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Re: Scientist comments on NWFP science synthesis draft chapter abstracts

Dear Regional Forester Jim Peña:

We are writing to express our support of the science synthesis underway by the Forest Service and to provide some professional insights as chapter authors prepare their submissions. We have extensive experience in aquatic, terrestrial, and socio-economic systems in the Pacific Northwest, and, therefore, would like to offer these comments to help ensure the agency is using the best available science in the synthesis and future revision of the landmark Northwest Forest Plan (NWFP), considered a global model for biodiversity conservation and ecosystem management[1]. Notably, Dr. David Olson (invertebrates) was on the Forest Ecosystem Management Assessment Team (FEMAT, 1993), Drs. Barry Noon and Dominick DellaSala served on the spotted owl recovery team (2006-2008), Dr. Dennis Odion and Monica Bond on the US Fish & Wildlife Service Klamath wildfire group for the Northern Spotted Owl (2012), Dr. Tom Power has published extensively on regional socio-economics, and each of us has published in numerous journals on the scientific foundation of the NWFP.

Based on the agency's 20-year monitoring reports and other NWFP published reviews[1], there have been marked improvements to aquatic (e.g., water quality, riparian functions) and terrestrial ecosystems (e.g., old forests, carbon uptake and storage[2]) under the NWFP mainly due to reduced logging levels on federal lands and emphasis on ecosystem management and biodiversity conservation. Therefore, while the plan's conservation targets are on a 100-year timeline, implementation of the NWFP has yielded important ecological benefits and demonstrated progress toward the broad goals of the plan that require consistent implementation. With the emergence of rapid climate change, invasive species like the Barred Owl, and continued land-use stressors, particularly on nonfederal lands, the science points clearly to building on the NWFP successes.

[1]Summarized in DellaSala, D.A., et al. 2015. Building on two decades of ecosystem management and biodiversity conservation under the Northwest Forest Plan, USA. Forests 6:3326-3352
[2]Krankina, O.N., et al. 2012. Carbon balance on federal forests lands of western Oregon and Washington: the impact of the Northwest Forest Plan. Forest Ecol. & Manage. 286:171-182.

Having recently reviewed the chapter abstracts on the agency's website, we have specific suggestions for your consideration. Importantly, we fully support the October scheduled peer review of the science synthesis. In addition to the quality-review standards of Forest Service science publications, we recommend that independent scientists (i.e., those with no potential conflicts of interest) conduct the peer review of the synthesis. An independent review should involve scientific societies having a track record of relevant expertise regarding ecology, conservation, and forest management in the region, including as the Ecological Society of America, the Society for Conservation Biology, The Wildlife Society, and the American Fisheries Society. To ensure a transparent process is used, we request that you publish your response to the reviewers and their response back to you as to whether concerns were sufficiently addressed. It is standard procedure in a scientific peer review to determine whether the review was adequately addressed before accepting a document for publication. In this fashion, the transparent process would reflect back-and-forth dialogue used to improve chapter deficiencies.

Importantly, we would like to emphasize the need for clear statements in the introduction chapter to establish the foundation of the NWFP as a regional framework for coordinated forest planning across 19 National Forests, 7 BLM Districts, 6 National Parks, National Wildlife Refuges and Department of Defense Lands covering 24.5-million federal acres. Too often these kinds of documents begin with limited or constrained conceptual contexts that lead inevitably to conclusions that are equally limited or constrained in the context of narrow goals or lack of unprecedented importance of the NWFP in reforming unsustainable forest policies. This is especially the case as FEMAT in 1993 was tasked with determining persistence probabilities for >1,000 species within the range of the Northern Spotted Owl. The framework and overall NWFP ecosystem management and biodiversity objectives need to be carried forward in the conservation measures and chapter summaries throughout the synthesis. Instead of casting competing approaches, the synthesis should be presented as approaches consistent with the stated intent of the NWFP's conservation strategy, including adaptive management that considers the need to expand the reserve network to deal with emerging stressors. The best product will integrate different approaches and ideas but with a consistent theme.

