Chapter 5 – Appendices

A. Acronyms

ACS – Aquatic Conservation Strategy

AMA – Adaptive Management Area

ATM – Access and Travel Management

BO – Biological Opinion

BPA – Bonneville Power Administration

CEQ – Council on Environmental Quality

CHU – critical habitat unit

CWD – coarse woody debris

dbh – diameter at breast height

DNR – Department of Natural Resources

EA – Environmental Assessment

EO – Executive Order

EUI – Ecological Unit Inventory

FEIS – Final Environmental Impact Statement

FSR – Forest Service Road

HPA – hydraulic project approval

KV – Knudson-Vandenberg

LRMP – Land and Resource Management Plan

LSR – Late Successional Reserve

LWD – large woody debris

MOA – Memorandum of Agreement

MOU – Memorandum of Understanding

MIS – Management Indicator Species

NEPA – National Environmental Policy Act

NMFS – National Marine Fisheries Service

NOAA – National Oceanic and Atmospheric Administration

NWFP – Northwest Forest Plan

OAHP – Office of Archeology and Historic Preservation

OHV – Off Highway Vehicle

OSHA – Occupational Safety and Health Administration

PBO – Programmatic Biological Opinion

REO – Regional Ecosystem Office

RM – River mile

ROD – Record of Decision

SHPO – State Historic Preservation Office

spp. – species

TES – Threatened and Endangered Species

USDA – United States Department of Agriculture

USDI – United States Department of the Interior

USFS – United States Forest Service

WDFW – Washington Department of Fish and Wildlife

WEPP – Water Erosion Prediction Project

B. Riparian Buffer Guidelines

General Guidelines for riparian buffers on streams and wetlands

Riparian buffers are prescribed No-Cut / No entry areas. This, however, does not necessarily eliminate hanging lines if needed for cable logging systems. Buffer distances are delineated below.

Fish bearing streams: 100' from the steam bank edge or slope break, whichever is greater.
Significant non-fish bearing streams: 66' (1 chain) from the steam bank edge or slope break, whichever is greater.
Minor non-fish bearing streams that are > 10 ' wide: 33 ' (1/2 chain) from the steam bank edge or the slope break, whichever is greater.
Minor non-fish bearing streams that are < 10 ' wide: trees sufficient to maintain shade or the slope break, whichever is greater.

Stream bank edge is considered to be the defined break at edge of stream that has upland type vegetation, such as hardwoods and conifer (not shrubs).

Slope Break is defined as significant gradient change, in many cases a change in vegetation from 70% - 100% hardwoods to 70% - 100% conifers. Boundary tags at the slope break should be placed on first solid line of conifers back from break.

Unit number	Recommended site-specific stream-side no-cut buffer designations	Comments
8	100' or slope break of unnamed fish tributary	The west side slope has inner gorge failures.
9	100' along Bear Creek and unnamed tributary. Include riparian restoration plots in stream buffer.	
16	100' or slope break. Where slope is long and consists of multiple breaks, use 100' no-cut buffer, and watch for old inner gorge failures	
17	100' or slope break. Where slope is long and consists of multiple breaks, use 100' no-cut buffer, and watch for old inner gorge failures	
	66' -- A small stream flows to unit 19. Locate a no-cut buffer between creek and 3000300 spur.	
18	100' or slope break. Where slope is long and consists of multiple breaks use 100' no-cut buffers; watch for old inner gorge failures.	
19	100' or slope break. Where slope is long and consists of multiple breaks use 100' no-cut buffers; watch for old inner gorge failures. Also apply to mid-unit stream to the 15-foot bedrock falls above the 30 Rd due to future potential fish usage.	
	66' for the small stream in mid-unit that may be fish-bearing in the lower portion.	

Unit number	Recommended site-specific stream-side no-cut buffer designations	Comments
22	100' or slope break.(whichever is greater) for fish-bearing stream.	
26	66'	The old road crosses dry channel, which does not appear to have surface flow.
27	No harvest between PUD road and creek	No harvest area may already be buffered out.
33	100' along Deep Creek mainstem (fish-bearing)	
	33' along small tributaries below the 30 road	There is an old failed crossing.
34	100' along the Deep Creek mainstem	
	33' along small tributaries	
35	100' along Deep Creek mainstem	
	66' or slope break	2 small tributaries cross and join below the 30 Rd
36	100' along Deep Creek mainstem	
37	33' back from slope break; include at least 2 rows conifer in no-cut buffer	
	33' -- Buffer the small stream east corner to maintain shading and incorporate some conifers.	
38, 39	66' for portions below the 30 Rd. For the debris flow stream, back off slope break and include at least 2 rows of conifer.	
39	Measure 66' back from first line of conifers for portion of unit above the 30 Road.	
40	Measure 33' back from the first line of conifers or alders in area below the 30 Road	
	33' for the portion of the unit above the 30 road. For lower part of the unit, buffer 33' upland of overflow channel for the main creek.	
	66' above road, part accessed off 3000490 road	
	33' along small streams off 3000490 spurs	
41	66' above the 30 road, if not already buffered	

Unit number	Recommended site-specific stream-side no-cut buffer designations	Comments
44	66' below road along first large tributary	
	slope break above first large tributary	
	slope break along the south side of the West Twin river	
	100' along the north side of the West Twin River	
45	100' along the West Twin River. If stand is similar to the southern part of Unit 44 (i.e., very dense conifers), then thin to the break.	
	33' along small tributary at the 30 road	
47	33' along large tributary below 30 road. Where PUD road parallels the creek, use slope break.	
	slope break or 66' along large tributary (above road)	
	100' or slope break along the West Twin River	
48	100' with no-cut below the break. There is a large inner gorge failure on the SW side of the large creek. Stay on gentle ground and break at the edge of the gorge.	
	100' or slope break along the West Twin River	
51	33' or at slope break along tributaries	
52	100' or slope break along the West Twin River	
55	100'	
57	100'	**NW side has steep slope to Bear Creek; suggest buffer to cat trail between Bear Creek and FSR 3006-011.**
58, 59	100' or slope break. Use the slope break or vegetation change to first line of conifers regardless of distance near the -011 spur. Thinning overstocked conifers is desirable in this unit.	
60	100' or slope break. Because of steepness to Bear Creek, use the slope break regardless of distance.	
60 or 61	33'	**Watch for the waterline creek.**

Unit number	Recommended site-specific stream-side no-cut buffer designations	Comments
62	33' along small tributaries and wetlands	There are 3 streams crossings and several wetlands in unit 62; stream edges may not be well defined.
63	33' along small tributaries	
64	100' along fish streams	
	66' along wetland edge	

C. Summary Table of Roads Proposed for Use[1]

ROUTE #	ROAD STATUS	WORK PROPOSED	ACCESS TRAVEL MANAGEMENT OBJECTIVE	POST HARVEST TREATMENT	ALT B MILES	ALT C MILES	UNITS ACCESSED
30	Level 3 (open, passenger cars)	Reconstruction	Level 3	Level 3	13.9	13.9	Haul route
3000200	Level 2 (open, high clearance vehicles)		Level 2	Level 2	2.0	2.0	Haul route
3000300	Level 2		Level 1	Level 1	1.6	1.6	Haul route
3067000	Level 2		Level 2	Level 2	1.3	1.3	Haul route
3067050	Level 1 (closed rd)		Level 1	Level 1	1.0	1.0	Haul route
3067055	Level 1		Level 1	Level 1	0.8	0.8	Haul route
3000400	Level 2		Level 2	Level 2	0.3	0.3	Haul route
3000395	Level 1		Level 1	Level 1	0.3	0.3	37
	TOTAL - FOREST SYSTEM RDS (TO REMAIN OPEN POST SALE)				**21.1**	**21.1**	

[1] *Values given are approximate and based on computer mapping and other calculations. These values may differ from actual project layout and implementation.*

ROUTE #	ROAD STATUS	WORK PROPOSED	ACCESS TRAVEL MANAGEMENT OBJECTIVE	POST HARVEST TREATMENT	ALT B MILES	ALT C MILES	UNITS ACCESSED
3000197	BPA Access	Work includes clearing and grubbing, earthwork, drainage and surfacing.	*	Open	0.6	0.6	8
3000198	BPA Access		*	Open	0.1	0.1	8
3000199	BPA Access		*	Open	0.1	0.1	9
3000201	BPA Access		*	Open	0.3	0.3	16, 18
3000301	BPA Access		*	Open	0.5	0.5	17, 19
3000302	BPA Access		*	Open	0.1	0.1	17
3000304	BPA Access		*	Open	0.5	0.5	27
3000581	BPA Access		*	Open	0.3	0.3	45
3000599	BPA Access		*	Open	0.4	0.4	47
3000602	BPA Access		*	Open	0.1	0.1	48
3000603	BPA Access		*	Open	0.1	0.1	48
3006011	BPA Access	These roads are maintenance level 2 roads open for administrative use. They have existing road use agreements with Bonneville Power Administration. Proposed work varies from none to brushing, surfacing and drainage work.	ML2	Open	0.8	0.8	60 - 62
3000580	BPA Access		ML2	Open	0.7	0.7	43 - 45
3000401	BPA Access		ML2	Open	0.4	0.4	38
3100010	BPA Access		ML2	Open	0.3	0.3	60 - 65
	TOTAL - BPA ACCESS RDS (TO REMAIN OPEN POST SALE)				**5.4**	**5.4**	

* *While BPA access roads were not included in the Forest ATM, they are tracked in the Natural Resource Information System (NRIS).*

