July 6, 2012

Public Comments Processing
Attn: FWS-RI-ES-2011-0112
Division of Policy and Directives Management
U.S. Fish and Wildlife Service
4401 N. Fairfax Dr. MS 2042-PDM
Arlington, VA 22203

Dear Sir/Madam;

Thank you for this opportunity to comment. This letter and attached appendices on the proposed designation of Critical Habitat for the threatened Northern Spotted Owl are submitted on behalf of American Bird Conservancy (ABC).

Additional habitat protection is needed to stabilize and eventually recover the Northern Spotted Owl’s population and ABC appreciates that the U.S. Fish and Wildlife Service (the Service) has identified nearly 14 million acres of potential Critical Habitat necessary to recover the threatened species and the old-growth ecosystem upon which it depends. With some modest additions, the Final Rule can provide a path towards eventual recovery and delisting of the species.

**ABC supports designating as Critical Habitat all of the 13,961,684 identified acres, and adding all areas within the late-successional reserve network that were excluded, plus any occupied or suitable Northern Spotted Owl habitat that was not identified in the draft.**

ABC is deeply concerned about the draft Rule’s encouragement of active management in Northern Spotted Owl Critical Habitat, the changes it suggests to management plans and projects, and logging projects in suitable owl habitat that have already been initiated. The 2010 Final Northern Spotted Owl Recovery Plan is already influencing management changes on federal forests potentially detrimental to the restoration of large blocks of habitat needed to
recover the Northern Spotted Owl such as regeneration of moist forests to create early-seral habitat. The draft Critical Habitat rule could expand this harmful policy and should be revised to instead to favor reducing forest fragmentation by maintaining the system of late-successional reserves to allow the continued formation of large blocks of suitable habitat.

A number of the Recovery Actions in the Final Recovery Plan appear to be contradictory, some calling for the protection of additional owl habitat, while others allowing, even encouraging increased adverse modification. This contradiction is also found in the draft Critical Habitat rule which proposes a significant increase in Critical Habitat acreage while at the same time green-lighting logging techniques proven harmful to owls and owl habitat, eliminating the proven late-successional reserves necessary to ensure large blocks of habitat, and recommending protection only for the very highest quality owl habitat.

The Environmental Assessment concluded that a wide degree of uncertainty would be created in regard to timber outputs, depending on how the Rule was implemented, and which of the advisory Recovery Actions were followed by the land management agencies. While the assessment did analyze different scenarios for timber production, it did not analyze a reserve-less strategy that could potentially allow for logging in currently-protected forests older than 80 years but not yet old enough to be considered high quality owl habitat. At the same time, the Service appears to endorse a policy of reserve-less management on page 94.

A more complete Environmental Assessment is needed for the public to be able to fully assess the potential consequences of this Rule. Similarly, the Economic Analysis is faulty and offers an incomplete look at the economic effects of the Rule by analyzing only the potential value of timber production, while ignoring the monetary benefits of other important values provided by maturing and old-growth forests such as stable stream flows, clean water supplies, and carbon storage.

Based on the available information in the draft Rule and Environmental Assessment, we must assume the elimination of late-successional reserves is a potential application of this Critical Habitat rule and Final Recovery Plan. Therefore the effects of eliminating the reserves should be fully analyzed by the Rule and companion Economic Analysis and Environmental Assessment. And because this analysis is notably absent, and because the Economic Analysis did not analyze the vast majority of economic activity on the forests affected, the public is currently unable to determine the full consequences of the pending rule.

We therefore urge the Service to make abundantly clear to the public and to the land managing agencies that elimination of the reserves is not an application of, or a recommendation of the final Rule, economic analysis, or environmental assessment.

The Service is promoting an unacceptably risky strategy in the Final Recovery Plan, Draft Rule and ESA consultations in regard to short-term losses of Northern Spotted Owl, a species that the evidence indicates merits endangered status. The draft Rule leaves many important
questions unanswered. There is a lack of quantification of how many Northern Spotted Owls can be taken or habitat acres degraded, no thresholds are provided that land managers should not exceed, nor is there any indication how many additional owls may (or may not) be gained by the claimed long-term habitat benefits of the projects, or how and where large blocks of habitat will be recovered absent the reserves. Given these uncertainties, a more cautious approach that maintains the reserves created by the Northwest Forest Plan is warranted.

Thank you for this opportunity to comment. In the pages that follow are additional comments on the proposed Critical Habitat rule, essential background, and supporting materials that we hope you will find useful as you develop the final Rule. We look forward to working with the Service to preserve and recover the Northern Spotted Owl.

Sincerely,

Steve Holmer
Senior Policy Advisor
American Bird Conservancy

Siskiyou National Forest, Oregon.
Comment Letter to President Barack Obama

Below is a comment letter concerning the Draft Critical Habitat rule from conservation groups and scientific organizations sent to President Barack Obama asking the mature and old-growth forests be protected and the Rule be changed to ensure the system of late-successional reserves created by the Northwest Forest Plan are maintained:

American Bird Conservancy ♦ Natural Resources Defense Council  
Sierra Club ♦ Center for Biological Diversity ♦ Friends of the Earth  
Endangered Species Coalition ♦ Oregon Wild ♦ Conservation Northwest  
WildEarth Guardians ♦ Cornell Lab of Ornithology ♦ Geos Institute

July 2, 2012

The Honorable Barack Obama  
President of the United States of America  
The White House  
1600 Pennsylvania Ave NW  
Washington D.C. 20500

Dear President Obama,

The undersigned organizations urge your support for the conservation of the mature and old-growth forests in the Pacific Northwest. These magnificent forests provide clean drinking water for millions of Americans, a world-class tourism destination, sustainable forestry, and habitat essential to the survival of hundreds of species of wildlife.

Conservation of the old-growth ecosystem as symbolized by the Northwest Forest Plan developed under the leadership of President Bill Clinton was a significant environmental advance that ended decades of unsustainable management practices in the region.

Studies show that the Northwest Forest Plan is working as intended to retain mature and old forests, and that the highly fragmented forest ecosystem is growing back into the large blocks of mature forest habitat needed to maintain water quality and recover threatened species such as the Northern Spotted Owl, Marbled Murrelet and Pacific salmon stocks.

Your administration recently released a draft Critical Habitat proposal for the Northern Spotted Owl that identifies sufficient habitat necessary to conserve the threatened species and the old-growth ecosystem upon which it depends. We commend the agency’s use of modeling to identify the proposed acreage which we believe represents the best available science.
However, the draft plan and accompanying Presidential Memorandum raise concern because of the proposed active management in owl critical habitat that is not supported by the best available science. Three major scientific societies are advising the administration to conduct more research on the effects of active management on owl populations before treatments are applied more broadly. We agree with the scientists’ call for caution.

The draft also includes provisions that could have the unintended consequence of weakening or eliminating habitat protections of the Northwest Forest Plan. We respectfully urge the administration to modify the proposed Critical Habitat rule to ensure that the protected reserves of the Northwest Forest Plan are maintained so that future generations of Americans will be assured they will have an opportunity to enjoy the splendor of these old-growth forests.

Sincerely,

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B. Petition to list the Northern Spotted Owl as Endangered prepared by the Geos Institute

C. Comments on the Draft Economic Analysis of Critical Habitat Designation for the Northern Spotted Owl by Ernie Niemi

D. Email from David Iverson, Region 4, dated August 6, 1990, Goodbye Thoughts, and “Inside Out” by Steven P. Smith, a farewell commentary by a Willamette National Forest biologist.

E. Scientific Societies Request for Environmental Impact Statement of Proposed Active Forest Management in Spotted Owl Critical Habitat

F. Open Letter to President Barack Obama from 229 Scientists in Support of Northwest Forest Plan

G. The Wildlife Society Peer Review of the 2010 Draft Revised Recovery Plan for the Northern Spotted Owl

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L. What is Wrong with the Secretarial Pilot Projects by Francis Eatherington, Cascadia Wildlands
Executive Summary

Draft Critical Habitat Rule Weakens Habitat Protection for the Northern Spotted Owl

Studies show that the Northwest Forest Plan is working as intended to retain mature and old forests, and that the highly fragmented forest ecosystem is growing back into the large blocks of mature forest habitat needed to maintain water quality and recover threatened species such as the Northern Spotted Owl, and Marbled Murrelet.

With some modest additions the draft Critical Habitat proposal for the Northern Spotted Owl identifies sufficient habitat necessary to conserve the threatened species and the old-growth ecosystem upon which it depends. ABC commends the agency’s use of modeling to identify a significant increase in proposed acreage which we believe represents the best available science. We support designating all of the identified acres, plus additional areas that warrant designation such areas in late-successional reserves, currently occupied and suitable owl habitat.

However, the draft plan and accompanying Presidential Memorandum raise concern because of the proposed active management in owl critical habitat that is not supported by the best available science. Three major scientific societies are advising the administration to conduct more research on the effects of active management on owl populations before treatments are applied more broadly. We agree with the scientists’ call for caution.

