APPENDIX C

BRIEF LIFE HISTORY NARRATIVES FOR BOTANICAL, WILDLIFE, AND FISH

SPECIES OF LOCAL INTEREST

Olympic National Forest

USDA Forest Service
Region Six, Pacific Northwest

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Life History Descriptions for Botanical, Wildlife and Fish Species of Local Interest on the Olympic National Forest

Appendix C provides life history and habitat information for the many botanical, wildlife and fish Species of Local Interest (SOLI) on the Olympic National Forest (Forest). SOLI's are: federally listed and Forest Service sensitive species (including species proposed for listing); Management Indicator Species (MIS); and Survey and Manage species (S&M).

This appendix, together with the effects analysis in Chapter 3 of the EIS, meets the requirements for Biological Evaluation of impacts on sensitive species; and informs the Biological Assessment required under Section 7 of the Endangered Species Act.

This appendix has been updated since the release of the Draft Environmental Impact Statement.

Botanical Species

Non-Vascular Plant Species

Bondarzewia mesenterica

Bondarzewia mesenterica is a ground dwelling, parasitic polypore that occurs solitary or in groups under conifers, usually near the stumps or trunks. It is found in the Coast and Cascade ranges in California, Oregon and Washington. *Bondarzewia mesenterica* produces a white stringy rot and is a slow root parasite associated with the conifers, firs and larches. It requires late-successional or old-growth host trees in order to fruit.

Since surveys have been instituted in the northern spotted owl region, this species has been commonly encountered in Washington where it occurs at 50 documented sites, with 13-40 having good viability. Its fruit body is large and showy, facilitating its find in surveys. There have been at least 20 occurrences documented from the Pacific Northwest (GeoBOB database, 2005).

There are 2 sites for *Bondarzewia mesenterica* located within 100 feet of treatment areas on the Olympic National Forest. These sites were located during fungi strategic surveys, and are mapped to within 1/8 mile in accuracy. At the present time, there are no direct impacts to this species from invasive plants. Future invasive spread has the potential to reduce habitat for this species and directly compete for ground space.

Diplophyllum plicatum

Diplophyllum plicatum is known from the North Pacific. It has been found in Asia (Amur, Japan, Korea, and Sakhalin), and Alaska, British Columbia, Washington and Oregon in North America (Hong, W.S., 1980). In the Pacific Northwest, the range extends from the coastal southern Oregon north to the Olympic Peninsula and the Washington Cascades. It is a common species in coastal British Columbia and Alaska, extending through the Aleutians (Sperling, J. 1996). It is found on both organic and inorganic substrates. These include decayed wood, down logs, trunks of Thuja plicata (Western red cedar), Pseudotsuga menziesii (Douglas-fir), Taxus brevifolia (Pacific Yew) and Picea sitchensis (Sitka spruce), mineral soil, and rock.
It occurs on moist north-facing slopes, especially in shaded fairly steep crevices along river and streams, and on soil of upturned roots.

There are 18 occurrences of *Diplophyllum plicatum* in Oregon, with ten of these sites having good viability. The total number of individuals in Oregon is estimated to be 5000 (http://oregonstate.edu/ornhic/survey/diplophyllum_plicatum_or.pdf, 2003).This species is rated by the Oregon Natural Heritage Information Center (ORNHIC) as G4/S2
for Oregon and Washington and is on List 2 for Oregon, which indicates that it is considered imperiled within the State of Oregon by ORNHIC but more common or secure elsewhere (ORNHIC 2004).

There is one site of *Diplophyllum plicatum* within 100 feet of a treatment area on the Olympic National Forest. No direct threats from invasives have been observed, yet as *Diplophyllum plicatum* is a ground dwelling organism, and a number of Olympic National Forest invasives occupy similar habitat to this liverwort, future habitat loss and direct competition of this species with invasives is a possibility.

***Hypogymnia duplicata,* Lichen**

Hypogymnia is a lichen that grows as an epiphyte on mountain hemlock, western hemlock, Pacific silver fir, Douglas-fir and subalpine fir in old-growth forests of the western Cascades, Olympics and Coast Range, primarily between 1100 and 5450 feet elevation. It is found in cool moist coastal forests, from low elevations to coastal mountaintops. It is found in Northwest North America from northwestern Oregon to Prince William Sound, Alaska. Most of the known *Hypogymnia* sites are on federal land with the majority (71%) occurring on the Mt. Baker Snoqualmie National Forest. A total of 183 sites are known for *Hypogymnia duplicata* (Conservation Assessment for *Hypogymnia duplicata,* 2004).

There are 11 sites for *Hypogymnia duplicata* known to be within 100 feet of treatment areas on the Olympic National Forest. *Hypogymnia* is not a ground dwelling organism; it grows on the boles and branches of mostly hemlocks and true firs on the Olympic National Forest. Therefore direct competition from invasive species is unlikely, herb Robert is the only invasive species in this project known to grow on the boles and branches of conifers under moist conditions. No direct threats from herb Robert has been observed. Future threats may include loss of habitat, due to a reduction from lost recruitment of host trees.

***Iwatsukiella leucotricha*, Moss**

Iwatsukiella is a moss that occurs on the trunks and branches of conifers and occasionally on alder trees along exposed, higher elevation coastal ridges in Washington and Oregon. On the Olympic National Forest, it has been found on boles of Silver Firs. Globally this species occurs in Japan and adjacent eastern Asia. In the Pacific Northwest, it is known from the coastal areas of Alaska, British Columbia, and Oregon. There are 45 estimated occurrences world-wide. Oregon has 2 known sites, and Washington has 7 occurrences (Oregon Natural Heritage Program, 2004). In Oregon, this species is ranked S1 (highest ranking, critically imperiled and fewer than five occurrences). In Washington, it is ranked as a S2 (second highest ranking), and is considered moderately vulnerable: there are 5 estimated occurrences with good viability, less than 50 individuals in Washington, estimated range in Washington is 2000 square miles, and estimated area of occupancy in Washington is less than 100 acres. In regards to *Iwatsukiella leucotricha* and this project, there are two sites where *Iwatsukiella leucotricha* is known to be within 100 feet of a treatment area, both in the 9P-44 or the 2258 road, Quinault Ridge Sale Planning Area.

Iwatsukiella is not a ground dwelling organism, it grows on the boles and branches of Silver Firs on the Olympic National Forest. The only invasive in this project known to grow in this habitat is Herb Robert, which does not occur in the *Iwatsukiella* treatment area. No direct threats from invasives have been observed, and future threats (within ten years) would be loss of habitat, if recruitment of the host, Silver Fir, is reduced.

***Nephroma bellum*, Lichen**

Nephroma bellum is found on trees, shrubs and rocks in moist forests where there is a strong coastal influence; often on riparian hardwoods. There are greater than 300 occurrences world-wide, with at least a third of these having good viability. *Nephroma bellum* is fairly abundant in the Pacific Northwest, and is known from Europe, Canada, Iceland, the Bering Strait, and is a low arctic-temperate circumpolar species.

This species is considered to be threatened throughout its entire distribution in Europe as the genus *Nephroma* is sensitive to air pollution (Oregon Natural Heritage, 2004). There are 121 occurrences of this species in Oregon, where it is considered stable and unthreatened, air pollution is currently not an issue, as the majority of the sites are far from cities (Oregon Natural Heritage, 2004). In Washington, there are 22 occurrences of this species which are well distributed across the state; few (4-12) are considered to have good viability, and the species is considered moderately vulnerable, and slightly threatened (Oregon Natural Heritage, 2004).

For this project, there are two sites of *Nephroma bellum* within 100 feet of a treatment area. One site is in the 9P-33 or 2204 Road, Edge of Colonel Bob Wilderness; Camp TG CG; Petes TH; Low Hump Timber Sale treatment area; and the other is in the 9P-25 or Matheny Ridge treatment area.

These sites are of sufficient distance from invasives to avoid the effects from encroachment. In general, *Nephroma bellum* does not grow on the ground, it is found on the boles and branches of trees and shrubs in the Olympic National Forest. The only invasive in this project known from this niche is Herb Robert, which has been found vigorously growing in moss mats up in the boles and limbs of conifers on the Olympic National Forest. Herb Robert is not known from either treatment area. Therefore, no direct threats from invasives have been observed, and future threats (within ten years) could be loss of habitat, due to a reduction from lost recruitment of host trees.

***Platismatia lacunosa*, Lichen**

Platismatia lacunosa occurs on boles and branches of hardwoods and conifers in moist, cool, upland sites as well as in moist riparian forests from sea level to 3500' in elevation. There are about 90 sites known in the Pacific Northwest, with a significant proportion having good viability. *Platismatia lacunosa* occurs on the west coast of North America from the Aleutians and Southern Alaska to northern California. There are 68 occurrences in Oregon, and 18 sites known in Washington (Oregon Natural Heritage, 2004). There are 7 sites for this species within 100 feet from treatment areas in this project area. Two of these sites are in 9H-21, one in 9H-12, two in 9H-16, one in 9H-25, and one in 9P-32a. This species is air pollution sensitive but the majority of sites in Washington, are a distance from cities, and therefore, are not at risk (Oregon Natural Heritage, 2004).

In general, *Platismatia lacunosa* does not grow on the ground, it is found on the boles and branches of trees and shrubs in the Olympic National Forest. The only invasive in this project known from this niche is Herb Robert, which has been found vigorously growing in moss mats up in the boles and limbs of conifers on the Olympic National Forest. Herb Robert is not known from any of the above treatment areas. Therefore, no direct threats from invasives have been observed, and future threats (within ten years) could be loss of habitat, due to a reduction from lost recruitment of host trees.

***Pseudocyphellaria rainierensis*, Lichen**

Pseudocyphellaria rainierensis is a foliose (leafy) lichen that grows on the boles and limbs of conifers in moist old growth forests at low to mid-elevations. As of 2004, the Oregon Natural Heritage Program reported 59 occurrences in Oregon and 56 occurrences in Washington. In both states it is considered widespread, and at low-severity threat (Oregon Natural Heritage, 2004). Four of these sites are within 100 feet of a treatment area, three in the West Fork Hump Tulip Trail treatment area.

Pseudocyphellaria rainierensis does not grow on the ground, it is found on the boles and branches of Silver Firs on the Olympic National Forest. The only invasive in this project known to climb up trees is Herb Robert, which has been found growing up boles and limbs of conifers in moss mats on the Olympic National Forest. Herb Robert is not known from the West Fork Hump Tulip Trail treatment area. Therefore, no direct threats from invasives have been observed, and future threats (within ten years) would be loss of habitat, due to lessened or lost recruitment of host trees.

***Racomitrium lorithamnus*, Fungus**

Ramaria lorithamnus is a terrestrial, mycorrhizal fungus associated with late successional forests of Douglas fir and Western Hemlock in the Pacific Northwest. This species is also thought to be found in New Zealand and Australia, however, these disjunctions may be two taxonomically distinct species. *Racomitrium aquaticum* is found forming mats on shaded, moist rocks and cliffs along shady streams or in forests, often in splash zones, but never in aquatic habitat.

One *Ramaria lorithamnus* is located within 100 feet of treatment areas on the Olympic National Forest. This site was located during fungi strategic surveys, and was mapped to within 150 feet accuracy. At the present time, there are no direct impacts to this species from invasive plants. Future invasive spread has the potential to reduce habitat for this species and directly compete with *Ramaria* for ground space.

***Schistostega pennata*, Moss**

Schistostega pennata occurs on finely textured mineral soil in shaded pockets of overturned tree roots, often adjacent to shallow pools of standing water at the base of root wads. It also grows attached to rock or mineral soil around the entrance to caves, old cellars, and animal burrows. A 2005 ISMS query resulted in 102 sites for this species recorded from across the range of the Northwest Forest Plan; Oregon Natural Heritage reports 50 sites from Washington, and 15 from Oregon. In Washington, this species is widespread, has many populations with good viability, and has a relatively stable long-term trend. In relation to this project, there are three *Schistostega* sites that are within 100 feet of an invasive plant treatment area, both located on the Quinault Loop Trail System treatment area, and both attached to root wads. This species is known throughout the Pacific Northwest, but becomes rarer as you go south into Oregon. Its southern-most location is mid-Oregon. In both Oregon and Washington, this species is ranked S2 (second highest category), imperiled because of rarity or because other factors make it very vulnerable to extinction.

No direct or indirect effects are expected to *Schistostega pennata.* This species has a highly selective habitat, one whose niche would not easily be occupied by invasive species. Threats to this species would include logging, removal of fallen tree root wads and recreational use of caves.

***Tetraphis geniculata*, Moss**

Tetraphis geniculata occurs on the cut or broken ends or lower half of large decay class three, four and five rotten logs or stumps, and occasionally on peaty banks in moist coniferous forests from sea level to sub-alpine elevations. In the Pacific Northwest, *Tetraphis* ranges from northern California to Alaska. According to a 2005 ISMS query, 103 sites for this species are known from Washington and Oregon; 2004 Oregon Natural Heritage reports 40 occurrences from Washington, and considers the species moderately vulnerable.