ROUTE #	ROAD STATUS	WORK PROPOSED	ACCESS TRAVEL MANAGEMENT OBJECTIVE	POST HARVEST TREATMENT	ALT B MILES	ALT C MILES	UNITS ACCESSED
3000011	Level 1	Proposed work would include brushing, surfacing and drainage work. Following the sale, these roads would be decommissioned if KV funds are available, or otherwise reclosed.	Decommission	Reclose; Decomm.w/ KV	0.4	0.4	58, 59
3000320	Level 1		Decommission	Reclose; Decomm.w/ KV	0.2	0.1	17
3000330	Level 1		Decommission	Reclose; Decomm.w/ KV	0.5	0.5	30 - 32
3000490	Level 1		Decommission	Reclose; Decomm.w/ KV	0.6	0.6	40
3000590	Level 1		Decommission	Reclose; Decomm.w/ KV	0.4	0.4	45,46
3000600	Level 1		Decommission	Reclose; Decomm.w/ KV	0.4	0.4	47
3000810	Level 1		Decommission	Reclose; Decomm.w/ KV	0.0	0.0	50
3000401	Level 1		Decommission	Reclose; Decomm.w/ KV	0.3	0.3	38
3100010	Level 1		Decommission	Reclose; Decomm.w/ KV	1.3	1.0	62 - 65
3000295	Level 1		Decommission	Reclose; Decomm.w/ KV	0.5	0.5	26
3000310	Level 1		Decommission	Reclose; Decomm.w/ KV	0.1	0.1	17
3000492	Level 1		Decommission	Reclose; Decomm.w/ KV	0.1	0.1	40
3000800	Level 2, but not open		Decommission	Decommission KV	1.3	1.3	50, 51, 53
	TOTAL – FOREST SYSTEM RDS (RECLOSE OR DECOMM. W/ KV POST SALE)				**6.1**	**5.7**	

ROUTE #	ROAD STATUS	WORK PROPOSED	ACCESS TRAVEL MANAGEMENT OBJECTIVE	POST HARVEST TREATMENT	ALT B MILES	ALT C MILES	UNITS ACCESSED
3000012	Unclassified, Abandoned	Work on proposed temporary roads on existing road grades would vary from light clearing and grubbing to minor excavation, drainage, and surfacing. These roads would not become National Forest System roads and would be decommissioned after use.		decommission	0.4	0.4	59
3000196	Unclassified, Abandoned			decommission	0.1	0.1	8
3000202	Unclassified, Abandoned			decommission	0.3	0	16, 18
3000221	Unclassified, Abandoned			decommission	0.1	0.1	14
3000223	Unclassified, Abandoned			decommission	0.1	0.1	16
3000224	Unclassified, Abandoned			decommission	0.1	0.1	16
3000302	Unclassified, Abandoned			decommission	0.2	0.1	17
3000303	Unclassified, Abandoned			decommission	0.1	0.2	17
3000305	Unclassified, Abandoned			decommission	0.1	0.1	27
3000331	Unclassified, Abandoned			decommission	0.2	0.3	30, 32
3000381	Unclassified, Abandoned			decommission	0.2	0.1	33
3000382	Unclassified, Abandoned			decommission	0.9	0.1	34, 35
3000383	Unclassified, Abandoned			decommission	0.2	0.1	34
3000384	Unclassified, Abandoned			decommission	0.3	0.1	37
3000385	Unclassified, Abandoned			decommission	0.1	0.1	33
3000579	Unclassified, Abandoned			decommission	0.5	0.1	43, 44
3000591	Unclassified, Abandoned			decommission	0.3	0.2	45, 46
3000601	Unclassified, Abandoned			decommission	0.2	0.2	48

ROUTE #	ROAD STATUS	WORK PROPOSED	ACCESS TRAVEL MANAGEMENT OBJECTIVE	POST HARVEST TREATMENT	ALT B MILES	ALT C MILES	UNITS ACCESSED
3006012	Unclassified, Abandoned	Work on proposed temporary roads on existing road grades would vary from light clearing and grubbing to minor excavation, drainage, and surfacing. These roads would not become National Forest System roads and would be decommissioned after use.		decommission	0.1	0.2	60
3006013	Unclassified, Abandoned			decommission	0.2	0.2	60, 61
3006014	Unclassified, Abandoned			decommission	0.1	0.3	57
3100011	Unclassified, Abandoned			decommission	0.3	0.1	63 - 65
3100012	Unclassified, Abandoned			decommission	0.1	0.0	62
3100013	Unclassified, Abandoned			decommission	0.1	0.3	62
3100014	Unclassified, Abandoned			decommission	0.1	0.2	60 - 62
3000203	Unclassified, Abandoned			decommission	0.1	0.1	18
	TOTAL - TEMPORY ROADS ON EXISTING GRADES (DECOMMISSION POST SALE)				**5.5**	**3.9**	
3000303	Temporary Road	Proposed newly constructed roads. These roads would not become National Forest System Roads and would be obliterated after use.		decommission	0.1	0.1	17
3000304	Temporary Road			decommission	0.1	0.1	27
3000332	Temporary Road			decommission	0.3	0.3	30, 31
3000386	Temporary Road			decommission	0.1	0.0	36
3067051	Temporary Road			decommission	0.1	0.1	24
3067052	Temporary Road			decommission	0.1	0.1	24
	TOTAL - NEW TEMPORY ROADS (DECOMMISSION POST SALE)				**0.9**	**0.7**	
	GRAND TOTAL				**38.9**	**36.8**	

D. Road Definitions

Forest roads. As defined in Title 23, Section 101 of the United States Code (23 U.S.C. 101), any road wholly or partly within, or adjacent to, and serving the National Forest System and which is necessary for the protection, administration, and utilization of the National Forest System and the use and development of its resources.

National Forest System road. A classified forest road under the jurisdiction of the Forest Service. The term "National Forest System roads" is synonymous with the term "forest development roads" as used in 23 U.S.C. 205.

New Road Construction. Activity that results in the addition of forest classified or temporary road miles (36 CFR 212.1).

Public roads. Any road or street under the jurisdiction of and maintained by a public authority and open to public travel (23 U.S.C. 101(a)).

Road. A motor vehicle travel way over 50 inches wide, unless designated and managed as a trail. A road may be classified, unclassified, or temporary (36 CFR 212.1).

> *a. Classified Roads.* Roads wholly or partially within or adjacent to National Forest System lands that are determined to be needed for long-term motor vehicle access, including State roads, county roads, privately owned roads, National Forest System roads, and other roads authorized by the Forest Service (36 CFR 212.1).
>
> *b. Temporary Roads.* Roads authorized by contract, permit, lease, other written authorization, or emergency operation not intended to be a part of the forest transportation system and not necessary for long-term resource management (36 CFR 212.1).
>
> *c. Unclassified Roads.* Roads on National Forest System lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned travel ways, and off-road vehicle tracks that have not been designated and managed as a trail; and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization (36 CFR 212.1).

Road Decommissioning. Activities that result in the stabilization and restoration of unneeded roads to a more natural state (36 CFR 212.1), (FSM 7703).

Decommissioning includes applying various treatments, which may include one or more of the following:

> a. Reestablishing former drainage patterns, stabilizing slopes, and restoring vegetation;
>
> b. Blocking the entrance to a road; installing water bars;

c. Removing culverts, reestablishing drainage-ways, removing unstable fills, pulling back road shoulders, and scattering slash on the roadbed;

d. Completely eliminating the roadbed by restoring natural contours and slopes; or other methods designed to meet the specific conditions associated with the unneeded roads.

Road maintenance. The ongoing upkeep of a road necessary to retain or restore the road to the approved road management objective (FSM 7712.3).

Road maintenance level. Maintenance levels define the level of service provided by, and maintenance required for, a specific road. Maintenance levels must be consistent with road management objectives and maintenance criteria. There are road five maintenance levels:

a. Level 1. Assigned to intermittent service roads during the time they are closed to vehicular traffic. The closure period must exceed 1 year. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level.

b. Level 2. Assigned to roads open for use by high clearance vehicles. Passenger car traffic is not a consideration. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level.

c. Level 3. Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities.

d. Level 4. Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds.

e. Level 5. Assigned to roads that provide a high degree of user comfort and convenience.

Road Reconstruction. Activity that results in improvement or realignment of an existing classified road as defined below:

a. Road Improvement. Activity that results in an increase of an existing road's traffic service level, expands its capacity, or changes its original design function.

b. Road Realignment. Activity that results in a new location of an existing road or portions of an existing road and treatment of the old roadway (36 CFR 212.1).

E. Response to Comments

Topic	Comment	Author	Response
Alternatives	I support Alternative B.	George Nelson Jr. (Nelson Tree Farm Inc.)	Thank you for your comment.
Alternatives	Favors Alternative B as outlined in the EA.	John Carroll (Columbia Helicopters Inc.)	Thank you for your comment.
Alternatives	The project received a thorough vetting when first introduced and, absent a singular technical issue, survived a legal challenge. The technical issue is resolved with additional public involvement. We field reviewed the project and reviewed the Environmental Assessment and see no reason why it should not go forward as structured as soon as possible.	Malcolm Dick, Jr. (American Forest Resource Council)	Thank you for your comment.

Topic	Comment	Author	Response
Alternatives	The EA does not offer a reasonable range of alternatives. The two action alternatives B and C resemble each other so closely that the involved public is essentially given a false choice. A more adequate range of alternatives would include, for example, an environmentally preferred alternative that explicitly avoids active management within all documented spotted owl activity centers and during nesting seasons for each listed avian species; avoids most road reconstruction and ground-based logging in Riparian Reserves and LSR (except where pre-existing road grades have been individually documented to exhibit chronic, adverse aquatic impacts, such as on FSR 3100010), and avoids thinning in alder stands/ neotropical bird habitat.	Kevin Geraghty (Olympic Forest Coalition, Board of Directors)	The alternatives considered in detail were developed to be responsive to the project's stated Purpose and Need. Alternatives that did not meet the Purpose and Need were not considered. The range of alternatives shown in the EA resulted from a rigorous interdisciplinary team process, and resulted in two action alternatives and two alternatives not considered in detail. The proposed action was developed to be responsive to resource concerns, a process which dropped from consideration about 21 forest stands which were originally considered for treatment. Additional stands were dropped from consideration because an alternative that included a bridge across Bear Creek was not considered in detail, which substantially decreased the potential range of alternatives. Additional modifications to the proposed action alternative were made to develop an additional alternative (Alternative C) based on remaining interdisciplinary team specialists concerns. The alternative presented in the comment as a possible additional alternative to expand the range actually lies between the No Action alternative and Alternative B, and is, therefore, still within the responsible official's discretion. While another option has been presented, the range of choices encompassed by the alternatives would not be further expanded by it.

