USDA Forest Service
Gifford Pinchot National Forest
Existing Information Analysis
For
Terrestrial Resources

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Abstract

Relatively little information exists about the status and distribution of wildlife species in the Packwood Lake Hydroelectric project area. Most of the existing available data was generated through informal, opportunistic observations during visits to the Packwood Lake/Lake Creek area by biologists and others. Species that may potentially be affected by the project, and known to occur in the project area, include the northern bald eagle, common loon, and osprey. Species that may occur based on the availability of suitable habitat include Cope's giant salamander, Cascade torrent salamander, Van Dyke's salamander, all of which are Forest Service, Region 6, Sensitive species, as well as other non-listed amphibians and many species of aquatic invertebrates. There are many additional documented and suspected species (e.g. northern spotted owl, Larch Mountain salamander) that are strictly terrestrial, and not expected to be affected by the project.

Adverse effects to aquatic, riparian and fish-dependent wildlife species, if present, could result from a) alterations in the flow regime of Lake Creek, and associated impacts to instream or riparian habitat quality and b) reduction in the supply of fish for species that prey upon them, such as the northern bald eagle and osprey. In addition to these two primary wildlife-related issues, there is the possibility that project operations are making potential habitat such as Agnes Island unsuitable for the common loon. Use of the area by the loon should be studied as part of the relicensing process. Other studies are suggested which include surveys to determine presence or absence of selected species, and evaluation of effects to fish populations.

I. Existing Situation

The purpose of this EIA is to describe the current condition of the wildlife resource in the Lake Creek sub-watershed, including Packwood Lake, and highlight how the Packwood Lake Hydroelectric Project (project) may affect it. It will also highlight additional study needs where information is presently incomplete.

The Upper Cowlitz watershed, which contains Packwood Lake and Lake Creek, has 268 wildlife species potentially present (USFS, Upper Cowlitz Watershed Analysis, 1997). This includes species federally-listed as Proposed, Endangered, Threatened or Candidates

by the U.S. Fish and Wildlife Service, and Sensitive by the USDA Forest Service, Pacific Northwest Region (i.e. Region 6). In addition, some species are classified as Management Indicator Species in the Gifford Pinchot National Forest Land and Resource Management Plan, or are otherwise highlighted in that plan for special management or protection. The Northwest Forest Plan provides protection or management guidelines for other species and their habitats.

This report will highlight some of these species, focusing on those most likely to be potentially impacted by the project.

a. **Federally-listed Species under the Endangered Species Act**

Table 1. Proposed, Threatened (**T**), Endangered (**E**) and Candidate (**C**) Species, and Critical Habitat areas, that are documented or suspected in the Packwood Lake drainage.

Species	Documented	Suspected	Comments
Gray wolf (*Canis lupus*) **T**		X	Wide-ranging species that potentially occurs in the project area.
Grizzly bear (*Ursus arctos*) **T**		X	Wide-ranging species that potentially occurs in the project area.
Northern spotted owl (*Strix occidentalis caurina*) **T**	X		The competing barred owl may have displaced spotted owls over much of this area.
Northern bald eagle (*Halieetus luecocephalus leucocephalus*) **T**	X		Has been documented at Packwood Lake, as well as lower reaches of Lake Creek during mid-winter bald eagle surveys.
Northern spotted owl Critical Habitat Unit WA-37	Designated		Includes all areas in Lake Creek drainage outside of wilderness.

Gray wolf and grizzly bear- These two wide-ranging species potentially occur in the Lake Creek drainage due to its proximity to wilderness, as well as the presence of deer and elk winter range below approximately 2,400 feet in elevation. There have been unconfirmed reports of gray wolves in the adjacent Goat Rocks Wilderness; whether these are actually wolves, wolf/dog hybrids, or large coyotes is not known. Occasional reports of grizzly bears have lacked detailed documentation, and are most likely cinnamon-phase black bears. Although both species could conceivably occur along the Packwood Lake shoreline or in the Lake Creek riparian zone, they are predominately upland species that would not be affected by the project.