On the Olympic National Forest, 20 sites are within 100 feet of the following invasive species treatment areas: Quinault Loop Trail System; 2257, 2266 Roads, Cook Creek, Big Shrew 2 Sale Planning Area; Lake Quinault South Shore Road and trails. This species has a highly selective habitat, one whose niche would not easily be occupied by invasive species. Threats to this species include the removal and disturbance of large coarse woody debris which would eliminate suitable habitat for *Tetraphis.*

Vascular Plant Species

Carex anthoxanthea

Carex anthoxanthea is predominantly a coastal species, which grows near bogs, on grassy slopes, and in wet meadows at an elevation of 32 to 3281 feet. *Carex anthoxanthea* is a circumboreal species found in British Columbia, the Yukon, Alaska, Washington, and Eurasia. In Washington, *Carex anthoxanthea* has been found at one site, on the upper side of a road in a thickly vegetated, open wet meadow/seep area on northerly aspects at an elevation of 2800 feet, on the Olympic National Forest. The Washington population, in Grays Harbor County on the Olympic National Forest, is the southernmost population known in North America, and is located in the Three Peaks Botanical Area treatment area. Currently, reed canary grass is in proximity to *Carex anthoxanthea,* but habitat has not yet been impacted. Wihtin five years, both habitat and *Carex* individuals may be impacted.

Washington State ranks this species as an S1, highest priority, as this species is known from fewer than five populations within a small geographic area. Threats to this species include any ground disturbing activities, or alteration in the hydrology of the system.

Carex obtusata

In Washington, *Carex obtusata* grows in scree meadows that are vernally moist, on alpine talus, and on ridgetops from 4700 to 6640 feet in elevation. It is a circumboreal species that can be found in Eurasia, Alaska and Canada south to New Mexico and South Dakota. In Washington, *Carex obtusata,* has been found in Jefferson, Clallam, and Mason counties. It is a Washington State, category S2 species (second highest priority) and is known from fewer than 10 sites that are cForestined to a small geographic area. All occurrences have some protection, as they are located in the Olympic National Forest or Olympic National Park.

Within this project, *Carex obtusata* is located in two treatment areas: the Buckhorn Botanical Area, and the Wet Weather Creek Research Natural Area. In the Wet Weather Creek Research Natural Area, the *Carex obtusata* is known from the rocky, alpine portion of the RNA on Silver Lake Ridge, for which invasive plant surveys have not taken place. In the Buckhorn Botanical Area, *Carex obtusata* also occurs on a rocky ridge-top in an area that has not been surveyed for invasive species. Currently, common dandelion and Canada thistle are known to be in the vicinity of both these sites, but it is unlikely invasive species are competing with the *Carex*, as rocky, scree ridgeline is not conducive habitat (Joan Ziegltrum, personal communication, June, 2005).

Carex pauciflora

*T*hroughout its range, *Carex pauciflora*, occurs in sphagnum bogs and acidic peat, usually on open mats, but also in partial conifer shade. In Washington, this species grows from 320 to 4550 feet. This *Carex* is found throughout Canada, northern Eurasia, and the northern continental US. In Washington, it is known from 8 counties. In Washington, this species has a ranking of S2 (second highest priority), and is known from fewer than 20 sites in a limited geographic area. For this project, there is only one site of concern on the Olympic National Forest, which is in the Cranberry Bog Botanical Area treatment area. The bog is about an acre in size with a small lake at the southern end, a sphagnum mat with *Carex pauciflora* on the north end, and the middle area which is dominated by cattails.

Reed canary grass is 30-40 feet from the lake fringe in the summer. Canada thistle is growing interspersed with the reed canary grass. Herb Robert is also located in the botanical area, approximately 200 feet south of the lake, and rapidly spreading. Therefore, there are no current threats to the *Carex pauciflora,* but within 5 years Canada thistle or herb Robert may compete with the *Carex* for space and resources.

Erythronium quinaltense

Erythronium quinaltense occurs in openings and rock ledges in coniferous forests at an elevation of 1640 to 2953 feet. It is known only from the southwestern Olympic peninsula in Jefferson and Grays Harbor counties in Washington, on the Olympic National Forest.

There are 12 sites of *Erythronium quinaltense* on the Olympic National Forest. Of these, nine are within 100 feet of the following treatment areas: 9P-25 (Matheny Ridge); 9P-26 Matheny Complex North, 2160 road; 9P-27 Matheny Complex South, 2140 road; 9P-31 roads 2190000 and road 2140000; 9P-29 (Higley Ridge), upper 2190 road; and 9P-Bill's Bog Botanical Area. Invasive plants are impacting *Erythronium quinaltense* habitat in proximity to eight of the nine sites; within five years, impacts to individuals at the sites are plausible.

9P-25 – scotch broom, and bull thistle in proximity to *Erythronium quinaltense*

9P-26 – scotch broom on roadside in proximity to *Erythronium quinaltense*

9P-27 – the invasive species known from this treatment area are: scotch broom, Canada thistle, tansy ragwort, bull thistle, Himalayan blackerrry, common tansy, cut-leaf blackberry, and Ox-eye daisy

9P-31 and Bill Bog's Botanical Area - *Erythronium quinaltense* is found along roadsides, and road ditches, with the following invasive species adjacent: scotch broom, Canada thistle, tansy ragwort, bull thistle, Himalayan blackberry, and cut-leaf blackberry

Galium kamtschaticum

Galium kamtschaticum occurs in moist, cold, coniferous forests and mossy places throughout its range. Sites on the Olympic peninsula are generally on north aspects, from 1930-2900 feet in elevation, in silver fir or mountain hemlock plant associations, in wet canopy gaps. This species is circumboreal in its distribution and occurs sporadically from Kamchatka and Korea, through the Aleutian Islands and the Alaska panhandle, to the Olympic Mountains and Cascade Range of Washington, where it apparently does not extend south of Snoqualmie Pass. This species also occurs in southeastern Canada and adjacent New England, New York State, and the northeastern side of Lake Superior. It has a global heritage rank of G5, which is considered demonstrably secure globally (Conservation Assessment for *Galium kamtschaticum,* 2004).

In Washington State, there are 87 total occurrences (Conservation Assessment for *Galium kamtschaticum,* 2004). The majority of the occurrences are in the western Cascades on the Mt. Baker-Snoqualmie National Forest. On the Olympic peninsula, all 8 occurrences occur on the Olympic National Forest. In terms of this project, there are 2 *Galium kamtschaticum* sites in the 9P-45, West Forks Humptulips Trail/junction of the 2204 road treatment area. Neither are in direct threat from invasive impacts. Within 5 years, there is potential for competition between invasives and *Galium kamtschaticum.*

Threats include: changes in hydrology resulting from management activities; compaction of saturated soils - this could alter wetland hydrology and destroy the shallowly rooted underground rhizomes; increased light intensity – virtually all populations received only partial or indirect sunlight; trampling, crushing, or other direct impacts to the fragile above-ground stems.

Parnassia palustris var. neogaea

On the Olympic National Forest, *Parnassia palustris var. neogaea* occurs in a variety of sites that are generally open areas that are wet or damp. These habitats include marshes, dune-slack communities, streamsides, moist meadows, and at or near springs/seeps. Many of the known sites can be classified as alkaline. On the Olympic National Forest, this taxa is found between 1500 and 3250 feet in elevation. It occurs in arctic tundra to montane moist areas, from Alaska south to Washington, and as far east as Newfoundland. In Washington, there are currently 19 known sites of *Parnassia palustris var. neogaea* on the Olympic National Forest in five counties, one in the Olympic National Park, and two sites on private land. *Parnassia palustris var. neogaea* sites on the Olympic National Forest range in abundance from 4 to over 30,000 flowering stems (Conservation Assessment for Northern Grass-of-Parnassus, *Parnassia palustris var. neogaea,* 2003*).*

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In regards to this project, *Parnassia palustris var. neogaea,* is known from two treatment areas at five sites: four from 9H-Three Peaks Botanical Area, and one from 9P-North Fork Matheny Ponds Botanical Area. Currently, habitat is being impacted by invasive species at four of the five sites in proximity to treatment areas.

In the 9H-Three Peaks Botanical Area, *Parnassia palustris var. neogaea* is located both above and below the road, in seeps where water movement is slow-paced. At this site, habitat is being impacted and within five years, individuals may be impacted. The 9P-North Fork Matheny Ponds Botanical Area site is located along the periphery of a pond, in two areas. In 2003, 247 flowering stems were counted on August 15th, near the southern end of the pond, near the inlet, 25 flowering stems were counted at the NE end of the pond. All *Parnassia palustris var. neogaea,* were located 1 foot above the highest waterline mark.

Pellaea breweri

Pellaea breweri occurs in open, rocky, alpine areas from 4700 to 6700 feet in elevation. It is often in south or west facing crevices, rocky basaltic or granite slides, alpine ledges and glacial cirques. This species occurs from the foothills to about timberline from Washington to Southern California, east to Southwest Montana, and south to Wyoming, Colorado, and Utah. There are 10 known occurrences of this species in Washington, on the Wenatchee National Forest, in Kittitas and Chelan counties, and the Olympic National Forest in Jefferson and Clallam counties (Washington Natural Heritage Program field guide, 2005). *Pellaea breweri* is known from one treatment area in this project, 9H-29 – Buckhorn Botanical Area, in the Buckhorn Wilderness. This site was reported in 1984, and has not been monitored since. Invasive plant surveys have not taken place at this *Pellaea breweri* site. It is unlikely invasive species are competing with *Pellaea breweri*, as rocky, scree ridgeline is not conducive habitat for invasives in this treatment area (Joan Ziegltrum, personal communication, June, 2005).

Synthyris pinnatifida var. lanuginosa

Synthyris pinnatifida var. lanuginosa occurs in dry rocky places and has been reported in elevations ranging from 5500 to 9300 feet, and is only found on the Olympic peninsula in Clallam and Jefferson Counties (Washington Natural Heritage Program, 2005). It has a state rank of S2, second highest priority ranking, with 21 occurrences in Washington, 11 on the Olympic National Forest, and 10 on the Olympic National Park.

There are 6 sites for *Syntheris pinnatifida var. lanuginosa* within the 9H-29 or Buckhorn Botanical Area treatment area, which is located in the Buckhorn Wilderness. The general habitat is a dry, rocky, alpine area with lots of scree slope. There is a trail going through this area. As hikers go off-trail to look at the views, etc., they risk spreading the weeds to new locations, as well as further along the trail corridor. It is unknown if the invasive plants and *Synthyris pinnatifida var. lanuginosa* are growing closely together i.e., intermingling, as invasive plant surveys are incomplete. At one of the six sites, habitat is being impacted.

Fungi Species

Albatrellus avellaneus

Albatrellus avellaneus is a ground dwelling polypore that is local, patchy and apparently restricted to Sikta spruce. It is a fall-winter fruiting mycorrhizal fungus which ranges from the Olympic peninsula in Washington to Humboldt County, California. This species is rare throughout its range. Its requirements are not known; however it is restricted in location to the coastal lowlands, has an apparent preference for Sitka spruce, and late-successional forests, which suggests a narrow environmental specificity.
The 2002 Oregon Natural Heritage Program reports 11 known collections (eight are historical, three are recent), four are from Washington, two are from Oregon, and 1 is from California (the type locality). Only 3 occurrences are verified in the ISMS (2002) database (**http://oregonstate.edu/ornhic/survey/albatrellus_avellaneus_global.pdf**).

There are three sites of *Albatrellus avellaneus* on the Olympic National Forest that are located within 100 feet of treatment areas. These sites were located during fungi strategic surveys, and are mapped to within 150 feet accuracy. At the present time, there are no direct impacts to this species from invasive plants. Future invasive spread has the potential to reduce habitat for *Albatrellus* and directly compete for ground space.

Bondarzewia mesenterica

Bondarzewia mesenterica is a ground dwelling, parasitic polypore that occurs solitary or in groups under conifers, usually near the stumps or trunks. It is found in the Coast and Cascade ranges in California, Oregon and Washington. *Bondarzewia mesenterica* produces a white stringy rot and is a slow root parasite associated with the conifers, firs and larches. It requires late-successional or old-growth host trees in order to fruit.

Since surveys have been instituted in the northern spotted owl region, this species has been commonly encountered in Washington where it occurs at 50 documented sites, with 13-40 having good viability. Its fruit body is large and showy, facilitating its find in surveys. There have been at least 20 occurrences documented from the Pacific Northwest (GeoBOB database, 2005).

There are 2 sites for *Bondarzewia mesenterica* located within 100 feet of treatment areas on the Olympic National Forest. These sites were located during fungi strategic surveys, and are mapped to within 1/8 mile in accuracy. At the present time, there are no direct impacts to this species from invasive plants. Future invasive spread has the potential to reduce habitat for this species and directly compete for ground space.

Ramaria aquaticum

Racomitrium aquaticum is found forming mats on shaded, moist rocks and cliffs along shady streams or in forests, often in splash zones, but never in aquatic habitat.
Racomitrium aquaticum is endemic to western North America and is known from Alaska, British Columbia, Alberta, Washington, Oregon, and California. The ISMS database contains about 20 sites from across the range of the Northwest Forest Plan.
There are estimated 2500-10,000 individuals worldwide.

There are three sites of this species known from within 100 feet of treatment areas on the Olympic National Forest. No direct threats from invasives have been observed, yet as *Racomitrium aquaticum* is a ground dwelling organism, and a number of Olympic National Forest invasives occupy similar habitat to this moss, future habitat loss and direct competition of this species with invasives is a possibility.

Ramaria lorithamnus

Ramaria lorithamnus is a terrestrial, mycorrhizal fungus associated with late successional forests of Douglas fir and Western Hemlock in the Pacific Northwest. This species is also thought to be found in New Zealand and Australia, however, these disjunctions may be two taxonomically distinct species.

