OREGON WILD
Formerly Oregon Natural Resources Council (ONRC)

PO Box 11648 | Eugene OR 97440 | 541-344-0675 | fax 541-343-0996
dh@oregonwild.org | http://www.oregonwild.org/

Riparian Reserves Provide Both Aquatic & Terrestrial Benefits –

A Critical Review of Reeves, Pickard & Johnson (2013)

By Doug Heiken, Oregon Wild[1] *24 June 2013*

Executive Summary

In 1994, to address mounting ecological harms and extended social controversy caused by past clearcutting of federal forests within the range of the northern spotted owl, the US Forest Service and Bureau of Land Management (BLM) adopted the Northwest Forest Plan (NWFP).[2] The NWFP established several different land allocations and standards & guidelines intended to conserve and restore both terrestrial and aquatic ecosystems.

The NWFP established "riparian reserves" to buffer all streams and other waterbodies. Activities within riparian reserves are regulated in order to promote a variety of conservation purposes, including maintain and improve water quality, protect and restore natural hydrologic functions, conserve both aquatic and terrestrial habitat, recover threatened wild salmon and steelhead runs, recover threatened terrestrial wildlife, maintain viable populations of species that are not yet threatened, mitigate for past degradation of watersheds, and mitigate the cumulative effects of past and ongoing forest management. The broad purposes served by riparian reserves require relatively wide buffers as part of a precautionary approach to forest conservation that recognizes the severely degraded state of both aquatic and terrestrial habitat and the need for meaningful protection during the long process of ecological recovery.

[1] With review and assistance from Andy Kerr, Rich Nawa, and Oregon Wild staff.

[2] USDA/USDI 1994. FSEIS and ROD for the Amendment of Planning Documents and Management of Habitat for Late-Successional Old-growth Forest Related Species Within the Range of the Northern Spotted Owl.

In 2013, Reeves, Pickard & Johnson[3] (hereinafter, Reeves et al.) propose to modify the NWFP riparian reserve system by systematically reducing the width of forested buffers along rivers, streams, springs, and wetlands. The stated purpose of this proposal is to allow for increased timber harvest, including clearcutting,[4] within and adjacent to the narrowed stream buffers. Reeves et al.'s main justification for reducing riparian reserves is that the wider buffers may not be strictly needed for conservation of aquatic ecosystems. However, the NWFP riparian reserve system has far broader purposes than simply protecting aquatic species. Narrowing the buffers requires narrowing the purpose of the buffers, and will thus undermine important objectives of the NWFP, including conservation of threatened terrestrial wildlife species that depend upon the existing riparian buffers.

Reeves et al.'s analysis is based on a gross oversimplification of the true purposes of the NWFP's riparian protections. Riparian reserves were adopted in 1994 to protect habitat for numerous species that live outside of water, e.g. amphibians, birds, mammals, etc., including threatened species like the spotted owl, marbled murrelet, red tree vole, and Pacific fisher. These species rely on riparian areas for a variety of life functions, such as feeding, breeding, shelter from predators and weather extremes, and as habitat corridors allowing wildlife to move across the landscape.

The NWFP recognized the need for some flexibility in defining the boundary of riparian reserves, and adopted a process for adjusting the width of riparian reserves based on careful consideration of both aquatic and terrestrial species needs. In their proposal to reduce riparian protections, Reeves et al. have not followed this process, nor have they substantively addressed the required terrestrial wildlife considerations.

Finally, Reeves et al. fail to adequately address new information that has emerged since 1994 that supports strong riparian protections. These new considerations include science showing: (i) the need to conserve additional suitable habitat to help spotted owls coexist with invading barred owls, (ii) the need to store carbon in forests to help mitigate climate change, (iii) the need to prepare for climate change by improving watershed integrity/resiliency and improving connective corridors for wildlife, (iv) the need to extend riparian reserves over ridgetops for

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[3] Reeves, G.H., Pickard, B.R., and K.N. Johnson 2013. Alternative Riparian Buffer Strategies for Matrix Lands of BLM Western Oregon Forests That Maintain Aquatic Ecosystem Values. REVIEW DRAFT. January 23, 2013.

[4] The Society of American Foresters defines "clearcut" as "1. a stand in which essentially all trees have been removed in one operation —note depending on management objectives, a clearcut may or may not have reserve trees left to attain goals other than regeneration …" http://dictionaryofforestry.org/dict/term/clearcut. Johnson & Franklin like to call their system "variable retention harvest" but as implemented it is more accurately described as "clearcut with reserves." See http://dictionaryofforestry.org/dict/term/regeneration_method and http://dictionaryofforestry.org/dict/term/variable_retention_harvest_system

improved habitat connections between watersheds, and (v) the important role that riparian reserves play in safeguarding clean drinking water for communities throughout western Oregon. This new information should be carefully considered before riparian reserves are reduced. Reeves et al. did not substantively address these factors.

In developing their proposal, Reeves et al. appear to be seeking an answer to the narrow question: "Can NWFP riparian protections be reduced to allow for increased logging without immediate harm to aquatic species?" This approach is based on the flawed premise that the only purpose of riparian reserves is to protect aquatic species. A careful analysis of the NWFP's conservation goals, and of the evolving science over the last 19 years, clearly shows that many important ecological values and significant public benefits would be sacrificed by reducing protection for streams.

Sadly, Reeves et al. largely ignore the elephant in the room which is the grossly inadequate protection of streams under the Oregon Forest Practices Act. Scientists can make a greater contribution to the current policy debate by highlighting the need for improved stream protection on non-federal lands, instead of trying to weaken stream protection on federal lands.

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Introduction

"Riparian area" refers to the area near streams and the vegetation that grows there. These areas provide essential hydrological and ecological functions such as: water quality, bank stability; slope stability; shade and temperature moderation; large wood structure and recruitment; capture, storage, and release of water, nutrients and sediments; and carbon storage. Riparian areas also provide habitat for a wide variety of fish and wildlife. Since streams form a linked network, water quality and stream health is closely associated with the intensity and cumulative extent of forest management activities near streams of all sizes, in all parts of the network.[5] The 1993 report of the Forest Ecosystem Management Assessment Team (FEMAT) explained:

> Aquatic ecosystems in the range of the northern spotted owl exhibit signs of degradation and ecological stress. … Approximately 55 percent of the 27,000 stream miles examined in Oregon are either severely or moderately impacted by nonpoint source pollution … Concern about aquatic ecosystems is elevated with the identification of large numbers of native freshwater and anadromous fish species and stocks that require special management considerations due to low or declining numbers …
>
> … Of the 314 at-risk anadromous salmonid stocks identified within the range of the northern spotted owl, only 55 occur solely on nonfederal land. Thus, federal agencies share in the responsibility for managing habitat for the other 259 at-risk stocks. Over the last century, federal land within the range of the northern spotted owl has become increasingly important for ensuring the existence of high quality aquatic resources. Privately held forest lands have been developed into farms, urban areas, transportation corridors, and industrial forests. Conversion of native forest to tree farms and agriculture decreases the capacity of these lands to supply high quality aquatic resources. Thus, society's reliance on federal forest lands to sustain aquatic resources continues to grow. …
>
> … An ecosystem approach is necessary to halt habitat degradation, maintain habitat and ecosystems that are currently in good condition, and to aid the recovery of habitat of at-risk fish species and stocks. ... This approach is both prudent and necessary given the current perilous state of many native salmon and trout stocks…[6]

Through the establishment of riparian reserves, the NWFP sought to achieve diverse conservation purposes (e.g., not just water quality; not just fish conservation):

[5] See 1993 FEMAT Report, Chapter V.

[6] 1993 FEMAT Report pp V-2.

- regulating activities in the riparian reserves to maintain and restore all nine Aquatic Conservation Strategy objectives;[7]
- adopting an ecosystem approach to aquatic conservation based on natural processes;[8]
- protecting and restoring natural vegetation processes of growth and mortality that provides continuous recruitment of wood to both streams and uplands, and shade that offers a cool-moist microclimate, both at the stream center and throughout the buffer;[9]
- protecting habitat for fish, including: Coho salmon, fall Chinook salmon, spring Chinook salmon/summer steelhead trout, winter steelhead trout, sea-run cutthroat trout, resident rainbow/cutthroat trout,[10] sculpins, longnose dace;[11]
- protecting and restoring habitat for stream dwelling species other than fish;[12]
- protecting and restoring habitat and dispersal/connectivity opportunities for a wide variety of terrestrial species associated with late successional forest, including explicitly, spotted owls and marbled murrelets.[13]
- mitigating the cumulative effects of management induced disturbance (e.g. logging);[14] and
- protecting and restoring water temperature and water quality.[15]

The rationale supporting these purposes is explained below. All of these purposes would be undermined by any effort to systematically reduce stream protection.

The NWFP adopted a process for adjusting the "interim" boundaries of riparian reserves. This process is intended to assure that all the benefited species and resources receive careful consideration before riparian reserves are reduced and before additional logging is allowed. The analysis supporting adjustments must be "site-specific," "scientifically sound" and the rationale must "be fully justified and documented."[16] Reeves et al. did not follow the NWFP-required process for adjusting boundaries. They ignore important required considerations, in particular they fail to account for the needs of terrestrial wildlife.

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[7] 1994 ROD p B-12.

[8] 1994 ROD p B-9.

[9] 1993 FEMAT, pp V-25 – V-26.

[10] 1994 FSEIS pp 3&4 – 192, 198-199.

[11] 1994 FSEIS p 3&4 – 196 – 201.

[12] 1994 FSEIS p 3&4 – 176.

[13] 1994 ROD p B-13.

[14] 1994 FSEIS pp 3&4 – 198-199.

[15] 1993 FEMAT, pp V-28 – V-29.

[16] 1994 ROD pp B-6. B-13.

From this review it is easy to conclude that the recommendations made by Reeves et al. do not account for the broad purposes of the riparian reserves, nor did they follow the careful process for adjusting reserves. If Reeves' recommendations and methods are followed in proposed legislation or in BLM's upcoming revised RMPs, it will represent a significant narrowing of the purposes of riparian reserves and will reduce protection for numerous species that riparian reserves were explicitly intended to benefit. Reducing the reserves would also undermine the baseline conservation requirements supporting species viability assessments and relied upon in Judge Dwyer's 1994 finding that the NWFP (barely) meets environmental laws.[17] Finally, reducing riparian reserves would limit options for mitigating significant new concerns such as climate change and barred owls.

Reeves et al. analysis is being uncritically accepted and promoted by policymakers to justify significant reductions in stream protection even though Reeves et al.'s analysis has not been published or subjected to adequate critical review. Governor Kitzhaber's 2013 letter to the delegation says that riparian reserves should be reduced because "evolving science concludes that such modifications can be made" and with an admonition that "no more studies are needed."[18] It is not clear that Governor Kitzhaber's team understood or applied any critical analysis to Reeves et al.'s flawed rationale for reducing riparian protection. With fatal flaws readily evident in Reeves' analysis, it is premature to rely on Reeves et al. for policymaking.

In a document clearly intended to advance Governor Kitzhaber's policy goals, including increased logging, Tuchmann & Davis (2013) cite Reeves at al.'s draft analysis to support the notion that "new science and technical information indicates that riparian buffers, for example, might be reduced on a portion of the O&C landscape and still achieve ecological objectives included in the NW Forest Plan…"[19] This statement is simply unsupported by the evidence. Reeves et al. does not show that all the objectives of the NWFP are met with smaller buffers. Reeves et al. fails to account for the role of riparian reserves in meeting the needs of terrestrial wildlife. Reeves et al. ignores abundant evidence of the importance of riparian reserves for threatened spotted owls and marbled murrelets. Reeves et al.'s analysis fails to recognize the importance of the "buffer-on-the-buffer" which ensures that wood recruitment and microclimate conditions are maintained at least within the inner half of the riparian buffers. Reeves et al.

[17] Judge Dwyer said: "The Secretaries have noted, however, that the plan 'will provide the highest sustainable timber levels from Forest Service and BLM lands of all action alternatives that are likely to satisfy the requirements of existing statutes and policies.' ROD at 61. In other words, any more logging sales than the plan contemplates would probably violate the laws. Whether the plan and its implementation will remain legal will depend on future events and conditions." *Seattle Audubon Society v Lyons*, 871 F. Supp. 1291 (W.D. Wash. 1994).

[18] Kitzhaber, J.A. 2013. Letter to Oregon Congressional Delegation. February 6, 2013.

[19] Tuchmann, E.T., and C.T. Davis. 2013. O&C Lands Report - Prepared for Oregon Governor John Kitzhaber. February 6, 2013. http://www.oregon.gov/gov/GNRO/docs/OCLandsReport.pdf

focuses on microclimate at the *stream-center*, while ignoring that narrow buffers will have adverse microclimate impacts on riparian amphibians and other species that use habitat much farther from streams.[20]

Tuchman & Davis (2013) quote Reeves et al. saying that "a single-minded focus on riparian buffers on federal lands will not be sufficient to recover fish populations." This is a statement about the inadequacy of stream buffers on private lands, not about riparian reserves on federal lands. The fact that fish conservation requires improved buffers on non-federal lands, does not diminish the importance of riparian buffers on federal lands. The real elephant in the room is the Oregon Forest Practices Act which has been found to be grossly inadequate to protect aquatic values.[21]

Comparative Riparian Reserve Scenarios

Reeves et al. propose a radical departure from the Northwest Forest Plan. Their approach not only reallocates land near streams from conservation-emphasis to logging-emphasis, it also allows more logging, even clearcutting, within the narrower buffers.

During the process of developing the NWFP, three riparian reserves scenarios were developed representing greater or lesser protection of streams. After reviewing all the available information on the degraded condition of streams as a result of past decades of road-building, logging, mining, and livestock grazing — and considering the great diversity of species that use riparian areas — the Clinton administration decided to adopt Riparian Reserve Scenario 1 which called for protection of buffers equal to the height of 2 site-potential trees along fish-bearing streams, and buffers equal to the height of 1 site-potential tree along non-fish-bearing streams. Within those reserves, conservation goals would prevail, and logging would be limited or excluded if it conflicted with conservation objectives.

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[20] 1993 SAT Report, Chapter 5, pp 461-462. See also Olson, D.H., Anderson, P.D., Frissell, C.A., Welsh, H.H., Jr., and D.F. Bradford. 2007. Biodiversity management approaches for stream–riparian areas: Perspectives for Pacific Northwest headwater forests, microclimates, and amphibians. Forest Ecology and Management 246 (2007) 81–107.

[21] Stout, H.A., P.W. Lawson, D. Bottom, T. Cooney, M. Ford, C. Jordan, R. Kope, L. Kruzic, G.Pess, G. Reeves, M. Scheuerell, T. Wainwright, R. Waples, L. Weitkamp, J. Williams, and T. Williams. 2011. Scientific conclusions of the status review for Oregon Coast coho salmon (*Oncorhynchus kisutch*). Draft revised report of the Oregon Coast Coho Salmon Biological Review Team. NOAA/NMFS/NWFSC, Seattle, WA. http://www.nwr.noaa.gov/publications/status_reviews/salmon_steelhead/coho/occ-review-2011.pdf. Independent Multidisciplinary Science Team. 1999. Recovery of Wild Salmonids in Western Oregon Forests: Oregon Forest Practices Act Rules and the Measures in the Oregon Plan for Salmon and Watersheds. Technical Report 1999-1 to the Oregon Plan for Salmon and Watersheds, Governor's Natural Resources Office, Salem, Oregon; http://www.fsl.orst.edu/imst/reports/forestry.html. National Marine Fisheries Service 1998. A Draft Proposal Concerning Oregon Forest Practices. http://www.coastrange.org/documents/NMFS_FP_pdf.pdf

Reeves et al. "describe two alternatives to the existing interim buffers that require less forest area …" Both of Reeves et al.'s approaches (Alternatives A and B) reduce the width of riparian reserves on fish-bearing streams from 2 site-potential trees to 1 site-potential tree. Additionally Reeves et al.'s Alternative A would allow increased logging (including clearcutting) in the outer portion of riparian reserves on non-fish-bearing streams. Reeves et al.'s Alternative B would rank streams according to "intrinsic potential" for certain charismatic mega-salmonids and allow even more logging along "low priority" stream segments, reducing riparian protection to 100 feet on fish-bearing streams and 50 feet on non-fish-bearing streams.

Reeves et al. shift the focus of management near streams from conservation toward timber extraction. Reeves et al. propose to change not just the boundaries of the riparian reserves but also expand logging within the narrowed reserves. The current NWFP mandates that management within riparian reserves be focused on conservation of Aquatic Conservation Strategy (ACS) objectives. Therefore, logging and other management activities must "maintain" and "not retard" attainment of ACS objectives.[22] Reeves et al. propose that logging, even clearcutting, be explicitly allowed in the outer portion of riparian reserves. Under the NWFP, logging is secondary to conservation within riparian reserves, while under Reeves et al.'s proposal, conservation objectives are compromised by economic objectives.

Reeves et al. claim their approach will "require less forest area while still achieving the goals of the ACS." This is not the case, because, even assuming that Reeves et al.'s alternative approaches meet some of the aquatic objectives of the ACS, unlike Reeves et al., the ACS is not focused exclusively on aquatic conservation. In fact, one of the "ACS Objectives" is to "maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species."[23] As explained throughout this paper, the riparian reserves were clearly established to help conserve much more than fish and water quality.

For purposes of a cursory analysis Reeves et al.'s proposals for reduced protection can be compared to Riparian Reserve Scenario 2 considered during development of the NWFP. Like Reeves et al., Riparian Reserve Scenario 2 provided narrower buffers than Riparian Reserve Scenario 1. Scenario 2 was rejected by the Clinton Administration because it was concluded that narrower buffers would not provide ecologically adequate or legally compliant protection for aquatic and terrestrial wildlife and other riparian resources.

The primary reasons for adoption of Riparian Reserve Scenario 1 (instead of Scenario 2) were that:

[22] 1994 ROD pp B-11, C-31.

[23] 1994 ROD p B-11.

(1) Wider buffers would improve species viability ratings for salmon and trout.[24]
(2) Wider buffers would benefit terrestrial wildlife and improve species viability ratings, including for spotted owls, marbled murrelets, and many other species such as those on the survey and manage list.[25]
(3) Wider buffers represent a buffer-on-the-buffer to ensure that the inner portion of the buffer would maintain a cool-moist microclimate and natural levels of wood recruitment, and to reduced edge effects, including wind damage.[26]
(4) Wider buffers help capture unstable slopes that recruit wood from outside of one site-potential tree but may be missed in the analysis process (i.e., wider buffers help avoid false negative findings of slope instability).
(5) Wider buffers would reduce adverse cumulative watershed effects from "management induced disturbance," e.g. logging and road construction.[27]

Note: It is important to remember that the riparian reserves were established in the NWFP as the greater of several different measures, including: top of the inner gorge, the outer edges of the 100-year floodplain, the outer edges of riparian vegetation, a distance equal to the height of one (or two) site-potential tree(s), 150 (or 300) feet slope distance 300 (or 600) feet total, including both sides of the stream channel), extent of unstable and potentially unstable areas (including earthflows).[28] In most cases, the site-potential tree is the determining factor, but the land management agencies cannot simply revert to the site-potential tree standard or without losing consideration for floodplains, unstable slopes, etc.

Rationale Supporting Current Buffers.

The Northwest Forest Plan Record of Decision (ROD), plus a wealth of supportive science and policy documents, provide abundant information explaining why the current riparian buffers are necessary, and why narrower buffers would not meet ecological objectives or legal requirements. This section recites the rationale for relatively wide riparian buffers based on the NWFP ROD and more recent evidence and reasoning.

[24] 1994 FSEIS p 3&4 – 196 - 201

[25] 1994 FSEIS, Appendix J2; 1994 FSEIS, Appendix B11, pp B-143 – B-145. Martin Raphael. 2012. The Function of Riparian Reserves for Terrestrial Species – What Was the Intent? http://ecoshare.info/wp-content/uploads/2013/01/Raphael-buffers.pptx

[26] 1993 FEMAT Report, pp V-25 - V-26.

[27] 1994 FSEIS pp 3&4 – 198-199.

[28] 1994 ROD pp C-30, C-31.

Riparian Reserves Protect Salmon and Other Fish.

Adoption of wider riparian reserves was deemed necessary to ensure population viability for the seven groups of salmonids considered in the NWFP. The EIS supporting the NWFP states:

> Incorporating Riparian Reserve Scenario 1 into Alternative 9 is expected to reduce the long-term risk to aquatic and riparian habitat outside of Tier 1 Key Watersheds. Including this standard and guideline in Alternative 9 would result in an 80 percent or greater likelihood of providing sufficient aquatic habitat to support stable, well-distributed populations of the seven salmonid races/species/groups evaluated. … The stocks receiving the most benefits occur in the coastal basins within the Franciscan, Washington/Oregon Coast Range, and Olympic Peninsula Aquatic Physiographic Provinces (Figure 3&4-1). The benefits are notable for these provinces because of the large number of at-risk anadromous fish stocks (Table B6-2), large areas of unstable land, and a lower proportion of land within Key Watersheds compared to the rest of the range of the northern spotted owl. The relatively high likelihood for these alternatives is a factor of the large amount of area in reserves and application of the Riparian Reserve Scenario 1 strategy to all federal lands within the range of the northern spotted owl.
> …
> The 80 percent or higher likelihood of attaining aquatic habitat of sufficient quality, distribution and abundance on federal land for each of the seven salmonid races/species/groups evaluated for Alternatives 1, 4, and 9 results from combining lower timber harvest levels with wider prescribed Riparian Reserve widths on intermittent streams in Tier 2 Key Watersheds and non-Key Watersheds. …
> … Alternative 9 which includes the standard and guidelines incorporated since the Draft SEIS, had higher likelihood of attaining sufficient aquatic habitat to support well-distributed populations of anadromous and resident salmonids than the other alternatives due to the inclusion of Riparian Reserve Scenario 1 for all intermittent streams outside of Tier I Key Watersheds. … The narrower widths on intermittent streams under Riparian Reserve Scenario 2 compared to Scenario 1 increase the risks to these streams due to management-induced disturbances. …
> … the risk to aquatic and riparian habitat is, in part, determined by the prescribed width of these reserves.
> … Resident rainbow and cutthroat trout … inhabit small, headwater streams.
> Incorporating Riparian Reserve Scenario 1 into the standards and guidelines for Alternative 9 would achieve an 80 percent or higher likelihood of attaining sufficient aquatic habitat to support well-distributed populations of resident salmonids. The Assessment Team believed that the prescribed Riparian Reserve Scenario 2 boundaries outside Tier 1 Key Watersheds for Alternatives 2, 3, 5, 6, and 10 would reduce the level of protection for the habitat of these fish. It is likely that habitats of other fish found in

> these streams, such as many of the sculpins and longnose dace, would be similarly affected by these alternatives.
> … Alternative 8 has a lower likelihood of attaining sufficient aquatic habitat to support well-distributed populations of the seven races/species/groups of anadromous and resident salmonids than all alternatives except Alternative 7. The principal reasons are the reduced size of Riparian Reserves for non fish-bearing perennial streams and for intermittent streams.[29]

It is notable that since the NWFP was adopted several Evolutionarily Significant Units (ESU) of salmonids have been listed under the Endangered Species Act (ESA), indicating that the status of these fish remains uncertain. Conditions in the ocean[30] and on private lands[31] are declining rather than improving. Habitat conditions on federal lands is one of the few areas that offer hope and optimism.[32] Reducing protection for imperiled salmonids on federal forestlands is contraindicated by the evidence.

