Coast Range Association
Comments on the BLM's
Draft Resource Management Plans (RMPs)
&
Draft Environmental Impact Statement (DEIS)

Part 1.

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20. No Environmentally Preferred Alternative.

21. The 2015 DEIS/RMP incorporates by reference the 2008 FEIS and cites pages in 2008 FEIS as a substitute for doing 2015 updated analysis.

22. BLM inappropriately used the Aquatic Resource Evaluation Monitoring Program (AREMP) 20 Year Report conclusions.

23. In the past, the BLM has repeatedly deviated from the explicit requirements and essential components of its plans.

24. The best available science still indicates that individual watersheds may vary in their conditions, capability and functions. The no-action alternative is the only alternative in the DEIS that includes watershed analysis and is the only one that can address individual watershed conditions, capability and functions.

25. Overreliance on "Best management Practices" (BMPs)

26. The BLM has chosen to bypass or avoid independent peer review of the scientific information contained in the DEIS.

27. ACECs – Areas of Critical Environmental Concern.

28. Timber Harvest Practices.

29. The RMP/DEIS violates the NEPA, ESA, FLPMA and CWA because it:
1) fails to provide spatially explicit mapping of coho critical habitat;
2) fails to establish or report baseline stream quality data (e.g. stream temperature trend, stream shade, large instream wood, sediment, road densities, nutrients, toxics) for specific critical habitat streams, BLM critical habitat stream reaches and watersheds;
3) fails to adequately identify numeric standards for stream temperature, stream shade, large instream wood, sediment and road densities;
4) fails to identify required and discretionary techniques to achieve measurable progress towards quantitative standards for important habitat criteria including but not limited to stream shade, stream temperature, large instream wood, and sediment;
5) fails to identify a time table for meeting or making measurable progress towards achieving quantitative Standards; and
6) fails to coordinate with ODFW and ODEQ to develop a schedule for monitoring physical and biological parameters in Coho critical habitat to demonstrate trend from existing baselines.

29.1 Critical Habitat of ESA Listed Fishes

29.2 Timber Harvest Activity: Sediment Impacts to Designated Critical Stream Habitat

29.3 Nutrient Impacts to Designated Critical Stream Habitat

29.4 Benefits of Two-tree-height Riparian Reserves for Listed Terrestrial Species, Proposed for Listing Species, USFWS Species of Concern, and Beaver, a Keystone Species for Critical Habitat

Appendix 1. The BLM and the RMP DEIS currently uses the wrong land allocation hierarchy of

standards and guidelines in the NWFP ROD.

Appendix 2. The BLM merges the "Affected Environment" section of a typical EIS out of existence which allows the agency to narrowly identify only those aspects of the environment they want to analyze.

Appendix 3. Comparison of ACS Objectives (No Action) with Management Objectives (Action alternatives).

Appendix 4. Hydrologic Impacts.
Adapted from an unpublished and unwanted (scuttled by the agencies) hydrology whitepaper, with only the relevant (coastal basins) information included.

CRA Comments: Literature Cited

Text of the CRA's submitted comments begins on the following page.

Coast Range Association

Building just and sustainable communities that provide for people and the natural world.

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August 20, 2015
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RE: Coast Range Association comments on BLM Draft 2015 Resource Management Plan/EIS for Western Oregon

On behalf of hundreds of member households and thousands of supporters throughout the Coast Range, Oregon and the nation, the Coast Range Association (CRA) submits these comments addressing the Draft Environmental Impact Statement (DEIS) for the Resource Management Plans (RMP) for BLM forests and watersheds in Western Oregon.

1. The RMP DEIS does not take a "hard look" at the impacts of removing all relevant aquatic standards and guidelines linking riparian, key watershed, hydrologic, physical, chemical and biological processes and their management to the nine Aquatic Conservation Strategy (ACS) Objectives and other requirements of the Northwest Forest Plan (NWFP).

There are over one hundred standards and guidelines in the NWFP Record of Decision (ROD) applying to lands within the range of the northern spotted owl that reference and require compliance with the ACS and its Objectives. These, along with the major components of the ACS, including watershed analysis, designated Key Watersheds, watershed restoration, riparian reserves (RRs), and Late Successional Reserves (LSRs), were intended to ensure that decades of past aquatic and riparian ecosystem damage would be reversed over the 50-100 year timeline of the NWFP.

2. The RMP DEIS fails to accurately describe the No-Action alternative and the full range of protections that the ACS and its standards currently provide in contrast to all action alternatives that remove protections.

The No-Action alternative is the only alternative that offers adequate science-based guidance and required Standards to promote maintenance of

stream and watershed conditions where they are currently functional, and to promote restoration where they are not.

3. The RMP DEIS does not present the complete array of resource concerns and issues that comprise the Affected Environment.

The RMP DEIS does not contain a sufficiently separate Affected Environment section. Dispensing with the Affected Environment section for a complex and controversial EIS allows BLM to avoid taking a hard look at degraded landscape conditions, and move quickly into modeling focused on projecting future impacts of a select set of issues. This appears to be a convenient way to ignore many environmental consequences that are of great concern to the public, such as harm to water quality, fish, and wildlife. Combining the "Affected Environment" and the "Environmental Consequences" sections in NEPA is not correct for highly complex actions with a large number and type of wide-ranging, significant impacts to the human environment. This flaw is exacerbated by inadequate scoping and inattentive or biased consideration of public scoping comment for determining significant issues "affecting" the human environment. In general, it appears that the few "issues" driving the development of this EIS were a result of political power and influence.

4. The RMP DEIS fails to take a hard look and disclose to the public the connected structure and overarching requirements of the NWFP ROD.

Such a hard look must address the ACS objectives, components, and Riparian Reserve Standards which overwrite and enhance provisions of all current RMPs even if the written language of the individual RMPs fail to incorporate all NWFP elements or incorrectly interpret the interrelated nature of objectives, components, guidance and standards. All because the 1995 RMPs were legally amended by the NWFP and must include all aspects of the NWFP if more protective than older, pre-1995 standards.

5. Because of items 1-4 above, the RMP DEIS fails two key tests of NEPA adequacy: correctly identifying the No Action alternative and meaningfully evaluating the impacts of each of the action alternatives when compared to those of the no-action alternative. The selection and comparative weighing of the impacts of alternatives is at the very heart of NEPA.

6. BLM often either claims "no significant impact" or states broadly that impacts cannot be determined at the scale deemed relevant by BLM to the decision scope.

But given the scale at which timber harvest and road management will be implemented by BLM, and the dramatic departure from existing conservation requirements under the NWFWP, it is only possible to assert no significant impact if you skirt the relevant issues, then restrict the analysis to a few highly simplified, mechanistic models designed to address only one or a few factors of interest. The premise that there is no way to determine an impact is easily rebutted by the fact that the BLM can (and often does) model the impacts. However, even then, the BLM's model maintains the "no significant impact" fiction. BLM's highly mechanistic models are all designed to show little or no

impact to resources of concern. This also suggests a paradox: if the models are correct that impacts are not significant, then an EIS is not required.

7. Regional Administrators of the primary federal agencies involved in the NWFP have not disclosed to the public that BLM has been found to be cutting numerous corners in implementing the ACS Objectives and protective ACS-related Standards over the past twenty years.

The impacts of ignoring or not fully implementing the ACS provisions in the NWFP have not been addressed in the DEIS, nor were these impacts expected or considered in the Final SEIS for Option 9, or the previous Federal Ecosystem Management Team (FEMAT) science synthesis reports that led to the protective aquatic and riparian provisions in Option 9 of the NWFP. Further, the DEIS fails to address the legacy of adverse impacts of past BLM actions (significant landscape damaging actions and projects prior to 1994-5, before the adoption and implementation of Option 9, i.e., the No Action alternative). Past and, in many cases, ongoing adverse impacts need to be analyzed along with current impacts of the BLM's misinterpreting and partially following the relevant standards in the ACS. The failure of the DEIS to account for the BLM's history of inadequate NWFP ACS implementation results in failing the third major litmus test of an EIS which is an accurate assessment of the NEPA environmental baseline (properly framed: what actually happens now and continues to happen into the future under the no-action scenario). The baseline is an essential starting point to do valid cumulative impacts analysis, which is another critical NEPA requirement. As such, BLM's cumulative impacts analysis also fails the litmus test of a "hard look" under NEPA.

The past and ongoing impacts of BLM (and USDA Forest Service) land management program and project-level actions have been hidden by a number of policy changes and sleights of hand interpretations. First, the impacts of the Rescissions Act of 1995 (the "Salvage Rider") have not been analyzed as part of the environmental baseline in NEPA. Under the Salvage Rider, acting in conflict with their responsibilities to protect the lands, waters and ecosystems they manage, BLM proceeded to carry out numerous legally enjoined and contested timber sales and roads projects. In all cases these projects went forward without any analysis of their likely impacts to listed fish (due to the "sufficiency language" in the rider) or ESA section 7 consultation. In addition, both before and after the Rescissions Act, all agencies charged with implementing the NWFP and ACS relied on weaker "transitional" standards and guidelines for a period of two- to-three years.

The BLM took significant advantage of the "interim guidance" (during ~1994-1998) to carry out numerous "borderline" projects that were not fully consistent with the ACS Objectives and Standards. Watershed analyses took several years to complete with many not being finished until 1999 or 2000 (or even 2001 for many non-key watersheds). Soon after the aforementioned period the "Healthy Forests Act" of 2002 further weakened analytical requirements for forest fire suppression activities, salvage sales, and "fuels reduction" projects. These projects were "categorically excluded" from NEPA, essentially by fiat.

In 2004 BLM was sued successfully for not implementing protective Survey and Manage requirements in two such projects, but there were many more projects located within the BLM RMP planning areas that were inconsistent with the ACS and its objectives.

8. The DEIS inadequately addresses current observable climate trends and the potential for further climate change impacts requiring greater aquatic and riparian protections when evaluating impacts of the alternatives, including no-action, both currently and moving forward over time.

9. The RMP DEIS portrays existing and planned thinning in riparian reserves as having few limits.

Yet, commercial timber harvest within RR boundaries is generally prohibited under the no action alternative on West Side forests. The BLM and USFS are not allowed to count timber volume taken from RRs toward meeting "timber targets" as part of their "programmed" timber outputs. Said another way, any such volume has to have an ecological not an economic justification. Yet, recent best available science increasingly suggests thinning in Riparian Reserves has multiple effects contrary to ACS objectives.