The draft also includes provisions that could have the unintended consequence of weakening or eliminating habitat protections of the Northwest Forest Plan. In particular, the provisions in the draft plan encouraging unproven thinning and restoration logging, combined with the expansive definition of adverse modification that allows degradation of owl habitat, have the potential to allow for logging of areas now protected by the Northwest Forest Plan, including mature forests that the Plan had intended to become old-growth.

These provisions, which were repeated numerous times in the draft, appear to intend a substantial increase of timber harvest in the region while providing a minimum of habitat protection, in terms of both total acreage by encouraging unwarranted exclusions, and weaker management standards than the standards and guidelines of the Northwest Forest Plan’s late-successional reserves. This language has the potential to allow excessive logging to the detriment of the Northern Spotted Owl population and may foreclose owl recovery by not providing adequate late-successional forest necessary to ensure high quality owl habitat in the future.

There is also concern about changes to land management plans resulting from the Critical Habitat rule and Final Recovery Plan. The Service tacitly endorsed elimination of the owl reserves east of the Cascade Crest by including language favorable to that approach in the Owl Recovery Plan. The proposed Okanogan-Wenatchee Forest Plan revision would eliminate the
existing owl reserves and in the Environmental Assessment (p. 94), it says that would be consistent with Recovery Plan and therefore compatible with owl recovery.

We strongly disagree. It should be noted that this portion of the Draft Recovery Plan was strongly criticized by peer reviewers, but in the Final Plan, their concerns were not addressed.

We respectfully urge the U.S. Fish and Wildlife Service to modify the proposed Critical Habitat rule to ensure that the protected reserves of the Northwest Forest Plan are maintained so that future generations of Americans will be assured they will have an opportunity to enjoy the splendor of these old-growth forests.

**Recommended Changes**

We urge that the Final Critical Habitat Rule make clear that eliminating the system of late-successional reserves would be detrimental to owl recovery and is not a recommended outcome of this rulemaking, or the Environmental Assessment and Economic Analysis.

The proposal encouraging adverse modification of habitat for ecoforestry purposes is not supported by the best available science. We recommend it be removed from the final rule.

We recommend that the determinations of adverse modification be at the appropriate fine scale to ensure ESA compliance.

We recommend that the standards and guidelines of the Northwest Forest Plan late-successional and riparian reserve systems be used to preclude inappropriate or unsustainable management practices. The Northwest Forest Plan allows for restoration and provides standards and guidelines that are more protective of owls and better suited to experiments in ecological restoration.

Prescriptive requirements to retain trees above a certain age or size to restore the deficiency in old forests, and mapping where large blocks of closed canopy forests will be retained and allowed to mature is necessary to ensure these values will be not become subject to mismanagement or overcutting.

Active management in owl habitat should be considered experimental, conducted on a small scale, and monitored to determine its impact on Northern Spotted Owls. The necessity and benefits of active management in owl habitat remains in dispute.

We recommend the Service develop an environmental impact statement to devise a research strategy that addresses this question.
American Bird Conservancy

American Bird Conservancy (ABC) is a 501(c)(3) non-profit organization whose mission is to conserve native birds and their habitats throughout the Americas. It achieves this by safeguarding the rarest bird species, restoring habitats, reducing threats to bird species, and building capacity to advance bird conservation.

ABC is the only U.S.-based group with a major focus on bird habitat conservation throughout the entire Americas. ABC has more than 8,000 individual members and 30,000 constituents. ABC’s members, supporters, and activists enjoy viewing, studying, and photographing migratory birds. Some of its members and constituents routinely observe the Northern Spotted Owl in California, Washington, and Oregon.

ABC is a leading organization working to reduce threats to birds from habitat destruction; from collisions with buildings, towers, and wind turbines; and from toxins such as hazardous pesticides and lead.

ABC uses a variety of mechanisms to achieve these objectives including scientific research and analysis; advocating for bird conservation at the local, state, regional, and federal levels; forming bird conservation partnerships; and pressing for meaningful regulatory changes to address such threats effectively through various means, including rulemaking petitions and litigation. See, e.g., ABC v Fed. Communications Commission, 516 F.3d 1027 (D.C. Cir. 2008) (in response to ABC’s review petition seeking protection of migratory birds from collisions with communications towers, the court vacated a part of the order for violation of the National Environmental Policy Act (“NEPA”), 42 U.S.C. § 4321 et seq.).

The American Bird Conservancy Strategic Bird Conservation Framework

The problems facing birds today are myriad and complex, requiring a far-reaching, bold vision for conservation. ABC has developed a unique and successful strategy to preserve bird diversity and maintain or increase wild bird populations. This strategy is fully articulated in *The American Bird Conservancy Guide to Bird Conservation* published in 2010 by University of Chicago Press (ISBN-13:978-0-226-64727-2).

The highest bird conservation priority is halting extinctions, followed by conserving and restoring habitats. In the case of the Northern Spotted Owl draft Critical Habitat rule, the Service is proposing to place lower priority general habitat needs before the specific needs of an endangered species, even to the point of allowing large numbers of Northern Spotted Owls to be killed (taken) and significant habitat to be degraded or completely eliminated for decades. While the stated goal to improve future habitat conditions for the owl is well-intended, this activity is not supported by peer-reviewed studies showing owl populations will benefit, and it is, in fact, pushing an already extremely imperiled species closer to extinction and should be immediately halted.
Review Indicates Endangered Status Warranted for Northern Spotted Owl

A review of the extensive literature on the Northern Spotted Owl, forest ecology, and conservation biology published over the two decades since the subspecies was listed indicates Northern Spotted Owl populations have continued to decline and now meet the Endangered Species Act’s definition of an *endangered* species, that is, it is "...in danger of extinction throughout all or a significant portion of its range...". As a result, stronger conservation measures are needed than the Service is currently considering.

On federal lands, Northern Spotted Owl populations not only continue to decline despite the Northwest Forest Plan, the decline is accelerating and vital rates are deteriorating (Forsman et al. 2010). In study areas not managed under the Northwest Forest Plan owl declines are significantly greater (Anthony et al. 2006). A recently published large-scale demographic study (Forsman et al. 2010) found that the species is declining on seven of eleven active demographic study areas at about 3% annually range-wide, and concluded that the Northern Spotted Owl clearly is on a trajectory towards extinction. Funk et al. (2010) provides evidence for recent genetic bottlenecks in northern spotted owls that increase the vulnerability of the Northern Spotted Owl to extinction.

Currently, the subspecies is already nearly extirpated in much of its range. In British Columbia, as far as we know, all remaining birds are in captivity; few remain on the Olympic Peninsula, Southwest Washington, and the northern portion of the Oregon Coast Range. Populations are very small and isolated in most of Washington where rates of decline are highest. Areas that have little federal land support few or no owls, and Forsman et al. (2010) state that as a result, too few Northern Spotted Owls exist in four regions (southwestern Washington, the Coast Range of northwest Oregon, the California Cascades, and much of Washington’s Olympic Peninsula) to conduct a demographic study with their methods. Further, the literature suggests
these declines are not likely to lessen even with the latest owl recovery plan in place due to the un-quantified and unmitigated risks accepted in the plan.

Considering that the best available science has documented an ongoing, range-wide decline of the Northern Spotted Owl and its extirpation in many regions that historically were occupied, we are requesting that the Service upgrade the Northern Spotted Owl’s Endangered Species Act listing status from threatened to endangered and take decisive action to stop the further deterioration of the Northern Spotted Owl’s population and degradation of its habitat.

The Northern Spotted Owl meets the Endangered Species Act’s definition of an endangered species because of impacts under four of five criteria established under the Endangered Species Act for determining the status of a species. A brief summary is provided here and the full analysis developed by the Geos Institute is available in the appendix.

1. The present or threatened destruction, modification, or curtailment of the owl’s habitat or range

The Northern Spotted Owl is endangered by loss and modification of habitat, due especially to historic and ongoing logging and fire associated management. Over a century of logging has removed much of the Northern Spotted Owls’ habitat. In 1990, habitat loss was estimated at 60-88% since the early part of the 19th Century. Since the owl was listed in 1990, habitat loss has continued throughout the owls’ range. While much of this loss has slowed on federal lands due to the Northwest Forest Plan, habitat loss continues at relatively high rates on nonfederal lands. Additionally, it appears that the effects of past logging still are occurring on both federal and nonfederal lands as increased fragmentation and habitat loss propagate through the ecosystem.

The Northwest Forest Plan assumed a period of decades would be necessary before habitat in many of the late-successional reserves became suitable for owls; only about 36% of the reserves currently are functioning as old-growth forests, with most of the reserves still in various stages of recovery from logging. Additionally, other human actions, including post-disturbance logging and extensive fuel treatments, urban development, livestock grazing, mining, recreation, and road construction, have contributed to past and continue to contribute to present cumulative losses and degradation of Northern Spotted Owl habitat and their prey.

2. Disease or predation

The Northern Spotted Owl is subject to disease and predation pressures that have increased substantially since its listing. Changes in habitat that result in more open areas (e.g., from forest thinning) and increased fragmentation of older forests likely cause an increase in predation by Great Horned Owls, Northern Goshawks, and Red-Tailed Hawks that either increase mortality on adult Spotted Owls or on dispersing juveniles. In addition, Leskiw and Gutiérrez (1998) present evidence of predation on Spotted Owls by Barred Owls, a risk that is growing with increasing overlap in distribution of Spotted and Barred Owls.