Riparian Reserves Help Protect Wildlife Other Than Fish

Reeves et al. admit that riparian reserves were established to provide "dispersal corridors for a variety of terrestrial organisms" and "[t]he boundaries of the Riparian Reserve were extended to a full site-potential tree height on all non-fish bearing streams … to provide additional support for non-fish organisms that use the area near streams as habitat or migratory corridors"[33] but

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[29] 1994 FSEIS p 3&4 – 196 - 201.

[30] Recht, F. xxxx. Climate Change along the U.S. West Coast - How anadromous and marine fish may be affected. http://www.psmfc.org/habitat/ClimateChange_WestCoast.pdf

[31] Stout, H.A., P.W. Lawson, D. Bottom, T. Cooney, M. Ford, C. Jordan, R. Kope, L. Kruzic, G.Pess, G. Reeves, M. Scheuerell, T. Wainwright, R. Waples, L. Weitkamp, J. Williams, and T. Williams. 2011. Scientific conclusions of the status review for Oregon Coast coho salmon (Oncorhynchus kisutch). Draft revised report of the Oregon Coast Coho Salmon Biological Review Team. NOAA/NMFS/NWFSC, Seattle, WA. http://www.nwr.noaa.gov/publications/status_reviews/salmon_steelhead/coho/occ-review-2011.pdf; and Independent Multidisciplinary Science Team (IMST). 1999. Recovery of Wild Salmonids in Western Oregon Forests: Oregon Forest Practices Act Rules and the Measures in the Oregon Plan for Salmon and Watersheds. Technical Report 1999-1 to the Oregon Plan for Salmon and Watersheds, Governor's Natural Resources Office, Salem, Oregon. http://www.krisweb.com/biblio/gen_ognro_imst_1999_1.pdf

[32] Gallo, K., Lanigan, S.H., Eldred, P., Gordon, S.N., and C. Moyer. 2005. Northwest Forest Plan—the first 10 years (1994–2003): preliminary assessment of the condition of watersheds. Gen. Tech. Rep. PNW-GTR-647. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 133 p. http://www.fs.fed.us/pnw/publications/pnw_gtr647/pnw-gtr647c.pdf; and Doppelt, B., Hamilton, R., Deacon-Williams, C., Koopman, M., and S. Vynne 2009. Preparing for Climate Change in the Upper Willamette River Basin of Western Oregon - Co-Beneficial Planning for Communities and Ecosystems. Climate Leadership Initiative. March 2009. http://comm.uoregon.edu/files/pmr/uploads/UpperWillamette_REPORT.pdf

[33] Reeves et al. pp 8 and 9.

their analysis never fully acknowledges the scope of the terrestrial wildlife objectives expected from riparian reserves, nor does their analysis show whether terrestrial objectives will be met if riparian reserves are systematically reduced as they propose.

In developing the Northwest Forest Plan, the agencies conducted "additional species analysis" to identify mitigation measures to address species with viability concerns. The EIS supporting the NWFP states:

> Possible mitigation measures were developed in conjunction with advice from species experts. The mitigation measures were designed primarily to modify features of Alternative 9. In many cases, the possible measures would adopt some component of another alternative in which the species outcome rated higher. In other cases, the mitigation measure would prescribe actions to be taken when very localized actions are planned. These mitigation measures were intended to address the rare and narrowly-distributed species. Finally, some mitigation measures were intended to offset the possible negative consequences of cumulative effects. In all cases, evaluation of mitigation measures was done to determine if they would bring the species to a point where it would pass through all the screens …[34]

Application of riparian reserves Scenario 1 throughout the range of the northern spotted owl was one of the key mitigations adopted to assure long-term viability of, not just fish, but a wide range of aquatic and terrestrial species. The EIS supporting the NWFP states:

> [General Mitigation Measures] Application of Riparian Reserve Scenario 1 in the intermittent streams would benefit a wide variety of terrestrial and aquatic species by providing additional habitat. These species include the northern spotted owl, coho salmon, amphibians, small mammals, and some vascular plants. Connectivity of the ecosystem would also be improved.[35]

The NWFP Record of Decision adopted Riparian Reserve Scenario 1 with the explicit intention to benefit: spotted owls, marbled murrelets, marten, red tree vole,[36] vascular plants, bryophytes, amphibians[37] (especially tailed frog, Van Dyke's salamander, clouded salamander, Del Norte salamander, black salamander, Cope's giant salamander, Cascade torrent salamander, southern torrent salamander[38]), bats,[39] birds, mammals, mosses, arthropods,[40] goshawk, fisher, bufflehead,

[34] 1994 FSEIS p 3&4 – 129.

[35] 1994 FSEIS p 3&4 – 49.

[36] 1994 FSEIS, Appendix B-11, p B-143 -145.

[37] 1994 ROD p B-13.

[38] 1994 FSEIS p 3&4 – 176; 1994 FSEIS, Appendix J2, p 45.

[39] 1994 FSEIS pp 3&4 – 186-187.

harlequin duck,[41] 19 mollusks,[42] 12 species of lichen, 23 species of fungi,[43] and 130 species that were subject to "additional species analysis" because of viability concerns and received mitigation in the form of wider riparian buffers).[44] Two of these benefited species - the spotted owl and marbled murrelet - were already listed as "threatened" under the ESA when the NWFP was approved. Since the NWFP was adopted, three additional benefited species are warranted (or likely warranted) for ESA listing (the Pacific fisher, the Humboldt marten, and the North Coast DPS of the red tree vole).

In upholding the Northwest Forest Plan Judge Dwyer said "The federal defendants were bound by law, and by the obvious fact of species interdependence, to consider the survival prospects of species other than vertebrates."[45] There is no new information available suggesting that the current buffers are not needed. In fact, there is some evidence suggesting that buffers should be extended to accommodate dispersal of wide-ranging amphibians over ridgetops.[46]

Reeves et al. devote a section of their paper (at pages 46-48) to address the terrestrial wildlife impacts of their proposal, giving five justifications for adopting smaller riparian reserves and why it will have "minimal" effects on terrestrial wildlife. All of their justifications are flawed.

Reeves et al.'s first justification is that they do not expect that mature and old forests will be logged. So the logic goes, if old forests protected, then the full riparian reserves do not need to be protected. Reeves et al. say:

> Much of the evaluation of effects of different management options on species in development of the Northwest Plan centered on harvest of mature and old-growth stands (FEMAT 1993). For a number of reasons, including the recommendations in the new Northern Spotted Owl recovery plan and the prescriptions associated with ecological forestry, it is unlikely that harvest of these stands would occur to any significant degree.

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[40] 1994 FSEIS, pp 3&4 – 61, 81.

[41] 1993 SAT Report, Ch 5, pp 296-298, 304, 308—309, 310.

[42] 1994 ROD p 38.

[43] 1994 FSEIS, Appendix J2, pp 20 – 23.

[44] 1994 FSEIS, Appendix J2; 1994 FSEIS, Appendix B11, pp B-143 – B-145. Martin Raphael. 2012. The Function of Riparian Reserves for Terrestrial Species – What Was the Intent? http://ecoshare.info/wp-content/uploads/2013/01/Raphael-buffers.pptx

[45] *Seattle Audubon Society v Lyons*, 871 F. Supp. 1291 (W.D. Wash. 1994).

[46] Science Findings, Issue 120 (February 2010) Linked in: Connecting riparian areas to support forest biodiversity, based on science by Kelly Burnett and Deanna Olson. http://www.fs.fed.us/pnw/sciencef/scifi120.pdf; and Olson, D.H., Anderson, P.D., Frissell, C.A., Welsh, H.H., Jr., and D.F. Bradford. 2007. Biodiversity management approaches for stream–riparian areas: Perspectives for Pacific Northwest headwater forests, microclimates, and amphibians. Forest Ecology and Management 246 (2007) 81–107.

It is true that some high quality old growth in the matrix is likely to be protected under the USFWS Recovery Plan for the Spotted Owl, because spotted owls need additional habitat in order to reduce adverse competitive interactions with barred owls. First, this policy is not as protective as Reeves assumes. It affects just a subset of mature & old-growth forests that Reeves et al. presume to be protected. Second, protection of this subset of high quality forests does not change the fact that conservation of spotted owls and other wildlife also requires conservation of riparian reserves. In fact, new information suggests that riparian hardwood stands may be one of the rare places where barred owls and spotted owls can co-exist.[47] The bottom line is that in order to conserve spotted owls and other wildlife, we need to conserve *both* old forests and riparian reserves, not one or the other.

The conservation goals of the NWFP will not be met by simply saving the last of the remaining old growth. The analysis supporting the NWFP highlighted the significant loss of old forest and the need to *restore* something approximating the historic abundance old forests in a pattern that meets the needs of wildlife. One of the overarching purposes of the NWFP is to restore and maintain a "functional interconnected, late successional forest ecosystem." To that end, the agencies adopted a network of Late Successional Reserves, however riparian reserves also contribute to that objective. The EIS supporting the NWFP states:

> Several of these mitigations, even individually, are likely to enhance the attributes of late-successional and old-growth forest ecosystems. Attributes (1) abundance and diversity, and (3) connectivity, are expected to be strengthened by the application of Riparian Reserve Scenario 1 …[48]

To change course now and clearcut maturing stands in the riparian reserves represents a forgone opportunity to grow more late-successional old-growth sooner. Conserving existing old forest does not justify clearcutting other forests in the reserves. Existing old forests are highly fragmented. The reserves were intended to reduce fragmentation by allowing young forests to grow up around (and eventually enlarge) the remaining patches of old forest.

Reeves et al.'s second justification is that "A sizeable majority of forest within two site-potential trees of fish-bearing streams or one site-potential tree of non-fish-bearing streams would be unaffected by adoption of Alternative A or B (Figure 18)." This is the oldest trick in the book – 'let's ignore the impacts of what we are causing here by pointing out other sites where we are not

[47] Wiens, J. David. 2012. Competitive Interactions and Resource Partitioning Between Northern Spotted Owls and Barred Owls in Western Oregon. PhD dissertation. OSU. http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/28475/WiensJohnD2012.pdf

[48] 1994 FSEIS p 3&4 – 39.

causing harm (yet).' E.g., it's OK to log public forests managed by BLM forests because public forests managed by the Forest Service are being protected.

The NWFP recognized that streamside habitat is disproportionally adversely affected by past management (roads, logging, splash damming, wood removal, etc). A rough calculation of the consequences of Reeves et al.'s recommendations shows that about half of the acres of riparian reserves on BLM lands would be reallocated to the matrix and sacrificed without following the requirements of the Northwest Forest Plan.

The NWFP adopted an interagency plan that requires both BLM and the Forest Service to operate under one coherent set of rules. There is no justification for sacrificing BLM lands under a substandard set of management practices. In fact, BLM's proximity to private industrial lands arguably makes their conservation even more critical. See the section below "Fallacy: Reducing Buffers on BLM Lands is No Big Deal."

Reeves et al.'s third justification is that "… aggregate retention patches that can be placed [in the former riparian reserves] to aid dispersal of organisms with low dispersal capabilities." This is an example of replacing a coarse filter approach with an untested fine filter approach. There is simply no evidence that retention of aggregates representing 20-30% of a stand is adequate mitigation when the NWFP called for aggregates to be placed in the matrix, not the reserves, and when the NWFP called for conservation of 100% of the acres in riparian reserves to meet a wide range of ecological objections. Placement of the aggregate retention patches is also discretionary. Discretionary conservation is ineffective in the face of pressure to meet timber targets. Operational convenience and timber volume objectives will trump the needs of species.

Reeves et al.'s fourth justification is that:

> The recent Northern Spotted Owl Recovery Plan and Critical Habitat analysis and rule did not single out these stream buffers in Matrix for spotted owl habitat. Rather, those plans, analyses, and rules focused more on retention of mature and old forest wherever it occurs and also some young forest near historic spotted owl nests.

Reeves et al. failed to look at all lines of evidence. See the following section of this paper providing abundant evidence that FWS recognized the importance of riparian reserves and that spotted owls disproportionately use areas near streams.

Reeves et al.'s fifth justification is that:

> While the forest near streams on federal land has been highlighted as potential wildlife corridors for some species, the fragmented (often checkerboard) nature of the BLM

> Western Oregon Forests makes it difficult to maintain continuous stream-side forest across the landscape no matter what management policies are chosen for these lands.

This reasoning is perplexing and flawed. A fragmented dispersal corridor may be less than ideal, but Reeves et al. proposal for smaller reserves and more clearcutting will create an even more fragmented corridor. All things being equal, larger patches are better than smaller patches, so the full NWFP riparian reserves are better than Reeves et al.'s reduced riparian buffers with increased clearcutting, fragmentation, and edge effects.

Reeves et al. also seem to make erroneous assumptions about dispersal mechanisms. Unlike fish, wildlife dispersal does not always follow linear stream features. Birds and other wildlife may hop-scotch from patch to patch. Drainage networks are naturally space-filling, so riparian reserves thus provide well-distributed dispersal opportunities.

Riparian Reserves Contribute Disproportionately to Spotted Owl Conservation

The NWFP represents the "federal contribution to recovery" of the threatened northern spotted owl.[49] The NWFP relies on riparian reserves to provide benefits to spotted owls, including dispersal, connectivity, and demographic support. Reeves et al. dismiss the need to maintain riparian buffers for spotted owls because FWS' final critical habitat rule did not specifically incorporate riparian reserves. A more thorough review of the evidence shows that riparian reserves are critically important for spotted owls, and increasingly so in light of new threats like the barred owl and climate change.

The 1994 Record of Decision for the NWFP explained the role of riparian reserves in conservation of spotted owls:

> **Mitigation Measures Adopted** … The standards and guidelines of the selected alternative mitigate the impacts to plant and animal species and their interrelated ecosystems. The standards and guidelines for the land allocations of this decision will improve current conditions and alter certain past practices detrimental to late-successional species by protecting large blocks of remaining late-successional and old-growth forests, and by providing for the regrowth and replacement of previously harvested late-successional forest stands. …
> … riparian reserves in particular mitigate timber harvest effects by providing for well distributed patches of late-successional forest that serve for dispersal of mobile species such as the northern spotted owl, and serve as refugia for species that disperse only short distances.

[49] 1994 ROD p 15.

> … Another possible mitigation is that the rate of timber harvest in the matrix could be controlled (such as with the 50-11-40 rule) to provide additional dispersal habitat for spotted owls. This measure was not adopted, in part, due to the acreage of late-successional and other reserves well-distributed in the matrix … this will protect larger amounts of nesting, roosting, and foraging owl habitat, which will be higher quality than what the 50-11-40 rule would have done (see Appendix G, part 3 of the Final SEIS).[50]

A careful review of the available evidence shows that riparian reserves provide disproportionate value to spotted owls and they represent an integral part of the spotted owl conservation strategy adopted in 1994. New evidence reinforces the importance of riparian reserves.

Contrary to Reeves et al.'s assertions, the critical habitat rule and the recovery plan explicitly recognize the role of riparian reserves in owl conservation. FWS's 2012 proposed rule for revised critical habitat said "Riparian Reserves, Adaptive Management Areas and Administratively Withdrawn Areas can provide both demographic support and connectivity/dispersal between the larger blocks, but are not necessarily designed for that purpose."[51] And FWS's 2011 Revised Recovery Plan states:

> Riparian Reserves, Adaptive Management Areas and Administratively Withdrawn Areas can provide both demographic support and connectivity/dispersal between the larger blocks, but are not necessarily designed for that purpose. … Apparently in response to barred owls, some marked spotted owl site centers have moved higher up slopes (Gremel 2005). According to one study, "the trade-off for living in high elevation forests could be reduced survival or fecundity in years with severe winters (Hamer et al. 2007:764).[52]

Spotted owls spend disproportionate time in riparian areas and on the lower third of slopes. Robert Anthony recently provided input to an interagency process regarding thinning in riparian reserves and noted that spotted owls are associated with riparian areas, and that logging has negative effects on spotted owls and their prey:

> Northern spotted owls are also associated with riparian areas, which is relevant to thinning of young forests in these areas (McDonald et al. 2006, Glenn et al. 2004). The association with riparian areas has been determined with the use of radiotelemetry studies of their movements and habitat use, which have shown that owls use riparian areas more than their proportional availability across the landscape. There have been at least three hypotheses proposed for the disproportionate use of riparian areas: (1) riparian areas

[50] 1994 NWFP ROD p 29-31.

[51] USFWS 2012. Proposed rule- Revised Critical Habitat for the Northern Spotted Owl. Federal Register Jun 1, 2012. http://www.gpo.gov/fdsys/pkg/FR-2012-06-01/html/2012-13305.htm

[52] USFWS 2011. Final Revised Recovery Plan for the Northern Spotted Owl. pp A-14, B-11.

> provide more favorable thermoregulatory conditions (Barrows 1981); (2) prey species are more abundant in riparian areas (Carey et al. 1992 1999); and (3) fire severity has been lower in riparian areas resulting in the retention of structural complexity (Reeves et al. 2006). There is some support for all three of these hypotheses so they all likely have some influence over the use of riparian areas by northern spotted owls.
>
> … [M]any of the forest management practices (i.e., clearcuts, shelterwood cuts, heavy commercial thinning) used in the Pacific Northwest have had negative effects on spotted owls (Forsman et al. 1984, Zabel et al. 1995, Buchanan et al. 1995, Hicks et al. 1999, Meimann et al. 2003).
>
> … [I]t is safe to say that commercial thinning within the range of the northern spotted owl will have a negative effect on abundance of northern flying squirrels. Northern flying squirrels are the owl's primary prey by number and biomass throughout most of their range; consequently, there is little doubt that commercial thinning will have a negative effect on abundance of flying squirrels as prey for spotted owls. In addition, commercial thinning has negative effects on the abundance of red-backed voles (Suzuki and Hayes 2003, Manning unpublished data), which is also an important prey species for the owl.[53]

The contractor's report supporting FWS' 2004 status review of the spotted owls found "owl locations were positively associated with proximity to riparian habitat …."[54] The SEI Report also said, "In the Klamath Province, more nests than random sites were on the lower third of slopes … "[55] Blakesly et al. (1992) found similar results in California: "Spotted owls also selected the lower third of slopes, used the middle third of slopes in proportion to their availability, and used the upper third of slopes less than expected …"[56]

Riparian stands may be particularly important to spotted owls in areas where old forests are uncommon, such as the BLM checkerboard of western Oregon. Glenn et al. (2004) said:

> [N]est sites for owls at NCR [Northern Coast Range] and ESF [Elliot State Forest] generally were located within mature/old conifer forest or along conifer–broadleaf edges associated with riparian areas. … In areas of western Oregon where spotted owls occupy sites with little or no old conifer forest, we recommend that managers retain existing old

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[53] Anthony, R.G. 2013. Effects of Riparian Thinning on Marbled Murrelets and Northern Spotted Owls. Part III of the Science Review Team for the identification and interpretation of the best available scientific information to determine effects of riparian forest management. 28 January 2013.

[54] SEI Scientific Evaluation Of The Status Of The Northern Spotted Owl, Chapter 5: Habitat Associations, p 5-6. http://www.sei.org/owl/finalreport/Chapter5HabitatAssociations.pdf *citing* Irwin et al. (in press).

[55] SEI p 5-19, *citing* Hershey et al. (1998).

[56] Blakesly, Franklin & Gutierrez 1992. Spotted Owl Roost And Nest Site Selection In Northwestern California. J. Wildl. Manage. 56(2):388-392. http://www.fs.fed.us/psw/publications/blakesley/blakesley1.PDF

and mature conifer forest, broadleaf forest, broadleaf forest edges, and forested riparian areas as owl habitat.[57]

Spotted Owls Use Riparian Reserves for Dispersal and Much More

The NWFP expected riparian reserves to serve two main purposes for spotted owls – First, owls use high quality habitat in riparian reserves for movement of adults within and between territories, and for dispersal of juveniles between reserves. Second, riparian reserves provide "demographic support" for owls in the matrix, that is, the additional suitable owl habitat occurring in riparian reserves supports a larger owl population that is less vulnerable to extinction.

The riparian reserves were adopted in part as a replacement for the spotted owl dispersal standard known as the "50-11-40 rule" that pre-dated the NWFP. Riparian reserves were expected to maintain and develop late-successional habitat, and provide superior dispersal habitat (i.e., better than 11" dbh and 40% canopy closure).[58] Higher quality dispersal habitat means that owls can not only move safely through the landscape with protective cover from predators, but they can also find roosting sites that are protected from weather extremes, hunting perches, a prey base offering foraging opportunities, as well as nesting/breeding sites.

An addendum to the Biological Assessment for the NWFP states:

> Owl dispersal requirements are believed to be met in Alternative 9 due to the cumulative benefits from a variety of land allocations and standards and guidelines which are not specifically earmarked as owl dispersal standards. The following are two [sic] the benefits which are expected to be the most important to assuring owl dispersal … .
>
> Riparian Reserve Scenario 1 results in an increase in the total acreage and the amount of owl habitat and murrelet habitat which would be retained along intermittent streams. This will have a greater effect in the provinces which have higher stream densities, as illustrated in the calculations below and the Aquatic Conservation Strategy discussion in Chapter 3&4. The larger acreage of protected habitat will increase the amount of dispersal and nesting habitat which will be retained throughout the owl and murrelet range.

[57] Glenn, Hansen, & Anthony 2004. Spotted Owl Home-Range And Habitat Use In Young Forests Of Western Oregon. Journal Of Wildlife Management 68(1):33–50. http://www.eddylsrproject.com/deis/B1/703-47%20Glenn%202004.pdf

[58] 1994 ROD p 29-31.