There is 1 site for *Ramaria lorithamnus* located within 100 feet of treatment areas on the Olympic National Forest. These sites were located during fungi strategic surveys, and are mapped to within 150 feet accuracy. At the present time, there are no direct impacts to this species from invasive plants. Future invasive spread has the potential to reduce habitat for this species and directly compete with *Ramaria* for ground space.

Wildlife Species

Federal Threatened and Endangered Species

Bald Eagle (Haliaeetus leucocephalus)

The bald eagle ranges throughout much of North America, nesting on both coasts and north into Alaska, wintering as far south as Baja California. The largest breeding populations in the contiguous United States occur in the Pacific Northwest states, the Great Lake states, Chesapeake Bay and Florida. Oregon and Washington are important for wintering bald eagles in the conterminous United States. The Forest provides wintering habitat for migratory eagles as well as residents.

Life History and Habitat Description

Bald eagles are most common along coasts, major rivers, lakes and reservoirs (U.S. Fish and Wildlife Service, 1986), and require accessible prey and trees for suitable nesting and roosting habitat (Stalmaster, 1987). Food availability, such as aggregations of waterfowl or salmon runs, is a primary factor attracting bald eagles to wintering areas and influences the distribution of nests and territories (Stalmaster 1987). Bald eagles feed primarily on fish during the breeding season, and eat waterfowl, seabirds and carrion during the winter (U.S. Fish and Wildlife Service, 1995). On the Forest, salmon carcass placement of hatchery stock along river systems occurs within some drainages which attract foraging bald eagles.

Bald eagles usually nest in trees near water, but are known to nest on cliffs and (rarely) on the ground. Nest sites are usually in large trees along shorelines in relatively remote areas that are free of disturbance. The trees must be sturdy and open to support a nest that is often 5 feet wide and 3 feet deep. 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, 1999).

Threats

Currently, mortality to bald eagles occurs from habitat loss, disturbance by humans, pesticide and mercury contamination, decreasing food supply, electrocution, impacts with wind turbines, and illegal shooting (U.S. Fish and Wildlife Service 1999, Welch, 1994). Human disturbance can flush eagles from a nest. Nesting can fail if disturbance is frequent (U.S. Fish and Wildlife Service, 1999).

A recent threat to bald eagles is mortality caused by a new disease, avian vacuolar myelinopathy (AVM) (U.S. Fish and Wildlife Service, 1999). AVM, first reported in 1994, has been the cause of death for at least 100 bald eagles (and 1,000's of American coots) at 11 sites from Texas to North Carolina. A recent hypothesis implicates a type of cyanobacteria that grows on the invasive aquatic plant, *Hydrilla verticillata* (Wilde, 2005). The cyanobacteria are thought to produce a neurotoxin that is fatal to herbivorous birds and their avian predators. Mortalities caused by AVM can have localized impact on bald eagles but there is currently no evidence that the overall recovery of the population is affected (U.S. Fish and Wildlife Service, 1999).

Conservation Measures
Management guidelines published by the U.S. Fish and Wildlife Service (1981) recommend establishing primary and secondary zones around all known eagle nests and restricting activities that occur within those zones. The primary zone is, at a minimum, 330 feet around the nest site and should be managed to protect or maintain the nest site by prohibiting timber harvest, mining, road or residential development, drilling or other disturbances that might alter the habitat. The secondary zone includes the area 660 feet around the nest and is designed to protect or maintain the habitat within the primary zone and to reduce disturbance of eagles during the breeding season.

Wintering eagles can be found concentrated at as salmon spawning areas and waterfowl wintering areas. On the Forest, salmon carcass placement areas also provide feeding opportunities for wintering resident and transient eagles. Wintering eagles can sometimes be found in large communal roosts during the winter. Isolation is an important feature of winter habitat and night roosts are usually in remote areas with less human disturbance. In Washington, 98 percent of wintering eagles tolerated human activity at a distance of 300 m (328 yards), but only 50 percent tolerated activity within 150 m (164 yards) (Stalmaster and Newman 1978).

Action Area Information
The Forest provides wintering habitat to both resident and migratory eagles.
Nesting eagles are sensitive to disturbance (U.S. Fish and Wildlife Service, 1986). The critical period in Washington when human activities could disturb occupied nest sites extends from January 1 until August 15 (U.S. Fish and Wildlife Service 2003, p. 9). Nest initiation, including courtship and nest building, occurs in January through March. Incubation occurs from March until late May, and young are in nests from early April through mid-August. Young usually remain in the nest area throughout August.

The Forest has identified winter night roosting areas which predominately are found in old growth forest and away from human disturbance. Wintering eagles on the Forest can be sensitive to disturbance from October 31 to March 31 (U.S. Fish and Wildlife Service 2003, p. 9).

A Programmatic Wildlife Biological Opinion (Programmatic BO) for the Forest (U.S. Fish and Wildlife Service 2003) identified nesting and winter limited operating periods near bald eagles. Table 1 lists the disturbance distances for nesting and wintering eagles. If disturbance-causing activities occur farther away from nesting or roosting eagles than the distances specified in Table 1, then no adverse effect will occur.

Table 1. Disturbance distances for bald eagle within which adverse effects may occur, as specified by FWS office in Lacey, Washington.

Activity	Distance
Use of chainsaw and other motorized tools	0.25-mile no-line-of sight, or 0.50-mile line-of-sight
Use of heavy equipment	0.25-mile no-line-of sight, or 0.50-mile line-of-sight
Burning	1-mile

Proposed weed treatment sites on the Forest are within or adjacent to some Bald Eagle Management Areas (BEMAs), which are a land management allocation under the 1990 Olympic National Forest Land and Resource Management Plan. These sites are either used for nesting, colonial winter roosting, or have high concentrations of eagles using them for feeding. The proposed treatments within Bald Eagle Management Areas are primarily along roads that have infestations of invasive plants. Of the known or historic bald eagle nests, winter roosts, high use feeding areas, or BEMAs on the forest, there are 11 known sites within 0.25 mile of proposed weed treatment sites. These treatment sites propose to use mechanical brushing or mowing, which could create a noise disturbance. Additional treatments could occur within 0.25 mile of eagle sites under the early detection / rapid response procedures.

Currently, there are no invasive plants on the Forest adversely affecting bald eagles. If left untreated, Japanese knotweed and Himalayan blackberry have the potential to adversely affect fish habitat on the Forest, and could affect the quality of some foraging areas for bald eagles. There is no evidence to suggest this is happening at present.

Northern Spotted Owl (Strix occidentalis caurina)

The current range and distribution of the spotted owls extends from southern British Columbia through western Washington, Oregon, and California, as far south as Marin County (U.S. Fish and Wildlife Service, 1990b). More detailed descriptions of the spotted owl's status and conservation history, as well as the environmental baseline and critical habitat on the Forest can be found in the Programmatic Biological Opinion for the Forest's activities (U.S. Fish and Wildlife Service 2003) as well as the Region Six Invasive Plant Program BA and BO (USDA Forest Service 2005, U.S. Fish and Wildlife Service 2005, respectively). This information is incorporated by reference.

Life History

The spotted owl is a relatively long-lived bird (average life span approximating 8 years) with a naturally low reproductive rate. Spotted owls do not reach sexual maturity until after 2 years; once an adult, females lay an average of 2 eggs per clutch (range 1-4 eggs). Nest sites are usually located within stands of old-growth and late-successional forest dominated by Douglas-fir, and consist of existing structures such as cavities, broken tree tops, or mistletoe (*Arceuthobium* spp.) brooms (Forsman et al. 1984, Blakesley et al., 1992, LaHaye and Gutierrez, 1999).

In general, courtship and nesting behavior begins in February to March with nesting occurring from March to June: however timing of nesting and fledging varies with latitude and elevation (Forsman et al., 1984). After the young fledge from the nest, they are still dependent on their parents until they are able to fly and hunt on their own. Parental care continues post-fledging into September (U.S. Fish and Wildlife Service, 1990b), and sometimes into October (Forsman et al., 1984). During this time the adults may not roost with the young during the day, but they will respond to begging vocalizations by bringing food to the young (Forsman et al., 1984).

The spotted owl's primary prey items vary geographically and by forest type. Generally, northern flying squirrels (*Glaucomys sabrinus*) and red tree voles (*Arborimus longicaudus*) are the more prominent prey in Douglas-fir and western hemlock forests (Forsman et al. 1984). Depending on location, other prey species (i.e., mice, birds, and insects) also comprise a small portion of the spotted owl diet (Forsman et al., 1984).

Habitat Description

Spotted owls rely on older forested habitats because they contain the structures and characteristics required for nesting, roosting, foraging, and dispersal. These characteristics include the following: a multilayered, multi-species canopy dominated by large overstory trees; moderate to high canopy closure; a high incidence of trees with large cavities and other types of deformities; numerous large snags; an abundance of large, dead wood on the ground; and open space within and below the upper canopy for owls to fly (Thomas et al., 1990; U.S. Fish and Wildlife Service, 1990a). Forested stands with high canopy closure also provide thermal cover as well as protection from predation. In some ecotypes, recent landscape-level analyses suggest that a mosaic of late-successional habitat interspersed with other vegetation types may benefit spotted owls more than large, homogeneous expanses of older forests (Franklin et al., 2000, Meyer et al., 1998).

Threats

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" (U.S. Fish and Wildlife Service, 1990b). The draft recovery plan for the northern spotted owl (U.S. Fish and Wildlife Service, 1992b) identified significant threats to the owl by physiographic province. These threats are summarized as follows: low populations, overall population decline, limited habitat, declining habitat, distribution of habitat or populations, isolation of provinces, predation and competition, lack of coordinated conservation measures, and vulnerability to natural disturbance.

Since listing of the northern spotted owl, new information suggests that hybridization with the barred owl (*Strix varia*) is less of a threat (Kelly and Forsman, 2004) and competition with the barred owl is a greater threat than previously anticipated (Courtney et al., 2004). Barred owls apparently compete with spotted owls through a variety of mechanisms: prey overlap (Hamer et al., 2001); habitat overlap (Hamer et al., 1989, Dunbar et al., 1991, Herter and Hicks, 2000, Pearson and Livezey, 2003); and agonistic encounters (Leskiw and Gutiérrez 1998, Pearson and Livezey, 2003).

West Nile virus (WNV) has been identified as a potential threat of unknown magnitude to the northern spotted owl (Courtney et al., 2004).

Critical Habitat

Critical habitat for the spotted owl was designated on January 15, 1992 (U.S. Fish and Wildlife Service, 1992a). Primary constituent elements for owl critical habitat consist of habitat features that support nesting, roosting, foraging, and dispersal.

The attributes of nesting and roosting habitat include moderate to high canopy closure (60 to 80 percent); a 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 owls to fly (Thomas et al. 1990).

Foraging habitat varies across the range of the owl and contains attributes similar to nesting and roosting habitat, but may also include more open fragmented habitat. Dispersal habitat consists of stands with adequate tree size and canopy closure to provide protection from avian predators and at least minimal foraging opportunities.

Action Area Information
There are currently no invasive plant species on the Forest adversely affecting spotted owls or their habitat.

The early nesting season for the northern spotted owl on the Olympic National Forest has been identified as the period from March 1 through July 15. The early nesting season is when egg-laying, incubation, hatching, feeding of nestlings, and fledging occurs, and active nest sites could be affected by disturbance.

Spotted owls are somewhat sensitive to disturbance caused noisy machinery during certain times of the year. If sound-generating activities occur within close proximity to a nest or unsurveyed suitable habitat during the early breeding season (March 1 to July 15), spotted owls may be disturbed by the sound, potentially causing missed feedings or the adults to flush, leaving young susceptible to predation and weather (U.S. Fish and Wildlife Service 2003, p. 129). After July 15, spotted owlets are no longer completely dependent upon the adults and are able to thermo-regulate, fly, and forage on their own, reducing their susceptibility to disturbance-related effects.

A Programmatic Wildlife Biological Opinion (Programmatic BO) for the Forest (U.S. Fish and Wildlife Service 2003) identified limited operating periods near spotted owl nests or activity centers. Table 2 lists the disturbance distances for nesting spotted owls. If disturbance-causing activities occur farther away from nesting spotted owls than the distances specified in Table 2, then no adverse effect will occur.

Table 2. Disturbance distances for spotted owls within which adverse effects may occur, as specified by FWS office in Lacey, Washington.

Activity	Distance[1]
Use of chainsaw and other motorized tools	65 yards
Use of heavy equipment	35 yards
Burning	0.25-mile

1 U.S. Fish and Wildlife Service. 2003. Estimates of distances at which incidental take of murrelets and spotted owls due to harassment are anticipated from sound-generating, forest-management activities in Olympic National Forest. Unpublished report prepared by Kent Livezey, Western Washington Fish and Wildlife Office, Lacey, WA. 20 pp.

Spotted owls may detect and become alerted by sounds without any adverse effects occurring. Louder sounds can cause a spotted owl to flush from a nest or miss feeding a chick, which would be considered an “injury” (U.S. Fish and Wildlife Service 2003). Sound-only injury distances for activities that would cause disturbance to the northern spotted owl are those at 92 decibels (dB) and above (U.S. Fish and Wildlife Service 2003). The estimated ambient noise levels for a forest setting are at 40 dB (U.S. Fish and Wildlife Service 2003). Hamer and Nelson (1998) measured mean decibel (dB) levels of some equipment in a forested environment at a distance of 25 m. They reported mean decibel levels of 58 dB for automobiles, 67 dB for trucks, and 72 dB for chainsaws.

