, mid to high elevations.
Carex saxatilis var. *major* Rock Sedge	SOLI	Watch List	D	LOW	Above 5000' in shallow wetlands, bogs, margins of ponds and streams with shallow standing water. Sites may become dry during drought years.
Carex scirpoidea ssp. scirpoidea Canadian Single-Spike Sedge	Sensitive	Sensitive	D	LOW	Moist alpine meadows bordering talus slopes, dry to moist meadows, and talus with some soil development between 5900' and 7600'.

	Vascular Species				
Scientific Name Common name	**RFSSS Status**	**State Status**	**Presence on Forest**	**Risk**	**Habitat**
Carex stylosa Long-styled Sedge	Sensitive	Sensitive	S	LOW	Saturated and seasonally flooded fibrous and sphagnum peat soils or sloping wetlands with surface seepage, silver fir and mountain hemlock zone.
Carex sychnocephala Many-headed Sedge	Sensitive	Sensitive	D	MID	Associated with permanently saturated, moist, or wet soils along lake shores and marshes from 1000' to 3000' elevation.
Carex tenuiflora Sparse-leafed Sedge	Sensitive	Threatened	D	LOW	At 5800' in a bog/fen wetland.
Carex vallicola Valley Sedge	Sensitive	Sensitive	D	HIGH	Moist to moderately dry slopes from the foothills to moderate elevations in the mountains, often with sagebrush or aspen.
Castilleja cryptantha Obscure Indian Paintbrush	Sensitive/ Federal Species of Concern	Sensitive	D	LOW	High elevation meadows.
Chaenactis thompsonii Thompson's chaenactis	Sensitive	Sensitive	D	MID	Mid-montane forest habitats with ABLA, PSME, and/or PIAL.
Claytonia lanceolata ssp. *pacifica* Pacific lance-leaved springbeauty	Sensitive	Threatened	S	LOW	Subalpine
Coeloglossum viride Long-bract frog orchid	Sensitive	Sensitive	D	LOW	Mesic to wet forests, grassy slopes, shores, bogs and swamps in the lowland and mountain zones.
Chrysosplenium tetrandrum Northern Golden-carpet	Sensitive	Sensitive	D	MID	Found in gentle terrain along steam banks and seeps or other wet sites in forests with densely vegetated creek bottoms, damp mossy hummocks.
Cicuta bulbifera Bulb-bearing Water Hemlock	Sensitive	Sensitive	D	MID	Between 1930'-3700' in elevation in muck soils or standing water associated with marshes, stream, lake, or pond margins where *Carex utriculata* is often the dominant sedge.
Coptis aspleniifolia Spleenwort-leaved Goldthread	Sensitive	Sensitive	S	LOW	Pacific silver fir (Abies amabilis) and Mountain hemlock (*Tsuga mertensiana*) forest habitats.
Cryptogramma stelleri Steller's Rockbrake	Sensitive	Sensitive	D	LOW	Seeps and moist shaded places in cliff crevices in moderate to steep slopes 3000' to 6000'
Cypripedium fasciculatum Clustered Lady's Slipper	SOLI	Sensitive	D	HIGH	In moist to rather dry and rocky open coniferous forests east of the Cascades.
Cypripedium parviflorum Yellow Lady's Slipper	Sensitive	Threatened	D	MID	Bogs, wet forest habitats, and in the channeled scablands of eastern WA., around ponds and in low, moist areas, generally in close association with red osier dogwood and aspen between 2100' and 3440' elevation.
Delphinium viridescens Wenatchee Larkspur	Sensitive/ Federal Species of Concern	Threatened	D	HIGH	This is a Wenatchee Mountain endemic found in dry Ponderosa pine/Douglas fir forests in mesic to moist sites.

	Vascular Species				
Scientific Name Common name	**RFSSS Status**	**State Status**	**Presence on Forest**	**Risk**	**Habitat**
Draba aurea Golden Draba	Sensitive	Sensitive	D	LOW	Well drained alpine meadows that are seasonally moist, krummholz, dry meadow, and talus slope habitats between 6800' to 7400'. Favors southerly aspects.