> Riparian Reserve Scenario 1 will apply to Alternative 9 throughout the range of the northern spotted owl. This modification increases the acreage of Riparian Reserve along intermittent streams from one-half to the full height of a site potential tree. … The decision to implement Riparian Reserve Scenario 1 results in 3,233,100 acres of Riparian Reserves, which is an additional 638,000 acres (25 percent increase) over the Draft SEIS Alternative 9. … These Riparian Reserves will improve travel and dispersal corridors for many terrestrial animals and plants, and serve as connectivity corridors between the Late-Successional Reserves. …
>
> The standards and guidelines state that Riparian Reserve widths may be modified after completion of watershed analysis. That analysis will take into account northern spotted owl dispersal needs as well as other species that were intended to be benefited by this mitigation measure. There are two specific values in the application of Riparian Reserve Scenario 1 for spotted owl dispersal. First is the fact that the acreage reserved will be fairly evenly arranged across the landscape. This is important because of the documentation of juvenile spotted owl dispersal occurring in random directions. An even distribution of dispersal habitat is important, and this was one factor which lead to the development of the 50-11-40 rule. The second important feature is that the acreage reserved will have the potential both in the short term and in the long term to provide higher quality habitat than "11-40" conditions. The Riparian Reserves will have more complex forest structure and more dead and down, which will provide better roosting and foraging conditions than a strictly 11 inch dbh and 40 percent canopy closure stand would provide. This will increase its effectiveness in providing for owl survival during dispersal.[59]

David Wiens conducted intensive research on spotted owls in the Oregon Coast Range west of Eugene and found that:

> Spotted owls and barred owls in my study selected foraging sites that were closer to streams than random locations, and the relative probability of selection decreased linearly with increasing distance to a stream for both species … . In my study area, small low-order streams were common in lower elevation riparian-hardwood zones and steep, narrow ravines in patches of mature and old conifer trees. Strong selection for habitats near riparian zones has at least 3 explanations. First, cool microclimates associated with stream drainages may be favorable for thermoregulatory purposes during hot, dry summers (Forsman 1976, Barrows 1981). Second, and perhaps more importantly, productive vegetation conditions near streams are likely to support a rich diversity of prey used by both owl species, including woodrats (Carey et al. 1999, Anthony et al.

[59] 1994 FSEIS, Appendix G – Part 3 – Addendum to Biological Assessment. pp G-23 – G-24.

> 2003), flying squirrels (Meyer et al. 2005, Wilson 2008), deer mice, and shrews (Verts and Carroway 1998). … A third reason that riparian areas were selected may be due to their complex canopy structures that resulted from past fires that burned less intensively along stream corridors than in upslope areas (Reeves et al. 1989, Kauffman et al. 2001). Such structures may provide good perching opportunities for hunting terrestrial or arboreal prey. … [60]

The 1993 SAT Report, which provided the genesis of the ACS, also offered evidence that riparian areas serve as source areas for small mammals which may serve as a prey base for spotted owls and other predators, stating:

> Many mammal populations are also dependent on riparian areas. Doyle (1986 and 1990) found that riparian areas in old-growth forests in the Cascades of Oregon were source areas for upland small mammal populations. Abundance of small mammals in coastal forests of Oregon were greatest within 300 feet of the stream, even though individuals were found up to 600 feet away (Gomez 1992). Chapter 5 of this document and USDI (1992) identify several mammal species that use or are dependent on riparian zones. Riparian corridors may also be important as dispersal, travel, and migratory routes for mammals (Gregory et al. 1991).[61]

Riparian Reserves Help Reduce Competition Between Spotted Owls and Barred Owls.

Barred owls, native to eastern North American, have moved west and invaded the entire range of the northern spotted owl. When the NWFP was adopted in 1994 the barred owl was barely mentioned in the analysis. It was assumed that all suitable spotted owl habitat would be available to spotted owls and contribute to their conservation and recovery. Now barred owls occupy and defend tens of thousands (if not hundreds of thousands) of acres of suitable owl habitat that was assumed to be available for the recovery of the spotted owl. Barred owls and spotted owls use similar habitat, and there is significant dietary overlap between the two owls, though barred owls appear to be more generalists in both habitat and food sources.

The barred owl population appears to be growing exponentially, and there is no evidence that its population growth is slowing. To mitigate for this, suitable owl habitat needs to be conserved now more than ever. Protecting existing habitat in riparian reserves (and growing more habitat inside and outside reserves) helps increase the chances that spotted owls and barred owl can co-

[60] Wiens, J. David. 2012. Competitive Interactions and Resource Partitioning Between Northern Spotted Owls and Barred Owls in Western Oregon. PhD dissertation. OSU. http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/28475/WiensJohnD2012.pdf

[61] 1993 SAT Report, Chapter 5, pp 461-462.

exist. Reducing stream buffers and increasing logging will just increase adverse competitive pressures and magnify the existential perils faced by the spotted owl.

There are two approaches being considered to address the new and significant threat posed by the barred owl: (1) grow more habitat, and (2) kill barred owls. These are not mutually exclusive. The first approach is to protect and grow more suitable owl habitat based on a well-known axiom of the "species-area relationship" from island biogeography which holds that as habitat area increases, the number of cohabiting species also increases.[62] Simply put, spotted owls are more likely to *co-exist* with barred owls if there is more suitable habitat, while local or regional *extirpation* is more likely if there is less suitable habitat available. The existing riparian reserves help protect and restore more suitable habitat and increase the chances of co-existence. Reeves et al. proposal for more logging in riparian reserves will mean reduced area of suitable habitat and greater likelihood of competitive exclusion.

Corroborating these ecological principles, Dr. David Wiens recent telemetry work shows that barred owls have a survival advantage relative to spotted owls in fragmented landscapes. However, that survival advantage diminishes in landscapes with a higher proportion of older forest (as show in the figure below).[63]

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[62] 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. See also Martina Carrete, José A. Sánchez-Zapata, José 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.

[63] Wiens, J. David. 2012. Competitive Interactions and Resource Partitioning Between Northern Spotted Owls and Barred Owls in Western Oregon. PhD dissertation. OSU. http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/28475/WiensJohnD2012.pdf. Wiens, D. 2012. Presentation to The Wildlife Society. http://tws.sclivelearningcenter.com/index.aspx?PID=6893&SID=163551 (at 1:12).

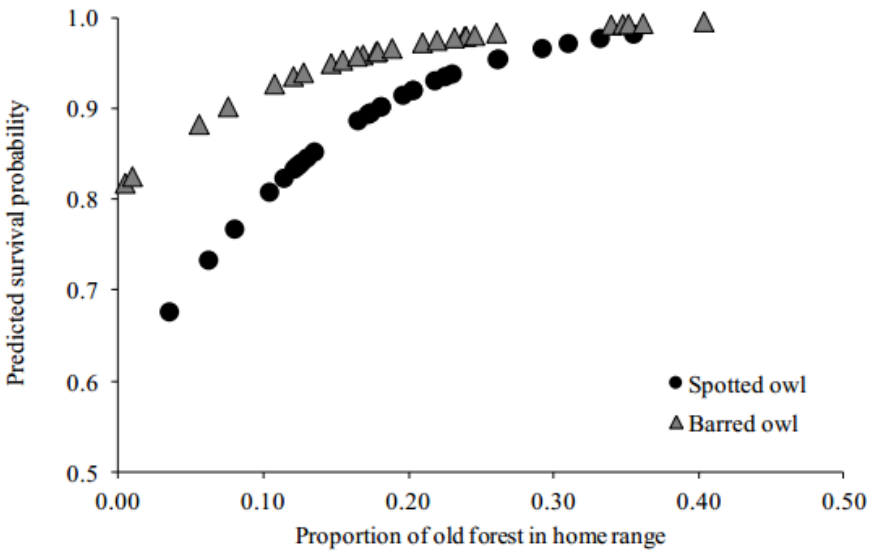

Figure 3.12. Predicted relationship between mean proportion of old conifer forest within the home range and survival probabilities of radio-marked northern spotted owls ($n = 29$) and barred owls ($n = 28$) in western Oregon, 2007–2009. Survival estimates were based on 6-mo time intervals; point estimates are from the best-supported model of survival, {S(Spp+old)}.

This provides strong support for the continued conservation of mature & old-growth forest inside and outside riparian reserves because spotted owls are able to compete nearly equally with barred owls in landscapes with a high proportion of old forest. According to Wiens:

> Survival of both species was positively associated with an increasing proportion of old (>120 yrs old) conifer forest within the home range, which suggested that availability of old forest was a potential limiting factor in the competitive relationship between the 2 species. When viewed collectively, my results support the hypothesis that interference competition with a high density of barred owls for territorial space can act to constrain the availability of critical resources required for successful recruitment and reproduction of spotted owls.[64]

To address the need for additional suitable habitat and to reduce the adverse competitive interactions between spotted owls and barred owls, the FWS adopted Recovery Action 32 that recommends conservation of a *subset* of high quality suitable owl habitat in all federal land allocations. This is a step toward mitigating the effects of the barred owl, but we are not ware of any analysis showing that protecting just a subset of the highest quality habitat is adequate mitigation for all the suitable habitat occupied and defended by barred owls. An impressive

[64] Id.

groups of spotted owl experts are already calling for conservation of a more inclusive subset of high quality owl habitat.[65]

Even if the highest quality owl habitat in the matrix is likely to be protected under Recovery Actions 10 and 32, riparian reserves still serve an important role in owl conservation. Reeves et al.'s suggestion otherwise is unsupported for several reasons. First, FWS made the recommendation for conservation of high quality habitat knowing that riparian reserves were important for spotted owls and riparian reserves were already protected. Spotted owl conservation likely requires conservation of *both* high quality owl habitat and riparian reserves, not one or the other. Second, riparian reserves are disproportionately important to owl conservation in general, and barred owl mitigation in particular, as described below. Protection of high quality owl habitat outside of riparian reserves is not a replacement for conservation of riparian reserves.

David Wiens' recent PhD dissertation based on field research in the Oregon Coast Range provides strong evidence that riparian reserves are disproportionately valuable for reducing competition between spotted owls and barred owls. Spotted owls' habitat selection shows a preference for riparian hardwoods (more than 4x greater than the non-forest reference), only slightly less than the owls' preference for old conifer forest (>5x). Furthermore, there is evidence that riparian forests may provide hope as an area where resource partitioning and niche segregation exists between the two owl species. That is, the diverse mix of food sources and habitat structures in riparian reserves appears to meet important needs of both species with less direct competition for resources. Finally, Wiens' telemetry work provides evidence that when spotted owls venture close to barred owls, their selection for riparian forests intensifies.

> Under the base [resource selection function] RSF for spotted owls, old conifer was >5 times as likely to be selected for foraging as the nonforest reference category (selection ratio [exp(ˆ)] = 5.3, 95% CI = 4.4–6.4), followed by riparian hardwood (4.3, 95% CI = 3.5–5.4), mature conifer (3.4, 95% CI = 2.8–4.1), and young conifer forest (1.9, 95% CI = 1.6–2.4). … As proximity to a barred owl's core-use area increased, a spotted owl's affinity for old, mature, and young conifer forest types was gradually replaced by selection for riparian hardwood forest (Fig. 3.7). … [S]potted owls spent a disproportionate amount of time foraging in steep ravines within patches of old conifer

[65] 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

> forest. Spotted owls in my study also showed strong selection for riparian-hardwood forest along low-order streams. … My results also parallel those of Glenn et al. (2004), who reported that resource selection by spotted owls in younger forests of western Oregon was associated with hardwood (broadleaf) trees and riparian areas. … Spotted owls and barred owls in my study selected foraging sites that were closer to streams than random locations, and the relative probability of selection decreased linearly with increasing distance to a stream for both species. … The best model of resource selection indicated that spotted owls responded to an increased likelihood of encountering core-use areas of barred owls by decreasing the time spent in mature and old forest and intensifying use of riparian-hardwood forests. Additionally, I found that when spotted owls did enter a core-use area of barred owls they were located more frequently within riparian-hardwood forest than other forest types. … Data on habitat selection and dietary composition suggested that riparian hardwood forests may be an important aspect of resource partitioning between the Species … My results emphasize the value of older conifer forests, large hardwood trees, and moist bottomland riparian areas to resource partitioning between spotted owls and barred owls in the central Oregon Coast Ranges. … My finding that older riparian-hardwood forests played an important role in niche segregation between the 2 species emphasizes the need to consider these forest conditions within a management context, as these forests are likely to promote a wide diversity of prey for both species …"[66]

The second approach to address barred owl competition is to shoot and kill barred owls in order to reduce their population and reduce their adverse competitive effects on the spotted owl. A large barred owl removal experiment is being proposed by USFWS, but it has not been approved or implemented and the results are not yet known. It is important to recognize that managers need to plan as if barred owls are here to stay. Even if barred owl control is practiced at a landscape scale, and even if it is effective in reducing competitive pressure on spotted owls, killing barred owls can never be expected to completely eliminate the threat, so the control program will have to be perpetually funded and implemented to remain effective. In an era of limited budgets and dysfunctional politics, the permanence and continuity of a barred owl control program are uncertain at best. If the control program were to cease, the barred owl population would be expected to repeat its rapid expansion across the region. This presents significant concerns, especially if owl habitat protections are ever relaxed in reliance on a barred owl control program, because the barred owl population would rebound much faster than suitable habitat can be regrown after clearcutting.

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[66] Wiens, J. David. 2012. Competitive Interactions and Resource Partitioning Between Northern Spotted Owls and Barred Owls in Western Oregon. PhD dissertation. OSU. http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/28475/WiensJohnD2012.pdf

Given the continuing pressures on the spotted owl from the barred owl, climate change, and industrial logging on non-federal lands, it will likely be necessary to both maintain riparian reserves, as well as conserve all suitable owl habitat inside and outside reserves. Increased clearcutting of riparian reserves is clearly not supported.

Riparian Reserves are Important for Marbled Murrelets

Marbled murrelets are a "threatened" seabird that nest on large mossy limbs of mature and old-growth trees located within about 50 miles of the coast. Like spotted owls, marbled murrelets also depend disproportionately on lower slopes and riparian forests. FWS' 1997 Recovery Plan for the Marbled Murrelet says "With respect to slope, eighty percent of nests in the Pacific Northwest were located on the lower one-third or middle one-third of the slope."[67] Hamer and Nelson (1995) show that the mean distance to streams from marbled murrelet nests in the Pacific Northwest is 159 meters.[68]

In California, Baker et al. (2006) found that marbled murrelet nest sites "were located closer to streams, had a greater basal area of trees >120 cm dbh, and were located lower on slopes than random sites based on analysis of variance models." Baker (2006) states:

> We found that nest sites were much closer to streams than would be expected based on randomly available sites within old-growth forests. Nest sites may have been located near streams because these sites afforded murrelets better access from at-sea flyways. Studies have found proximity to streams or other openings to be important for murrelet nesting in other regions as well (Hamer and Nelson 1995, Meyer et al. 2004, Zharikov et al. 2006).[69]

In British Columbia Burger & Chatwin (2002) found that "[f]orests bordering major stream channels provided high quality nest habitat for murrelets, with large trees, high epiphyte cover and many potential nest platforms. Detections of murrelets were also highest along stream beds …"[70]

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[67] USFWS 1997. Marbled Murrelet Recovery Plan, p 32. http://ecos.fws.gov/docs/recovery_plans/1997/970924.pdf

[68] Thomas E. Hamer & S. Kim Nelson. 1995. Chapter 6: Characteristics of Marbled Murrelet Nest Trees and Nesting Stands. USDA Forest Service Gen. Tech. Rep. PSW-152. 1995. http://www.fs.fed.us/psw/publications/documents/gtr-152/chap6.pdf.

[69] Baker, L.M., Peery, M.Z., Burkett, E.E., Singer, S.W., Suddjian, D.L., And S.R. Beissinger. 2006. Nesting Habitat Characteristics of the Marbled Murrelet in Central California Redwood Forests. The Journal of Wildlife Management (70(4) 939-946. https://www.cnr.berkeley.edu/beislab/BeissingerLab/Steve'%20Publications/Baker_et_al_2006.pdf

[70] Burger, A.E., and T.A. Chatwin. 2002. Multi-scale studies of populations, distribution and habitat associations of Marbled Murrelets in Clayoquot Sound, British Columbia. Ministry of Water, Land and Air Protection Victoria, BC. March 2002. http://env.gov.bc.ca/wld/documents/techpub/mamuwebs.pdf

Increased clearcutting within riparian reserves is in direct conflict with FWS' 1997 Recovery Plan for the Marbled Murrelet which recommends that mature forests within "secured areas" (such as riparian reserves) be protected so they can serve as future nesting habitat for the marbled murrelet.[71] This recovery plan recommendation is not about *existing* high quality habitat, but about mature forests that can serve as future recruitment habitat. These 80-120 year-old maturing forests are precisely those targeted for logging in many recent policy proposals, such as the BLM Secretarial Pilots,[72] and the federal legislation proposed by Representatives DeFazio, Walden, and Schrader.[73]

Riparian Reserves are Part of an Ecosystem Approach.

The state-of-the-art conservation science embodied in the NWFP relies on the complementary application of both "coarse filter" and "fine filter" approaches. Fine filter approaches include particular emphasis on the needs of individual species (to the extent they are known) such as the ESA requirement to avoid "take" of listed species, and the survey-and-manage program requirements to identify and buffer rare and uncommon wildlife that may be in the path of logging. Coarse filters, include protection of Late Successional Reserves and riparian reserves where logging is restricted so that natural processes of growth and disturbance can continue to create and maintain natural ecosystem structures and patterns that species evolved with.

Ideally, if the coarse filters are applied early enough (before a landscape becomes fragmented) and if they are fully functioning and effective, the needs of all species are likely to be met and fine filters should not be needed. However, in the northwest, forest ecosystems have suffered cumulative degradation from past and ongoing logging, roads, grazing, and fire exclusion, and the specific needs of every species are not well known, so a combination of coarse- and fine-filters are required. In a nutshell, this is why we have the NWFP. Judge Dwyer said "Given the current condition of the forests, there is no way the agencies could comply with the environmental laws without planning on an ecosystem basis."[74]

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[71] USFWS 1997. Recovery Plan for the Marbled Murrelet. http://ecos.fws.gov/docs/recovery_plans/1997/970924.pdf

[72] Oregon Wild 2011. Scoping Comments on the Wagon Road and Roseburg BLM Secretarial Pilots. http://www.oregonwild.org/oregon_forests/forest-management/in-your-forests/files-for-eyes-on-the-agencies/Wagon_Road_and_Roseburg_Pilots_scoping_6-29-2011_BLM.pdf

[73] Oregon Wild 212. Problems and Pitfalls Associated with the Proposed "O&C Trust, Conservation, and Jobs Act" Version 1.3, June 5, 2012. http://www.oregonwild.org/oregon_forests/old_growth_protection/westside-forests/western-oregon-s-patchwork-public-lands/O-C_Trust_Act_White_Paper_FINAL_6-5-2012_w_DeFazio_response.pdf

[74] *Seattle Audubon Society v Lyons*, 871 F. Supp. 1291 (W.D. Wash. 1994).

The NWFP recognizes that fine filters by themselves will not be adequate, and employs coarse filters based on the natural disturbance regime. The NWFP ROD states:

> This conservation strategy employs several tactics to approach the goal of maintaining the "natural" disturbance regime … Any species-specific strategy aimed at defining explicit standards for habitat elements would be insufficient for protecting even the targeted species. The Aquatic Conservation Strategy must strive to maintain and restore ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources and restore currently degraded habitats.[75]

The riparian reserves adopted in the NWFP are part of the coarse-filter, ecosystem approach. Relatively wide riparian reserves are intended as mitigation for a wide range of fish and wildlife that have been harmed by past and ongoing habitat loss and degradation caused by logging, roads, grazing, fire suppression, etc. Riparian reserves serve the needs of least 130 terrestrial species of concern.[76]

The Northwest Forest Plan also recognized that fine filters require adequate knowledge of species requirements, but the needs of many species were not well-known, so the plan puts an emphasis on coarse-filter approaches such as the Late Successional Reserves and riparian reserves. Fine filters cannot be eliminated, but the emphasis on reserves helps minimize the number of required "fine filters" like the survey and manage program, and the ESA. As an example the NWFP said: "Protection buffers are no longer required for the American marten in Alternative 9. The standards and guidelines added to Alternative 9 as a result of additional species analysis, such as Riparian Reserve Scenario 1, are expected to benefit this species."[77]

Now, almost 20 years after the NWFP adopted a state-of-the-art conservation plan, Reeves et al. attempt to reverse course by de-emphasizing ecosystem management and focus instead on the needs of just a few species, such as "high intrinsic potential" (HIP) for Coho salmon. The NWFP already rejected this approach, in part because different species require different habitat and we do not have enough information to identify HIP for each species. For instance, Coho salmon prefer low gradient perennial streams, while other species prefer other types of habitat (e.g., high gradient streams, moist sites adjacent to streams, or fishless headwaters).

Instead of trying to identify high-intrinsic potential (HIP) lands for every one of the hundreds of species associated with streams and riparian areas, the NWFP relies upon riparian reserves as a

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[75] 1994 ROD p B-9.

[76] Martin Raphael. 2012. The Function of Riparian Reserves for Terrestrial Species – What Was the Intent? http://ecoshare.info/wp-content/uploads/2013/01/Raphael-buffers.pptx

[77] 1994 FSEIS, Appendix F, p F-148.

"coarse filter," to capture the needs of a wide range of species. Riparian reserves can thus be viewed as the sum of HIP for all species. Riparian reserves $\approx \sum HIP_{sp}i + HIP_{sp}ii + HIP_{sp}iii + \ldots HIP_{sp}n$. We do not have detailed information on needs of all species, so we rely on the adopted stream buffers as an approximation. Reeves' alternative scheme of using high intrinsic potential for a few high-profile species would shift federal forest management from its intended emphasis on healthy ecosystems that serve the needs of all species, to focus instead on just a few species. Fine-filter approaches like HIP should be considered a *complement* to coarse-filter strategies, but not as a *replacement*. HIP approaches might be a big improvement to current practices on non-federal lands, but if a single-species approach replaces riparian reserves, it would be a big step backwards on federal lands.

