From: Doug Heiken [mailto:dh@oregonwild.org]
Sent: Sunday, January 06, 2008 1:11 PM
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Cc: tom.spies@oregonstate.edu; Andy Kerr
Subject: FFAC: Oregon Wild comments on Old Growth Forests

Dear FFAC,

Here are my thoughts on old-growth forests. The attached MS Word file has some supporting material.

Doug Heiken

— Oregon Wild —

Old-Growth Comments for the Federal Forest Advisory Committee

In the near future, maximizing our forests' capacity to sustainably store carbon to reduce and mitigate climate change will likely be the dominant measure of how much old forest should be conserved and restored. Luckily such forest carbon storage will be highly complementary with societal objectives for clean water, wildlife, and quality of life.

The natural range of variability is a another useful template for managing older forests because many scientists agree that the natural or historic range of variability is more likely to achieve recovery of imperiled species' populations as well as restore and sustain ecosystem services such as clean water, carbon storage, habitat, biodiversity, soil stability, fire resilience, recreation, quality of life, and the capture, storage & release of sediment, nutrients & water.

After decades of clearcutting on both public and private lands, Oregon's older forests are currently far outside the historic range of variability. In the Pacific Northwest on average over the last few thousand years scientists say that about two-thirds or 67% our forests were mature and old-growth. [1] The proportion of old forests certainly varied over time and space, but the system varied most at the smallest scales, and varied least at the largest scales. As with most variable systems they spent more time near the middle of the range and less time near the extremes.

Currently, federal lands are thought to contain roughly 30% older forests and the landscape as a whole is only about 15% older forest, some areas like the Oregon Coast Range contain dangerously less than this regionwide average.

What should the target be? The long-term objective should be to attain a dynamic range, similar to the natural system. The short-term objective should be to move the landscape "above average" to compensate for the time spent "below average." We do not need to fight over the definition of old growth nor even the precise amount of old forest needed, because we know what direction we need to move. That's all we need to know to decide we should stop sacrificing any old forest and start restoring it.

The many definitions of old-growth are a useful distraction provided by the timber industry, but this is not really a barrier to moving forward. Let's focus on which forests need to be protected and which need to be restored. Careful thinning can be used to move highly plastic dense young stands toward desired old forest characteristics, but there is a lack of evidence that logging benefits older forests where growth rates have slowed and some of the characteristics of old-growth are evident.

The authors of the Northwest Forest Plan decided that 80 years old was a useful cut-off between younger forests (<80 years) that may benefit from careful thinning because the ecological benefits are likely to exceed the ecological costs, versus older forests (>80 years) that should generally be left to develop on their own because the adverse impacts of logging likely outweigh the ecological benefits. Logging unavoidably degrades soil, water, wildlife, carbon storage, spreads weeds, and "captures mortality" which deprives developing forests of the important ecological values associated with large snags and dead wood. To be clear 80 year-old forests are not classic old-growth (yet), but if conserved, they are best suited for addressing the current deficit of old-growth forest.

In moist forests with long fire return intervals, conservation of old forests can be "stand-based" (intervention is not needed in older stands), while in dry forests with frequent fire return intervals, conservation of old forests can be more "tree-based." Dry forests often suffer from the effects of fire suppression and can sometimes benefit from the removal of small fuels in order to protect rare large and old trees from fire and drought stress. This *exception* to the principle that logging is inadvisable in older stands must be very carefully handled because research has shown that removal of commercial size logs can conflict with both fire hazard objectives and habitat objectives.

Wildlife and ecological processes know no boundaries, so we need to consider the whole landscape, not just the federal lands. The stark dichotomy that is predicted to develop between federal and non-federal forest landscapes is not desirable, because the pattern and scale of habitat patches are important. Until more non-federal forest managers change their ways and become part of the solution, we must protect more old forests on federal lands to mitigate for the lack of old forests on non-federal lands.