U.S. Fish and Wildlife Service (2003) reported higher dB levels for chainsaws used in timber harvest. The maximum 1-minute reading for the largest chainsaw (Stihl 38) was 90.8 dB, with a peak reading of 104.2 dB.

Some equipment used to treat invasive plants could create noise above ambient levels, depending upon site-specific conditions. Engines used to pump herbicide and other liquids through nozzles for roadside spraying operations, normally in the back of a pick up truck, may generate noise levels that could disturb spotted owls. Because noise levels of this type of equipment were not known, two diesel pump engines used for roadside spraying and mounted in the back of running pick-up trucks were evaluated for noise level. Two separate readings of different pump engines using different decibel meters produced readings of 72-75 decibels within 10 yards, dropping to 64-67 decibels at 35 yards (observations in the project file). The threshold for a noticeable noise is 70 decibels and the threshold for disturbance causing "injury" or "harassment" is 92 decibels (U.S. Fish and Wildlife Service 2003). No measurements exceeded 92 dB. County Weed Coordinators also reported that the noise of diesel pump engines measured for this analysis was greater than the noise of gasoline-powered pump engines used by some operators (D Sherwin, pers. comm. 2005, D. Durfey, pers. comm. 2005). The gasoline-powered pump engines will be quieter than the diesel pump engines that were measured.

There is substantial owl suitable habitat (nesting, roosting, and foraging) and dispersal habitat within or adjacent to proposed weed treatment sites. All suitable habitat that does not have current surveys completed to protocol is considered occupied. Applicable project design features are therefore implemented for unsurveyed habitat. Designated critical habitat for the northern spotted owl occurs on the Forest. The Forest contains 10 critical habitat units (CHU) (CHU numbers WA-43 to WA-52). These units are almost completely within Late Successional Reserves and incorporate virtually all of the blocks of suitable spotted owl habitat on the forest (U.S. Fish and Wildlife Service 2003). In addition, there are 60,355 acres of dispersal habitat on the Forest, of which 16,945 occur within CHUs (Forest 2000 habitat data).

Marbled Murrelet (Brachyramphus marmoratus)

The murrelet ranges from the Aleutian Archipelago to central California. The distribution of murrelets becomes more disjunct at the southern extreme of their range. In Washington, Oregon, and California, there are distinct gaps between breeding populations that are thought to relate to availability of onshore nesting habitat. Murrelets are generally found in near-shore ocean waters but come inland to nest.

Murrelet nests are not evenly distributed between the coast and the inland extremes of their range, but are observed most often within about 12 miles of the ocean. However, their inland nesting distribution is not fully known because survey effort has been inconsistently distributed, especially in areas greater than 40 miles from the coast. In marine environments, there are also distinct gaps between breeding populations that are thought to relate to availability of onshore nesting habitat. It is believed that marine productivity is high along most of this coast during the breeding season which suggests foraging habitat is not limiting.

Life History and Habitat Description
The murrelet is a small robin-sized seabird of the family Alcidae in the order Charadriiformes. These small, fast flying seabirds are unique among North American alcids in their use of coastal coniferous forest, primarily late-successional trees as nesting habitat. Nesting season occurs from late March to September. Their solitary nests are usually concealed within the forest canopy and breeding birds are cryptic and primarily crepuscular at nest sites. Egg laying, incubation, and hatching occur before August 5, and feeding of young occurs from August 6 to September 15 (Hamer and Nelson, 1995). 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 50 miles inland from the marine environment, on large limbs of mature conifers. Marbled murrelets are mostly pelagic during the winter.

Unlike most auks, murrelets nest solitarily on mossy platforms of large branches in old-forest trees (Lank et al., 2003). Suitable habitat for murrelets may include contiguous forested areas with conditions that contain potential nesting structure. These forests are generally characterized by large trees greater than 18 inches diameter at breast height (dbh), multistoried canopies with moderate closure, sufficient limb size and substrate (moss, duff, etc.) to support nest cups, flight accessibility, and protective cover from ambient conditions and potential avian predators (Manley, 1999; Burger, 2002; and Nelson and Wilson, 2002). Over 95 percent of measured nest limbs were ≥ 15 cm diameter, with limb diameter ranges from 7-74 cm diameter (Burger, 2002).

Threats
The Marbled Murrelet Recovery Plan (U.S. Fish and Wildlife Service, 1997) identified the primary threats to the species: (1) predation; (2) loss of nesting habitat; (3) by-catch in gill-nets, and; (4) oil pollution both chronic and from major spills. More recently, McShane et al. (2004), has concluded all threats are still present although loss of nesting habitat, particularly on Federal lands, has declined. New information indicates that predation posses a high threat level due to its affect on limiting murrelet nest success (Hebert and Golightly, 2003, Peery et al. in prep., Luginbuhl et al., 2001).

Critical Habitat
The FWS designated critical habitat for the marbled murrelet in 1996 (U.S. Fish and Wildlife Service, 1996). Coastal forests in Washington, Oregon, and northern California contain designated critical habitat.
Critical habitat consists of only suitable nesting habitat and does not include foraging habitat in marine areas. The FWS determined that marine foraging habitats did not need additional management consideration or protection.

The primary constituent elements of murrelet critical habitat include: 1) individual trees with potential nesting platforms, and 2) forested areas within 0.5 miles (0.8 kilometers) of individual trees with potential nesting platforms and with a canopy height of at least one-half the site-potential tree height (U.S. Fish and Wildlife Service, 1996).

Individual nest trees are usually large trees, generally more that 32 inches (81 centimeters) dbh, with large branches or deformities that can serve as nest platforms. Forested areas around nest trees provide more suitable microclimate and protect nest trees from windthrow.

Designated critical habitat included most of the Late Successional Reserves (LSR) described in the Northwest Forest Plan (federal); State lands in southwestern Washington, northwestern Oregon, and California south of Cape Mendocino; as well as private lands. No tribal lands were included in the critical habitat designation. FWS designated a total of about 3.8 million acres in 32 critical habitat units. Twenty-two of the critical habitat units contain some State, county, city, or private lands. Federal land in the three states accounts for just over 3 million acres of critical habitat.

Action Area Information
There are currently no invasive plant species on the Forest adversely affecting marbled murrelets or their habitat.

The marbled murrelet recovery plan (U.S. Fish and Wildlife Service, 1997) identified six recovery zones for the marbled murrelet. The Forest is included in Zones 1 and 2. There are numerous marbled murrelet sites on the Forest, many of which are within or adjacent to treatment areas.

A Programmatic Wildlife Biological Opinion (Programmatic BO) for the Forest (U.S. Fish and Wildlife Service 2003) identified limited operating period near marbled murrelet nests between April 1 and August 5 within the distances listed below in Table 3. If disturbance-causing activities occur farther away from nesting marbled murrelets than the distances specified in Table 3, then no adverse effect will occur. All activities that generate noise above 92 dB must be scheduled between 2 hours after sunrise and 2 hours before sunset during the murrelet nesting season (April 1 to September 15).

Table 3. Disturbance distances for marbled murrelets within which adverse effects may occur, as specified by FWS office in Lacey, Washington.

Activity	Distance[1]
Use of chainsaw or motorized equipment	45 yards
Use of heavy equipment	35 yards
Burning	0.25 miles

1 U.S. Fish and Wildlife Service. 2003. Appendix 1: Estimates of distances at which incidental take of murrelets and spotted owls due to harassment are anticipated from sound-generating, forest-management activities in Olympic National Forest. Unpublished report prepared by Kent Livezey, Western Washington Fish and Wildlife Office, Lacey, WA. 20 pp.

Marbled murrelets may detect and become alerted by sounds without any adverse effects occurring. Louder sounds can cause a marbled murrelet to flush from a nest or miss feeding a chick, which would be considered an "injury" (U.S. Fish and Wildlife Service 2003). Sound-only injury distances for activities that would cause disturbance to the marbled murrelet are those at 92dB and above (U.S. Fish and Wildlife Service 2003). The estimated ambient noise levels for a forest setting are at 40 dB. Hamer and Nelson (1998) measured mean decibel levels of some equipment in a forested environment at a distance of 25 m. They reported mean decibel levels of 58 dB for automobiles, 67 dB for trucks, and 72 dB for chainsaws. U.S. Fish and Wildlife Service (2003) reported higher dB levels for chainsaws used in timber harvest. The maximum 1-minute reading for the largest chainsaw (Stihl 38) was 90.8 dB, with a peak reading of 104.2 dB. Therefore, some equipment used to treat invasive weeds could exceed the 92 dB level for injury disturbance to the marbled murrelet.

Decibel readings from engines used for roadside boom spraying were measured, as discussed previously in the Northern Spotted Owl discussion. Roadside spraying equipment produced readings of 72-75 decibels within 10 yards, dropping to 64-67 decibels at 35 yards (observations in the project file). No measurements exceeded 92 dB.

Survey and Manage Species

In 1994, the U.S. Department of the Interior, Bureau of Land Management (BLM) and the USDA Forest Service adopted standards and guidelines for the management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl, commonly known as the Northwest Forest Plan (USDA Forest Service and USDI BLM, 1994). Mitigation measures were included for the management of known sites, site-specific pre-habitat disturbance surveys, and/or landscape scale surveys for about 400 rare and/or isolated species. These are species that, either because of genuine rarity or because of a lack of information, the Agencies did not know whether they would adequately be protected by other elements of the Northwest Forest Plan. This decision was amended in January 2001 by the Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USDA Forest Service and USDI BLM, 2001). The standard and guidelines for these mitigation measures are known as Survey and Manage. The 2004 Record of Decision to Remove or Modify the Survey and Manage Mitigation Measures Standards and Guidelines removed the standards and guidelines, and moved some survey and manage species onto the Region's Special Status/Sensitive Species Program (USDA Forest Service and USDI BLM, 2004).

On January 9, 2006, Judge Pechman signed an Order on Plaintiffs' Motion for Injunctive Relief (Northwest Ecosystem Alliance et al. v. Mark E. Rey et al., No. 04-844P) that:

1. "The Record of Decision dated March 22, 2004, entitled "To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl" (the "2004 ROD") is hereby set aside, and Defendants shall not rely on it or implement it."
2. "The Record of Decision dated January 2001, entitled "Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines" (the "2001 ROD") is hereby reinstated, including any amendments or modifications to the 2001 ROD that were in effect as of March 21, 2004." [e.g., including results of the 2001, 2002, and 2003 Annual Species Reviews (ASR)].
3. "Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2001 ROD applied unless such activities are in compliance with the provisions of the 2001 [sic] ROD (as the 2001 ROD was amended or modified as of March 21, 2004)."
4. "No project or activity enjoined under this Order may occur unless and until this Court modifies or vacates this Order." [or the agencies bring the activities into compliance with the 2001 ROD].

Species that were covered under Survey and Manage as of March 21, 2004 (prior to the 2004 ROD) are once again included in the Survey and Manage program. The inclusion of some of these species in the Region's Special Status/Sensitive Species Program remains in effect. For the Forest, mollusks are the only fauna included in the Survey and Manage program. All the Survey and Manage mollusks are also included in the Special Status/Sensitive Species Program and are listed above, except for evening fieldslug (*Deroceras hesperium*).

Evening fieldslug

This slug has been reported to be associated with wet meadows in forested habitat in a variety of low vegetations, litter, and debris; rocks may also be used (Pilsbry 1944). Little is known about this species or its habitat, but it is thought to be most associated with perennial wetlands, springs, seeps in riparian areas (Duncan et al. 2003). It is one of the least known slugs in the western U.S. (Duncan 2005). The majority of currently documented sites for this species occur on the eastern slope of the Oregon Cascades (Duncan 2005) and no known sites (19 total) are reported from Washington. From 1998-2002, the Forest conducted extensive surveys for this species, as well as other mollusks, across the forest in a range of habitat conditions. The evening fieldslug has not been documented on the Forest. Based on the lack of known sites in Washington, the extensive surveys conducted on the Forest, the Forest Ecologist has concluded that the Forest is outside the range for this species (Ziegltrum, personal communication). Therefore, this species will not be discussed further in this document.

Other species

The other Survey and Manage Species (Puget Oregonian; Burrington, and Malone's jumping slugs; blue-gray taildropper; and Hoko vertigo) are discussed under the section titled "Special Status/Sensitive Species". The Burrington jumping slug is the only Survey and Manage mollusk that occurs on the Forest. The warty jumping slug was removed as a Survey and Manage species for the Forest in the 2001 Annual Species Review. It remains a Forest Service Sensitive Species.

Forest Service Sensitive Wildlife Species

Terrestrial wildlife species found on the Forest that are included in the Region's "Special Status/Sensitive Species Program" are listed in Table 5. The Regional Forester's Sensitive Species List are proactive approaches for meeting the Agencies obligations under the Endangered Species Act and the National Forest Management Act (NFMA), and National Policy direction as stated in the 2670 section of the Forest Service Manual and the U.S. Department of Agriculture Regulation 9500-4. 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 FWS as "candidates" for listing under the ESA, and meeting the Forest Service criteria for protection, are included on the Regional Forester's Sensitive Species Lists.

The Pacific fisher and the California wolverine do not currently occur on the Forest. The wolverine occurrence is a mistake in the 2004 Regional Forester's Sensitive Animal List which will be corrected in the next version (Piper, 2005, pers. com.). The Pacific fisher is extirpated from the entire state of Washington (WDFW, 2005). The Washington Department of Fish and Wildlife is planning to reintroduce Pacific fisher into the Olympic peninsula in 2007. Potential reintroduction sites are likely to be within the Olympic National Park, however National Forest lands may be used.