Buffer-on-the-Buffer Maintains Conditions For Wildlife that Live Near Streams (but not in Streams)

Reeves et al. claim that new information shows that narrow buffers will adequately protect the microclimate needed to meet ACS objectives, stating:

> A number of research efforts have examined the effects of forest management on microclimate in riparian areas since the ACS and the associated ecological function curves were originally formulated. … it has been suggested that a one tree-height buffer on fish streams should reduce potential impacts of harvesting in areas on the edge of the buffer on riparian microclimate and water temperature (Brosofske et al. 1997, Moore et al. 2005) (Figure 9b).
>
> … With buffers of 49 ft or greater width, daily maximum air temperature above stream center was less than 1°C greater, and daily minimum relative humidity was less than 5 percent lower than for unthinned stands.[78]

Reeves et al. err by focusing on conditions at the *center of the stream* instead of conditions *throughout the buffers*. This is one of the most significant errors in Reeves et al.'s analysis. Riparian reserves are intended to protect numerous species that do not live *in* the stream, rather, they live in the stream-side forest extending hundreds of feet from the stream, but they still require a relatively cool-moist microclimate, complex forest structure, and abundant wood, and these species will be adversely affected by logging adjacent to narrower riparian reserves. This is part of the reason the NWFP adopted a *buffer-on-the-buffer*, that is, an outer buffer of shade and cover to maintain suitable microclimate conditions for wildlife that live in the inner buffer.

The EIS supporting the NWFP states:

> Riparian areas are widely considered to be important wildlife habitat. Cool air temperatures due to the presence of cool and turbulent surface waters, typically dense

[78] Reeves et al. pp 25, 26.

> vegetative canopy cover, and their location in the lowest portions of watersheds combine to maintain a distinct microclimate along stream channels and in the adjacent riparian area. Maintaining the integrity of the vegetation in these areas is particularly important for riparian-dependent species of amphibians, arthropods, mammals, birds, and bats. Many species of amphibians, birds, and mammals use late-successional and old-growth riparian areas, including associated streams, ponds and wetlands, for reproducing, foraging, roosting, and as travel corridors (Table 3&4-11). The many wildlife species, along with lichens, mosses, vascular plants and mollusks, listed in Table 3&4-11 depend on diverse and complex riparian and aquatic habitats.
>
> …
>
> The principal factor influencing the outcomes for amphibians related to the width of Riparian Reserves.[79]

The NWFP anticipated regeneration harvest (modified clearcutting) on lands in the matrix outside of riparian reserves. The ongoing threat of regeneration (clearcut) logging is highlighted by recent efforts to increase regeneration harvest by Reeves et al., Johnson & Franklin (2009, 2012),[80] Secretarial Pilot Projects on BLM's Roseburg and Coos Bay Districts,[81] and forthcoming revisions of BLM's Western Oregon Resource Management Plans.[82] The NWFP recognized that forest openings adjacent to a riparian buffer would create "edge effects" that change the microclimate in the buffer and reduce the recruitment of wood to the buffer. The NWFP addressed this problem by adopting a *buffer-on-the-buffer* so that at least the inner portion of the riparian reserves would have near-natural microclimate and wood recruitment processes.

Reducing the width of riparian reserves and increasing logging adjacent to the narrower buffer will expose sensitive wildlife such as amphibians, lichen, mollusks, red tree vole, and spotted owls, to unfavorable microclimate conditions and reduced levels of dead wood recruitment. This

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[79] 1994 FSEIS pp 3&4 - 61, 3&4 - 81.

[80] Johnson, K. N. And J. F. Franklin. 2009. Restoration of the federal forests of the Pacific Northwest. http://www.cof.orst.edu/cof/fs/PDF/JohnsonRestoration_Aug15_2009.pdf. Franklin, J. F. And K. N. Johnson. 2012. A Restoration framework for federal forests in the Pacific Northwest. J. For. 110(8): 429-439.

[81] Roseburg BLM Pilot: http://www.blm.gov/or/districts/roseburg/forestrypilot/; Coos Bay Wagon Road Pilot: http://www.blm.gov/or/districts/coosbay/forestrypilot/. Johnson, K. N. And J. F. Franklin. January, 2013. Recommendations for future implementation of Ecological Forestry projects on BLM Western Oregon Forests. Draft. http://www.forestry.oregonstate.edu/cof/fs/PDFs/BLM_report_Feb15_Johnson.pdf. Johnson, K. N. And J. F. Franklin. 2012. Southwest Oregon secretarial pilot projects on BLM lands: Our experience so far and broader considerations for long-term plans. http://www.cof.orst.edu/cof/fs/PDF/BLM_report_feb15_Johnson.pdf.

[82] BLM Oregon State Office. 2013. Resource Management Plans (RMPs) for Western Oregon. http://www.blm.gov/or/plans/rmpswesternoregon/

undermines the viability of numerous species that were specifically intended to benefit from the absence of edge effects in the inner buffer.

Reeves et al. recognize a "primary purpose for the extension of the boundary of the Riparian Reserve from one site-potential tree height to two on fish-bearing streams was to protect and enhance the microclimate of the riparian ecosystem within the first tree height …"[83] but they inexplicably dismiss concerns about microclimate throughout the inner buffer by shifting the focus to microclimate conditions at the *stream center,* or at most 20 meters from the stream. This ignores the fact that many riparian species that were intended to benefit from the riparian reserves use habitat much further from the stream. The outer buffers were established in part to protect microclimate within an inner buffer extending up to 1 site-potential tree height from the stream, which notably protects only a portion of the habitat used by riparian associated species.

Reeves et al. rely on Olson et al. (2007)[84] to support the idea that narrower buffers may be adequate, stating:

> Olson et al. (2007) reviewed studies of the effects of timber harvest activities, inside and outside of riparian buffers, on microclimatic conditions and amphibians. They concluded that relatively narrow buffers (compared to those of the Northwest Forest Plan) can be effective in maintaining microclimates 33-66 ft (10-20 m) from the stream center. Potential concerns about microclimate that could arise from reducing the size of riparian buffers can be reduced further by minimizing clearcutting along the outer boundary (Moore et al. 2005, Anderson et al. 2007, Kluber et al. 2008). As mentioned previously, clearcutting is not part of the silvicultural strategy under ecological forestry—strategically placing aggregated retention patches during harvest should help ameliorate concerns here.[85]

Reeves et al. make several errors here:

- First, Olson et al. (2007) actually refer to buffers that maintain conditions "at stream center" and the microclimate that "*may* extend 10-20 meters." Reeves tries to make an uncertain statement seem more certain.
- Second, Reeves et al. ignore a very important caveat in Olson et al. (2007) which actually expresses a specific concern about the microclimate effects upslope beyond 10-20 meters from the stream center. Olson et al. state: "However, we have few data for predicting the

[83] Reeves et al. p 24.

[84] Olson, D.H., Anderson, P.D., Frissell, C.A., Welsh, H.H., Jr., and D.F. Bradford. 2007. Biodiversity management approaches for stream–riparian areas: Perspectives for Pacific Northwest headwater forests, microclimates, and amphibians. Forest Ecology and Management 246 (2007) 81–107.

[85] Reeves et al. p 27.

countervailing spatial extent of upslope harvest influences on microclimates within buffers."[86]

- Third, riparian reserves are intended to protect many species that rely on moderated microclimate conditions extending more than 10-20 meters from the stream. The reduced riparian buffers advanced by Reeves et al. might maintain the microclimate at the *stream center,* or at most 20 meters from the stream, but the NWFP sought to protect the microclimate out to a distance equal to the height of a *site-potential tree*, often 60 meters.[87]
- Fourth, the variable retention harvest (VRH) advocated by Reeves et al. and Franklin & Johnson (2012)[88] is in fact a form of clearcutting (with small reserves). At the site scale, VRH likely creates "edge effects" that are indistinguishable from clearcutting.

Figure 1. The clearcut in the foreground is "variable retention regen harvest" in unit 1 of the Buck Rising timber sale, part of the Roseburg BLM's Secretarial Pilot Project. The clearcuts in the background are industrial clearcuts under the Oregon Forest Practices Act. The differences in terms of "edge effects" may be indistinguishable. Photo credit: Francis Eatherington.

[86] Olson et al. (2007) at p 98.

[87] 1993 SAT Report, Chapter 5, pp 461-462. See also Olson, D.H., Anderson, P.D., Frissell, C.A., Welsh, H.H., Jr., and D.F. Bradford. 2007. Biodiversity management approaches for stream–riparian areas: Perspectives for Pacific Northwest headwater forests, microclimates, and amphibians. Forest Ecology and Management 246 (2007) 81–107.

[88] Franklin, J. F. And K. N. Johnson. 2012. A Restoration framework for federal forests in the Pacific Northwest. J. For. 110(8): 429-439.

Figure 2. Another view of the edge created by “ecological forestry” in the Buck Rising Variable Retention Harvest by Roseburg BLM (before the felled trees were removed). Photo credit: Francis Eatherington.

A key issue is whether narrow buffers are adequate to protect wildlife, such as amphibians, that may be associated with streams, but also venture away from the water. The NWFP adopted wider buffers in part because many amphibians live up to 900 feet from water. The 1993 SAT Report explained:

> The abundance of amphibians in Pacific Northwest forest and riparian zones is influenced by habitat conditions in riparian areas (Bury et al. 1991, Gomez 1992). Amphibians populations are generally found less than 900 feet from water sources (Nussbaum et al. 1983). Gomez (1992) found that rough-skinned newts, tailed frogs, and western redbacked salamanders were the most abundant species of herptafauna in upland and riparian areas along the Oregon Coast Range. These organisms were found up to 600 feet from streams but were most abundant within 300 feet. Many species have specific tolerance thresholds (e.g., temperature and moisture) microhabitat requirements (e.g., headwater seeps or talus slopes). Many also require downed wood, but may differ in types of wood (e.g., snag, bark on a log, or bark on the ground) or particular decay class of wood (refer to Chapter 5 more specific requirements of specific species). Alteration of

microhabitat climate may influence the suitability of riparian conditions for riparian-dependent organisms.[89]

Narrow buffers that maintain microclimate at the stream center are unlikely to protect temperature-sensitive species that live hundreds of feet from streams.

Reeves et al. offer an incomplete and misleading account of amphibian habitat use, saying "Recent research by D. Olson of the USFS Pacific Northwest Research Station, found that most amphibians moved along the stream within 45 ft (13.6 m) of the channel."[90] In reality there is abundant evidence from Olson and others showing that amphibian use habitat much farther than 45 feet from streams.

Table 3
Maximum distances away streams into upland forests at which Pacific Northwest amphibians have been found

Species	Distance (m)	Comments	Reference
RHKE/RHVA, ANFE, PLDU, PLVE, ENES, TAGR [ASTR, DITE]	30–40 m [20–30 m]	Time-constrained searches in quadrats 0–10, 10–20, 20–30, and 30–40 m from streams; 5–100+ year old conifer stands, 0 to 40+ m buffers, 1st–3rd order streams, Oregon; DITE, RHKE/RHVA, PLDU and ASTR found primarily at 0–10 m from stream, PLVE found primarily at 0–20 m from stream	Vesely (1996)
AMGR, TAGR, ENES, PLVE	55	Pitfall traps and cover boards spanning 5, 30 and 55 m from stream; 70-year-old conifer stands; British Columbia; more AMGR were captured at 30 m from stream than 5 and 55 m from stream; AMGR and TAGR moved more along streams than up or down slopes	Maxcy and Richardson (2000)
ASTR	65	Pitfall traps at 5, 25, 45, 65 m from stream; <5 and 80+ year old conifer stands; non-fish-bearing streams <3 m wide; British Columbia; no difference in capture frequency across distance from stream	Matsuda and Richardson (2005)
DITE	66, 22, 19	Radiotracking; forested, clearcut with buffer (20–30 m), and clearcut conifer stands; small strems 1–6 m wide; British Columbia; maximum distance from stream was 66 m in intact forested habitat, 22 m in clearcut, 19 m in buffered clearcut	Johnston and Frid (2002)
ASTR	100	Pitfall traps 5, 25, 50 and100 m from stream; 5- and 250-year-old conifer stands; headwater streams 1–3 m wide and fishless; British Columbia; mean distances from stream reported (adults: 28 m; juveniles: 17 m; males 23 m; females 17 m); frogs captured farther from streams in old growth than in clearcuts	Wahbe et al. (2004)
DITE, TAGR, PLVE, ENES, AMGR, ASTR, RAAU	~135	Pitfall traps, 10 × 10 grid across 135 m × 135 m; 40–50-year-old red alder stands; 2nd order streams, Oregon	McComb et al. (1993a)
ASTR, DITE, BAWR, PLDU, PLVE, RAAU, RHsp, TAGR	200	Pitfall traps at stream and 200 m upslope, 2 trans-riparian pitfall arrays with traps every 25 m; 5–200+ year old conifer stands, deciduous stands; 3rd–4th order streams, Oregon	Gomez and Anthony (1996)
DITE, TAGR, PLDU, PLVE, ENES, ANFE, ASTR, RAAU	400	Pitfall traps <10 and 400 m from streams, 2 trans-riparian arrays with traps every 50 m; 12–140 year conifer stands; 2nd–3rd order streams, Oregon	McComb et al. (1993b)

Species acronyms follow Table 2.

Table 3 (from Olson et al. (2007)). [91]

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[89] 1993 SAT Report, Chapter 5, p 461.

[90] Reeves et al. p 28.

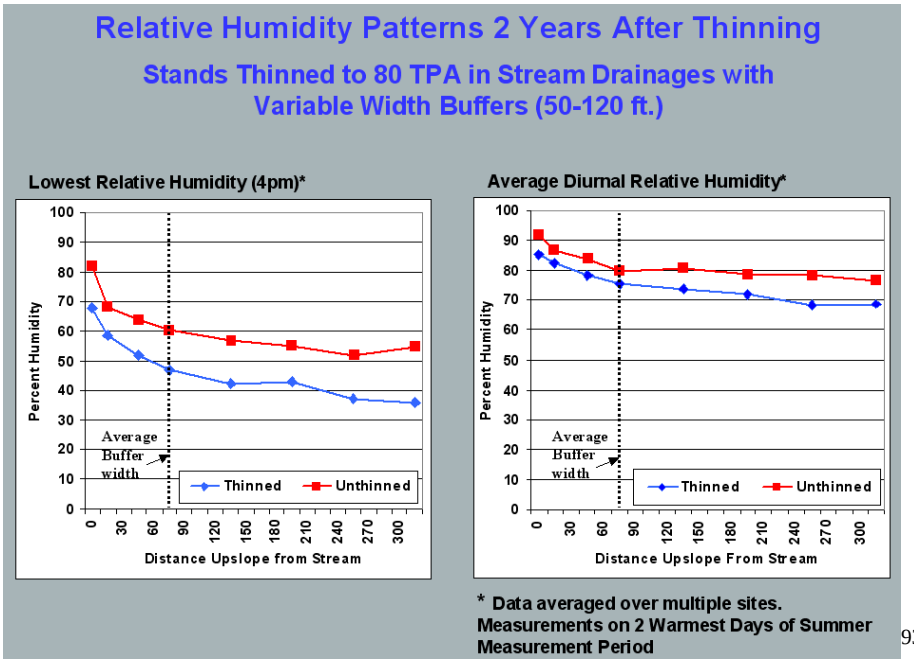
[91] Olson, D.H., Anderson, P.D., Frissell, C.A., Welsh, H.H., Jr., and D.F. Bradford. 2007. Biodiversity management approaches for stream–riparian areas: Perspectives for Pacific Northwest headwater forests, microclimates, and amphibians. Forest Ecology and Management 246 (2007) 81–107.

The results presented in Olson et al. (2007) do not justify any systematic reduction of stream buffers on federal lands. In fact, their findings strongly reaffirm the importance of the existing buffers, or even an expansion of buffers to promote connectivity between watersheds:

> Recent recognition that **stream-breeding amphibians can disperse hundreds of meters into uplands** implies that connectivity among neighboring drainages may be important to their population structures and dynamics. Microclimate studies substantiate a ‘‘stream effect’’ of cool moist conditions permeating upslope into warmer, drier forests. … Riparian areas may function as habitat for resident species and as corridors for transient species … [Amphibians] may be abundant upslope, and loss or degradation of upland forest habitat could disrupt population dynamics or affect persistence. … Questions persist about whether narrow buffers provide sufficient moderation of microclimate, habitat diversity, and transfers of energy and matter to support non-fish aquatic and riparian biota, particularly sensitive frogs and salamanders, whose abundance is often greatest upstream of fish-bearing waters and whose adult stages sometimes forage hundreds of meters upland from the immediate stream margin. … Many studies reveal pronounced decreases in the ability of amphibians to disperse as human alteration of landscapes increases, and survival of juveniles in such fragmented landscapes is often substantially reduced (see Cushman, 2006). These findings imply dramatic effects on immigration because dispersal in amphibians is thought to be primarily effected by juveniles rather than adults (e.g., Funk et al., 2005; Cushman, 2006). … [L]ess intensive thinning harvests that retain a substantial proportion of the pre-harvest stand density and canopy cover have less impact on stream and riparian microclimates than do more intensive regeneration harvests. … Relatively narrow buffers … can be effective in maintaining stream center microclimate conditions and therefore the steep near-stream microclimate gradients that may extend 10–20 m from streams in intact stands (Anderson et al., 2007; see above microclimate discussion). However, we have few data for predicting the countervailing spatial extent of upslope harvest influences on microclimates within buffers. In general, our understanding of trans-buffer microclimate gradients must be improved by sampling at a higher spatial resolution with spacing among sensors sufficient to quantify non-linear trends across ecotones associated with both stream-buffer and buffer-upslope edges.[92]

Evidence continues to show adverse effects on microclimate from logging near streams.

[92] Olson, D.H., Anderson, P.D., Frissell, C.A., Welsh, H.H., Jr., and D.F. Bradford. 2007. Biodiversity management approaches for stream–riparian areas: Perspectives for Pacific Northwest headwater forests, microclimates, and amphibians. Forest Ecology and Management 246 (2007) 81–107 (emphasis added).



[93]

Reeves et al. recognize that "large wood is an important element of stream and river ecosystems"[94], however, Reeves et al. mislead when they assert that "[a]llowing ecological forestry in the outer half of the riparian buffers along non-fish-bearing streams is also unlikely to affect wood recruitment."[95] Reeves et al. fail to recognize that recruitment of wood is not just important for streams but also for terrestrial/upland ecosystems that were also intended to benefit from riparian reserves. Reeves et al.'s focus on clearcutting adjacent to narrow buffers and tree tipping into streams fails to recognize likely adverse affects on wood recruitment to terrestrial portions of the riparian reserves.

Many riparian species rely on unimpeded successional processes that accumulate abundant dead wood *near* streams, but not necessarily *in* streams. Logging within and adjacent to riparian reserves will capture mortality, truncate wood recruitment processes, and deprive wildlife of the abundant dead wood they need. Likewise, reducing stream buffers and allowing clearcut edges directly abutting inner riparian buffers will eliminate one source of down wood that would otherwise fall into the buffer. Protecting an outer *buffer-on-the-buffer* helps maintain natural levels of wood recruitment at least within the inner buffer, though the outer buffer itself would still suffer from depleted dead wood levels due to edge effects.

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[93] Aquatic/Riparian Ecosystem Dynamics and Associated Management Implications - Recent Findings. Powerpoint, 32.6M. This topic was presented at the Regional Interagency Executive Committee meeting on January 7, 2003. http://www.reo.gov/library/presentations/Szaro_present_Aquatic_Rip_Final.ppt

[94] Reeves et al. p 14.

[95] Reeves et al. p 28.

The NWFP explicitly recognized the problem of reduced wood recruitment in narrow riparian buffers adjacent to logged sites. The 1993 FEMAT Report, an appendix to the EIS supporting the NWFP explained:

> Large wood on the ground is an important habitat component in riparian areas. Maintaining the integrity of the vegetation is particularly important for riparian-dependent organisms including amphibians, arthropods, mammals, birds, and bats (see appendix V-E for greater detail).
>
> …
>
> **Riparian Processes as a Function of Distance from Stream Channels**
>
> …
>
> **Large wood delivery to riparian areas**. Large downed logs are recruited into riparian areas from the riparian forests and from upslope forests. Similar to large wood delivery from riparian areas into streams, the effectiveness of upland forests to deliver large wood to the riparian area is naturally expected to decline at distances greater than approximately one tree height from the stand edge (Thomas et al.., 1993). Timber harvest adjacent to the riparian area creates an edge that eliminates one source of large wood. Thus, long-term levels of large wood may diminish in the riparian zone.[96]

Additionally, any proposal to protect buffers narrower than one site-potential tree will trigger concerns about wood recruitment to streams, and (depending on slope and aspect) could also degrade the riparian microclimate. Wood is recruited from the full site-potential tree buffer, plus unstable areas. Logging in those areas will capture mortality and reduce instream wood recruitment. Also, riparian reserves serve to mitigate for logging outside the buffers. Retaining untreated "skips" (such as riparian reserves) helps mitigate for the loss of snags and dead wood in logged uplands.

Note: Reeves et al. suggest that "tree tipping" will mitigate for past clearcutting by accelerating near-term recruitment of wood to the stream. While it is true that tree tipping may be beneficial in some circumstances, it should not be used to justify more commercial logging in riparian reserves, because if tree-tipping is accompanied by commercial logging in riparian reserves, it cannot fully mitigate for the long-term loss of wood recruitment in riparian reserves. Reeves et al. clearly contemplate commercial removal of significant volumes of wood from riparian reserves ("We estimate that [tree tipping] would take 10-15 percent of the total volume that would be harvested in the outer half of the buffer…"[97]) Commercial removal of functional wood exports habitat values and diverts part of the productive capacity of the site where it cannot

[96] 1993 FEMAT Report, pp V-25 - V-26.

[97] Reeves et al. p 29.

contribute to any habitat value. Also, tree tipping tends to direct all the mitigation toward the aquatic system, while depriving the terrestrial ecosystem of wood that would otherwise grow and be recruited as snags and dead wood in uplands. Finally, there is also a question about the economic viability of tree tipping. Figure 7 in Reeves et al. appears to show tree tipping in the future that would *not* be associated with thinning. In this case, tree tipping is speculative because it will require appropriated funds to accomplish, and those funds may not be available. In sum, the benefits of tree tipping are hypothetical unless the activity is independent of commercial logging and funded at scale.

Riparian Reserves Help Capture the Benefits of Dynamic Processes Near Streams

The current system of riparian reserves helps ensure that ecological processes associated with streams are allowed to operate without interference from management activities. Important ecological processes include: unimpeded growth of woody biomass; unimpeded movement of organisms, water, sediment and wood; and disturbance processes such as competitive mortality, wind, insects, and landslides that deliver high quality material to streams. Management activities that interfere with these natural processes include logging that exports woody material from riparian areas and unstable areas, as well as roads that impede the natural movement of wildlife, water, wood, and sediment. For example, roads intercepting landslides before they can deliver beneficial material to streams.

