Cascadia Wildlands
we like it wild.

July 2, 2015

Via email and certified mail

Regional Forester
USDA Forest Service
Attn: 1570 Objections
P.O. Box 3623
Portland, OR 97208-3623

RE: Objections to the Loafer Timber Sale Project, Draft Decision Notice and FONSI

Dear Reviewing Officer:

Objectors Cascadia Wildlands, Oregon Wild, and Klamath-Siskiyou Wildlands Center file this objection to the Draft Decision Notice and Finding of No Significant Impact ("Draft DN and FONSI") for the Loafer Timber Sale Project ("Project"), dated May 19, 2015. Alice Carlton, Umpqua National Forest Supervisor, Responsible Official. These objections are submitted pursuant to 36 C.F.R. § 218. These objections directly relate to comments submitted by Objectors and we incorporate by reference our prior comments on the Loafer Timber Sale that are addressed to the issues raised in our statement of reasons. The scoping comments, comments on the draft Environmental Assessment ("EA"), and prior appeal are all still relevant to the project as proposed by the May 19, 2015 draft DN and FONSI.

The Objectors submitted scoping comments for the Loafer Timber Sale on March 14, 2012 and May 28, 2012. Objectors commented on the first Environmental Assessment for the Loafer Timber Sale, on April 18, 2013 and April 25, 2013. Objector Oregon Wild submitted individual scoping comments on March 30, 2012 and individually commented on the draft EA on April 18, 2013. Objectors appealed the 2013 Loafer decision on June 24, 2013 and filed a complaint on December 3, 2013 alleging multiple legal deficiencies that resulted in the vacating of the 2013 Loafer EA. This objection is a result of the continued inadequacies in the analysis of the Loafer project put forth in the 2015 Loafer EA.

As required by 36 C.F.R. § 218.8(d), Objectors provide the following information:

1. The names, addresses, and telephone numbers of the objectors are listed below.
2. In addition to the electronic signatures below, verification of authorship is available upon request.
3. The lead objector is Cascadia Wildlands.
4. The proposed project being objected to is the Loafer Timber Sale Project, including the Environmental Assessment, draft Decision Notice and Finding of No Significant Impact. The Loafer Timber Sale will be implemented on the Diamond Lake Ranger District of the Umpqua National Forest. The Responsible Official is Alice Carlton, Forest Supervisor for the Umpqua National Forest.
5. A description of the aspects of the proposed project being objected to is included below.

6. All issues addressed in this objection relate to comments made during the designated comment periods for this project. Objectors submitted scoping comments on March 14, 2012, May 28, 2012. Objector Oregon Wild submitted comments on the 2013 Environmental Assessment on April 18, 2013, April 25, 2013. Objectors appealed the Decision on the 2013 Loafer project on June 24, 2013 and filed a legal complaint in the Oregon District Court on December 12, 2013. The 2013 Loafer EA was withdrawn on April 10, 2014, resulting in the dismissal of the District Court Case. The 2015 Loafer EA and the Decision addressed in this Objection is the result of the Forest Service attempt to provide "greater cohesiveness and efficiency for authorizing and implementing the project." [1]

PROJECT DESCRIPTION: Alternative 2

- Commercially thin 1,397 acres, retaining:
  20 to 70 trees per acre in meadow habitats;
  50 to 90 trees per acre pine-dominated stands;
  90 to 120 trees per acre in mid-seral and mixed conifer stands.
- 40 acres of riparian reserves thinning
- 821 acres of prescribed burning
- 9.6 miles of new temporary and spur route construction
- Logging within the Dread and Terror unroaded area
- Decision includes units 4, 5, 6, 7, 8, 15, 16, 17, 23, 26, 27, 28, 29, 30, 32, 33, 35, 36, 37, 39, 40, 43, 58, 59, 120, 121, 122, 137, 141, 142, 200, 201, 202, 301, 302, 303 and 304.

The decision includes the following four prescriptions:

1) C4-II 4-Part Winter Range, "the management objective . . . is to manage for an optimal mix of forage and cover by retaining 5-10% of the unit area in leave islands, retaining 15-30% of the unit area in forage openings have less than 25% canopy closure, managing the rest to 30% canopy closure, and releasing desirable native pine species."

2) C4-III Shrubland Restoration, "the management object is to restore big game winter range and land bird habitat … by thinning to no more than 25% canopy closure".[2]

3-4) Wildlife Cover Block and Variable Density Thinning to 50-90 TPA.

Our objection does not include objections to thinning in managed plantations or prescribed burning. Our objection focuses on stands within proposed wilderness, as mapped on page 166 of the EA, and native, old growth forests.

OBJECTIONS

[1] Draft Decision Notice & Finding of No Significant Impact, Loafer Timber Sale Project (2015) at 50.

[2] 2015 EA at 51.

[6] 16 U.S.C. § 1533(a); *Determination of Threatened Status for the Northern Spotted Owl*, 55 Fed. Reg. 26,114 (June 26, 1990) (codified at 50 C.F.R. § 17.11(h)).

[2] 2015 EA at 51.

At its core, the final EA fails to disclose and analyze the direct, indirect, and cumulative effects of a number of aspects of the Loafer timber sale, including effects on the northern spotted owl and its critical habitat; other wildlife including red tree voles; wolverine, gray wolf, and Oregon spotted frog; old growth trees; roadless and potential wilderness areas; riparian reserves; and the North Umpqua Trail and Umpqua Hot Springs. These issues are described in greater detail below.

Issue 1. The Project will adversely affect the northern spotted owl and degrade habitat.

The Project will adversely affect the threatened northern spotted owl by impacting its important habitat and nesting areas. The northern spotted owl has been listed as a threatened species under the Endangered Species Act since 1992.[6] Even with the listing, northern spotted owl populations have continued to decline.[7] Northern spotted owls rely on older forest habitats because such habitats generally contain the structures and characteristics required for nesting, roosting, and foraging habitat so that "nesting pairs can survive, obtain resources, and breed successfully."[8] The Project would remove up to 908 acres of nesting, roosting, and foraging habitat and degrade an additional 522 acres. The Project would also remove 563 acres of dispersal habitat.[9] Therefore, we object to the Decision to implement Alternative 2, which would remove and degrade important spotted owl habitat necessary for species survival and is contrary to the Northern Spotted Owl Recovery Plan.

a. Recovery Action 32

The Umpqua National Forest Land and Resource Management Plan (LRMP) requires that sites occupied by species listed as threatened or endangered comply with species recovery plans. The Northern Spotted Owl Recovery Plan identifies the ongoing loss of spotted owl habitat as a result of timber harvest as one of the most pressing threats to the species.[10] The NSO Recovery Plan states that the Forest Service must "conserve spotted owl sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population."[11]

Specifically, Recovery Action 32 states,

> Because spotted owl recovery requires well distributed, older and more structurally complex multi-layered conifer forests on Federal and non-federal lands across its range, land managers should work with the Service as described below to maintain and restore such habitat while allowing for other threats, such as fire and insects, to be addressed by restoration actions. These high-quality spotted owl habitat stands are characterized as

[6] 16 U.S.C. § 1533(a); *Determination of Threatened Status for the Northern Spotted Owl*, 55 Fed. Reg. 26,114 (June 26, 1990) (codified at 50 C.F.R. § 17.11(h)).
[7] The HJ Andrews Central Cascades Demography Study Area, just north of the Loafer Timber Sale Project area, showed a spotted owl population decline of 20 to 30 percent between 1988 and 2008.
[8] *Endangered and Threatened Wildlife and Plants; Revised Recovery Plan for the Northern Spotted Owl (Strix occidentalis caurina*), 76 Fed. Reg. 38,575 (July 1, 2011) at 37(Hereafter NSO Recovery Plan)
[9] 2015 EA at 60
[10] *Endangered and Threatened Wildlife and Plants; Revised Recovery Plan for the Northern Spotted Owl (Strix occidentalis caurina*), 76 Fed. Reg. 38,575 (July 1, 2011).
[11] NSO Recovery Plan, Recovery Action 10

having large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees."[12]

Many of the units in the Loafer decision contain a large number of old-growth trees, high canopy cover, and decadence components. Though the EA describes stands with >20" dbh trees as late seral and identifies multiple units meeting the threshold dbh, the Umpqua National Forest concluded that the "project has avoided all high quality spotted owl habitat (RA 32) and all alternatives are compliant with the current Recovery Plan."[13] The decision is to log these units to a resulting canopy closure below 30% in C4-III prescriptions. Other prescription types would reduce canopy closure at or above 40%. However, Table 8, shows that not a single unit is expected to have a resulting canopy closure above 55%.[14] This level of logging is expected to eliminate the nesting, roosting, and foraging habitat and convert it to dispersal habitat, thus violating the RA-32 recommendation to maintain and restore high-quality habitat.

Units 26, 29, and 35 should be removed from the sale. Units 26, 29, and 35 have abundant mature forest with legacy trees. The units have large diameter trees, high canopy cover, fire-damaged old growth trees, cavities, snags, and fallen trees. These characteristics meet the aforementioned habitat designated under Recovery Action 32. Objectors visited units 26, 29, and 35 on June 23, 2015. Objectors photographed these characteristics and again assert these units contain high quality NSO habitat. Units 26, 29, and 35 should be classified as RA-32 stands per the NSO Recovery Plan and thus removed from the sale.

Objectors raised this concern previously in the 2013 appeal and complaint filed with the Oregon District Court. The 2015 Loafer EA again does not recognize these units as high quality stands and as such again violates the RA 32 requirements.

We assert that the Forest Service has incorrectly categorized many old growth units in the Loafer decision as not qualifying as high-quality spotted owl habitat, or RA 32 units. The logging that has been authorized by Alternative 2 in the Draft DN and FONSI fails to meet the Recovery Plan requirements that these units be maintained or restored.

b. Recovery Action 10

This project violates the spotted owl recovery plan recovery action 10: "Conserve spotted owl sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population."[15] The spotted owl sites impacted by the project include some of the old growth units described above.[16] These sites must be conserved, not converted to dispersal habitat. The Umpqua National Forest is required to follow recovery plan recommendations.

Units 35, 26, and 15 have the highest loss of NRF habitat.[17] These three units are included in the Decision. These units also include a substantial amount of new roads, the construction of which

[12] NSO Recovery Plan, Recovery Action 32
[13] 2015 EA at 61.
[14] 2015 EA at 56.
[15] Revised NSO Recovery Plan. Page III-43.
[16] 2015 EA at 216.
[17] 2015 EA Appendix 1, page 218.

will impact the owl sites aside from the actual prescriptions to be implemented. The Forest Service is required to conserve these historic spotted owl sites.

Special attention should be given to complying with Recovery Action 10. The Loafer Biological Opinion says "The recovery plan states, 'active forest management may be necessary to maintain or improve ecological conditions. We support projects whose intent is to provide long-term benefits to forest resiliency and restore natural forest dynamic process . . .Therefore the Loafer Timber Sale is consistent with Recovery Action 10." However, the Winter Range prescriptions are not for the purpose of restoring "natural forest dynamics." This prescription manipulates the forest, it does not restore natural ecosystem processes. Instead, the purpose is to benefit one non-endangered species - elk. Natural processes retain and recruit mortality and accumulate dead wood. Logging captures and exports mortality, retards development of dead wood structure and requires roads. Natural forest processes do not.

b. Degrading Critical Habitat

The Forest Service is not allowed to degrade critical habitat for the NSO. However, the Loafer Decision would remove up to 908 acres of NSO NRF habitat and degrade another 522 acres, all within designated critical habitat for the spotted owl. Both the Forest Service and the U.S. Fish and Wildlife Service admit that the Loafer project would adversely affect NSO critical habitat.

The project would degrade critical habitat for the two purposes of "improve[ing] habitat for pine species" and "restoring historic disturbance regimes" and promoting historic meadow distributions."[18] The EA justifies downgrading habitat in the C4-III and C4-II prescriptions because they fall within historic meadows which were excluded from the proposed final rule.[19] Owls, however, have thrived in this area despite historically not nesting in meadows. We do not object to restoring historic meadows, we object however, to labeling mature forests as historic meadows and degrading current NSO habitat due to meadow habitat that was created by humans.

The Decision also proposes thinning in VDT and cover block treatments that will reduce canopy cover and the diversity of tree diameters within the units.[20] These treatments are expected to result in a short term reduction in NSO NRF habitat, but provide "a long term benefit in the form of increased structural diversity, increased tree vigor and diameter growth, and a reduced risk of crown fire initiation within treated stands."[21] The EA failed to demonstrate that the current downgrade of NRF habitat by logging will lead to such improvement so as to actually benefit owls in the long term by having increased structural diversity. The current provision of NRF now, with an abundance of prey species, may be more valuable than future structural complexity since the NSO numbers are currently so low.

The "Winter Range Rx" involves significant road construction and numerous heavily thinned "openings," with less than 25% canopy cover in the openings, and barely 40% canopy cover outside of the openings. This is a high impact prescription, which will adversely modify spotted owl critical habitat. It does not make sense to manage spotted owl critical habitat to benefit

[18] 2015 EA at 215.
[19] Id.
[20] 2015 EA at 216.
[21] Id.

another specific species, particularly a species that is not experiencing the dramatic population declines of the NSO. This is not "ecological forestry" as envisioned in the critical habitat rule. The open canopy and reduction in cover will adversely affect spotted owls (exposing them to predators and weather extremes), as well as adversely affecting their prey (such as the flying squirrel and red tree vole).