Specific Chapter Abstract Comments and Suggestions

- *Climate and Vegetation Change in the Northwest Forest Plan Area* – we suggest that in addition to climate change this chapter include a major section on land-use stressors as cumulative impacts to ecosystems dealing with both a rapidly changing climate and land-use impacts, especially the surrounding non-federal ownerships where cumulative impacts work against the NWFP. Simply put, climate change should not be looked at in a vacuum nor should the science synthesis wait until the last chapter to integrate. The effects on biodiversity and ecosystem processes are often not linear but are cumulative and often occur in rapid sequence (ecosystem tipping points)[3]. This integration of land-use and climate stressors should take place in each chapter where cross walking of key

[3]Carroll. C., et al. 2015. Biotic and climatic velocity identify contrasting areas of vulnerability to climate change. PLOS ONE 10(10): e0140486.

concepts is germane to the main questions being addressed. Importantly, we are concerned that this chapter apparently does not include a specific discussion of forest carbon, which, instead, appears only in the Integration chapter at the end of the synthesis. Forest carbon should be singled out as a specific topic in this and the Old Growth chapter and linked to other ecosystem services and biodiversity[4]. The importance of carbon is further illustrated by the region's older forests that include some of the most carbon-dense forests globally[5]. Thus, protecting them, particularly forests not currently in reserve allocations, and extending timber harvest rotations[6], is fundamental to mitigation and adaptation strategies given there is published recognition of these forests for myriad ecosystem services[7]. We also encourage you to include carbon life-cycle assessments for determining emissions of land-use activities so that managers can choose alternatives that optimize carbon stores[8]. This is particularly germane to any discussion involving fire-related emissions compared to thinning-related emissions as modeling has demonstrated emissions from thinning most often exceed those of forest fires, even severe ones[9]. Additionally, the chapter discussion should incorporate information on the social cost of carbon[10] so that managers can determine how forest management emissions will affect the health and long-term economics of the region (perhaps this could be linked to the socioeconomics chapter as well to round out the approach to economics).

- *Old-Growth and Forest Dynamics* – we suggest that you use the new structural mapping of older forests beginning with Old-Growth Site Index 80 ($OGSI_{80}$) to define what you mean by "old-growth forests" so that mature forests also are included in this definition along with spatially explicit landscape connectivity of older forests in the reserve network and related designations. We are especially

[4]Brandt, P. et al. 2014. Multifunctionality and biodiversity: Ecosystem services in temperate rainforests of the Pacific Northwest, USA. Biological Conservation 169: 362–371.

[5]Southwick, E.A.H. et al. 2002. Potential upper bounds of carbon stores in forests of the Pacific Northwest. Ecol. Applic. 12:1303-1317. Luyssaert, S., et al. 2008. Old-growth forests as global carbon sinks. Nature 455:213-215. Krankina, O., et al. 2014. High biomass forests of the Pacific Northwest: who manages them and how much is protected? Environmental Management. 54:112-121.

[6]Hudiburg, T. et al. 2009. Carbon dynamics of Oregon and Northern California forests and potential land-based carbon storage. Ecol. Applic. 19:163-180. Krankina, O., et al. 2012. (ibid).

[7]Krankina, O., et al. 2014. High biomass forests of the Pacific Northwest: who manages them and how much is protected? Environmental Management. 54:112-121. Olson, D.M., et al. 2012. Climate change refugia for biodiversity in the Klamath-Siskiyou ecoregion. Natural Areas Journal 32:65-74. Brandt, P., et al. 2014 (ibid).

[8]See Hudiburg, T., et al. 2013. Interactive effects of environmental change and management strategies on regional forest carbon emissions. Environmental Science & Technology 47:13132-40. Also, http://landcarb.forestry.oregonstate.edu

[9]Some examples: Mitchell, S.R., et al. 2011. Forest fuel reduction alters fire severity and long-term carbon storage in three Pacific Northwest ecosystems. Ecol. Applic. 19:643-655. Hudiburg, T.M., et al. 2013. Interactive effects of environmental chane and management strategies on regional forest carbon emissions. Environmental Science & Technology 47:13132-13140. Law, et al. 2013. Thinning effects on forest productivity: consequences of preserving old forests and mitigating impacts of fire and drought. Plant Ecology & Diversity 6:73-85