The NWFP ROD explained the role of riparian reserves in restoring natural processes supporting the goals above:

> This conservation strategy employs several tactics to approach the goal of maintaining the "natural" disturbance regime. Land use activities need to be limited or excluded in those parts of the watershed prone to instability. The distribution of land use activities, such as timber harvest or roads, must minimize increases in peak streamflows. Headwater riparian areas need to be protected, so that when debris slides and flows occur they contain coarse woody debris and boulders necessary for creating habitat farther downstream. Riparian areas along larger channels need protection to limit bank erosion, ensure an adequate and continuous supply of coarse woody debris to channels, and provide shade and microclimate protection.[98]

Reeves has previously published evidence that in some stream systems a significant portion of wood in streams is delivered from unstable upslope areas, rather than from immediate streamside areas. Reeves et al. (2004) state:

[98] 1994 ROD p B-9.

> The estimated mean volume of upslope-derived pieces [>90 m from the stream] was about one-third that of streamside-derived pieces. Upslope-derived pieces were located primarily in the middle stream reaches and in the zones of influence that had the most contact with the low-flow channel. .... Our findings suggest that previous studies that examined only streamside sources of wood have limited applications when designing and evaluating riparian management approaches in landslide-prone areas. The failure to recognize the potential sources of wood from upslope areas is a possible reason for the decline of large wood in streams in the Pacific Northwest.
>
> …
>
> Upslope-derived wood constituted a substantial proportion of the volume and number of pieces of large wood in Cummins Creek. This finding is similar to results of recent studies in Washington and northern California. …
>
> … [T]he substantial volume of upslope-derived wood in Cummins Creek suggests that upslope sources contribute appreciably to habitat complexity. We believe that it is important to cautiously interpret the results of many previous studies on the distance from streams that wood originates, particularly in areas where landslides and debris flows are major processes. Consistent with stated objectives, previous studies of wood sources either did not address wood from upslope sources (e.g., Van Sickle and Gregory 1990) or avoided study reaches that were impacted by landslides (McDade et al. 1990; F. Swanson, personal communication).
>
> … Future management and restoration efforts that focus on processes, such as the delivery of wood from all sources, including upslope, rather than meeting individual in-channel habitat targets, such as a specified number of large wood pieces, may ultimately be more effective in creating self-sustaining ecosystems that provide favorable conditions for aquatic and riparian-dependent organisms (Reeves et al. 1995; Ebersole et al. 1997; Beechie and Bolton 1999).[99]

It remains very important to retain unstable areas in the riparian reserve network. New modeling tools may be available to help managers identify unstable areas, but both models or managers are fallible, especially when there is pressure to meet timber targets. NWFP riparian reserves help capture some unstable areas that may be incorrectly identified as stable. As part of the precautionary approach adopted in the NWFP, the current riparian reserves include unstable areas that are located relatively close to streams and have a high probability of delivering beneficial material to streams. NetMap and other tools can help identify potentially unstable areas outside of the site-potential tree buffers, but retaining the existing riparian reserves helps avoid the problem of false negative findings within the site-potential trees.

[99] Gordon H Reeves, Kelly M Burnett, Edward V McGarry 2004. Sources of large wood in the main stem of a fourth-order watershed in coastal Oregon. Canadian Journal of Forest Research, 2003, 33(8): 1363-1370. http://andrewsforest.oregonstate.edu/pubs/pdf/pub3094.pdf

Habitat in Riparian Reserves is Degraded and Needs to be Restored.

Protecting the existing riparian reserves helps mitigate for the fact that streamside forests, and the many important ecological functions they provide, have been severely degraded by past mismanagement. The NWFP sought to reduce management related disturbance in areas close to streams during the long process of natural regrowth and recovery. Reducing stream buffers will increase the risks associated with management induced disturbance, including increased erosion, sedimentation, loss of shade and wood recruitment, and increased cumulative effects.

Reeves et al. suggest that the oldest stands in riparian reserves are unlikely to be logged because of the requirements of the Spotted Owl Recovery Plan (Recovery Actions 10 and 32), but Reeves suggests that it may be acceptable to sacrifice younger stands in riparian reserves in order to increase timber harvest. Sacrificing riparian forests of any age is inconsistent with the NWFP, because the riparian reserves were expected to both conserve existing old forests and grow more old forest to mitigate for the long-standing old-forest deficit. The NWFP ROD said:

> The standards and guidelines for the land allocations of this decision will improve current conditions and alter certain past practices detrimental to late-successional species by protecting large blocks of remaining late-successional and old-growth forests, and by providing for the regrowth and replacement of previously harvested late-successional forest stands.[100]

An Appendix to the NWFP EIS explained the role of riparian reserves in owl conservation and made clear the expectation that young forests would be allowed to grow old, and not be clearcut:

> The assessment considers possible outcomes over the next 100 years. Forest successional development in Riparian Reserves during this time should allow these areas to become suitable connectivity habitat. Development of forests in the Late-Successional Reserves will increase the portion of the landscape containing late-successional and old-growth forest conditions. Additionally, standards and guidelines in this SEIS will cause the retention or development of connectivity in other land allocations. The increase in Riparian Reserve widths of intermittent streams under Riparian Reserve Scenario 1 … would increase their function as connectivity.
>
> … Ingrowth in Late-Successional and Riparian Reserves is expected to improve connectivity over the next 200 years.[101]

[100] 1994 ROD p 29.

[101] 1994 FSEIS, Appendix F, p F-13.

Reducing riparian reserves and allowing increased clearcutting conflicts with the NWFP expectation of successional development and restoration of well-connected large blocks of late successional habitat.

Riparian Reserves Help Reduce Cumulative Effects

The current network of riparian reserves helps protect fish and wildlife by reducing the adverse cumulative effects of "management induced disturbance." This means limiting the extent of logging and roads within each watershed. The NWFP EIS recognizes that narrow riparian buffers means increased timber harvest and increased risks to fish & wildlife:

> The 80 percent or higher likelihood of attaining aquatic habitat of sufficient quality, distribution and abundance on federal land for each of the seven salmonid races/species/ groups evaluated for Alternatives 1, 4, and 9 results from combining lower timber harvest levels with wider prescribed Riparian Reserve widths on intermittent streams …
> … The narrower widths on intermittent streams under Riparian Reserve Scenario 2 compared to Scenario 1 increase the risks to these streams due to management-induced disturbances. …
> [T]he risk to aquatic and riparian habitat is, in part, determined by the prescribed width of these reserves.[102]

Limiting cumulative watershed effects from logging is particularly important given the fact that non-federal forest lands in Oregon are being very aggressively logged and current forest practice rules do not adequately protect aquatic ecosystems. The National Marine Fisheries Service's (NMFS) recent status review of the Oregon Coast Coho salmon said:

> Burnett et al. (2007) suggested that widespread recovery of coho salmon in the OC Coho Salmon ESU is unlikely unless habitat improved in areas of high intrinsic potential on private lands. The effects of timber harvest on fish and habitat is likely most pronounced on private and state lands. Requirements for management of riparian zones on these lands are less than on federal lands. Current forest practice regulations reduce the size of the streamside riparian area to less than that needed to maintain the full suite of ecological processes provide by riparian areas and allows for the removal of trees from within this zone, which further reduces ecological effectiveness. Additionally, there is no requirement for protection on small intermittent streams, which are important sources of wood (Reeves et al. 2003, May and Gresswell 2003, Bigelow et al. 2007), on private lands. These streams are given consideration on a portion of each stream on state lands. Botkin et al. (1995) and the IMST (1999) found these regulations to be insufficient to improve or recover habitat that is currently degraded.

[102] 1994 FSEIS pp 3&4 – 198-199.

> The recent availability of Landsat images, along with the development of tools for analysis, allowed a comprehensive, uniform picture of human disturbance patterns that was previously unavailable. This analysis showed that disturbance has been widespread in the ESU, that some basins experienced much higher disturbance than others, that rates of disturbance are relatively constant, and that the most intense disturbance has moved from federal to private lands, presumably in response to policy changes.
> … [C]urrent policies guiding the management of riparian areas on state and private lands have limited or no management requirements for this important potential source of wood.[103]

Given the significant adverse effects of industrial clearcutting and the inadequacy of forest practices on non-federal lands, current stream buffers and appropriately limited logging on federal lands helps mitigate for adverse cumulative effects.

Protecting Riparian Reserves Helps Store Carbon and Mitigate Climate Change.

Since the NWFP was adopted 19 years ago concerns about global climate change have escalated. There is a growing recognition that the global carbon cycle must be carefully managed to maintain and increase carbon storage in living systems such as forests, and there is a need to limit activities, such as logging mature forests, that halt photosynthesis and hasten decay processes thus accelerating the transfer of carbon from the forest to the atmosphere where it will persist for long periods.

Riparian forests are disproportionately valuable as carbon reservoirs. Riparian forests tend to have deep soils and relatively high productivity. The cool-moist microclimate and vegetation diversity makes riparian reserves more resistant and resilient to fire and other disturbances, making riparian reserves relatively good places to grow and store carbon to mitigate climate change.[104]

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[103] Stout, H.A., P.W. Lawson, D. Bottom, T. Cooney, M. Ford, C. Jordan, R. Kope, L. Kruzic, G.Pess, G. Reeves, M. Scheuerell, T. Wainwright, R. Waples, L. Weitkamp, J. Williams, and T. Williams. 2011. Scientific conclusions of the status review for Oregon Coast coho salmon (*Oncorhynchus kisutch*). Draft revised report of the Oregon Coast Coho Salmon Biological Review Team. NOAA/NMFS/NWFSC, Seattle, WA. http://www.nwr.noaa.gov/publications/status_reviews/salmon_steelhead/coho/occ-review-2011.pdf

[104] Oregon Wild. 2008. "The Straight Facts on Forests, Carbon, and Global Warming" http://www.oregonwild.org/oregon_forests/old_growth_protection/forests-global-warming/oregon-wild-report-on-forests-carbon-and-global-warming; and Ingerson & Anderson 2010. Top Ten Carbon Storing National Forests in America. The Wilderness Society. http://www.usclimatenetwork.org/resource-database/top-ten-carbon-storing-national-forests-in-america/at_download/file

Reeves et al. (20013) recommendations to reduce riparian buffer widths and increase logging runs directly counter to current priorities for conserving and increasing biogenic carbon stores. Logging of riparian reserves will increase greenhouse gases emissions, while continued conservation of riparian reserves will increase carbon storage and help mitigate climate change.[105]

Riparian Reserves Help Prepare Watersheds for Climate Change

Separate from the issue of carbon storage to reduce the *severity* of climate change, we must recognize that past and continuing emissions have already committed us to some level of climate change, so we must *prepare* for the unavoidable consequences. While precise prediction of the local consequences of climate change is impossible, there are some general patterns that can be anticipated and incorporated into our planning – these patterns include (i) warming and its association with drought and soil-water stress, (ii) an accelerated hydrologic cycle, and (iii) altered disturbance regimes. Continued conservation of riparian reserves serves multiple climate preparedness objectives related to both watershed functions and old forest habitat. Increased clearcutting in riparian reserves conflicts with climate preparation objectives.

Protecting riparian reserves are part of a sound climate preparation strategy. Beschta et al. (2013) explained the disproportionate importance of riparian systems:

> Although riparian areas occupy only 1–2 % of the West's diverse landscapes, they are highly productive and ecologically valuable due to the vital terrestrial habitats they provide and their importance to aquatic ecosystems (Kauffman and others 2001; NRC 2002; Fleischner 2010). Healthy riparian plant communities provide important corridors for the movement of plant and animal species (Peterson and others 2011). Such communities are also crucial for maintaining water quality, food webs, and channel morphology vital to high-quality habitats for fish and other aquatic organisms in the face of climate change.[106]

Seavy et al. (2009) explained that riparian conservation makes several important contributions to climate preparedness, including: natural resilience of riparian systems, enhancing connectivity for wildlife whose geographic or elevational ranges may shift, providing redundancy to accommodate metapopulation dynamics, promoting linkages between aquatic and terrestrial

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[105] Oregon Wild 2011, "Forests, Carbon & Global Warming". https://dl.dropboxusercontent.com/u/47741/Oregon%20Wild%20Report%20on%20forests%2C%20carbon%2C%20and%20global%20warming%2C%20ver.%201.4.pdf

[106] Beschta, R.L., Donahue, D.L., DellaSala, D.A., Rhodes, J.J., Karr, J.R., O'Brien, M.H., Fleischner, T.L., and C.D. Williams. 2012. Adapting to Climate Change on Western Public Lands: Addressing the Ecological Effects of Domestic, Wild, and Feral Ungulates. Environmental Management. DOI 10.1007/s00267-012-9964-9. http://fes.forestry.oregonstate.edu/sites/fes.forestry.oregonstate.edu/files/PDFs/Beschta/Beschta_2012EnvMan.pdf.

systems, conserving thermal refugia, and providing hydrologic resiliency in the face of intensified storm events, (e.g., increased water infiltration and reducing flood effects).[107]

There are several consistent themes that emerge from various recommendations on how to prepare ecosystems for global climate change,[108] including:

- Ecosystems may be able to accommodate added climate stress if other anthropogenic stresses are reduced. It is therefore unwise to shrink riparian buffers and spread the adverse effects of logging and roads near streams.
- Wildlife need opportunities to disperse from places that are becoming less climatically suitable to places that may be more suitable. This can be accomplished by emphasizing landscape connectivity and wildlife dispersal. The well-distributed network of riparian reserves serve an important role in wildlife dispersal and landscape connectivity. Reducing stream buffers is moving in the wrong direction.
- Help existing high quality habitats persist. Due to climate uncertainty, it is uncertain whether high quality habitat can be recreated from degraded sites, so existing high quality habitat such as that in riparian reserves should be retained, not subjected to clearcutting.

The Wildlife Society's (TWS) review of Reeves et al. emphasized the importance of riparian reserves as wildlife movement corridors in the face of climate change:

> Anticipated effects from climate change emphasize the importance of maintaining viable forested movement corridors for plant and animal species. Wider corridors with high quality habitat are easier for species to find and traverse, reduce edge effects, contain

[107] Seavy, N.E., Gardali, T., Golet, G.H., Griggs, F.T., Howell, C.A., Kelsey, R., Small, S.L., Viers, J.H., and J.F. Weigand 2009. Why Climate Change Makes Riparian Restoration More Important than Ever: Recommendations for Practice and Research. Ecological Rest. September 1, 2009 vol. 27 no. 3 330-338. doi: 10.3368/er.27.3.330. https://watershed.ucdavis.edu/pdf/Seavy_etal_2009_Ecological_Restoration.pdf

[108] Risto Seppälä, Alexander Buck and Pia Katila. (eds.). 2009. Adaptation of Forests and People to Climate Change. A Global Assessment Report. IUFRO World Series Volume 22. Helsinki. 224 p. http://www.iufro.org/download/file/4485/4496/Full_Report_pdf/. Malcolm, J.R., and L.F. Pitelka. 2000. Ecosystems and Global Climate Change: A Review of Potential Impacts on U.S. Terrestrial Ecosystems and Biodiversity. Pew Center on Global Climate Change, Arlington, VA. http://www.pewclimate.org/docUploads/env_ecosystems.pdf. Jill S. Baron, Linda A. Joyce. Guidelines for Helping Natural Resources Adapt to Climate Change. *In* Mountain News, Newsletter of the Consortium for Integrated Climate Research in Western Mountains. CIRMOUNT, Vol. 3, No. 1, February 2009. http://www.fs.fed.us/psw/cirmount/publications/pdf/Mtn_Views_feb_09.pdf. Climate Leadership Initiative. 2008. Preparing the Pacific Northwest for Climate Change — A Framework for Integrative Preparation Planning for Natural, Human, Built and Economic Systems. Institute for a Sustainable Environment. University of Oregon. February 4, 2008. http://climlead.uoregon.edu/publicationspress/Preparing_PacNW_for_ClimateChange_4-2-08.pdf.

more suitable habitat for breeding and dispersal, may be more resilient to climate change, and conserve ecological processes.[109]

TWS recommends maintaining redundancy in the riparian corridor system, and even expanding the riparian reserves network to serve important biodiversity goals such as corridors linking LSRs, and corridors linking watersheds over ridgetops:

Identify high-priority biodiversity corridors:

- Focus first on preserving/developing high quality, permanent biodiversity corridors between Late Successional Reserves, including maintaining wider (e.g., two SPTH) forested stream buffers in both LSR and matrix lands along these corridors.
- Provide biodiversity corridors for areas with high biological importance …
- Provide biodiversity corridors between watersheds. This would result in some headwater, non fish-bearing, low Intrinsic Potential streams afforded wider (e.g., 1.5-2 SPTH) buffers along select movement corridors. [110]

Climate change is likely to cause altered disturbance regimes (e.g., fire, insects, floods), thus creating early seral habitat and duplicating the very purpose of Johnson & Franklin's "ecological forestry" clearcuts. Lemieux et al. (2008) said "Ecologically, increased distribution and frequency of disturbances may result in increased distribution and dominance of early successional ecosystems dominated by fire adapted species..."[111] Thus, it is highly questionable whether there is an ecological "need" for logging that mimics early seral conditions.

Increased climate driven disturbance also increases the uncertainty whether we can maintain the old forests we have and whether we can meet NWFP objectives for regrowing old forest from highly-uncharacteristic initial conditions, such as the existing young plantations that lack structure and diversity. Forests in riparian reserves may be uniquely able to meet the need to conserve and restore older forest in the face of altered disturbance regimes, because riparian forests are relatively protected from wind and their deep soil and cool-moist microclimate makes them less vulnerable to drought and fire. Reducing stream buffers to facilitate increased clearcutting of riparian reserves conflicts with climate preparation objectives, because existing older forests are more important than previously realized ("a bird in the hand is better …").

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[109] The Wildlife Society – Oregon Chapter. 2013. Subject: Comments on Review draft: Alternative riparian buffer strategies for matrix lands of BLM western Oregon forests that maintain aquatic ecosystem values

[110] Id.

[111] Lemieux, Christopher J., Daniel J. Scott, Rob G. Davis and Paul A. Gray. 2008. Changing Climate, Challenging Choices: Ontario Parks and Climate Change Adaptation. University of Waterloo, Department of Geography: Waterloo, Ontario
http://web.archive.org/web/20101023221023/http://www.fes.uwaterloo.ca/geography/faculty/danielscott/PDFFiles/NRCAN-Report-FINAL.pdf

Watershed functions are already highly degraded as documented in the NWFP. Global warming is expected to bring more frequent and more intense precipitation events to the Pacific coast of North America.[112] The poles are warming faster than the equator thus reducing the temperature gradient that drives the jet stream, resulting in a slower and more sinuous jet stream.[113] This could expand the spatial, temporal, and elevational range of rain-on-snow events. More frequent large storm events will put additional cumulative stress on watersheds that are already compromised as a result of past logging, roads, grazing, mining, agriculture, and development. Global climate change and the amplified hydrologic cycle will challenge the capacity of watersheds to provide important functions such as water quality, capture/storage/ release of water/sediment/wood, floodplain function, energy dissipation, and habitat for fish and wildlife.

The logical response to this amplification of the hydrologic cycle is to strive for increased conservation of watersheds, not less. Clearcutting in the existing riparian buffer as proposed by Reeves et al. will increase cumulative watershed effects and make streams less resilient to intense precipitation events. Thus increased logging in riparian reserves directly conflicts with management priorities for climate preparedness. Managers are advised to redouble efforts to reduce, not increase, cumulative watershed effects from logging and roads. The NWFP EIS specifically noted that riparian reserves help limit cumulative effects from forest management.

> The narrower widths on intermittent streams under Riparian Reserve Scenario 2 compared to Scenario 1 increase the risks to these streams due to management-induced disturbances. …
>
> [T]he risk to aquatic and riparian habitat is, in part, determined by the prescribed width of these reserves.[114]

Instream woody structure is important to help streams sort and store gravel, dissipate the energy of high flows, and spatially partition habitat. These functions become even more critical and more difficult to sustain as a result of the amplified hydrological cycle caused by climate change. Most streams have depleted woody structure due to past mismanagement. It makes no sense to increase logging and export of wood from watersheds that need to recruit more wood to prepare for climate change.

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[112] Dominguez, F., E. R. Rivera, D. P. Lettenmaier, and C. L. Castro (2012), Changes in winter precipitation extremes for the Western United States under a warmer climate as simulated by regional climate models, Geophys. Res. Lett., doi:10.1029/2011GL050762, *in press*. http://www.agu.org/pubs/crossref/pip/2011GL050762.shtml

[113] Mason J. 2013. A Rough Guide to the Jet Stream: what it is, how it works and how it is responding to enhanced Arctic warming. Posted 22 May 2013. http://skepticalscience.com/jetstream-guide.html

[114] 1994 FSEIS pp 3&4 – 198-199.

Forest roads cause significant adverse hydrological effects. For instance, road drainage systems accelerate the delivery of storm water to streams resulting in chronic erosion and unnatural peak and low flows. Increased precipitation events caused by climate change indicate a need to reduce the adverse effects of the road system. However, increasing the area available for perpetual logging as proposed by Reeves et al. will require extending the spatial and temporal footprint of the road network. This directly conflicts with priorities related to climate change preparation.

The impacts of road construction, use, and maintenance are adverse to riparian reserve objectives. Road drainage systems were designed for a different hydrologic regime than the one they will experience in the coming decades under the influence of climate change. The density of roads and road/stream crossing need to be reduced. Culverts need to be removed, replaced or resized. Unstable slopes will become more likely to fail, and when they do fail they should deliver high quality sediment and large wood instead of just mud and stumps.

Riparian Reserves Protect Drinking Water, Recreation, Scenic Values

Riparian reserves serve a variety of important social values including drinking water, recreation, scenic quality. Increased logging near streams will threaten these values and invite unneeded controversy. Reeves et al. do not provide any compelling justification for increasing potential harm to these social values and the heated conflict they are likely to generate.

Process for reducing buffers

The NWFP adopted a process for adjusting the interim riparian boundaries. This process requires a scientifically rigorous evaluation of both watershed conditions and the needs of aquatic and terrestrial wildlife. In approving the NWFP in 1994, Judge Dwyer said "The effectiveness of the ACS is still subject to debate among scientists. If the plan as implemented is to remain lawful the monitoring, watershed analysis, and mitigating steps called for by the ROD will have to be faithfully carried out, …"[115] These mitigating steps include careful consideration of the needs of terrestrial wildlife before riparian reserves are adjusted.