Northern spotted owl- The Lake Creek drainage contains hundreds of acres of suitable spotted owl habitat. Much of this is high quality “nesting and roosting” habitat, typified by multi-layered, old-growth forest stands. Only one spotted owl pair is known to occur

in the drainage (#415, Lake Creek pair), however. This is very likely due to the large number of barred owls in the drainage, particularly in the Packwood Lake area. Barred owls likely physically exclude spotted owls from their historic territories, and make those territories unavailable for recolonization (Pearson and Livezey 2003). Hybridization, although rare, also is known to occur; a detection of a spotted - barred owl hybrid bird occurred in 1995 at Packwood Lake, and this "sparred owl" was detected each subsequent year through 2000 (R. Pearson, Packwood, WA, pers. comm. via e-mail, 9/01/2004). Despite the recent, numerous records of barred owls (or the above hybrid owl) in the Packwood Lake area, two northern spotted owls were recently detected during opportunistic surveys in September, 2004 (R. Pearson, Packwood, WA, pers. comm. via e-mail, 09/08/04). It is unknown if spotted owls will co-exist with barred owls in this area, or if barred owls will exclusively occupy this habitat over the long-term.

As spotted owls are upland, terrestrial species, it is unlikely that the project will impact them. There is the potential that noise disturbance from motorized vehicles accessing the water control structure and Packwood Lake may adversely impact individual spotted owls or owl pairs, however the transitory nature and relatively low intensity of this noise, combined with the low frequency of disturbance, mean that any adverse effects would be minimal and discountable in terms of short-term, long-term or cumulative impacts to spotted owls, or other wildlife species.

Northern spotted owl Critical Habitat Unit (CHU) WA-37: The section of the Lake Creek drainage outside of designated wilderness is located in spotted owl critical habitat. Critical habitat is designated to provide for the recovery of federally-listed species. At Lake Creek, the CHU overlaps the Late-Successional Reserve allocation in the Northwest Forest Plan, which does not allow for regeneration timber harvest, or projects that degrade habitat quality for wildlife that utilize late-successional forests. As discussed above, the project is not expected to directly impact suitable spotted owl habitat due to the absence of upland effects, and noise disturbance effects associated with motorized access to the drop structure and lake are anticipated to be negligible. The project will have no direct effect to CHU WA-37, or compromise its ability to provide for recovery of the northern spotted owl.

Northern bald eagle- Bald eagles winter along the Cowlitz River, and have been regularly recorded at the mouth of Lake Creek during annual mid-winter bald eagle surveys (data on file, USFS, Cowlitz Valley Ranger District). Bald eagles are occasionally observed during the remaining months at Packwood Lake, although nesting has not been documented. A formal survey to locate an eagle nest has not been undertaken. Packwood Lake appears suitable for bald eagle nesting, with large trees capable of supporting an eagle nest, as well as an available food supply. Any reduction in the supply of fish in either Lake Creek or Packwood Lake could adversely impact wintering eagles, or, potentially, breeding birds at Packwood Lake. (See also discussion of the osprey and other fish-eating species below).

Forest Service Sensitive Species

Table 2. USDA Forest Service, Region 6, Sensitive species that are documented or suspected to occur in the Packwood Lake drainage.