10. RMP DEIS ignores a recent, comprehensive scientific review of the ACS (Frissell et al. 2014).

The ACS alone, while a significant improvement over past aquatic systems management, is insufficient to avoid lasting and irretrievable damage to fisheries and aquatic ecosystems. A recent science synthesis supports the conclusion that the ACS needs to be strengthened to remain a viable, conservation strategy in light of newer scientific evidence. New science regarding climate change, cumulative impacts of timber harvest, thinning, extensive ground disturbance, riparian vegetation removal, and road related impacts on adjacent, non-federal lands were all considered. The entire report (Frissell et. al 2014) is included in these comments as Appendix 5.

Beyond the basic ACS provisions, the NWFP's other protective standards and components for terrestrial resources, also proposed for removal in all the DEIS action alternatives, were expected to provide significant benefits to aquatic systems over time. Late-successional and old-growth management provisions (e.g., LSR Objectives, LSOG retention standards within watersheds), the limited yet important roadless standards (i.e., the strict standard requiring "no new roads in remaining RARE II areas if they were located within Key Watersheds"), and Survey and Manage standards are but a few categories or sets of standards that, along with the ACS, are necessary (but sadly not likely sufficient) to ensure conservation outcomes that were predicted by the FEMAT scientists for a wide variety of species.

11. RMP DEIS "management objectives" which apply to all newly revised RMPs are significantly weaker than the nine Aquatic Conservation Strategy Objectives (See Appendix 3).

No analysis is offered in the DEIS to fully explain how the new management objectives and direction would lead to an adequate protection of aquatic and riparian-dependent resources, or how

those management objectives are to be achieved (other than assumed sufficiency of BMPs). In comparison, the ACS Objectives in the No Action alternative are to be achieved specifically by following the Riparian and Key Watershed Standards and Guidelines of the NWFP which link directly back to the ACS Objectives as well as to the statement (the statement is in NWFP ROD, Appendix C, hence part of the No Action S&Gs themselves) preceding each of the ACS Objectives that "Lands… will be managed to…[meet the objectives]" and the related S&G requiring managers to support their findings of project level ACS consistency using watershed analysis. In the action alternatives, there are lists of BMPs but a) these do not have to be explicitly followed; b) they do not clearly connect to simplified management objectives or weakened management direction; and c) managers are not required to use watershed analysis, where the findings are scientifically supportable, to determine what are the appropriate practices for the specific watershed to achieve the ACS Objectives over time.

The BLM DEIS has not fully analyzed the impacts of these changes in Management Objectives on streams, waterbodies and fisheries. This should be done in the Final EIS.

Key CRA Finding: There is no scientific basis or justification for the changes in management objectives and direction from those already contained and well justified in the NWFP/ACS (No Action alternative). BLM must provide an explicit scientific basis for the changes in management objectives and management direction in the FEIS.

12. All key functions provided by the Riparian Reserves are not analyzed and the existing Sandards and Guidelines for riparian reserves are made less protective with fewer physical, hydrologic and biotic functions mentioned.

This shift toward less holistic treatment of the full suite of functions of RRs needs to be fully analyzed in the FEIS. The BLM DEIS limits its analysis of the numerous functions provided currently by Riparian Reserves to only those BLM chooses to model (principally shade, sediment, peak flows, and large wood). In doing so, the BLM uses highly questionable assumptions (and in many cases, misinterprets their own cited sources) regarding hydrologic and physical processes and system responses. BLM must analyze all the functions represented in the ACS Objectives that will be lost or further degraded under the new set of management objectives and weakened direction. As stated earlier, in the NWFP ROD numerous explicit Standards and Guidelines link back to the requirement to "meet" (the NWFP defines as "not retard or prevent attainment of") the nine ACS Objectives and the processes and functions described within them, which are complex and also highly specific. Explicit Riparian Reserve standards that have this interrelationship to the ACS Objectives and functions apply to most if not all individual management activities within the Riparian Reserves, as well as outside them. A comparison of functions and processes to be examined is in Appendix 3.

13. Inadequate range of alternatives.

No alternative that would increase RR widths from the current, default delineation of 1-2 site potential tree heights or 100' minimum depending on stream and waterbody type. There is an inadequate range of alternatives in the DEIS largely as a result of inadequate scoping of issues, and

the DEIS limited Purpose and Need statement. (See comment 14 below).

The BLM has this to say about why they did not include an alternative that increases the RR widths: "This [potential] alternative would include Riparian Reserves that would be wider than the Riparian Reserves in the No Action alternative (i.e., more than two site-potential tree heights on fish-bearing streams and more than one site-potential tree height on non-fish-bearing streams). **Such an alternative would be substantially similar to the Riparian Reserves in the No Action alternative, because of its effect on the conservation and recovery of listed fish and the protection of clean water.** Based on the results in the interagency Aquatic and Riparian Effectiveness Monitoring Program (AREMP), which evaluated watershed condition and trend for a fifteen-year period (1994-2008) in the Northwest Forest Plan area, the protections provided, in part, by the Riparian Reserves are improving watershed conditions (Lanigan et al. 2012)" (DEIS Alternatives, p. 80, emphasis added)

The bolded portion identified above is in error. The full implementation of the ACS, including RR widths and protections is necessary, but not necessarily sufficient, to conserve listed fish and to protect clean water. This has already been demonstrated by the inconvenient fact that salmon species listings continued to be needed after the NWFP was written and the ACS was implemented in 1994 (part of the determination that goes into ESA listing decisions is the adequacy of existing regulatory mechanisms).

Furthermore, most streams on BLM lands remain listed under Section 303(d) of the Clean Water Act. Frissell et al. (2014) state that the ACS is in need of significant improvement to address current inadequacies. ACS improvements are necessary to address: fish species listings and recovery plans that have occurred and put in place since 1994, climate impacts that were not foreseen when the ACS was developed, and heavy clearcut harvest, salvage harvest, and road impacts both on federal lands (via the history of abuses outlined under comment #7 above) and on adjacent non-federal lands particularly in the last 5-10 years, among other factors. Moreover the ACS is being eliminated by the action alternatives and no improvements are being provided.

AREMP monitoring does show limited improvements in some watershed variables, but it must be clarified in the FEIS that:

a) AREMP uses HUC (mapped hydrologic unit) boundaries, not "true" watershed boundaries which in many cases are smaller and may not have been sampled sufficiently. Many actual small watersheds that were seriously degraded remain so despite the rosy picture painted by AREMP.
b) AREMP, as designed, cannot be interpreted as biologically or ecologically meaningful for any particular stream reach, or watershed because the overall scale of AREMP inference is the regional NWFP area.
c) AREMP has not undergone one completed "before/after" test sequence and hence the reported results of AREMP are preliminary

On this last point AREMP results currently cover less than 20 years of (at best) partial and lackluster implementation of the ACS. This is less than $1/5^{th}$ to $1/10^{th}$ of the time necessary to achieve aquatic and riparian system recovery from a generally degraded condition, which is roughly one to two centuries.

The DEIS goes on to say: "Additional width of Riparian Reserves would not provide additional protections for fish habitat or water quality. Furthermore, **the Riparian Reserves in the No Action alternative were designed to meet an array of objectives, including broad ecological objectives and riparian and terrestrial species habitat. In contrast, the Riparian Reserves in the action alternatives are designed to meet narrower objectives:** conservation and recovery of listed fish and protection of clean water, consistent with the purpose and need for action. **Because of these narrower objectives, the action alternatives considered in detail do not include widening the Riparian Reserve widths.** (DEIS. Chapter 2, pages 80-81, emphasis added)

Additional widths of Riparian Reserves would certainly provide additional protections for fish habitat and water quality. In the science based ACS, watershed analyses are used to determine final RR widths. Using watershed analysis correctly it was expected that in some cases the initial (interim) widths of Riparian Reserves would have to be increased. The conditions included such things as landslide risk, slope steepness, underlying soil/rock type, adjacent wetlands, springs/seeps and groundwater connections, floodplain width, inclusion of the inner gorge in steep V-notch systems, potential for channel migration, wetland connectivity, and stream density.

Climate change impacts will require riparian reserves that are sufficiently large to allow for species movements across larger landscapes, including directional movements to the north and upslope for many climate sensitive species, as well as species that must make movements from hotter and drier to wetter and cooler environments, particularly amphibians.

The BLM has essentially admitted that the purpose and need in the DEIS is too narrow to allow for science based conservation of wildlife populations (See comment 14, below)

14. The BLM has established a Purpose and Need statement that is not based on a full evaluation of existing and foreseeable resource needs and conditions.

The "Purpose and Need" statement in the DEIS is biased toward timber outputs, ignores the current ecological status and conservation importance of BLM lands and will perpetuate management failure if it does not consider climate impacts and projections as a contributor to current and future impacts to streams, fish, aquatic systems and water quality.

The Purpose and Need statement misrepresents the current status and trend of BLM lands within the larger landscape that, generally, are dominated by industrial forest owners whose management regime follows financial objectives mandating intense disturbance through short rotation harvest times. Such interspersed private landscapes are depauperate of many forest and aquatic values. The FEIS must correct the above DEIS shortcoming and assess interspersed private landscapes at multiple ecological scales to establish watershed baselines.

The DEIS is premised on an incorrect statement of existing legal requirements, placing the O&C Lands Act of 1937 legally above all other environmental laws – particularly the Clean Water Act and the Endangered Species Act. Such a hierarchy is incorrect and severely limits the development of alternatives that address many pervasive pre-existing and evolving "problems" critical to identify (for ex., through adequate NEPA scoping) and examine in detail: ESA listings since 1994-5, Clean Water Act 303(d) listed waterbodies and actual and projected climate impacts for this

region which include, among other things, decreased summer low flows, increased nighttime and summer stream temperatures, reduced connectivity of streams and wetlands during longer and more intense periods of drought, and loss of snowpack leading to altered hydrologic regimes (not only in current rain-on-snow zones, as BLM asserts (see comment 16, below).