There are proposed treatment areas within and adjacent to potential release sites. Since the location and timing of potential releases is uncertain, there is insufficient information to evaluate future effects of invasive plant treatments to Pacific fisher. Additional analysis for effects to Pacific fisher will be conducted once reintroduction timing and location are known and can be evaluated against proposed treatment methods in the vicinity of the fishers. The Pacific fisher and California wolverine will not be discussed further in this analysis.

Townsend's Big-eared Bat (Corynorhinus townsendii)

The Townsend's big-eared bat is a large bat with unusually long ears. This bat occurs from southern British Columbia and the western U.S. to southeastern U.S. and southern Mexico. Townsend's big-eared bats inhabit a wide variety of habitats from old-growth forests to extreme desert. It roosts in buildings, caves, mines, rock crevices, and bridges. One young is born from April to July (Maser et al. 1981). This bat feeds primarily on moths, but will also eat beetles, true bugs, and flies. It captures prey in flight or by gleaning from foliage (Csuti et al. 1997). Big-eared bats hibernate in winter and are not known to migrate long distances. These bats are very intolerant of human disturbance at either winter hibernacula or summer roosts (Csuti et al. 1997). Significant 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.

Action Area Information

Several years of surveys for Townsend's big-eared bat have been conducted on the Olympic National Forest. Most recently (2005) wildlife staff conducted bridge and building surveys throughout the entire forest to document day and night roosting activity by bats. The species was found to use 23% of the 83 bridges surveyed. Proposed weed treatment sites are within the road corridor and along bridges where Townsend's big-eared bats have been known to roost.

Western (Mazama) Pocket Gopher (Thomomys mazama melanops)

There are 15 recognized subspecies of pocket gophers, eight of which occur in Washington. The subspecies *T.m. melanops*, the Mazama pocket gopher, is listed as a Region 6 sensitive species. In western Washington, the Mazama pocket gopher is associated with glacial outwash prairies, though their distribution seems patchy as some high quality prairies within the species range lack gophers (Steinberg and Heller 1997). The species is seriously imperiled in Washington, primarily due to habitat destruction and degradation from agricultural expansion, livestock grazing, fire suppression, exotic plant invasion, and urban sprawl (Steinberg 1995, Stinson 2005). The Mazama pocket gopher subspecies is found in the Olympic National Park in Clallam County where it is restricted to subalpine habitat of the higher Olympic Mountains.

Gophers eat above- and below-ground portions of various forbs, grasses, bulbs, plant roots, and also tree bark. Mazama pocket gophers appear to prefer bulbs, particularly wild onion and wild garlic, but have been reported eating clover (*Trifolium* spp.), lupine (*Lupinus* sp.), false dandelion (presumably *Hypochaerus radicata*) and grasses (Maser 1981). They create an underground tunnel system and may store large amounts of food in their chambers.

In January 2003, the U.S. Fish & Wildlife Service received a petition from the Center for Biological Diversity and Northwest Ecosystem Alliance to protect Washington's eight subspecies of pocket gopher under the Endangered Species Act. At that time, the species was given a "Listing Priority Number" (LPN) of 6.

As of June 2004, the gopher's status was as a "continuing candidate," that is, although the Service felt listing was warranted, the action was precluded by higher priority species, i.e., those with lower listing priority numbers. In the May 11, 2005 Federal Register, the USFWS, because of the increased imminence of a variety of threats, changed the LPN of all eight subspecies of the pocket gopher to a 3.

Action Area Information
There is a possibility that the species inhabits the higher altitudes in Buckhorn Wilderness of the Olympic National Forest. The Olympic National Forest does not have records of the Mazama pocket gopher within its jurisdiction. There are no proposed treatment areas within the Buckhorn Wilderness, but treatment areas 9H-01 and 9H-Three O'Clock Botanical Area are adjacent to the wilderness. These treatment areas are not preferred gopher habitat.

Common Loon (Gavia immer)
The common loon breeds predominantly north of the Canadian border. In Washington, there were 16 confirmed breeding locations in the late 1980's, but none south of the Seattle area (King County) (Merrifield 2003).

In western North America it winters primarily along marine coasts, but does occasionally winter in fresh water down the Pacific states as far south as northern Baja California (Merrifield 2003). This species can be found wintering, and occasionally throughout the year, on the Columbia River from the coast upstream to Umatilla County, Oregon. It can be found at large freshwater lakes during migration. Spring migration for inland Washington likely peaks in April, while Fall migration appears to peak in mid November (Merrifield 2003).

Loons feed primarily on small fish, but also eat crustaceans (including crayfish), amphibians, insects, and mollusks (Merrifield 2003). Loons are easily disturbed by humans.

Action Area Information
The loon has been documented on larger lakes within the boundaries of the Olympic National Forest (Lake Quinault and Wynoochee Lake). They are primarily winter visitors to the Peninsula and breeding is not documented on the Forest. Breeding may occur on Lake Quinault (Breeding Bird Atlas 1995). Proposed weed treatment sites are within Forest Service campgrounds that are adjacent to large bodies of water that common loon are known to inhabit.

American Peregrine Falcon (Falco peregrinus anatum)
Peregrine falcons are crow/raven-sized raptors that inhabit cliffs located within approximately 0.5 mile of riparian habitat. Peregrines nest on ledges clear of rock rubble, located approximately 40 - 80 percent of total cliff height. 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 lay 2-4 eggs in March-May, and commence incubation after the clutch is complete. Eggshell thinning induced by the metabolite of DDT (DDE), affected populations in the Pacific Northwest and elsewhere, and residual levels of DDE continue to affect the reproductive success of peregrines. Reproductive failure at peregrine nests has been chronic in northern CA and OR at all nest sites since at least 1983 due to eggshell thinning.

Eggs hatch after an incubation period of 31-33 days. Fledging occurs when the young are between 37 and 45 days of age (56 days at the upper end). Juveniles continue to be fed and protected by the adults until they disperse, which can range from 3 weeks to 3 months (Davis unpub. data, Pagel unpub. data).

Adults (or subadults in some instances) at lower and medium elevation nest sites occupy the nesting territory for the remainder of the year until the next nesting season commences at the winter solstice. In extreme instances, the adult(s) temporarily abandon the territory due to cold temperatures and/or significant reduction of availability of avian prey. During this period, the peregrines will travel to coastal, or central valley areas of CA, OR, and WA (Pagel unpub. data).

Peregrine falcons can be disturbed by human activity during the nesting season (Pagel unpub.data). Disturbance can cause: nest sites and new territories to be abandoned; active nesting attempts to fail due to egg breakage; or divert adult attention from opportunities to forage and feed eyases (Pagel unpub. data). Invasive plants do not directly affect peregrine falcons. Peregrine falcons in the Pacific Northwest are most affected by bioaccumulation of contaminants, and direct disturbance to their nesting at known or suspected nest sites; both which have caused numerous nesting failures during the previous 20 years of observation (Pagel unpub. data).

Action Area Information
Many peregrine falcons nest on the Olympic peninsula. Most of the known nests occur along the immediate Pacific coast and are not suspected to occur on the Forest. No recent surveys for peregrines have been conducted on the Forest; there are some marginal nest sites within the forest boundary. Peregrines could use portions of the forest. No current peregrine nest sites or suitable nest sites are located within 1.5 miles of any proposed invasive plant treatment areas on the Forest.

Van Dyke's Salamander (Plethodon vandykei)
Van Dyke's salamander is endemic to Washington. A study by McIntyre (2003) found that the presence of Van dyke's salamander is strongly correlated with certain key features in stream segments at a micro- and macro-habitat scale. Stream features most predictive of Van Dyke's salamander occurrence were the presence of non-forested areas on the valley wall, exposed bedrock, and deeply incised valley morphology. On a micro-habitat scale, the key variables were an absence of trees, presence of seeps or tributary streams, and areas of accumulated, small cobbles. Van Dyke's salamander has been found in upland forests, near lake shores, cave entrances, and using seeps and streamside habitat. It occurs in the Northwest Coast and Western Cascades Ecoregions with three isolated populations occupying the Olympic Peninsula, the Willapa Hills and the south Cascades Range.

Most surface activity takes place in the spring after snowmelt and before summer drought and in the fall after the onset of fall rains and before temperatures approach freezing. More specifically, most surface activity occurs when soil moisture is high (moist or wet) and soil temperatures are between 4 degrees to 14 degrees C (Hallock and McAllister 2005b). Because this species may occupy wet habitats, it is sometimes surface active even in the summer. Nests found on the Olympic Peninsula (elevations below 700 meters) were laid in early May and development was completed by early October (Hallock and McAllister 2005b). Females brood and guard the eggs during the summer.

Interestingly, small populations survived in the Mount Saint Helens' blast zone; these were probably protected by their subterranean refugia and heavy snowpack (Hallock and McAllister 2005b). Large decaying conifer logs near streams appear to be important habitat for nests. It is at risk due to its limited distribution and apparently small, isolated assemblage of populations. Van Dyke's Salamander may be harmed by alterations to the riparian habitats where it resides (Hallock and McAllister 2005b).

Action Area Information
There are 22 documented sites on the Forest where Van Dyke's salamanders are known to occur. There is a great deal of un-surveyed, but suitable, habitat on the forest.

Copes Giant Salamander (Dicamptodon copei)
Dicamptodon copei is a medium to large salamander (up to 20 cm total length) that inhabits small, silt-free, permanent streams or seeps, often with steep-gradients, but occasionally also are found in cold mountain lakes and ponds (Corkran and Thoms 1996; Jones and Raphael 2000; Leonard et al. 1993; Nussbaum et al. 1983). Experts are moderately confident that they are typically restricted to systems in moist coniferous forests with water temperatures that range from 8 to 14 degrees C, and are seldom above 18 degrees C. They are much more common in Washington than in Oregon.

Dicamptodon copei spend the day in streams beneath rocks or in hidden cavities (Leonard et al. 1993). They emerge at night from their diurnal hiding places and move about the stream bottom or in the moist splash zone along the banks of streams (Leonard et al. 1993; Nussbaum et al. 1983). *D. copei* is very rarely found in the metamorphosed stage and is unlikely to travel more than a few feet from a stream or lake edge (Corkran and Thoms 1996, Nussbaum 1983, as cited on NatureServe 2005).

During and after heavy rainfall, individuals can be found at night crawling among the wet rocks and vegetation at streamside. Terrestrial adults have been found at the stream edge beneath debris (Corkran and Thoms 1996; Leonard et al. 1993).

Populations are reportedly stable in Washington (NatureServe 2005). Cope's giant salamanders are extremely sensitive to stream siltation and stream warming which may be induced by activities such as logging, or stream bank clearing. Invasive plant species may alter the vegetation of stream banks and could impact this salamander.

Action Area Information
There are 12 known sites for Cope's giant salamander documented on the Forest and 77 documented sites on Olympic National Park. An additional 9 known sites occur outside the boundaries of the Park or Forest. None of the 12 known sites on the Forest occur within proposed treatment areas.

Olympic Torrent Salamander (Rhyacotriton olympicus)

Rhyacotriton spp. are found primarily in streams in humid coniferous forests, Douglas-fir, mixed conifer, montane riparian and mountain hardwood-conifer habitats (Stebbins 1951, Anderson 1968; Marangio 1988). *Rhyacotriton olympicus* is associated with streams with steep gradient and coarse substrate (Adams and Bury 2002) and is endemic to the Olympic Peninsula. *Rhyacotriton* abundance has been higher in headwater streams than lower gradient, downstream reaches (Wilkins and Peterson 2000, Stoddard 2001). They are found among pebbles and rocks within streams and seeps and stay within a 10 m-2 area (Marangio 1988).

Adults regularly are found under objects a few meters from water after heavy rains, and have been found on ridges during winter rains, but they are the most aquatic of metamorphosed salamanders found in the Pacific Northwest. They should be expected only in saturated stream-side talus, under woody debris in riparian areas, and in streams (Corkran and Thoms 1996; Nussbaum et al. 1983; Leonard et al. 1993). Transformed adults are not often encountered between May and September (Nussbaum and Tait 1977), during which time they may aestivate (Marangio 1988) or retreat to subsurface flows in deep cobble or fractured bedrock substrate.

According to Nussbaum (1983) habitat above 1,200 m does not support *Rhyacotriton*, and lower elevation areas may be locally unable to support *Rhyacotriton*, depending on water temperature. High quality habitat is available primarily where riparian disturbance has not occurred.

Action Area Information

Information on specific locations of *Rhyacotriton olympicus* on the Forest is limited. There are 2 known sites on the Forest that are within proposed treatment areas.

Puget Oregonian snail (Cryptomastix devia)

The Puget Oregonian is found from southern Vancouver Island, B.C. south through the Puget Trough and western Cascade Range in Washington to the Oregon side of the Columbia River Gorge. 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 big-leaf maple (*Acer macrophyllum*) and vine maple (*Acer circinatum*).

Action Area Information

There is one location of Puget Oregonian on the Olympic National Forest, located after extensive surveys throughout the Forest during the Survey and Manage required surveys for proposed ground-disturbing projects. One shell was discovered and was not live. The one location for this species is not within a proposed treatment area.

Warty jumping slug (Hemphillia glandulosa)

The range of the warty jumping-slug includes British Columbia south to northern Oregon, between the western Cascade Range and the Pacific Ocean. After the first two years of project survey efforts for survey and manage mollusks, many warty jumping slug sites were documented across their range in the NW Forest Plan area. The majority of sites are on the Olympic Peninsula and the northern Oregon Coast Range (Hebo District of the Siuslaw NF), with smaller numbers on the Tillamook Resource Area (Salem District BLM) and in the southwestern Cascades (Gifford Pinchot NF).