[10]Interagency Working Group on Social Cost of Carbon, United States Government. 2013. *Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis – Under Executive Order 12866*. May. Pizer et al. 2014. Using and improving the social cost of carbon. *Science* 346:1189-1190. DOI:10.1126/science.125974

concerned with recent attempts to diminish FEMAT's emphasis of late-seral/old growth (≥80 years) by redefining older forests using other metrics (e.g., structurally complex, high quality owl habitat, >160 yrs) that might allow management incompatible with mature forests[11]. With regard to fire and insects, we encourage chapter authors to address ecosystem benefits of natural disturbances, even if they are occurring in older forests, as the ensuing complex early seral forests[12] are as ecologically rich as old growth. To this extent, we suggest that you include recent studies de-linking insect outbreaks from severe fires as managers have often assumed they are linked, which is clearly not the case[13]. It is important to include dynamic models when viewing effects of natural disturbances on older forests as some analyses have shown current rates of fires are not a major threat to older forests given recruitment of mature forests is outpacing fire-related replacement of old forests, assuming those forests are not logged[14]. Additionally, it should not always be assumed that wildfires are a threat to old forest associates as spotted owls and Pacific fishers have both been shown to be resilient to mixed-severity fires that include unburned (refugia) to moderately burned patches for nesting and roosting and severe patches for foraging, although an empirical dataset absent confounding post-fire logging effects has proven nearly impossible to obtain[15]. We urge chapter authors to include the extensive literature on the ecological impacts of post-fire logging on successional processes and capacity of newly created forests to become old growth over time given extensive information shows post-fire logging to be a major deterrent to biological legacy formation and natural ecosystem dynamics[16]. Thus, this chapter should clearly differentiate early seral originating from clear-felling or other approaches (e.g., "ecoforestry"[17]) vs. complex early seral originating from natural disturbances (insects, fires, etc) as there are substantial

[11]For instance, BLM Resource Management Plans for Western Oregon. 2016. Powers, M., and S. Wessell. 2016. Management impacts and developmental patterns in mature Douglas-fir forests of the Pacific Northwest: an annotated bibliography.

[12]Swanson, M.E. et al. 2011. The forgotten stage of forest succession: early-successional ecosystems on forested sites. Frontiers in Ecology and Environment 9:117-125 doi:10.1890/090157

[13]Some examples include: Black, S.H., et al. 2013. Do bark beetle outbreaks increase wildfire risks in the Central U.S. Rocky Mountains: Implications from Recent Research. Natural Areas Journal 33:59-65. Donato, D.C., et al. 2013. Bark beetle effects on fuel profiles across a range of stand structures in Douglas-fir forests of Greater Yellowstone. Ecol. Applic. 23:3-20. Meigs, G.W., et al. 2016. Do insect outbreaks reduce the severity of subsequent forest fires? Environmental Res. Letters 11(2016) 045008.

[14]Odion, D.C., et al. 2014. Effects of fire and commercial thinning on future habitat of the northern spotted owl. Open Ecology Journal 7:37-51.

[15]Bond, M.L., et al. 2009. Habitat use and selection by California spotted owls in a postfire landscape. J. Wildlife Manage. 73:1116-1124. Clark, D.A., et al. 2013. Relationship between wildfire, salvage logging, and occupancy of nesting territories by northern spotted owls. J. Wildlife Mange. 77:672-688. Hanson, C.T., 2013. Habitat use of pacific fishers in a heterogeneous post-fire and unburned forest landscape on the Kern Plateau, Sierra Nevada, California. The Open Forest Science Journal 6:24-30.

[16]For reviews see – Lindenmayer, D.B, et al. 2008. Salvage logging and its ecological consequences. Island Press: Washington, DC. DellaSala, D.A., et al. 2015. In the aftermath of fire: logging and related actions degrade mixed- and high-severity burn areas. Pp. 313-347, *In* DellaSala, D.A., and C.T. Hanson (eds), The ecological importance of mixed-severity fires: nature's phoenix. Elsevier, United Kingdom

[17]See debate - DellaSala, D.A., et al. 2013. Alternative views of a restoration framework for federal forests in the Pacific Northwest. Journal of Forestry 111:402-492.