The Forest Service did not address the tradeoff of removing current NRF to benefit these so-called "meadows." These areas now support late successional spotted owl nesting, roosting, foraging habitat that should be retained for the time being, allowing the owl habitat to recover to levels that support full recovery of the species. The Northwest Forest Plan specifically contemplated retention of some dense forest on sites that may have been historically less dense (and not suitable owl habitat). The Forest Service is abandoning this goal without careful environmental review.

The FWS has said that short-term adverse impacts on owls might be tolerated when there are long-term benefits for spotted owls, but this is not the case here. The FS is taking suitable spotted owl habitat and converting it to meadow-like conditions, not to develop higher quality owl habitat in the future. There is no long-term benefit for the spotted owl.

The final NSO CHU rule says:

> In general, there are five possible outcomes in terms of how proposed Federal actions may affect the PCEs or physical or biological features of northern spotted owl critical habitat or essential habitat qualities associated with that critical habitat area: (1) no effect; (2) wholly beneficial effects (e.g., improve habitat condition); (3) both short-term adverse effects and long-term beneficial effects; (4) insignificant or discountable adverse effects; or (5) wholly adverse effects.

The many acres of "meadow" treatments in this project seem to most closely fit the "wholly adverse effect" category. This raises concerns about adverse modification of critical habitat.

Issue 2. Saving Owls from Fire

The EA claims that logging may benefit the owl by reducing fire hazard. The EA, at 60, says "creation of residual stands that are more resilient to disease and wildfire. These alternatives may help mitigate the likelihood of landscape scale loss of spotted owl habitat as a result of wildfire." This is unsupported. The EA provides no analysis to support this speculation. And the EA does not weigh and compare the magnitude and likelihood of these alleged habitat "benefits" relative to the "costs" in terms of habitat removed and degraded. This lack of supporting analysis is in contrast to the Forest Service's assertion that the EA provides a "thorough analysis of direct and indirect effects . . . ."

When logging intended to benefit habitat will also reduce the quality of habitat, the NEPA analysis must include some evaluation of ecological costs and benefits — e.g., the probability that logging will degrade habitat vs. the probability that fuel reduction treatments will interact favorably with fire and thus benefit habitat. This evaluation requires an estimate of the probability of future wildfire. To assume, as many analyses do, a 100% chance of future wildfire over-estimates the likelihood that treatments will interact with fire, thus over-estimating the

ecological value of fuel treatments, and under-estimating the ecological effects of logging on habitat.[22]

There is a strong interest among the federal land management agencies to conduct widespread logging in suitable spotted owl habitat in order to reduce the effect of fire. The agencies view fuel reduction logging as beneficial to owl habitat because modeling shows that fire behavior is moderated by fuel reduction, but proponents never seem to conduct a careful evaluation of the relative probability, and the relative harms, of logging versus wildfire. Strangely, the probabilistic aspects of this issue have been largely ignored in the owl science literature, but recently explored in the forest-carbon literature which recently showed that although thinning can modify fire behavior, logging to reduce fire effects is likely to remove more carbon by logging than will be saved by modifying fire.[23] The reason for this seemingly counterintuitive outcome is a result of the "law of averages." As explained by Cathcart et al 2009:

> The question is—if the implementation of fuels treatments within the Drews Creek watershed had the beneficial effect of reducing the likelihood of wildfire intensity and extent as simulated in this study, why is the expected carbon offset from fuels treatment so negative? The answer lies in the probabilistic nature of wildfire. Fuels treatment comes with a carbon loss from biomass removal and prescribed fire with a probability of 1. In contrast, the benefit of avoided wildfire emissions is probabilistic. The law of averages is heavily influenced that given a wildfire ignition somewhere within the watershed, the probability that a stand is not burned by the corresponding wildfire is 0.98 (1 minus the average overall conditional burn probability …
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> Thus, the expected benefit of avoided wildfire emissions is an average that includes the predominant scenario that no wildfire reaches the stand. And if the predominate scenario for each stand is that the fire never reaches it, there is no avoided CO2 emissions benefit to be had from treatment. So even though severe wildfire can be a significant CO2 emissions event, its chance of occurring and reaching a given stand relative to where the wildfire started is still very low, with or without fuel treatments on the landscape.[24]

Both carbon and spotted owl habitat tend to accumulate in relatively dense forests with intermediate or longer fire return intervals. Thus, we can replace the word "carbon" with the word "spotted owl habitat" and the results will likely hold in these studies.

In an effort to advance the discussion and help the agencies conduct better risk assessments in the NEPA context, Oregon Wild has prepared a white paper in an attempt to clarify the critical considerations in a probabilistic risk assessment that compares the risk of logging versus

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[22] See Heiken, D. 2010. Log it to save it? The search for an ecological rationale for fuel reduction logging in Spotted Owl habitat. Oregon Wild. v 1.0. May 2010. http://dl.dropbox.com/u/47741/Heiken_Log_it_to_Save_it_v.1.0.pdf.

[23] Mitchell, Harmon, O'Connell. 2009. Forest fuel reduction alters fire severity and long-term carbon storage in three Pacific Northwest ecosystems. Ecological Applications. 19(3), 2009, pp. 643–655 http://www.fs.fed.us/pnw/pubs/journals/pnw_2009_mitchell001.pdf.

[24] Jim Cathcart, Alan A. Ager, Andrew McMahan, Mark Finney, and Brian Watt 2009. Carbon Benefits from Fuel Treatments. USDA Forest Service Proceedings RMRS-P-61. 2010. http://www.fs.fed.us/rm/pubs/rmrs_p061/rmrs_p061_061_079.pdf

wildfire.[25] This report is most relevant in SW Oregon but the proposed evaluative framework is applicable in the east Cascades, northern California, and elsewhere.

To justify such fuel reduction logging in suitable owl habitat on ecological grounds requires several findings: (1) that wildfire is highly likely to occur at the site of the treatment, (2) that if fire does occur it is likely to be a severe stand-replacing event, and (3) that spotted owls are more likely to be harmed and imperiled by wildfire than by logging at a scale necessary to reduce fire hazard. Available evidence does not support any of these findings, which raises serious questions about the need for and efficacy of logging to reduce fuels in western Oregon and other forests lacking frequent fire return intervals.

The probabilistic element of the risk equation demands careful consideration. Both logging and fire have meaningful consequences, so the issue really boils down to a comparative probabilistic risk assessment where risk is characterized by two quantities: (1) the magnitude (severity) of the possible adverse consequence(s), and (2) the likelihood (probability) of occurrence of each consequence.

Framework for Assessing the Risk of Wildfire vs Fuel Reduction Logging			
	Likelihood of event	Magnitude of harm	Net Benefit
Wildfire	LOW: Stand replacing wildfire is not common in western Oregon. Fire suppression policy prevails. The chance that any given acre of forest will experience wildfire is low.	LOW: The majority of wildfire effects are not stand replacing. Fire is a natural process to which native wildlife are adapted. There is still a deficit of natural fire processes on the landscape.	Fire is likely less harmful to habitat than fuel reduction logging.
Logging	HIGH: To be effective in controlling fire, logging must be very extensive, and sustained. Many more acres would need to be logged than would burn.	HIGH: Widespread logging will have significant impacts on canopy, microclimate, understory vegetation, down wood, and long-term effects on recruitment of large trees and snags.	Fuel reduction logging is likely more harmful to habitat than wildfire.

The white paper is organized around these risk evaluation parameters.

In spite of what we often hear, that federal forests are not at imminent risk of destruction by wildfire. Fire return intervals remain relatively long, due to both natural factors and active fire suppression policies. Wildfire severity also remains moderate. Most wildfires are NOT stand replacing. Most fires are in fact low and moderate severity.

[25] Heiken, D. 2010. Log it to save it? The search for an ecological rationale for fuel reduction logging in Spotted Owl habitat. Oregon Wild. v 1.0. May 2010. http://dl.dropbox.com/u/47741/Heiken_Log_it_to_Save_it_v.1.0.pdf.

The location, timing, and severity of future fire events cannot be predicted making it difficult to determine which forests will benefit from treatment - consequently fuel treatments must be extensive and many stands will be treated unnecessarily, thus incurring all the costs of fuel logging, but receiving none of the beneficial effects on fire behavior.

Furthermore, logging for purposes of fuel reduction has impacts on owl and prey habitat that remain under-appreciated, especially the reduction of complex woody structure, and the long-term reduction in recruitment of large snags and dead wood. Fuel reduction logging also has complex effects on fire hazard with potential to increase fire hazard, especially when fuel reduction efforts involve removal of canopy trees.

When all this evidence is put together, it becomes clear that "saving" the spotted owl by logging its habitat to reduce fuels often does not make any sense.

Similar conclusions were reached by The Wildlife Society (TWS) peer review of the 2010 Draft Recovery Plan for the Spotted Owl. The draft plan called for extensive logging to reduce fire hazard ("inaction is not an option"). TWS used state-and-transition model to evaluate the effects of opening dry forests to reduce fire hazard versus the effects of wildfire. Oregon Wild submitted excerpts of this study in their Loafer EA comments, page 17. In summary, to recognize effects of fire and treatments on future amounts of closed forest habitat, it is necessary to explicitly and simultaneously consider the rates of fire, forest recruitment, and forest treatment over time, which has not yet been done by the Service. There has been no formal accounting of how closed canopy forests can be maintained with the widespread treatments that are being proposed.[26]

In early 2012 release of the FWS proposed rules for spotted owl critical habitat and the announcement of their intention to encourage widespread "active management" within suitable, critical habitat,[27] brought out critics in the scientific community who call for more rigorous analysis of the consequences before widespread adoption of logging as a means of habitat management. Oregon Wild's comments on the original Loafer EA quoted extensively from the scientist's letter to Secretary of Interior Salazar, detailing scientific concerns with the decision to move forward with untested "active management" at the landscape level prior to validation through the scientific peer-review process.[28]

Even back in 1990 scientists were calling for research to determine if logging was compatible with owl conservation. That research has not been done. The Interagency Scientific Committee

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[26] The Wildlife Society 2010. Peer Review of the Draft Revised Recovery Plan for NSO. November 15, 2010. http://www.fws.gov/oregonfwo/Species/Data/NorthernSpottedOwl/Recovery/Library/Documents/TWSDraftRPReview.pdf.

[27] Fed. Reg. March 8, 2012. http://www.gpo.gov/fdsys/pkg/FR-2012-03-08/pdf/2012-5042.pdf.

[28] Society for Conservation Biology, The Wildlife Society, American Ornithologists Union. 4-2-2012 letter to Secretary of Interior Salazar. http://www.eenews.net/assets/2012/04/02/document_gw_01.pdf [fn] *citing* Dugger, K.M., R.G. Anthony, and L.S. Andrews. 2012. Transit dynamics of invasive competition: barred owls, spotted owls, habitat, and the demons of competition present. Ecological Applications (2011) Volume: 21: 2459-2468.

said "Allow silvicultural treatments that have been tested or demonstrated through experimentation to facilitate the development of suitable habitat, such as planting trees."[29]

Also, in 2011 the GEOS Institute submitted a draft white paper to the FWS, which was attached to their comments on Appendix C of the Owl Recovery Plan. Oregon Wild submitted excerpts of this white paper in their Loafer EA comments, page 1. The GEOS Institute found that forests would have to experience a nearly an eightfold increase in fire in the Cascades before positive net growth in relation to fire would cease. The rapid regrowth rate of forests makes them resilient to substantially enhanced rates of burning.[30]

Also see Loafer EA comments from Oregon Wild for other fire science from William Baker.[31] Wildfire severity does not appear to be increasing as so often assumed.[32] Oregon Wild also discusses in their Loafer EA comments the dissent in *LOWD v. Allen*, and support for Mitchell and Harmon (2009) from Alan Ager and the WESTCARB Project. They could not find a greenhouse gas benefit from treating forests to reduce the risk of fire.

As part of Kadyszewski's work, his team directly compared the carbon stocks in about 6,000 acres of forests in Shasta County, Calif., and Lake County, Ore., before and after applying forest management treatments to reduce the risk of severe wildfires, such as prescribed burns and thinning. Then, based on modeled projections, they found that if a wildfire ignited on treated lands rather than untreated lands, there would generally be lower emissions. That was the good news. But there was a catch: knowing where fires might happen.

Since there is a relatively low risk of fire at any one site, large areas need to be treated, releasing their own emissions in the treatment process. The researchers have concluded that the expected emissions from treatments to reduce fire risk exceed the projected emissions benefits of treatment for individual projects.[33]

The reason for this seemingly counterintuitive outcome is a result of the "law of averages." As explained by Cathcart et al (2009):

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[29] 1990 ISC Report, p 325.