The warty jumping slug is now known as locally common, abundant and well distributed in the Olympic Province and the Oregon Coast Range, but less abundant with a patchy distribution in the southwestern Cascades.

They have been found in a wide range of habitat conditions, mostly in young, second-growth forests between 35-80 years old, with a few new sites in late seral forests. Several sites have been documented in young plantations (11-15 years in age) on the Siuslaw NF and Tillamook BLM. Warty jumping slugs are often found associated with various sizes of woody debris on the forest floor, in both conifer and hardwood settings. Searching under the moss layer of the down wood often reveals a jumping slug. Woody materials in moderate to advanced stages of decomposition are often used (decay classes 3-5). They may also be found on the forest floor around swordferns (*Polystichum munitum*), or foraging on mushrooms, or in the litter of big leaf maple (*Acer macrophyllum*), vine maple (*A. circinatum*), and red alder and (*Alnus rubra*). They occupy a wide range of vegetation zones and plant associations.

Warty jumping slugs also occur in previously thinned forests. Monitoring of completed commercial thinnings on the Olympic and Siuslaw Forests revealed the presence of these jumping slugs in both recent and older thinnings, ranging between 1.5 – 12 years since completion of thinning activities.

The genus *Hemphillia* is endemic to the Pacific Northwest and its members lay eggs in the fall on the forest floor and crevices in down woody debris. It is assumed that the adults die and the eggs overwinter, with immature slugs emerging in the spring (J. Ziegltrum, personal observation).

Action Area Information
The warty jumping slug is locally common and abundant on the Forest, with 605 known sites as of 2002 (Ziegltrum 2001). It was dropped from the Survey and Manage list in 2001 for the Forest, but remains on the Regional Forester's Sensitive Animal List. It is found in a variety of vegetation types and stand ages. It is often associated with decaying woody material, hardwood leaf litter, moss, and moist sites. A total of 478 known sites for *H. glandulosa* are located within proposed treatment areas. There are 125 known sites for *H. glandulosa* outside of any proposed treatment area.

Burrington's jumping slug (Hemphillia burringtoni)
The Burrington jumping slug was first described as a subspecies of *H. glandulosa* by Pilsbry (1948, as cited in Wilke 2004), and later elevated to species status by Branson (1972, as cited in Wilke 2004), based on eight specimens. Wilke (2004) found that morphological characteristics were not reliable in distinguishing between *H. burringtoni* and *H. glandulosa*. There is uncertainty regarding the taxonomic relationship of *H. burringtoni* and *H. glandulosa* and recent genetic research indicates two species complexes (Wilke 2004).

Burrington's (aka keeled) jumping-slug is found on the Olympic Peninsula south to the Coast Range of northwestern Oregon. Along with the other *Hemphillia* species, they inhabit moist, undisturbed conifer forest, sometimes within riparian areas, and can be found among logs and heavy ground cover of low vegetation, litter and debris. The genus *Hemphillia* is endemic to the Pacific Northwest and its members lay eggs.

Threats to this species include changes in microclimate within habitat destruction and fragmentation from timber harvest, conversion to agriculture, development, road construction, and fire.

Action Area Information
A total of eight known sites for *H. burringtoni* occur within proposed treatment areas; 9H-05 (1 site), 9P-10 (4 sites), and 9P-12 (3 sites). Two known sites occur outside of any proposed treatment areas.

Malone's jumping slug (Hemphillia malonei)
South-central Washington south to coastal and central Oregon is the known range for this species. The Malone jumping-slug may be found in partly open, moist Douglas-fir forest with diverse herbaceous vegetation and an abundant litter layer. It prefers ravine, gorge, or talus sites and persistent moisture is required. This slug may also be found near seeps, springs, and wet riparian areas, under or among rotting logs, ferns, and mosses. Specific forest type where it is typically found are moist forest stands, generally >50 years old, with >50% canopy cover, especially where dense sword fern and large woody material exist. Other life history traits and threats are the same as described for *H. burringtoni*. This species is more widespread and abundant than *H. burringtoni*, based on the number of current locations entered into the ISMS database.

Action Area Information
Although the Malone's jumping slug is suspected to occur on the Olympic National Forest, there has not been a discovery during extensive mollusk surveys throughout the Forest. The nearest site is located on the Capitol State Forest, approximately 35 miles from the forest boundary.

Blue-gray Tail-dropper (Prophysaon coeruleum)
This slug is found from the Puget Trough south through the western Cascade Range and Oregon Coast Range to northern California. This species is common in Oregon but very rare in Washington. 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. Like other terrestrial mollusks, it is generally associated with moist plant communities, litter, woody debris, and mosses.

Action Area Information
After extensive surveys for mollusks forest-wide the species has not been discovered. Although the type locality indicated "Olympia", numerous biologists have searched parks and natural areas in southern Puget Sound and no blue-gray taildroppers have been found (J. Ziegltrum, pers. observ.).

Hoko Vertigo
An endemic species, this snail is known only from the Hoko River drainage on the Olympic Peninsula in Clallam County, Washington. The Hoko vertigo is arboreal and found on the trunks and lower limbs of alders and other deciduous trees. They are associated with old growth and riparian habitats. This snail is a "livebearer" in which the eggs hatch before leaving the uterus of the parent. Threats to the species include timber harvest, alterations in microclimatic conditions, fire, floods, and non-native species, particularly invasive vines that could cover tree trunks.

Action Area Information
This species has not been documented within the Olympic National Forest. During pre-disturbance surveys for Survey and Manage mollusks in many project areas, this species has not been located on the forest (J. Ziegltrum, personal communication). There may be potential habitat on the extreme northwest corner of the Forest.

Management Indicator Species (MIS)

MIS are discussed below. The bald eagle is sensitive to management in riparian areas. The northern spotted owl represents wildlife species associated with mature and older coniferous forests. The bald eagle and northern spotted owl have been discussed above under the section titled "Federally Listed Species."

Pileated woodpecker
The pileated woodpecker represents species that inhabit mature coniferous forest habitats. The pileated woodpecker is the largest woodpecker species in the western United States and nests in cavities of large trees or snags. It is a denizen of mature forests, relying on dead and decaying trees for foraging and nesting. Pileated woodpeckers can act as a keystone habitat modifier by excavating large numbers of cavities that are depended upon by several other species, and by influencing ecosystem processes such as decay and nutrient cycling (Aubry and Raley 2002). Pileated woodpeckers will return to areas after timber harvesting (Ehrlich 1988), however, past management in the Pacific Northwest has lead to relatively few snags and down logs, especially of large diameters, remaining in many watersheds. Previous timber harvest, as opposed to wildfire events, has had the greatest effect on the availability of large diameter standing dead trees in the Olympic National Forest.

Primary cavity excavators
A large number of species rely on cavities in trees for shelter and nesting. The Forest has designated a group of species for this Management Indicator category. This group of species represents snag-dependent cavity nesters. It includes animals dependent on dead or dying trees for nest sites. "Primary cavity excavators" comprise a broad group of species associated with standing dead trees or snags and down logs, and that excavate their own nests. Species included in this MIS group are listed in Table 4.

Table 4. Species included in the "primary cavity excavators" group and their occurrence on the Forest.

Species	Occurrence on Forest
Lewis' woodpecker	transient
Red-breasted sapsucker	common
red-napped sapsucker	transient
downy woodpecker	very common
hairy woodpecker	very common
three-toed woodpecker	very rare
black-backed woodpecker	transient
northern flicker	very common
pileated woodpecker	common
black-capped chickadee	common
mountain chickadee	very rare
chestnut-backed chickadee	very common
red-breasted nuthatch	very common
white-breasted nuthatch	transient
northern flying squirrel	common

The following information was taken from Marshall et al. 2003.

Lewis' woodpecker – distributed from southern BC and Alberta to central California, Arizona, New Mexico, and Texas. It inhabits open woodland habitat. Lewis' woodpecker nests in cavities but seldom excavate their own; they often nests in oak or cottonwood. They are opportunistic feeders, eating insects in spring and summer and fruits and acorns in fall and winter. They obtain prey by flycatching or gleaning insects, which are primarily carpenter ants, bees, wasps, mayflies, beetles and grasshoppers.

Red-naped sapsucker – distributed from southwest Canada to eastern California, Nevada, Arizona, New Mexico, and Texas. It inhabits riparian habitats and aspen, and some mixed conifer, foraging largely in riparian areas. Red-naped sapsuckers excavate cavities in aspens, larch, pine, and Douglas-fir. It eats sap, cambium, and insects attracted to sap by foraging in trees.

Red-breasted sapsucker – distributed from Alaska to northwest California, east to Nevada. Its habitat consists of moist conifer of the western Cascades, often old growth. Red-breasted sapsuckers nest in large snags or live trees with heart rot and their main diet is insects (primarily ants and beetles), and sap.

Downy woodpecker – distributed from Alaska to California, and Newfoundland to Florida. Downy woodpeckers use deciduous and mixed forests and nest in snags. Their main diet is scale insects (Coccids), beetles, and ants. These woodpeckers forage primarily in trees, but sometimes will forage in shrubs.

Hairy woodpecker – distributed from Alaska to Panama, across Canada and the U.S., and south from Newfoundland to Bahamas. Preferred habitat consists of mixed conifer and ponderosa pine and adjacent deciduous stands. They nest in snags with light to moderate decay. The main diet is beetles, and ants, which they obtain by foraging on mature and old-growth conifers but also on deciduous trees during breeding.

Three-toed woodpecker – Holarctic distribution. In North America, this woodpecker is found from Alaska to Arizona and New Mexico. Three-toed woodpeckers are found in lodgepole pine, fir/hemlock, and Douglas-fir/mixed conifer habitats. They nest in cavities, eat bark beetles and larvae, and forages in trees.

Black-backed woodpecker – distributed from Alaska to California, Canada to S. Dakota and elsewhere in northern and eastern U.S. They inhabit conifer forest with snags, especially recently burned or bark-beetle killed forests. Black-backed woodpeckers nest in live (heartrot) or dead trees and can use smaller trees for nest cavities. Their main diet is larvae of wood-boring beetles gathered from under bark of trees.

Northern flicker – the western red-shafted group is distributed from Alaska to Mexico, and southern Canada to the western edge of Great Plains. They use many habitats, but are most common in open forests and forest edges. Northern flickers nest in large-diameter decaying snags. Their diet is primarily ants, crickets, beetles, berries, seeds, obtained by foraging on the ground in open areas and on trees.

Black-capped chickadee- distributed from Alaska and Canada to east coast, south to California and across the U.S. to North Carolina. They are found in hardwood habitats and riparian areas. They nest in cavities or artificial nest boxes and are common visitors at backyard feeders. They eats caterpillars, spiders, snails and slugs, seeds, and fruit.

Mountain chickadee – distributed from Washington, Oregon, Idaho, and Montana to California, Arizona, and New Mexico. Mountain chickadees breeds in pine and conifer forests, juniper, and aspen. They nest in cavities, nest boxes or down logs. These chickadees forage high in the canopy, eating insects and conifer seeds.

Chestnut-backed chickadee – distributed from Alaska and BC / Alberta to southern California. Their habitat is usually older moist conifer forests. These chickadees will use woodpecker cavities and nest in snags and stumps. They forage in branches of trees, gleaning insects.

Red-breasted nuthatch – distributed from Alaska to California, across Canada and south to the Appalachians. This species breeds mostly in old-growth and mature conifer. It nests in snags or dead limbs, and forages along trunk and branches of conifers, or sometimes deciduous trees. It eats weevils, ants, leafbugs, and bark beetles. Outside the breeding season, conifer seeds are an important food.

White-breasted nuthatch – distributed from across Canada to Florida and California, except in theGreat Basin, Great Plains, and Sonoran Desert. It inhabits various woodlands, especially ponderosa pine.

White-breasted nuthatches will use woodpecker cavities for nesting and roosting. They forage mainly on large tree limbs and trunks, eating beetles, and weevils. They will also visit backyard feeders, eating sunflower seeds and suet.

Northern flying squirrel – distributed from Alaska and Canada, south to California and the eastern U.S. It inhabits mature and immature conifer, and some tanoak and riparian habitats. This squirrel is strictly nocturnal and it nests mostly in tree cavities. It eats mostly fungi, some vegetation, insects, nuts, seeds, fruits, and meat (Maser et al. 1981).

Roosevelt elk and Columbian black-tailed deer

These two species are known throughout the Olympic National Forest and Peninsula. There are several established herds of Roosevelt elk that reside on the Forest as year-round residents, as well as many that are migratory, for example, moving into the Olympic National Park during the summer. Deer occur throughout the forest, and both species use a combination of habitats comprised of cover and forage areas that are not too fragmented by road systems. Taber and Raedeke (1980) reported that winter mortality, legal harvest, and poaching were the primary causes of elk morality. Poaching is the second leading cause of mortality to elk in Washington state and is prevalent on the Olympic Peninsula (WDFW 2004). As one might expect, a high density of roads, common throughout much of the Peninsula, can have a negative impact on elk with increased disturbance from legal hunting and poaching (CEMG 1999) and therefore, closing roads no longer needed results in a significant reduction in disturbance to elk (Witmer et al. 1985).