Species	Documented	Suspected	Comments
Larch Mountain salamander (*Plethodon larselli*)	X		Historic locations exist along hiking trails and at Packwood Lake, potentially exists for many additional sites due to large amounts of suitable habitat.
Van Dyke's salamander (*Plethodon vandykei*)		X	No surveys have been conducted for this species in the PL area. Suitable habitat may occur in Lake Creek.
Cope's giant salamander (*Dicamptodon copei*)		X	No surveys have been conducted for this species in the PL drainage. Suitable habitat exists in Lake Creek.
Cascade torrent salamander (*Ryacotriton cascadae*)		X	No surveys have been conducted for this species in the PL area. No documented occurrences near the PL drainage.
Common loon (*Gavia immer*)	X		Has been occasionally observed on Packwood Lake during migration, but no nesting records.
American peregrine falcon (*Falco peregrinus anatum*)		X	Likely occurs during migration or winter in the lake area.
Townsend's big-eared bat (*Corynorhinus townsendii*)		X	No surveys have been conducted for this species in the PL area
California wolverine (*Gulo gulo*)		X	Possible transient or rare visitor to the Packwood Lake area.
Puget Oregonian [snail] (*Cryptomastix devia*)		X	May occur near bigleaf maple trees in lower drainage. Has been located in the Upper Cowlitz drainage.
Malone jumping-slug (*Hemphillia malonei*)		X	May occur due to suitable habitat conditions, although no documented locations exist within 12 miles of Packwood Lake.
Blue-gray tail-dropper [slug] (*Prophysaon coeruleum*)		X	May occur, although no documented locations exist within 20 miles of Packwood Lake.

Of the above listed species, the American peregrine falcon and California wolverine are wide-ranging and would be expected to occur in the Packwood Lake area only as transients or infrequent visitors.

Larch Mountain salamander - This terrestrial salamander occurs in rocky substrates such as forested talus slopes, conifer forests, caves and occasionally in or around seeps (Crisafulli 1999). It is known from approximately 100 locations in the Columbia River Gorge and in the Oregon and Washington Cascades. In the Washington Cascades, populations are patchily distributed. Although there has been very little formal survey effort in the planning area for terrestrial salamanders, there have been four incidental sightings of this species along hiking trails and within 100 feet of the lake shoreline (USFS Cowlitz Valley R.D. data). All of these sightings were under coarse woody debris in old-growth forest areas. It is likely that the Lake Creek drainage contains numerous sites, or is one very large site, for this species. Although this species may occur near Packwood Lake or Lake Creek, it is not a riparian associate and not expected to be impacted by the project.

Van Dyke's salamander - This very rare species is terrestrial, yet is often found in semi-aquatic or near aquatic habitats such as seeps and streamside areas (Jones 1999). Endemic to the state of Washington, it ranges from sea level to over 5,000 ft. elevation. Populations are small and disjunct from each other, and much apparently suitable habitat appears to be unoccupied (Wilson et al. 1995). There are no documented sites for this species in the Lake Creek drainage, although no surveys have been performed. Suitable habitat may exist along Lake Creek, particularly at or near steep gradient sections.

Cope's giant salamander - The Cope's giant salamander is a predominately aquatic species that has been documented in the Upper Cowlitz watershed. It apparently only rarely transforms into a terrestrial form, and is known primarily from the larval or neotenic forms (Leonard et al. 1993). One study (Hawkins et al.1983) found that aquatic *Dicamptodon* (i.e. giant salamander) densities were correlated with substrate composition, and observed salamanders only in high gradient streams with coarse substrates. Another study (Bury et al. 1991) collected Cope's giant salamanders most frequently from pool habitats, compared to the more common Pacific giant salamanders, which were taken in both pools and riffles.

No surveys for this species, or other aquatic salamanders or mollusks, have occurred in the Lake Creek drainage and no documented sites exist. This species has been documented at Skate Creek - also in the Upper Cowlitz watershed - approximately four miles northwest of the outlet of Lake Creek, in similar stream habitat. If present in Lake Creek, the project may affect this species due to alterations in stream flows, possible reductions in reproductive habitat, or other factors.

The Pacific giant salamander (*Dicamptodon tenebrosus*), which often occurs sympatric with Cope's giant salamander but is not listed as Sensitive, may occur in Lake Creek and be impacted by changes in the stream flow regime associated with the project. The same is true of the tailed frog (*Ascaphus truei*), which likewise occurs in clear, fast-moving stream systems and has been documented from nearby Coal Creek in the Upper Cowlitz watershed. The larval forms of the tailed frog are strictly aquatic and would be the life stage most likely to be adversely impacted by changes in natural flow regimes.