3. Inadequacy of existing regulations to protect the owl and its habitat

The Northern Spotted Owl is endangered and its habitat is subject to adverse modification due
to the inadequacy of existing state and federal regulations. Existing regulations have failed to truly protect the Northern Spotted Owl and its habitat on private, state, or federal lands. This failure is evidenced by the continued loss and degradation of owl habitat, the failure to restore habitat damaged by past management practices, and by a demonstrated failure to reverse the decline of the Northern Spotted Owl over the last two decades.

4. Other natural or human caused factors
The Northern Spotted Owl is endangered by threats associated with the continued increase in Barred Owl populations. These detrimental impacts may be interacting with habitat loss and fragmentation to accelerate the decline of Northern Spotted Owl populations. Barred Owls compete with Northern Spotted Owls and are considered a major threat to Spotted Owls. Collapse of Northern Spotted Owl populations has followed the north to south invasion of the Barred Owl and areas that recently have been invaded by Barred Owls are beginning to show signs of population declines.

A Conservation History of the Northern Spotted Owl
The conservation history of the Northern Spotted Owl offers important lessons that should advise the options developed by policymakers. The consequences of past active management and agency misconduct have engendered mistrust with the public, and are a reason for caution whenever new proposals for active management in owl habitat are considered.

The damage caused to the National Forests by overcutting during the 1960s, 1970s, 1980s, and 1990s has yet to be addressed by the land management agencies. For example, there remains an excess of logging roads on the National Forests and an estimated $10 billion backlog of road maintenance. The impacts to publicly owned forests are reduced water quality, increased water filtration costs for downstream communities, and diminished fisheries and aquatic ecosystems.

Agency scientists first confirmed the Northern Spotted Owl’s decline and connection to old-growth forest habitat in 1983. But instead of taking steps to moderate habitat loss, a series of legislative riders allowed for record logging levels in owl habitat from 1983 – 1990 and

Aerial view of fragmentation and road impacts in Oregon’s Coast Range.
listing of the species as threatened was delayed until 1990.

In 1990, Congress passed an old-growth logging rider (section 318 of the FY 1990 Interior Appropriations bill) that overturned two court injunctions that had halted over 140 old-growth timber sales, and orders the Forest Service and Bureau of Land Management (BLM) to offer a fixed volume of timber in Washington and Oregon during that year, about 9.6 billion board feet. It also includes sufficiency language saying citizens could not challenge these projects if they violate environmental laws except for the Endangered Species Act. Many of these projects did not have stream buffers to protect water quality or other minimal environmental safeguards.

Defeat of the next legislative amendment offered in 1991 to prevent environmental review of timber sales in owl habitat, opened the court house door to legal challenges against timber sales proposed in owl habitat. In 1991, Federal Judge William Dwyer then ruled the agency had systematically and deliberately failed to abide by wildlife protection laws.

Regeneration harvest fragments habitat which is detrimental to the Northern Spotted Owl. Mt. Hood National Forest, Oregon.

Judge Dwyer’s scathing ruling and resulting injunctions shut down the region’s timber sales program on federal lands. In Congress, public pressure was building for permanent protection of the ancient forests. Only the intervention of Speaker of the House Thomas Foley prevented a House vote on the Ancient Forest Protection Act, a bill that had been championed by Rep. Jim Jontz.

The injunctions and political gridlock prompted intervention by incoming President Bill Clinton.
A forest summit was held in Portland, Oregon in 1993, and agencies were directed to develop the Northwest Forest Plan. This was a first of its kind, multispecies and ecosystem conservation plan intended to protect late-successional forests and riparian areas, as well as the Northern Spotted Owl, Marbled Murrelet, Pacific Salmon stocks, and 600 other old-growth-dependent species. The Plan went into effect in 1994 and it remains today the best available conservation framework of its kind.

The Emergency Rescissions Act of 1995, better known as the “salvage logging rider” or “lawless logging”, suspended most environmental laws from June 1995 until December 1996 to allow the Forest Service to address forest health emergencies. Instead of legitimate restoration, the public witnessed hundreds of old-growth and roadless area timber sales offered for sale, including dozens in the Pacific Northwest that had been previously ruled illegal by federal courts.

Strong public opposition and hundreds of protests ensued. Pressure on the Clinton Administration led then Secretary of Agriculture Dan Glickman to cancel over 150 of the roadless area projects that had been offered under the Rider, but many of the old-growth sales were logged.

Agency budgeting and the system of incentives created by Congress to boost logging played a role in the management abuses that occurred under the rider. In 1976, the Forest Service Salvage Fund was created to expedite the removal of insect-infested, dead, damaged, or down timber. Salvage sale revenues are deposited in the Salvage Fund to pay for additional projects. The Fund created an incentive for managers to promote salvage sales, because forest managers keep the sales receipts instead of returning the funds to the Treasury.

The Interagency Review on the Salvage Program of 1996 found that the fund creates a financial incentive for agency managers to choose salvage logging when other restoration activities that do not return receipts to the agency would be more appropriate. Other incentives such as the KV fund were found to create a similar problem. By allowing the Forest Service to keep all timber sale receipts instead of returning the proceeds of selling the public’s timber to the Treasury, a powerful incentive has been created for the agency to overcut the forest to maintain their own budgets and staffing levels.

In the aftermath of the Salvage Logging Rider, multiple attempts were made in Congress and by the subsequent Bush Administration to expedite logging by weakening or eliminating environmental protection and public involvement for timber sales nationwide. Most of these efforts, such as Rep. Bob Smith’s Forest Health Bill of 1997, were unsuccessful, but the Healthy Forests Restoration Act of 2003 did pass and was signed into law by President Bush, although only after significant changes were made to target projects towards thinning around homes and communities.

Repeated attempts were also made to reduce or eliminate key protections of the Northwest Forest Plan, including agency proposals to eliminate the survey and manage requirement, and
the aquatic conservation strategy protecting streams and degraded watersheds. The Northern Spotted Owl Critical Habitat designation and Owl Recovery Plan offered by the Bush Administration were heavily criticized as scientifically flawed and biased against the Northwest Forest Plan.

A later investigation by the Department of Interior’s Inspector General confirmed that political interference had prevented the Service from preparing a scientifically sound Recovery Plan. This contributed to the Recovery Plan being remanded and the Critical Habitat designation being thrown out.

In addition, BLM developed and publicly promoted the Western Oregon Plan Revisions (WOPR), a scientifically flawed plan that would have eliminated the late-successional reserves or allowed logging in reserve to increase logging of federal mature and old-growth forests managed by BLM in Oregon by 400%. Independent scientific reviews, including those by the U.S. Environmental Protection Agency and National Marine Fisheries Service, found the plan would likely cause significant harm to the forests, water quality, and threatened species. A review of the draft plan by BLM’s own science assessment team found numerous deficiencies.

The WOPR planned for the elimination of 680 known nesting sites of the threatened Northern Spotted Owl, and another 600 known nesting sites of the Marbled Murrelet, a threatened seabird that also depends on old-growth forests. The BLM’s flawed WOPR analysis concluded that owl and murrelet populations would not be harmed by increased logging, but BLM refused to consult with Service wildlife experts on its plan. A federal judge ruled the WOPR illegal in March 2012.

**Administration Proposes another Western Oregon Plan Revision**

The Administration has announced a new planning process for BLM-managed lands in Oregon. Based on the Notice of Intent (NOI) and the Administration’s press statements, the plan shows a bias towards active management and proposes a significant departure from the Northwest Forest Plan by encouraging regeneration in moist mature forests. This is harmful to the Northern Spotted Owl by risking take of individual birds and habitat, increasing forest fragmentation, and setting back the needed expansion of the old-growth forest ecosystem over time to provide for owl recovery.

For example, the NOI states:

“The revisions to the existing RMPs will determine how the BLM will actively manage BLM-administered lands in western Oregon to further recovery of threatened and endangered species, provide clean water, restore fire-adapted ecosystems, produce a sustained yield of timber products, and provide for recreation opportunities.”

The statement shows a high degree of bias because it falsely assumes active management can
accomplish all of those things. In fact, past active management that resulted in excessive logging and road building is the reason we have threatened and endangered species in the region. Active management, while producing timber volume, also harms water quality and diminishes recreational opportunity. Active management has also been shown to increase, rather than decrease fire risk if expensive follow up treatments to remove or burn slash piles and to conduct managed burns are not carried out.

The Northwest Forest Plan is working to restore degraded watersheds and protect clean drinking water supplies. Willamette National Forest, Oregon.
It also ignores the benefits of preservation. The Wilderness Society has released a report *Wilderness and Water Mix Well* on the relationship between healthy watersheds and protected lands in the National Forest System. The report found that only 38% of watersheds where active management is greatest were functioning properly, 58% were at risk, and 5% were impaired. In contrast, protected lands scored much higher; 80% of Wilderness is functioning properly and only 18% at risk and 1% impaired. Roadless areas scored in second place with 64% functioning properly, 34% at risk and 2% impaired.