Reeves et al. suggest a new method to reduce interim riparian boundaries that address only a subset of the required considerations and ignores the needs of terrestrial wildlife. It is easy to imagine smaller stream buffers in an alternate universe where riparian reserves serve only a subset of the intended purposes, but if the reserves are going to fulfill the full suite of aquatic and terrestrial purposes, all of which remain important, then the process for adjusting boundaries must take into account the broad purposes for which riparian reserves were established.

[115] *Seattle Audubon Society v Lyons*, 871 F. Supp. 1291 (W.D. Wash. 1994).

Reeves et al. propose to use new tools to adjust the boundaries of riparian reserves. "NetMap (Benda et al. 2007) is an analysis platform that integrates a suite of numerical models and analysis tools to provide insights about the context of locations in a timely and cost-efficient manner, the way that watershed analysis was originally intended to be."[116] Netmap does not follow the required process for adjusting riparian reserves, nor does it account for the full range of terrestrial and aquatic values that are protected by riparian reserves.

An appendix to the NWFP EIS explained some of the reasons that the current boundaries of Riparian Reserve were adopted and the process for possible adjustments:

> The following standards and guidelines were developed in response to public and internal comments to increase protection of habitat for species whose habitat assessments were relatively low under Alternative 9.
>
> …
>
> Riparian Reserve Scenario 1 will be applied on intermittent streams throughout the range of the northern spotted owl. … [T]he prescribed Riparian Reserve widths for intermittent streams may be adjusted in decisions following watershed analysis. **That analysis should take into account all species that were intended to be benefited by this standard and guideline. Those species include fish, mollusks, amphibians, lichens, fungi, bryophytes, vascular plants, American marten, red tree voles, bats, marbled murrelets, and northern spotted owls.** The specific issue for spotted owls is retention of adequate habitat conditions for dispersal. … [R]iparian protection in Adaptive Management Areas should be comparable to that prescribed for other federal land allocations. However, in those cases where alternate means are proposed to meet riparian objectives, those alternate means must meet objectives for management of all species. In areas where there are concerns about species as noted above, **species protection takes priority over any objectives that would reduce reserves, and adjustments to Riparian Reserves should take into account all species that were intended to be benefited** by this standard and guideline.[117]

The process and required considerations for adjusting riparian reserves was further explained in the NWFP ROD:

> Although Riparian Reserve boundaries may be adjusted on permanently-flowing streams, the prescribed widths are considered to approximate those necessary for attaining Aquatic Conservation Strategy objectives. **Post-watershed analysis Riparian Reserve boundaries for permanently-flowing streams should approximate the boundaries prescribed in these standards and guidelines.** … [A]ny analysis of Riparian Reserve

[116] Reeves et al. p 33.

[117] 1994 FSEIS, Appendix B-11, p B-143 -145 (emphasis added).

> widths must also consider the contribution of these reserves to other, including terrestrial, species. **Watershed analysis should take into account all species that were intended to be benefited by the prescribed Riparian Reserve widths**. Those species include fish, mollusks, amphibians, lichens, fungi, bryophytes, vascular plants, American marten, red tree voles, bats, marbled murrelets, and northern spotted owls. The specific issue for spotted owls is retention of adequate habitat conditions for dispersal. … The prescribed widths of Riparian Reserves apply to all watersheds until watershed analysis is completed, **a site-specific analysis is conducted and described, and the rationale for final Riparian Reserve boundaries is presented through the appropriate NEPA decision-making process**.[118]
>
> …
>
> Other Riparian Reserve objectives, such as providing wildlife dispersal corridors, could lead to Riparian Reserve widths different than those necessary to protect the ecological integrity of the intermittent stream or wetland. These **other objectives could yield wider Riparian Reserves than those necessary to meet Aquatic Conservation Strategy objectives**.[119]
>
> …
>
> Regardless of stream type, **changes to Riparian Reserves must be based on scientifically sound reasoning, and be fully justified and documented**.[120]
>
> …
>
> Watershed analysis provides the ecologic and geomorphic basis for changing the size and location of Riparian Reserves necessary to meet Aquatic Conservation Strategy objectives. **Ultimate design of Riparian Reserves is likely to be a hybrid of decisions based on consideration of sites of special ecological value, slope stability, wildlife dispersal corridors, endemic species considerations and natural disturbance processes**. Figure B-3 illustrates how slope stability and debris flow runout models may be used as part of watershed analysis for adjusting Riparian Reserves. … For example, on intermittent streams **in unstable areas with high potential to generate slides and debris flows, Riparian Reserves wider than those conforming to the definition may be necessary to ensure ecological integrity**.[121]

The "interim" riparian buffers were adopted in part as a hedge against uncertainty, and buffers could be adjusted based on new information that would reduce those uncertainties. The NWFP EIS says "There is less than complete knowledge about many of the relationships and conditions

[118] 1994 ROD p B-13 (emphasis added).

[119] 1994 ROD p B-14 (emphasis added).

[120] 1994 ROD p B-16 (emphasis added).

[121] 1994 ROD p B-23 (emphasis added).

of wildlife species… . The ecology, inventory, and management of large forests is a complex and developing discipline. The biology of the specific species prompts questions about population dynamics and habitat relationships."[122] Unfortunately, in most cases, mangers still lack data and tools necessary to justify reducing the interim buffers. There remains a lot of uncertainty, especially about survey and manage species and northern spotted owl/barred owl interactions. Reeves et al.'s method for reducing the boundaries of riparian reserves does not follow required methods or take into account all the required considerations. Now there are new reasons to protect these forests, e.g. barred owl competition, amphibian dispersal, carbon, climate change, drinking water, and dead wood.

In the late 1990's the regional executives charged with implementing the NWFP commissioned James Pipkin, the Department of the Interior's Director of Policy Analysis, to "revisit" the Plan. Adjusting riparian reserve boundaries was among the issues addressed in his 1998 report, known as the Pipkin Report:

> Riparian reserves are designed to protect the full suite of aquatic ecosystem functions and provide connectivity across the landscapes for terrestrial species. …
> The Northwest Forest Plan prescribed initial reserve widths for protected riparian areas, and specified standards and guidelines for timber management, road construction and maintenance, grazing, recreation, minerals management, fire and fuels management, research, and restoration activities. The initial boundary widths were intended to remain in effect until modified following watershed and site analysis and appropriate National Environmental Policy Act documentation. However, **agencies have found it difficult to analyze all of the processes and functions that were intended to be protected** in riparian reserves. Consequently, few boundaries have been changed. Instead, **agencies seem to be using watershed analysis to define appropriate management activities within the reserves rather than changing the boundaries themselves.**
> The agencies are field testing a module developed by an interagency, interdisciplinary team for assessing riparian reserves at the watershed and site scales. The module is designed to guide analyses considered necessary for designing management actions within riparian reserves or changing reserve boundaries. Given the very large spectrum of organisms, processes and functions intended to benefit from the interim reserve widths, such studies are costly, particularly in view of the fact that sufficient data would be needed to convince those who may be negatively affected by a boundary change that such a change is warranted.[123]

[122] 1994 NWFP FSEIS, p 3&4 – 3.

[123] James Pipkin. 1998. The Northwest Forest Plan Revisited. September 1998. http://web.archive.org/web/20030803082439/www.doi.gov/nrl/PPA/NWForest/Full_rpt.htm (emphasis added).

The "module" referred to in Pipkin Report was an effort by the Interagency Advisory Committee (IAC) and the Regional Ecosystem Office (REO) to standardize the process for adjusting riparian reserve boundaries. However the agencies ceased development of the module because: (a) the interim riparian boundaries were being supported internally and externally, so there was a not a lot of interest in reducing stream protection; (b) there was not enough information on the needs of diverse wildlife to justify shrinking the interim boundaries; (c) the adjustment process could be used to justify wider buffers, not narrower; (d) the NWFP standards already allow active management in riparian reserves, so the agencies perceived that there was little to be gained by shrinking the reserves, and relatively more to be gained by developing criteria for appropriate restoration activities in the riparian reserves.[124] A 1998 IAC status report explained:

> **REO Staff Proposal:**
> Currently there does not seem to be a strong desire by Federal land management field units to modify interim riparian reserve boundaries. Instead, the focus appears to be on the development of appropriate restoration and enhancement measures within the reserves to promote NFP objectives.
>
> At this time, there does not appear to be consensus among the agencies to reallocate staff resources to reconvene the Riparian Reserve Technical Team to revise the draft module because most are assigned to other high priority initiatives…
> …
> Summary of FY 1997 Field Unit Test and Review Comments
> …
> • Dispersal habitat for terrestrial species is not addressed.
> • Biological requirements and habitat conservation relationships are not adequately evaluated.
> • There is inadequate consideration of species viability from past and current management activities.
> …
> • The module does not consider beneficial effects of natural disturbance processes.
> …
> • The connection to upland wildlife ecology is poorly developed.
> …
> • Once all of the habitat requirements for all species of concern are overlaid, there is no room for riparian reserve adjustment without triggering species viability concerns. …
> …
> • … omits other species that benefit from riparian reserves like the spotted owl (dispersal habitat).

[124] Intergovernmental Advisory Committee (IAC) May 1998. Riparian Reserve Module - Status Report. http://www.reo.gov/library/iac/letters/1119iac.htm.

…

• The level of assessment for Survey and Manage species was not done in most watershed analyses and would require quite a bit of additional work.

…

• "We believe that the depth of analysis required to justify a decision to modify Riparian Reserve widths may exceed the budget and staff time available to a typical District, particularly for wildlife analyses. It may be that the default decision would be not to bother, and continue with the interim reserve widths."

…

• All of the information called for in the module does not exist, particularly for wildlife.

…

• … Would cost substantially more if inventory and data were collected for wildlife species.

…

• The team would expect that the only changes that could be justified would be expansion of the interim riparian reserves to include unstable and potentially unstable soil concerns, based on site-scale analyses.

• Results from applying the module will be used to justify adherence to interim reserve widths and to prioritize restoration activities within reserves.

• Applying the module did not result in recommendations to modify reserve widths, but general recommendations for restoration actions within the reserves … [125]

Clearly, the land management agencies working within the legally defensible framework of the NWFP have thought this issue through more thoroughly than Reeves et al. whose proposal lacks the thoroughness and scientific rigor expected under the NWFP.

Actual Implementation of the Boundary Adjustment Process.

The Forest Service and BLM have conducted numerous watershed analyses that have endorsed the NWFP interim riparian reserves widths or even recommended larger buffers. If the approach recommended by Reeves et al. is adopted it could sweep away the results of watershed analyses that are based on more rigorous site-specific information and local expertise than that used by Reeves et al. For example the Deschutes National Forest recommended ¼-mile riparian reserves (several site-potential tree heights) in some areas and full NWFP buffers in other areas:

Riparian Reserve Widths

West Odell Creek Landscape Area has a broad floodplain/water influence zone and the outer terrace defining the vegetation break is approximately a quarter mile from the creek

[125] Intergovernmental Advisory Committee (IAC) May 1998. Riparian Reserve Module - Status Report. http://www.reo.gov/library/iac/letters/1119iac.htm

> in most segments. The recommendation is for the entire landscape area to be managed as a Riparian Reserve, where any activities conducted within this zone are to be complimentary to riparian goals.[126]

The Umpqua National Forest's Layng Creek Watershed Analysis recommended maintaining full protection of the interim buffers:

> Major Recommendations. Maintain full Riparian Reserve widths for Class I through IV streams.
>
> …
>
> Riparian Reserve Width: The ACS is designed to ensure protection of species, populations and communities associated with the Riparian Reserves. When examined at the detailed, point level, this environment is very complex and its full function with regard to the resident species is not well understood. Further study is needed to assure compliance with ACS objectives before Riparian Reserve width can be reduced.
>
> …
>
> The most critical vegetation issue in Layng Creek is the loss of large woody material in snags and down wood, especially in the Riparian Reserves. Full reserve widths are recommended because of the loss of large woody material in the watershed, the sensitivity of earthflow terrain and the risk of blowdown. Full reserve widths are described in the ROD and are recommended on both perennial and intermittent streams.[127]

Medford BLM's Little Butte Creek Watershed Analysis made similar recommendations to "Follow the interim Riparian Reserve widths identified in the ROD Standards and Guidelines."[128]

Roseburg BLM conducted watershed analysis for Lower Cow Creek and recognized that the additional protection afforded to non-aquatic species offers a *margin of safety* for fish and water quality:

> The Standards and Guidelines for Riparian Reserve widths on fish bearing streams are used to protect fish habitat and other riparian dependent species and resources. The

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[126] Deschutes NF. 1999 Crescent-Odell Watershed Analysis, p 167. http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5284640.pdf

[127] USFS 2005. Layng Creek Watershed Analysis Iteration 1.1. Umpqua National Forest Timber Planning Team. November, 2005. pp vii, 109, 126, 135. http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5335947.pdf

[128] Medford BLM, Rogue River NF 1997. Little Butte Creek Watershed Analysis, Version 1.2. November 1997. p 204.

> additional protection for the other species and resources provides an additional margin of safety for fish and stream protection.[129]

The Willamette National Forest's Upper McKenzie Watershed Analysis recommended maintaining or increasing riparian reserve widths:

> [block 4] If contiguity of LS habitat cannot be maintained, riparian reserve widths should be increased to 360'.
>
> …
>
> [block 6] Maintain forested condition of class I-III streams for foraging with no harvest of late successional habitat in riparian reserve widths prescribed in WA.[130]

False Premises (Both Explicit and Implicit):

Reeves et al. propose to "increas[e] the land base for long-term timber production" based on several false premises, including: that the agencies are not meeting timber targets; that riparian reserves are not already being extensively logged; that revenue from increased logging will contribute meaningfully to county finances, employment, and economic development; that clearcutting riparian reserves will not be controversial (or will succeed in spite of controversy); that clearcutting mimics natural disturbance and therefore represents ecological restoration; and that the riparian reserves can be reduced and reallocated to clearcutting without undermining important conservation objectives of the NWFP.

Fallacy: The Agencies are Not Meeting Timber Targets

Reeves et al. assume incorrectly that that timber targets are not being met (e.g., "… projected timber harvest levels but rarely have achieved …")[131]

First, the timber volume projections made in 1994 were estimates, and those estimates were explicitly uncertain and explicitly conditioned on meeting the other standards & guidelines in the NWFP.[132] Timber volume was expected to be an outcome (rather than a goal) of applying the standards & guidelines.[133]

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[129] Roseburg District BLM 2002. Lower Cow Creek Watershed Analysis and Water Quality Restoration Plan, South River Resource Area. Second Iteration, November 2002, p 58. http://www.blm.gov/or/districts/roseburg/plans/files/LwrCwCWA.pdf

[130] Willamette NF 2006. Upper McKenzie Watershed Analysis Update. March 2006.

[131] Reeves et al. pp 5-6.

[132] 1994 ROD p 19.

[133] 1994 ROD p 66.

Second, the projections were an estimate of potential harvest levels, while actual timber outputs would depend on congressional funding. The real timber targets are set by Congress each year and those targets have been met far more often than not.

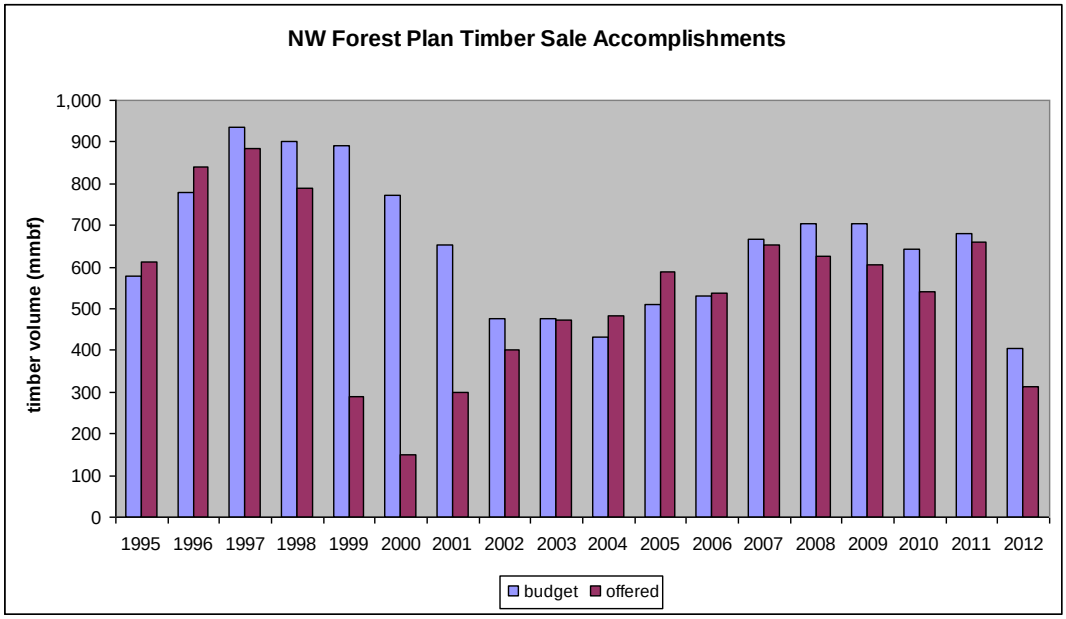

Figure 2: Timber sale accomplishments under the NWFP 1995-2010. The agencies offered timber meeting Congressional timber targets in most years. The shortfall in 1999-2001 was related to the agencies' failure to meet survey and manage requirements and the Aquatic Conservation Strategy. Sources: USFS Regions 5&6 PTSAR Report, BLM - Lyndon Werner -Timber Sale Information System (TSIS).

Third, GAO noted that the decline in harvest volumes was itself anticipated:

> The drop in probable sale quantity bears out the plan's observation that changes could occur. For example, the plan noted that timber sale levels could be affected by requirements for conducting additional environmental analysis or setting aside additional lands to protect threatened or endangered species or by a change in the acreage allocated to riparian reserves following an analysis and inventory of intermittent steams. Officials told us that the probable sale quantity will likely change yet again.[134]

Fallacy: Logging Riparian Reserves Can Help County Finances.

Reeves et al. perpetuate the notion that the Northwest Forest Plan was supposed to meet the financial needs of the counties and that increased logging can significantly improve county finances. Reeves et al. state:

[134] US GAO. 1999. ECOSYSTEM PLANNING - Northwest Forest and Interior Columbia River Basin Plans Demonstrate Improvements in Land-Use Planning. GAO/RCED-99-64. http://www.gao.gov/archive/1999/rc99064.pdf

> Under the Northwest Forest Plan (NWFP), timber harvest, mainly from thinning, has been lower than projected, reducing the potential employment that would be provided from logging and wood processing and payments to counties. Over the last decade, Congress provided funds to the counties through appropriations to compensate them for the loss of these payments, but that revenue stream is unlikely to continue.[135]

Reeves et al. appear to forget that timber harvest levels under the NWFP were expected to be far lower than historic highs and thus could never be expected to provide significant county revenue. The financial windfall that the counties fondly remember was based on unsustainable liquidation of old-growth forests. It is simply unreasonable to expect a return to the ecologically destructive and socially unpopular forest practices of the past. What our federal forests need now (and for the foreseeable future) is thinning previously managed young stands (<80 years old). If done carefully, this will improve forest conditions, create jobs and produce substantial wood projects for the next 20-30 years. However, thinning young stands will simply not produce significant county revenue.

Even if some regeneration/clearcutting is stimulated by the current flurry of radical new policy proposals, the scale of logging is highly unlikely to match the historic high levels that supported the counties during the liquidation period. The NWFP is based on a recognition that too much old growth has been lost and we need to protect what remains and grow more. Programs to fund the counties need to recognize several compelling facts: first, the old-growth forests needed to support historic revenue windfalls simply do not exist; second, further liquidation of old growth is inconsistent with legal requirements and those legal requirements (e.g., CWA, ESA, and NEPA) are widely popular with the voting public; and third, the agencies have lost the social license to log old-growth forests. Thus, it is highly improbable that the agencies will return to the "bad old days" of old-growth clearcutting and associated county revenue.

The bottom line is that whatever the forest policy is adopted, whether widespread thinning or modest clearcutting, will do little to nothing to fill the gaping holes in the counties' budgets. The hard choices necessary to stabilize county finances must still be made, and they will not involve forest policy. Proponents of increased logging are asking for a huge increase in controversial logging (clearcutting mature forests near streams), and this controversy comes with a significant decrease in county funding compared to the windfalls they enjoyed under either the Secure Rural Schools legislation or the period of unsustainable old-growth liquidation.

Note: An often underappreciated economic consideration is that revenue from restoration logging needs to be reinvested in the forest and watersheds to address the persistent effects of

[135] Reeves et al. p 3.

past mismanagement, e.g. pre-commercial thinning, road removal and maintenance, weed removal, reintroducing fire, etc.[136] The counties need to understand that their windfall is past, and that financial solutions for the counties must be found outside of forest policy.

Fallacy: Logging is Good Economic Development

Reeves et al. perpetuate the often repeated notion that logging is good economic development ("The southwest Oregon counties where most of the BLM lands are located continue to have high unemployment levels. Thus, political pressure has built for the BLM to increase timber harvest from its Western Oregon Forests."[137])

Contrary to the pro-logging mantra often heard in economic development circles in Oregon, sound economic development strategies must focus on growing sectors. For more than 20 years, the non-timber sectors of Oregon's economy have grown much faster than wood products, which is a shrinking and now small fraction of Oregon's economy and employment.

Also, even as the number of mills declines, the remaining large mills keep expanding and improving their technology, so the industry as a whole has the capacity to process more logs but with fewer employees. The public interest is not served by an industry that provides declining employment opportunities while expanding its ecological footprint.

Economist Tom Power explains why it is unreasonable to expect great economic or employment gains from the wood products industry:

> Employment in wood products, besides being unstable in the short run as housing cycles and national economic fluctuations buffet it, is also in a long run decline. Wood products manufacturing is a mature industry serving a very specific market for building products. That housing market, at best, is likely to grow only as fast as the overall economy grows. As competition from non-wood building materials rises, the market may grow more slowly than the rest of the economy. In addition, as a mature industry, one can expect technological change to continue to boost worker productivity as capital and energy are substituted for labor. This has already been taking place on an impressive scale. Automated stud mills producing a small number of uniform products have replaced saw mills that produced a variety of different types of boards. Total output has risen while employment and labor income have declined. The harvest of the trees in the woods is shifting from workers with

[136] Johnson & Franklin 2009. Restoration of Federal Forests in the Pacific Northwest: Strategies and Management Implications. http://www.forestry.oregonstate.edu/cof/fs/PDFs/RestorationOfFederalForestsInThePacificNorthwest.pdf ("Significant investment will be needed to restore the federal forests of the Pacific Northwest.")