Topic	Comment	Author	Response
Purpose and Need	The stated Purpose and Need is purely ecological and this is a good thing. But we caution you that many habitual practices on the Olympic National Forest are, in our view, not consistent with such a Purpose and Need. One such habit is a certain casualness in unit selection, and a reluctance to drop manifestly unsuitable units or portions thereof as more details emerge.	Kevin Geraghty (Olympic Forest Coalition, Board of Directors)	Unit selection is anything but casual. A rigorous interdisciplinary team (IDT) review of potential units is conducted using Geographic Information Systems (GIS) and other resource information, as well as field visits by IDT members. This information is used to develop the Proposed Action and in the development of alternatives. If new information becomes available once the NEPA analysis has been completed, modifications to units (such as dropping portions of units) can and often does occur in the decision making process and also occurs during the field layout of the timber sales which implement the project.
Purpose and Need	Commodity extraction and revenue generation is not mentioned as an objective and we therefore reasonably conclude that entering stands solely for reasons of revenue or commodity production is inconsistent with the Purpose and Need. Irrespective of this stated Purpose and Need, commodity extraction is not a licit motivation for thinning in either Late-Successional Reserves or Riparian Reserves under the NWFP.	Kevin Geraghty (Olympic Forest Coalition, Board of Directors)	The commenter is correct that entering stands solely for the reasons of revenue or commodity production is inconsistent with the project's Purpose and Need. The purpose of the project is to increase structural diversity of forest stands by developing a multi-layered canopy and other components of late-successional habitat. The project does include a secondary need to have a viable commercial timber sale as the only certain funding source to accomplish the implementation of the project is through the sale of wood products that would be removed as part of the treatment.
Silviculture	Contrary to what is stated in the EA in Chapter 3, page 52, about stand conditions, Forest Service stand exam data	Kevin Geraghty (Olympic Forest	Stand conditions are described as ***structurally*** uniform at the cited location in the EA, and the paragraphs in the EA following this statement describe the variability in other stand attributes mentioned by the commenter. The dominant tree species within any of the

Topic	Comment	Author	Response
	paints a more nuanced picture. Units are far from uniform in understory, species composition, pathogens, disturbance history, or site quality. Many units are dominated by species which clearly were not planted and approximately eight units are alder dominated. Unit 24 contains very little Douglas-fir and is dominated by species that were not planted in the 50's.	Coalition, Board of Directors)	current stands are the result of a variety of factors including (but not limited to) variability in the survival of planted trees, the quantity of natural regeneration, competitive interactions between individual trees and the tree species and individuals retained during past precommercial thinning treatments.
Silviculture	The EA states that portions of units that have older forest characteristics (such as units 39 and 51) would not be treated. Why not exclude portions of stands that have older forest characteristics from unit boundaries?	Kevin Geraghty (Olympic Forest Coalition, Board of Directors)	Small patches or groups of older trees were noted during Forest staff field reconnaissance, and these areas would be excluded from treatment. During field layout of timber sales designed to implement the project, unit boundaries would be adjusted to exclude such areas when they are adjacent to the boundary. Patches of older trees located in the interior of units would be designated as no-cut areas. Generally, these areas are sufficiently small in size that they are not readily displayed at the scale of the maps included in the EA.
Silviculture	The general stand description in the EA is wholly inaccurate for one entire unit, unit 65. Virtually the entire unit fits the description of older forest characteristics. We are not in any way reassured the portions of this unit with older forest characteristics would not be treated. We note as the	Kevin Geraghty (Olympic Forest Coalition, Board of Directors)	Unit 65 is an alder-dominated stand where the only planned treatment is the removal of red alder to release conifers and help accelerate the natural progression of the stand. The trees with older forest characteristics referred to in this comment would be excluded by the treatment prescription.

Topic	Comment	Author	Response
	west end of the Bear Creek Saddle project would have been the first to be sold under the now withdrawn decision, unit 65 has been marked on the ground. Old forest portions of this stand are unambiguously within the marked unit and have not been excluded.		
Silviculture	A photo of a clump of trees in unit 65 shows some Douglas-fir with diameters of 52 and 38 inches. An increment core of one of the trees shows one of the trees to be at least 90 years old. What would DxD do here? With the red cedar exclusion, what would happen? What is this area doing in a thinning unit of a project which is suppose to be developing components of late-successional habitat? We recommend you drop this entire unit and all identifiable portions of other units which are older forest.	Kevin Geraghty (Olympic Forest Coalition, Board of Directors)	Of the photos submitted, several were recognized by Forest staff as specific locations outside of the proposed unit boundaries or within riparian no-cut buffers. However, unit 65 does contain some clumps of larger conifers, none of which would be removed by the proposed treatment. Unit 65 is an alder-dominated stand where the only planned treatment is the removal of red alder to release conifers. Any prescription applied here would not include conifers as a cut tree.

Topic	Comment	Author	Response
Silviculture	The EA states that patches of pure alder will not be treated (page 4). A companion assertion is that alders would only be removed if they are within a set distance of live conifers that are 4 inches dbh and greater in size. Considering these assertions, units that are almost pure alder (such as units 29 or 43) are probably not commercially viable, and why then are they being retained in the project?	Kevin Geraghty (Olympic Forest Coalition, Board of Directors)	Patches of pure alder within these stands would not be thinned. Units 29 and 43 have sufficient numbers of understory conifers to warrant a conifer release treatment. The purpose of the project is to increase structural diversity of forest stands by developing a multi-layered canopy and other components of late-successional habitat. The project includes a need to have viable commercial timber sales in order to accomplish implementation; however every unit will not make an equal contribution to economic viability. Economic viability will change over time due to fluctuations in the timber market.
Silviculture	Our comments on the previous version of the Bear Creek Saddle project explained at length why we believe that mixed alder/conifer stands (in addition to pure alder) are very poor candidates for thinning interventions to increase structural diversity and other components of late-successional habitat. We have not changed our opinion. The evidence does not support thinning in alder-dominated or heavily alder-influenced stands for such purposes. Comments from the previous version include:	Kevin Geraghty (Olympic Forest Coalition, Board of Directors)	Within the project area, late-successional stands would be by definition conifer-dominated stands. The removal of some red alder to release conifers would help to accelerate the natural development of future conifer-dominated stands in the units selected for this treatment. Alders do shade conifers and reduce their growth since alder leaves are out during the growing season. Riparian conifer release projects on the Olympic National Forest that involve removing alder have been ongoing the last 10 years for fisheries habitat improvement. Research conducted in the field of riparian restoration has shown that conifer survival and growth can be enhanced by the removal of red alder competition. Underplanting could also be used in combination with the removal of red alder competition, but is not part of the proposed project. A summary of research in this area is contained in: Poulin, V.A., Bart Simmons, and Cathy Harris. 2000. Riparian Silviculture: An Annotated Bibliography for Practitioners of Riparian Restoration. B.C. Ministry of Forests. March 2000.

Topic	Comment	Author	Response
	• While a substantial body of literature exists which lends some support to the assertion that at least some features of old forests can be encouraged through some kinds of thinning interventions, no such body exists in the case of alder-dominated or mixed alder-conifer stands. • There is much literature which suggests collectively that thinning sixty-year old pure or mixed alder-conifer stands does not make any sense if one's objective is to create or encourage components of late-successional habitat. • Does it make ecological sense to remove alder which will be dead in a few decades, which is actively adding persistent soil fertility,		The Rainy Creek Biodiversity Project, a long term cooperative study between the Forest and Peninsula College would be continued with implementation of the Bear Creek Saddle project. This study is intended to evaluate the extent to which silvicultural manipulations of forest structure affect productivity and assess the relative impacts of different silvicultural treatments. The study includes alder dominated stands and would provide valuable monitoring data on the impacts of conifer release treatments.

Topic	Comment	Author	Response
	which will provide snags and rotten wood when it dies, which supports lush, productive understories, and which to all appearances is not hindering the development of established understory conifers? • Why thin a stand that is shortly and certainly going to thin itself, in complex ways, without human intervention, without robbing the stand of biomass and suffering the damage caused by yarding and road construction? • In cases where conifer seedling establishment is a perceived problem, one appropriate non-destructive intervention might be underplanting of shade-tolerant conifers. • Units 63, 65, 8, 9, 29, 30, and 43 fall into		The proposed action includes removing some red alder trees to increase the growth and vigor of the established understory conifers. All alder-dominated stands would retain many alder trees under the proposed prescriptions, since the conifer release treatment is designed only to increase the representation, size, and structure of minor species (mainly spruce and hemlock) in the stand. Ground vegetation would be disturbed, but not eliminated and would display a productive response to increased sunlight. Overall cover should remain about the same, since it is already high in alder areas. Sufficient red alder would remain in the stand to provide ecological benefits such as nitrogen inputs to the soil, future snags and coarse woody debris. Underplanting would be ineffective without thinning the alders and controlling competing vegetation (salmonberry) and animal damage (mountain beavers and ungulates), and is not proposed as a part of

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	alder-dominated and heavily alder-influenced stands. We do not see any ecological, as opposed to revenue generating, justification for thinning these stands.		this project. See discussion above and response to previous comment for the objectives related to these stands.
Silviculture	A close reading of the EA suggests to us that cottonwood and bigleaf maple are classified as “minor species” but there remains doubt, since the section in Chapter 2 which discusses prescriptions states only “cascara, willow, and other minor hardwoods” are to be retained. We are of course of the opinion that these species should not be cut if the objective of the project is as laid out in the Purpose and Need. We request that you clear up any lingering ambiguity on this subject of cutting bigleaf maple and black cottonwood.	Kevin Geraghty (Olympic Forest Coalition, Board of Directors)	Black cottonwood and bigleaf maple are minor hardwoods and would be retained.