[30] Odion, Hanson, et al 2011 (in press). "Effects of Fire and Forest Treatments on Future Habitat of the Northern Spotted Owl: A White Paper Produced by the Geos Institute." Later published as Dennis C. Odion, Chad T. Hanson, Dominick A. DellaSala, William L. Baker, and Monica L. Bond. 2014. Effects of Fire and Commercial Thinning on Future Habitat of the Northern Spotted Owl. The Open Ecology Journal, 2014, 7, 37-51 37. http://benthamopen.com/toecolj/articles/V007/37TOECOLJ.pdf

[31] Baker W. [undated] Fire Risk and Northern Spotted Owl Recovery in Dry Forests. http://www.fws.gov/OregonFWO/Species/Data/NorthernSpottedOwl/Recovery/Library/Documents/DryForestPresentations/Baker_fire_risk_and_NSO.pdf

[32] Miller, J. D.; Skinner, Carl; Safford, H. D.; Knapp, Eric E.; Ramirez, C. M. 2012. Trends and causes of severity, size, and number of fires in northwestern California, USA. Ecological Applications, 22(1), 2012, pp. 184–203. http://www.fs.fed.us/psw/publications/skinner/psw_2012_skinner001.pdf.

[33] Dina Fine Maron 2010. FORESTS: Researchers find carbon offsets aren't justified for removing understory (E&E Report 08/19/2010).

> The question is—if the implementation of fuels treatments within the Drews Creek watershed had the beneficial effect of reducing the likelihood of wildfire intensity and extent as simulated in this study, why is the expected carbon offset from fuels treatment so negative? The answer lies in the probabilistic nature of wildfire. Fuels treatment comes with a carbon loss from biomass removal and prescribed fire with a probability of 1. In contrast, the benefit of avoided wildfire emissions is probabilistic. The law of averages is heavily influenced that given a wildfire ignition somewhere within the watershed, the probability that a stand is not burned by the corresponding wildfire is 0.98 (1 minus the average overall conditional burn probability …
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> Thus, the expected benefit of avoided wildfire emissions is an average that includes the predominant scenario that no wildfire reaches the stand. And if the predominate scenario for each stand is that the fire never reaches it, there is no avoided CO2 emissions benefit to be had from treatment. So even though severe wildfire can be a significant CO2 emissions event, its chance of occurring and reaching a given stand relative to where the wildfire started is still very low, with or without fuel treatments on the landscape.[34]

And we can reliably replace the word "carbon" with virtually any other forest value that depends on dense forests with relatively high accumulations of dead wood, e.g. spotted owls, flying squirrels, goshawk, marten, pileated woodpecker, etc. and we get the same result.

> Since there is a relatively low risk of fire at any one site, large areas need to be treated -- which *[degrades habitat values for dense forests and dead wood]* in the treatment process. The researchers have concluded that the expected *[habitat loss]* from treatments to reduce fire risk exceed the projected *[habitat]* benefits of treatment for individual projects.

Oregon Wild comments on the Loafer EA included relevant excerpts from Roloff[35] on page 24.

Further, spotted owls do not abandon prime habitat in the wake of fire. A recent study, conducted by researchers with Hanover, N.H.-based Wild Nature Institute and published this week in *The Condor: Ornithological Applications*, found that within a year after the Rim Fire burned more than 257,000 acres the owls were occupying their historical territory even when the standing trees were completely scorched.[36]

Issue 3. Barred Owls

The EA analysis of effects to spotted owls does not provide any meaningful discussion of the risk that removing and/or degrading approximately 1300 acres of spotted owl nesting, roosting,

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[34] Jim Cathcart, Alan A. Ager, Andrew McMahan, Mark Finney, and Brian Watt 2009. Carbon Benefits from Fuel Treatments. USDA Forest Service Proceedings RMRS-P-61. 2010. http://www.fs.fed.us/rm/pubs/rmrs_p061/rmrs_p061_061_079.pdf.

[35] Gary J. Roloff, Stephen P. Mealey, and John D. Bailey. 2012. Comparative hazard assessment for protected species in a fire-prone landscape. Forest Ecology and Management 277 (2012) 1–10.

[36] Derek E. Lee, Monica L. Bond. Occupancy of California Spotted Owl sites following a large fire in the Sierra Nevada, California. AmericanOrnithology 177 (2015) 228-236.

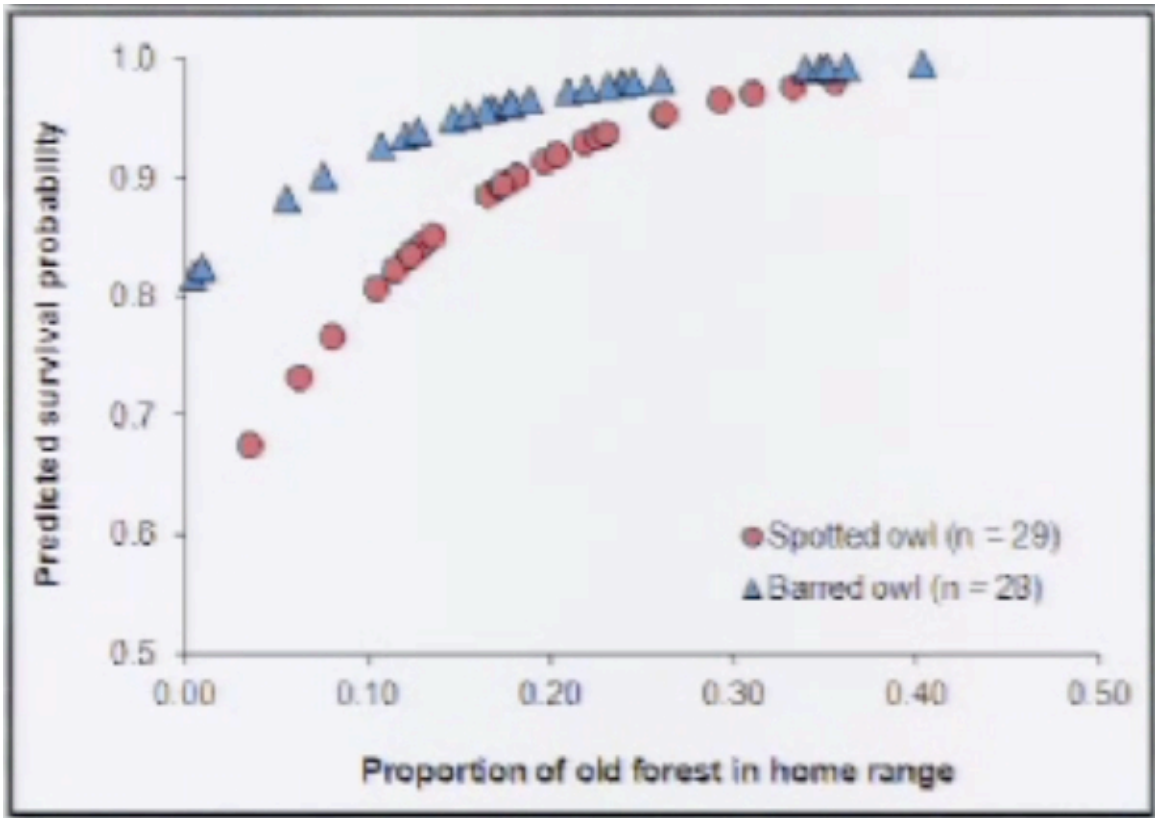
foraging habitat will exacerbate adverse competitive interactions with barred owls now or in the future.

Oregon Wild provided a full discussion of the impacts from the barred owl in its EA comments, submitted on April 18, 2013, starting on page 26. Those comments are incorporated into this objection by reference.

The programmatic NEPA analysis supporting the matrix land allocation is invalid because it was adopted before barred owls were a significant concern. The invasion of the barred owl, which competes with the spotted owl for space and food, creates a need to conserve more habitat for these two species are more likely to co-exist instead of competitively exclude each other. We know that more suitable habitat is needed to provide for recovery, but there has not been any NEPA analysis conducted to identify how much more. This project will remove and degrade a significant amount of suitable owl habitat and will exacerbate the interspecies competition. The FS should refrain from taking irreversible actions like this until they have conducted the analysis of how much more habitat is needed. This project may be foreclosing options to conserve more owl habitat. NEPA does not allow the FS to do this without carefully considering and disclosing the consequences.

> Competition and displacement from the **barred owl** which is dramatically increasing in numbers throughout the range of the spotted owl. The current plan for spotted owls does not account for the effects of barred owls which compete with spotted owls and exclude spotted owls from otherwise suitable habitat. The barred owl is barely mentioned in the 1994 SEIS. The invasion of the barred owl undermines a critical assumption underlying the Northwest Forest Plan - that all suitable owl habitat is available to spotted owls. Tens of thousands of acres old forest owl habitat (which was in short supply before the barred owl arrived) are now occupied and defended by barred owl to the exclusion of spotted owls. The logical response now is to protect and restore more habitat to reach spotted owl population goals; **Implications**: Based on well-established species/areas relationships the agencies need to protect more suitable habitat is needed to ensure that these two owl species can co-exist, and to decrease the likelihood of competitive exclusion. This is corroborated by FWS' Final Recovery Plan for the Northern Spotted Owl, which recommends protection of "substantially all of the older and more structurally complex multi-layered conifer forest outside of MOCAs" in westside provinces (as well as on non-federal lands). "These forests are characterized as having large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees." See Recovery Action 32. This recovery action is intended to reduce competitive pressures between spotted and barred owls, but unfortunately an analysis has not been done to show *how much* additional habitat needs to be protected to help assure co-existence of the competing owls, and the USFS and BLM have not taken steps to implement this recovery plan recommendation.

A recent telemetry study showed that in fragmented landscapes barred owls have a survival advantage relative to spotted owls, but that survival advantage diminishes in landscapes with a higher proportion of older forest. In other words, conservation of mature & old-growth forest should be favored because spotted owls are able to compete nearly equally with barred owls in landscapes with a high proportion of old forest.



See Wiens, D. 2012. Presentation to TheWildlife Society. http://tws.sclivelearningcenter.com/index.aspx?PID=6893&SID=163551 (at 1:12).

The final Recovery Plan for the Northern Spotted Owl has partially addressed the barred owl issue by adopting Recovery Action 32 which urges the FS and BLM to "Maintain substantially all of the older and more structurally complex multi-layered conifer forests on Federal lands outside of MOCAs…" based on the idea that "protecting these forests will not further exacerbate competitive interactions between spotted owls and barred owls as would occur if the amount of shared resources were decreased."[37] The revised critical habitat for the northern spotted owl was also expanded to "… increase the likelihood that spotted owls would be able to persist in areas where barred owls are also present. … [A]dditional critical habitat may allow for coexistence of the two species, potentially reducing competition."[38] In considering this recommendation the agencies must prepare NEPA analysis which considers the full potential of suitable habitat quantity and quality and its mediating influence on the interactions between spotted owls and barred owls. Maintaining a subset of suitable habitat as recommended by the recovery plan is one option, but the agencies must consider the full benefits of protecting all suitable habitat, not just a subset, and providing additional mitigation in matrix areas such as managing the matrix to enhance habitat for owl prey species. The recovery plan is not a NEPA document and FWS was not required to consider all reasonable alternatives. Action agencies like the FS and BLM on the other hand are required to fully consider alternatives. It would be wise to do so at a range-wide level, but until that is done, the agencies should not

[37] NSO Final Recovery Plan at 34.
[38] Dugger et al. 2011; Forsman et al. 2011). FWS 2012. CHU draft EA, p 53, 62. http://www.fws.gov/oregonfwo/Species/Data/NorthernSpottedOwl/Documents/CH_DRAFTEnvAssmnt_6.1.12.pdf.

adversely modify any suitable habitat. The recovery plan purports to offer the agencies an exception to the recommendation in Recovery Action 32 ("Land managers have made significant investments of time and resources in planning projects that may have been developed prior to the approval of this Recovery Plan, thus some forests meeting the described conditions might be harvested…" (FRP p 35)), however, FWS cannot exempt the action agencies from NEPA. Protection of additional suitable habitat in order to reduce competitive interactions between the two owls is now a recognized tool in the toolbox and represents significant new information about *any* proposal to modify suitable habitat regardless of how far the planning process may have proceeded.

A 2010 Draft report "Population Demography of Northern Spotted Owls" corroborates the need to protect more than just the highest quality spotted owl habitat as contemplated in the draft Recovery Action 32.