Cascade torrent salamander - This species inhabits cold, permanent streams, seepages and waterfall splash zones, typically in areas with a thick canopy cover. They usually occur in stream segments or off-channel habitats that are shallow, slow flowing, and have gravel

or rock rubble that is silt-free (Hallock and McAllister 2002). It occurs in the western Cascades from just south of the Nisqually River to the Columbia River (Hallock and McAllister 2002). Although typically found at higher elevations (above 3,500 feet) on the Cowlitz Valley Ranger District, it has been located below 2,000 feet south in an old-growth forest site (data on file, USFS, Cowlitz Valley Ranger District). As with the Van Dyke's and Cope's giant salamanders, no surveys have been conducted for this species in the Lake Creek drainage.

The Cope's giant and Cascade torrent salamanders are aquatic or semi-aquatic species that may occur in Lake Creek or its riparian zone. Although classified as a terrestrial species, the Van Dyke's salamander occurs in riparian situations near water sources such as splash zones from waterfalls or other high gradient stream reaches. All of these species, if present, could be affected by alterations in stream flow regimes associated with the project.

Common loon - The common loon is a rare breeder in Washington state, with fewer than 20 confirmed nest sites known to have been active for at least one year during the years 1979-1999 in Chelan, Douglas, Ferry, King, Okanagan, and Whatcom counties (Richardson et al. 2000). There is little information available on the former abundance and distribution of this species in Washington. In the past, characteristic nest sites would have been relatively undisturbed forest lakes at least 20 ha (49 ac.) in size, with deep inlets and bays, and islands, logs, or other floating debris for nesting (Richardson et al. 2000). This description, with the exception of the inlets and bays, would include Packwood Lake.

The common loon has been documented during migration at Packwood Lake (data on file, USFS, Cowlitz Valley Ranger District). Agnes Island appears to offer suitable nesting habitat on the lake, but there are no recent nesting records. Historic data on common loon occurrence, including nesting, is unavailable. It is possible that loons are unable to forage effectively for fish in the relatively deep waters of Packwood Lake, which may be the reason they don't nest there. There is also the possibility that the fluctuations in water levels in Packwood Lake results in an inability of loons to access potentially suitable nest sites such as Agnes Island, due to the exposure of steep shorelines, which loons cannot physically ascend. This should be evaluated as part of the study phase.

Townsend's big-eared bat: There are very few records of this species on the Cowlitz Valley Ranger District, almost all of which consist of individual bats roosting under concrete bridges. However, there has been almost no survey effort for bats on the District, so this species may be more common than assumed. It may roost near Packwood Lake or Lake Creek in tree cavities or under bark, and forage over water or in forest areas. It also potentially roosts in structures near Packwood Lake, such as buildings or trail bridges. Due to the lack of disturbance to available nesting sites or prey (insect) populations in the area, the project would not adversely affect this, or other, bat species.

Sensitive mollusk species: *Cryptomastix devia*, *Hemphillia malonei*, *Prophysaon coeruleum*: These three Sensitive, terrestrial mollusk species have been recorded on the Cowlitz Valley Ranger District. The most common and widespread one in the Cispus and Cowlitz River drainages is *Cryptomastix devia* (Puget Oregonian [snail]), which occurs at

or near bigleaf maple trees. The other two species- both slugs- are rare in the Cispus/Cowlitz watersheds and generally occur in association with late-successional forests or forest components, such as coarse woody debris. Very little survey effort has occurred in the Lake Creek sub-watershed, and there are no records of these species in the area. Like the terrestrial Larch Mountain salamander, the vast majority of the available suitable habitat for these species occurs in upland sites that would not be impacted by the project.