Draba cana Lance-leafed Draba	Sensitive	Sensitive	D	LOW	Alpine fell fields on mid to upper slopes frequently in steep terrain from 5900' to 7800', dry rocky exposures.
Dryas drummondii var. *drummondii* Yellow Mountain Avens	Sensitive	Sensitive	S	MID	In calcium rich areas between 2000' and 6750' in elevation, in open gravelly areas often above treeline or at lower elevations along streams.
Erigeron salishii Salish Fleabane	Sensitive	Sensitive	D	LOW	Alpine species found on typically flat, southerly exposed ridge lines, mountain tops, fell fields, and upper slopes from 6800' to 8690'.
Eriophorum viridicarinatum Green-keeled Cottongrass	Sensitive	Sensitive	D	LOW	At 6000' elevation in fens/bogs, wet meadows, and wetland margins.
Eritrichium nanum var. elongatum Pale Alpine Forget-me-not	Sensitive	Sensitive	D	LOW	Alpine ridges in relatively stable granitic scree. Associated with alpine cushion plant communities on gentle slopes, in exposed gravelly soil between 7300'-8300'.
Eurybia merita Arctic aster	Sensitive	Sensitive	S	LOW	Subalpine
Gentiana douglasiana Swamp gentian	Sensitive	Sensitive	D	LOW	Subalpine – alpine species, in relatively shaded moist meadows, bogs, and ephemeral seeps. Associated with conifers and alpine forbs on gentle slopes between 3000 and 7000 ft elevation.
Gentiana glauca Glaucous Gentian	Sensitive	Sensitive	D	LOW	Wetland transition zones on hummock topography, seeps, wetlands in basins and on alpine benches between 6800 and 8000'.
Gentianella tenella ssp. *tenella* Slender Gentian	Sensitive	Sensitive	D	LOW	Subalpine and alpine meadows and wetlands with gently sloping terrain between 6800' and 7100', on southerly aspects.
Geum rivale Water Avens	Sensitive	Sensitive	D	LOW	Open lodgepole pine and Engleman spruce at 6440'.
Geum rossii var. depressum Ross's Avens	Sensitive	Endangered	D	LOW	High elevation alpine or krummholz habitat.
Githopsis speculariodes Common Blue-cup	N/A	Sensitive	D	HIGH	Dry hillsides in the transition zone between shrub steppe and dry forest.
Hackelia hispida var. disjuncta Sagebrush Stickseed	Sensitive	Sensitive	D	HIGH	Dry forest and shrub steppe habitats, often in rocky bluffs and cliff micro-habitats. Rocky talus between600 and 2100 feet.
Hackelia tayloria (H. sp. novum) Taylor's Stickseed	Strategic	Threatened	D	LOW	High elevation
Hackelia venusta Showy Stickseed	Federally Endangered	Endangered	D	HIGH	Found in dry open bunchgrass forest habitats, and adjacent cliffs.
Heterotheca oregona var. *oregona* Oregon Goldenaster	Sensitive	Threatened	D	HIGH	Sand and gravel bars along rivers. In Washington, this species was found on a sandy riverbank at the edge of a Douglas fir-ponderosa pine forest at 2600 ft.
Howellia aquatilis Howellia	Federally Threatened	Threatened	S	MID	Small, vernal ponds, although some of the ponds may retain water throughout the year. Soils are rich in organic matter and frequently contain partially decomposed leaves, stems, and wood, between 10' and 2300'

	Vascular Species				
Scientific Name Common name	**RFSSS Status**	**State Status**	**Presence on Forest**	**Risk**	**Habitat**
Illiamna longisepala Longsepal Globemallow	Sensitive	Sensitive	D	HIGH	Sagebrush/bitterbrush steppe to ponderosa pine forests in the low to mid elevations between 500' to 4500'. Dry, open hillsides, gravelly streamsides and open ponderosa pine forests.
Juncus howellii Howell's Rush	Sensitive	Threatened	D	MID	Moist area at the base of a basalt cliff at 2840 ft.