The timber industry posits that more logging is the answer to creating new old-growth forests, but they fail to recognize the creating new old-growth requires two things: (1) *disturbance,* which establishes new stands (but which we already have in abundance in the form of non-federal logging and natural fires), and (2) *time,* i.e. long periods of growth and recovery between disturbances (which we have too little of). Let's give forests what they need, which is time to grow, instead of what they already have in abundance, which is more logging. We can more rapidly fix the old forest deficit if we protect mature forests than start at ground zero with new clearcuts. It's better to keep the old forests we have rather than rely on logging to create new ones.

Logging does not mimic natural processes. Professional foresters are not necessarily prepared to manage old-growth forests and all the ecosystem services that the public expects from their forests. Professional foresters who were trained for the job of "tree farming" may need to be retrained for forest restoration.

Doug Heiken
January 2008

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[1] It is important to recognize that historically, those forests that were NOT old actually contained significant structural legacies left over from disturbance and that is clearly not the case today, because clearcutting and salvage logging deprive developing forests of those important structural legacies. This has adverse impacts on species associated with dead wood and complex young forests as well as old forest species that can often utilize old forest legacies when they occur in young forests.

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— Oregon Wild —

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Doug Heiken
January 2008

Supporting Materials (hastily compiled)

Why Mature Forests Must be Protected.

The agencies must protect mature forests because they are the best candidates to grow and develop into old-growth habitat in the shortest time frame.

1. There is a serious region-scale deficit in mature and old-growth forest habitat. Over time, the Northwest Forest Plan seeks to re-establish 3.44 million acres of mature and old-growth forest (http://www.fs.fed.us/land/fm/oldgrow/oldgrow.htm). But by continuing to log mature forests we are significantly delaying this recovery. If we are going to make a timely recovery from that deficit, and give struggling species a chance to survive the habitat bottleneck that we have created, we must protect mature forests so that they can become old-growth, and we must manage young forest so they can become mature.
2. The transition from mature forest to old growth is a process that takes time and varies depending on factors such as location and species and disturbance events. In a mature forest, all the ingredients are there to make old growth (e.g., large trees) and the scientists agree that these forests need protection to help meet the current old-growth forest deficit.
3. The architects of the Northwest Forest Plan found that many of our best large intact forest landscapes are mature forests, not old-growth. Some large forest fires burned westside forests between 1840 and 1910 and many such areas were skipped over by the timber harvest planners because they were more intent on converting the very old forests to tree plantations. These former fire areas, now mature forests, offer some of our best hopes of recreating large blocks of intact older forest.
4. Cutting mature forests is not needed for ecological reasons. These forests are already exhibiting the characteristics that provide excellent habitat and they continue to develop and improve without human intervention. As recognized in the Northwest Forest Plan standards and guidelines for Late Successional Reserves, stands over 80 years old do not need to be manipulated to become old-growth. All the ingredients are there, they just need time.
5. Mature forests provide essential habitat for the species we are most concerned with such as: spotted owl, marbled murrelet, Pacific salmon, and most of the "survey and manage" species.
6. Protecting mature and old-growth forest leads to a real ecological solution, while protecting only old-growth is merely a partial solution to an ecological problem that is bigger than just old-growth.
7. Cutting mature forest will remain controversial and socially unacceptable. If we seek to resolve conflict over management of older forests, protecting the old-growth while leaving mature forests unprotected would be only half a solution and would lead to more conflict. Shifting to a restoration paradigm gets everyone at the table working toward the same goal.
8. If mature forest is left unprotected, some members of the environmental community will distrust the agencies and oppose them on many fronts.