The above flaw also applies to the missing "Affected Environment" section of the DEIS, which, as stated earlier, is how BLM skirts an assessment of on the ground conditions and evolving landscape dynamics related to terrestrial and aquatic conditions.

15. "New ESA listings" in some chapters of the DEIS are relegated to the future but in fact there have been new species listings since 1994-5.

16. Biased and incomplete hydrologic modeling and analysis

Using a hydrologic model the BLM states that "Less than 2 percent of the decision area would be susceptible to peak flow increases over time under any alternative. The No Action alternative and Alternatives A and D would result in slight decreases and Alternatives B and C would result in slight increases in the number of sub-watersheds susceptible to peak flow increases." (Chapter 3, Hydrology, page 286)

First, BLM limits the hydrologic analysis to "peak flows." There is no stated basis for this and no explanation of why any other flow attributes of potential interest are not evaluated. For example the other attributes that BLM currently must evaluate under the no-action alternative, pursuant to ACS Objective number 6 before major entry into riparian reserves or key watersheds are: "...timing, magnitude, duration, and spatial distribution of peak, high, and low flow [all of which] must be protected." (NWFP ROD page B-11).

Focusing only on peak flows appears to be based on a set of assumptions that are not scientifically supportable. The typical assumptions are that peak flows (as opposed to low flows, base flows or the timing and spatial distribution of flows), are the only flows that affect the stream channel or biota, and that it is the highest of the peak flows (e.g., only the 50- or 100-year recurrence-interval events) that are most damaging, either in the short- or longer term. These assumptions are incorrect. In fact, many species depend on sufficient flows in late spring and summer, natural pattern and timing of higher flows for attraction and spawning, consistent base flows to maintain habitat extent, or a natural pattern of surface water distribution. These species require sufficient summer low flows, base flows, and relatively natural temporal and spatial patterns of flows – patterns to which their life histories and movements are often uniquely adapted.

Also, the 1-2 year recurrence interval events (or 1-2 year flows) are considered by even basic hydrology texts (Leopold et al. 1964) to be channel maintenance flows. These smaller yet frequent peak flows (those that statistically recur every 1-2 years) appear to increase after clearcutting for a period of 5-8 years, with the time period of increase varying on the rate of vegetation regrowth, and the prior condition of watersheds which affects their potential for hydrologic recovery. (See Appendix 4).

Despite citing the Grant 2008 hydrologic synthesis paper (which is a Forest Service technical report, not a published peer reviewed synthesis of the literature) the BLM fails to mention that there can be significant impacts caused by even small increases in the 1-2 year peak flows. These frequent flow events also have the advantage of providing sufficient sample sizes and statistical power to be analyzed separately with reasonable confidence, which is not true of larger, less frequent peak flow events. Also, following an increase in winter or early spring peaks for roughly 5-8 years, the late summer flows (low flows) tend to decline for a much longer period (up to 30 years post logging). (See Appendix 4)

The BLM fails to mention impacts to summer low flows which, combined with increases in drought conditions due to current and projected climate change, is a significant oversight. The BLM must address the impacts of all alternatives on low flows not just peaks. Drying of streams in summer means shallower water, leading to both loss of overall habitat extent and to warmer stream temperatures

The BLM's model is biased in that it only considers peak flow impacts to be of concern in the Rain-on-Snow (ROS) transitional zone within watersheds (this is a misinterpretation of and inconsistent with the findings of Grant et al. (2008 and other researchers); peak flows can also increase in the rain dominated zone and snowmelt zones, and the only watersheds of concern for management-induced peak flow to be those that are above a fixed threshold of land management activity – a threshold that is artificical.*

*Looking at Grant et al.(2008), specifically Figures 8 and 10 (which BLM misinterprets) there are no such thresholds present; instead, for watersheds both with and without roads there is a relatively linear response relationship for all peak flows combined, as well as for peak flows only in the rain-on-snow zone. There is no threshold of response, i.e., no point of inflection or rapid increase. It appears to be simply a linear relationship which is quite likely the case – the greater the area harvested and/or roaded, the greater the impact.

In addition to the synthesis report (Grant et al. 2008) there is a wide ranging, published, peer reviewed scientific literature on flows dating back to the early 1970s. That literature is replete with studies that have found significant hydrologic impacts of timber harvest and roads (see Appendix 4).

BLM's methods of analysis are biased and appear to be selected in order to ensure that analyses are incapable of detecting environmental and resources responses of BLM's proposed actions For example, in their hydrologic model BLM delimits the watersheds that contain "sufficient" amounts of land within the transitional rain-on-snow dominated flow ("ROS") zone, removing from further analysis any watersheds that have less than 60% ROS (this assumption that watershed with less than 60% ROS area screen apparently excludes the majority of watersheds with BLM ownership in its first step). Then the DEIS determines what percentage of the overall planning area might experience "increased peak flows" based on projected levels of management activities in the remaining few watersheds that passed this arbitrary 60% s screen test (they do this by removing any watershed where less than 19% of the watershed would experience regeneration harvest and roads from further analysis—again with no clear scientific justification for such a threshold). This leaves only a few small sub-watersheds within the planning area/region and a very small

percentage of BLM lands "of management concern" for peak flows. The 19% value is not a scientific threshold for hydrologic response. Rather it is where a statistical relationship (in Grant et. al. 2008) crosses the +10% peak flow, which in that paper is assumed to be a "detection limit." A detection limit is not an effect limit. Environmental effects can and will occur regardless of what we identify as the detection limit, or power of a particular analytic method and specific type of data to detect an effect.

There are a number of problems with relying on this method. The linear fitting of the relationship appears to be based on data for all peak flow event types–not just ROS but also rain or snow dominated. But the BLM in their choice of model has already excluded all rain-dominated systems prior to applying this relationship. This unexplained and baffling methodological incongruity alone throws question on the veracity of the analysis and results. Second, the peaks used in the Grant et al. 2008 paper (Grant et al. 2008, figures 8 and 10) include all reported peak flow event magnitudes (peak flows of various sizes), not only the more management-sensitive 1-2 year peak flows (see Appendix 4). This adversely affects the +10% peak flow "detection limit." The smaller 1-2 year peak flow events (and in particular those for smaller watersheds) need to be evaluated separately to determine what a reasonable, i.e., precautionary, "management limit" might be in many BLM checkerboard watersheds. Third, the BLM uses projected (future) management levels within watersheds and thus ignores the fact that most if not all BLM mixed ownership watersheds are already heavily managed and extensively roaded. Hydrologic response to BLM actions will in the real world, on the ground, reflect the cumulative effect of past BLM logging and roads, together with logging and roads on adjacent lands not under BLM management, together with the effects of future timber harvest and road construction or reconstruction actions programmed in the plan period.

Climate projections for the region do not fully agree on a general trend for precipitation but it appears that the ROS zone may shrink or expand, depending on normal decadal variability due to ENSO/PDO cycles. That means that the snow zone in some years may become rain-on –snow dominated, and with an expected increase in winter season precipitation, parts of the present rain-dominated zone may become rain-on-snow dominated in others. Many floods result not from rain on snow events within the "ROS" alone, but during anomalous juxtapositions of cold weather producing snow to the middle and lower elevations, followed by a warm front producing rain that rapidly melts the transient snow. Climate change models generally project a strong increase in the juxtaposition of warn and cold weather that will produced rain on snow runoff from a much broader range of elevations and larger number and area of watersheds than BLM's analysis admits. The BLM needs to use a stochastic and dynamic model that includes intraseasonal climate variability to determine where or how much ROS will exist and where and how it may be affected. However, again, the BLM must not limit its analysis to peak flows.

The BLM neglects to fully analyze hydrologic and other impacts to intermittent streams which are a large proportion of the total stream miles in many watersheds. The BLM also fails to fully examine the hydrologic impacts that occur now due to ongoing, generally poor identification and appropriate management of intermittent streams. Intermittent streams are by definition ephemeral features of aquatic landscapes. In practice, the agencies only retain standing trees in the correctly defined (minimum 100') riparian buffers if water is seen flowing in the channel at the time the units are flagged. This practice was adopted in 1995 (facilitated in many cases by scientifically deficient watershed analyses) but is now institutionalized. The loss of relevant geotechnical and hydrologic expertise within the BLM district and field offices and at the two consulting agencies,

combined with an increase in "contract logging" and outsourcing of timber sale planning, allows untrained staff to make the call when flagging the units.

The NWFP uses specific language to determine the presence and extent of intermittent streams. It includes all streams (even if fully dry) showing "evidence of scour or deposition." With climate changing, it is imperative the BLM use this definition when delineating all intermittent streams. All intermittent streams should receive 150' no cut vegetative buffers on either side, measured as slope distance from the outer edge of the floodplain if evident or from outer edge of the area of visible scour and/or deposition (not "ordinary high water mark" as this is not always evident for intermittent streams), in all alternatives. Analyses completed since FEMAT have determined that full protection of intermittent streams, seeps and areas of groundwater to surface water interaction (i.e., headwaters) is even more critical than the FEMAT scientists believed or were able to incorporate (largely for political reasons). Intermittent stream buffers of only 100' or less on either side are essentially inadequate to protect watersheds from cumulative hydrologic, thermal, erosional, and sediment impacts

Persistent or recurrent drought makes streams dry out starting from the top, which could reduce previously cold and productive stream miles available to fish, and potentially freeing up riparian areas for more extensive or intensive timber harvest over time. The BLM DEIS needs to evaluate the full range of biophysical processes and resource elements affected by riparian and near-stream logging and road construction and maintenance, and analyze what impacts, both on-site and downstream, are likely to be reduced riparian buffer protection. BLM needs to address how perennially flowing streams will shrink, and intermittent streams dry up or disappear, given climate change projections particularly during drier cycles. In fact this is probably already happening on BLM lands, exacerbated by increased evapotranspiration coupled with increased sediment loads from second-growth, post-logging forests, as affected by BLM forestry practices, state forest practices, and non-federal forestry practices, coupled with interference of natural flow paths via extensive ground disturbance, soil compaction, landings, and roads.