Loiseleuria procumbens Alpine Azalea	Sensitive	Threatened	D	LOW	Above 6000' in heather communities.
Luzula arcuata ssp. *unalaschcensis* Curved Woodrush	Sensitive	Sensitive	D	LOW	Above 7000' in moist boulder talus crevices above timberline and often near mountain summits.
Lycopodium dendroideum Treelike Clubmoss	Sensitive	Sensitive	S	MID	Between 800' and 3650' in the moist forests.
Mimulus patulus Stalk-leaved Monkey-flower	Strategic	Threatened	D	MID	Ephemeral seeps, moist basalt, and very fine gravel on top of bedrock in a small drainage from 1000 to 2000 feet elevation.
Mimulus pulsiferae Pulsifer's Monkey-flower	Sensitive	Sensitive	D	MID	Found in seasonally moist rock out crops and moist depressions in flat terrain in ponderosa pine and dry Douglas-fir forest types. In seasonally moist, open places often in exposed mineral soil from the foothills and valleys to the mid elevations east of the Cascades.
Mimulus suksdorfii Suksdorf's Monkey-flower	Sensitive	Sensitive	D	LOW	Known from a steep talus and scree slope above timberline at 7100' with a south aspect. It is suspected to occur in wet to dry open places from the lowlands to high in the mountains.
Montia diffusa Branching montia	Sensitive	Sensitive	D	MID	Moist forests at lower elevations
Nicotiana attenuata Coyote Tobacco	Sensitive	Sensitive	D	HIGH	Dry sandy bottom lands, dry rocky washes, and in other dry open places from 400' to 10,000'. Has been reported to occur with *Elymus cinereus* and common weedy species such as mullein (VETH), knapweed (CEDI), Russian thistle (SAKA), and cheatgrass (BRTE).
Oxytropis monticola Slender Crazyweed	Sensitive	Sensitive	S	MID	Documented in alpine habitat in N. Central WA. Suspected habitat is wide ranging from mesic to dry meadows, grassy slopes, sandy or gravelly riverbanks and terraces, and forest opening from lowlands and steppe to alpine zones.
Packera porteri Porter's Butterweed	Strategic	Sensitive	D	LOW	In Washington this species was found on an un-glaciated nunatak (a hill or mountain once surrounded by glacial ice) in deposited volcanic sediments and shifting talus at 7800 feet.
Parnassia kotzebuei Kobzebue's Grass-of-Parnassus	Sensitive	Threatened	D	LOW	4800' to 6700' elevation on north aspects in moderate to steep terrain associated with cliff edges and at the base of talus slopes in moist seeps.
Pedicularis rainierensis Mt. Rainier Lousewort	Sensitive	Sensitive	D	MID	Moist alpine meadows, open coniferous forests, and on rocky slopes. Often it grows near streams, and it is known to occur throughout some lake basins.
Pellaea brachyptera	Sensitive	Sensitive	D	HIGH	Known from 1100' to 2500' elevation in the state. Habitat is associated with dry rocky

	Vascular Species				
Scientific Name Common name	**RFSSS Status**	**State Status**	**Presence on Forest**	**Risk**	**Habitat**
Sierra Cliff-brake					slopes low to mid elevations in open bunchgrass communities with scattered ponderosa pine.
Pellaea breweri Brewer's Cliff-brake	Sensitive	Sensitive	D	LOW	7500', rock crevices, ledges, and talus slopes. Less often in open rocky soil form the foothills to about treeline, on serpentine in WA.
Penstemon eriantherus var. *whitedii* Whited's Penstemon	Sensitive	Sensitive	D	HIGH	West facing slopes of small canyons, and in dry and rocky habitats in the foothills of the Cascade Range and in the Columbia Basin from 525 to 3835 feet.
Petrophytum cinerascens Chelan Rockmat	Sensitive/ Federal Species of Concern	Endangered	D	MID	Only known from gneissic cliffs along the Columbia River in dry rocky habitat.
Phacelia minutissima Dwarf Phacelia	Sensitive/ Federal Species of Concern	Endangered	D	MID	Found at mid elevations in the mountains.