> We also found a negative relationship between recruitment rates and the presence of Barred Owls and a positive relationship between recruitment and the amount of suitable owl habitat in the study areas. Recruitment was higher on federal lands where the amount of suitable owl habitat was generally highest. [p 96] …
>
> While our observational results do not demonstrate cause-effect relationships, they provide support for the hypothesis that the invasion of the range of the Spotted Owl by Barred Owls is at least partly the cause for the continued decline of Spotted Owls on federal lands. Our results also suggest that Barred Owl encroachment into western forests may make it difficult to insure the continued persistence of Northern Spotted Owls (see also Olson et al. 2004). The fact that Barred Owls are increasing and becoming an escalating threat to the persistence of Spotted Owls does not diminish the importance of habitat conservation for Spotted Owls and their prey. In fact, the existence of a new and potential competitor like the Barred Owl makes the protection of habitat even more important, since any loss of habitat will likely increase competitive pressure and result in further reductions in Spotted Owl populations (Horn and MacArthur 1972, Olson et al. 2004, Carrete et al. 2005). [pp 97-98] …
>
> Our results and those of others referenced above consistently identify loss of habitat and Barred Owls as important stressors on populations of Northern spotted Owls. In view of the continued decline of Spotted Owls in most study areas, it would be wise to **preserve as much high quality habitat in late-successional forests for Spotted Owls as possible**, distributed over as large an area as possible. This recommendation is comparable to one of the recovery goals in the final recovery plan for the Northern Spotted Owl (USDI Fish and Wildlife Service 2008), but **we believe that a more inclusive definition of high quality habitat is needed** than the rather vague definition provided in the 2008 recovery plan. Much of the habitat occupied by Northern Spotted Owls and their prey does not fit the classical definition of "old-growth" as defined by Franklin and Spies (1991), and a narrow definition of habitat based on the Franklin and Spies criteria would exclude many areas currently occupied by Northern Spotted Owls. [p 99]....[39]

[39] Eric D. Forsman, Robert G. Anthony, Katie M. Dugger, Elizabeth M. Glenn, Alan B. Franklin, Gary C. White, Carl J. Schwarz, Kenneth P. Burnham, David R. Anderson, James D. Nichols, James E. Hines, Joseph B. Lint, Raymond J. Davis, Steven H. Ackers, Lawrence S. Andrews,

A well-known axiom of the species-area relationship from island biogeography holds that as habitat area increases, the number of cohabiting species also increases.[40]

> The major causes of population and species extinction worldwide are habitat loss and interactions among species. … The most robust generalization that we can make about population extinction is that small populations face a particularly high risk of extinction. … [E]mpirical support for the extinction-proneness of small populations has been found practically wherever this issue has been examined. … The loss of habitat reduced population size …. Larger habitat patches have larger expected population sizes than smaller patches. Therefore, other things being equal, we could expect large habitat patches to have populations with a lower risk of extinction than populations in small patches. … More generally, the relationship between patch size and extinction risk provides a key rule of thumb for conservation: other things being equal it is better to conserve a large than a small patch of habitat or to preserve as much of a particular patch as possible. … [T]here are likely to be many complementary reasons why large patches have populations with low risk of extinction. [41]

The effects of habitat availability on competing species was explored by expert wildlife population modelers who found:

> The territorial occupancy model developed by Lande (1987), extended here to include two competing species, represents a useful tool for evaluating how equilibrium breeding numbers could be affected by changes in habitat availability, demographic parameters, dispersal behavior and interspecific competition … Its application shows that **increases in the exclusive suitable habitat of each species is the best option to maintain viable populations of territorial competitors** in a same area, given that it reduces competition for territories. Increases in habitat overlap by reducing the exclusive habitat available for

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Brian L. Biswell, Peter C. Carlson, Lowell V. Diller, Scott A.Gremel, Dale R. Herter, J. Mark Higley, Robert B. Horn, Janice A. Reid, Jeremy Rockweit, Jim Schaberl, Thomas J. Snetsinger, and Stan G. Sovern. "Population Demography of Northern Spotted Owls." DRAFT COPY 17 December 2010. This draft manuscript is in press at the University of California Press with a projected publication date of July 2011. It will be No. 40 in Studies In Avian Biology, which is published by the Cooper Ornithological Society. http://www.reo.gov/monitoring/reports/nso/FORSMANetal_draft_17_Dec_2010.pdf.

[40] See especially, Part III - Competition in a Spatial World *in* Tilman, D. and P. Karieva, Eds. 1997. Spatial Ecology: The Role of Space in Population Dynamics and Interspecific Interactions. Monographs in Population Biology, Princeton University Press. p. 368.

[41] Oscar E. Gaggiotti and Ilkka Hanski. 2004. Chapter 14 - Mechanisms of Population Extinction. *In* Ecology, Genetics, and Evolution of Metapopulations. Elsevier. 2004. http://web.archive.org/web/20070612211945/http://www.eeb.cornell.edu/sdv2/Readings/Gaggiotti&Hanski.pdf

one species strongly affected the outcome of competition, resulting in extinction of the species for which exclusive habitat had been eliminated.[42]

From these ecological foundations, one can see that the barred owl, by invading, occupying suitable habitat and excluding spotted owls, has reduced the effective size of the reserves that were established in 1994, and thereby reduces the potential population of spotted owls. Extinction risk is increased by this loss of habitat and smaller population. If we provide more suitable habitat, the population potential increases, and the risk of extinction decreases. The most rational way to respond is to protect remaining suitable habitat, expand and restore the reserve system to provide more suitable habitat to increase the likelihood that the two owl species can co-exist.

This view is corroborated by owl biologist David Wiens who was interviewed on the Lehrer NewsHour. He said: "The more habitat you protect, the more you're going to alleviate the competitive pressure between the species. Rather than reducing it and increasing the competitive pressure between these two species, we need to provide as much habitat as possible for them." Robert Anthony agrees, "If you start cutting habitat for either bird, you just increase competitive pressure."[43] And in the same article Eric Forsman added "You could shoot barred owls until you're blue in the face," he said. "But unless you're willing to do it forever, it's just not going to work."

The book "Signs of Life: How Complexity Pervades Biology" by Sole and Goodwin has an interesting discussion that immediately brings to mind the barred owl/spotted owl issue. Chapter 7 of the book describes work being done by a Japanese researcher named Kaneko who developed and explored a modeling concept called "coupled map lattices." The lesson from these models is that when habitat is abundant, competing species operate within the "coexistence regime" but when habitat becomes scarce the model switches to a new attractor and operates in the "exclusion regime." This model strongly supports the idea that retaining more habitat increases the likelihood that spotted and barred owls can coexist, and if we eliminate reserves or continue to log suitable habitat in the matrix, then barred owl may competitively exclude and extirpate the spotted owls. Similar results are demonstrated in resource competition models described by Tilman, Lehman, and Thompson.[44]

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[42] Martina Carrete, Jose´ A. Sa´nchez-Zapata, Jose´ F. Calvo and Russell Lande. Demography and habitat availability in territorial occupancy of two competing species. OIKOS 108: 125-136, 2005 http://www.ebd.csic.es/carnivoros/personal/carrete/martina/recursos/13.%20carrete%20et%20al%20%282005%29%20oikos%20108-125.pdf.

[43] Welch, Craig. 2009. The Spotted Owl's New Nemesis. Smithsonian Magazine. January 2009. http://www.smithsonianmag.com/science-nature/The-Spotted-Owls-New-Nemesis.html?c=y&page=2

[44] Tilman, Lehman, and Thompson. Plant diversity and ecosystem productivity: theoretical considerations. Proceedings of the National Academy of Sciences. 94:1857-1861. (1997). http://www.cedarcreek.umn.edu/biblio/fulltext/t1694.pdf. See also, Tilman, D. and P. Karieva, Eds. 1997. Spatial Ecology: The Role of Space in Population Dynamics and Interspecific Interactions. Monographs in Population Biology, Princeton University Press. 368 pp. and Valenti

It is important to think of the non-equilibrium dynamics of owl populations interacting across time and space. The two owl species are not bound to reach equilibrium like two chemical constituents in a well-mixed beaker. Incomplete mixing of species in a heterogeneous environment promotes species coexistence. The effect of the spatial dimension in these models is that space acts to dampen the tendency for competitive exclusion. The more space the two owl species could potentially occupy, the less chance that the barred owl will occupy all of it at once which gives the spotted owl a fighting chance to persist in the interstices that are unoccupied by barreds. If on the other hand the shared habitat becomes smaller due to habitat loss from logging, then there is a greater chance that barred could accomplish the feat of occupying all of the habitat at once, or at least it increases the chance that spotted owls will be relegated to small patches/populations and vulnerable to stochastic variation and extirpation.[45]

Issue 4. Snags and Dead Wood

Logging the Loafer timber sale will degrade the future number and quality of snags and down dead wood, along with degrading the wildlife habitat it provides. This was not fully accounted for in the EA. Snags and dead wood are important for a variety of wildlife of conservation concern (like spotted owls, prey species, marten, Pacific fisher, bats, pileated woodpeckers, and other cavity creators/users) and ecosystem functions (like carbon storage).

Logging mature forests will remove valuable large tree structure from the forest. One of the big impacts from commercial logging is to "capture mortality" and increase the vigor of remaining green trees, and reduce and delay recruitment of ecologically important snags and dead wood. The EA (p 85) continues to rely on outdated and discredited standards for dead wood ("Snag retention for all alternatives exceeds levels envisioned in the Forest Plan . . . All alternatives provide for continued viable populations . . . ."). The FS needs to adopt new standards to replace the outdated and ineffective. It is misleading to the public and the decision-maker to recite the old standards as if they provide some assurance of adequate snag habitat. The Forest Service is "flying blind" – reducing snag habitat before it has determined how many snags are needed and how many green trees need to be retained to recruit that level of snags continuously over time.[46]

Heavy thinning, such as extensive logging below 50% canopy cover (and even 30% canopy cover), will likely have significant adverse effects on snag recruitment.

D., Fiasconaro A., Spagnolo B. Pattern formation and spatial correlation induced by the noise in two competing species http://arxiv.org/PS_cache/cond-mat/pdf/0401/0401424v1.pdf.

[45] See Peter Chesson 2000. General Theory of Competitive Coexistence in Spatially-Varying Environments. Theoretical Population Biology 58, 211-237 (2000). http://eebweb.arizona.edu/Faculty/chesson/Peter/Reprints/2000_General_Theory.pdf.

[46] See Rose, C.L., Marcot, B.G., Mellen, T.K., Ohmann, J.L., Waddell, K.L., Lindely, D.L., and B. Schrieber. 2001. Decaying Wood in Pacific Northwest Forests: Concepts and Tools for Habitat Management, Chapter 24 in Wildlife-Habitat Relationships in Oregon and Washington (Johnson, D. H. and T. A. O'Neil. OSU Press. 2001) http://web.archive.org/web/20060708035905/http://www.nwhi.org/inc/data/GISdata/docs/chapter24.pdf

See Oregon Wild EA comments, page 38, for a additional snag and dead wood information that should have been included in the EA. The agencies need to prepare an EIS to consider a replacement methodology for maintaining species and other values associated with dead wood. This is especially critical because adequate dead wood is recognized as an essential feature of healthy forests and the Forest Service has identified lots of "management indicator species" associated with dead wood habitat. This is also important in unroaded habitat important to the wolverine.

Issue 5. Failure to disclose existing condition

NEPA requires that "information is available to public officials and citizens before decisions are made and before actions are taken. The information must be of high quality."[47] "The environmental impact statement shall succinctly describe the environment of the area(s) to be affected or created by the alternatives under consideration."[48] Therefore, NEPA requires the disclosure of the existing condition of the units proposed for logging.

The Loafer EA failed to do that. For instance, in the final 2015 EA, no stand age was disclosed. It is not clear to the public how old the units are, or how much old growth they might contain. Protecting old growth forests is important to the public, and yet the EA failed to describe if this type of forest exists in the project area, and if so, the impacts to it. Further, the EA claims that no RA-32 forests exist. Since the definition the Forest Service is using for RA-32 forests includes how many trees per acre are over 30" DBH, the EA should have disclosed this information for each stand in Table 6.

The 2015 EA lacked important details about the existing condition of the 40 acres of Riparian Reserves to be logged. Lacking in the analysis is the age of the reserves and whether they are native forests or plantations. Age and management history are important details to determine whether logging in reserves meets the Aquatic Conservation Strategy objectives. The EA and the Response-to-Comments simply repeated over and over that logging in reserves meets the ACS. But there is limited description of the reserves. The EA should have thoroughly described the reserves.

Issue 5. The temporary road construction and road maintenance will adversely impact the Project area's natural features and habitats

The Project will require 5.6 miles of new temporary roads and approximately 4 miles of reconstructed temporary roads to be built within the project area.[49] These roads will decrease the amount of undeveloped areas in the Project area. Additional roads will disrupt the natural setting of the area, disturb wildlife, including the species mentioned above, add noise and pollution to the area, and impact the ability of visitors to the area to enjoy its natural state.

An additional 31 miles of road maintenance is proposed as needed for haul operations detailed in the plans. Road maintenance includes: grading, shaping, and rocking of road surfaces; repairing and improving drainage dips, installing stream crossing and ditch relief culverts; opening and

[47] 40 CFR 1500.1
[48] 40 CFR 1502.15
[49] Draft DN/FONSI at 4

reclosing 4 miles of existing closed roads, utilizing five existing quarries to produce crushed aggregate and riprap; and dust abatement activities might occur on roads that could include using magnesium chloride or water.[50]

Road construction and maintenance can lead to increased sedimentation in streams and waterways, erosion due to runoff, water concentration on roadways, increased air pollution, and increased noise. All of the effects of road construction and maintenance will have an adverse impact on the Project area. Particularly regarding unit 302, the EA never considered whether logging the forest above this segment of the trail could impact the hydrology of the trail. This popular section of the North Umpqua Trail, just under unit 302, is remarkable because of its walls of dripping moss, water running down rock columns, gushing springs, and waterfalls. The Forest Service failed to consider if logging the forest above this trail, has a potential of disrupting the hydrology of the trail.

The Decision Response said (page 105) the Forest Service "did not identify any surface water in Unit 302." That response was not relevant to our comment. We previously noted that logging could disrupt the hydrology of the North Umpqua Trail beneath unit 302, not surface water in unit 302. Heavy logging has the potential to impact more than surface water. In this highly porous, pumice soil, ground water can easily be impacted by logging through soil compaction, peak-flow increases or increased sunlight and dryness.