This new WOPR planning effort is essentially BLM pulling out of the Northwest Forest Plan. This undermines the integrity of the Plan, which provides an adequate regulatory mechanism to conserve the Northern Spotted Owl and other wide-ranging species. The importance of consistent management across the owl’s range has been cited in past court cases.

Two key assumptions behind the biological analysis of the Northwest Forest Plan were that (1) “[r]iparian and Late-Successional Reserves (LSRs) will retain reserve status and will not be available for timber production other than as provided in Alternative 9” and (2) “[a]lternative 9 applies to Forest Service and BLM lands; all future actions on these lands would be consistent with Alternative 9, as adopted in the Record-of-Decision (ROD).” See FEIS at 2-33 to 2-34. (Earthjustice comment letter).

BLM’s indicated management direction as expressed by the NOI, violates both of these assumptions.

**Okanogan-Wenatchee National Forest Plan Revision**

The Okanogan-Wenatchee National Forest Plan Revision has also raised great concern by proposing the elimination of the existing system of late-successional reserves. A Region 6 Forest Service Assessment found that late-successional forests are generally below their historic range of variability, and the availability of snags larger than 20 inches, and snag habitat is generally lacking in some forest types because of past management practices.

While the notice of intent proposes that a designated percentage of the forest will be managed for the owl’s benefit, there will no longer be areas where the species’ protection is guaranteed. This proposal is not consistent with the Northwest Forest Plan, which provides reserves with guaranteed protections that cannot be ignored at the discretion of the local land managers.

The Forest Service claims that static reserves are no longer a viable strategy for conserving the owl, but to date has not produced credible evidence to support that contention. Portions of the now discredited Northern Spotted Owl Recovery Plan of 2008 reached the same unfounded conclusion, and inclusion of similar language in the 2010 Draft Recovery Plan spawned strong opposition from the scientific societies that peer-reviewed the plan.
The Final Owl Recovery Plan calls for conserving older stands that have occupied or high-value spotted owl habitat, and to “Continue to manage for large, continuous block of late-successional forest.” Without the system of late-successional reserves remaining in place, the agency has not provided any mechanism to ensure that the land management agencies will provide for large, continuous blocks. In fact, given the management history, and continued proposals to further fragment the forest, the importance of maintaining the reserve system should be that much more apparent.

The reviewers found that the science included in the draft was incomplete because numerous studies to the contrary had not been considered. In the final draft, a greater effort was made to reference the omitted studies, but the conclusions remained the same. For example, evidence presented in Hanson et al. (2009) on fire risk was cited but not used.

Several new studies have been published that also analyze satellite images of the forest, and have found that high intensity, “catastrophic” fires have not been increasing in Northern California, or on the Eastside. As a result, we believe the plan overestimates fire risk. Similarly, the Hanson study was also not used regarding the rates of recruitment relative to rates of loss to stand-replacing fires, resulting in an overestimation of the amount of reserve likely to be lost.

In addition, the management standards proposed for portions of the former late-successional reserves could be potentially harmful to many species of wildlife, including the Northern Spotted Owl. The proposed Okanogan-Wenatchee forest plan would allow for significantly greater road densities (more than 15%) than allowed in the current six owl reserves and possibly eight others depending on agency interpretation changes in summer road use. Allowing greater fragmentation and road densities would reduce the amount of suitable owl habitat in those areas, not to mention increasing fire risks, and should not be allowed.

**Volume Driven Restoration is Not Restoration**

The Obama Administration has committed itself to a significant increase in logging on the National Forests as indicated by the February 2012 report “Increasing the Pace of Restoration and Job Creation on our National Forests.” A March Forest Service memo to Region 6 calls for a 20% increase in volume this year, and that it is to fall under the rubric of restoration.

We question whether legitimate restoration can be accomplished when meeting timber volume targets is the primary management directive. Hard timber targets on the National Forests were ended because evidence emerged that it was causing harm to the forests, and to the Forest Service itself.

Included in the appendix is a farewell letter from Steven Smith, a wildlife biologist from Willamette National Forest detailing mistreatment of agency biologists at the hands of timber
managers. Here’s one excerpt:

“Even more disheartening is attending meetings where the spotted owl gets blamed for this internal crisis as well. A strange paradox since Forest Service managers are ultimately responsible for the spotted owl crisis as well.”

A return to timber target driven management would mark a huge setback that threatens to undo the agency’s progress towards professional integrity and stewardship. We urge the Service to oppose Forest Service and BLM plans to increase timber production under the guise of restoration. It threatens the Northern Spotted Owl and risks returning the Forest Service and BLM to the errant ways of their past as well as delegitimizing other much needed restoration work on federal lands.

**Flawed Final Northern Spotted Owl Recovery Plan**

Concern is being raised by scientists that active management in suitable owl habitat is not supported by the best available science. There are currently no peer-reviewed studies showing Spotted Owls benefit from the proposed logging treatments, while others show short-term harm to owl and prey base from thinning with declines lasting up to 30 years.

Estimates of owl habitat loss from fire are not based on defensible data sources and we remain concerned that the agency is operating on the unproven and unanalyzed assumption that Northern Spotted Owls are not resilient to fire. All three subspecies of Spotted Owl exist in fire adapted forests. At the same time, the agency fails to address the problem of post-fire logging which degrades and eliminates legacies, habitat for the owl’s prey base, and owl foraging areas.

Given the 2.9% annual decline in owl population, it is not acceptable to allow for short-term losses of owls in the hope that improved habitat conditions might prove beneficial to the species someday in the distant future. But this is precisely what the draft Plan is calling for.

“While proposed Federal actions must comply with requirements of the Act, actions with some short-term adverse impacts to spotted owls and critical habitat, but whose effect is to conserve or restore natural ecological processes and enhance forest resilience in the long term, should generally be consistent with the goals of critical habitat management.”

*(Executive Summary p. 8)*
The proposed Critical Habitat rule relies heavily on the Final Northern Spotted Owl Recovery Plan and cites it as if it were a peer reviewed document. However, the Final Owl Recovery Plan was never peer reviewed. In addition, peer reviewers identified many faults in the Draft Recovery Plan, particularly concerning active management and the need for maintaining owl reserves that were never corrected in the Final.

For example, the summary of The Wildlife Society (TWS) review states:

"Other aspects of the 2010 DRRP are flawed and many are not based on best available science. The lack of a permanent proposal for a reserve system is a major problem that prevents full review of the 2010 DRRP. We believe this will necessitate further peer review prior to finalization of a recovery plan. The Service’s strategy for no reserves in dry forests in the eastern Cascades is exacerbated by the proposals for aggressive management of these dry forests because the treatments will reduce the amount of closed canopy forests in the landscape and reduce the amount and suitability of habitat for the subspecies. These proposals are not based on a complete review of the available science and they rely on unpublished reports. In addition, there has been no formal accounting of how closed canopy forests can be maintained with the widespread treatments that are being proposed. Management actions, which are not based on good science, in dry forests with no reserves will likely lead to failure to achieve recovery criteria."

The TWS review also noted that in at least a dozen instances, important studies with bearing on these issues, and that often contradicted the intended management direction were excluded from the analysis. It can be concluded that the agency had cherry-picked studies supporting one view while actively ignoring opposing studies. The Society concluded in its typically diplomatic fashion that:

"In summary, we commend the Service for their intent to use the best available science in developing the 2010 DRRP for the Spotted Owl; however, we found strong evidence that this was not the case throughout much of the Plan. The Service should make a comprehensive effort to base their recommendations and guidelines on the best available science so that they are in compliance with Secretarial Order #3305 issued by Interior Secretary Salazar on September 29, 2010 and the Presidential Memorandum of Scientific Integrity."

Unfortunately, no such effort was made to correct the scientific deficiencies identified in the TWS review. While some of the omitted studies were cited in the final recovery plan, the same unsubstantiated conclusions in support of logging in owl habitat and eliminating owl reserves on the Eastside were reached.

Another team of five scientists (Hansen, Bond, Odion, DellaSala, Baker) that reviewed the draft concluded, “...there are considerable deficiencies in the 2010 draft recovery plan where the Fish and Wildlife Service did not make use of best science, untested assumptions regarding risks of active management vs. fire, and unpublished literature in assessing forest recruitment vs. late-
"successional “losses” post-fire."

The group of scientists urged the Service to recommend retention of all existing late-successional reserves, additional new reserves to create greater connectedness across the landscape, and greater protections from logging, especially post-disturbance logging within late-successional reserves.

Old-growth forests in the Pacific Northwest and northern California store more carbon per acre than any other forests in the world.

Research on Effects of Logging on Owl Populations

The scientific societies are urging the agency to develop an Environmental Impact Statement on the effects of thinning and ecoforestry on Northern Spotted Owl populations. To date the agency has no evidence that thinning or ecoforestry benefits owl populations, but we know that many of the projects will, in fact, cause short-term harm.