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Silviculture	The Soleduck LSR Assessment indicates Sitka spruce will be retained in all stands, which does not correspond with the EA's statement that this particular species "would not be favored by designation specifications…". This seems an unfortunate and poorly explained change of heart on the part of the Forest Service. Please explain.	Kevin Geraghty (Olympic Forest Coalition, Board of Directors)	Sitka spruce would be retained in all stands in which it is found. It needs no particular favored treatment in the designation system because it is generally larger than its neighbors and would, therefore, be a "leave tree." No tree over 20 inches dbh would be cut in the Late Successional Reserve or Adaptive Management Area (except for within gaps or incidental danger trees), as noted on pages 19 and 35 of the EA.
Silviculture	It is not stated how the DxD marking algorithm would interact with species which are not to be cut, e.g. redcedar and minor hardwood species. Are trees of these untouchable species suppose to be invisible to the DxD algorithm? If a larger member of a cuttable species (larger than any other within the specified DxD cutting radius), e.g. Douglas-fir, is next to a redcedar, what happens? Does the Douglas-fir get cut?	Kevin Geraghty (Olympic Forest Coalition, Board of Directors)	Site-specific assessment of stand conditions would be used to determine how the application of a DxD spacing would interact with retained species. In some but not all cases, retained species would be treated as "ghost trees" (not used for spacing), and would be ignored during application of the DxD spacing. In other cases, such as where a conifer release treatment is the proposed prescription, the removal of red alder trees of larger diameter would increase the growth and vigor of adjacent smaller conifers.

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Silviculture	We believe strongly that DxD without significant additional hand marking or complexification cannot credibly be termed “variable density thinning” and is not an appropriate basis for a project whose sole stated purpose is to “increase structural complexity” and develop “components of late-successional habitat”. In particular it does not permit trees ever to remain in clumps as they are prone to do in natural forests. Please refer to a recently published paper by Derek Churchill and Andrew Larson, “Spatial patterns of overstory trees in late-successional conifer forests” (Can. J. For. Res. 38: 2814-2825 (2008)). DxD, and indeed all other sorts of crude “thinning from below” can also simplify canopies and eliminate preexisting midstories.	Kevin Geraghty (Olympic Forest Coalition, Board of Directors)	Use of a DxD spacing does result in higher variability in tree spacing and leave tree diameters than a strict thinning from below prescription. Additional spatial and structural variability across the project area would be added by one or more of the following methods in each stand prescription: riparian buffers, interior skips, treating some or all of retained tree species as “ghost trees”, utilizing diameter limits (upper and/or lower), and the resulting understory response to thinning over time. The trees retained in the stand by these methods would interact with the DxD spacing to produce some of the tree clusters referred to in the cited article by Larson and Churchill. On a site-specific basis the lower diameter limit would be adjusted, if necessary, to maintain midstory trees when they are a younger cohort with high crown ratios.

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Silviculture	The EA on page 19 states that "Leave trees would be selected irrespective of whether the tree has any damage, so that trees with defects, potential cavity or nesting trees and other similar features of structural diversity may be retained in the stands." We think this is far from adequate as a prescription designed to "increase structural diversity and other components of late-successional habitat". Far preferable would be to mark such trees, or to stipulate that they are invisible to the DxD algorithm. This would also promote the heterogeneity in residual density which we know unaided DxD does not and cannot produce.	Kevin Geraghty (Olympic Forest Coalition, Board of Directors)	Green damaged trees would not be targeted for removal under the prescriptions, but would be retained at a rate that is proportional to their occurrence in the stands. Project implementation and subsequent storm events would replace damaged trees removed by the thinning.

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Silviculture	The EA statement on page 19 states there will not be an upper diameter limit on thinning in the AMA. This provision contradicts the project's Purpose and Need, which is to increase the structural diversity of forest stands by developing a multi-layer canopy and other components of late-successional habitat. If the primary intent within the AMA is instead to generate volume, then the Purpose and Need should be revised. Otherwise, thinning prescriptions within the AMA should not appreciably from those in the LSR.	Kevin Geraghty (Olympic Forest Coalition, Board of Directors)	The primary intent of thinning treatments in AMA is to add complexity to simplified second growth stands. A diameter limit is not automatically needed to achieve this, although it can help achieve spatial heterogeneity in some cases. In general there will not be an upper diameter limit on thinning in AMA, however based on individual stand conditions, an upper diameter limit may be specified in some cases (EA p. 19).
Aquatic	During the lawsuit which followed OFCO's appeal of the previous Bear Creek Saddle EA decision, a consulting hydrologist, Jon Rhodes, on behalf of OFCO presented detailed testimony on the likely aquatic effects of the previous project. None of the substantive criticisms leveled by Mr. Rhodes have been answered in the new version of the Bear Creek	Kevin Geraghty (Olympic Forest Coalition, Board of Directors)	Mr. Rhodes comments were prepared and submitted to respond to the analysis contained in the original May 2006 EA. This EA (November 2008) contains additional information and analysis. Specific comments by Mr. Rhodes have been addressed as discussed later in this appendix. The project's no-cut buffers were determined on a case-by-case basis by the fisheries specialist (EA page 21, 146-149) to protect known sensitive areas. A recent study by Rashin et al, 2006, was directed at determining the effectiveness of BMP's (riparian no entry buffers) for protecting water quality from sedimentation related to timber harvest activities. The study indicated no-cut buffers at least 10 meters wide were effective in protecting water quality.

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	Saddle EA. It is still the case that the exiguous no-cut buffers are inadequate to protect streams from activity-generated sediment. There has been no quantitative analysis of the effects of reconstructing and constructing an acknowledged total of nearly four miles of roads within riparian reserves, nor is there any additional information or analysis on landings. No information is presented on landings for ground or cable-based yarding, and the impact of these could easily equal that of the proposed road activities.		The EA at page 85 includes a discussion of why an accurate quantitative analysis of sediment generated from the project would be difficult to determine because of the variables associated with project activities, and why even if an accurate quantitative analysis could be completed it would not relate directly to impacts on fish or water quality. The location and magnitude of helicopter landing activities are disclosed in the EA and its associated maps. Ground and cable-based logging system landing locations need to be negotiated with the timber sale purchaser, so they were not mapped. However there are numerous project design criteria and mitigation measures listed in the EA (pages 33-35) which address landings and landing rehabilitation. The impacts of landings are disclosed in Chapter 3 of the EA.

Topic	Comment	Author	Response
Aquatic	The EA's analysis of indicators affected by the project is not a surrogate for analysis of effects of Aquatic Conservation Strategy Objectives (ACSOs), but, nonetheless, indicates the project conflicts with the Aquatic Conservation Strategy (ACS) and several ACSOs.	Jonathan Rhodes, Consulting hydrologist	The use of selected indicators from the NMFS methodology in the EA was for the purpose of framing the effects analysis of the project on the fisheries resource. Their use was not intended to be a surrogate for the effects of the project on the ACSOs. The NMFS methodology was developed for making determinations of effect for listed fish species. Because there are no listed in the project area, there is no requirement to follow the NMFS document or to analyze all the factors in their matrix of pathways and indicators. The use of the selected indicators was based on the fisheries biologist's professional opinion on how best to describe the project's effects. The effects of the project to the nine ACSOs are described in the EA on pages 125-133. The short-term adverse impacts are described and are expected to be well within the range that would occur as a result of natural events. The long-term benefits of the project, multiple resource benefits and aiding in restoring ecological process within the watershed, are also described. Overall the project would maintain or restore each of the ACSOs.

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Aquatic	The degradation of road density and drainage by the project indicates that the project's impacts conflict with several ACSOs and a NFP requirement for Key Watersheds.	Jonathan Rhodes, Consulting hydrologist	The ACS consistency analysis in the EA (pages 125-133) discloses that the project would maintain or restore each of the ACSOs. Additionally the EA discloses (pages 103-104) that of the subwatersheds that currently exceed the 2.5 miles per square mile indicator described in the Sol Duc Pilot Watershed Analysis, only the Deep Creek subwatershed has temporary road construction and this is minor (0.1 mile) and would not significantly change road densities. The NFP requirement for Key Watersheds to have no net increase in roads would be met by this project. The no net increase in roads is gauged from a 1994 baseline and since that time there has been extensive road decommissioning (about 32.3 miles of system roads) to reduce road miles in the Sol Duc watershed.
Aquatic	The EA did not disclose the dimensions and locations of Riparian Reserves within the project area.	Jonathan Rhodes, Consulting hydrologist	While this was a true statement relative to the September 2006 version of the EA, it is not true of the November 2008 version. One of the EA maps shows the locations of Riparian Reserves within the project area. And as mentioned on page 21 of the EA, the supporting watershed analyses for this project (Sol Duc Pilot and Deep Creek and East and West Twin Rivers) indicate the Riparian Reserve dimensions, which are based on site potential tree heights.