9. Leaving mature forests unprotected would leave substantial areas of roadless lands subject to future conflict. Many westside roadless areas may not qualify as old-growth, but still provide important values as roadless and mature forests.
10. Complicated environmental analysis will be required for logging mature forests compared to thinning plantations. Wildlife surveys will be needed. Environmental Impact Statements will more often be needed instead of abbreviated Environmental Assessments. Formal consultation under the Endangered Species Act will more often be triggered.
11. We do not need to log mature forest to provide jobs. Less than 2% of the jobs in Washington and Oregon are in the lumber and wood products sectors, and only a small fraction of those are on federal land and only a fraction of those are related to mature forest logging. Many more environmentally benign jobs are available in restoring roads, streams, thinning young plantations, and managing fire and recreation.
12. We do not need to log mature forest to prop up the economy. The NW economy has greatly diversified in the last decade. Our economy typically creates more new jobs every year than exist in the entire lumber and wood products sectors.
13. We do not need to log mature forest to prop up the timber industry. Less than 10% of the logging in Oregon and Washington in recent years has been on federal lands. Only a fraction of that is mature forest. Much more environmentally benign and socially acceptable timber can be derived from thinning young plantations or small diameter fuel reduction where it is appropriate.
14. Since managing these stands is not "needed" for any ecological reason or any economic or social reason, what would be the objective?
15. Standing in a mature forest, once gets the distinct feeling that "this beautiful place should not be destroyed by logging."

Table 4.5-4. Overall distribution of forest age classes in western Washington and Oregon on National Forest and industrial forestland, 1997.

10-year class mid-point	Approximate Acreage (1,000 ac.)
5	2,300
15	2,200
25	1,500
35	1,600
45	1,800
55	1,500
65	950
75	700
85	550
95	410
105	410
115	350
125	400
135	300
145	290
155	230
165	240
175	230
185	195
195	170
200+	1,350
Total	**17,675**

Source: Curtis et al. (1998).

McShane, C., T. Hamer, H. Carter, G. Swartzman, V. Friesen, D. Ainley, R. Tressler, K. Nelson, A. Burger, L. Spear, T. Mohagen, R. Martin, L. Henkel, K. Prindle, C. Strong, and J. Keany. 2004. Evaluation report for the 5-year status review of the marbled murrelet in Washington, Oregon, and California. Unpublished report. EDAW, Inc. Seattle, Washington. Prepared for the U.S. Fish and Wildlife Service, Region 1. Portland, Oregon. (p 4-77).

Manage within the Natural or Historic Range of Variability

The agency usually interprets it's multiple-use mandate to mean it has a duty to "get the cut out" and contribute wood products to the nation. However, long after the Multiple-Use Sustained-Yield Act was passed, Congress passed National Environmental Policy Act which added an environmental consideration to everything the agency does. The CEQ regulations specifically require that "Each agency shall interpret the provisions of the Act as a supplement to its existing authority and as a mandate to view traditional policies and missions in the light of the Act's national environmental objectives." 40 CFR 1500.6. This should help the agency adopt and implement the objective of managing toward the "natural range of variability" not just in terms of seral stages, but in the fullest spectrum of ecological structures, functions, and processes. Under this view, it makes no sense to conduct regen harvest, salvage, or capture mortality from mature forests when there is still variable density thinning to do in dense young stands, and it makes no sense to remove fire-tolerant trees larger than 15-18 inches dbh (or "capture mortality" from these and larger sizes classes), when there are fire-intolerant trees smaller than 12" dbh that need to be removed from fire suppressed stands near existing roads.

> Swanson et al. (1994) contend that managing an ecosystem within its range of variability is appropriate to maintain diverse, resilient, productive, and healthy

> ecosystems for viable populations of native species. Using the historical range of variability, they believe, is the most scientifically defensible way to meet society's objective of sustaining habitat.

Patrick Daigle and Rick Dawson, Extension Note 07; Management Concepts for Landscape Ecology (Part 1 of 7). October 1996. http://www.for.gov.bc.ca/hfd/pubs/docs/en/en07.pdf; citing Swanson, F. J.; Jones, J. A.; Wallin, D. O.; Cissel, J. H. 1994. Natural variability--implications for ecosystem management. In: Jensen, M. E.; Bourgeron, P. S., tech. eds. Eastside Forest Ecosystem Health Assessment--Volume II: Ecosystem management: principles and applications. Gen. Tech. Rep. PNW-GTR-318. Portland, OR: U.S. Dept. of Agriculture, Forest Service, Pacific Northwest Research Station: pp 89-106.