b. Management Indicator Species

Management Indicator Species (MIS) are a group of species that are in high demand for consumptive or non-consumptive use, or are thought to represent other species with similar habitat requirements. These MIS are listed in the 1990 Gifford Pinchot National Forest Land and Resource Management Plan (p. III-3) and include the northern spotted owl, pileated woodpecker, pine marten, "cavity excavators", Roosevelt elk and black-tailed deer, mountain goat, bald eagle and peregrine falcon, wood duck and "goldeneye duck". The spotted owl, bald eagle and peregrine falcon are discussed above. All of the remaining species, with the exception of the wood duck, are known to occur, or strongly suspected to occur, in the Lake Creek sub-watershed due to the presence of suitable habitats. All except the goldeneye are terrestrial species that are not directly affected by the project. Both Common and Barrow's goldeneyes are frequently observed at Packwood Lake during migration, and Barrow's likely nests in tree cavities along the shoreline. It is very unlikely that the project will affect Management Indicator Species (with the possible exception of the bald eagle, addressed previously) due to the absence of upland forest effects.

c. Other species

Osprey and other fish-eating species- The 1995 Gifford Pinchot NF Land and Resource Management Plan (p. 2-75) prescribes protection buffers around nest of several species, including the osprey. There is at least one documented osprey nest at Packwood Lake, and it has been active for a number of years. Active nests also exist along the Cowlitz River, within 2.5 miles of its confluence with Lake Creek. Ospreys prey on fish, and, like the bald eagle, could be adversely affected by any effects resulting from the project that reduce prey availability. The same can be said for other species that prey upon fish, including river otters, black bears, great blue herons, and common mergansers.

Aquatic invertebrates- Aquatic invertebrates, including mollusks (e.g. aquatic snails and clams), insect larvae, etc. are important links in the food chain, and provide prey for a wide variety of wildlife including salamanders, fish, birds, and other species. The diversity and abundance of these organisms could be adversely affected by alterations in Lake Creek flow levels associated with the project.

II. Management Direction

Forest Plan

The Gifford Pinchot National Forest Land and Resource Management Plan as amended by the Northwest Forest Plan (1995), provides management direction for all National Forest system lands and their associated resources directly affected, or in the vicinity of, the Packwood Lake Hydroelectric Project. Forest-wide standards and guidelines for wildlife also apply to projects that are permitted, but not performed by the Forest Service. The following pertain to this hydro-electric project:

1) All project areas affected by management activities will be reviewed for Sensitive, Threatened, or Endangered plant and animal species. (p. 2-71)
2) A biological evaluation will be conducted before any ground disturbing activities occur which may adversely affect Sensitive species. (p. 2-71)
3) Plant and wildlife Conservation Strategies will be prepared for each sensitive species, guild or habitat. (p. 2-71)
4) When eagles are found, a survey and habitat inventory will be conducted in the Cowlitz, Nisqually, and Lewis Rivers, and other drainages, to identify active bald eagle nests and potential habitat. (p. 2-71)
5) Consultation with the U.S. Fish and Wildlife Service will be required for each program activity or project that the Fish and Wildlife Service determines may affect Threatened or Endangered species and will be completed before any decision is made on the proposed project. Management activities must be conducted in such a manner that they will not impair recovery of any Threatened or Endangered species. (p. 2-71)
6) **Osprey**: a protective area with a radius of approximately 660 feet should be established around each identified nest site. A management plan should be prepared for each nest site. Plans should describe specific requirements for each nest site, as well as for major feeding areas. The plans should be based on known reactions of birds to human intrusion … (p.2-76)
7) **Habitat Management Objectives for Bats**: see p. 2-77 for discussion of protection measures for caves, mines, and abandoned wooden bridges and buildings that are used as roost sites for bats.
8) **Riparian Reserve Standards and Guidelines for Wildlife**: 1. Stream and lake surveys should be conducted prior to management activities, which could adversely affect wildlife or fish habitat. Ongoing stream and lake habitat surveys should identify opportunities for habitat and fish passage improvement.