On the Olympic Peninsula, winter range is typically defined as land below 1500 feet in elevation (USDA 1995). The Olympic LRMP (USDA 1990) provides interim direction that in those areas managed for winter survival, habitat should be managed to provide 10-15% of the area in openings (natural and created) and the remainder in thermal and hiding cover, 20% of which should be optimal cover (the LRMP also recommends managing roads to reduce wildlife disturbance). Preferred forage areas are in natural openings or managed stands that have been harvested no later than 30 years ago.

American marten

The American marten (*Martes americana*), also known as the pine marten, represents species that inhabit mature coniferous forest habitats. American martens occur in forests containing snags and down logs, which provide suitable denning sites and are most closely associated with heavily forested east and north-facing slopes that contain numerous windfalls (Maser 1998). They tend to avoid areas that lack overhead protection and the young are born in nests within hollow trees, stumps, or logs. According to a Washington Department of Fish & Wildlife study (Sheets 1993), which combined trapper interviews with remote camera surveys in various locations on the Peninsula, it was concluded that marten may only be found within the Olympic National Park, and in surrounding low elevation wilderness areas and un-fragmented mature timber on Forest lands adjacent to the park. National Forest land, in general, has perhaps become too fragmented to support a population.

Past management has lead to relatively few snags and down logs, especially of large diameters. Historic fire and intensive forest stand management within the national forest has lead to relatively few large snags and down logs, resulting in lower densities relative to historic levels. Much of the area is less than 60 years old and is interspersed with small patches of old growth.

The Olympic National Park has conducted surveys for pine marten in recent years using smoked track plates and remote camera stations. No pine marten have been detected within the park during these surveys. Given these survey results, it is unlikely that they would occur on the Forest, but they could be present in more remote wilderness areas, or in contiguous mature forest, where forest has not been fragmented.

Birds of Conservation Concern

Northern goshawk

This large and impressive accipiter is found throughout forested areas of North America as far south as the Mexican highlands (Marshall 2003). Goshawks eat a variety of birds and mammals ranging from passerines to grouse and chipmunks to hares. Nest building begins in spring and incubation takes about 1 month. Young are in the nest for 6 weeks and then move to nearby perches. Parents continue to feed fledglings into early September. Goshawks migrate south for the winter but little is known about wintering biology.

Black swift

These unusual birds prefer to nest near or behind the curtain of a waterfall. They catch insects on the wing high above forested and open areas. The breeding range of the black swift includes Alaska south to southern California, and as far east as Colorado. They likely winter in South America, but their wintering grounds are unknown. These birds are rare to uncommon and most often seen as single birds, or in flocks of fewer than 15 birds (Combs 2003).

Rufous hummingbird

The rufous hummingbird may be the most wide ranging hummingbird in North America (Patterson 2003). It has occurred in every state and most Canadian provinces. It is a common visitor at backyard nectar feeders. Rufous hummingbirds are found in a wide variety of habitats, though it shows a breeding preference for wooded areas with a high canopy and well-developed understory (Patterson 2003). They feed on nectar of many plants, including flowering currant, salmonberry, and pacific madrone, but show a preference for tubular flowers. Hummingbirds will also glean insects.

Olive-sided flycatcher

The most famous attribute of this bird is its song, which sounds like *quick three beers*, at least to birders. Olive-sided flycatchers perch at the top of a tall tree or snag and dart out to catch flying insects. It breeds only in coniferous forests of North America, from Alaska south to Baja California in the west, and from Canada to North Carolina in the east. It winters in Central and South America. This flycatcher is often found along the wooded shores of streams, lakes, marshes and bogs. Breeding Bird Survey data has shown highly significant population declines for all continental, national, and regional analyses.

The causes of population decline are thought to be habitat alteration and losses on wintering grounds because of the relatively consistent declines throughout the breeding range of the species (Altman 2003).

Aquatic Species

For purposes of addressing pacific salmon and other fish species of local interest within the context of their status and life history, only brief summaries from various sources are presented in this document. Additional information related to brief life history information and status of populations at the ESU or DPS scale can be found in the following sources:

- Regional Invasive Plant EIS Fisheries Biological Assessment, Environmental Baseline,
- NMFS Federal Register documents (http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Index.cfm),
- USFWS Federal Register documents (http://www.fws.gov/pacific/bulltrout/),
- Shared Strategy for Puget Sound for Puget Sound Chinook Salmon, Hood Canal summer chum salmon, and bull trout population in the Puget Sound area (http://www.sharedsalmonstrategy.org/plan/docs/), and
- Draft Coast Puget Sound Bull Trout Recovery Plan (http://www.fws.gov/pacific/bulltrout/recovery.html)

Federally Listed Fish Species (Section 7, Endangered Species Act)

Coastal Puget Sound Bull Trout (Salvelinus cForestluentus)

Bull trout are native to North America. Although they closely resemble another char, the Dolly Varden (Salvelinus malma), and the ranges of the two species overlap along the Coastal/Puget Sound region of Washington State and British Columbia, bull trout are genetically more closely related to an Asian char (Salvelinus leucomaenis) than to Dolly Varden. Historically, bull trout have been recorded from the McCloud River in Northern California, the Klamath Basin in Oregon, and throughout much of interior Oregon, Washington, Idaho, western Montana and British Columbia. Bull trout also occur east of the Continental Divide in the headwaters of streams entering Hudson Bay and the Arctic Ocean (Quigley and Arbelbide 1997).

Bull trout express two distinct life history forms, resident and migratory (Rieman and McIntyre 1993). Resident populations are often found in headwater streams where they spend their entire lives. Migratory forms spawn in tributary streams, rear for one to three years before migrating downstream to larger rivers or lakes. Bull trout can also be anadromous in coastal and Puget Sound drainages but to a lesser extent than Dolly Varden (Brown 1992).

The Coastal Puget Sound DPS of bull trout encompasses all Pacific Coast drainages within the State of Washington, including Puget Sound. The DPS is separated from other populations of bull trout by the Columbia River basin to the south and the crest of the Cascade Mountain Range to the east. The population segment is highly significant to the species as a whole, since all types of bull trout can live in the Puget Sound area, including the only known anadromous forms of bull trout in the coterminous United States. Also unique to this population segment is the overlap in distribution with Dolly Varden, another native char species extremely similar in appearance to bull trout, but distinct genetically.

The USFWS has identified 347 subpopulations of native char (bull trout and/or Dolly Varden) within the Coastal Puget Sound DPS. These subpopulations were grouped into five analysis areas based ontheir geographic location: Coastal, Straight of Juan de Fuca, Hood Canal, Puget Sound, and Transboundary. These groupings were made to identify trends that may be specific to certain geographic areas. A total of 14 bull trout core areas occur within the Coast Puget Sound DPS.

The status of only one of the 34 subpopulations has been determined to be strong by the USFWS: the lower Skagit River subpopulation in the Puget Sound analysis area. The status of the other 14 subpopulations in the Puget Sound analysis area is either considered unknown or depressed. Within the Strait of Juan de Fuca analysis area, both the Lower Elwah River and the Lower Dungeness/Gray Wolf subpopulations have been determined to be depressed and three other subpopulations are considered unknown. The ten subpopulations within the Coastal analysis area are considered unknown, with the exception of the Hoh River subpopulation which has been determined to be depressed. Of three subpopulations in the Hood Canal analysis area, two are depressed and one is unknown. The Chilliwack River/Selesia Creek subpopulation is the single subpopulation in the Transboundary analysis area; its status is considered unknown.

Puget Sound Steelhead Trout (Oncorhynchus mykiss)

On Mar. 29, 2006 NOAA Fisheries Service announced that it is proposing to list the Puget Sound Steelhead Distinct Population Segment (DPS) as "threatened." The DPS includes all naturally spawned anadromous winter-run and summer-run steelhead populations, in streams in the river basins of the Strait of Juan de Fuca, Puget Sound, and Hood Canal, Washington, bounded to the west by the Elwha River (inclusive) and the north by the Nooksack river and Dakota Creek (inclusive), as well as the Green River natural and Hamma Hamma winter-run steelhead hatchery stocks (71 FR 15666).

The most widespread run type of steelhead is the winter (ocean-maturing) steelhead. Winter steelhead are found in nearly all coastal rivers of Washington, Oregon, and California, south to Malibu Creek. Summer (stream-maturing) steelhead, including spring and fall steelhead in southern Oregon and northern California, are less common.

The steelhead life history form has undergone status review for listing under the ESA. Busby et al (1996) identified 15 steelhead ESUs, 12 coastal forms and 3 inland forms. Of the coastal forms, the Puget Sound, Olympic Peninsula, Lower Columbia, Upper Willamette, Oregon Coast, Klamath Mountains Province are found in the planning area. The Puget Sound and Olympic Peninsula ESUs are within the range of the Olympic National Forest.

In general, the ESUs include resident forms in cases where they have the opportunity to interbreed with anadromous fish (Busby et al 1996), but where populations are listed under ESA the purely resident forms are not included.

The Puget Sound ESU occupies river basins of the Strait of Juan de Fuca, Puget Sound, and Hood Canal, Washington. Included are river basins as far west as the Elwha River and as far north as the Nooksack River. This ESU is primarily composed of winter steelhead but includes several populations of summer steelhead (Busby et al 1996).

Olympic Peninsula ESU steelhead, found on the Olympic National Forest, occupies river basins of the Olympic Peninsula, Washington, west of the Elwha River and south to, but not including, the rivers that flow into Grays Harbor on the Washington coast. The Olympic Peninsula ESU is primarily composed of winter steelhead but includes several populations of summer steelhead in the larger rivers (Busby et al 1996). This ESU is not listed under ESA.

Puget Sound Chinook (Oncorhynchus tshawytscha)

The Puget Sound chinook salmon ESU, listed as threatened on March 24, 1999 (64 FR 14308), includes all natural populations of spring-run chinook salmon from rivers and streams flowing into Puget Sound including the Straits of Juan De Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington.

Critical habitat was designated for Puget Sound chinook salmon on February 16, 2000 (65 FR 7764), but vacated by court order on April 30, 2002. Critical Habitat for this species was proposed on December 14, 2004 (69 FR 74572) and designated on September 2, 2005 (70 FR 52629). Below is a brief narrative of their distribution within the action area taken from the Regional Invasive Plant EIS Fisheries Biological Assessment.

Skykomish sub-basin, approximately 50 percent of which is within Olympic NF, has 5 major streams that contain more than five miles of anadromous fish habitat inside the National Forest land, including SF Skykomish River, Rapid River, Beckler River, Foss River, and NF Skykomish River. Beckler River holds roughly 10 miles of anadromous fish habitat inside the NF land.

Dungeness/Elwha sub-basin, approximately 20 percent of which is within Olympic NF, has 2 major streams that contain more than five miles of anadromous fish habitat inside the National Forest land, including Dungeness River and Gray Wolf River. Gray Wolf River holds roughly 7 miles of anadromous fish habitat inside the NF land.

Hood Canal sub-basin, approximately 35 percent of which is within Olympic NF, has 3 major streams that contain more than five miles of anadromous fish habitat inside the National Forest land, including Dosewalips River, Duckabush River, and Big Quilcene River. Dosewalips River holds roughly 7 miles of anadromous fish habitat inside the NF land.

Skokomish sub-basin, approximately 45 percent of which is within Olympic NF, has 1 major stream, SF Skokomish River, which contains more than five miles of anadromous fish habitat inside the National Forest land. SF Skokomish River holds roughly 17 miles of anadromous fish habitat inside the NF land

Lower Columbia River Coho (Oncorhynchus kisutch)

Originally part of a larger Lower Columbia River/Southwest Washington ESU, Lower Columbia River coho were identified as a separate ESU and listed as threatened on June 28, 2005. The ESU includes all naturally spawned populations of coho salmon in the Columbia River and its tributaries in Washington and Oregon, from the mouth of the Columbia up to and including the Big White Salmon and Hood Rivers, and includes the Willametter River ot Willametter Falls, Oregon, as well as twenty-five propagation programs that were determined not to be divergent relative to the local natural population(s) within the ESU.

Grays Harbor sub-basin, approximately 30 percent of which is within Olympic NF, has 2 major streams that contain more than five miles of anadromous fish habitat inside the National Forest land, including the WF Humptulips River and EF Humptulips River. The EF Humptulips River holds roughly 17 miles of anadromous fish habitat inside the NF land.

Lower Chehalis sub-basin, approximately 20 percent of which is within Olympic NF, has 2 major streams that contain more than five miles of anadromous fish habitat inside the National Forest land, including Wynoochee River and WF Satsop River. Wynoochee River holds roughly 12 miles of anadromous fish habitat inside the NF land.

Hood Canal Summer-run Chum (Oncorhynchus keta)

Olympic National Forest is located within the Hood Canal Summer-run chum ESU. The Hood Canal summer-run chum ESU, listed as threatened on March 25, 1999 (64 FR 14508), includes all natural-origin populations of chum in streams within the Hood Canal.

Critical habitat was originally designated for Hood Canal summer-run chum salmon on February 16, 2000 (65 FR 7764), but was administratively withdrawn on April 30, 2002. Critical Habitat for this species was proposed on December 14, 2004 (69 FR 74572) and designated on September 2, 2005 (70 FR 52629). Below is a brief narrative of their distribution within the action area taken from the Regional Invasive Plant EIS Fisheries Biological Assessment.

Dungeness/Elwha, Hood Canal, and Skokomish. There are 6 streams all together in this ESU that have at least five miles of anadromous fish habitat inside NF land. South Fork Skokomish River inside Skokomish sub-basin (17 miles) and Dosewalips River inside Hood Canal sub-basin (7 miles) are the two rivers that have the highest amount of anadromous fish habitat (as shown in the parentheses) within this ESU.