Culverts and road/stream crossings further reduce fish passage and accessible habitat area. Road system extensions increase water spreading (water diversions, road cuts, gullies, roadside ditches, and other runoff channels expand the pattern of flows) and reduce in-stream flows particularly in late spring and summer. In fall and winter the roads themselves may become "streams" and alter both flow and sediment regimes. What effects do BLM's present and proposed road networks have on the timing, magnitude and spatial pattern of flows? Will the alternatives improve flow and sediment conditions in streams, cause them to worsen, or sustain them in the current, mostly highly degraded state? The DEIS appears reluctant or unable to disclose such basic factual and verifiable predictions that should flow from a reasoned analysis grounded by best available scientific information and methods.

What do the findings of Watershed Analyses conducted by BLM tell us about potential responses of watersheds, aquatic ecosystems and riparian sources to changes proposed by BLM in alternatives of this DEIS? A review of BLM watershed analyses throughout the region (Please see Pacific Rivers Council, comments on BLM WOPR DEIS, and briefly summarized and cited in Frissell et al. 2014) would demonstrate that RR widths have quite often been reduced without basis particularly for intermittent streams and non-fish streams. These reductions have hydrologic consequences as well as impacts to sediment regimes, nutrient flows and aquatic food chains. These whole categories of environmental impact are not addressed or disclosed in this DEIS, and

need to be fully analyzed in the FEIS (See Frissell et al. 2014).

17. Outdated and biased LWD analysis

The Large Woody Debris (LWD) Recruitment analysis relies on 2008 modeling and is inconsistent with best available science and with the actual condition of riparian stands on the ground, particularly in coastal streams and tributaries in central to northern Oregon.

An interagency panel (the "Large Wood Elevation Team", Spies, T., M. Pollock, G. Reeves and T. Beechie. 2013. Effects of Riparian Thinning on Wood Recruitment: A Scientific Synthesis. Report of the Science Review Team, Wood Recruitment Subgroup. USDA Forest Service Forestry Sciences Laboratory, Corvallis, OR, and Northwest Fisheries Science Center, Seattle, WA. 46 pp.) reviewed current models for LWD delivery to streams within wetter forests, and determined that thinning reduces LWD pieces and volumes entering streams for up to 90+ years. Only after that were remaining trees within the recruitment zone appreciably larger. BLM co-sponsored the Interagency scientific panel—why aren't the findings of Spies et al. 2013 reported considered in this DEIS? Instead, both many of the technical assumptions underpinning the analyses and the findings of this DEIS that alternatives will not differ substantially in large wood recruitment and delivery to streams appear to be in unexamined but in acute conflict with the findings of the Spies et al. panel (and with much of the literature that panel relied on). Under the BLM plan alternatives, the portion of trees not within a limited inner "no cut "zone of less than one tree height would be subject to harvest, so even then LWD recruitment to streams would be lower than natural rates. In the intervening 90 years LWD amounts in the smaller size classes were removed, so there is a 90 year deficit, followed by uncertain benefit. (Pollock and Beechie 2014). Meanwhile the extensive road-related and physical disturbance impacts to streams necessary to do wide-spread thinning or regeneration timber harvest in the outer portions of reserves would likely be considerable.

LWD recruitment to riparian and stream habitat will be reduced by at least the following actions, compared to wood recruitment that can be expected from management under current NW Forest Plan standards, guidelines, and objectives (when they are faithfully executed):

I Halving of the RR boundaries in most cases (an exception perhaps is Alternative D for certain stream types).
ii Removal of the inner gorge from RR definitions for all action alternatives.
iii Inadequate protection for potentially unstable (landslide prone) slopes that can deliver LWD episodically.
iv Inadequate protection and concern for the "channel migration" zone in RR definitions for all action alternatives.

In many steep and moderately steep coastal tributary streams in central to northwestern Oregon, the "inner gorge" is often dominated by alder/hardwood stands, with intermittent individual conifers or coniferous patches. Conifers in some steeper systems extend mainly upslope from approximately the upper third of the inner gorge. All action alternatives eliminate the inner gorge portion of the RR definition (i.e., they do not include the whole inner gorge, as does the No Action/NWFP). In alternatives B and C only the inner half of the one-tree-height RR distance is a "no-thin" zone, and in Alt A, fish-bearing streams may be clearcut to within one site-potential-tree height distance of

the stream (note: the current No-Action alternative's protection for all fish bearing streams is two site potential tree heights or 300' on each side of the stream, whichever is greatest). This has the effect of leaving primarily the alder and hardwood dominated zone standing around streams that are planned for either extensive thinning or clearcutting. Potential large coniferous wood delivery in these systems (large, stable pieces that form log jams and create and maintain fish habitat) would be reduced both from within and outside of the designated stream buffers. In the above situation, which is quite common, the best chance of large "key pieces" of LWD getting to the stream is via debris flows, unstable or potentially unstable slope failures or larger landslides. In all action alternatives, the RR definition excludes potentially unstable slopes. The DEIS fails to identify, evaluate, and explain the consequences of these changes in riparian protection and management practices.

The existing pattern of large coniferous wood sources on the landscape, combined with the loss of the inner gorge portion of the RR definition, and the elimination of the "potentially unstable" portion of the RR definition is not fully accounted for in BLM's modeling and analysis of LWD inputs. The combination of factors described above will reduce or significantly delay essential LWD key piece delivery to stream channels. The likely reduction in total LWD delivery appears highly likely to be far greater than is suggested in BLMs modeling, which fails to account for and address these mechanisms and source areas of wood recruitment to streams and riparian areas.

But other research has shown that it may not be only total wood delivery that is important. Reeves et al. (2003) found in Cummins Creek, Western Oregon, that:

"About 65%of the number of pieces and 46% of the estimated volume of wood were from upslope sources. Streamside sources contributed about 35% of the number of pieces and 54% of the estimated volume of wood. The estimated mean volume of upslope-derived pieces 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. Streamside-derived pieces were more evenly distributed among the examined reaches and were predominately in the influence zones that had the least contact with the low flow channel."

Thus, LWD delivery from upslope areas outside the 1-tree-height distance for coastal 4th order streams (Cummins Creek is an unlogged reference system) may not be the "rare occurrence" that BLM asserts it to be. Furthermore, the location of the LWD from upslope sources appears to have a higher ecological value that may exceed its volume. Indeed, recent landslides appear to be the principal source of large wood accumulations shaping fish habitat in BLM-managed portions of Canton Creek, Douglas County, OR, a major tributary of the North Umpqua River (C. A. Frissell, unpublished).

18. The DEIS lacks a synoptic or overall look at either cumulative watershed impacts or climate impacts. Cumulative impacts of current management on adjacent non-federal lands, as well as reasonably foreseeable future actions of private, state, and all federal actors are not fully examined.

Cumulative effects are defined by regulation (40 CFR Section 1508.7) under the National Environmental Policy Act as:

> "...the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future action regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time." (CEQ 1997)

Reasonably foreseeable impacts of extensive thinning, clearcutting, road construction, post-fire salvage, etc., are not given the "hard look" that NEPA requires. Furthermore, ongoing climate impacts to streams, fish and riparian- and aquatic-dependent resources are not evaluated as part of cumulative impacts. The DEIS must contain a synthetic cumulative impacts and climate impacts analysis. These two lines of evidence must be integrated, using "best available scientific information" on climate impacts and projections as well as updated baseline and cumulative impacts of past, present and future management actions. This circles back to the primary defect of the RMP DEIS which is an inadequate portrayal of the current ecological state of affairs. This biased assessment of the status quo also results in a biased Purpose and Need statement, which, in turn, results in an inadequate range of alternatives (see Comments 13 and 14)

19. Riparian Reserves vs. "managed" large block reserves – a manufactured controversy.

Note: See Appendix 1 for an explanation of how BLM inaccurately portrays RR vs. LSR provisions of Non Action, and hence the current protections on the landscape.

It seems unfortunately apparent that the BLM chose to pit fish biologists and owl biologists against one another, rather than seeking a conservation plan that structures BLM actions to benefit both resource sets. The No-Action alternative already provides a carefully measured balance between later successional forest development in LSRs and adequate stream and listed fish protection via the ACS. If the balance is compromised, as it will be under any of the several Action alternatives, the end result will undermine the upcoming USFS plan revisions process.

The loss of overall NWFP validity will result in more lawsuits, ESA petitions, species listings and termination or renegotiation of a large number of Habitat Conservation Plans (HCPs) within the region. These all waste taxpayer dollars, not to mention agency time & resources better spent fixing problems on the ground. Extended public controversy, as well as litigation overload stemming from flawed analysis could forestall effective and noncontroversial restoration actions, recovery plan implementation, and other necessary conservation efforts. These are all foreseeable impacts and should be presented as such in the RMP FEIS as an outcome of <u>all</u> the action alternatives.

True Riparian Reserve protections are not inconsistent with functional, climate-informed wildlife migration corridors and interconnected larger block reserve development. It is rather distressing that the BLM has constructed the alternatives in the DEIS to create a false dichotomy between aquatic and terrestrial protections. Both are needed.

20. No Environmentally Preferred Alternative.

The BLM must create a new action alternative (the "environmentally preferred" alternative) that does not compromise either the ACS or late successional forests – it will resemble the no action alternative, but with improvements to the ACS, as well as improvements in the spatial arrangement and connectivity of later seral forests, to allow for species migrations in light of observed and projected climate changes.

21. The 2015 DEIS/RMP incorporates by reference the 2008 FEIS and cites pages in 2008 FEIS as a substitute for doing 2015 updated analysis.

Analysis and data from USDI/BLM 2008 is at least 8 years old. For example DEIS: 221 states: "The 2008 RMP/EIS analyzed potential large wood and small functional wood contribution to streams considering the effects of forest management and stand growth over time in portions of the landscape capable of delivering wood to streams. That analysis is incorporated here by reference (USDI BLM 2008,pp. 779-797)."

We assert that any and all comments submitted to BLM during the failed 2008 WOPR process are valid for the purpose of demonstrating flawed analysis in USDI BLM 2008 which is repeatedly referenced to support conclusions in the 2015 DEIS/RMP.