differences in habitat quality (e.g., legacies), processes, and biological communities. Finally, we encourage chapter authors to conduct a global literature review on the **overwhelming scientific support of fixed reserves** in maintaining sensitive species, ecosystem processes, ecological integrity, and forest carbon. There is little debate globally on the scientific merits of inviolate reserves[18]. There is controversy as to whether thinning is beneficial to mature dry forests; however, there is little debate on the importance of fixed reserve networks even in dynamic systems[16,17]. The debate, in particular, has had a strong bias towards fire as a threat to ecosystems and thinning as restorative despite lacking an empirical basis or adequate discussion of thinning impacts to closed-canopy associates and fire-dependent species (e.g., Black-backed Woodpeckers). Notably, to address the role of natural disturbances in reserve dynamics, FEMAT included coarse- and fine-filter reserve networks, redundancy in reserve types and distributions, and landscape connectivity. Thus far there is no evidence that natural disturbance dynamics are inconsistent with fixed reserve concepts built on the NWFP approach or that natural disturbances are a major threat to biological communities, particularly disturbance adapted ones[1]. To this end, we request that you include in this review the importance of **expanding the reserve network to achieve fundamental biodiversity goals** (representation, redundancy, connectivity, focal species persistence). As it stands, the chapters seem to include discussions only of reducing buffers or alternative reserve designs and this is inconsistent with the fundamental conservation strategy of the NWFP.

- *Northern Spotted Owl* – regarding use of wildfire areas by owls, we note that spotted owl habitat quality mapping by federal scientists currently has not included the importance of wildfires as foraging habitat for owls and therefore is overstating wildfire impacts[14], particularly given proven difficulties in securing a clean dataset not confounded by post-fire logging. In separate meetings of federal scientists (Spies and Davis) with some of us (DellaSala and others), there was interest in revising the agency's spotted owl habitat mapping to take into account severely burned forests as owl foraging habitat. It is unclear whether agency models now incorporate burned foraging areas for owls and this omission needs a published correction. Additionally, assessing the risks of treated and untreated owl habitats should include recent published modeling studies[13] showing thinning may have a greater impact to owl habitat than forest fires. Thus, the chapter assessment should include effects of thinning on juvenile dispersal habitat (which is similar to nesting, roosting, and foraging[19]), Barred Owl encroachment given this species is a generalist and may increase with habitat fragmentation, future fires particularly if slash is not removed and prescribed burning not used, and, importantly, effects on closed-canopy prey populations. Regarding the question of whether spotted owls are more likely to persist with fire, insects, disease, and

[18]Noss, R.F., et al. 2012. Bolder thinking for conservation. Conservation Biology 26:1-4. Watson, J.E.M . 2014. The performance and potential of protected areas. Nature 6:67-73. Martin, T.G., and J.E.M. Watson. 2016. Intact ecosystems provide best defence against climate change. Nature Climate Change 6:122-124

[19]Sovern, S.G., et al. 2015. Roosting habitat use and selection by northern spotted owls during natal dispersal. J. Wildlife Manage. 79:254-262.

climate change, this question appears to treat all stressors equally when some may be beneficial (e.g., insects and fire can create snags for nesting and foraging habitat) and others nonlinear (climate change). That question also needs to be examined in the context of post-fire logging to separate cause from effect of shifts in spotted owl movements, influence of management (e.g., habitat fragmentation, thinning) on Barred Owls, and what is happening in the surrounding nonfederal ownership where nearly all forests are logged after fire.