The need for this type of research was identified by Jack Ward Thomas in the 1990 Interagency Science Report, which also found that logging had not been found to be compatible maintaining suitable owl habitat, and the need for a precautionary approach that requires treatments be proven before broadly implemented.
“We propose a two-part conservation strategy. The first stage, prescribes and implements the steps needed to protect habitat in amounts and distribution that will adequately ensure the owl’s long-term survival. The second stage calls for research and monitoring to test the adequacy of the strategy and to seek ways to produce and sustain suitable owl habitat in managed forests. Insights gained in this second stage can be used to alter or replace habitat conservation areas prescribed in the first stage, but only if the modified strategy can be clearly demonstrated to provide adequately for the long-term viability of the owl.” (ISC p 2)

“The ability to harvest timber in currently suitable owl habitat and have that habitat remain suitable has not been clearly demonstrated.” (ISC p 104)

“Allow silvicultural treatments that have been tested or demonstrated through experimentation to facilitate the development of suitable habitat, such as planting trees.” (ISC p 325)

More recently the Forest Service Fifteen Year Monitoring Report on the Northwest Forest Plan states:

“First, there is very little research documenting the effect of wildfire on spotted owls and spotted owl demography. In light of losses of nesting/roosting habitat to wildfires as high as 10 percent in some provinces, we need to understand how fire severity, spatial patterns of wildfire, and fuel reduction management treatments might affect owl habitat use, prey populations, and owl demography. We recommend increased research and monitoring on this subject to better inform managers on how to manage habitat in fire-prone areas.”

**High Quality Habitat Is Insufficient**

The best available science and the continuing decline of Northern Spotted Owl populations indicate that the agency should designate as Critical Habitat and protect all suitable owl habitat, not just high-quality owl habitat. The definition of high quality owl habitat needs to be made more inclusive to ensure sufficient habitat will be conserved to allow for recovery.

In its review of the draft recovery plan The Wildlife Society raised concern about the narrow definition of high quality owl habitat being proposed. The Society notes that the proposed definition is only a subset of suitable habitat. Their analysis then states:

"...by limiting the definition of high quality habitat to a fairly narrow range of habitat conditions, management agencies will be able to justify thinning or commercial harvest in a broad range of naturally regenerated stands. Most of these naturally regenerating stands originated from fire and usually are suitable spotted owl habitat; therefore, they are not likely to be greatly “improved” by management. In western Oregon and Washington such stands are typically comprised of large trees that are 80-160 years old, and include scattered (i.e., residual) old-growth trees that survived wildfires. These stands may not meet the strict definition of high
quality habitat, but they are often the best remaining habitat in the heavily harvested or burned landscapes that are managed by the Bureau of Land Management and Forest Service. They often occur in small patches, isolated among large areas of young forest within these disturbed landscapes, and they often serve as nest sites for spotted owls as well as refugia for species such as flying squirrels and tree voles, which are important prey of northern spotted owls. Because of the high timber volume in these stands there is intense pressure to log them. Commercial thinning is often recommended as a prescription to reduce risk of fire or improve forest conditions for owls in these stands, despite the fact that it is usually unclear if thinning will either improve these forests as habitat for owls or accelerate their transition from suitable to high quality habitat.

This uncertainty was one of the reasons that the Northwest Forest Plan included recommendations to restrict thinning in naturally regenerated stands over 80 years old in western Oregon and Washington. This restriction should be retained in the final Critical Habitat Rule.

Downed woody debris and legacy trees are important elements of quality habitat for the Northern Spotted Owl and its prey base.

Under the proposed Rule, it is likely that the issue of whether a particular habitat meets the high quality standard will become an area of ongoing controversy and dispute, and as the TWS analysis indicates, it has the potential to leave unprotected large acreage in the 80-160 year range. These forests are currently protected if they are in late-successional reserves, but if the
reserves are eliminated, these areas become subject to logging that will set back the recovery of owl habitat by many decades.

TWS recommended changes to the draft that were not incorporated into the final:

"Therefore, we recommend that the Service use a more inclusive definition of high quality habitat that would encompass a variety of late-successional forest types (i.e. mature and old-growth forests) in which spotted owls nest, roost, and forage. We also recommend that the Service take a more conservative approach and not recommend thinning in naturally regenerated stands over approximately 80 years old, especially when those stands include remnant old-growth trees. These stands will be the spotted owl nesting habitat of the future (if they are not already), and thinning them will most likely represent habitat loss for spotted owls and their prey, both in the near and long term. Such habitat loss will be in conflict with the Service’s recovery criteria and delisting objectives as stated in the recovery plan."

**Timber Sales Harmful to the Northern Spotted Owl**

Forest Service Region 5 and now the BLM with the Pilots are moving forward with the type of active management envisioned in the Final Recovery Plan and Draft Critical Habitat rule. The results are not encouraging. Projects are resulting in take of Northern Spotted Owls, loss of Critical Habitat, controversy, appeals and litigation. There are better policy alternatives.

**The Beaverslide Project**

The Beaverslide Project on the Six Rivers National Forest proposes to remove and degrade owl habitat claiming it will provide long-term benefits after causing short-term harm. The proposed active management will degrade 850 acres of "low to moderate quality" nesting and roosting habitat, and 2,162 acres of foraging habitat.

The project was approved only several months before the owl Recovery Plan was completed and is being challenged by Conservation Congress and Environmental Protection Information Center who argue that due to new information from the Recovery Plan and other studies, the Fish and Wildlife Service should reinitiate consultation.

The plaintiffs argue that the agency has violated the ESA for failing to consider new information and for failing to use the best available science; violated the National Environmental Policy Act for failing to consider direct, indirect, and cumulative effects for its action the owl, its habitat, and its prey; and that the Forest Service violated the National Forest Management Act by failing to comply with monitoring requirements of the Six Rivers National Forest plan.

The 2011 Recovery Plan requires that "active management" projects explicitly evaluate the short-term effects to Spotted Owls and their prey while considering the long-term benefits of
such projects, especially in Spotted Owl core areas. There are significant adverse short-term direct impacts to owls and to the owl’s prey from commercial thinning and other management activities (Forsman et al. 2004, Manning et al. 2012). The Forest Service failed to consider these studies in its Biological Assessment because it predated the Recovery Plan.

The 2011 Revised Northern Spotted Owl Recovery Plan states:

"Research directly evaluating spotted owl responses to vegetation management including thinning, fuels reduction, and management intended to restore ecosystem functions is needed to address...whether thinning operations designed to create future spotted owl habitat result in site abandonment during or after the operation and what types of vegetation management operations will spotted owl to persist in existing territories (2011 RP at III-46 to III-47)."

This lack of information should cause the Service to take a precautionary approach, but instead the agency appears to be moving ahead as though those questions have been answered. To date, we see no indication the agency is even attempting to answer these questions and its work on the Beaverslide project shows a remarkable abdication of the agency's responsibility to conserve and recover a threatened species.

In the project area, "twelve of the thirteen Northern Spotted Owl territories are currently below threshold within the 0.7 mile radius and all territories are below threshold within the 1.3 mile radius" below which reproduction is diminished. But, the Service failed to consider the 2011 Recovery Plan's discussion about direct effects of thinning on Northern Spotted Owl’s, or several other studies concerning decreased use by Northern Spotted Owl of harvested areas and reduced forage in stands that have been thinned or selectively logged for one to five decades. Without an explicit evaluation of short-term impacts to Northern Spotted Owls, it appears that implementation of the project will likely adversely affect the Northern Spotted Owls in the project area.

In an expert declaration in the case, Dominick DellaSala, chief scientist of the Geos Institute states: "The fact that all of these owl territories are below the Services' thresholds is a significant factor in analyzing potential harm to the resident owls in this area because any further degradation of the owl's structural habitat, or the owl's prey habitat is likely to cause significant short-term adverse effects on the owls, which may disrupt essential behavior patterns, including breeding, feeding, or sheltering...there is no analysis in the Biological Assessment that describes the short-term effects on the spotted owls that reside in the remaining territories...and the Service only presents its conclusions about the long-term habitat needs of the owl. The Service ' fails to ensure that they meet the requirements of the 2011 Recovery Plan that the area, "retain sufficient nesting, roosting, and foraging habitat within the provincial core-use area and within the provincial home range to support, breeding, feeding, and sheltering."

DellaSala also notes the area is already heavily fragmented from past active management and that "any additional fragmentation from road building (even temporary roads) or logging is
likely to adversely impact owl occupancy" and could facilitate invasion of the area by Barred Owls.

In addition, the Forest Service failed to take a hard look as required by the National Environmental Policy Act at the short-term effects on the owls and their prey. The agency analysis admits that "timber harvest and associated management activities may have a short-term negative effect on Northern Spotted Owl by modifying suitable owl habitat", but it never provides the necessary "hard look" to determine whether this short-term negative effect could cause additional reductions in "productivity and survivorship" in these below threshold activity centers, and it also failed to discuss the potential adverse indirect effects from the short-term reduction in the owl's prey base.