Physaria didymocarpa var. *didymocarpa* Common Twinpod	Sensitive	Sensitive	D	HIGH	Dry forest. .
Pilularia americana American Pillwort	Sensitive	Threatened	D	MID	Middle zones of vernal pools from 1930 to 2310 feet (588-704 meters) elevation.
Pinus albicaulis Whitebark pine	Sensitive		D	LOW	Alpine species, frequently found on dry southern exposures and exposed windswept ridges, often on very thin soils. 4,000 to 11,000 feet elevation
Platanthera chorisiana Choris' Bog-orchid	Sensitive	Threatened	S	LOW	Wettest regions of sphagnum bogs and along streamsides, and on moss-covered rocks. 2540 - 4300 ft.
Platanthera obtusata Small Northern Bog-orchid	Sensitive	Sensitive	D	MID	Damp to wet places in forests, marshes, bogs, meadows, and along streambanks. 800' to 5000'.
Platanthera sparsiflora Canyon bog-orchid	Sensitive	Threatened	D	MID	Open wet areas, seeps, bogs at low to mid elevations.
Polemonium viscosum Skunk Polemonium	Sensitive	Sensitive	D	LOW	Above 6300', favors flat to gentle terrain in alpine talus, fell fields in glacial cirques, summits, and shoulder slopes.
Potamogeton filiformis var. occidentalis Western Fineleaf Pondweed	SOLI	Review Group 1	D	LOW	Shallow, standing, or slow moving water. 1074 to 3550 feet.
Potentilla nivea Snow Cinquefoil	Sensitive	Sensitive	D	LOW	Found above 7000' on flat to gently sloping topography in alpine meadows, fell fields, and rock outcrops along alpine ridges and summits
Pulsatilla patens ssp. *multifida* Cutleaf anemone	Sensitive	Threatened	D	HIGH	Ponderosa pine communities, dry hillsides.
Pyrrocoma hirta var. *sonchifolia* Sticky Goldenweed	Sensitive	Sensitive	D	MID	Meadows and open wooded slopes in the foothills, at moderate elevations. 4700 ft in Washington.

	Vascular Species				
Scientific Name Common name	**RFSSS Status**	**State Status**	**Presence on Forest**	**Risk**	**Habitat**
Ranunculus pygmaeus Dwarf Buttercup	SOLI	Review Group 1	D	LOW	Moist to wet seepage sites, snowbeds, shady ledges and scree slopes in the subalpine and alpine zones.
Ribes oxyacanthoides ssp. *irriguum* Idaho Gooseberry	Sensitive	Threatened	D	MID	Along streams, meadow openings, and slopes of moist to dry canyons 3000 to 5000 feet.
Rotala ramosior Lowland Toothcup	Sensitive	Threatened	D	MID	Damp areas in fine sand and silt. Wet, swampy places, lakes and pond margins, and along free flowing river reaches between 200 to 2259 ft.
Rubus arcticus ssp. *acaulis* Nagoonberry	Sensitive	Threatened	D	LOW	Open wetlands and wet meadows within spruce dominated forests at 5900'.
Salix glauca ssp. *glauca* var. *villosa* Glaucous willow	Sensitive	Sensitive	D	LOW	Perennial streams, stream banks, and marshes in draws, floodplains, and glacial cirques and valleys between 5200' and 5850' in gentle to flat topography.
Salix maccalliana Maccall's Willow	Sensitive	Sensitive	D	MID	Bogs, fens, swamps, and marshes in open, low-lying sites. 2400 to 3000 feet.
Salix pseudomonticola False mountain willow	Sensitive	Sensitive	S	LOW	Moist fens, treed bogs, and river floodplains.
Salix tweedyi Tweedy's Willow	SOLI	Sensitive	D	MID	Along streams in glacial valleys and cirques with gentle sloping topography, and perennially wet areas associated with springs, seeds, fens, bogs, and lakeshores between 4620' and 7200' in elevation.
Sanicula marilandica Black Snake-root	Sensitive	Sensitive	D	MID	Moist floodplains and woods, marsh edges and old riverine channels in gentle to flat topography with silty and sandy river bottoms, between 1800' and 3400'.