22. BLM inappropriately used the Aquatic Resource Evaluation Monitoring Program (AREMP) 20 Year Report conclusions.

The DEIS states that "[m]monitoring results conclude that the ecological condition of approximately two-thirds of the watersheds in the Northwest Forest Plan area have improved in condition in the past two decades." (DEIS, page 233). AREMP results can only make broad, coarse scale inferences about the general condition of watersheds (HUCs) or basins where there is > 25% federal ownership. Watersheds primarily at the boundaries of federal ownership and/or where BLM checkerboard lands coexist with mostly non-federal land would be underrepresented or simply not represented by the AREMP monitoring data. In any event it is questionable whether AREMP results, which are FS land-base-centric, apply to all BLM land ownerships within the planning area. Moreover, as all BLM action alternatives remove ACS protections, the BLM cannot claim that any improving trends in watershed conditions, even if real, will continue, as the improving trend depends on full ACS implementation moving forward.

BLM cannot extend the questionable "improving trend" in AREMP monitoring results because these results represent only the first twenty years of ACS implementation. Under the NWFP, the ACS was expected to continue for another 30-80 years (i.e., beyond the first 20).

23. In the past, the BLM has repeatedly deviated from the explicit requirements and essential components of its plans.

In particular, the BLM never faithfully integrated or implemented many interrelated aspects of the

ACS Standards and Guidelines. In all the action alternatives, these features are removed, thus formalizing BLM's current inadequate aquatic and riparian management regime. The action alternatives essentially institutionalize current BLM management in violation of NWFP Standards, Guidelines and overall provisions of the ROD. The action alternatives, however, would accelerate and multiply the damage that BLM has already caused in its erratic and incomplete implementation of the NWFP ACS.

24. The best available science still indicates that individual watersheds may vary in their conditions, capability and functions. The no-action alternative is the only alternative in the DEIS that includes watershed analysis and is the only one that can address individual watershed conditions, capability and functions.

The BLM has a record of furthering the nine ACS Objectives, which rely on the information contained in completed watershed analyses. The BLM has repeatedly ignored its own watershed analysis findings when proceeding with timber sale and road management projects. The no action alternative, if executed with fidelity to rule, is the only alternative that would potentially incorporate and respond to the wealth of science based information contained in watershed analysis documents that is needed to meet all relevant ecological conditions specified in the ACS Objectives. The BLM must require that watershed analysis findings be explicitly addressed in all planning documents (including this EIS) and also in the design of all land and water management projects. Please incorporate by reference all watershed analyses completed by BLM or jointly by BLM and USFS. These analyses are available on BLM district websites as inventories: http://www.blm.gov/or/districts/medford/plans/inventas.php Watershed Analysis is intended to identify watershed conditions in need of corrective actions. In general the DEIS/RMP has failed to incorporate existing watershed analyses into analysis and alternative development.

25. Overreliance on "Best management Practices" (BMPs)

Chapter 3, Appendix "I" of the BLM DEIS is devoted to roughly 36 pages of BMPs. BMPs are a form of mitigation for damages, not protection. Furthermore, the BLM DEIS's extensive list of mitigation measures is evidence that the risks from cumulative mitigation failure are potentially very large. Rashin et al. (2006) evaluated similar timber harvest BMPs in Washington State and determined that the effectiveness of BMPs declined as a function of distance from streams. In their study, two of the primary operational factors influencing BMP effectiveness were the proximity of ground disturbing activities to streams and the presence or absence of designated stream buffers. They also state another problem with BMP-based approaches is the failure to match or adapt BMPs to actual site conditions such as the density of small streams at harvest sites and the steepness of inner stream valley slopes. The BLM DEIS identifies no mechanism to address either of these key factors when implementing or carrying out BMPs and, in fact, all BLM action alternatives eliminate the use of watershed analysis, dramatically reduce intermittent stream protections and remove language from the current no action alternative's RR definitions requiring inclusion of the "inner gorge" within the RR boundary. These eliminated practices are in fact BMPs, and they are among the most effective BMPS known, which was the basis for their incorporation in to the NW Forest Plan. The BLM action alternatives all reduce protective buffers, hence shortening the distance between the ground and vegetation disturbance and mitigation measures applied to

ameliorate ground and vegetation disturbance *post hoc*, and all stream classes and types, thus, according to the findings of Rashin et al (2006), weakening the effectiveness of the full slate of BMPs.

Given that numerous ecological processes and landscape dynamics are complex and emergent, agency discretion through the extensive use of Guidelines or BMPs is in error. Where uncertainty, as distinct from risk, informs future outcomes (impacts) the reasonable planning option is to state clear Standards which foreclose on specific agency actions. The only alternative that adequately states Standards is the No Action alternative.

26. The BLM has chosen to bypass or avoid independent peer review of the scientific information contained in the DEIS.

All models and scientific assessments contained in the DEIS should undergo independent scientific peer review to identify and remedy the following types of flaws in BLM's use of science - particularly in the design and parameterization or models and interpretation of results.

Flaws in the modeling approaches noted above for hydrology and LWD delivery suggest that **all** of the BLM models used in this DEIS need to be carefully examined for the following fatal flaws:

- Arbitrary narrowing of the environmental factors of interest
- False or biased modeling assumptions
- Improper parameterization of models
- Inappropriate use or application of "thresholds"
- Improper interpretation of results
- Misuse or inaccurate use of scientific information
- Selective use of scientific citations, and
- Overreliance on non-peer reviewed "grey literature"

Note: the models for shade, stream temperature, and carbon storage were not fully reviewed for these comments due to lack of time; however, it appears that all the models suffer from the same kinds of flaws detected in the hydrologic and LWD models. For example, the carbon storage model neglects to account for the 50-70% loss of carbon in milling wood and manufacturing wood products and also does not account for climate change impacts to soil moisture storage, which can affect carbon storage.

27. ACECs – Areas of Critical Environmental Concern.

Concurrent with the comment period for this DEIS, the BLM is seeking comments and recommendations from the public on "Areas of Critical Environmental Concern" (ACECs). This construct comes from FLPMA and is a regressive (non holistic) approach to limiting environmental protections to small geographic areas meeting BLM's planning criteria. By removing science-based protections that exist across large landscapes and that already support a variety of important environmental and human resource needs – the ACECs appear reasonable. However, by not

analyzing the net loss of ecological protections, the BLM is being disingenuous to the public. NEPA requires a hard look at impacts, accurate comparison of alternatives, and full disclosure to the public of any impacts to the human environment. The DEIS fails on all counts. Limited delineation of ACECs is not helpful or responsible.

All current Key Watersheds, all LSRs, all interim and designated riparian reserves on all streams and waterbodies in the entire NWFP plan area, including BLM lands, are in need of *increased* protection relative to No-Action, whether or not they would meet BLM's criteria as "ACECs." Also, all BLM watersheds that contain Southern Oregon/Northern California (SONC) Coho salmon populations, spring Chinook, coastal coho, summer and winter steelhead populations, Pacific Lamprey, and bull trout populations must be protected, whether or not they meet BLM's ACEC criteria.

The Native Fish Society has submitted comments that include examples of specific streams and rivers of concern for native fish conservation. Many of the rivers of concern lie in the northern tier of BLM ownership – an area particularly impacted by reduced environmental protections in the DEIS. Those comments are incorporated here by reference; however, they are not the only waterbodies that would be severely degraded by the action alternatives in the DEIS.

28. Timber Harvest Practices.

The DEIS fails to disclose in a side by side comparison table the range of mandated clear-cut acres in each alternative and sub-alternative. For example, while the No Action NW Forest Plan allows clear cutting, it does not mandate a prescribed amount as is the case for each action alternative. We have calculated mandated clear cutting in table below for inclusion in the FEIS as an aid to decision making.

Table 1. Projected **decadal** clear cut acres for No Action NW Forest Plan and Draft RMP action alternatives. Bold numbers indicate minimum mandated clear cutting (CC) in BLM 2015 Resource Management Plan DEIS. Black is District Manager maximum discretionary clear cutting. Implemented clear cut acres for NW Forest Plan (discretionary) for BLM Districts has been less than 10% of NWFP projected since 2000 while thinning acres have been 100-500% of projected. NW Forest Plan allows discretionary clear cutting of stands >160 years while all DEIS action alternatives prohibit clear cutting in stands >160 years and/or stands identified by districts as structurally diverse. Compiled by R. Nawa (Klamath-Siskiyou Wildlands Center). Source: DEIS 27-75; 905-985, Resource Management Plan Evaluation Report 2012 http://www.blm.gov/or/plans/files/RMPEvaluation.pdf

Alternative	Age Criteria for Clear Cutting	Land Allocation	Acres	% CC	Acres Clear Cut
No Action (NWFP)	>100/>150	Matrix	691,998	5	37,000
Alt. A	<120	HITA	289,060	6-10	23,124 - 49,140
Alt. A	<120	UTA	54,840	3	1,645

Alt. A	<120	Dry LSR	188,440	2.5	4,711
Alt. A Total					**23,124 - 55,496**
Alt B	Varies by District	LITA	72,358	6-10	4,341 – 7,236
Alt B	Varies by District	MITA	210,087	8-10	16,807 – 21,008
Alt B	Varies by District	UTA	273,890	3	8,217
Alt B	Varies by District	Dry LSR	223,399	2.5	5,585
Alt B Total					**21,148 – 42,046**
Sub-Alt B	Varies by District	LITA	30,761	6-10	1,846 – 3,076
Sub-Alt B	Varies by District	MITA	129,120	8-10	10,330-12,912
Sub-Alt B	Varies by District	UTA	138,239	3	4,147
Sub-Alt B	Varies by District	Dry LSR	223,399	2.5	5,585
Sub-Alt B Tot.					**12,176-25,720**
Alt C	<160	HITA	553,857	8-17	44,309-94,156
Alt C	<160	UTA	184,715	3	5,541
Dry LSR	<160	Dry LSR	148,776	2.5	3,719
Alt C Total					**44,309-103,416**
Sub-Alt C	<80	HITA	402,665	8-17	33,213-68,453
Sub-Alt C	<80	UTA	92,842	3	2,785
Sub-Alt C	<80	Dry LSR	61,525	2.5	1,538
Sub-Alt C Tot.					**33,213-72,776**
Alt D	<120/140/160	MITA	160,575	8-10	12,846-16,058
Alt D	<120/140/160	OHTA	427,556	2.5	10,688
Alt D	<120/140/160	UTA	62,251	3	1,868
Alt D Total					**12,846-28,614**

The DEIS fails to identify an alternative or sub-alternative that would make controversial regeneration harvest optional with the District Manager. The RMP says to "Offer" a specified

amount of land for clearcutting in each action alternative (Appendix B). The only discretion for the District Manager is the precise location within the land allocation. The DEIS fails to provide a standalone alternative or sub-alternative that relies on uneven aged management/thinning at levels appropriate to properly stated baseline conditions. Such an alternative will likely result in limited timber or no timber cutting in many watersheds highly degraded by past management.