Dungeness/Elwha sub-basin (with only 45 percent as part of the ESU area, approximately 45 percent of which is within Olympic NF) has 2 major streams that contain more than five miles of anadromous fish habitat inside the National Forest land, including Dungeness River and Gray Wolf River. Gray Wolf River holds roughly 7 miles of anadromous fish habitat inside the NF land.

Hood Canal sub-basin, approximately 40 percent of which is within Olympic NF, has 3 major streams that contain more than five miles of anadromous fish habitat inside the National Forest land, including Dosewalips River, Duckabush River, and Big Quilcene River. Dosewalips River holds roughly 7 miles of anadromous fish habitat inside the National Forest.

Skokomish sub-basin, approximately 45 percent of which is within Olympic NF, has 1 major stream, SF Skokomish River, which contains more than five miles of anadromous fish habitat inside the National Forest land. SF Skokomish River holds roughly 17 miles of anadromous fish habitat inside the NF land.

Forest Service Sensitive Fish Species

Sockeye Salmon (Oncorhynchus nerka)

Populations of lake spawning sockeye are found in Lake Pleasant and Quinault on Olympic National Forest. Lake Pleasant sockeye salmon ascend the Quillayute and Sol Duc Rivers and Lake Creek to spawn in Lake Pleasant, Washington. These areas lie partially or wholly within Clallam County (NatureServe 2005). More information is needed on population size and trend. Quinalt sockey spawn in the Quinault River drainage and rear in Quinault Lake, Washington.

Most sockeye spawning occurs in rivers and streams that are tributaries to lakes, but often substantial numbers of sockeye salmon spawn along lake shores in areas where ground water percolates through gravel. Generally, sockeye utilize areas along lake shores where the gravel is small enough to be readily dislodged by digging. Sockeye, however, may also utilize lake shore areas with other substrate types and sizes, depending largely on the presence or absence of upwelling.

Landlocked populations of sockeye, known as kokanee, are found in Lake Ozette and Crescent Lake on the north Olympic Peninsula; Lake Whatcom, Baker Lake, American Lake, Summit Lake, and Lake Washington in the Puget Sound area. Typically, kokanee populations are maintained by stocking hatchery fish (Wydoski and Whitney, 2003).

Olympic Mudminnow (Novumbra hubbsi)

Current distribution of the Olympic mudminnow on or near Olympic National Forest includes the southern and western lowlands of the Olympic Peninsula (Mongillo and Hallock 1999). Lake Ozette is believed to have provided refugia for Olympic mudminnows during the last glaciation because it was ice free. Olympic mudminnows are known to be distributed from the lower Deschutes River (occasional, apparently as a result of floodwater exchange with Chehalis River), Chehalis River drainage (eastward to the Skookumchuck River), north along western base of Olympic Mountains to Queets River system; and in Ozette Lake (NatureServe 2005). Although these fish live primarily in wetland habitats, they are also found in slow-moving streams and ponds. Studies suggest that Olympic mudminnows are missing from oxbow lakes because of the presence of exotic fish species. Required habitat characteristics are several centimeters of soft mud bottom substrate, little to no water flow, and abundant aquatic vegetation. Their diet is typical of a small carnivorous fish.

Olympic mudminnows prefer quiet waters with mud or dark bottoms, usually in well-vegetated areas and under overhanging banks, and especially marshy streams and brownish water of bogs and swamps (Wydoski and Whitney 2003). They have also been found in such disturbed habitats as roadside ditches and eutrophic waters. Olympic mudminnows do not occur in otherwise suitable areas that have introduced spiny-rayed fishes. Sexes aggregate in separate areas in spring and fall. Spawning sites are shallow, and in low flow areas such as flooded areas adjacent to streams (Kendall and Mearns 1996). Eggs are individually adhesive on aquatic vegetation. Fry attach themselves to vegetation, using "gluing" head glands (NatureServe 2005).

Low tolerance to water current has restricted Olympic mudminnows to lowlands (ibid 1999). Additional sampling for the Olympic mudminnow is suggested because their population status is not known. Mongillo and Hallock (1999) believe there are undoubtedly more undiscovered populations within the range of the species.

The future of the Olympic mudminnow is completely dependant upon our ability to maintain the quality and amount of lowland wetlands within its range. Because of their very restricted distribution, local disturbances leading to habitat loss for the Olympic mudminnow may have profound effects on its persistence. Urbanization, forestry and agricultural practices, and invasion by exotic plants and animals continue to result in wetland loss and habitat degradation for the Olympic mudminnow (Mongillo and Hallock 1999).

Salish Sucker (Catostomus sp.)

The Salish sucker in Washington has been documented at Lake Cushman on the Olympic Peninsula, and in the river systems along east/northeast Puget Sound. Lake Cushman in Washington is adjacent to Olympic National Park and within Olympic National Forest. Range of the Salish sucker includes a number of streams that flow into Hood Canal, Puget Sound, most notably the Union River, Duwamish River, and the Little Skookum River (NatureServe 2005). Salish suckers can be found in lakes, reservoirs, or small, lowland streams. Within streams it is most abundant in headwater reaches, which have slightly cooler summer water temperatures and slightly higher average gradients than lower areas (ibid). These fish tend to be associated with long, continuous areas of deep pool habitat, with suitable riffles for spawning.

The salish sucker resembles the longnose sucker. Populations of longnose sucker that are found west of the Cascade Mountains are considered to be morpohologially different from populations found on the east side of the Cascades (Wydoski and Whitney 2003). Western populations are referred to as salish sucker and are reproductively isolated from populations in eastern Washington (ibid).

Coastal Cutthroat Trout (Oncorhynchus clarki clarki)

No populations of coastal cutthroat trout are currently listed under ESA within the Olympic National Forest. However, they are a Sensitive species on the Olympic National Forest.

This species is widely distributed in the coastal and Puget sound drainages in Washington. It's wide distribution includes northern California northward along the Pacific Coast of Oregon, Washington, and British Columbia to southeastern Alaska, generally within 90 miles of the coast (Wydoski and Whitney 2003). Forty groups of stocks of coastal cutthroat trout were identified in Washington. Stocks within the Puget Sound area include those that are found in drainages of Puget sound, Hood Canal, and the eastern Olympic peninsula (east of and including the Elwha River), and the Straight of Juan de Fuca. The Olympic peninsula stocks includes those that are found in the Straight of Juan de Fuca west of the Elwha river and coastal streams south to, but not including, streams that drain into Grays Harbor.

Coastal cutthroat trout exhibit diverse life histories with four distinct life history patterns. The life history patterns include anadromous populations, which migrate to the ocean or estuary for usually less than one year before returning to freshwater; fluvial populations that migrate between small spawning tributaries and main rivers downstream; adfluvial populations migrate between spawning tributaries and lakes or reservoirs; and nonmigratory resident forms (Quigley and Arbelbide 1997).

Orlay et al (1999) suggested six potential coastal cutthroat trout ESUs, two of which occur within the Olympic National Forest. The coastal cutthroat trout ESUs are Puget Sound and Olympic peninsula. The Puget Sound ESU includes populations of coastal cutthroat trout that enter protected marine waters in northwestern Washington. Waters draining the east side of the Olympic National Forest are included. Olympic ESU cutthroat are found from the Strait of Juan de Fuca west of the Elwha River and coastal streams south to, but not including, streams that drain into Grays Harbor.

Puget Sound/Straight of Georgia and Pacific Coast Chum (Oncorhynchus keta)

The Puget Sound/Straight of Georgia and Pacific Coast Chum ESUs are Sensitive species on the Olympic National Forests. The chum salmon has the widest natural geographic and spawning distribution of any Pacific salmonid, primarily because its range extends farther along the shores of the Arctic Ocean than other salmonids. Chum salmon have been documented to spawn from Korea and the Japanese island of Honshu, around the rim of the North Pacific Ocean, to Monterey Bay in southern California. Chum salmon are the second largest Pacific salmon, smaller only than Chinook salmon as adults. The species is best known for the enormous canine-like fangs and striking body color of spawning males (a calico pattern, with the front two-thirds of the sides marked by a bold, jagged, reddish line and the rear third by a jagged black line). Females are less flamboyantly colored than males and have smaller teeth. (Johnson et al 1997).

Chum salmon spend more of their life history in marine waters than other Pacific salmonids. Chum salmon usually spawn in coastal areas, and juveniles migrate to seawater almost immediately after emerging from the gravel. This ocean-type migratory behavior means that survival and growth of juvenile chum salmon is less dependent upon freshwater conditions than the stream-type behavior of some other species in the genus Oncorhynchus, which usually migrate to sea at a larger size, after months or years of freshwater rearing (Johnson et al 1997).

The Puget Sound/Strait of Georgia ESU includes most U.S. populations of chum salmon and the vast majority of adult spawners that return to U.S. waters outside Alaska. This ESU includes all chum salmon populations from Puget Sound and the Strait of Juan de Fuca as far west as the Elwha River, with the exception of summer-run populations in Hood Canal and along the eastern Strait of Juan de Fuca (Johnson et al 1997).

The Pacific Coast ESU includes all natural chum salmon populations from the Pacific coasts of Washington and Oregon, as well as populations in the Strait of Juan de Fuca west of the Elwha River (Johnson et al 1997).

Washington Coast Chinook salmon (Oncorhynchus tshawytscha)

Chinook salmon are widely distributed along the Oregon and Washington Coast and in the Columbia Basin. Chinook salmon tend to spawn in larger river systems but they do occur in smaller coastal streams. Natal streams for Chinook salmon may be relatively short coastal rivers or tributaries at the head of major drainages hundreds of kilometers from the sea (Meehan and Bjornn 1991). Chinook salmon attain the largest size of any Pacific salmon. They are relatively long lived, commonly maturing at the age of 4 to 5 years. Chinook salmon populations can have very different life histories. Salmon populations are often described based upon migration timing into fresh water. For example, in the Columbia Basin Chinook have been traditionally been described as spring, summer, and fall races based upon migration timing over Bonneville Dam. Spring run fish cross Bonneville Dam from March through May, summer fish from June to July, and fall fish from August to September (Quigley and Arbelbide 1997). This nomenclature has led to cForestusion because populations with similar run timing may differ in spawning areas, life histories, behavior and genetic characteristics.

Chinook salmon are also described based upon when juveniles migrate seaward. Ocean-type juveniles (subyearling) may enter saltwater soon after yolk resorption ("immediate") or more typically in the late summer or autumn of their first year. If environmental conditions are not conducive to subyearling emigration, ocean-type Chinook salmon may remain in fresh water for a year. Stream types juveniles (yearling) migrate during their second, or, more rarely, their third spring. The underlying biological basis for differences in juvenile life history appears to be both environmental and genetic (Myers et al 1998). Ocean-type and stream-type Chinook salmon have adapted to different ecological niches.

Ocean-type Chinook salmon tend to use estuaries and coastal areas more extensively for juvenile rearing. Stream-type juveniles are much more dependent on freshwater stream ecosystems. Ocean-type Chinook salmon predominate along the coastal drainages, and in Puget Sound (Myers et al 1998). Within the Snake River basin and tributaries to the Columbia River downstream from the Snake River, stream-type Chinook salmon include spring-and summer run fish and ocean type Chinook salmon include fall-run fish. Within the Columbia upstream from the confluence with the Snake River stream-type Chinook salmon include spring-run fish and ocean-type Chinook salmon include summer and fall-run fish (Quigley and Arbelbide 1997). Washington Coast Chinook salmon ESU includes those populations spawning north of the Columbia River and west of the Elwha River. These ocean-type fish are Not Warranted for listing under ESA and are a Sensitive Species on the Olympic National Forest.

Puget Sound ESU includes all Chinook salmon runs in the Puget Sound region from the North Fork Nooksack River to the Elwha River on the Olympic Peninsula. They are ocean-type fish, and listed as a Threatened Species under ESA. Puget Sound ESU runs are found on the Olympic National Forest.

Puget Sound/Straight of Georgia coho (Oncorhynchus kisutch)

The Puget Sound/Straight of Georgia coho are a sensitive species on Olympic National Forest. Federal listing under the ESA was not warranted on July 25, 1995, but classified as a Species of Concern on April 25, 2004 due to specific risk factors. The ESU includes all naturally spawned populations of coho salmon from drainages of Puget Sound and Hood Canal, the eastern Olympic Peninsula (east of Salt Creek), and the Straight of Georgia from the eastern side of Vancouver Island and the British Columbia mainland (north to and including the Campbell and Powell Rivers), excluding the upper Fraser River above Hope.

Coho salmon are an important sport and commercial fish native to many watersheds around the Pacific Rim from California to Alaska. Coho salmon are found in a broader diversity of habitats than any other anadromous salmonid, from small tributaries of coastal streams to inland tributaries of major rivers (Meehan and Bjornn 1991). Coho salmon were abundant in the Columbia River Basin (above Bonneville Dam) prior to the 1900's. There now are essentially no naturally spawning fish in the interior Columbia Basin (Quigley and Arbelbide, 1997) although there are currently efforts to re-establish nonnative coho to the Yakima, Wenatchee and Methow Rivers.

The majority of coho salmon adults returning to spawn along the Oregon and Washington coasts are 3-year-olds, spending approximately 18 months in freshwater and 18 months in saltwater (Weitkamp et al 1995). Most west coast coho enter their natal rivers in October and spawn from November to December and occasionally into January.