Saxifraga cernua Nodding Saxifrage	Sensitive	Sensitive	D	LOW	Boulder talus above 6500' in thin moist soils and moist scree.
Saxifraga rivularis Pygmy Saxifrage	SOLI	Sensitive	D	LOW	Damp cliffs, rock crevices, and talus near snowbanks, and alpine slopes, cracks, and shaded cliffs. Elevation from 6000-7000 ft .
Saxifragopsis fragarioides Strawberry Saxifrage	Sensitive	Threatened	D	HIGH	Dry forest.
Sidalcea oregana var. *calva* Wenatchee Mt Checker-mallow	Federally Endangered	Endangered	D	HIGH	Dry forest and moist meadows, stream margins generally within ponderosa pine forest.
Silene sargentii Sargent's Catchfly	Strategic	Review Group 1	D	LOW	Subalpine and alpine forest.
Silene seelyi Seely's Silene	Sensitive/ Federal Species of Concern	Sensitive	D	MID	Shaded crevices in ultramafic to basaltic cliffs and rock outcrops, and occasionally among boulders in talus. Occurs from 1500 to 6300 feet in elevation.
Sisyrinchium sarmentosum Pale blue-eyed grass	Sensitive	Threatened	S	MID	Occurs primarily in open wet meadows, sometimes in association with perennial streams and within a mosaic that includes coniferous forested wetlands, grasses and sedges commonly dominate the habitats. 2100 to 6100 feet elevation.
Sisyrinchium septentrionale Blue-eyed Grass	SOLI	Sensitive	D	MID	Open wet meadows, along perennial streams, and wetlands within coniferous forests, between 2100' and 6100'.
Spiranthes diluvialis	Federally Threatened	Endangered	S	MID	Floodplains, channels, streambanks, springs, seeps, lake and pond margins where soils are likely alkaline, periodically flooded, and moist

	Vascular Species				
Scientific Name Common name	**RFSSS Status**	**State Status**	**Presence on Forest**	**Risk**	**Habitat**
Ute Ladies'-tresses					throughout the growing season. Elevations range between1500' and 7000'.
Spiranthes porrifolia Western Ladies-tresses	Sensitive	Sensitive	D	LOW	Between 5400' and 6800' in glacial cirque wetlands, bogs, and fens. Also in vernally moist seeps in otherwise dry rocky habitats.
Talinum sediforme Okanogan Flameflower	SOLI	Watch List	D	LOW	Rocky exposed slopes and ledges in the lower mountains of Okanogan county. Most sites are between 2700' and 4000' elevation with a few sites documented as high as 6000'. Mostly on thin soils over exposed rock.
Trifolium thompsonii Thompson's Clover	Sensitive/ Federal Species of Concern	Threatened	D	HIGH	Endemic to southeastern Chelan County and adjacent Douglas County, WA. Open grassland and open ponderosa pine forest.
Utricularia minor Lesser Bladderwort	Strategic	Review Group 1	D	LOW	Low nutrient lakes and peatbog pools in the lowland and montane zones at elevations from 135 to 4000.
Vaccinium myrtilloides Velvet-leaf Blueberry	Sensitive	Sensitive	D	LOW	Mid-slope in open semi-mature Engleman spruce forests in a well developed moss layer at around3500'. Dry to moist, sandy or rocky clearings and open woods, sphagnum bogs, and swamps.
Viola renifolia Kidney-leaved violet	Sensitive	Sensitive	D	MID	Generally found in moist forested sites, and sometimes along ditches or streams. May be found from lowland coniferous forest to subalpine slopes.

Region 6 Survey and Manage Species (2011) documented or suspected on the Forest.

Species	**Category**	**Forest**	**Invasives risk**	**Habitat**
Botrychium montanum Mountain moonwort VASCULAR PLANT	Category A	D	LOW	Dark coniferous forests, usually with *Thuja plicata*. Near streams and swamps from 3300 to 9800 ft elevation.