[137] Reeves et al. p 3.

> saws and axes in hand to large machines. Those machines hold, cut, delimb, and load logs in one step. A single machine can replace a half-dozen workers. The impact of this automation on employment can be seen in Figure 6-4. For example, wood products output in the Pacific Northwest was higher in 1988 than it was in 1978, yet the jobs associated with that output had fallen by 35,000 or 20 percent. Nation-wide during the 1980s lumber mill production **rose** by almost two percent per year while employment at those mills was **declining** by two percent per year . Clearly, even increased levels of harvest and production do not necessarily mean reliable employment. There is no reason to believe that this rising labor productivity in the wood products industry is at an end. Because of that, the long run employment projections in the wood products industry are downward. The wood products industry, even if it faced no raw material supply constraints, is likely to be a downward force on local economies in the future rather than a source of economic vitality. Analysis of the impact of the lumber industry on rural towns in the past confirms this expectation. One study of forest-dependent communities in the northeastern United States found that forestry communities had unstable populations and economies and high rates of divorce, poverty and ill-health. Communities tied to wood products fared worse than agricultural, mining, or tourist communities in terms of both economic and social health . This is not the path to local economic vitality.[138]

The proposition that natural resource extraction is a source of wealth is discredited by evidence that "Remoteness, as measured by urban influence code, has a negative effect on every measure of economic development indicator. It reduces income, employment, housing prices and total developed areas." [139] If natural resources were a source of wealth, remoteness would enhance wealth but the evidence shows that it does just the opposite. Note however, that the negative effects of remoteness can be mitigated in part through natural amenities that attract people who are willing to trade lower wages for higher quality of life. These are important considerations in the analysis of community welfare related to federal land management.[140]

Federal lands contribute more toward economic development via ecosystem services, amenities and quality of life, rather than via resource extraction. The Sonoran Institute offers a good

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[138] Thomas Power, The Economics of Wildland Preservation. 2000. http://www.cas.umt.edu/econ/papers/Wildland%20Economics%20Report.htm.

[139] JunJie Wu, Munisamy Gopinath. 2005. How Do Location Decisions of Firms and Households Affect Economic Development in Rural America? Selected Paper prepared for presentation at the American Agricultural Economic Association Annual Meeting, Providence, Rhode Island, July 24-27, 2005. http://ageconsearch.umn.edu/bitstream/19229/1/sp05wu02.pdf http://web.archive.org/web/20090115192759/http://oregonstate.edu/dept/ncs/newsarch/2008/Aug08/remotecommunities.html

[140] Id.

starting point for developing a better understanding the role of federal forests in economic development. Their report on the economic role of public lands says:

> This report changes the debate on protected lands and the economy of the West. This report verifies a clear connection between the prosperity of Western communities and the vast, publicly-owned open spaces that surround them.
>
> Prosperity in the 21st Century West dispels the notion that public lands hurt local economies by preventing the development of natural resources. In fact, the contrary is true: public lands draw people who want to live and work in rural areas which leads to vibrant economies and better quality of life.
>
> In the West - defined in this study as the 11 western mainland states of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming - mining, logging, and oil and gas development have historically played a significant role in economic development. In a very real sense, our identity, sense of place, culture, architecture and even fashion have been shaped by these industries. However, today these industries provide few jobs. They have not been a significant source of new jobs or personal income in the last three decades.
>
> This doesn't mean that resource industries should disappear. They can be an important part of an increasingly diverse economy. In some communities, and for some families, resource extraction will continue to be important. But these are the exceptions. Local leaders in the West who understand that enormous shifts have taken place will be much better positioned to help their communities thrive in the 21st Century's changing economy. (p 7)
>
> In rural towns, the promise of good jobs in logging, mining and energy development can be a powerful deterrent to the conservation of public lands. … [However] It turns out there is an inverse relationship between resource dependence and economic growth; the more dependent a state's economy is on personal income earned from people who work in the resource extractive industries, the slower the growth rate of the economy as a whole. (p 10)
>
> What is striking - and worrisome - is that the dependence on what should be high wage jobs in mining, oil, gas, and the wood products industry has not resulted in overall growth in personal income. Worse, the opposite seems to be occurring. Possible reasons for this are that boom periods, especially in oil and gas development, can serve as a strong distraction from the need to stimulate other industries and, by so doing, diversify and stabilize the economy. (p 11)

> The slowest growth occurs in counties with public lands that are unprotected and not close to protected areas. These are more likely to be used for resource extraction. (p 15)
>
> • The presence of public lands in the West is a significant driver of economic growth.
> …
> • Protected lands in the form of Wilderness, National Parks, and National Monuments go hand in hand with economic growth though some counties fare better than others.
> …
> • Protected areas are the most strongly tied to growth in counties that are remote and isolated. (p 23)[141]

Among the report's conclusions:

> In all counties in the West, the amount of the county's land in public ownership is a significant positive driver of growth. (p 3-40)
> …
> Much research by geographers suggests that environmental quality and quality of life may be two sides of the same coin.
>
> Rural development is most effective in increasing quality of life when it can increase diversity, both in the environment and in the economy, which can increase social capital – the norms and networks that provide for a collective identity and mutual respect. It can also increase standard of living. Efforts to promote standard of living that ignore these dimensions of quality of life may have serious negative consequences for people and places. (p 4-1, quoting, Flora (1998))
> …
> … the keys to success for western counties, measured in terms of economic growth and over the last three decades, is to have a high proportion of public lands, in protected status if possible, and if not protected, then in close proximity to protected areas. Amenities such as ski areas and eating and drinking places are also important, as is an educated workforce, newcomers to the community, and a high proportion of people employed in the producer services, such as engineering, finance, insurance, and real estate.
>
> A low education rate and a high dependence on transformative industries, which includes mining, oil, gas, logging and wood products manufacturing, contributes to failure. Also

[141] Sonoran Institute, Prosperity in the 21st Century West - The Role of Protected Public Lands. http://web.archive.org/web/20070105005615/http://sonoran.org/pdfs/Prosperity%20Report.pdf.

> detrimental to growth is an economy that is specialized (not diverse), and is distant from larger markets in metropolitan areas. (p 4-3)[142]

Reeves et al. would have us embrace outdated models of economic development at a time when Oregon desperately needs to develop a more modern vision of economic development, based on its wealth of natural assets and human capital.

Fallacy: Riparian Reserves Are "Too Protected."

Reeves et al.'s efforts to increase logging in riparian reserves implicitly assumes that riparian reserves are "no touch" zones with little or no logging occurs. This is incorrect. Not only is logging allowed in riparian reserves, but a substantial fraction of federal log production over the last decade has come from thinning dense young stands within riparian reserves. Unfortunately, the agencies do not separately track volume production from riparian reserves, but a review of BLM annual monitoring reports shows that substantial commercial logging regularly occurs in riparian reserves, for example:

- Between 2005 and 2011, more than a third of the timber volume sold from the Salem District BLM came from reserve land allocations, and about half of that was from riparian reserves.[143]
- On the Eugene District BLM, from 2008 through 2010, more than half of all the acres of commercial thinning took place in riparian reserves.[144]
- On the Roseburg District BLM, between 2007 and 2011, more than half of the offered timber volume on the District came from reserves, and more than one-third of that comes from riparian reserves.[145]
- In recent years on the Coos Bay District approximately half of the sold timber volume comes from reserve land allocations, including riparian reserves.[146]

The NWFP allows and encourages active management of riparian reserves when needed to meet ACS objectives. It is not necessary to shrink the reserves in order to allow logging, because

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[142] Sonoran Institute, Public Lands Conservation and Economic Well-Being. http://web.archive.org/web/20060702224913/http://www.sonoran.org/pdfs/full%20study.pdf.

[143] USDI BLM 2011. Salem District Annual Program Summary Plan Maintenance and Monitoring Report for Fiscal Year 2011. http://www.blm.gov/or/districts/salem/plans/files/APS2011.pdf pp 29-30.

[144] USDI BLM 2011. Eugene District Annual Program Summary Plan Maintenance and Monitoring Report for Fiscal Year 2011. http://www.blm.gov/or/districts/eugene/plans/files/APS_2011.pdf p 36.

[145] USDI BLM 2011. Roseburg District Annual Program Summary Plan Maintenance and Monitoring Report for Fiscal Year 2011 http://www.blm.gov/or/districts/roseburg/plans/files/aps2011.pdf p 29.

[146] USDI BLM 2011. Coos Bay District Annual Program Summary Plan Maintenance and Monitoring Report for Fiscal Year 2011. http://www.blm.gov/or/districts/coosbay/plans/files/aps-2011.pdf p 94.

logging is already occurring. The only plausible justification for reducing buffers is to allow damaging clearcutting instead of restorative thinning within riparian reserves.

Dr. Reeves previously stated an intention to help articulate management criteria that would constrain logging in riparian reserves to ensure it is beneficial to ecological objectives,[147] but this is strangely missing from Reeves et al. Those of us striving to uphold the restoration vision of the NWFP could really use help from Dr. Reeves and other to reign in the harmful logging practices that sometimes still occur in riparian reserves under the guise of restoration, for example:

- The Goose, Canyon Thin, and Margie Projects on the Willamette National Forest include hundreds of acres of logging in mature forests in riparian reserves;
- The Rail 2, and D-Bug Projects on the Umpqua National Forest also include substantial amounts of logging in riparian reserves stands more than 80 years old; and
- The Long Tom Landscape Project on the Eugene BLM, and the Cheney Slate and Farout Projects on the Medford BLM also involve logging in older stands in riparian reserves.

The agencies have been perpetuating a flawed model of riparian development and restoration which posits that thinning in riparian reserves enhances dead wood recruitment. While it may be true that thinning increases growth on a few stems, this is not net restorative, because those marginal gains are outweighed by the fact that (i) thinning directly exports functional wood harming both aquatic and upland ecosystems, (ii) thinning dramatically reduces the tree population from which future functional wood is grown and recruited, and (iii) thinning increases the vigor on remaining trees thus delaying wood recruitment from density-dependent mortality. Except in stands that are very dense and very young, the reduction and delay in wood recruitment caused by thinning vastly outweighs any gains in growth on a few stems.[148]

Instead, they recommend clearcutting in the outer half of riparian reserves on non-fish-bearing streams. This is clearly inconsistent with the standards & guidelines of the NWFP, so Reeves et al. effectively expand (instead of constrain) harmful logging.

Fallacy: Clearcutting Riparian Reserves Won't be Controversial

Reeves et al. cite social conflict among the reasons that mature and old-growth forest is being logged less than anticipated in the NWFP. It is not entirely clear if Reeves et al.'s recommendation are intended to address that problem, but the recognition that social

[147] Personal communication with G. Reeves, August 14, 2012.

[148] Heiken, D. 2012. Thinking About Dead Wood in Managed Landscapes (powerpoint) https://dl.dropbox.com/u/47741/dead%20wood%20slides%202012.ppt. Spies, T., Pollock. M., Reeves. G., and T. Beechie 2013. Effects of Riparian Thinning on Wood Recruitment: A Scientific Synthesis - Science Review Team Wood Recruitment Subgroup. Jan 28, 2013, p 36.

acceptability plays a role in attainment of logging objectives seems to fly in the face of Reeves et al.'s proposal to reduce riparian reserves and allow clearcutting near streams.

Clearcutting is controversial. Clearcutting near streams is even more controversial. Reeves et al. seem to assume either that clearcutting riparian reserves will not be controversial, or will succeed in spite of controversy. Adopting outdated and controversial logging practices is unlikely to advance Reeves et al.'s goal of increased logging.

Reeves et al. says "Franklin and Johnson (2012) expect the call for resumption of regeneration harvests on federal lands to be controversial, even if focused on previously harvested forests, because stakeholders usually equate it with the unpopular practice of clearcutting (Bliss 2000). However, Franklin and Johnson (2012) propose using variable-retention harvesting and not clearcutting; these are very different approaches."[149] In spite of proponents' assertions to the contrary, Variable Retention Harvest (VRH) is clearcutting, except in the small areas that are not logged, because VRH as proposed by Johnson & Franklin (2013) waives existing NWFP requirements for dispersed retention of trees in order to increase logging efficiency.[150] This has unacknowledged ecological (and social) costs. For instance, structurally deprived openings and lack of continuous wood recruitment creates a dispersal barrier for many cryptic organisms.

Reeves' recommendations are intended in part to address the fact that "protest and litigation over attempts to harvest mature and old-growth forest"[151] have limited the agencies ability to fulfill matrix objectives. First, clearcutting riparian reserves may be just as controversial, or more controversial, than logging mature forests in the matrix. Second, protest and litigation are signs of controversy and lack of public support. Increased clearcutting in previously protected riparian reserves will not reduce controversy but rather increase public concern and distrust. Do Reeves et al. believe that public protests will decline if we increase logging near streams? If the goal is to increase logging and revenue, more controversial logging is an unlikely path to success. Third, the land management agencies already rejected a prior proposal to amend the ACS in 2008, and the prior amendment was arguably less controversial than this one, in that it did not involve reallocating riparian areas from reserve to the matrix, nor was it explicitly designed to increase clearcutting in riparian reserves.

[149] Reeves et al. p 18.

[150] Johnson & Franklin 2013. Recommendations for Future Implementation of Ecological Forestry Projects on BLM Western Oregon Forests. http://fes.forestry.oregonstate.edu/sites/fes.forestry.oregonstate.edu/files/PDFs/BLMJohnson_Franklin_APRIL16.pdf

[151] Reeves et al. pp 5-6.

Fallacy: Terrestrial and Aquatic Strategies Are Distinct

Reeves et al. state: "The ACS has five components … Each component is essential … any assessment must consider them in aggregate. The key components considered in this analysis are watershed analysis and the riparian reserves …" Reeves et al. thus view riparian reserves as a component of the ACS. It is more accurate to view aquatic objectives as a sub-subset of all the purposes served by riparian reserves, but those purposes also include terrestrial objectives. Riparian reserves are thus a means of achieving both aquatic and terrestrial strategies of the Northwest Forest Plan. We agree each purpose of the riparian reserves is essential and any assessment must consider all purposes in aggregate. Reeves et al.'s analysis did not do this.

Reeves et al. seem to selectively remember only the aquatic purposes in the riparian reserves,[152] and they likewise assume that the needs of terrestrial wildlife will be met exclusively in LSRs or other land allocations. In fact, the NWFP adopted a more integrated approach that explicitly recognizes tremendous complementary benefits of the various elements of the plan. In other words, the plan explicitly recognized that LSRs provide benefits to aquatic systems and watershed values, and likewise riparian reserves provide benefits to terrestrial wildlife and ecosystems.

The EIS supporting the NWFP explained:

> Late-Successional Reserves will be managed to protect and restore habitat for late-successional and old-growth related species. While these reserves were not derived as part of the Aquatic Conservation Strategy, they benefit aquatic ecosystems. Late-Successional Reserves provide two major benefits to fish habitat and aquatic ecosystems. First, the standards and guidelines under which the reserves are managed significantly reduce activity in these areas, thereby reducing the risk of management-related disturbances and providing increased protection for all stream types. Second, because these reserves possess late-successional characteristics, they tend to be located in relatively undisturbed areas, although some management and natural disturbance events may have taken place in them. Some reserves offer core areas of high quality stream habitat that act as refugia in predominantly degraded landscapes and serve as centers from which degraded areas can be recolonized as they recover. Streams in the Late-Successional Reserves may be particularly important for endemic or locally-distributed fish species and stocks.[153]

[152] Reeves et al. : "In the NWFP, interim Riparian Reserves were established along streams in the Matrix, to conserve and restore aquatic ecosystem values as part of the Aquatic Conservation Strategy."

[153] 1994 FSEIS pp 3&4 – 65 and 3&4 – 195.

Reeves et al. fail to recognize the synergy between aquatic and terrestrial conservation. Reeves et al. look at riparian reserves exclusively as a component of the Aquatic Conservation Strategy, providing primarily aquatic conservation values. In fact, both LSRS and riparian reserves serve both aquatic and terrestrial purposes. Any reduction of either LSRs ***or*** riparian reserves will adversely affect both aquatic ***and*** terrestrial objectives.

Fallacy: The "Original Intent" of the ACS is Not Being Met

Reeves et al. state "the original intent of watershed analysis was never realized because of a number of factors, including costs and the need to consider a multitude of species and their ecological requirements …"[154] Reeves et al. appear to have a personal conception of the "original intent" of the ACS that appears to be focused exclusively on aquatic conservation. This is simply a misconception. The "intent" that matters most is the intent of the 1994 NWFP Record of Decision adopted by the Clinton administration, which was very clear that the needs of terrestrial wildlife must be considered before adjusting the boundaries of riparian reserves. The short-cut method proposed by Reeves et al. simply does not fulfill the legal requirements of the Northwest Forest Plan.

Prior to the NWFP, thinking about riparian buffers may have focused narrowly on aquatic conservation, but the collective expertise of those who developed and adopted the final NWFP determined it was necessary to expand the purposes of riparian reserves to include terrestrial habitat conservation. Reverting to narrow, aquatic-only, purposes of riparian reserves now will in fact subvert the "original intent" of the riparian reserves.

To be clear, the terrestrial purposes of the riparian reserves, were not last minute additions to the NWFP. The 1993 Report of the Scientific Analysis Team (SAT Report), described an aquatic strategy that was a direct precursor to the ACS. The SAT Report called for riparian buffers to protect both aquatic and terrestrial wildlife and to provide a margin of safety for streams and watersheds that have been degraded by decades of mismanagement. Dr. Reeves is one of the authors of the SAT Report.

After reciting the evidence of amphibian populations that live hundreds of feet from streams and the evidence that riparian areas serve as source areas for small mammals, the SAT Report recommended wide riparian buffers: "We believe that it is prudent and justified to require Riparian Habitat Conservation Areas widths to incorporate areas larger than traditional riparian management areas, at least in the interim until a watershed analysis is completed."[155]

[154] Reeves et al. p 32.

[155] 1993 SAT Report. Ch 5, p 461-462.

Like the NWFP, the SAT Report contemplated that riparian reserves might be adjusted, and recognized the need to account for terrestrial wildlife needs before adjusting the boundaries of riparian reserves. The SAT Report explains:

> Riparian Habitat Conservation Areas may be altered after completion of the watershed analysis if warranted by the information resulting from that analysis. ... Particular attention should be given to terrestrial or semi-aquatic organisms (e.g., molluscs, amphibians) that are associated with the microclimates of non-fish bearing and intermittent streams. Habitat associations of many of these organisms are not completely understood at this time.[156]

Note: There are aspects of the SAT recommendation that were altered in the NWFP and that would have provided greater protection for streams if they were carried forward. For instance, the SAT Report proposed to measure stream buffers based on *horizontal* distance from the stream, rather than *slope distance*, as adopted in the NWFP. Horizontal measurement would increase the widths of buffers in steep terrain, which makes sense from the standpoint of slope protection and wood recruitment. The SAT Report also defined "site-potential tree" as the *maximum potential* tree height for the site conditions, but FEMAT redefined it to be the height of trees at *200 years*.[157] Any effort to reduce buffers should consider adopting the SAT team's original methods of defining boundaries.

Fallacy: Riparian Reserves Should be Reallocated to the Matrix.

Given Reeves' acknowledgement that "[t]he boundaries of the Riparian Reserve were extended to a full site-potential tree height on all non-fish bearing streams … to provide additional support for non-fish organisms that use the area near streams as habitat or migratory corridors" is it perplexing why Reeves et al. would make an unwarranted logical leap to assume that if wider riparian reserves are not needed to meet aquatic objectives, then they should be immediately reallocated to the matrix for clearcutting. Reeves et al. seem to have forgotten that there are other important conservation purpose for these lands.

The outer portion of riparian reserves, even if they are not needed for strictly aquatic purposes, do serve other important conservation purposes, including: conservation of terrestrial wildlife (e.g., spotted owls, marbled murrelets, amphibians, survey and manage species); they act as a buffer-on-the-buffer (maintaining microclimate and wood recruitment in the inner buffer); they help mitigate climate change (via carbon storage); and they help prepare watersheds and ecosystems for climate change (by improving watershed resilience and providing habitat connectivity).

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[156] 1993 SAT Report, Chapter 5, p 294.

[157] 1993 FEMAT, p V-34.

There is no rational basis for preferentially re-allocating riparian reserves to the matrix. Based on the entire record of the NWFP (and subsequent science) one can make a strong argument that any portions of the riparian reserves not needed for aquatic species should be reallocated to the LSRs to serve explicitly recognized purposes of terrestrial wildlife habitat.

Fallacy: Important Fish Habitat is on Non-Federal Land, Therefore Less Protection in Needed on Federal Lands.

Reeves et al. state "The results [of Coho-centric NetMap analysis] suggest that many miles of higher-priority fish-bearing and non-fish-bearing streams occur on private lands. This argues strongly for a 'whole watershed' or 'all lands' approach to aquatic ecosystem conservation." No one disagrees that important fish habitat exists on private lands or that improved land management practices on non-federal lands are necessary for fish conservation, but these facts simply do not support an argument for reduced protection of streams on federal lands. Riparian reserves on federal lands provide important habitat for a host of species other than Coho salmon. Lands owned by the public are well suited to meet diverse public interests such as clean water, carbon storage, recreation, fish & wildlife habitat, and mitigation for past abuses, and mitigation for the sub-standard management of non-federal lands, etc.

If Reeves et al. care so much about all the important Coho habitat on non-federal lands, they should advocate vigorously for improved practices on non-federal lands, instead of advocating for reduced conservation on federal lands that remain ecologically and socially important for so many reasons.

Fallacy: Reducing Buffers on BLM Lands is No Big Deal.

Reeves et al. state "It is important to note that in this paper the discussion of using ecological forestry in streamside areas of both Moist Forests and Dry Forests applies only to the BLM Matrix."[158] Reeves et al. seem to imply that any adverse ecological effects from reducing riparian reserves and increasing logging are minimal because they only propose to reduce buffers on BLM lands and BLM lands are just a small part of the landscape. This is assumption is unsupported for several reasons:

- First, low elevation forests are disproportionately important for conservation of both aquatic and terrestrial ecosystems, but such forests not well represented on federal forest lands across western Oregon, however BLM manages a disproportionate amount of the limited low-

[158] Reeves et al. p 21.

elevation forests that are federally owned.[159] Reduced protection of important low-elevation riparian reserves is not mitigated by continued protection higher-elevation forests on other parts of the landscape.