- *Marbled Murrelet* – this chapter, like the owl and old forest chapters, has the potential to overstate wildfire impacts and underestimate logging impacts. Specifically, why are fires and insects being called out as topical questions – which are less of a threat to murrelets along the coast – but not habitat fragmentation, which is an unequivocal threat? Like the owl, murrelets evolved with periodic fire (long return intervals) but not habitat fragmentation.
- *Other Species and Biodiversity of Older Forests* – this chapter is particularly important in light of the 2012 forest planning rule given federal managers will need to also address focal species conservation and there have been ongoing efforts to strip protections from survey and management species (e.g., BLM's Western Oregon Plan Revisions). Without protection of late-seral species, as currently afforded via the survey and manage program/fine-filter approach, some species may become increasingly isolated, particularly where they persist in fire refugia pockets that are then subject to post-fire logging. This may be particularly the case in areas with high levels of endemism such as the Klamath-Siskiyou ecoregion[20]. To reiterate, this chapter should clearly address the importance of specific biological communities like range restricted endemics, the complex of native species characteristic of places to be managed or conserved under the NWFP and how those might be affected by management, climate change, and biological condition (prior, current, presumed future). It should also build on the persistence probabilities of FEMAT for rare, imperiled, and lesser- known taxa based on new information acquired from the survey and manage program.
- *Aquatic and Riparian Ecosystems* – we urge chapter authors to consider not only options for reducing riparian widths (which has been the norm thus far, e.g., BLM Western Oregon Plan Revisions) but also how can the reserve network function even better by **expanding and increasing the riparian buffers**[21]? How will narrow vs. wide buffers handle periodic drought and flooding and maintenance of watershed dynamics under a changing climate? How will increasing or reducing buffer widths affect listed species (spotted owl, murrelet); Barred Owl encroachment; invasive species; ambient temperature in the surroundings; shade and microclimate for amphibians, mollusks, and other riparian obligates; soil dynamics and compaction; habitat connectivity; and watershed/hydrologic

[20]Carroll, C., et. al. 2010. Optimizing resiliency of reserve networks to climate change: multi-species conservation planning in the Pacific Northwest, USA. Global Change Biology 16:891-904.
Olson, D.M., et al. 2012. Climate change refugia for biodiversity in the Klamath-Siskiyou ecoregion. Natural Areas Journal 32:65-74.

[21]Frissell, C.A., et al. 2014. Conservation of Aquatic and Fishery Resources in the Pacific Northwest: Implications of New Science for the Aquatic Conservation Strategy of the Northwest Forest Plan; Report prepared for the Coast Range Association: Corvallis, OR, USA, 2014; p. 35. http://coastrange.org

disruption (mainly from roads and heavy logging)? In general, however, the questions that drive the aquatics chapter appear too limited and do not reflect all of the necessary functions and processes that maintain aquatic habitats and provide important watershed and riparian functions and processes. Notably, roads and their impacts appear to be inadequately addressed, along with cumulative impacts from extensive landscape level thinning treatments in riparian areas.

- *Socioeconomic Well-Being and Forest Management in Northwest Forest Plan Area Communities* – we encourage chapter authors to include a comprehensive review of the myriad ecosystem services derived from intact federal forests and not just timber. Clearly, what communities (both urban and rural) are getting from national forests in clean air, clean water, climate remediation, long-term carbon storage, and recreation far eclipses the limited value coming from the small amount of federal timber still being harvested relative to non-federal lands. Additionally, this chapter should address the effects of log exports from private lands on the regional timber job force, automation in the industry and its impacts on timber jobs, and global economic forces affecting jobs in the industry as there has been a tendency to over-state the influence of federal logging on rural communities when, in fact, it is much more complex[22].
- *Integration* - Chapter 11 calls for an integrative approach that would merge lessons coming from the first ten chapters. Unless substantive efforts are made in each of the ten chapters to integrate within, between, and among chapters, the end product will be less useful to managers. The integration step needs to be the core of all chapters.

Finally, we encourage chapter authors to include widely accepted concepts such as ecosystem integrity, biological condition, and ecological sustainability in their assessments. Ecosystem integrity is now embraced by the Forest Service as a key concept in forest plan revisions inculcated by the 2012 forest planning rule. Ecological sustainability was addressed by the Committee of Scientists[23] reporting to Chief Dombeck and remains a key concept for inclusion in the socioeconomics chapter.

As you deliberate on these concepts, we reiterate our concern that chapter assessments include sufficient discussion of the merits of **expanding reserve networks** in this region given increasing threats to biodiversity from multiple stressors and the irreplaceable importance of myriad ecosystem services in a changing climate.

Thank you for this opportunity to consider our views.

[22]Power, T.M. 2006. Public timber supply, market adjustments, and local economies: economic assumptions of the Northwest Forest Plan. Conservation Biol. 20:341-350.
[23]Committee of Scientists. 1999. Sustaining the people's lands. Recommendations for stewardship of the National Forests and Grasslands into the next century. USDA, Washington D.C. http://www.fs.fed.us/emc/nfma/includes/cosreport/cosfrnt.pdf

Sincerely (affiliations are for identification only),

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