The Forest Service then makes numerous statements about the project benefits, but never provides any quantifiable or the required detailed hard look to substantiate those conclusions. For example, there is no disclosure that flying squirrels may not again use these areas for 20 years or that Northern Spotted Owls may not again forage in these areas for decades, or that this may lead to a loss of productivity and survivorship. The Forest Service' failure to take a hard look at the direct and indirect impacts of thinning and other management activities on the Northern Spotted Owls and their prey base in already degraded activity centers is unreasonable, arbitrary, capricious, and otherwise in violation of NEPA.

Because the project would reduce the amount of snags in the project area, it is important to look at the effect that would have on species that require snags such as the Western Screech Owl. There is essentially no Western Screech Owl population data for the project or planning area making Forest Service assertions that these species habitats are sufficient impossible to verify. Other species that may be negatively affected by snag removal in the project area include the Red-breasted Sapsucker, White-headed Woodpecker, Downy Woodpecker, Hairy Woodpecker, Brown Creeper, Vaux's Swift, and Flammulated Owl.

**Goose Logging Project**

Conservation groups have filed a legal challenge against the 2,100 acre Goose timber sale in the Willamette National Forest, Oregon for the potential damage to streams and endangered species habitat it may cause if carried out unchanged. The project would remove large mature trees from riparian buffers, adversely modify 454 acres of suitable Northern Spotted Owl habitat, and the agency did not analyze or disclose the impacts the logging will have on competition with Barred Owls.

**Rio Climax Timber Sale**

Four conservation groups are protesting a BLM Medford District’s plan to log trees larger than 30 inches in diameter and construct a new logging road because this will likely to adversely affect habitat of the Northern Spotted Owl.
**Kelsey Peak Timber Sale, Six Rivers National Forest**

The project proposes 1,521 acres of commercial thinning, 51 acres of late mature forest restoration and another 237 acres of low thinning considered as stand improvement (TSI). There are 13 owl activity centers in the project area. Fuel and thinning treatments within nesting-roosting habitat would amount to 327 and 85 acres respectively, for a total of 412 acres for all action alternatives. (DEIS p. 94) Within Northern Spotted Owl territories, Alternative 2A and 4 would thin 83 acres and Alternative 3 would thin 82 acres of nesting, roosting Northern Spotted Owl habitat that may cause short-term habitat degradation (DEIS 252).

**Algoma EIS, Shasta-Trinity National Forest**

The project area is in Northern Spotted Owl Critical Habitat and proposes to thin 5,600 acres of mixed conifer in natural stands and plantations, including 930 acres of sanitation treatments and 640 acres in Riparian Reserves, 1,100 acres of natural and activity generated fuels with mechanical and prescribed fire and an additional 200 acres with under burning. Including the future projects in the CHU from Table 14, there will be a 50 percent degradation of Northern Spotted Owl foraging habitat for 30 years, possibly longer. One stated purpose of the project is to produce LSR reserves to serve as habitat for the Northern Spotted Owl, yet the entire project area is in already suitable owl critical habitat. This logic would make sense if the FS were converting unsuitable habitat or plantation habitat to become nesting/foraging habitat. There is no need for forestry “improvements”.

**Mudflow EIS, Shasta-Trinity National Forest**

The agency preferred Alternative 2 proposes 1626 acres of thinning of mixed conifer stands, 594 acres of plantations, 185 acres of ponderosa pine sanitation, 197 acres of regeneration, 189 acres of wet meadow logging, 121 acres of shaded fuel break, 45 acres of black oak restoration. 134 acres of regeneration is proposed for a plan amendment that would reduce the 15% retention guidelines. 88% of the project area is within designated Critical Habitat CA-2 for the Northern Spotted Owl.

**Pettijohn HFRA LSR EIS, Shasta-Trinity National Forest**

The project is within Clear Creek Late Successional Reserve (LSR) and Critical Northern Spotted Owl Habitat. Silvicultural methods include 802 acres (and 58 acres in Riparian Reserve (RR)) of Tractor thinning from below, 104 acres (and16 acres in RR) of Cable logging, 153 acres (and 22 acres in RR) of Helicopter logging and 1,995 acres of FMZs that include mastication and hand pile/burn concentrations. The Biological Assessment page 51 for the Pettijohn project determined that the proposed actions “may affect and likely adversely affect the northern spotted owl through the reduction of habitat quality”. Existing NRF habitat would be degraded in about 1,793 acres due to FMZ and thinning prescriptions. Existing foraging habitat would be downgraded to connectivity habitat in about 288 acres due to thinning prescriptions.
Gemmill EIS, Shasta-Trinity National Forest

1,279 acres commercial logging, 10 Northern Spotted Owl Activity Center’s - The project proposes to; commercial thin 1,279 acres of that 300 acres is within Riparian Reserves (RR), 751 acres of mature forests and 528 acres of old-growth forest, thin from below 268 acres to reconstruct a 30 year old ridge top fuel break, 44 acres of plantation thinning, reduce fuels on 27 acres adjacent to private property, reconstruct 23.6 miles of road, construct 0.5 miles of “temporary” road. In LSR and Northern Spotted Owl Critical Habitat.

Petersburg Pines HFRA EA, Klamath National Forest

The project area boundary encompasses 10,380 acres. The proposed action is comprised of five main treatment types comprised of 7,350 acres: Thinning 2,332 acres with variable density thinning followed by fuels reduction activities (935 acres Tractor, 1,147 acres Skyline Yarder and 250 acres Helicopter); prescribed burning on 2,753 acres; fuel reduction activity in shaded fuel breaks on 879 acres; roadside fuels reduction activities on 1,288 acres and fuels reduction activities immediately adjacent to private property on 98 acres. The Proposed Action would “modify” 164 acres of N/R habitat within 1.3 mile home ranges and 755 acres of F habitat. Within Northern Spotted Owl 1.3 mile home ranges the Proposed Action may downgrade or remove approximately 79 acres of N/R habitat and 80 acres of forage habitat. Within Core Areas 17 acres of N/R and 45 acres of F would be modified.

Alternative 3 would modify 141 acres of N/R habitat and 834 acres of forage habitat. Understory burning and Fuel breaks could be detrimental to Northern Spotted Owl habitat and have the potential to downgrade and remove habitat within the project area by removing or reducing the suitable habitat characteristics within units. Shaded fuel breaks could be detrimental to Northern Spotted Owl habitat by reducing the amount and/or types of snags, CWD, understory vegetation and prey. Combined treatments within 1.3-mile Northern Spotted Owl home ranges would modify 560 acres of N/R and 1247 acres of foraging habitat. The Proposed Action would remove/downgrade N/R habitat within home range for a reproductive pair.

Smokey HFRA, Mendocino National Forest

Approximately 80% of the project area is within the Buttermilk Late Successional Reserve (LSR). 933 of commercial “thinning” is proposed within 737 acres in LSR and 196 acres in the Matrix land allocation. Mechanical fuels treatments are proposed on 637 acres, prescribed fire on 2689 acres, pre-commercial thinning on 400 acres, understory thinning and meadow enhancement on 1763 acres.

What is Wrong with Secretarial Pilot Projects in Moist Forests

Secretary of the Interior Ken Salazar has initiated a series of Pilot Projects on lands managed by
the Bureau of Land Management that seek to test new ideas in ecoforestry. Two moist forest Pilot Projects are being implemented to test the theories of Drs. Norm Johnson and Jerry Franklin using regeneration harvest to produce high-quality early-seral forests. These are the Roseburg BLM Pilot and the Coos Bay BLM Pilot.

After tracking the BLM’s two moist forest pilot projects, Cascadia Wildlands, a partner of American Bird Conservancy has identified significant problems, detailed in full in the appendix.

In our view, these moist forests are already providing Spotted Owl habitat and therefore should be retained. We encourage the BLM to discontinue implementation this type of harvest, especially in the new proposed Resource Management Plans. In addition, the Coos Bay BLM Pilot proposes to log over 900 healthy, rare, Port Orford Cedars and jeopardizes hundreds more that are retained, even old-growth trees.

The BLM has argued there is a need to break through “gridlock”, implying that environmentalists have stopped all logging. This is not true. The Coos Bay BLM has been selling 150% of their target volume over the past five years with virtually no controversy. Roseburg BLM has been close to their target volume. There is no gridlock in our forests, and there are better ways to promote high-quality early-seral habitat, such as not salvage logging after a natural disturbance.

The Siuslaw National Forest in Oregon has operated a successful and noncontroversial timber sale program for the past decade.
Lack of Service Oversight Allowing Owl Take on Private and State Lands

The U.S. Fish and Wildlife Service needs to do more to enforce the ESA against take of the Northern Spotted Owl on private lands. When asked about this at a public open house concerning the draft Critical Habitat rule, Oregon State Director Paul Henson stated that the agency had tried to enforce ESA Section 9 against Boise Cascade in one case twenty years ago and was ruled against by the court, and therefore would not make another Section 9 enforcement attempt for take on private lands. We like to see federal agencies doing everything it can to conserve the rapidly declining owl.

During the last administration, a Service program to review California timber sale plans and provide technical assistance to landowners was discontinued. As a result, these sales, that were formerly were often modified to mitigate the most likely harm to owl or owl habitat, are now proceeding unchanged.