> A coarse-filter approach to manage biodiversity at the landscape level should:
> • protect old growth and other biologically important ecosystems; and
> • maintain a range of seral stages (Steventon 1994).
> . . . This ecosystem management approach assumes that deviations from the natural distribution of seral stages will increase the risk to biodiversity, whereas less change will decrease the risk.

Susan Bannerman, Extension Note 18; Seral Stages across Forested Landscapes: Relationships to Biodiversity (Part 7 of 7), April 1998, http://www.for.gov.bc.ca/hfd/pubs/Docs/En/En18.pdf

> Stewardship of aquatic resources has the highest likelihood of protecting biological diversity and productivity when land use activities do not substantially alter the natural disturbance regime to which these organisms are adapted (Swanson et al. in press).

FEMAT V-29.

> Province, river basin, and individual watershed analyses will provide the baseline information and define the range of natural variability. The range of natural variability thus implicitly defines the context of the "natural" disturbance regime from which decisions will be made. Decision makers will use the information developed during these analyses to decide if proposed or existing management actions meet Aquatic Conservation Strategy objectives. . . .

FSEIS Appendix B-83

Using a model based on historic fire size and historic fire frequency Wimberly 2000 estimated the mean percentage of old growth and late successional forest in the Oregon coast range during the last 3000 years.

> At the late-successional reserve scale, variability was so high that any amount of old growth from 0 to 100% might be considered historically probable. . . . Under a disturbance regime of large, relatively infrequent fires, a range of historic variability may be definable only for relatively large areas.

Michael C. Wimberly, Thomas A. Spies, Colin J. Long, and Cathy Whitlock; "Simulating Historical Variability in the Amount of Old Forests in the Oregon Coast Range," Conservation Biology, Pages 167-180, Volume 14, No. 1, February 2000; http://www.fs.fed.us/pnw/pubs/journals/0010.pdf. At the province scale, the mean percentage of old growth in the Oregon Coast Range was estimated at between 39 and 55

percent. The mean percent of late successional forest showed less variation at between 66 to 76 percent. The authors also noted that currently

> the entire Coast Range province contains approximately 5% old growth and 11% late successional forests. These estimates fall far below the 5% quantiles for percent old growth and percent late successional forest modeled at the province scale. . . . Current levels of old growth and late successional forests are so low that even halving the natural fire rotation or doubling the mean fire size would not bring them within the estimated provincial-scale ranges of historical variability.

A century of human influence punctuated by several decades of aggressive and irresponsible clearcutting and development have pushed forest ecosystems far outside the natural range of variability. Numerous species in our forests and streams qualify for listing under the Endangered Species Act or have recognized concerns for persistence. To be consistent with the Northwest Forest Plan and to help recover at-risk species, all future management actions must be designed to move forest and stream ecosystems towards the middle of the range of variability, and must NOT push ecosystems further toward the extremes. All regen harvest, salvage harvest, and road building will move forests in the wrong direction further toward the extremes. Thinning young plantations to create complexity and diversity and encourage decadence would move forest ecosystems in the right direction.

Recent research covering the Oregon Coast Range (but likely applicable to all conifer forests in Western Oregon) shows, "The majority of the landscape historically contained 500-700 Mg/ha of live wood and 50-200 Mg/ha of dead wood. The current dead wood condition is outside HRV. Stands with very low dead wood are currently dominant but rarely occurred historically." Nonaka, Etsuko, Spies, Thomas, Wimberly, Michael, Ohmann, Janet. 2004. ***Historical range of variability in biomass dynamics and stand disturbance history: A simulation approach.***
http://abstracts.co.allenpress.com/pweb/esa2004/document/?ID=35104
NONAKA, ETSUKO AND THOMAS A. SPIES. 2005. HISTORICAL RANGE OF VARIABILITY IN LANDSCAPE STRUCTURE: A SIMULATION STUDY IN OREGON, USA Ecological Applications, 15(5), 2005, pp. 1727–1746.
http://www.cabnr.unr.edu/weisberg/NonakaSpies2005.pdf
http://www.fsl.orst.edu/clams/download/pubs/2005EA_nonaka_spies.pdf