The road going into unit 302 is also questionable. It appears to go through a large cluster of boulders – a place that would normally be called unique habitat. Road construction through this area would likely require explosives to remove these rocks. The EA did not mention this aspect and there was no discussion of impacts and potential alternatives. The Decision Response (page 105) confirmed that these rocks are likely to be blown up: "Your request to avoid blasting or disturbing these items through road construction has been noted and will be considered by the deciding official." However, the impacts should be fully analyzed and disclosed before the decision, not simply during the decision. Additionally, the proposed road location within many of the units will require the removal of old growth trees. In particular, the road flagging in units 007, 008, and 302 appears to go directly through old growth trees. When these trees weren't flagged themselves, they were well within the 40 ft width for road construction in Forest Service standards. Road construction through this unit without full disclosure is not allowed by NEPA.

The EA never considered the impacts to recreation from road building above and across from the hot springs. Road construction and maintenance will adversely impact the visual and recreational activities of the Umpqua Hot Springs. The Umpqua Hot Springs are a popular recreation destination for many reasons. The Springs boast sweeping views of the North Umpqua River, the Umpqua National Forest, and its diverse wildlife. The Springs and the adjacent campsites are a relaxing retreat for many visitors and a popular stop along the North Umpqua Trail. Units 302, 303, and 304 are located on either side of the Hot Springs and are visible from the Springs. Road construction and maintenance in these units will decrease the natural beauty and tranquility of the area and will be visible from the Springs. The additional noise, pollution, and truck traffic will be noticeable at the Springs and disrupt the natural setting that the numerous visitors to the Hot Springs and adjacent campsites enjoy every day.

[50] Draft DN/FONSI at 4

The EA also never considered if the road construction and maintenance in Unit 302 would adversely impact the public's recreational enjoyment of the North Umpqua Trail. The North Umpqua Trail runs directly beneath and behind Unit 302. The noise and pollution from the road construction and maintenance in Unit 302 will disrupt the ability of walkers, runners, hikers, and cyclists to enjoy the natural views and scenery along the Trail. The unit is visible from the Trail, and any construction will be visible and loud. The EA's description of the visual impacts to the trail is substantially brief. Referring to the visual quality objectives (VQO) for the North Umpqua Trail #1414, the Forest Service explains that the area "would be managed to meet Partial Retention VQO's . . . All four units are on higher ground from the trail."[51] This is the only discussion of the management of this section of the trail. There is no inclusion of specifics of how the VQO's will be met. The prescriptions for the units contain a range of the number of TPA that will be retained. The flagging laying out the road for unit 302 shows the road going through multiple large and tall trees. The Forest Service response that "Trail 1414 would not be affected visually because unit 302 is on a high bluff" is in adequate. Ground visits both through the unit and the trail lead us to disagree with this statement.

Further, several remarkable hydrological features occur along this section of the Trail, such as waterfalls, gushing springs, and natural runoff flows through rock columns and moss down from the unit right next to the Trail. The road construction and maintenance could affect the quality of these water features by destroying, disrupting, or polluting them. This section of the Trail also has hike-in camping areas between it and the river, which are often used. The Forest Service should do nothing in this area that has the potential of disrupting this unique area and its vast recreational opportunities and visitors.

Issue 6. Decrease in undeveloped areas/ Dread and Terror and Thorn Prairie Wilderness Area

The EA fails to correctly analyze the Dread and Terror and Thorn Prairie areas as potential wilderness areas. The Dread and Terror and Thorn Prairie are currently undeveloped areas, and are eligible for classification as wilderness areas. Currently, the Project area contains 14,176 acres of undeveloped areas that have received little or no previous management like roads or logging. Further, portions of the project area are part of the Crater Lake wilderness citizen's proposal, and the Loafer Project would adversely affect the ability of those lands to be designated as wilderness. Undeveloped areas may have unique characteristics and habitats because they have not been managed in the last 60 years, such as a lack of stumps and landings. Undeveloped areas may be able to provide a sense of solitude and remoteness, as they generally have fewer developed roads and the correlated ambient noise and a more natural appearance.

The Project will decrease the Dread and Terror undeveloped area by 432 acres, from 1,906 acres to 1,474 acres.[52] The Thorn Prairie undeveloped area will be decreased by 66 acres, from 1,063 acres to 997 acres.[53] The Dread and Terror Ridge is a large roadless area with a potential for wilderness. It is impacted by proposed units 4, 53, 29, 26, 15, 6, 16, 17, 5, and 22. This is part of the Crater Lake Wilderness Proposal. Units 302 and other units infringe into another roadless

[51] 2015 EA at 171.
[52] 2015 EA at 182
[53] 2015 EA at 182

area just north of the Umpqua Hot Springs, one of the most popular recreation spots on the entire Forest.

The EA analysis of the unroaded areas is inadequate. The EA excludes all areas smaller than 5,000 acres, even though smaller areas (>1,000 acres) are ecologically significant. The EA does not disclose how much logging will occur in "other undeveloped areas" in particular the roadless areas that are part of the citizen's wilderness proposal.

Many of the roadless unit are slated for "Winter Range Rx" involving road construction and numerous heavily thinned "openings" with less than 25% canopy cover. This is a high impact prescription for a roadless area and in critical habitat for the spotted owl. The Response to Comments Appendix A, page 85 responded: "The Loafer Timber Sale Project does not propose to build any new permanent roads. Without building roads, the project will not impact or degrade the character of any lands from a "roadless" perspective." Temporary roads, however, can be seen on the landscapes for decades. Stumps can be seen for even longer. Roads and stumps degrade the character of lands from a roadless perspective.

The NEPA analysis should have discussed whether the project will push the landscape toward or away from the natural range of variability for large-scale habitat patches. Landscape analysis based on historic disturbance patterns suggests that historically the majority of old forest occurred in large patches.[54] These large patches of older forests that native fish and wildlife species evolved with are now severely underrepresented on the forest landscape and must be protected and restored.

The Northwest Forest Plan LSOG Effectiveness Monitoring Plan says that "perhaps 80 percent or more [of the historic late-successional old-growth forest] would probably have occurred as relatively large (greater than 1,000 acres) areas of connected forest."[55] Currently, these 1,000-acre and larger patches are rare on the landscape.

A growing number of scientific studies indicate the significant value of roadless areas smaller than 5,000 acres and larger than 1,000 acres. See Oregon Wild Loafer EA comments, page 10, for a partial list of the recent scientific literature that emphasizes the importance of unroaded areas greater than 1,000 acres as strongholds for the production of fish and other aquatic and terrestrial species, as well as sources of high quality water. Next, Oregon Wild quotes from a letter to President Clinton urging the protection of roadless areas from 136 scientists.

The EA disagrees with the public on what is a potential wilderness area (PWA), or the importance of interior forests. The EA says that "professional judgment and local knowledge was used regarding unique, site-specific conditions of each area being considered for inclusion" as a

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[54] See Wimberly, M. 2002. Spatial simulation of historical landscape patterns in coastal forests of the Pacific Northwest. Can. J. For. Res. 32:13-16-1328 (2002) http://andrewsforest.oregonstate.edu/pubs/pdf/pub2859.pdf (72% of the total mature forest in the Oregon Coast Range was concentrated in patches >1,000 ha).

[55] Miles Hemstrom, Thomas Spies, Craig Palmer, Ross Kiester, John Teply, Phil McDonald, and Ralph Warbington; Late-Successional and Old-Growth Forest Effectiveness Monitoring Plan for the Northwest Forest Plan, USFS General Technical Report PNW-GTR-438; December 1998; http://www.fs.fed.us/pnw/pubs/gtr_438.pdf.

PWA, and decided none of these areas qualified.[57] Our organizations also have professional judgment and local knowledge that led us to a different conclusion.

The FS should be inclusive when identifying "potential" wilderness and let Congress set the final boundaries. The 200-foot buffers often used in the Loafer EA to determine the boundaries of "potential wilderness areas" are exceedingly large and unsupported by logic and evidence. The Forest Service identified criteria within the Forest Service Handbook, FSH 1909.12, Sec. 71, to determine if any potential wilderness areas or undeveloped areas exist.[58] However, the criteria identified still does not provide the basis for failing to recognize the Dread and Terror Ridge and Thorn Prairie areas as potential wilderness. The Forest Service justification focuses on ease and convenience: "the 200 foot buffer was located along both sides of roads to account for the activities described below. This distance is consistent with the process used in identifying the land to be included in the Rogue-Umpqua Divide Wilderness and the Boulder Creek Wilderness. This distance is based on local knowledge and professional judgment regarding the evidence of recognizable stumps, skid trails, etc. which occur to varying degrees adjacent to forest roads and to facilitate easy on-the-ground identification of a uniform, measureable boundary along a semi-permanent human-made feature."[59]

The FS must remember that they are looking for "potential" wilderness, so they should be inclusive. Congress has established wilderness boundaries much closer than 200 feet from roads in many instances. The FS should not prejudge wilderness potential by excluding from its NEPA analysis areas that Congress might later decide to include in wilderness. Habitat adjacent to roads may be somewhat modified by edge effects but it is still "roadless" right up to the edge of the road (e.g., soil and vegetation are essentially intact; wildlife movement is not encumbered; hydrology is generally functioning, the imprint of man is generally unnoticeable, etc.).

Tellingly, when constructing new roads, the FS never discloses adverse effects extending 200 feet on either side of the road.

In its Sept 2012 appeal of the Umatilla NF's South George Project, The Lands Council explained the problems with the purity doctrine that underpins large buffers:

> Moreover, the FEIS states at H-3 that a 300 ft. boundary was set on each side of forest roads, further eliminating potential wilderness lands (Map H-3), despite acknowledging that this criteria is inaccurate at H-3. This rigid application by the Forest Service has become known as the "purity doctrine," in which any remote sign of past logging or road building will unequivocally preclude consideration of or recommendation for wilderness designation. There is, however, no foundation for such a rigid doctrine.
>
> First, the FSH uses the permissive "may" when it states that "[a]reas may qualify for the inventory of potential wilderness even though they include the following types of areas or features: (9) Timber harvest areas where logging and prior road construction are not evident …." Forest Service Handbook, 1909.12, 71.11(9). The Forest Service, however, failed to include any area that has been subject to logging as mapped in the District's GIS

[57] 2015 EA at 172.
[58] 2015 EA at 161.
[59] Id.

harvest layer and systematically applied a 300 ft. buffer around all roads. Second, the Wilderness Act does not contain language that unequivocally requires no past management activities: "with the imprint of man's work substantially unnoticeable" an "area of underdeveloped Federal Land" (as opposed to undeveloped). 16 U.S.C. § 1131(c). Third, numerous wilderness areas have been designated where past logging and other management activities are present. Finally, and perhaps most importantly, Congress has expressly asked the Forest Service to abandon the "purity doctrine." In a Senate Report from the Committee on Energy and Natural Resources regarding the Endangered American Wilderness Act of 1977, the Committee stated: "Generally, the committee believes that the so-called 'purity' concept of wilderness long adhered to by the Forest Service, is unnecessarily restrictive and should be abandoned." S. Rept. 95-490 on H.R. 3454. 95th Cong. 1st sess. October 11, 1977. As a result of the Forest Service's rigid application of PWA criteria, 12,815 acres are not assessed under the Ninth Circuit's requirement that roadless expanses are analyzed because of either "past timber harvest" or because "the boundary was set as 300 feet each side of the forest roads" (FEIS at 3-183 and Table 3-82).

Also, Congress rejected the argument that "outside sights and sounds" (such as those from adjacent roads) exclude an area from wilderness consideration. Senator Church quoted Senator Murray from the July 2, 1960 Congressional Record which noted that "wilderness character" is determined by looking at the very area under consideration, not by evaluating an adjacent area, even if some disturbances may emanate from that adjacent area. Church said, "Sights and sounds from outside the boundary do not invalidate a wilderness designation or make threshold exclusions necessary, as a matter of law."

The Forest Service should strive to be more consistent with its prior policies dating back to 1960 relating to identification of roadless and potential wilderness areas. Application of a 200-foot buffer is an unprecedented and divergent policy that demands great explanation. The Loafer EA failed to adequately justify why it applies a 200 foot buffer, when other regions use much smaller buffers that basically extend just to the edge of the road or the road prism. Region 1's Roadless Area Inventory Protocol (11/20/96) applies a 50' buffer from the centerline of roads. Region 4's Protocol for Identifying and Evaluating Areas for Potential Wilderness (10/28/2004) recommends a 33-foot buffer from the centerline of roads. The FS must eliminate the large 200-foot buffers, and disclose how much logging is proposed in those areas.

Issue 7. Riparian Reserves

This decision includes 40 acres of riparian reserves along perennial non-fish bearing and intermittent streams outside of no-cut buffers.[60] These 40 acres are in native, never before logged mature forests.[61]

The purpose and need for logging in Riparian Reserves is to: "restore species composition and structural diversity needed to attain ACS objectives within Riparian Reserves".[62] However, since

[60] Draft Decision and FONSI at 3
[61] Loafer Decision Appendix A – Response to Comments. Page 72.
[62] 2015 EA at 4.

these are native forests, there are no past logging units to "restore" species composition. The EA failed to describe what is degraded about these reserves.

The response to comments, page 90, said the treated acres in the riparian reserves "have deviated from their historical range of variability due to fire exclusion (EA: pg. 45)." However, page 45 of the EA does not mention Riparian Reserves. It refers to the "flat landscape" and lack of fire. There is no disclosure of the conditions in specific riparian reserves.