The Environmental Protection Information Center has been compiling owl take information gathered by analyzing Timber Harvest Plans of Sierra Pacific Industries, Inc. whose actions, including logging, road building and other disturbance in northern California that result in significant habitat degradation and destruction that is likely to actually kill and injure Northern Spotted Owls. Sierra Pacific's actions result in unlawful take of Northern Spotted Owl by significantly impairing the essential behavior patterns of nesting, roosting, and foraging in violation of Section 9(a) of the ESA.

A review of seventeen Timber Harvest Plans with at least one Northern Spotted Owl activity center in or near the THP boundary. In total these will destroy over 1,000 acres of nesting/roosting habitat, and over 3,500 acres of foraging habitat. This constitutes illegal take under the ESA. Additional habitat will be destroyed by Sierra Pacific in areas where occupancy and use by the Northern Spotted Owl is unknown, and because the company does not share all information about Northern Spotted Owl on its property, additional take can be assumed.

Sierra Pacific currently lacks an HCP for management of their lands. Conservations groups are requesting the company halt logging or disturbance of owl habitat and immediately begin working with the Service to develop an HCP. We further urge the Service to renew the program of review timber harvest plans in California.

Regarding management of state lands in Washington State, the Society for Conservation Biology review of the draft owl Recovery Plan states: “One reviewer who is familiar with the actions of state agencies in Washington suggests that the regulations seem designed to facilitate continued declines in, rather than recovery of, Northern Spotted Owl populations.”
Forest practices on state and private lands in Oregon such as this are detrimental to Northern Spotted Owls, Marbled Murrelet and water quality.

Benefits of the Northwest Forest Plan

The Northwest Forest Plan is a significant environmental achievement of the Clinton Administration that should be built upon and extended by the Obama Administration. We believe this would be the best policy from a forest and wildlife management perspective. It is also the only mechanism available to provide legal certainty and ensure that an adequate regulatory mechanism remains in place to conserve and recover wide-ranging threatened species in the region.

What follows are a series of summaries and excerpts from Northwest Forest Plan documents detailing the management philosophy, standards and guidelines, and results.

The Forest Service Ten Year Review of the Northwest Forest Plan found that, overall, the Plan’s conservation strategy and reserve network appear to be working as designed. The total area of medium and large older forests on federal lands in the Plan increased by more than 1 million acres during the ten-year period, almost double the anticipated amount. The Plan’s outcomes for Spotted Owls were expected to take at least a century. Spotted Owl population declines
were expected for the first 40 to 50 years under the Plan, with owl populations stabilizing in the mid-21st Century and possibly increasing after that as owl habitat recovery exceeded loss.

**FEMAT:** Report of the Forest Ecosystem Management Assessment Team

Option 9: thinnings are allowed in any stand regardless of origin up to 80 years; salvage of areas larger than ten acres where trees have been killed by catastrophic events.

The requirements for the Matrix under Option 9 vary by area:

- For most National Forests in Washington, Oregon, and California, 15 percent of trees would be retained following harvest; half of that volume would be left in small intact patches of late-successional forest and the rest dispersed throughout the harvest unit.

- For National Forests in the Oregon Coast Range, and the Olympic and Mt. Baker-Snoqualmie National Forests, retention requirements would be reduced because of the extent of Riparian Reserves and Marbled Murrelet protection in those areas.

For Bureau of Land Management districts in Oregon, retention varies from 6 to 25 large green trees per acre depending on location, with 150-year rotations prescribed for some areas.

* For federal forests in northern California, long rotations are prescribed for conifer and mixed conifer/hardwood (180 years) and hardwood (100 years) forests.

Five options (1, 3, 4, 5, and 9) specifically require protection of specified rare and locally endemic species associated with late-successional forests within the Matrix. All options except 7 and 8 require surveys and protection of occupied marbled murrelet nesting sites. Other protective measures may be added to provide for at-risk species under each option.

**Late-Successional Reserves**

Under Option 9, Late-Successional Reserves are based on boundaries that represent an Integration of previous efforts (Johnson et al. 1991; USDI 1992c). They incorporate some portion of the reserves from each of those previous efforts and include new areas designated to protect Key Watersheds. Thinning or silvicultural treatments inside Reserves require review by an interagency oversight team to ensure that they are beneficial to the creation of late-successional forest conditions. Activities that would be permitted in the western and eastern portions of the range are described separately below. Salvage of dead trees would be based on guidelines adapted from the Final Draft Recovery Plan for the Northern Spotted Owl (USDI 1992c) and would be limited to areas where catastrophic loss exceeded ten acres.

**West of the Cascades**

There is no entry allowed in stands older than 80 years of age. Thinnings (pre-commercial and commercial) may occur in stands up to 80 years of age regardless of the origin of the...
stands (plantations planted after logging or stands naturally regenerated after fire or blow down). The purpose of these silvicultural treatments is to be neutral or beneficial to the creation and maintenance of late-successional forest conditions.

East of the Cascades and the eastern portion of the Klamath Province

Given the increased risk of fire in these areas due to more xeric conditions and the rapid accumulation of fuels as the aftermath of insect outbreaks and drought, there are additional management activities allowed in late-successional reserves. Guidelines to reduce risks to large-scale disturbance are adapted from the Final Draft Recovery Plan for the Northern Spotted Owl (USDI 1992c). These guidelines can be found at the end of the chapter.

**Northwest Forest Plan Record of Decision & Standards and Guidelines**

Late-successional reserves: Late-successional reserves are to be managed to protect and enhance old-growth forest conditions. For each late-successional reserve (or group of small reserves), managers should prepare an assessment of existing conditions and appropriate activities. No programmed timber harvest is allowed inside the reserves. However, thinning or other silvicultural treatments inside these reserves may occur in stands up to 80 years of age if the treatments are beneficial to the creation and maintenance of late-successional forest conditions.

In the reserves east of the Cascades and in Oregon and California Klamath Provinces, additional management activities are allowed to reduce risks of large-scale disturbance. Salvage guidelines are intended to prevent negative effects on late-successional habitat. Non-silvicultural activities within late-successional reserves are allowed where such activities are neutral or beneficial to the creation and maintenance of late-successional habitat. Thinning or other silvicultural activities must be reviewed by the Regional Ecosystem Office and the Regional Interagency Executive Committee.

Alternative 9, like all of the other action alternatives, applies the same criteria for management of habitat on both Forest Service and BLM lands. This was done in order to accomplish most efficiently the dual objectives discussed above -- that is, achieving the biological results required by law, while minimizing adverse impact on timber harvests and jobs. The inefficiencies involved in applying different criteria on Forest Service and BLM land have been noted in previous analyses. For example, in the Report of the Scientific Analysis Team ("SAT Report"), the team found that BLM's plans were relatively high-risk, when compared to the plans of the Forest Service, in terms of conserving the northern spotted owl. As a result, the SAT found that in order for the Forest Service to "make up for significantly increased risks," it would have to dramatically increase the size of protected areas on Forest Service land (SAT Report, pp. 12-13).

In addition, Alternative 9 offers one advantage that the other alternatives do not — its
inclusion of adaptive management areas. Adaptive management involves experimentation, identifying new information, evaluating it, accounting for it in discretionary decisions, and determining whether to adjust plan direction. The object is to improve the implementation and achieve the goals of the selected alternative. Each of the alternatives incorporates the principles of adaptive management to some extent, but Alternative 9 is the only one that specifically allocates ten adaptive management areas, which may be used to develop and test new management approaches to achieve the desired ecological, economic, and other social objectives.

These AMAs offer the opportunity for creative, voluntary participation in forest management activities by willing participants. We recognize that this will take time, effort, and a good-faith commitment to the goal of improved forest management. Many of the potentially participating communities and agencies have different capabilities for joining this effort. Our approach to implementing this initiative will recognize and reflect these differences as we seek to encourage and support the broadest possible participation. Moreover, Alternative 9 allows silvicultural activities, such as thinning young monoculture stands, in late-successional reserves when those activities will enhance late-successional conditions.

Forest Service Ten Year Review (2003)

Overall, the Plan’s conservation strategy and reserve network appear to be working as designed.

- The total area of medium and large older forests on federal lands in the Plan area gained more than 1 million acres during the ten-year period, almost double the anticipated amount.

- Spotted Owl populations declined about 7.5 percent per year across their northern range and 2 percent per year across their southern range. Declines may have resulted from habitat loss, Barred Owls, and other factors.

- The loss of habitat was less than expected, as less timber was harvested and less habitat was lost to wildfire than expected.

The Plan’s outcomes for Spotted Owls were expected to take at least a century. Spotted Owl population declines were expected for the first 40 to 50 years under the Plan, with owl populations stabilizing in the mid-21st Century and possibly increasing after that as owl habitat recovery exceeded loss.