Topic	Comment	Author	Response
Aquatic	The EA fails to disclose the amount and location of project activities within Riparian Reserves and at stream crossings.	Jonathan Rhodes, Consulting hydrologist	While this was a true statement relative to the September 2006 version of the EA, it is not true of the November 2008 version. The EA at pages 15-18, 22, and 26-29 describes treatment unit acreages and road work within Riparian Reserves. The alternative maps also indicate proposed road use relative to Riparian Reserves.
Aquatic	The EA fails to adequately disclose that project's road activities, especially those in Riparian Reserves, will trigger impacts on sediment delivery in conflict with several ACSOs.	Jonathan Rhodes, Consulting hydrologist	The soils and fisheries environmental consequences discussion in Chapter 3 of the EA disclose the project's road activities impacts on sediment delivery (specifically EA pages 92-95, 102). As discussed in the ACS consistency section of the EA (pages 125-133) the project would maintain or restore all the ACSOs.
Aquatic	The EA's claim that some road reconstruction and re-opening will have net benefits has no sound basis and is very likely incorrect.	Jonathan Rhodes, Consulting hydrologist	The fisheries environmental consequences discussion in Chapter 3 of the EA discloses the project's road activities impacts and benefits (specifically EA pages 90-104). As discussed in the ACS consistency section of the EA (pages 125-133) the project would maintain or restore all the ACSOs. Benefits of road reconstruction are specifically discussed for ACSOs 2, 3, 5, and 9. The EA at page 115 also discusses the benefits to invasive species treatment associated with road reconstruction.

Topic	Comment	Author	Response
Aquatic	The EA fails to disclose the location and magnitude of landing activities and explicitly analyze their impacts on ACSOs.	Jonathan Rhodes, Consulting hydrologist	See previous comment response.
Aquatic	The EA fails to reasonably disclose that project activities in Riparian Reserves conflict with ACSOs by degrading the reserves, the project's no-cut buffers will not eliminate these impacts.	Jonathan Rhodes, Consulting hydrologist	The EA at pages 125-133 discloses how the project would maintain or restore all of the ACSOs. See previous comment response related to effectiveness of no-cut buffers.
Aquatic	The analyses of effects on ACSOs in the EA and "Dear Interested Party" letter are not adequate because they fail to reasonably incorporate the persistent cumulative impacts of the project.	Jonathan Rhodes, Consulting hydrologist	The cumulative effects to soils and aquatic resources of the project are discussed in the EA at pages 94-96, 100-101, 104, and 106. Where appropriate these effects were incorporated into the EA discussion of ACS consistency (EA pages 125-133).
Aquatic	The EA fails to adequately disclose the project's direct, indirect, and cumulative impacts on soils, watersheds, water quality, stream channels, and fish populations and their habitats.	Jonathan Rhodes, Consulting hydrologist	The project's impacts to the listed resources are discussed at length in Chapter 3 of the EA.

Topic	Comment	Author	Response
Aquatic	Statements in the EA concerning designed gaps (EA page 20) and location of helicopter landings (EA page 34) seem to suggest that the placement of landings within Riparian Reserves has some sort of restoration or complexity benefit. But it does not. The ACS directs the Forest Service generally to "minimize road and landings locations in Riparian Reserves". Putting "most" helicopter landings within Riparian Reserves does not seem like a great way to adhere to this guideline.	Kevin Geraghty (Olympic Forest Coalition, Board of Directors)	There is no language in the EA which suggests that placing helicopter landings within Riparian Reserves will specifically provide a restoration benefit. Landings are a necessary part of this overall project. Landing location was given careful consideration during project development. Operational constraints, such as existing road locations, topography, and powerline locations, made it necessary to locate a number of proposed helicopter landings within Riparian Reserves. Project design features and mitigation measures will minimize potential impacts of helicopter landings within Riparian Reserves (EA pages 33-35). Impacts of landings on soil compaction are discussed in the EA on page 92. Impacts of helicopter landings on the function of Riparian Reserves are discussed on pages 102 -103. The potential impact of helicopter landings in Riparian Reserves in context of the whole project is discussed in the ACS consistency section of the EA (pages 125-133). The project will maintain or restore all the ACSOs (EA (pages 125-133). The project also meets all Riparian Reserve standards and guidelines, including RF-2 which requires the Forest Service to minimize road and landing locations in Riparian Reserves (NWFP ROD C-32).
Aquatic	About 20% of Riparian Reserve acreage will not be entered because it is within a designated no-cut buffer. The remaining 80% will be treated identical to the surrounding non-Riparian Reserve allocations, which amounts to an effective 80% shrinkage of	Kevin Geraghty (Olympic Forest Coalition, Board of Directors)	The riparian no-cut buffers were not developed as a replacement for Riparian Reserves. A description of these buffers and how they were developed and for what purpose are explained in the EA at pages 21-22, and 146-149. The Riparian Reserve Forest Plan allocation is described in the EA at pages 8 and 21, and the Bear Creek Saddle project in no way proposes shrinkage of this allocation. Project design criteria and management requirements (EA pages 30 – 37) will ensure compliance with Riparian Reserves standards and guidelines.

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	Riparian Reserves. Such a shrinkage would imply that Riparian Reserve on fish-bearing streams are well less than a site potential tree height, and Riparian Reserve on non-fish bearing streams are well less than half a site-potential tree height. Wood is being removed from well within treefall and litterfall radius of most streams in the project area. We point out that relatively small diameter wood has acknowledged functions in relatively small velocity and small volume streams, and that downed wood acts to store sediment and regulate sediment delivery. We would expect that, at a minimum, the removal percentages and balance of yarding methods within this 80% of "entered" Riparian Reserve should be different from the standards on surrounding areas with less direct aquatic influence.		Stand conditions described in the EA at pages 52-53 generally pertain to Riparian Reserves as much as they do to the remaining portions of stands within LSR and AMA. As such, the treatments proposed within Riparian Reserves are expected to improve the complexity and diversity of these stands and will be a benefit to the Riparian Reserves. This project follows Riparian Reserve management direction (EA page 9) and meets all Riparian Reserve standards and guidelines, including TM-1 which requires the Forest Service to apply silvicultural practices to Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy Objectives (NWFP ROD C-32). The project will maintain or restore all the ACSOs and contribute to a restorative effect on ACSOs 1 and 8 (EA (pages 125-133). The no cut buffers included on all streams would retain the existing stem densities and provide a source of smaller size trees as referred to in the paper cited by the commenter. The fisheries biologist considered the benefits to be accrued by thinning versus not thinning. The distribution of no cut and treatment areas near the streams provides a mix of small diameter and future larger diameter trees. Based on professional opinion the fish biologist determined that there would be a more than adequate supply of small and larger diameter trees providing LWD recruitment and leaf litter within each of the 3 watersheds, given the miles of stream adjacent riparian areas that are not being treated (outside planning area units). The paper by Beechie et al, 2000, did not address modeling diameter function in small or large streams where no cut buffers were implemented.
Wildlife	We find it rather shocking to see prohibitions on cutting large trees (over 21") with	Kevin Geraghty (Olympic	Trees with potential nesting structures have not been identified within the AMA stands proposed for treatment. To meet the stand density objectives in locations where the majority of trees are larger

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	potential nesting structures during northern spotted owl and marbled murrelet breeding seasons (EA page 37). This of course implies that it is permissible to cut such trees outside of the breeding season, presumably in AMA since the EA states that no trees over 21" dbh will be cut in LSR. Here we detect a clear intent not to protect them. How is the felling and removal of large trees with potential nest structures in any way consistent with the stated Purpose and Need for this project? We strongly recommend that the dbh diameter limits which you propose to impose on LSR logging in this project also apply to AMA. We note in passing that in past programmatic BiOPs, trees over 21 " dbh have generally been excluded from such programmatic permissions.	Forest Coalition, Board of Directors)	than 21"DBH, removal of the smaller trees by the thinning treatment may result in cutting some trees greater than 21" DBH, however these trees are not considered potential nest trees due to the absence of adequate structure (platforms, large branches, adjacent cover, etc). In this case if trees larger than 21" DBH would be cut, then adjacent larger trees would remain as leave trees. Trees larger than 21" DBH may also be removed in gaps to meet the objectives for this component of the variable density thinning treatment, but again, these trees are not considered potential nest trees. Danger trees along roads or landings that are greater than 21" DBH will be reviewed as potential nest trees by the wildlife biologist; removal of such trees, should they meet the criteria, are allowed under the current programmatic.
Sensitive Species	The EA points out (page 75) that certain Survey and Manage "sensitive " species do not require surveys because stand ages are less	Kevin Geraghty (Olympic Forest Coalition,	Per the silviculturalist's report, this stand is approximately 50–60 years old. Scattered trees may be older, however the entire stand is of an age that would not require surveys for Survey and Manage species.

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	than 80. We contend that that assertion is likely incorrect in the case of unit 65, and thus commercial entry would require such a survey.	Board of Directors)	
Roads	We commend the EA's commitment to limit skyline corridor width to 12 feet, and to minimize clearing widths on temporary roads "to what is necessary for safe haul". We suggest that the clearing width limits also be applied to other non-open roads, either "ghost" roads or level 1 roads, since many of these are heavily vegetated and some in fact are not easily distinguishable from their surroundings.	Kevin Geraghty (Olympic Forest Coalition, Board of Directors)	Thank you for your comment. The unclassified, abandoned roads used for the project will be treated as temporary roads in terms of construction and decommissioning requirements. As such the project design criteria concerning temporary road construction on page 33 of the EA apply to unclassified, abandoned roads. This criteria is "Minimize clearing widths to what is necessary for safe haul (generally widths of 16 feet on level ground, 20 feet for curves, and slightly more for steeper grades)". Level 1 roads generally have a more defined road profile than unclassified, abandoned roads so the clearing width limits for these roads will in some cases be set by the existing conditions. However the goal on these roads, as with temporary roads, is to minimize clearing widths to what is necessary for safe haul.
Slash Burning	We also commend generally the intent to leave non-merchantable material in units and scatter landing residues, or place the material on temp roads, rather than piling and burning. We do not like slash burning in wet forests. It volatilizes organic matter and nutrients which would be better left on site.	Kevin Geraghty (Olympic Forest Coalition, Board of Directors)	Thank you for your comment.