The Response to Comments, page 90, states that the Loafer Timber Sale Project is not proposing any Riparian Reserve thinning in stands over 80 years old. Several times we are told all logging in riparian reserves will be in forests under 80 years old. The EA should have disclosed this information, as the age of the Riparian Reserves are relevant to how logging meets, or does not meet, the objectives of the ACS.

We visited some reserves, like unit 121, and found forests over 80 years old. In fact, most units that have riparian reserves are designated as *over* 80 years old in the 1st EA, Table 5, page 54. (This age information that is not in the Final 2015 EA). Take unit 39 for example, where riparian reserves will be logged. First EA Table 5 says this unit is 115 years old, not under 80. Unit 7 and 2 have riparian reserves. The first EA Table 5 says unit 7 is 108 years old and unit 2 is 100 years old. Neither are under 80 years. Providing misleading information in the Response to Comments and no update in the 2015 EA is a violation of NEPA.

In spite of the claims of the Response-to-Comments, it appears the Forest Service *is* logging in Riparian Reserves over 80 years old. Our objection includes by reference the comments of Oregon Wild, Riparian Reserves, page 31. Oregon Wild's comments determine that since logging in LSRs over 80 years old is not allowed, it is also not allowed in riparian reserves. "Riparian Reserves which have similar structural goals as the LSRs … A maximum thinning age of 80 years was used here."[63] FEMAT page IV-109 says that logging in riparian reserves stands older than 80 years is not appropriate. Such stands were presumed to remain unharvested as mitigation for Bryophytes and other species that prefer dense forest cover and abundant dead wood.

The EA says that without thinning it would "take longer for larger diameter trees to become available for snags and down wood."[64] This is unsupported, because it is reasonable to expect that density dependent mortality would be more active in unthinned stands.

The analysis of riparian reserves should not be too stream-centric. Riparian reserves were established to benefit terrestrial species too. The EA analysis of dead wood reduction resulting from logging in riparian reserves focuses on the reduction in wood to streams, but terrestrial species occur throughout the riparian reserve and many of those species also prefer abundant dead wood.

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[63] Johnson & Franklin 2009. Restoration of Federal Forests in the Pacific Northwest: Strategies and Management Implications. (p. 49)
http://fes.forestry.oregonstate.edu/sites/fes.forestry.oregonstate.edu/files/PDFs/RestorationOfFederalForestsInThePacificNorthwest.pdf

[64] 2015 EA at 183.

The EA does not adequately explain how the specific ACS components are being benefited and how those benefits outweigh the known adverse effects of logging on important goals for riparian reserves, such as wood recruitment. Logging in the riparian reserves is justified based on "desired future condition" based on "natural range of variability" but the natural range of variability encompasses a wide range of conditions and the existing stand conditions are already within that range. One hundred acres of riparian forest that are denser than the foresters prefer are not denser than the high end of the natural range of variability. Therefore, density reduction based on restoration of the NRV is unsupported.

Furthermore, managing toward NRV is not the same as meeting the ACS. The ACS prohibits logging unless it's needed and only if conditions are maintained and not retarded. Logging is not needed in mature forests, and dead wood recruitment will be retarded. The analysis does not justify the action, in light of the applicable standards & guidelines. Comments from Oregon Wild go into detail on the impacts to dead wood recruitment from logging in the Riparian Reserves in their EA comments, starting on page 33.

The EA fails to conduct a quantitative analysis to show any benefit in terms of increased recruitment of large dead wood. The EA admits that small wood is functional, and says large wood is better (and the EA seems to imply that logging provides some benefit in terms of this large wood, but no analysis shows this result). The EA fails, however, to provide an adequate explanation for how much functional wood is lost in order to obtain hypothetical benefits for very large wood.

In January 2013, the Science Review Team Wood Recruitment Subgroup reported their "Key Points" regarding the effects of commercial thinning on wood recruitment in riparian reserves:

> … We conducted some limited simulation modeling to illustrate some of the relationships between thinning and dead wood recruitment. The simulations (and comparison of models) were not comprehensive or a rigorous analysis of thinning effects and should be viewed as preliminary. Below we provide 15 key points from our efforts:
>
> Key Points
>
> 1. Thinning is most beneficial in dense young stands. Existing literature and stand development theory suggest that the greatest potential ecological benefits of thinning to accelerate the development of older forest structure (e.g. large trees, large dead trees, spatial structural and compositional heterogeneity, etc.) comes in dense uniform plantations less than 80 years and especially less than 50 years old. The benefits of thinning for older forest ecological objectives are less clear in stands over 80 years of age. Hence, our report focused primarily on plantations less than 50 years of age.
>
> 2. Results may not be applicable to all stand conditions. For this synthesis, many of our conclusions were based on modeling the effects of thinning 30 to 40 year old Douglas-fir plantation stands that range in density from 200 to 270 trees per acre (tpa). We consider such stands moderately dense, as young plantation stand densities range from less than 100 to greater than 450 tpa. In terms of dead wood production, higher density stands are likely to see more benefits from thinning, and lower density stands less benefits.

3. Accurate assessments of thinning effects requires site-specific information. The effects of thinning regimes on dead wood creation and recruitment (relative to no-thinning) will depend on many factors including initial stand conditions, particularly stand density, and thinning prescription—it is difficult to generalize about the effects of thinning on dead wood without specifying the particulars of the management regime and stand conditions.

4. Conventional [i.e., commercial] thinning generally produces fewer large dead trees. Thinning with removal of trees (conventional thinning) will generally produce fewer large dead trees across a range of sizes over the several decades following thinning and the life-time of the stand relative to equivalent stands that are not thinned. Generally, recruitment of dead wood to streams would likewise be reduced in conventionally thinned stands relative to unthinned stands.

5. Conventional [i.e., commercial] thinning can accelerate the development of very large diameter trees. In stands that are conventionally thinned, the appearance of very large diameter dead trees (greater than 40”) may be accelerated by 1 to 20 years relative to unthinned plantations, depending on thinning intensity and initial stand conditions. Trees of such sizes typically begin to appear 5 to 10 decades after thinning 30 to 40 year old stands.

6. Nonconventional [i.e., non-commercial] thinning can substantially accelerate dead wood production. Stands thinned with prescriptions that leave some or all of the dead wood may more rapidly produce both large diameter dead trees in the short-term and very large diameter dead trees (especially greater than 40”) in the long-term, relative to unthinned stands. Instream wood placement gets wood into streams much sooner than by natural recruitment, and can offset negative effects of thinning on dead wood production.

7. Assessments of thinning effects may vary depending on the forest growth model. The previous statements are supported by three stand simulation models (FVS, ORGANON, and ZELIG). However, the magnitude and timing of effects of thinning on dead wood recruitment and stand growth varied among models.

8. Dead wood in streams comes from multiple sources. Dead wood in streams is primarily recruited through near-stream inputs (e.g. tree mortality and bank erosion) and landslides and debris flows. All types of recruitment are important and the relative importance varies with site and stream characteristics.

9. 95% of near-stream wood inputs come from within 82 to 148 feet of a stream. The distance of near-stream inputs to streams varies with forest conditions and geomorphology. Empirical studies indicate that 95% of total instream wood (from near-stream sources) comes from distances of 82 to 148 feet. Shorter distances occur in young, shorter stands and longer distances occur in older and taller stands.

10. Thinning can increase the amount of pool-forming wood under certain conditions. Thinning can increase the amount of pool-forming wood only when the thinned trees are smaller in diameter than the average diameter of pool-forming wood (which varies with stream size).

11. The function of instream wood varies with size and location. Large instream wood can serve as stable "key" pieces that create instream obstructions and form wood jams by racking up numerous smaller pieces of wood that are mobile during high flows. Such wood jams typically consist of a wide range of piece sizes and provide multiple ecological functions that vary with stream size and gradient.

12. Effects of thinning on instream wood needs to be placed in a watershed context. Assessing the relative effect of riparian thinning on instream wood loads at a site and over the long term requires an estimation of the likely wood recruitment that will occur from the opposite bank, from upstream transport, and the rate of decay and downstream transport of wood from the site.

13. The ecological effects of thinning needs to be placed in a watershed context. Watershed-scale perspectives are needed to restore streams and riparian vegetation. The ecological effects of thinning on instream habitat will vary depending upon location in the stream network. Riparian management practices can be varied to match the ecological functions of streams.

14. Variation in thinning is essential (i.e. don't do the same thing everywhere). Variation in thinning prescriptions will produce more variable forest and wood recruitment conditions, which may more closely mimic natural forest conditions. Using a variety of treatments is also consistent with the tenets of adaptive management in situations where the outcomes of treatments are uncertain.

15. Healthy, diverse forests contain many dead trees. Numerous terrestrial forest species require large dead or dying trees as essential habitat. Some directly, others indirectly; to support the food web within which they exist. Abundant large snags and large down wood on the forest floor are common features of natural forests and essential for the maintenance of biological diversity.[65]

The statement in #5 that "thinning can accelerate development of very large diameter trees" should be kept in proper perspective:

- The alleged gain in very large trees is very minor, compared to not logging;
- The alleged gain in very large trees is overwhelmed by the significant loss of functional wood in smaller size classes (including "large" wood), and even "medium " and "small" wood that serves vital functions in small streams that are typical in most projects; and
- The alleged gain in very large trees is in the distant future and more speculative; while the loss of smaller functional wood is in the near-term and more certain. Predicting future mortality in thinned stands is difficult. If the trees do not die and fall down there is no benefit in terms of down wood.

The apparent dissonance between the fact that thinning reduces wood recruitment (#4), but also has the potential to increase production of the very large trees (#5) might be resolved by looking to the right mix of different treatments as suggested in #14 – with some riparian reaches left

[65] Thomas Spies, Michael Pollock, Gordon Reeves, and Tim Beechie 2013. Effects of Riparian Thinning on Wood Recruitment: A Scientific Synthesis - Science Review Team Wood Recruitment Subgroup. Jan 28, 2013, p 36.

unthinned to provide for recruitment of large amounts of wood in a range of sizes, some areas thinned non-commercially, and some riparian patches thinned to produce those very large trees. Also, the statement in #10 that thinning can increase pool-forming wood depending on stream size, needs more explanation. Most riparian thinning occurs near small streams where small wood can be pool-forming.

Thinning to produce very large wood in the distant future at the expense of more abundant wood recruited over time is not advised. The SAT Report, upon which the ACS is founded, was clear that continuous input of wood is important. "Riparian zones along larger channels need protection to limit bank erosion due to trampling, grazing, and compaction, to ensure an adequate and continuous supply of large wood to channels …" 1993 SAT Report. Ch 5, p 455.

The mapping of the Riparian Reserves falls short of the level of disclosure required by NEPA. Figure 40, detail of riparian reserves, show streams that are not reserved on the Decision Notice Treatment Map.[66] Page 187, Table 30, describes streams in unit 39, a unit included in this decision. Figure 40 showed two streams through the western part of unit 39, but the Decision Map only includes on stream in unit 39. However, in our visit of unit 40 and unit 39, we found all streams have made annual scour and deposition and should have full riparian buffers.

Issue 8. The Environmental Assessment failed to consider direct, indirect, and cumulative impacts to the wolverine and to the gray wolf

The Forest Service failed to analyze the direct, indirect, and cumulative impacts of the Project on potential wolverine seclusion habitat. A previous environmental assessment completed in 2013 determined the Project area contained 625 acres of seclusion habitat for the wolverine.[67] Seclusion habitat is defined as "areas at least ½ mile away from a road or trail open to motorized vehicles (including authorized OHV use trails)."[68] The 2013 environmental assessment also stated that wolverines "can occupy a wide variety of habitat types, including areas such as the Loafer Timber Sale analysis area."[69]

However, the 2015 EA failed to consider the direct, indirect, and cumulative impacts to the wolverine. The 2015 EA did not analyze the direct, indirect, and cumulative impacts to wolverine seclusion habitat. Unlike the 2013 EA, which clearly stated that wolverines could occupy habitat within the Project area, the 2015 EA did not address the impacts to the wolverine and its potential habitat within the Project area. The 2015 EA dismisses the wolverine as a consideration in the project area for multiple erroneous reasons. The EA states that the wolverine is not a consideration at the elevation of the projects area, are "not thought to be dependent on specific vegetation or habitat features that might be manipulated by land management activities," and "there are no documented wolverine locations within the analysis area in the recent past."[70] However, there has long been a wolverine den suspected on the flanks of Mt. Thielsen, just west of the project area. The wolverine has a very large home range, so the Loafer Project Area could be within the home range of a wolverine. In fact, the large roadless areas, such as the Dread and

[66] 2015 Decision Map
[67] 2013 EA at 83.
[68] 2013 EA at 83.
[69] 2013 EA at 83.
[70] 2015 EA at 74.

Terror roadless area, is prime, secluded wolverine habitat. This project, by building many roads in to the Dread and Terror roadless area, and creating openings, will significantly degrade that habitat. The 2015 EA completely disregards the impact to wolverine seclusion habitat. Therefore, the 2015 EA does not meet the requirements for a proper National Environmental Policy Act ("NEPA") analysis for impacts to the wolverine. Thus, the agency's Draft DN and FONSI that rely upon the 2015 EA are arbitrary and capricious.