The DEIS 77-79 argues against using "continuation of the current practices" as a baseline for analyzing action alternatives. The DEIS:78 then goes on to identify sub-alternative 1 from 2008 RMP/EIS "that would limit timber harvest to thinning".

The DEIS:79 states "The BLM has eliminated from detailed analysis the continuation of the current practices as an action alternative, because it would not be a reasonable alternative, in that it would not provide for a sustained yield of timber over the long term." We disagree with the logic of this statement. First, the DEIS is biased because it fails to cite compelling data from (USDI 2012) and data through 2014 that BLM has been selling the majority of its timber volume since 2000 by way of thinning. We doubt that BLM has been "unreasonable" using thinning to sell large amounts of timber volume, even if thinning is deemed unsustainable in the long term. Thus, there is nothing unreasonable about selling so-called sustained yield timber volume with thinning since this is what the BLM has been doing for the past 15 years.

In fact, the issue of timber harvest is not one of sustainability but of annual volume, timber sale net revenue and log type harvested. Any number of thinning harvest regimes could support a huge annual output of timber from 2.4 million acres. The BLM's actual goal is absolute volume of a certain type of saw log harvested in a certain way. Oregon's political operatives and leaders have been clear what their demands on the BLM require: Larger saw timber (30" to 40" dbh) highly desired by Oregon's mills and harvested by way of clearcutting to maximize net revenue distributions to county governments. All of which is a statement of political economy – the real driver behind BLM Purpose and Need for new plans.

The DEIS is flawed because it failed to provide analysis of how much longer BLM can continue timber sales using thinning. Is it five years or ten years or fifty years? This analysis would appear to be an overriding consideration for a NEPA analysis in this EIS/RMP process. NEPA analysis is needed to properly inform the public and decision makers about the potential role of thinning to provide timber volume in the short term and long term (100 years).

The DEIS:79 states "The analysis of a thinning-only sub alternative in the 2008 RMP/EIS provides an approximation of the effects of this management approach, concluding that thinning levels can only be sustained for less than a decade." This excuse for not analyzing a "thinning only" sub alt is in error. First, the DEIS:78 indicates that many candidate areas have been thinned since 2008 so there are fewer sites available for thinning. The analysis in the 2008 RMP/EIS is stale. New analysis in this EIS/RMP is needed to determine the potential for thinning volume and eliminating clear cutting volume based on what has been cut and what is available. The 2008 RMP/EIS was found defective by the courts and administratively withdrawn. It cannot be used to support conclusions about the practicality of a sub alternative that would maximize thinning in the short term for this 2015 EIS/RMP process.

29. The RMP/DEIS violates the NEPA, ESA, FLPMA and CWA because it:
1) fails to provide spatially explicit mapping of coho critical habitat;
2) fails to establish or report baseline stream quality data (e.g. stream temperature trend, stream shade, large instream wood, sediment, road densities, nutrients, toxics) for specific critical habitat streams, BLM critical habitat stream reaches and watersheds;
3) fails to adequately identify numeric standards for stream temperature, stream shade, large instream wood, sediment and road densities;
4) fails to identify required and discretionary techniques to achieve measurable progress towards quantitative standards for important habitat criteria including but not limited to stream shade, stream temperature, large instream wood, and sediment;
5) fails to identify a time table for meeting or making measurable progress towards achieving quantitative standards; and
6) fails to coordinate with ODFW and ODEQ to develop a schedule for monitoring physical and biological parameters in Coho critical habitat to demonstrate trend from existing baselines.

29.1 Critical Habitat of ESA Listed Fishes

The RMP/DEIS failed to map the linear extent of critical habitat for federally listed fishes (DEIS 288) and more importantly failed to include an action alternative with a 2 site tree width (each side of stream) for the protection and enhancement of critical habitat designated for threatened and endangered salmonid fish species. This means that critical stream habitat for salmonid fishes would have a 2 tree width while other streams with unlisted fishes could have lesser protection.

The National Marine Fisheries Service identifies several benefits of critical habitat (64FR24050):

- A designation of critical habitat provides Federal agencies with a clear indication as to when consultation under section 7 of the ESA is required.
- A critical habitat designation will also assist Federal agencies in planning future actions because the designation establishes, in advance, those habitats that will be given special consideration in section 7 consultations.
- Another indirect benefit of designating critical habitat is that it helps focus Federal, tribal, state, and private conservation and management efforts in such areas. Management efforts may address special considerations needed in critical habitat areas—including conservation regulations that restrict both private and Federal activities.

The National Marine Fisheries Service (NMFS) discusses “Adjacent Riparian Zones” in the designation of critical habitat for SONCC coho 86FR24053-55. The NMFS states that “On Federal lands within the range of the northern spotted owl, Federal agencies should continue to rely on the Aquatic Conservation Strategy of the NFP to guide their consultations with NMFS.” (64FR24055) Previous section 7 consultation has found the Northwest Forest Plan two tree width riparian reserve (each side) adequate for protecting listed species on federal lands. These facts support the continuation of a 2 site tree width riparian reserve for critical salmonid habitat.

We provide additional science based analysis to support two tree riparian reserves for critical stream habitat.

Channel Migration and Conservation of Lateral or "Off-channel" Critical Habitat

The RMP/DEIS 219-230 asserts that there is no difference in effects between a one-tree-height riparian buffer width (action alternatives) and a two-tree-height riparian buffer width (no action alternative) for shade and large wood recruitment for salmonids. This narrow analysis of two parameters utterly and inexplicably fails to consider all attributes of critical habitat and the dynamic nature of streams over the 100 year period of modeling. The fundamental assumption of the DEIS modeling conclusions, that streams will remain within the middle of the riparian buffer, is known to be false. The modeling conclusions that there is no difference between a one-tree-height and two-tree-height tree riparian reserve are not based on the best available science. For example, the 64FR24053 states: "Streams and stream functioning are inextricably linked to adjacent riparian and upland (or upslope) areas. Streams regularly submerge portions of the riparian zone via floods and *channel migration*, and portions of the riparian zone may contain off-channel rearing habitats used by juvenile salmonids, especially during periods of high flow." (emphasis added).

The 64FR:24061 states "Critical habitat consists of the water, substrate, and adjacent riparian zone of estuarine and riverine reaches (*including off-channel habitats*)…" (emphasis added). Off channel habitats can be abandoned channels, beaver ponds, and overflow winter channels. These critical habitats are often located more than 1 tree height from the summer low flow channel which will receive the "no cut" inner riparian buffer. More importantly these off-channel *critical* habitats will develop over time in unpredictable locations due to natural channel shifts over a 100 year period. The 1964 flood moved many stream channels hundreds of feet (e.g. Sucker Creek trib to East Fork Illinois River). This magnitude of change is within the range of natural variability and can be expected in the future 100 years.

Pre-logging and pre-stream clean out era stream channels in alluvial areas with large amounts of wood had anastomosing channels much wider than the hypothetical single thread channels modeled in the DEIS (Gendaszek et al. 2012). The DEIS incorrectly models streams as if they will remain in the same single thread linear location over the next 100 years despite the known influx of large amounts of large wood over the next 100 years and the known influence of channel changing debris flows. The DEIS/RMP fails to consider stream channel migration zones which would logically require a minimum 2 tree riparian reserve to ensure adequate shade, adequate large wood recruitment, moderation of sediment, nutrient cycling, and protection of off channel habitats over the next 100 years (see King County 2012 Chapter 4).

29.2 Timber Harvest Activity: Sediment Impacts to Designated Critical Stream Habitat

The DEIS fails to take a hard look at the differences in potential logging sediment delivery to critical stream habitat from a 1 tree riparian reserve versus 2 tree riparian reserve. The 64FR24054 states: "Human activities in the adjacent riparian zone, or in upslope areas, can harm stream function and can harm salmonids, both directly and indirectly, by interfering with the watershed functions described here. For example, timber harvest, road-building, grazing, cultivation, and other activities can *increase sediment*, destabilize banks, reduce organic litter and woody debris, increase water temperatures, simplify stream channels, and increase peak flows." (Emphasis

added).

The DEIS failed to adequately consider that logging will occur on very steep slopes where shallow debris slides will penetrate and pass sediment through the narrow uncut riparian reserve and logging related sediment will enter streams. The DEIS fails to disclose that new roads, reconstructed roads, and temporary roads on steep slopes would be much less likely to deliver sediment to critical habitat streams when these roads are located 2 tree heights away from stream channels as is the current management policy with the ACS.

29.3 Nutrient Impacts to Designated Critical Stream Habitat

Similarly, the DEIS fails to take a hard look at the differences in potential harmful nutrient enrichment to critical habitat streams from a 1 tree riparian reserve versus 2 tree riparian reserve. A 2 tree riparian reserve would far more effective in filtering out excess phosphorus and nitrogen. (See Frissell et al. 2014:17)

29.4 Benefits of Two-tree-height Riparian Reserves for Listed Terrestrial Species, Proposed for Listing Species, USFWS Species of Concern, and Beaver, a Keystone Species for Critical Habitat

Adoption of a two-tree-height riparian reserve width is supported, not contradicted, with the known ecological benefits to other listed species, proposed for listing species, USFWS species of concern and beaver. The DEIS/RMP failed to take a holistic multi-species perspective with proposed riparian reserve widths in action alternatives. The 64FR 24054 states: "[i]nterim riparian reserve recommendations in the FEMAT report were based on a systematic review of the available literature, primarily for forested habitats, concerning riparian processes as a function of distance from stream channels. The interim riparian reserves identified in the FEMAT report for fish-bearing streams on Federal forest lands are intended to (1) provide protection to salmonids, *as well as riparian-dependent and associated species*, through the protection of riparian processes that influence stream function, and (2) provide a high level of fish habitat and riparian protection until site-specific watershed and project analyses can be completed. (Emphasis added).