Schistostega pennata MOSS	Category A	D	LOW	On mineral soil in shaded pockets of overturned tree roots, often with shallow pools of standing water at the base of the root wad. It also grows attached to rock or mineral soil around the entrance to caves, old cellars and animal burrows.
Tritomaria exsectiformis LIVERWORT	Category B	D	LOW	Dry to moist, partially shaded soil or litter and soil in rock crevices. Also on rock and decaying wood. One site is next to a low gradient stream in a subalpine cirque basin.
Tetraphis geniculata MOSS	Category A	S	LOW	Moist coniferous forest with large down logs, and occasionally on peaty banks in moist coniferous forests from sea level to subalpine elevations.
Dendriscocaulon intricatulum LICHEN	Category B	S	LOW	Mesic to moist forests in the upper western hemlock and lower pacific silver fir zone (30-2170'). Primarily in mature and old-growth Douglas-fir, hemlock, and pacific silver fir where it is epiphytic on lower twigs of suppressed understory hemlock and pacific silver fir. Less frequently on subalpine fir.

Leptogium burnetia var *hirsutum* LICHEN	Category A	S	LOW	Infrequent over trees and rare over mossy outcrops in sheltered intermountain forests.
Leptogium cyanescens LICHEN	Category A	D	LOW	Tree bark of both conifers and hardwoods, logs, mossy rocks in sheltered humid, cool microsites of intermountain forests.
Nephroma bellum LICHEN	Category F	D	LOW	Restricted to moist forests with strong Pacific coastal influence. Substrate is often riparian hardwoods.
Peltigera pacifica LICHEN	Category E	S	LOW	Mossy logs, tree bases, soil and rocks in low elevation moist forest habitats.
Tholurna dissimilis LICHEN	Category B south of the Columbia River	D	LOW	On twigs and branches of exposed conifers in humid subalpine and alpine habitats. Mostly on exposed subalpine ridges and peaks, occasionally at low to mid elevations in cool moist sites.
Albatrellus ellisii FUNGI	Category B	D	LOW	On ground, under conifers.
Clavariadelphus occidentalis FUNGI	Category B	D	LOW	On soil or duff under conifers or mixed coniferous deciduous forest.
Clavariadelphus sachalinensis FUNGI	Category B	D	LOW	On soil or duff under mixed conifers. Moist forests or riparian zones.
Cudonia monticola FUNGI	Categoru B	D	LOW	On *Picea* needles and conifer debris.
Gomphus bonarii FUNGI	Category B	D	LOW	Hidden in deep humus under *Pinus* and *Abies* species.
Gomphus kauffmanii FUNGI	Category B	D	LOW	Hidden in deep humus under *Pinus* and *Abies* species.
Leucogaster citrinus FUNGI	Category B	D	LOW	Found in association with roots of *Abies concolor, A. lasiocarpa, Pinus contorta, P. monticola, Pseudotsuga menziesii, and Tsuga heterophylla* from 280 meters to 200 meters in elevation.
Ramaria amyloidea FUNGI	Category B	D	LOW	On humus or soil under *Abies* spp., *Pseudotsuga menziesii,* and *Tsuga heterophylla.*
Ramaria aurantiisiccescens FUNGI	Category B	D	LOW	On humus or soil under *Abies* spp., *Pseudotsuga menziesii,* and *Tsuga heterophylla.*
Ramaria largentii FUNGI	Category B	D	LOW	Fruits in humus or soil and matures above the surface of the ground. Associated with *Abies* species, *Pinus monticola*, *Pseudotsuga menziesii*, and *Tsuga heterophylla*.
Ramaria rubrievanescens FUNGI	Category B	D	LOW	In humus or soil. Associated with Pinaceae species.
Ramaria rubripermanens FUNGI	Category B	D	LOW	In humus or soil. Associated with Pinaceae species.
Sarcodon fuscoindicus FUNGI	Category B	D	LOW	On the ground in association with *Tsuga* and Pinaceae species.
Spathularia flavida FUNGI	Category B	D	LOW	In clusters or fairy rings on litter or woody debris of conifer and hardwood forests.