Similarly, the Forest Service's analysis of the effects of the Loafer project on the gray wolf is inadequate. Although there currently are no known wolves residing in the project area, wolf populations are expanding to Oregon's Cascade mountains, and it is only a matter of time before there are wolf populations on the Umpqua National Forest. As such, the Forest Service should analyze the effects of road construction and timber harvest on gray wolves. Even if there are no wolf packs currently on the Forest, or in the project area, it is undeniable that gray wolves have extensive home ranges, and travel vast distances when dispersing. It is simply wrong to state that the Loafer project will have no effect on gray wolves because the Forest Service does not know this to be true. At a minimum, the Forest Service must disclose specifically what restrictions on harvest will occur, and what steps will be taken to protect wolves and wolf dens, should wolves inhabit the project area before the project is completed.

Issue 9. Climate Change and Carbon storage

The NEPA disclosure and analysis on the carbon consequences of logging and its contribution to climate change is inadequate. Mature native forests store carbon and mitigate climate change. Logging will accelerate the transfer of carbon from storage in the forest to the atmosphere where it will exacerbate global climate change. The EA failed to fully disclose these impacts, including the carbon consequences of logging versus not logging over time. Importantly, the EA should follow and explain compliance with CEQ's draft guidance for NEPA analysis related to climate change and greenhouse gas emissions.

The EA says "[a]s forest carbon storage increases, there is a potential for greater loss of carbon stores from forest fires, and insect outbreaks."[71] This discussion focuses on the carbon release that might happen, rather than increased carbon storage and capture that does happen through natural processes. Further, the EA also focuses on the potential that global climate change might increase the risk of biogenic carbon emissions, but it does not clearly disclose that this project will increase biogenic carbon emissions through logging. It may be difficult to specify specific climate impacts, but the Forest Service can disclose this project's CO_2 emissions. This is inadequate. The Forest Service can quantify these things, and has done so in other contexts, including for timber sales on other forests. Climate change is a pressing problem, and the Loafer Project will contribute to climate change, even if on a small scale. The Forest Service must do more than merely include boilerplate language regarding the generalized effects on climate change.

Projects involving partial removal should analyze and consider the following factors:

- As stands develop from young to mature to old they recruit large amounts of material from the live tree pool to the dead wood pool which continues to accumulate large amounts of

[71] 2015 EA at 156.

carbon for centuries. Logging, even thinning, captures that mortality and can dramatically affect the accumulation of carbon in the dead wood pool.

· Thinning might help or hinder forest growth. Focusing tree growth of fewer stems may, over the long-term, increase the size, vigor, and longevity of the trees and increase ratio of wood volume to surface area which helps slow decay. But even if the growth rate of individual trees may be enhanced by thinning, the growth rate of the stand as a whole will decrease due to the removal of many growing trees. The increase in volume growth on retained trees is less than the total volume growth of the whole stand in the absence of thinning. Furthermore, thinning can damage residual trees' roots, stems, and canopies which may inhibit growth rates[72];

· Opening the canopy may warm the soil and litter layers and increase the rate of soil respiration which is controlled in part by temperature.[73]

· Increased light levels could increase the rate of photodegradation of lignin thus allowing increased microbial access to cellulose and increasing respiration rates.[74]

· Thinning may increase or decrease fire hazard depending on the complex interaction of fuel structure (thinning may reduce small surface and ladder fuels or increase slash and remove medium and large trees that are relatively fire tolerant) and microclimate effects (thinning makes the stand hotter-dryer-windier);

· Thinning may increase stand diversity and the fraction of carbon stored in species other than dominant crop trees.

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[72] (See Table 2 *in* Han-Sup Han and Loren D. Kellogg. 2000. Damage Characteristics in Young Douglas-fir Stands from Commercial Thinning with Four Timber Harvesting Systems. Western Journal of Applied Forestry. 15(1):27-33. http://andrewsforest.oregonstate.edu/research/related/ccem/pdf/WJAF.pdf)

[73] Fang, J. 2010. Soils emitting more carbon dioxide - Trend could exacerbate global warming. Scientific American | March 24, 2010. http://www.scientificamerican.com/article.cfm?id=soils-emit-carbon-dioxide. Bond-Lamberty and Thomson, 2010. Temperature-associated increases in the global soil respiration record, Nature 464, 579-582 (25 March 2010) | doi:10.1038/nature08930, http://www.nature.com/nature/journal/v464/n7288/full/nature08930.html ; Karhu, K., Fritze, H., Hämäläinen, K., Vanhala, P., Jungner, H., Oinonen, M., Sonninen, E., Tuomi, M., Spetz, P. & Liski, J. 2010. Temperature sensitivity of soil carbon fractions in boreal forest soil. Ecology 91(2): 370-376. http://www.ymparisto.fi/default.asp?contentid=351875&lan=en. Francesca M. Hopkinsa, Margaret S. Tornc, and Susan E. Trumbore. 2012. Warming accelerates decomposition of decades-old carbon in forest soils. PNAS June 26, 2012 vol. 109 no. 26 E1753-E1761. http://www.pnas.org/content/109/26/E1753.abstract?etoc ("Consistent with global ecosystem model predictions, the temperature sensitivity of the carbon fixed more than a decade ago was the same as the temperature sensitivity for carbon fixed less than 10 y ago. However, we also observed an overall increase in the mean age of carbon respired at higher temperatures…"). PNW Research Station 2012. Science Findings: Logging Debris Matters: Better Soil, Fewer Invasive Plants. issue one hundred forty five / August 2012. Mazza, R. *ed.* http://www.fs.fed.us/pnw/sciencef/scifi145.pdf ("... cooler soil temperatures led to slower soil respiration, and thus less carbon dioxide was released to the atmosphere…")

[74] Amy T. Austin, Carlos L. Ballaré. 2010. Dual role of lignin in plant litter decomposition in terrestrial ecosystems. PNAS March 9, 2010. Vol. 107 no. 10 4618-4622. doi: 10.1073/pnas.0909396107 http://www.pnas.org/content/107/10/4618.abstract?etoc.

· Thinning in mid-seral and mature forests will "capture mortality" and truncate the important process of accumulating carbon pools in the forest floor.[75] Building up carbon stores in the forest floor takes time, and if the slow-to-decompose large material is removed from the site, the high rates of carbon accumulation found in old forests are not likely to materialize.
· There is no bonus wood (or bonus carbon) from thinning. "In this as in other LOGS installations, the unthinned plots have consistently produced more total volume (CVTS) than any of the thinning treatments."[76] "[T]he data have not supported early expectations of 'bonus' volume from thinned stands compared with unthinned. … [T]hinnings that are late or heavy can actually decrease harvest volume considerably."[77]
· In May of 2011, a study on the effects of thinning and biomass utilization on carbon release and storage was published by Oregon State University. Among the findings of the study were: • Forest carbon pools always immediately decreased as a result of thinning, with reductions increasing as a function of heavier thinning. • After thinning, carbon pools remain lower throughout a 50-year period. • Carbon pool estimates for thinned stands remained lower even after accounting for carbon transferred to wood products.[78]

Law & Harmon conducted a literature review and concluded …

> Thinning forests to reduce potential carbon losses due to wildfire is in direct conflict with carbon sequestration goals, and, if implemented, would result in a net emission of CO2 to the atmosphere because the amount of carbon removed to change fire behavior is often far larger than that saved by changing fire behavior, and more area has to be harvested than will ultimately burn over the period of effectiveness of the thinning treatment.[79]

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[75] See Geisen, T. et al. 2008. Four centuries of soil carbon and nitrogen change after stand-replacing fire in a forest landscape of the western Cascade Range of Oregon. Canadian Journal of Forest Resources 38:2455-2464; and Thomas William Giesen. 2005. Four Centuries of Soil Carbon and Nitrogen Change After Severe Fire in a Western Cascades Forest Landscape. MS THESIS. Oregon State University.

[76] Curtis, Robert O.; Marshall, David D. 2009. Levels-of-growing-stock cooperative study in Douglas-fir: report no. 18—Rocky Brook, 1963–2006. Res. Pap. PNW-RP-578. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 91 p. http://www.fs.fed.us/pnw/pubs/pnw_rp578.pdf.

[77] Talbert and Marshall. 2005. Plantation Productivity in the Douglas-fir Region Under Intensive Silvicultural Practices: Results From Research And Operations. Journal of Forestry. March 2005. pp 65-70 *citing* Curtis and Marshall. 1997. LOGS: A Pioneering Example of Silvicultural Research in Coastal Douglas-fir. Journal of Forestry 95(7):19-25.

[78] Clark, J., J. Sessions, O. Krankina, T. Maness. 2011. Impacts of Thinning on Carbon Stores in the PNW: A Plot Level Analysis. College of Forestry, Oregon State University. Corvallis, OR http://switchboard.nrdc.org/blogs/ngreene/Impacts%20of%20Thinning%20on%20Carbon%20Stores%20in%20the%20PNW_Final%20Report.pdf

[79] Law, B. & M.E. Harmon 2011. Forest sector carbon management, measurement and verification, and discussion of policy related to mitigation and adaptation of forests to climate change. Carbon Management 2011 2(1). http://terraweb.forestry.oregonstate.edu/pubs/lawharmon2011.pdf.

Issue 10. Apparent implementation before final decision

It appears that the project is being implemented before a final decision has been issued. This is a NEPA violation. On June 24, 2015 Cascadia Wildlands came upon felled trees in unit 30. These knobcone pine trees were half limbed, but not bucked. There was a white piece of paper stapled to the stumps, with on reading "18" in big letters and smaller letters giving the DBH and height of the tree. The cut gave the appearance of cruising, but the cutting was done on what appears to be non-commercial trees. We inquired with the Forest Service on June 25, 2015 about the situation and as of the time of this objection have not had a response. We object to the cutting of these trees within a Sale unit before the project is implemented if that is the case.

Issue 11. An Environmental Impact Statement is required

NEPA requires that the Forest Service prepare an EIS when it proposes a major federal action that may significantly affect the quality of the environment. 42 U.S.C. § 4332(2)(c). In determining whether a proposed action may "significantly" impact the environment, both the context and intensity of the action must be considered. 40 C.F.R. § 1508.27.

In evaluating intensity, the agency must consider numerous "significance" factors including: impacts that may be beneficial and/or adverse; the unique characteristics of the geographic such as proximity to ecologically critical areas; the degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks; the degree to which the action may establish a precedent for future actions with significant effects of represents a decision in principle about a future consideration; whether the action is related to other actions with individually insignificant but cumulatively significant impacts; the degree to which the action may adversely affect an endangered species or its habitat; and whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment. 40 C.F.R. §§ 1508.27(b).

The Project has significant effects and therefore the Forest Service must prepare an EIS. There will be extensive logging in critical habitat for threatened northern spotted owl that will remove ideal nesting, roosting, foraging habitat. The project will remove 908 acres of spotted owl nesting, roosting, foraging habitat, and will degrade an additional 522 acres. The project will also remove 563 acres of spotted owl dispersal habitat. The loss and degradation of critical habitat for spotted owl will adversely affect the spotted owl, and spotted owl numbers are already rapidly declining. By permitting the extensive logging of this spotted owl critical habitat, the Project will be setting precedent in terms of what types of management are appropriate in critical habitat and how much nesting, roosting, foraging habitat can be removed or degraded before adverse modification occurs. Thus, the Forest Service must prepare an EIS for these significant effects. Additionally, the project will have effects on other species, including red tree voles, gray wolves, and Oregon spotted frog. These effects also add to the significance of the Loafer project.

The Project will have significant effects on the Umpqua Hot Springs and part of the North Umpqua Trail. The Project will affect the natural setting of the Springs and Trail, and will impact the ability of visitors to the area to enjoy its scenic views, peaceful setting, unique hydrological features, and utilize the nearby campsites. The Umpqua Hot Springs and the North Umpqua Trail are high use recreation areas and the logging and road construction in these areas will have significant effects that need to be analyzed with an EIS.

The Project will also have significant effects (both beneficial and adverse) on a number of ecologically critical areas, including, but not limited to, roadless and potential wilderness areas; riparian reserves; northern spotted owl critical habitat; habitat for Oregon spotted frog; and stands containing mature old growth trees and forest. Similarly, many of these effects are also controversial (such as logging in old growth, logging in riparian reserves, consideration of anthropogenic fire regimes as a "natural disturbance regime"). Similarly, many of these effects also create a precedent, including logging in riparian areas and logging in stands containing old growth Similarly, some of these effects contemplate a violation of federal law, including violations of the National Forest Management Act through the logging in riparians areas and violations of ACS objectives.

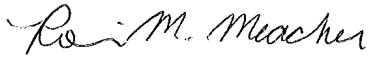
The extensive amount of road construction and maintenance required for this project will also have significant effects. The road construction and maintenance will affect the natural setting and habitats of the Project area that are enjoyed by both wildlife and recreational visitors to the area. The road construction and maintenance will increase noise, pollution, traffic, and sedimentation of the area and disrupt the natural setting and the public's ability to enjoy these areas.

The EA analysis of each resource is abbreviated and inadequate. The EA does not analyze how logging in mature forest will halt photosynthesis and carbon capture in trees. This will accelerate the transfer of carbon from the forest to the atmosphere and exacerbate global climate change. The Forest Service must prepare an EIS to analyze these significant effects. The Forest Service's decision not to prepare an EIS must be supported by a "convincing statement of reasons" demonstrating why the project's impacts are not significant. *Blue Mtns. Biodiversity Project v. Blackwood,* 161 F.2d 1208, 1212 (9th Cir. 1998). The justification offered by the UNF for the FONSI does not meet this requirement and is deficient for several respects.