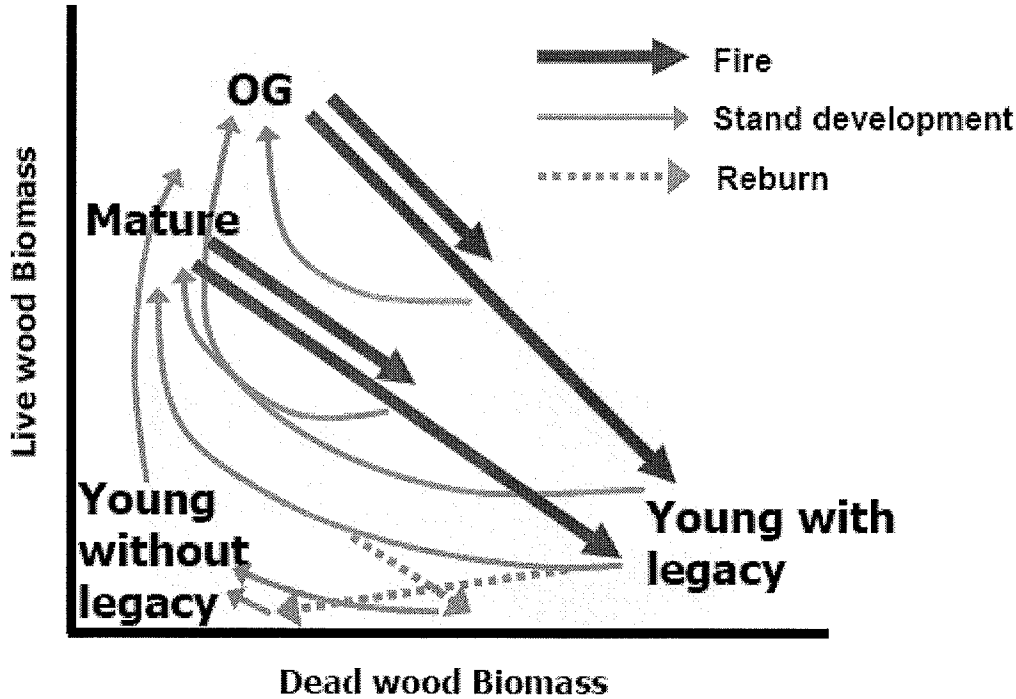

Figure 3.2: Dynamics of live and dead wood biomass in response to different fire severities and frequencies. The thick arrows are fire events, and the short ones are moderate-severity fires, which do not convert all live wood biomass into deadwood. The dotted arrows indicate repeated burns, which returned to the stand when live biomass has not been well developed. The thin arrows indicate stand development over time. "Young with legacy" refers to young stands (< 80 yrs) with high amounts of deadwood, and "young without legacy" refers to young stands with relatively small amounts of deadwood because of reburns. The shaded area conceptually indicates all possible range of pathways under the fire regime and forest growth. Under the historical fire regime, the shaded area can be considered as the HRV of biomass dynamics. Mature = mature forests (80-200 yrs). OG = old-growth forests (> 200 yrs). [from Etsuko Nonaka's MS Thesis: CHAPTER 3: HISTORICAL RANGE OF VARIABILITY (HRV) IN LIVE AND DEAD WOOD BIOMASS: A SIMULATION STUDY IN THE COAST RANGE OF OREGON, USA]

The following tables show Abundance of forest types with various combinations of live and dead wood relative to historic mean values derived from multiple 1,000 year simulations. Based on Table 3.4 *in* Nonaka, E, Spies, TA, Wimberly, MC, and Ohmann, JL. Historical range of variability (HRV) in live and deadwood biomass: a simulation study in the Coast Range of Oregon, USA.