National Forest Management Act

36 CFR 219 covers the planning process for development of National Forest Land and Resource Management Plans. The Code of Federal Regulations provides the implementing direction for the National Forest Management Act (1976).

In the 1982 edition of the regulations at 36 CFR 219.19, paragraph 1 states, *Fish and Wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area. For planning purposes, a viable population shall be regarded as one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area. In order to insure that viable populations will be maintained, habitat must be provided to support, at least a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area.*

-219.19 (2) *Planning alternatives shall be stated and evaluated in terms of both amount and quality of habitat and of animal population trends of the management indicator species. For the Gifford Pinchot NF, cutthroat trout, steelhead trout and bull trout were selected as management indicator species.*

-219.19 (3) *Biologists from State fish and wildlife agencies and other Federal agencies shall be consulted in order to coordinate planning for fish and wildlife, including opportunities for the reintroduction of extirpated species.*

Section 219.27(g) Diversity states in part, *Management prescriptions, where appropriate and to the extent practicable, shall preserve and enhance the diversity of plant and animal communities, including endemic and desirable naturalized plant and animal species.*

Federal Power Act (FPA)

Section 4(e) of the FPA provides the USDA Forest Service, as administrators of reserved lands affected within the project area, authority to attach mandatory terms and conditions to project licenses. This section of the FPA states, "that licenses shall be subject to and contain such conditions as the Secretary of the department under whose supervision such reservation falls shall deem necessary for the adequate protection and utilization of such reservation." Section 4(e) also states that "…the Commission (FERC), in addition to the equal power and development purposes for which licenses are issued, shall give equal consideration to the purposes of enhancement of, fish and wildlife (including related spawning grounds and habitat)…". Forest Service terms and conditions are based upon management direction contained in amended Forest Plans. If the project being relicence is not located on Forest Service land but affects resources managed by the agency (i.e. migratory fish that historically used NFSL), the Forest Service can make recommendations regarding fish passage to FERC.

Master MOU Washington Department of Fish and Wildlife and USDA Forest Service Region Six

Signatory parties agreed under this MOU to consult on fish and wildlife actions that occur or may affect USDA Forest Service Region Six Forests. Listed below are four key elements of this MOU.

Section A #2. The Forest Service agrees to recognize WDFW as being responsible for the protection, perpetuation, and management of all game fish and wildlife in the State of Washington.

Section B #2. WDFW agrees to solicit Forest Service participation in establishing the desired level of fish and wildlife populations on the National Forests…

Section B #4. WDFW agrees to consider Forest Service's goals and objectives in the development of Fish and Wildlife plans.

Section B #6. WDFW agrees to cooperate with the Forest Service in preparation and conduct of research plans of mutual interest.

III. Forest Plan Desired Condition

The project area on NFS lands is within the Packwood Late-Successional Reserve. The objective of late-successional reserves is to protect and enhance conditions of late-successional and old-growth related species, including the northern spotted owl. (Gifford Pinchot Forest Plan 1995 p. 5-1.) The Gifford Pinchot Late-Successional Reserve Assessment (p. 3-3) describes the desired condition for riparian associated species. "Healthy, functioning riparian habitats will occur across the landscape. These areas will provide protected microclimates, large coarse woody debris, and cold, clear water for fish, amphibians, and other riparian dependent species."

IV. Need for Change

It is presently unknown if there is a need for change in project operations to address effects to the wildlife resource. This is due to a lack of survey data for most of the species that would be potentially impacted by project operations. Most of the known information come from incidental, opportunistic observations. It is not known, for example, if listed species such as the sensitive Cope's giant salamander occur in Lake Creek, and therefore need to be addressed in the relicensing proposal. There has been no long-term monitoring of bald eagle or osprey occurrence and nesting in the Lake Creek sub-watershed. Until survey data is collected, it is not possible to determine if project operations are compatible with listed and sensitive species.