The threatened northern spotted owl and threatened marbled murrelet would benefit from a 2 tree width riparian reserve because they are known to use valley bottom forests disproportionately compared to ridge tops. Similarly the fisher (proposed for listing) also makes heavy use of areas adjacent to streams and would benefit from a 2 tree width riparian reserve. The northwestern pond turtle has been petitioned for listing and is a USFWS species of concern. The 2 tree width riparian reserve would ensure protection of potential turtle nest sites that are generally located within 300 ft of stream and pond habitats. Coho salmon need beaver ponds with cool water refugia in summer and flood refugia in winter. Beaver need 2 tree riparian widths because of beaver propensity to build dams in off channel areas.

In addition to these ESA relevant species, it's well known "best available science" that areas adjacent to streams are disproportionately (more) important to most wildlife species, especially amphibians. We assert that RMP programmatic planning and analysis must value the multi-species

benefits of a 2 tree riparian reserve and not discount them as if salmonids were the only species of concern. A singular focus on specific needs of listed salmonids is appropriate for project implementation during section 7 consultation[1] but the DEIS/RMP salmonid-centric approach is not appropriate for programmatic planning that must consider all species. The RMP/DEIS uses modeling techniques intended for a single group of salmonid species to dictate the riparian reserve needs of multiple species.

[1] 64FR24054 states: "While NMFS has used the findings of the FEMAT report to guide its analyses in ESA section 7 consultations with USFS and BLM regarding management of Federal lands, NMFS recognizes that the interim riparian reserves may be conservative with regard to the protection of adjacent riparian habitat for salmonids since they are designed to protect terrestrial species that are riparian dependent or associated as well as salmonids. Moreover, NMFS' analyses have focused more on the stream functions important to salmonids and on how proposed activities will affect the riparian area's contribution to properly functioning conditions for salmonid habitat."

Appendix 1:

The BLM and the RMP DEIS currently uses the wrong land allocation hierarchy of standards and guidelines in the NWFP ROD. Note: This has been a tactic both FS and BLM have been using for years, allowing them to actively manage RR acreage within LSRs as if the other ACS related standards and guidelines for Riparian Reserves did not apply. In reality RR S&Gs as well as LSR S&Gs apply.

The BLM states in Chapter 2 that "[**t]he Riparian Reserves acreage for the No Action alternative presents only the Riparian Reserves within the Matrix [land use allocation] which is how the 1995 RMPs presented the hierarchy of land use allocations. The Late-Successional Reserves acreage for the No Action alternative do not account for Riparian Reserves within the Late-Successional Reserves.**" (Chapter 2, page 32, Emphasis added)

The BLM then contradicts itself by saying that ..."[i]n the No Action alternative, the Riparian Reserves would overlay the Late-Successional Reserves, and implementation in those overlapping areas would apply the **management objectives and management direction [*]** for both land use allocations." **(USDA/USDI 1994, pp. A-5) [**]"** [This is correct - both the LSR and RR standards would legally apply; however it is not what BLM has actually been implementing for 20+ years.

[*] but not the numerous ACS related S&Gs? - This is actually terminology used in the action alternatives and comes not from the NWFP ROD but from the O&C Lands Act

[**] mapping protocol not the "hierarchy of S&Gs for land allocations" – that's on ROD C-1

The BLM states further that " ...As a result, **the 1995 RMPs only accounted for the Riparian Reserves acreage in the Late-Successional Reserves as Late-Successional Reserves; the only Riparian Reserve acreage calculated were those in the Matrix.** Thus, the acreage of Riparian Reserves and Late-Successional Reserves presented in the 1995 RMPs cannot be directly compared to the acreages presented in this analysis." (Emphasis added, Chapter 2, Alternatives, page 32)

RMPs only "accounted" for – is that the same as considered for purposes of management? The RR acreages would then be treated as LSRs allowing for management within the RR widths to achieve "LSR objectives." This is incorrect.

It appears upon analysis that the BLM applies the wrong hierarchy of Standards and Guidelines during their implementation of their RMPs (i.e., the mapping/display hierarchy on ROD page A5, instead of the correct hierarchy of S&G application on ROD page C-1) for the various land allocations. In short, the BLM is admitting to the public that they generally treat the Riparian Reserves in LSRs as full on management zones.

This is consistent with their claim elsewhere in their analysis that there are and are "no constraints" on thinning within Riparian Reserves <u>generally</u> under the 1995 RMPs (no action alternative). Of course that also shows that the BLM treats Riparian Reserves as management zones pretty much everywhere, including within Key Watersheds. This issue relates directly to the failure to adequately describe and analyze No Action. In the case of the BLM RMP DEIS, No Action should be all of the following: what the 1995 RMPs say (as written), what they legally require (as

amended by NWFP and ACS), and how the BLM actually implements them, particularly within the designated Riparian Reserves and LSRs.

Unlike what BLM asserts these are not “no holds barred” management zones. Using the correct hierarchy of S&Gs the RR protections **add to** LSR protections. Riparian Reserve Standards are more precautionary than LSR Standards with respect to aquatic conservation. But this is not how BLM manages RRs (or LSRs) as a general rule.

Meaningfully, federal courts and also the National Marine Fisheries Service and U.S. Fish and Wildlife Service, have previously determined that these riparian reserve standards, and other ACS provisions including the requirement to maintain and restore conditions mentioned in the ACS Objectives are to be applied for each action.

Under the current, no action alternative, Riparian Reserves can only be changed by watershed and site specific analysis. Watershed analysis is done away with completely in all action alternatives. There is no hint or indication of any inclination by BLM to examine site specific riparian reserve needs in subsequent actions. The RR widths will be much smaller everywhere and roughly half of them (or more) will be subject to heavy thinning, clearcutting, roads and physical ground disturbance.

Appendix 2.

The BLM merges the "Affected Environment" section of a typical EIS out of existence which allows them to narrowly identify only those aspects of the environment that they want to analyze (using mechanistic, models that are extreme oversimplifications of the full suite of existing conditions and resource issues on the landscape):

The DEIS states up front:

"Although many EISs present the affected environment and environmental consequences in separate chapters, the BLM has combined these two topics into this single chapter to provide all of the relevant information on a resource in a single discussion. This chapter includes sections for each resource that the RMPs are likely to affect… Each section begins with a summary of the methods used to analyze the impacts of the alternatives on this resource." (DEIS Introduction)

The last sentence of the above is disingenuous, as it allows BLM to move quickly into a discussion of "methods" without framing all the resource issues of concern in the affected environment. The purpose of the "Affected Environment" section in NEPA is to fully describe all issues and resource concerns that occur presently on the landscape, so as not to miss any type of impact as well as to inform cumulative impacts analysis. The BLM must go back and describe all the resources that are affected by the RMP revisions in a correctly formulated "Affected Environment" section, before selecting "methods" for analysis. Then the BLM must evaluate all direct, indirect and cumulative impacts to the affected resources.

A perfect example of this is Key Watersheds. The Affected Environment includes a system of tier 1 and tier 2 key watersheds. All the action alternatives do away with key watersheds. Currently, all tier 1 key watersheds are the focus of stream restoration for listed fish and all tier 2 Key Watersheds are to be managed as critical watersheds for water quality support to downstream communities. The Affected Environment section should explain this fact as part of the baseline environmental and resource conditions, and present why this is so. What caused there to be a need for Key Watersheds? How are they trending? In fact, some may be improving but overall there has not been a sufficient level or extent of improvement – Key Watersheds were supposed to be the focus of restoration as important refugia or critical water sources and were expected to improve more rapidly than other non-key watersheds).

Appendix 3.

Comparison of ACS Objectives (No Action) with Management Objectives (Action alternatives):

"Aquatic Conservation Strategy Objectives:

Forest Service and BLM-administered lands within the range of the northern spotted owl **will be managed to:**

1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

2. Maintain and restore **spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia.** These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

3.Maintain and restore the **physical integrity of the aquatic system, including shorelines, banks, and bottom configurations**.

4. Maintain and restore **water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities**.

5. Maintain and restore the **sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.**

6. Maintain and restore **in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.**

7. Maintain and restore the **timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.**

8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide **adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability**.

9. Maintain and restore **habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species**"

(NWFP ROD page B-11, emphasis added)

Note: ACS Objectives above link directly to roughly a hundred activity specific standards and guidelines that must be followed under the no-action alternative. The removal of these key objectives, which are themselves binding standards and guidelines has not been sufficiently analyzed in the DEIS.]

In comparison, the BLM Management Objectives below for Western Oregon (Section 3, Appendix B, page 906 et. seq.) would apply to all the action alternatives and are far more limited in terms of the functions or values they would "protect"– they include (weaker language in italics):

West of Highway 97:

"*Contribute to* the conservation and recovery of listed fish species and habitats and *provide for* conservation of special status fish and other special status riparian associated species.

Maintain and restore the proper functioning condition of riparian areas, stream channels and wetlands by *providing forest shade, sediment filtering, wood recruitment, stability of stream banks and channels, water storage and release, vegetation diversity, nutrient cycling and cool and moist microclimate.*

Maintain water quality and streamflows within the range of natural variability, to protect aquatic biodiversity, *provide quality water for contact recreation and drinking water sources.*

Meet ODEQ water quality targets for 303(d) water bodies with approved Total Maximum Daily Loads (TMDLs).

Maintain high quality water and *contribute to the restoration of* degraded water quality downstream of
BLM-administered lands.

Maintain high quality waters within ODEQ designated Source Water Protection watersheds.

Appendix 4. Hydrologic Impacts

Note: This is adapted from an earlier unpublished and unwanted (scuttled by the agencies) hydrology whitepaper, with only the relevant (coastal basins) information included.

Main point #1: Timber Harvest and Roads affect a wide range of hydrologic impacts, not only "peak" flows:

Timber harvest and roads cause significant hydrologic impacts to watersheds, and to do the hard look that NEPA requires, BLM must examine the full range of potential hydrologic responses, not just peak flows.

Timber harvest and its associated road construction and site preparation practices can have significant effects on hydrologic processes – the amount of infiltration, overland flow, subsurface flow and ground water recharge – affecting the overall water yield and the timing, duration and size of flow events

Analysis of the entire suite of flows within a watershed is generally required to determine the effect of timber harvest and roads. This includes peak flows of various recurrence intervals (or sizes), low flows, and especially the one-two year events that are associated with channel formation and maintenance. Various landscape, geologic and hydrologic factors and watershed pre-conditions form the context for examining the changes in the pattern of sediment, nutrient, and wood routing, and the timing, magnitude, duration, and spatial distribution of peak, high, and low flows resulting from timber harvest activities.