live wood biomass	very high		mature and old-growth forests with abundant live biomass and some dead wood are significantly below the historic mean			
	High					
	moderate high			unsalvaged disturbances with abundant dead		

	moderate	clearcuts and post-fire salvage result in young forests with little dead wood. This type was rare historically but now significantly above the historic mean		wood are well below the historic mean		
	Low					
	very low					
		very low	low	moderate	moderate high	high	very high
		dead wood biomass					

Here is the same chart showing magnitude of the departure from historic mean. Each + or - represents a deviation from the mean of 1% of the landscape).

live wood biomass	very high		- - -	- - -

inexcusable in this day and age because they will only create more of the young legacy-deprived forest types that are already far in excess of natural range of variability, while reducing both old and young legacy-rich forest types that are far below natural range of variability.

> Setting targets for maintaining the natural diversity of ecosystems requires identifying the thresholds at which disturbance greater than the natural range results in detrimental change. The scientific search for such thresholds is relatively new; and, because of time lags, it takes a while for the harmful impacts of habitat change to become apparent. Consequently, empirical evidence of thresholds is restricted to a limited number of ecosystems. In a small number of landscape-level studies, habitat thresholds in temperate and boreal forests range between 10% and 80%, occurring most frequently between about 30% and 70%. Simulation modelling produces similar results: in a theoretical landscape, habitat patches start to become isolated at 30% habitat loss and all patches are isolated at 70% loss.

Robert Prescott Allen. Coast Information Team Review Report. January 2005. http://www.citbc.org/c-citreview-jan05.pdf

Manage within the historic range of variability with restoration efforts that increase under-represented elements and reduce over-represented elements.

- Existing intact habitats should be protected, while restoration focuses on areas that have been degraded by past management. The agency should defer logging in the stands older than 80 years, because these areas are relatively more intact, and because older stands do not respond as well to thinning, making the younger stands with greater expectations of thinning response a much higher priority,
- Roads are an "alien" structure in our watersheds and though they are a necessary evil, management efforts must reduce the over-built road system to the bare minimum. Riparian roads that separate streams from their flood plains and or separate them from sources of large woody debris should be the very high priority for removal. Mid-slope roads that cross streams and steep slopes are also a high priority because they are likely to disrupt the natural movement of sediment and large woody debris and deprive streams of this vital material.
- Most mature and old-growth forest habitat historically occurred in large habitat patches which are currently greatly under-represented relative to the historical condition, so existing unroaded areas should be protected, while road closures are designed and prioritized to recreate more of the large intact habitat blocks.
- Dense young stands with little structural retention (e.g. stands resulting form past clearcutting and densely replanted) are vastly over-represented relative to the historical condition. Management should focus on thinning stands that are accessible from existing roads. Thinning should always use variable retention techniques that create a variety of microhabitats and habitat gradients within and between stands. Unthinned "skips" provide important refugia and centers for dispersal for post-thinning recovery. Heavily thinned "gaps" provide important landscape scale diversity. Skips should generally be much larger than the gaps.

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fallen trees. Gen. Tech. Rpt. PNW- GTR-229. USDA Forest Service, Portland OR. http://www.fs.fed.us/pnw/pubs/229chpt1.pdf

- Stands that were artificially planted following logging often have one or a few species (such as Douglas fir) that are over-represented. Restoration thinning will require that tree species other than Douglas fir be retained as much as possible, especially large specimens. Certain trees such as Pacific yew, western redcedar, (and Sitka spruce in some areas) are under-represented and need to be planted or otherwise encouraged. Tall shrubs and other understory plants are underrepresented in dense plantations and will be helped by appropriate variable density thinning.
- Snags and dead wood habitat are critical components of healthy forests and provide not only essential habitat for a wide range of fish & wildlife, but they also provide essential functions related to soil stability and soil formation, nutrient cycling, and hydrology that are intimately tied to the very productivity of the forest. Dead wood is also far under-represented relative to the historical condition, so all future activities must manage for, not against, "decadence." This can include leaving existing snags and down wood, selectively killing some live trees, and retaining some extra live trees on site for future recruitment of dead wood.
- Healthy streams are also under-represented. Restoring connectivity and functionality to the stream network will include: restoring instream flows; removing road culverts and other non-native structures that block passage of aquatic organisms as well as blocking delivery of beneficial sediment and large wood structure to streams; restoring stream-side vegetation structure; and restoring natural processes such as floods and structure-rich landslides.