Relief Requested

We respectfully request that the Forest Service withdraw the Loafer Timber Sale Project Draft Decision Notice and —
* issue a new decision that drops objectionable units, as described in this objection; or
* prepare a new EIS that fully complies with the requirements of NEPA and the CEQ regulations and addresses the specific concerns expressed in our EA comments and statement of reasons.

Sincerely,



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Appendix A

Index of References

16 U.S.C. § 1533(a); *Determination of Threatened Status for the Northern Spotted Owl*, 55 Fed. Reg. 26,114 (June 26, 1990) (codified at 50 C.F.R. § 17.11(h)).

The HJ Andrews Central Cascades Demography Study Area, just north of the Loafer Timber Sale Project area, showed a spotted owl population decline of 20 to 30 percent between 1988 and 2008.

Endangered and Threatened Wildlife and Plants; Revised Recovery Plan for the Northern Spotted Owl (Strix occidentalis caurina), 76 Fed. Reg. 38,575 (July 1, 2011). at 37

See Heiken, D. 2010. Log it to save it? The search for an ecological rationale for fuel reduction logging in Spotted Owl habitat. Oregon Wild. v 1.0. May 2010. http://dl.dropbox.com/u/47741/Heiken_Log_it_to_Save_it_v.1.0.pdf.

Mitchell, Harmon, O'Connell. 2009. Forest fuel reduction alters fire severity and long-term carbon storage in three Pacific Northwest ecosystems. Ecological Applications. 19(3), 2009, pp. 643–655 http://www.fs.fed.us/pnw/pubs/journals/pnw_2009_mitchell001.pdf.

Jim Cathcart, Alan A. Ager, Andrew McMahan, Mark Finney, and Brian Watt 2009. Carbon Benefits from Fuel Treatments. USDA Forest Service Proceedings RMRS-P-61. 2010. http://www.fs.fed.us/rm/pubs/rmrs_p061/rmrs_p061_061_079.pdf

Heiken, D. 2010. Log it to save it? The search for an ecological rationale for fuel reduction logging in Spotted Owl habitat. Oregon Wild. v 1.0. May 2010. http://dl.dropbox.com/u/47741/Heiken_Log_it_to_Save_it_v.1.0.pdf.

The Wildlife Society 2010. Peer Review of the Draft Revised Recovery Plan for NSO. November 15, 2010. http://www.fws.gov/oregonfwo/Species/Data/NorthernSpottedOwl/Recovery/Library/Documents/TWSDraftRPReview.pdf.

Fed. Reg. March 8, 2012. http://www.gpo.gov/fdsys/pkg/FR-2012-03-08/pdf/2012-5042.pdf.

Society for Conservation Biology, The Wildlife Society, American Ornithologists Union. 4-2-2012 letter to Secretary of Interior Salazar. http://www.eenews.net/assets/2012/04/02/document_gw_01.pdf [fn] *citing* Dugger, K.M., R.G. Anthony, and L.S. Andrews. 2012. Transit dynamics of invasive competition: barred owls, spotted owls, habitat, and the demons of competition present. Ecological Applications (2011) Volume: 21: 2459-2468.

1990 ISC Report, p 325.

Odion, Hanson, et al 2011 (in press). "Effects of Fire and Forest Treatments on Future Habitat of the Northern Spotted Owl: A White Paper Produced by the Geos Institute." Later published as Dennis C. Odion, Chad T. Hanson, Dominick A. DellaSala, William L. Baker, and Monica L. Bond. 2014. Effects of Fire and Commercial Thinning on Future Habitat of the Northern Spotted

Owl. The Open Ecology Journal, 2014, 7, 37-51 37.
http://benthamopen.com/toecolj/articles/V007/37TOECOLJ.pdf

Baker W. [undated] Fire Risk and Northern Spotted Owl Recovery in Dry Forests.
http://www.fws.gov/OregonFWO/Species/Data/NorthernSpottedOwl/Recovery/Library/Documents/DryForestPresentations/Baker_fire_risk_and_NSO.pdf

Miller, J. D.; Skinner, Carl; Safford, H. D.; Knapp, Eric E.; Ramirez, C. M. 2012. Trends and causes of severity, size, and number of fires in northwestern California, USA. Ecological Applications, 22(1), 2012, pp. 184–203.
http://www.fs.fed.us/psw/publications/skinner/psw_2012_skinner001.pdf.

Dina Fine Maron 2010. FORESTS: Researchers find carbon offsets aren't justified for removing understory (E&E Report 08/19/2010).

Jim Cathcart, Alan A. Ager, Andrew McMahan, Mark Finney, and Brian Watt 2009. Carbon Benefits from Fuel Treatments. USDA Forest Service Proceedings RMRS-P-61. 2010.
http://www.fs.fed.us/rm/pubs/rmrs_p061/rmrs_p061_061_079.pdf.

Gary J. Roloff, Stephen P. Mealey, and John D. Bailey. 2012. Comparative hazard assessment for protected species in a fire-prone landscape. Forest Ecology and Management 277 (2012) 1–10.

Derek E. Lee, Monica L. Bond. Occupancy of California Spotted Owl sites following a large fire in the Sierra Nevada, California. AmericanOrnithology 177 (2015) 228-236.

Dugger et al. 2011; Forsman et al. 2011. FWS 2012. CHU draft EA, p 53, 62.
http://www.fws.gov/oregonfwo/Species/Data/NorthernSpottedOwl/Documents/CH_DRAFTEnvAssmnt_6.1.12.pdf.

Eric D. Forsman, Robert G. Anthony, Katie M. Dugger, Elizabeth M. Glenn, Alan B. Franklin, Gary C. White, Carl J. Schwarz, Kenneth P. Burnham, David R. Anderson, James D. Nichols, James E. Hines, Joseph B. Lint, Raymond J. Davis, Steven H. Ackers, Lawrence S. Andrews, Brian L. Biswell, Peter C. Carlson, Lowell V. Diller, Scott A.Gremel, Dale R. Herter, J. Mark Higley, Robert B. Horn, Janice A. Reid, Jeremy Rockweit, Jim Schaberl, Thomas J. Snetsinger, and Stan G. Sovern. "Population Demography of Northern Spotted Owls." DRAFT COPY 17 December 2010. This draft manuscript is in press at the University of California Press with a projected publication date of July 2011. It will be No. 40 in Studies In Avian Biology, which is published by the Cooper Ornithological Society.
http://www.reo.gov/monitoring/reports/nso/FORSMANetal_draft_17_Dec_2010.pdf.

Tilman, D. and P. Karieva, Eds. 1997. Spatial Ecology: The Role of Space in Population Dynamics and Interspecific Interactions. Monographs in Population Biology, Princeton University Press.
Oscar E. Gaggiotti and Ilkka Hanski. 2004. Chapter 14 - Mechanisms of Population Extinction. *In* Ecology, Genetics, and Evolution of Metapopulations. Elsevier. 2004.
http://web.archive.org/web/20070612211945/http://www.eeb.cornell.edu/sdv2/Readings/Gaggiotti&Hanski.pdf

Martina Carrete, Jose´ A. Sa´nchez-Zapata, Jose´ F. Calvo and Russell Lande. Demography and habitat availability in territorial occupancy of two competing species. OIKOS 108: 125-136

Welch, Craig. 2009. The Spotted Owl's New Nemesis. Smithsonian Magazine. January 2009. http://www.smithsonianmag.com/science-nature/The-Spotted-Owls-New-Nemesis.html?c=y&page=2

Peter Chesson 2000. General Theory of Competitive Coexistence in Spatially-Varying Environments. Theoretical Population Biology 58, 211-237 (2000). http://eebweb.arizona.edu/Faculty/chesson/Peter/Reprints/2000_General_Theory.pdf.

Rose, C.L., Marcot, B.G., Mellen, T.K., Ohmann, J.L., Waddell, K.L., Lindely, D.L., and B. Schrieber. 2001. Decaying Wood in Pacific Northwest Forests: Concepts and Tools for Habitat Management, Chapter 24 in Wildlife-Habitat Relationships in Oregon and Washington (Johnson, D. H. and T. A. O'Neil. OSU Press. 2001) http://web.archive.org/web/20060708035905/http://www.nwhi.org/inc/data/GISdata/docs/chapter24.pdf

Wimberly, M. 2002. Spatial simulation of historical landscape patterns in coastal forests of the Pacific Northwest. Can. J. For. Res. 32:13-16-1328 (2002) http://andrewsforest.oregonstate.edu/pubs/pdf/pub2859.pdf

Miles Hemstrom, Thomas Spies, Craig Palmer, Ross Kiester, John Teply, Phil McDonald, and Ralph Warbington; Late-Successional and Old-Growth Forest Effectiveness Monitoring Plan for the Northwest Forest Plan, USFS General Technical Report PNW-GTR-438; December 1998; http://www.fs.fed.us/pnw/pubs/gtr_438.pdf.

Johnson & Franklin 2009. Restoration of Federal Forests in the Pacific Northwest: Strategies and Management Implications. http://fes.forestry.oregonstate.edu/sites/fes.forestry.oregonstate.edu/files/PDFs/RestorationOfFederalForestsInThePacificNorthwest.pdf

Thomas Spies, Michael Pollock, Gordon Reeves, and Tim Beechie 2013. Effects of Riparian Thinning on Wood Recruitment: A Scientific Synthesis - Science Review Team Wood Recruitment Subgroup. Jan 28, 2013.

Han-Sup Han and Loren D. Kellogg. 2000. Damage Characteristics in Young Douglas-fir Stands from Commercial Thinning with Four Timber Harvesting Systems. Western Journal of Applied Forestry. 15(1):27-33. http://andrewsforest.oregonstate.edu/research/related/ccem/pdf/WJAF.pdf

Fang, J. 2010. Soils emitting more carbon dioxide - Trend could exacerbate global warming. Scientific American | March 24, 2010. http://www.scientificamerican.com/article.cfm?id=soils-emit-carbon-dioxide.

Bond-Lamberty and Thomson, 2010. Temperature-associated increases in the global soil respiration record, Nature 464, 579-582 (25 March 2010) | doi:10.1038/nature08930, http://www.nature.com/nature/journal/v464/n7288/full/nature08930.html ;

Karhu, K., Fritze, H., Hämäläinen, K., Vanhala, P., Jungner, H., Oinonen, M., Sonninen, E., Tuomi, M., Spetz, P. & Liski, J. 2010. Temperature sensitivity of soil carbon fractions in boreal forest soil. Ecology 91(2): 370-376. http://www.ymparisto.fi/default.asp?contentid=351875&lan=en.

Francesca M. Hopkinsa, Margaret S. Tornc, and Susan E. Trumbore. 2012. Warming accelerates decomposition of decades-old carbon in forest soils. PNAS June 26, 2012 vol. 109 no. 26 E1753-E1761. http://www.pnas.org/content/109/26/E1753.abstract?etoc

PNW Research Station 2012. Science Findings: Logging Debris Matters: Better Soil, Fewer Invasive Plants. Issue 145 August 2012. Mazza, R. *ed.* http://www.fs.fed.us/pnw/sciencef/scifi145.pdf

Amy T. Austin, Carlos L. Ballaré. 2010. Dual role of lignin in plant litter decomposition in terrestrial ecosystems. PNAS March 9, 2010. Vol. 107 no. 10 4618-4622. doi: 10.1073/pnas.0909396107 http://www.pnas.org/content/107/10/4618.abstract?etoc.

Geisen, T. et al. 2008. Four centuries of soil carbon and nitrogen change after stand-replacing fire in a forest landscape of the western Cascade Range of Oregon. Canadian Journal of Forest Resources 38:2455-2464;

Thomas William Giesen. 2005. Four Centuries of Soil Carbon and Nitrogen Change After Severe Fire in a Western Cascades Forest Landscape. MS THESIS. Oregon State University.

Curtis, Robert O.; Marshall, David D. 2009. Levels-of-growing-stock cooperative study in Douglas-fir: report no. 18—Rocky Brook, 1963–2006. Res. Pap. PNW-RP-578. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. http://www.fs.fed.us/pnw/pubs/pnw_rp578.pdf.

Talbert and Marshall. 2005. Plantation Productivity in the Douglas-fir Region Under Intensive Silvicultural Practices: Results From Research And Operations. Journal of Forestry. March 2005. pp 65-70 *citing* Curtis and Marshall. 1997. LOGS: A Pioneering Example of Silvicultural Research in Coastal Douglas-fir. Journal of Forestry 95(7):19-25.

Clark, J., J. Sessions, O. Krankina, T. Maness. 2011. Impacts of Thinning on Carbon Stores in the PNW: A Plot Level Analysis. College of Forestry, Oregon State University. Corvallis, OR http://switchboard.nrdc.org/blogs/ngreene/Impacts%20of%20Thinning%20on%20Carbon%20Stores%20in%20the%20PNW_Final%20Report.pdf

Law, B. & M.E. Harmon 2011. Forest sector carbon management, measurement and verification, and discussion of policy related to mitigation and adaptation of forests to climate change. Carbon Management 2011 2(1). http://terraweb.forestry.oregonstate.edu/pubs/lawharmon2011.pdf