F. References

Anthony, RG, ED Forsman, AB Franklin, DR Anderson, KP Burnham, GC White, CJ Schwarz, J Nichols, JE Hines, GS Olson, SH Ackers, S Andrews, BL Biswell, PC Carlson, LV Diller, KM Dugger, KE Fehring, TL Fleming, RP Gerhardt, SA Gremel, RJ Gutierrez, PJ Happe, DR Herter, JM Higley, RB Horn, LL Irwin, PJ Loschl, JA Reid, and SG Sovern. 2004. Status and Trends in Demography of Northern Spotted Owls, 1985-2003. Interagency Regional Monitoring Report, Portland, Oregon.

Aubry, K. Research Wildlife Biologist, Pacific Northwest Research Station, Olympia, Washington. 2008. Personal communication with Susan Piper, August 15, 2008, at the Supervisor's Office, Olympic National Forest, Olympia, Washington.

Aulerich, DE, KK Johnson and HA Froehlich. 1974. Tractors or skylines: what's best for thinning young-growth Douglas-fir?. Forest Industries 101(12): 42-45.

Bailey, JD., and JC Tappeiner. 1997. Effects of thinning on structural development in 40- to 100-year-old Douglas-fir stands in western Oregon. Forest Ecology and Management 108 (1998) 99-113.

Beggs, LR. 2004. Vegetation response following thinning in young Douglas-fir forests of Western Oregon: Can thinning accelerate development of late-successional structure and composition? Master of Science in Forest Science thesis, Oregon State University.

Biswell, B. 2005. Personal communication with Betsy Howell, July 13, 2005, at the Olympic Supervisor's Office, Olympic National Forest, Olympia, Washington.

Brooks, KN, PF Ffolliott, HM Gregersen, JL Thames. 1991. Hydrology and the management of watersheds. Iowa State University Press. Ames, IA.

Brown, ER. Technical Editor. 1985. Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington, USDA Forest Service, Pacific Northwest Region, 332 p.

Carey, AB, and RO Curtis. 1996. Conservation of biodiversity: a useful paradigm for forest ecosystem management. Wildlife Society Bulletin 1996, 24(4):610-620.

Carey, AB and ML Johnson. 1995. Small mammals in managed, naturally young, and old-growth forests. Ecological Applications, 5(2): 336-352 .

Carey, AB, BR Lippke, and J Sessions. 1999. Intentional systems management: managing forests for biodiversity. Journal of Sustainable Forestry, Vol. 9(3/4).

Carey, AB, and TM Wilson. 2001. Ecological Foundations of Biodiversity, 1999-2000 Biannual Report. Pacific Northwest Research Station, Forestry Sciences Laboratory.

Castellano, MA, J Smith, T O'Dell, E Cazares, and S Nugent. 1999. Handbook to Strategy 1 Fungal Species iin the Northwest Forest Plan. USDA General Technical Report PNW-GTR-476. October 1999.

Castellano, MA, E Cazares, B Fondrick, and T Dreisbach, 2003. Handbook to Additional Fungal Species of Special Concern in the Northwest Forest Plan. USDA General Technical Report PNW-GTR-572. January 2003.

Cooperative Elk Management Group (CEMG). 1999. Elk management on the Olympic Peninsula: State-Tribal technical management document. June 1999. 54 pp.

Chappell, CB, RC Crawford, C Barrett, J Kagan, DH Johnson, M O'Mealy, GA Green, HL Ferguson, WD Edge, EL Greda, and TA O'Neil. 2001. Wildlife habitats: Descriptions, status, trends, and

system dynamics. Pp. 22-114 in: DH Johnson and TA O'Neil, ed. Wildlife-habitat relationships in Oregon and Washington. Oregon State University Press, Corvallis, Oregon.

Chastain, C. Pacific Salmon Coalition. 2006. Personal (email) communication with Betsy Howell, January 18, 2006 from the Olympic National Forest Supervisor's Office, Olympia, Washington.

Chornesky, E.A.; A.M. Bartuska; G.H. Aplet; K.O. Britton; J. Cummings-Carlson; F.W. Davis; J. Eskow; D.R. Gordon; K.W. Gottschalk; and R.A. Haack. 2005. Science priorities for reducing the threat of invasive species to sustainable forestry. BioScience 55(4): 335-348.

Cipollini, M.L., B.G. Drake, and D. Whigham. 1993. Effects of elevated CO_2 on growth and carbon/nutrient balance in the deciduous wood shrub *Lindera benzoin* (L.) Blume (Lauraceae). Oecologia 96: 339-346.

Climate Change Science Program. 2008. Preliminary review of adaptation options for climate-sensitive ecosystems and resources. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research [Julius, S.H.; J.M. West (eds.), J.S. Baron, B. Griffith, L.A. Joyce, P. Kareiva, B.D. Keller, M.A. Palmer, C.H. Peterson, and J.M. Scot (Authors)]. U.S. Environmental Protection Agency, Washington, D.C. 873 pp.

Climate Impacts Group, University of Washington. 2004a. Forest Biodiversity: climate change and the Pacific Northwest.

-----. 2004b. Forest growth and climate change.

-----. 2006a. Climate change scenarios. Accessed on February 14. http://www.cses.washington.edu/cig/fpt/ccscenarios.shtml.

-----. 2006b. Climate outlook. http://www.cses.washington.edu/cig/fpt/coutlook.shtml. Updated September 17.

-----. 2007. Update on Pacific Northwest climate change scenarios.

Cooper, BA., MG. Raphael, and DE Mack. 2003. Refining a landscape-scale habitat model and inland monitoring program for marbled murrelets in the Olympic Peninsula. Final Report prepared for USFS Pacific Northwest Research Station and Olympic Natural Resources Center. ABR, Inc., Environmental Research & Services, P.O. Box 249, Forest Grove, OR 97116.

Corkran, CC and C Thoms. 1996. Amphibians of Oregon, Washington and British Columbia. Lone Pine Publishing, Redmond, Washington. 175 pp.

Courtney, SP, JA Blakesley, RE Bigley, ML Cody, JP Dumbacher, RC Fleischer, AB Franklin, JF Franklin, RJ Gutierrez, JM Marzluff, and L Sztukowski. 2004. Scientific evaluation of the status of the Northern Spotted Owl ("The Status Review"). Sustainable Ecosystems Institute, Portland, Oregon.

Curtis, P.S., B.G. Drake, and D.F. Whigham. 1989. Nitrogen and carbon dynamics in C_3 and C_4 estuarine marsh plants grown under elevated CO_2 in situ. Oecologia 78: 297-301.

Curtis, RO. 1982. A simple index of stand density for Douglas-fir. Forest Science, Vol. 28, No. 1, pp. 92-94.

Curtis, RO and DD Marshall. 1993. Douglas fir rotations—time for reappraisal? Western Journal of Applied Forestry. 8(3): 81-85.

Curtis, RO, DS DeBell, CA Harrington, DP Lavender, JB St. Clair, JC Tappeiner, and JD Walstad. 1998. Silviculture for multiple objectives in the Douglas-fir region. Gen. Tech. Rep. PNW-GTR-435. USDA Forest Service, PNW Research Station, Portland, OR. 123 p.

Dukes, J.S. and H.A. Mooney. 1999. Does global change increase the success of biological invaders? TREE 14(4): 135-139.

Duncan, SH, RE Bilby, JW Ward, and JT Heffner. 1987. Transport of road surface sediment through ephemeral stream channels. Water Resources Bulletin. 23 (1):113-119.

Durall, DM, MC Jones, EF Wright, P Kroeger and KD Coates. 1999. Species richness of ectomycorrhizal fungi in cutblocks of different sizes in the Interior Cedar-Hemlock forests of northwestern British Columbia: sporocarps and ectomycorrhizae. Canadian Journal of Forestry 29: 1322-1332

Ehrlich, PR, DS Dobkin and D Wheye. 1988. The Birder's Handbook, A Field Guide to the Natural History of North American Birds. Simon and Schuster, New York, NY.

Forest Ecosystem Management Assessment Team [FEMAT]. 1993. Forest ecosystem management: an ecological, economic, and social assessment. Portland, OR: U.S. Department of Agriculture; U.S. Department of the Interior [et al.].

Flewelling, JW, KN Wiley, and TJ Drew. 1980. Stand-density management in western hemlock. Weyerhaeuser Forestry Research Technical Report 042-1417/80/32.

Geyer, F. 2005. Personal communication with Betsy Howell, May 12, 2005, at the Forks Ranger District Office, Forks, Washington.

Gravenmier, B. 2008. Personal communication with Tim Davis, March 24, 2008.

Grubb, TG. 1995. Constructing Bald Eagle Nests With Natural Materials. Rocky Mountain Forest and Range Experiment Station, RM-RN-535, 2500 S. Pine Knoll Dr., Flagstaff, AZ 86001.

Harris, AS. 1989. Wind in the forests of southeast Alaska and guides for reducing damage. USDA Forest Service, Pacific Northwest Research Station, General Technical Report PNW-GTR-244.

Hellamann, J.J.; J.E. Byers; B.G. Bierwagen; and J.S. Dukes. 2008. Five potential consequences of climate change for invasive species. Conservation Biology 22(3): 534-543.

Henderson, JA, DH Peter, RD Lesher, and DC Shaw. 1989. Forested Plant Associations of the Olympic National Forest, USDA Forest Service, Pacific Northwest Region, 502 p.

Hibbs, DE and DS Debell. 1994. Management of Young Red Alder. In The Biology and Management of Red Alder, OSU Press (Chapter 14), 256 p.

Hitchcock, CL, A Cronquist, M Ownbey, and JW Thompson. 1969. Vascular Plants of the Pacific Northwest. (5 Vols). University of Washington Press. Seattle, WA.

Johnson, H.B., H.W. Polley, and H.S. Mayeux. 1993. Increasing CO_2 and plant-plant interactions: effects on natural vegetation. Vegetation 104/105: 157-170.