- Second, the large blocks of habitat on Forest Service lands in the Cascades, Coast Range, and Klamath Mountains are separated by a checkerboard of BLM and private lands. To reconnect these larger blocks, BLM lands play a critical role in landscape connectivity and dispersal, as do riparian reserves. Therefore, riparian reserves on BLM lands represent a doubly important connectivity function. Wider riparian buffers help mitigate for dispersal challenges presented by the checkerboard.
- Third, BLM's contribution to the interagency conservation scheme helps meet legal requirements across the landscape. Loss of protection on BLM lands, undermines the ability to meet legal requirements on the National forests. Judge Dwyer said "The management decision made here in regard to the O&CLA lands was a lawful exercise of the Secretary's discretion. If this ruling were to be reversed on appeal, the ROD would have to be reconsidered because of the loss of important LSOG and riparian reserves."[160]
- Forth, maintaining protection on BLM lands provides regulatory stability for non-federal lands. In 2003, Oregon Department of Forestry said:

  > "[T]he Northwest Forest Plan … serves as the conservation anchor for the Oregon Plan for Salmon and Watersheds. The Northwest Forest Plan in turn took pressure off of private lands to provide for recovery of spotted owls, murrelets, and salmonids listed under the ESA. Our fear is that a leaner forest plan would no longer provide adjacent non-federal forest lands protection from added land use restrictions to comply with federal environmental laws."[161]

- Fifth, once buffers are reduced on BLM lands, there will be added pressure to reduce them on FS lands as well.

The SAT Report explained the role of BLM lands in providing connectivity between the different provinces of western Oregon:

> Reduced long-term distribution of spotted owl habitat linking the Oregon Coast Range, Klamath Mountains, and Oregon Cascades West Physiographic Provinces is highly likely to reduce chances of spotted owls moving among these provinces. The distribution of Habitat Conservation Areas proposed by the Interagency Scientific Committee on

[159] 1994 FSEIS pp S – 12, 2 – 69, 3&4 – 28, - 31, - 46, 148, - 232. (e.g., "Alternative 9 might have achieved a higher overall rating if it provided for more acreage of late-successional ecosystems in the low elevations in Oregon." By extension, reducing protection of low-elevation forests will reduce the effectiveness of the NWFP.)

[160] *Seattle Audubon Society v Lyons*, 871 F. Supp. 1291 (W.D. Wash. 1994).

[161] ODF 2003. Roy Woo, Oregon Department of Forestry letter to Forest Service regarding new forest planning rules, 4-7-03.

> National Forests alone will not meet the Interagency Scientific Committee's Strategy's requirements for well-distributed blocks of habitat connected by dispersal habitat. … [T]he Oregon Coast Range Physiographic Province has been identified as an area of concern, where the density of northern spotted owls is one-eighth of that recorded in other coastal areas. Habitat conditions on lands administered the Bureau of Land Management within the Oregon Coast Range Province are critical for maintaining a well-distributed, connected network of nesting, roosting, and foraging habitat.[162]

USFWS' 1992 critical habitat designation for the northern spotted owl explained the importance of BLM lands:

> The majority of owls and owl habitat (about 85 percent) are currently found on Federal lands**.** These lands are particularly important in the State of Oregon because very little owl habitat remains on non-Federal lands in that state. The Oregon and California lands, managed by the Bureau are more crucial to owl conservation than many other lands."[163]

Any reduction in the commitment to conservation on BLM lands will have significant adverse effects on the overall conservation scheme of the NWFP.

Fallacy: Streams Are Dynamic, So Logging is Good.

When speaking in public, Dr. Reeves often reminds audiences that aquatic systems are dynamic, which is true. Reeves et al. say the ACS "was premised on preserving key ecological processes, and recognized that periodic disturbances may result in less than optimal conditions for fish for short periods." This is also true, but the ACS is premised on "natural disturbance" that grows, retains, and recruits large woody structure, not unnatural logging that kills and removes habitat structure.

Reeves et al. seems to imply that since aquatic systems and logging are both dynamic, then logging must not be too bad for fish. This logic is deeply flawed. Natural disturbance and logging are both dynamic but they are not equivalent. In fact, the effects of logging versus flooding or fire are different in important ways. Natural disturbance processes tend to be episodic with relatively long periods of growth and recovery between disturbance events, while logging disturbance tends to be chronic, especially at the watershed scale, and logging disturbance is a cumulative addition of stress to natural disturbance regime that is still operating. Logging also requires roads that disrupt natural watershed processes that capture/store/release water/sediment/wood.[164]

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[162] 1993 SAT Report, Chapter 2, p 69. (Citations omitted.)

[163] USFWS 1992. Final rule designating critical habitat for the northern spotted owl. Fed. Reg. Jan 15, 1992.

[164] 1994 FSEIS, pp 3&4 – 55 - 59.

Reeves et al. also claim "two recent scientific advances … permeate both alternatives: 1) a recognition that aquatic ecosystems are dynamic in space and time, and 2) a recognition of the ecological importance of non-fish-bearing streams."[165] Neither of these scientific principles are new, both were well known and articulated in the NWFP, and neither principle justifies increased clearcutting near streams. The NWFP EIS says:

> Stream systems depend on disturbances to maintain and create a diversity of habitat characteristics. To maintain aquatic community viability throughout a large basin, it is necessary to maintain features of the natural disturbance patterns. The frequency, duration and magnitude of natural disturbances contribute to the maintenance of a diversity of species, populations and communities that may be uniquely adapted to these specific structures and processes.[166]
>
> …
>
> Riparian areas are particularly dynamic portions of the landscape. … Disturbances characteristic of upland ecosystems, such as fire and windthrow, as well as disturbance processes unique to stream systems, such as channel erosion, peakflow, floods, and debris flows, influence riparian areas.[167]

Increased clearcutting in riparian reserves will subject watersheds to altered frequency and character of disturbance processes that the NWFP sought to restore to more natural patterns.

Fallacy: Clearcutting is "Ecological Forestry"

Reeves et al. assume that clearcutting in within and adjacent to riparian reserves is "ecological forestry" with negligible effects. In reality, Variable Retention Harvest (VRH) is roughly equivalent to "clearcutting with reserves"[168] and clearcutting causes more significant adverse impacts compared to thinning.[169]

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[165] Reeves et al. p 11.

[166] 1994 FSEIS p 3&4 – 52.

[167] 1994 FSEIS, p 3&4 - 59.

[168] The Society of American Foresters defines "clearcut" as "1. a stand in which essentially all trees have been removed in one operation —note depending on management objectives, a clearcut may or may not have reserve trees left to attain goals other than regeneration …" http://dictionaryofforestry.org/dict/term/clearcut. Johnson & Franklin like to call their system "variable retention harvest" but as implemented it is more accurately described as "clearcut with reserves." See http://dictionaryofforestry.org/dict/term/regeneration_method and http://dictionaryofforestry.org/dict/term/variable_retention_harvest_system

[169] Olson, D.H., Anderson, P.D., Frissell, C.A., Welsh, H.H., Jr., and D.F. Bradford. 2007. Biodiversity management approaches for stream–riparian areas: Perspectives for Pacific Northwest headwater forests, microclimates, and amphibians. Forest Ecology and Management 246 (2007) 81–107.

Reeves et al. says that the "ecological forestry" methods advanced by Johnson & Franklin (2012) "incorporate principles of natural forest development, including the role of natural disturbances in the initiation, development, and maintenance of stands and landscape mosaics" and "variable-retention harvests provide optimal conditions for … development of diverse early-seral ecosystems…"[170] We refute these assertions below. To summarize, incorporating a few mitigations in the practice of clearcutting does not adequately compensate for its significant and well-documented adverse effects.

As used in current policy discussions in Oregon, the term "ecological forestry" is a misleading name for clearcutting. Variable Retention Harvest clearcutting causes a wide range of adverse effects: [171]

- VRH clearcutting removes wood legacies in direct conflict with natural processes. VRH may be better than industrial clearcutting, however, contrary to Reeves et al.'s assertion VRH does not provide "optimal" early seral habitat. Natural disturbances are more optimal because they retain a well-distributed pulse of structural legacies, while the majority of a VRH harvest unit resembles a structurally-deprived clearcut.
- VRH clearcutting requires roads that represent novel hydrological structures on the landscape that reroute water, wood, and sediment. Roads are a source of chronic sediment.
- VRH clearcutting adds unnatural cumulative disturbance on top of natural processes that are already creating early-seral forests and dynamic stream conditions. The NWFP was intended to limit, not expand, the adverse effects of clearcutting.
- VRH clearcutting causes habitat fragmentation often resulting in small disconnected islands of habitat.
- VRH clearcutting harms soil through compaction, nutrient loss, erosion, landslides.
- VRH clearcutting depletes forest carbon stores and exacerbates global climate change.
- VRH clearcutting degrades scenic views, recreation, quality of life.

Clearcutting (even with reserves) does not provide optimal conditions for wildlife, even early seral wildlife, because natural disturbances are not mimicked by logging that removes a substantial portion of the legacy structure and exposes watersheds to an unnatural pattern of chronic disturbance, instead of episodic disturbance that typifies natural disturbance regimes in the Northwest.

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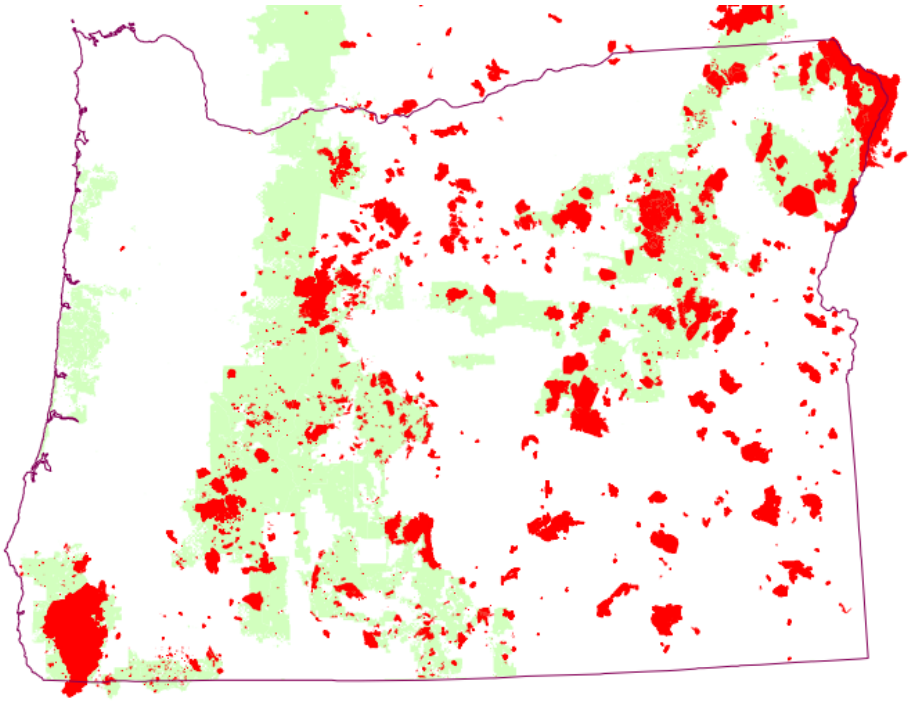
[170] Reeves et al. pp 16 and 19.

[171] See for instance FEMAT Chapter V - Aquatic Ecosystem Assessment, pp V-12 - V-29. Independent Multidisciplinary Science Team. 1999. Recovery of Wild Salmonids in Western Oregon Forests: Oregon Forest Practices Act Rules and the Measures in the Oregon Plan for Salmon and Watersheds. Technical Report 1999-1 to the Oregon Plan for Salmon and Watersheds, Governor's Natural Resources Office, Salem, Oregon. http://www.fsl.orst.edu/imst/reports/forestry.html. National Marine Fisheries Service 1998. A Draft Proposal Concerning Oregon Forest Practices. http://www.coastrange.org/documents/NMFS_FP_pdf.pdf. Beschta et al "Cumulative Effects of Forest Practices..." (33 Mb) http://www.forestry.oregonstate.edu/cof/fr/facultypages/CumulativeEffectsofForestPractices.pdf

Johnson and Franklin (2009 and 2012) assert that clearcutting with reserves makes an "ecological contribution." This vague assertion is premised on two incorrect assumptions – first, that early seral forests are underrepresented on the landscape, and second, that logging can mimic natural disturbance processes. Neither of these premises are well supported. Early seral forest is extremely abundant across the forest landscape as a result of extensive clearcutting on non-federal lands, plus fires and other disturbances that occur across the federal and non-federal landscape. This map of fire perimeters across Oregon over recent decades reveals that natural processes are still at work creating early seral habitat.



Nonaka et al. (2007) show that young forests with little structure (i.e. clearcuts) are vastly over-represented in the Oregon Coast Range, while structure-rich early seral habitat are under-represented.[172] Clearcutting creates the wrong kind of early seral habitat, while natural disturbance is more likely to create optimal structure-rich early seral habitat.

There are no ESA-listed species that rely exclusively on early seral forest conditions. In fact, early seral associated species tend to be mobile, generalists, and opportunists, finding suitable

[172] Nonaka, E, Spies, TA, Wimberly, MC, and Ohmann, JL. 2007. Historical range of variability (HRV) in live and deadwood biomass: a simulation study in the Coast Range of Oregon, USA. Can. J. For. Res. 37:2349-2364. http://naldc.nal.usda.gov/download/9953/PDF.

habitat in the wake of fire and other relatively infrequent disturbances. The NWFP EIS explained:

> Any species that find optimum habitat in burned forests must have had the dispersal and reproductive capabilities to find and reproduce in these dispersed and infrequent patches of habitat. In general, species associated with early-successional conditions are good dispersers, have high reproductive rates, and are able to persist in small patches of habitat that result from small-scale disturbance (Hunter 1990, Smith 1966)....
> Compared to their historic populations, species associated with these early-successional conditions have increased in abundance. For example, Raphael et al. (1988) estimated that populations of 11 species of birds have probably tripled over historic numbers, and another 4 species have more than doubled. Raphael et al. (1988) and Raphael (1988) compared the estimated abundance of amphibians, reptiles, birds, and mammals from historic times to their present abundance and concluded that the early-successional associates that have increased over time were associated with more open, drier conditions; were widely distributed (larger total geographic ranges than species associated with late-successional conditions); and, had wider ecological tolerances (i.e., they occupy a greater variety of habitat types). As noted by Harris (1984), birds associated with early-successional forest are more often migrants whereas late-successional associates are generally permanent residents. These studies also show that whereas some species associated with early-successional conditions reach their maximum abundance in early-successional forest, none of the species were restricted to that successional stage.
> ...
> The creation of early-successional conditions as a result of logging has produced a different pattern on the landscape than the pattern that likely would have resulted solely from natural disturbance. Patches of early-successional forest are now more evenly distributed across the landscape, and sizes of patches are smaller. This pattern may have resulted in a more widespread distribution of early-successional species than in the past.[173]

The following excerpt from Oregon Wild' scoping comments on BM's Secretarial Pilot Projects provide a productive framework to evaluate whether clearcutting riparian reserves serves valid ecological restoration objectives:

> ## Complex early seral forest
>
> One of the primary restoration objectives we keep hearing for these projects is the need to restore *complex early seral forest*. This may well be an important goal. However, this goal needs to be validated and if valid, alternative means of meeting the goal must be

[173] 1994 NWFP FSEIS, pp 3&4-203 – 204.

explored. With a little thought and creativity one can see that many ways to increase rare early seral habitat without sacrificing rare mature & old-growth forests.

Validation of the early seral habitat objective requires, among other things, asking if the current and projected amount of early seral habitat might be adequate to meet the needs of the opportunistic and generalist species that tend to occur in those areas. Only the interior valleys (and a few ridgetops) of western Oregon likely had persistent early seral conditions, while most of the federal forest landscape had transient early seral conditions associated with disturbances. Early seral wildlife species likely evolved to take advantage of early seral conditions when and where it could be found in the shifting mosaic of seral conditions.

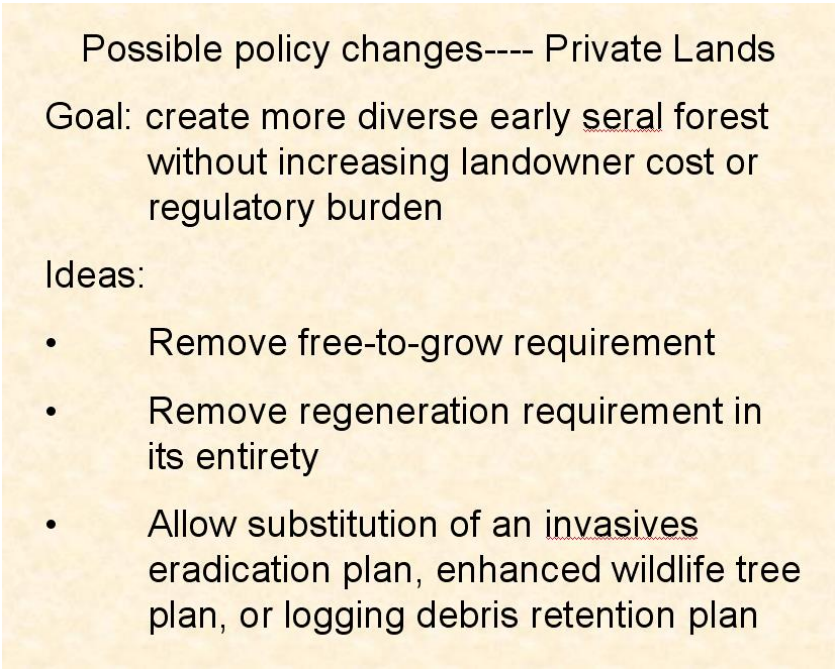
Natural disturbance processes continue to operate across the landscape, including fire, wind, ice storms, landslides, floods, volcanoes, native insects, native disease, etc. Each of these helps create various sized patches of early seral forests every year. Many predict that climate change will increase the frequency of these natural events, suggesting that any shortage of early seral conditions might just take care of itself. "Ecologically, increased distribution and frequency of disturbances may result in increased distribution and dominance of early successional ecosystems dominated by fire adapted species..." Lemieux, Christopher J., Daniel J. Scott, Rob G. Davis and Paul A. Gray. 2008. Changing Climate, Challenging Choices: Ontario Parks and Climate Change Adaptation. University of Waterloo, Department of Geography: Waterloo, Ontario http://web.archive.org/web/20101023221023/http://www.fes.uwaterloo.ca/geography/faculty/danielscott/PDFFiles/NRCAN-Report-FINAL.pdf [fn/ Conversely, it may become harder to maintain existing late-seral ecosystems and species, so existing late-successional old-growth forests should be retained in order to avoid making the shortage of late seral forest worse.]

There is widespread recognition that early seral forest is produced in abundance on non-federal lands (through industrial clearcutting). Current industrial forest practices does not produce *high quality* or *long-lasting* early seral forest. It is also true, but not widely recognized that the *absolute abundance* of early seral forest on non-federal lands might partially mitigate for its lack of quality.

Early seral vegetation also exists along many streams, rock outcrops, meadows, as well as roadsides, landings, and other disturbed sites throughout the forest. An honest assessment of the early seral shortage must account for the quantity, quality and functionality of all these early seral forest elements.

If there is indeed a shortage of complex early seral forest, we must evaluate a full range of alternative ways of increasing either the quantity and/or quality of such features. Alternatives that have been suggested include:

(a) Reform forest practices on non-federal lands to retain more legacy structures and allow a longer period of conifer establishment and more vegetation diversity after harvest, as suggested by Norm and Debora Johnson in 2007 —



K. Norm Johnson, Debora L. Johnson. 2007. Policies to Encourage Diverse, Early Seral Forest in Oregon: What Might We Do? http://www.reo.gov/ecoshare/ccamp/good_forest_opening/powerpoints/Early%20seral%20talkrevfinal.ppt

(b) Rely on natural processes such as fire, wind, insects, etc. Since the public has been misinformed that natural forest mortality processes are undesirable, this approach would work best if we increase public tolerance for natural processes. This approach may also require reform of fire suppression policies and post-fire salvage logging and replanting, as suggested by Norm Johnson, Jerry Franklin, and others in 2007 Early Seral Forest Symposium. http://www.reo.gov/ecoshare/ccamp/Good_Forest_Opening.shtml.

(c) Aggressive pre-commercial thinning in existing very young stands or failed plantations to extend the early seral stage, as suggested in the Chalk Parker Project on the Middle Fork District of the Willamette NF;

(d) Create patches of heavily-thinned, structure-rich "gaps" in variable density thinning projects in dense planted stands <80 years old, as suggested by numerous projects around the region.

All these alternative methods would allow meaningful restoration of early seral forest conditions without unnecessarily sacrificing mature forests.[174]

These comments make the case that there is no compelling ecological need to create more sub-optimal early seral forests through logging, especially when there are so many ways to enhance early seral habitat that do not require sacrificing rare mature forests, and when these mature forests are our best candidates for recruitment as future old growth and meet the restoration goals of the NWFP.

Conclusion

Reeves et al. can be commended for freely admitting that the underlying purpose of their paper, is to "search for ways to increase timber harvest and associated revenue from these lands."[175] The point of Reeves et al.'s paper is to increase logging, rather than to faithfully implement the Northwest Forest Plan — including the full suite of aquatic and terrestrial purposes for riparian reserves. This paper compels a conclusion that Reeves et al.'s proposal to reduce protection of streams cannot be accomplished without significant harm to other equally important goals of the NWFP.

Development of the NWFP, involved the most impressive team of ecological, forestry and legal expertise ever assembled. These experts did their best to balance fish, wildlife, and resource extraction. This required protecting relatively wide riparian reserves for both aquatic and terrestrial purposes. Reeves et al. are not working within the existing NWFP framework, but rather, they are trying to redefine (and narrow) the purposes of the riparian reserves and ignore the needs of terrestrial wildlife, so that more land can be devoted to timer production, and less land is devoted to conservation of wildlife and watersheds.

All the original motivations for adoption of the NWFP and its Aquatic Conservation Strategy remain compelling. Adopting Reeves et al. proposal to shrink riparian reserves will upset the NWFP's careful balance between conservation and resource extraction.

[174] Oregon Wild 2011. Scoping Comments on the Wagon Road and Roseburg BLM Secretarial Pilots. http://www.oregonwild.org/oregon_forests/forest-management/in-your-forests/files-for-eyes-on-the-agencies/Wagon_Road_and_Roseburg_Pilots_scoping_6-29-2011_BLM.pdf

[175] Reeves et al. p 48.