Don't Abuse the Historic Range of Variability Concept.

The agencies sometimes invoke the concept of "historic range of variability" (HRV) to justify industrial intervention such as logging and roading. However, the HRV concept is meaningless unless a scale is specified (preferably both a temporal and spatial scale). The scale of determining the historic range of variability is critical. At small scales, the amount of old forest varied from zero to 100 percent depending on how recently the site was disturbed by intense fire, flood, volcanism, etc. HRV at this scale is meaningless and must never be used as an excuse to destroy old forests. But at very large scales, such as the Interior Columbia Basin, the condition of vegetation is a mosaic that reflects the effects of fires and other disturbances. At these large scale, the historic range of variability begins to approach the amounts of young and old forest expected based on the fire return interval for stand replacing fires.

In the Northwest Forest Plan area and the Interior Columbia Basin, the amount of old forest, large trees and large snags are far below the historic range of variability. If we look only at the 5th field watershed scale we will miss this larger pattern of loss of old forest structure. Those few watersheds that are at or above HRV should be managed and conserved to compensate for the many watersheds that are below HRV.

All HRV references in the NEPA document must be clarified to specify a geographic and temporal scale and note what whether the same parameter is within the HRV at the more meaningful regional scale.

Furthermore, the agencies must avoid managing for a snap-shot in time, such as when Europeans arrived. HRV must be described as a range of values, not just a single

midpoint value. Any single-value representation of HRV represents by necessity a static world, which we know to be false. A few examples will help clarify:

1. Fire return interval should not be reported as merely a mean value and landscape exceeding that mean should not be considered outside the natural range of variability. Instead fire return interval should be reported as a histogram of fire return values for a particular landscape. See Baker, William. 1994. Restoration of Landscape Structure Altered by Fire Suppression. Conservation Biology. vol 8, no. 3, Sept. 1994. The mean fire return value will likely be one of the high bars on the histogram, but presenting fire return interval as a histogram clearly shows that fire return intervals both shorter and longer than the mean were part of the natural range of variability and should not necessarily be considered abnormal.
2. Snag and dead wood values should not be presented as simple average values measured across a wide range of sites and seral conditions. Snag and dead wood values are highly variable across space and time, so this variability should be disclosed and not hidden. While average number of snags and down wood tend to be low, high values are expected after fire or other disturbances. Management activities must be viewed as disturbance events, and as such they should attempt to emulate the natural pattern by retaining much higher levels than average levels of snags and dead wood. The NEPA analysis should at a minimum disclose the expected values of dead and down wood over time in stands subject to a natural disturbance regime and compare those values to the expected snag and dead wood values under the proposed management regime.

The speakers at the January 2005 workshop on "Using Past Ecological Conditions" emphasized a few things that the project team should consider:

1. always specify the temporal and geographic scales;
2. choose scales of analysis that elucidate meaningful system properties; (don't be devious by choosing scales that justify predetermined action)
3. specify whether climate variability is being accounted for;
4. consider the probability of various values within the range of variability; specify the expected frequency distribution for values within the historic range of variability; recognize that systems spend more time near the mid-point of the range of variability and much less time near the extremes of the range of variability;
5. restore both structures and the processes that ultimately create and sustain them;
6. state assumptions and limitations;
7. describe consequences of types and degree of deviation from the historic range of variability;
8. account for exotic species (e.g. brook trout, false brome) and exotic structures (e.g., roads and culverts).