Joyce, L.A.; G.M. Blate; J.S. Littell; S.G. McNulty; C.I. Millar; S.C. Moser; R.P. Neilson; K. O'Halloran; and D.L. Peterson. 2008. National Forests. Pp. 3-1 to 3-127 *In* Preliminary review of adaptation options for climate-sensitive ecosystems and resources. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research [Julius, S.H.; J.M. West (eds.), J.S. Baron, B. Griffith, L.A. Joyce, P. Kareiva, B.D. Keller, M.A. Palmer, C.H. Peterson, and J.M. Scot (Authors)]. U.S. Environmental Protection Agency, Washington, D.C. 873 pp.

Kranabetter, JM and P Kroeger. 2001. Ectomycorrhizal mushroom response to partial cutting in a western hemlock-western redcedar forest. Canadian Journal of Forest Research 31: 978-987.

Laubenheimer, K. 2005. Personal communication with Betsy Howell at the Pacific Ranger District, Olympic National Forest, Forks, Washington.

Lawton, E. 1971. Moss Flora of the Pacific Northwest. The Hattori Botanical Laboratory, May 1971.

Leonard, WP, HA Brown, LLC. Jones, KR. McAllister, and RM Storm. 1993. Amphibians of Washington and Oregon. Seattle Audubon Society, The Trailside Series, Seattle, Washington.

Lewis, JC and GE Hayes. 2004. Feasibility Assessment for Reintroducing Fishers to Washington. Washington Department of Fish and Wildlife, Olympia, Washington. 70 pp.

Lindh, BC, and PS Muir. 2004. Understory vegetation in young Douglas-fir forests: does thinning help restore old-growth composition? Forest Ecology and Management 192(2004) 285-296.

Link, WA, and JR Sauer. 1997. Estimation of population trajectories from count data. Biometrics 53:63-72.

Little, JD. 2007. Personal communication with Yewah Lau. Research scientist with Climate Impacts Group, University of Washington.

Manley, IA and SK Nelson. 1999. Habitat characteristics associated with nest success and predation at marbled murrelet tree nests (Abstract). Pacific Seabirds 26:40.

Maser, C. 1998. *Mammals of the Pacific Northwest, From the Coast to the High Cascades*. Oregon State University Press, Corvallis, OR. 406 pp.

McCune, B and L Geiser. 1997. Macrolichens of the Pacific Northwest. Oregon State University Press, Corvallis, OR

McShane, C, T Hamer, H Carter, G Swartzman, V Friesen, D Ainley, R Tressler, K Nelson, A Burger, L Spear, T Mohagen, R Martin, L Henkel, K Prindle, C Strong, and J Keany. 2004. Evaluation report for the 5-year status review of the marbled murrelet in Washington, Oregon, and California. Unpublished report. EDAW, Inc. Seattle, Washington. Prepared for the U.S. Fish and Wildlife Service, Region 1. Portland, Oregon.

Mellen, K, BG Marcot, JL Ohmann, K Waddell, SA Livingston, EA Willhite, BB Hostetler, C Ogden, and T Dreisbach. 2003. DecAID, the decayed wood advisor for managing snags, partially dead trees, and down wood for biodiversity in forests of Washington and Oregon. Version 1.10. USDA Forest Service, Pacific Northwest Region and Pacific Northwest Research Station; USDI Fish and Wildlife Service, Oregon State Office; Portland, Oregon. http://wwwnotes.fs.fed.us:81/pnw/DecAID/DecAid.nsf.

Miller, RE, W Scott and JW Hazard. 1996. Soil compaction and conifer growth after tractor yarding at three coastal Washington locations. Canadian Journal of Forestry Resources. 26: 225-236. Canada

Mote, P.W. 2004. How and why is Northwest climate changing? Pp. 11-22 In D.L Peterson, J.L. Innes, and K. Obrian (eds.). Climate change, carbon, and forestry in Northwestern North America: Proceedings of a Workshop. November 14-15, 2001. Orcas Island, Washington. USDA Forest Service, Pacific Northwest Research Station, Gen. Tech. Rept. PNW-GTR-614.

Mote, P.W. and 18 co-authors. 1999. Impacts of climate variability and change: Pacific Northwest. A report of the Pacific Northwest Regional Assessment Group for the U.S. Global Change Research Program. JISAO/SMA Climate Impacts Group, University of Washington, Seattle.

National Assessment Synthesis Team. 2000. Climate change impacts on the United States: The potential consequences of climate variability and change. US Global Change Research Program. Washington, D.C. 154pp.

Nelson, SK and TE Hamer. 1995. Nest Success and the Effects of Predation on Marbled Murrelets. General Technical Report PSW-GTR-152. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture.

Newton, M and EC Cole. 1987. A sustained-yield scheme for old-growth Douglas fir. Western Journal of Applied Forestry. 2(1): 22-25.

Old-Growth Definition Task Group (J Franklin, F Hall, W Laudenslayer, C Maser, J Nunan, J Poppino, CJ Ralph, and T Spies). 1986. Interim definitions for old-growth Douglas-fir and mixed conifer forests in the pacific northwest and California. USDA Forest Service, Pacific Northwest Research Station, Research Note PNW-447.

Oliver, CD and BC Larson. 1990. Forest Stand Dynamics, McGraw-Hill, Inc., New York, 467 p.

Palazzotto, N. 2005. Personal communication with Betsy Howell, November 15, 2005, during a field day at one of the flying squirrel study grids, Forks, Washington.

Partners in Flight. 1998. North American Bird Conservation Initiative (NABCI): Strategy and Action Plan.

Perlmeter, SI 1995. Bats and Bridges: A Field Study of the Thermal Conditions and Social Organization of Night Roosts in the Willamette National Forest. Msc. Thesis, Graduate Programme in Biology, York University, North York, Ontario.

Perschel, Robert T., A. Evans and M. Summers. 2007. Climate Change, Carbon, and the Forests of the Northeast. Forest Guild. December 2007.

Peter, D. 1995. Vegetation report, in Sol Duc Watershed Analysis, USDA Forest Service, Olympic National Forest, Olympia, Washington.

Pojar, J and A MacKinnon. 1994. Plants of the Pacific Northwest Coast, Washington, Oregon, British Columbia, and Alaska. B.C. Ministry of Forests and Lone Pine Publishing.

Power, WE. 1974. Effects and observations of soil compaction in the Salem District. USDIBLM Tech Note No. 256. Denver, CO: Federal Center Building 50. 12 p.

Pyke, C.R.; R. Thomas; R.D. Porter; J.J. Hellmann; J.S. Duke; D.M. Lodge; and G. Chavarria. 2008. Current practices and future opportunities for policy on climate change and invasive species. Conservation Biology 22(3): 585-592.

Pyle, RM. 2002. The Butterflies of Cascadia. Seattle Audubon Society, Seattle, Washington. 420 pp.

Regional Ecosystem Office (REO). 1996. Criteria to Exempt Specific Silvicultural Activities in Late-Successional Reserves and Managed Late-Successional Areas from Regional Ecosystem Office Review. Memorandum from Donald R Knowles, Regional Ecosystem Office Executive Director to Regional Interagency Executive Committee. July 9.

Rogers, Jr., H.H.; G.B. Runion; S.A. Prior; A.J. Price; H.A. Torbert III; and D.H. Gjerstad. 2008a. Effects of elevated atmospheric CO_2 on invasive plants: comparison of purple and yellow nutsedge (*Cyperus rotundus* L. and *C. esculentus* L.). Journal of Environmental Quality 37: 395-400.

Rogers, Jr., H.H.; D.H. Gjerstad ; G.B. Runion; S.A. Prior; A.J. Price; E. Van Santen; H.A. Torbert III. 2005. Effects of elevated atmospheric CO_2 on invasive weed species in managed terrestrial ecosystems of the southeastern U.S. Southeastern Regional Center, National Institute for Global Environmental Change, Annual Report for Fiscal Year 2004. University of Alabama, Tuscaloosa, AL. 4 pp.

Sheets, TJ. 1993. Washington State Pine Marten Distribution. Washington Conservation Corps, Washington Department of Fish & Wildlife.

Smith, S.D.; T.E. Huxman; S.F. zitzer; T.N. Charlet; D.C. Housman; J.S. Coleman; L.K. Fenstermaker; J.R. Seemann; and R.S. Nowak. 2000. Elevated CO_2 increases productivity and invasive species success in an arid ecosystem. Nature 408:79-82.

Spies, TA, JF Franklin, and M Klopsch. 1990. Canopy gaps in Douglas-fir forests of the Cascade Mountains. Canadian Journal of Forest Resources, 20:649-658.

State of Washington, Natural Heritage Program, 2004.

Steinberg, EK. 1995. A study of genetic differentiation and variation in the Mazama pocket gopher (Thomomys mazama) with emphasis on Fort Lewis populations. Final report submitted to Fort Lewis and The Nature Conservancy. 46 pp + appendices. California Department of Fish and Game, Nongame Bird and Mammal Program Report 94-5.

Steinberg, EK, and D Heller. 1997. Using DNA and rocks to interpret the taxonomy and patchy distribution of pocket gophers in western Washington prairies. Pp. 43–51 in South Puget Sound Prairie Landscapes (P. Dunn and K. Ewing, eds.). The Nature Conservancy of Washington, Seattle. 289 pp.

Survey Protocols for Survey & Manage Category A & C Lichens in the Northwest Forest Plan Area, Version 2.1 (2003). C. Derr, R. Helliwell, A. Ruchty, L. Hoover, L. Geiser, D. Lebo & J. Davis.

Taber, RD and KJ Raedeke. 1980. Status report, Roosevelt elk of the Olympic National Forest. University of Washington, College of Forest Resources. Seattle, WA.

Tabor, RW and WM Cady. 1978 Geologic Map of the Olympic Peninsula, Washington. USDI USGS. Map I-994. (FROM GEOLOGY SECTION in Specialist report????)

Tappeiner, JC, D Huffman, D Marshall, TA Spies, and JD Bailey. 1997. Density, ages, and growth rates in old-growth and young-growth forests in coastal Oregon. Canadian Journal of Forest Resources. 27:638-648.