Main point #2: The history and current condition of streams and watersheds matters when evaluating hydrologic impacts.

If the stream is adjusting to changes in hydrology due to past management practices, as evidenced by down-cutting, excessive lateral movement, stream bank erosion, or other signs, it would be critical to decision-making to factor in the impact of additional timber harvest on the overall hydrologic function of the system. More severe effects can result when channels are unstable at the time flow increases occur (Leopold et al. 1964, see also Heede 1991).

Main point #3: BLM watersheds with 50% mixed land ownership are already degraded in many cases both physically and hydrologically, so the above observation by Leopold likely applies.

Peak Flows

Peak flows refer to the instantaneous maximum discharge associated with individual storm or snowmelt events (McDonald et al. 1991, Christener and Harr 1983). In the low-lying coastal basins in the Pacific Northwest, winter rainfall is the primary cause of peak flows, while in many of the higher elevation and interior areas, peak flows are generated by spring snowmelt. Other possible causes of peak flows events are summer thundershowers and rain-on snow events." (McDonald et al. 1991).

In general several major studies report the following important findings relevant to this region (Western Oregon and coastal California where the hydrologic mechanisms are largely similar):

1. In the Coast and western Cascade Ranges of Oregon studies have shown that forest management activities can increase fall peak flows up to 200 percent and small winter peak flows up to 50 percent in small watersheds (Harr et al. 1979, Rothacher 1993, Jones and Grant 1996). Road building and soil compaction associated with timber harvest may also contribute to damage in small headwater streams as a result of increased size of larger peak flows (Harr 1976; Christner and Harr 1983).

2. Spence et al. (1996) conclude from a review of hydrologic literature (Beschta et al. 1995, Chamberlin et al. 1991, Harr et al. 1979, Rothacher 1971, MacDonald and Ritland 1989, Harr 1986) that most studies in rain-dominated systems of the Coast Range have indicated increases in peak flows following logging, particularly those peaks occurring in the fall. Ziemer (1981) for example, found that early fall peaks in one low elevation coastal, rain-dominated, watershed in northern California increased about 300% after logging.

3. Forest harvest can increase the size of the largest peak flows in areas where the largest floods are caused by rain-on-snow events. This increase in the size of peak flows is due to the combination of increased snowpack (caused by a reduction in interception losses) and increase in snowmelt due to increased turbulent heat transfer. (McDonald et al. 1991).

4. Ziemer and Lisle (1998) caution that converting subsurface flow to overland flow via soil compaction, whether caused by log skidding, road building, or grazing, can increase storm flows and runoff velocity.

Research by Jones and Grant (1996) shows that the effects of forest management on the largest peak flow events is still an open question and that continued research is needed to gain better understanding of peak flow changes in larger basins. They report that:

- Timber harvest and road building in three small basins created greater changes in small peak flows than in larger flows.

- Forest harvesting increased large peak discharges by as much as 100% in three large basins over the past 50 years.

- Forest harvesting in five paired basins (n = 375 storm events in the western Cascades of Oregon) increased peak discharges by as much as 50% in small basins and 100% in large basins. The addition of roads to clear-cutting in small basins produced a quite different hydrologic response than clear-cutting alone, leading to significant increases in all sizes of peak discharges in all seasons, and especially prolonged increases in peak discharges of winter events (Jones and Grant 1996).

Harr et al. (1979) in a study of changes in peak flow in three small headwater watersheds of the South Umpqua River, after three types of timber harvest (clear-cut, shelterwood, small patch cut) found that winter increases in peak flows due to logging where largest in absolute terms, but in many years are smaller in relative terms than the increases found in either fall or summer.

Peak flows that recur on an interval of 1.5 years (e.g., 1-2 year flows) are the dominant channel maintenance flows in a large variety of rivers (Wolman and Miller 1960, in Dunne and Leopold 1978). Bankfull flows in headwater areas are the major mechanisms that form channels, and steep stream channels are eroded and aquatic habitats damaged during high flows (Christner and Harr 1983). Large (e.g., 50 - 200 year) flows are too infrequent to govern stream channel characteristics; however these events can cause marked long-term changes in channel conditions. Low flows are too small to have any major effect on stream channel form, thus an intermediate flow is implicated as the dominant channel forming flow. Studies that have examined the effects of logging and road building using paired watersheds and which reported results for smaller peak flows have generally found statistically significant increases in smaller, yearly seasonal peak flows in the treated watersheds (Harr 1976, Cheng 1989, Jones and Grant 1996, Thomas and Megahan 1998).

Other Flow Issues

Land use can affect several aspects of water yield in addition to peak flows, including winter base flows, summer low flows, total volume, timing and duration, and therefore should be considered in watershed analysis. The issues mentioned in ACS Objective # 6 of flow timing, duration and magnitude (see Appendix 2 of these comments) may be applicable to a variety of flow types. For example, the timing or magnitude of peak flows, and timing, duration or magnitude of seasonal high or summer low flows may be appropriate for analysis. The cumulative effect of roading on variable flow regimes is an additional important consideration.

Summer Low Flows. The effects of harvest and roading on summer low flows have not been as well studied as those of peak flows, although several researchers are currently conducting such evaluations. Because the removal of trees can reduce the water demand in the summer, summer low flows may increase (Keppeler, 1998) and even be temporarily beneficial to the stream. Hicks et al. (1991) studying the effects of clearcut harvest on peak and low flows reported that an initial eight year increase in base flows was followed 19 years of decreased summer low flows. Changes in low flows may be the result of different mechanisms operating in different geoclimatic settings. For example, if increased erosion also accompanies the harvest and roading, then stream channels can become the sites of increased sedimentation. This channel aggradation can then lead to decreased summer low flows. Consequently, the examination of the effects of land management activities on low flow regimes must not only consider the water budget, but also possible channel changes that would affect how the water is routed through the channel. Another possible mechanism was pointed out by Harr (1982) who attributed the decrease in low flow following logging to reduced canopy that lead to decreased fog drip. Basic hydrologic analyses of the watersheds in question can assess which flows in a given region are important in maintaining channel form and transporting sediment, and whether increase in low to moderate flows will significantly affect these aspects.

Changes in summer flows can affect salmonid habitat (Hicks et al. 1991) by changing water quality, or available space. For example, increases in summer low flow may affect the stream temperature regime. An increase in the volume of water in a channel in the summer would make a stream less susceptible to water temperature increases. However, if more water goes subsurface because of channel aggradation, the water flowing through gravel rather on top of gravel will have a different temperature regime.

Influence of Roads on Spatial Distribution of Flow and Flow Condition. A study of an extensive logging-road network in two adjacent 62 and 119km^2 basins in the western Cascades of Oregon, had three important findings: 1) a large portion (57 percent) of the road network in the basins studied is hydrologically connected to the stream network; 2) a possible explanatory mechanism for changes in hydrograph shape following road construction is the enhanced routing efficiency due to connecting road segments and stream networks; and 3) the timing of road development and accompanying hydrologic integration of the road network corresponds to the timing of observed changes in peak flows in the two study watersheds. This work supports the hypothesis that road segments that are linked to channel network increase flow routing efficiency and hence provides a plausible mechanism for observed increases in peak flows (Wemple et al., 1996).

Jones and Grant (1996) state that their results support the hypothesis that roads interact positively with clear-cutting to modify water flow paths and speed the delivery of water to channels during storm events. Mechanisms they describe for altering surface and subsurface flow patterns are include extension of the active channel network by roads and roadside ditches, increased subsurface flow interception at cutbanks, increased overland flow on road surfaces, and alteration of flow routing by ditches and culverts. They cite other studies (Harr et al. 1975; Wemple 1994; Wright et al 1990; and Reid and Dunne 1984) which found that road surfaces, cutbanks, ditches and culverts all can convert subsurface flow paths to surface flow paths. But few studies have looked at how roads may significantly change the spatial distribution by redirecting flows in other ways. Forcing or combining of streams into culverts (infrequent stream crossing structures, routing of water along roadside ditches) can capture water from microdrainages outside the watershed, and represents a form of "stream piracy" (Megahan 1972). All of these changes in flow paths (alteration of surface and subsurface flow paths and moving of water from one stream channel to another) are equivalent to changes in the spatial distribution of flows and can be associated with timber-harvest-related road-building.

Studies have shown that peak flow frequency (Harr 1976), duration (Jackson and Haveren 1984), and timing (Rothacher 1973; Harr 1976; Ziemer 1981, Harr et al. 1975 1979, Harr 1976) are affected by timber harvest activities. The life-history characteristics of many aquatic species is influenced by flow regime, therefore forest management activities that can cause changes to the flow regime should be carefully evaluated.

Summary of Flow Regime Studies

The following summary is based upon the above review and on broader reviews of the scientific literature on instream flow changes associated with regeneration harvest (Spence et. al 1996, McDonald and Ritland 1989).

1. The effects of forest management on streamflow vary by season, by region and by overall hydrologic regime.

2. Logging and roading have generally caused statistically significant increases in 1-2 year peak flows. These are channel maintenance flows.

3. Harvest and roading can influence the magnitude and frequency of smaller peak flows (smaller than a 2-year return period) in 1st to 3rd order watersheds (i.e., smaller than 6th field

subwatersheds. A peak flow with a return period of one to two years can be a bankfull or over-bank flood.

4. Extensive clearcutting results in short-term increases in summer low flows. However, after longer periods (5-8 years) this effect may be followed by a longer period of reduced summer low flows (e.g., 30 or more years; Hicks et al. 1991) after clear-cut areas become revegetated.

5. Increases in peak flows are often associated or related with the cumulative area harvested within a basin, recent rates of clearcutting, and percent of watershed soil surface compacted or seriously disturbed, which is why many currently employed cumulative effects index methodologies attempt to model potential hydrologic and other effects using the area or rate of disturbance**.**

6. The influence of harvest and roading on peak flows (greater than a 2-year return period) would be most apparent at smaller geographic scales (1^{st} to 3^{rd} order drainages).

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