The courts demand an honest account of HRV and how it is used in the decision-making process:

> … Although treatment may be designed to restore old growth to "historic conditions," [plaintiff] points out this can be a misleading concept: for example, information regarding historic conditions is incomplete; altering particular sections of forest in order to achieve "historic" conditions may not make sense when the forest as a whole has already been fundamentally changed; many variables can affect treatment outcomes; and the treatment process is qualitatively different from the "natural" or "historic" processes it is intended to mimic.

> ...Here, the Service is not simply maintaining the amount of old-growth habitat necessary to support old-growth dependent species — it is altering the composition of old-growth habitat through an invasive process.

Ecology Center v. Austin (9th Circ 2005)
http://www.ca9.uscourts.gov/ca9/newopinions.nsf/AD80E02F50359F82882570D0007C6849/$file/0335995.pdf

Taken in proper context, the range of natural variability is probably wider than currently recognized. Consider for example: Prichard, Gedalof, and Peterson. A 10,000-year record of fire and vegetation history in the North Cascades Range, Washington, USA. Symposium: Mixed Severity Fire Regimes: Ecology and Management. Spokane, WA. USA. November 2004.
http://emmps.wsu.edu/fire/secondary/SYMPOSIUM.html#Abstracts/Prichard.html

> ABSTRACT
> Mixed severity fire regimes are widespread throughout the Cascade Range, but few studies on the dynamics of fire and vegetation have been conducted in these systems. We reconstructed the long-term history of fire and vegetation at a montain forest site in the North Cascade Range. Lake sediment charcoal and fossilized conifer needle records, sampled at the same high resolution, were used to establish vegetation and fire histories. During the early Holocene (>10,500 to c. 7700 calibrated years before present (cal yr BP)), climate was likely warm and dry, and forests were dominated by lodgepole pine with Douglas-fir, subalpine fir and western white pine as stand associates. During the mid Holocene (c. 7700 to c. 5200 cal yr BP), regional climate gradually shifted to cooler and moister conditions. Lodgepole pine became uncommon and Douglas-fir and western white pine were dominant. Shade tolerant species including western hemlock and western red cedar first appeared at the beginning of the late Holocene (5200 cal yr BP to present). Alaska yellow cedar appeared most recently at 2000 years BP. The present forest assemblage contains the greatest tree diversity of any time throughout the Holocene record. Although climate and vegetation clearly varied over the Holocene record, fire frequency did not significantly change over millennial time scales. The high variability in fire return intervals throughout the Holocene is notable in our record and suggests that mean fire return intervals estimated from tree-ring reconstructions do not represent the variability in historic fire frequencies and should be treated with caution.

Future range of variability.

We should consider the possibility that the future range of variability is different than the historic range of variability. In other words, we raise the significant possibility that CO2 enrichment, plus cessation of native burning and continuation of fire suppression, plus climate change (different spatial and temporal patterns of wet/dry ad warm/cold) has resulted in a different range of future possibilities relative to the past? The historic range of variability is still a useful point of reference but may be an unattainable goal. How should the agency respond? We suggest that the agencies need to tolerate more dense stands while maintaining enough variability so that disturbances are controlled by discontinuities (e.g. disturbance is not overly contagious), then make sure that post-disturbance landscapes retain structural legacies and are allowed to recover their complexity.

We should recognize that forests have ecological inertia that will help them persistent through small ranges of climate variability but that large scale climate variation is on the horizon and over long time frames stand replacing disturbance is inevitable. Such stand replacing disturbances may bring on a phase transition that may divert the trajectory of the vegetation into a new attractor basin (e.g. hardwoods or shrub fields).

The stand replacing disturbance could be either fire or regen harvest, so we could choose to delay the phase transition by NOT conducting regen harvest. It might also be persuasively argued that thinning in some cases actually make forests more resilient to disturbance and forestall the phase transition.

This all assumes that we prefer forests over the alternatives, which may be placing human values on the question, but it would be best to think of it as helping all the forest dwelling critters persist a little longer before they face ever more pressure from human caused climate change.