Tausch, R.J. 2008. Invasive plants and climate change. (May 20, 2008). U.S. Department of Agriculture, Forest Service, Climate Change Resource Center. http://www.fs.fed.us/ccrc/topics/invasive-plants.shtml

Taylor, K., and C. Potvin. 1997. Understanding the long-term effect of CO_2 enrichment on a pasture: the importance of disturbance. Canadian Journal of Botany 75(10): 1621-1627.

Thomas, JW, ed. 1979. Wildlife habitats in managed forests – the Blue Mountains of Oregon and Washington. Handbook No. 533. Washington, D.C.:U.S.Dep. Agric. 512 pp.

Thomas, JW, ED Forsman, JB Lint, EC Meslow, BR Noon, and J Verner. 1990. A Conservation Strategy for the Northern Spotted Owl. USDA Forest Service, USDI Bureau of Land Management, USDI Fish and Wildlife Service, USDI National Park Service. Portland, Oregon.

Thomas, JW, MG Raphael and RG Anthony [et al.]. 1993. Viability assessments and management considerations for species associated with late-successional and old-growth forests of the Pacific Northwest. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. 523 p.

USDA Forest Service. 1988. General Water Quality Best Management Practices. Pacific Northwest Region. 86pp.

-----. 1989. Forested Plant Associations of the Olympic National Forest. Pacific Northwest Region. R6-ECOL-TP 001-88 1989. J. Henderson, D. Peter, R. Lesher, D. Shaw.

-----. 1990a. Olympic National Forest Land and Resource Management Plan. Olympia, WA.

-----. 1990b. Olympic National Forest land and Resource Management Plan, Final Environmental Impact Statement. Olympia, WA.

-----. 1994. The Scientific Basis for Conserving Forest Carnivores, American Marten, Fisher, Lynx, and Wolverine in the Western United States. GTR RM-254, Fort Collins, CO.

-----. 1995. Sol Duc Pilot Watershed Analysis. Olympic National Forest. Olympia, WA.

-----. 1997. Soleduck Late Successional Reserve Assessment, Olympic National Forest, Soleduck Ranger District, Forks, Washington.

-----. 1998a. Forest Service Manual. Title 2520 – Watershed Protection and Management. R-6 Supplement No. 2500.98-1. Portland, Oregon.

-----. 1998b. Olympic Adaptive Management Area Guide. Olympic National Forest, Olympia, WA

-----. 2000a. Road management strategy for the Olympic National Forest, *unpublished.*, Olympic National Forest. Olympia, WA.

-----. 2000b. Olympic National Forest Ecological Unit Inventory, Olympic National Forest, Pacific Northwest Region.

-----. 2002. Deep Creek and East and West Twin Rivers Watershed Analysis. Olympic National Forest. Olympia, WA.

-----. 2003a. Olympic National Forest Programmatic Biological Assessment for the USDI Fish and Wildlife Service. Olympic National Forest, Olympia, WA.

-----. 2003b. Access and travel management plan. Olympic National Forest. Olympia, WA.

-----. 2004a. Federally Listed, Proposed and Candidate Species, and Proposed or Designated Critical Habitat. Pacific Northwest Region.

-----. 2004b. Olympic National Forest Strategic Plan: Integrating Aquatics, Wildlife, and Silviculture. *unpublished.* Olympic National Forest, Olympia, Washington.

-----. 2004c. Regional Forester's Sensitive Species List. Portland, Oregon.

-----. 2005a. Olympic National Forest Rare Plant Occurrence GIS cover. Olympic National Forest.

-----. 2005b. Pacific Northwest Region Invasive Plant Program: Preventing and Managing Invasive Plants, Final Environmental Impact Statement. April 2005. R6-NR-FHP-PR-02-05.

-----. 2005c. Pacific Northwest Region Invasive Plant Program: Preventing and Managing Invasive Plants, Record of Decision. October 2005. R6-NR-FHP-PR-02-05.

-----. 2005d. Natural Resource Information System (NRIS), Invasive Plant Inventory Database.

-----. 2008. Olympic National Forest Final Environmental Impact Statement And Record of Decision – Beyond Prevention: Site-Specific Invasive Plant Treatment Project. March 2008.

USDA Forest Service Olympic National Forest, Elwha Klallam Tribe, and Washington Department of Ecology. 2002. Deep Creek, East Twin, West Twin Rivers Watershed Analysis. Olympic National Forest, Olympia, WA.

USDA Forest Service Olympic National Forest, Washington Department of Natural Resources Olympic Region, and Quileute Indian Tribe. 1995. Sol Duc Pilot Watershed Analysis. Olympic National Forest, Olympia, WA.

USDA Forest Service and USDI Bureau of Land Management. 1994a. Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl. Portland, Oregon.

-----. 1994b. Record of decision for amendments to Forest Service and Bureau of Land Management planning documents within the range of the Northern Spotted Owl; Standards and guidelines for management of habitat for late-successional and old-growth forest related species within the range of the Northern Spotted Owl.

-----. 2001. Record of decision and standards and guidelines for amendments to the survey and manage, protection buffer, and other mitigation measures standards and guidelines.

-----. 2004. ISMS database and associated GIS covers.

-----. 2004a. Record of decision amending resource management plans for seven Bureau of Land Management districts and land and resource management plans for nineteen national forests within the range of the Northern Spotted Owl; decision to clarify provisions relating to the Aquatic Conservation Strategy.

USDA Natural Resources Conservation Service, PLANTS Database. http//plants.usda.gov.

USDI Fish & Wildlife Service. 1992. Critical Habitat for the Northern Spotted Owl, Maps and Legal Descriptions, Washington. Portland, Oregon.

-----. 1993. Listed and Proposed Endangered and Threatened Species and Critical Habitat; Candidate Species; and Species of Concern in the Western Portion of Washington State. Western Washington Fish and Wildlife Office, Lacey, Washington.

-----. 1997. Recovery Plan for the Threatened Marbled Murrelet (*Brachyramphus marmoratus*) in Washington, Oregon, and California. USDI Fish and Wildlife Service, Portland, Oregon. September 1997.

-----. 1999. Federal Register, Vol. 64, No. 164, August 25, 1999, Final Rule to Remove the American Peregrine Falcon from the Federal List of Endangered and Threatened Wildlife, and To Remove the Similarity of Appearance Provision for Free-Flying Peregrines in the Conterminous United States.

-----. 2003. Biological Opinion and letter of concurrence for effects to bald eagles, marbled murrelets, northern spotted owls, bull trout, and designated critical habitat for marbled murrelets and northern spotted owls from Olympic National Forest program of activities for August 5, 2003 to December 31, 2008. USDI Fish and Wildlife Service, Lacey, Washington. August 2003; revised September 2004.

-----. 2007a. National Bald Eagle Guidelines, May 2007. U.S. Fish and Wildlife Service.

-----. 2007b. Fisher Reintroduction Plan Environmental Assessment, September 2007. Olympic National Park, Port Angeles, Washington.

-----. 2008. Revised Designation of Critical Habitat for the Northern Spotted Owl; Final Rule. Fed. Reg. 73(157):47326–47522.

Washington Department of Fish & Wildlife. 1996. Final environmental impact statement for the Washington State management plan for elk. Wildlife Program, Washington Department of Fish and Wildlife. Olympia, WA 217 pp.

Washington Department of Fish & Wildlife. 2004. Washington State Elk Herd Plan, Olympic Elk Herd. Olympia, WA.

Washington Department of Fish and Wildlife (WDFW) and Western Washington Treaty Tribes (WWTT). 2002. Washington State Salmon and Steelhead Stock Inventory. Olympia, WA.

Washington Forest Practices Board. Watershed Analysis Manual. 1995.

Washington State Noxious Weed Control Board, http://www.nwcb.wa.gov.

Washington State Working Subgroup of the Silviculture Subcommittee (C Oliver, C Harrington, M Bickford, L Hicks, S Martin, T Raettig, J Hoyer, B Gara, W Knapp, G Lightner, and J Tappeiner). 1991. Northern spotted owl habitat in previously managed forests in western and eastern Washington with and without further management. USDI Fish and Wildlife Service, 72 p.

White House Council on Environmental Quality. 2005. Guidance on the Consideration of Past Actions in Cumulative Effects Analysis. Memorandum by James L. Connaughton, Chairman to Heads of Federal Agencies. June 24.

Wilke, T. 2004. Genetic and Anatomical Analyses of the Jumping Slugs, Final Report, Contract #43-05G2-1-10086.

Witmer, GW, and DS deCalesta. 1985. Effects of forest roads on habitat use by Roosevelt elk. Northwest Science. 59:122-125.

Zaborske, RR, MH McClellan and TA Hanley. 2000. Understory vegetation development following commercial thinning in Southeast Alaska: preliminary results from the second-growth management area demonstration project. USDA Forest Service, Alaska Region, Juneau, AK.

Zenner, EK. 2005. Development of tree size distributions in Douglas-fir forests under differing disturbance regimes. Ecological Applications. 15(2),701-714.

Ziegltrum, J. 2001. Olympic National Forest Monitoring Report. Olympia, WA.

Ziegltrum, J. 2004. Draft Management Recommendations for Two Species of the Genus *Hemphillia*. Olympic National Forest, Olympia, WA.

Ziegltrum, J. Olympic National Forest Ecologist. 2005. Personal communication with Betsy Howell, November 8, 2005, at the Olympic Supervisor's Office, Olympic National Forest, Olympia, Washington.

Ziska, L.H. 2003. Evaluation of the growth response of six invasive species to past, present and future atmospheric carbon dioxide. Journal of Experimental Botany 54(381): 395-404.

Ziska, L.H., S. Faulkner, and J. Lydon. 2004. Changes in biomass and root:shoot ratio of field-grown Canada thistle (*Cirsium arvense*), a noxious, invasive weed, with elevated CO_2: implications for control with glyphosate. Weed Science 52:584-588.