V. USDA Forest Service Interests and Preliminary Objectives

- Provide high quality riparian and upland habitat for native species including appropriate connectivity between populations and habitats.

- Learn the magnitude of continuing project effects on sensitive wildlife species and other aquatic and riparian species from alterations of the natural flow regime in Lake Creek.
- Learn the effects of the project on the availability of fish for the federally-listed northern bald eagle, osprey, and other fish-dependent wildlife species.
- Learn the effect of project operations on nesting sites for the common loon.
- Cooperatively develop and implement a comprehensive invasive species management plan for the project area.

VI. Study Requests

1) A survey of Lake Creek below the existing water control structure to determine presence or absence of sensitive salamander species (i.e. Cope's giant salamander, Van Dyke's salamander, Cascade torrent salamander).

2) A survey of aquatic invertebrate presence and abundance in Lake Creek.

3) Determine if the project is having an adverse effect on fish availability to species such as the osprey and northern bald eagle. Data from fisheries studies for this project should be used to make this assessment.

4) A survey during the spring and summer (May to August) to determine if apparently suitable common loon nesting habitat is unsuitable or inaccessible due to project operations.

5) A survey to determine the extent of noxious weed infestation on project lands and project access routes.

VII. References Cited

Bury, R. Bruce; Corn, Paul Steven; Aubry, Keith B. (and others). 1991. Aquatic amphibian communities in Oregon and Washington. In: Ruggerio, Leonard F.; Aubry, Keith B.; Carey, Andrew B.; Huff, Mark H. tech. Cords. Wildlife and Vegetation of Unmanaged Douglas-fir Forests. Gen. Tech. Re. PNW-GTR-285. Portland, OR. USDA Forest Service, Pacific Northwest Res. Sta.: 353-362.

Crisafulli, Charles M. 1999. Survey Protocol for the Larch Mountain Salamander (*Plethodon larselli*), Version 3.0. Chapter VII in Survey protocols for amphibians under the Survey and Manage provision of the Northwest Forest Plan, Version 3.0, October, 1999. USDA Forest Service, USDI Bureau of Land Mangement.263 pp.

Hawkins, Charles P.; Murphy, Michael L.; Anderson, N.H.; Wilzbach, Margaret A. 1983. Density of fish and salamanders in relation to riparian ecology and physical habitat in streams of the northwestern United States. Canadian Journal of Fisheries and Aquatic Sciences. 40: 1173-1185.

Hallock, L.A. and K.R. McAllister. 2002. Cascade torrent salamander. Washington Herp Atlas. http//:www.dnr.wa.gov/nfp/refdesk/herp/

Jones, Lawrence L.C. 1999. Survey protocol for the Van Dyke's salamander (Plethodon vandykei). Chapter VI in Survey protocols for amphibians under the Survey and Manage provision of the Northwest Forest Plan, Version 3.0, October, 1999. USDA Forest Service, USDI Bureau of Land Management. 263 pp.

Leonard, William P.; Brown, Herbert A.; Jones, Lawrence L.C.; McAllister, Kelly R.; Storm, Robert M. 1993. Amphibians of Oregon and Washington. Seattle Audubon Society, Seattle, WA. 168 pp.

Pearson, Robert R. and Kent B. Livezey. 2003. Distribution, numbers, and size characteristics of spotted owls and barred owls in the Cascade Mountains of Washington. The Journal of Raptor Research, 37(4): 265-276.

Richardson, S.; D. Hays, R. Spencer, and J. Stofel. 2000. Washington state status report for the common loon. Washington Dept. Fish and Wildlife, Olympia, WA. 53 pp.

USDA Forest Service 1995. Land and Resource Management Plan Gifford Pinchot National Forest.

Wilson, A.G. Jr, J.H. Larsen, and K.R. McAllister. 1995. Distribution of Van Dyke's Salamander (*Plethodon vandykei* Van Denburgh). American Midland Naturalist 134: 388-393.