Forest Service Fifteen Year Review (2008)

The NWFP projected that over a time horizon of ten decades, LSOG forest could be restored and maintained at desired levels. In this second monitoring cycle....these analyses indicate a NWFP-wide decline in federal LSOG slightly less than what was anticipated (FEMAT 1993); however, losses in some
provinces (e.g. Oregon Klamath) were higher than the projected 2.5 percent decadal rate of loss. Helping to offset these losses is the potential for future recruitment in the next few decades (fig. 1-7). Furthermore, the results support assumptions made in the NWFP that the primary role in maintaining or restoring LSOG and related habitats would fall to federal lands. Specifically, federal lands contain less than half of the total forest land, but the federal share of total LSOG increased from 65 to 67 percent over the monitoring period. Harvesting removed about 13 percent (approximately 491,000 ac) of LSOG on nonfederal lands. Loss of LSOG on federal land due to harvest was less than 0.5 percent (approximately 32,100 ac).

The study found that: “...the current analysis of habitat within and around the large reserve network validates the assumption that the repetitive design of large reserves can absorb losses without resulting in isolation of population segments. Not enough time has passed for us to accurately detect or estimate significant recruitment of nesting/roosting habitat, however increases were observed in “marginal” younger forests indicating that future recruitment of nesting/roosting habitat will occur as anticipated, within the next few decades.”

The most recent estimate for Northern Spotted Owl population trends on federally administered lands is a 2.8 percent annual rate of decline, which is slightly lower than the 2.9 percent estimated by Forsman et al. (2011), which included two additional nonfederal study areas not managed under the NWFP. The rate of decline is highest in the northern portion of the range (Washington), where populations are estimated to have declined 40 to 60 percent since 1994. Populations remain stationary in the central portion of the owl’s range, located in southwestern Oregon (fig. 2-4).

**Marbled Murrelet Findings in 15-Year Report**

Declining murrelet population trends and habitat losses underscore the need to minimize the loss of suitable habitat, especially in the relatively near term (next 40 to 50 years at least), until re-growing forests develop the structure needed for marbled murrelet nesting. The observed population decline, about four percent per year at the NWFP-area scale, was not unexpected, as population demographic models have predicted murrelet populations to be declining south of Canada in the range of three to seven percent per year (McShane et al. 2004, USFWS 1997).

In light of the observed population declines and habitat losses, continued management of federal NWFP lands to conserve existing potential nesting habitat and to promote development of new nesting habitat is essential. It is not clear what other actions could be taken on federal lands to help reverse the population decline. Management to reduce risk of losses to fire would be important if done so that the management action has minimal impact to nesting habitat. The possible causes of observed population decline will require further study, and likely involve several interacting factors. Timber harvest of higher suitability habitat on nonfederal lands is one factor that may contribute to these declines.

**Watershed Condition Status and Trend 15-Year Report**

A Forest Service analysis of watershed condition released in Feb. 2012 finds that the Northwest Forest Plan is working well to recover impaired watersheds across the region. Watershed Condition Status and Trend (Laningan et al 2012) published by the Pacific Northwest Research Station analyzed data from 1994-2008, the first fifteen years of the Northwest Forest Plan and found that 69% of the watersheds in the NWFP area had a positive change in condition as a
result of road decommissioning and vegetation growth. The report summary notes: “Watershed condition was most positive for congressionally reserved lands, followed by late-successional reserves, and then matrix lands.”

Northern Spotted Owl Critical Habitat Rule

After the Bush Administration’s owl Critical Habitat rule and Recovery Plans were remanded by a federal court in 2010, new plans were initiated with a court-ordered Nov. 15, 2012 deadline for the Critical Habitat designation. The best science indicates any final critical habitat designation and management recommendations should exceed the protections of the Northwest Forest Plan, not minimize or ignore them.

It is vitally important to note that this Critical Habitat designation will guide future management changes in the region. Following publication of the final rule, the land management agencies have indicated that forest and land management plans will be amended to conform to the Critical Habitat rule across the owl’s range. Based on the available information, we must assume the elimination of late-successional reserves is a potential application of this Critical Habitat rule and therefore the effects of eliminating the reserves should be fully analyzed by both the rule and companion economic analysis and environmental assessment. And, because this analysis is notably absent, the public is currently unable to determine the full consequences of the pending rule. Redoing the analysis at this point is impossible given the court-ordered deadline.

We therefore urge the agency to make abundantly clear to the public and to the land
managing agencies that elimination of the reserves is not an application of, or a recommendation of this rule.

The rule as drafted endorses a significant departure from the standards and guidelines of the Northwest Forest Plan by promoting active management in owl habitat, potentially weakens habitat protection for the threatened owl further by endorsing elimination of late-successional reserves, neither of which reflect the best available science.

The final Critical Habitat rule should instead provide for additional habitat protection needed to reverse the owl’s decline and allow for its eventual recovery. Given past mismanagement, continuing pressure to utilize these forests to meet economic needs and to pay for local government services, and the influx of the Barred Owl, it is essential that firm protections, such as the system of late-successional reserves provided by the Northwest Forest Plan remain in place and that suitable owl habitat be preserved, not subjected to logging.

The Draft Critical Habitat Rule Undermines the Northwest Forest Plan

The draft critical habitat rule notes that the Northwest Forest Plan “...has been successful in the conservation and recruitment of late-successional forest and associated species on Federal lands (Thomas et al. 2006. P. 283) (p.52), but then proceeds to recommend its dismantling based on three main justifications, that commercial timber harvest from matrix lands was insufficient, the lack of active restoration in areas that may contain “uncharacteristically high risk of severe fire,” and the a lack of early-seral habitats in moist forests. A careful review of these claims reveals that none of them hold up to scrutiny.

It should be noted the Service appears to be biased against the Northwest Forest Plan by ignoring information and studies in the scientific literature Courtney et al. (2004), Lint (2004), DellaSala and Williams (2006) that demonstrate the importance of reserves and others that show the effectivenes of the overall strategy such as the Forest Service’ fifteen year reviews mentioned above. Most recently 229 scientists sent a letter to President Barack Obama urging the preservation of the reserve system created by the Northwest Forest Plan. The letter is included in the appendix. This appearance of bias is of particular concern because that was one aspect of the political interference undermining the 2008 Critical Habitat Rule and Recovery Plan due to demands by Bush administration officials to ignore the requirements of the Northwest Forest Plan.

The Service on page 53-54 of the draft rule sites and appears to be agreeing with Thomas et al concerning improvements to the Northwest Forest Plan. Missing from the list however, was any mention of maintenance of large blocks of habitat necessary for the owl survival and recovery.
Fragmented forests. Willamette National Forest, Oregon.
The bias against the late-successional reserves is heard once again on page 54 where it repeats that “Critical Habitat for the northern spotted owl is not intended to be a “hands off” reserve in the traditional sense. Rather, it should be a hands-on ecosystem management landscape that should include a mix of active and passive actions to meet a variety of conservation goals that support long-term spotted owl conservation.”

However, on page 131 the draft contradictorily advises “(3) Continue to manage for large, continuous blocks of late-successional forest.”

And on page 274 directs for the East Cascades “In the interim, management actions are needed to protect current habitat, especially where it occurs in large blocks on areas areas of the landscape where it is more likely to be resistant or resilient to fires and other disturbance events.”

There is no indication how these requirements are to be accomplished under a reserve-less system. And nowhere is there any analysis showing that a reserve-less strategy allowing logging in owl habitat is going to be better for Northern Spotted Owl populations than the current system of protected reserves.

**Timber Analysis: Agencies Meeting 96% of Funded Volume Target Since 2003**

Timber sale data undermines the idea that the Northwest Forest Plan is not producing a stable flow of timber. The final Northwest Forest Plan was a political compromise that under-delivered on old-growth protection by placing 42% of the remaining acres in the matrix, and overpromised on timber volume. The plan’s billion board foot estimate was never realistic because it is predicated on logging old-growth, which is not supported by the public and that in practical terms has generally been ruled in violation of wildlife protection laws. The estimate was also completed prior to the designation of the riparian reserve network which turned out larger than anticipated. The Bush Administration recognized these factors to a degree, and lowered the allowable sale quantify to 800 million board feet.

A look at timber sale output in the Northwest Forest Plan region reveals the agency is at a sustainable level and meeting the volume targets budgeted by Congress; see Forest Service and BLM Offered under the Northwest Forest Plan included in the appendix. Since 2003, the budget approved by Congress and the Administration has called for 4,668 million board feet from the Northwest Forest Plan area. The agencies have offered 4,507 board feet, or 96% of the planned budget.

In addition, exports from the region are skyrocketing. In 2010 over 2 billion board feet of logs and lumber were exported from the West Coast. In 2011 it topped 3 billion. There is no shortage of logging in the Pacific Northwest.
The Probable Sale Quantity (PSQ) needs to be recalculated to offer a realistic assessment based on conservation needs. Here are some factors to consider:

Clearcutting and regeneration harvest are socially and scientifically unacceptable because removing the majority of the structure harms water quality and does not mimic natural processes. By increasing forest fragmentation it is particularly harmful to the threatened Northern Spotted Owl and Marbled Murrelet.

The need to increase protection Northern Spotted Owls and meet Recovery Action 32 to protect all suitable nesting, roosting, foraging habitat indicates that all suitable nesting, roosting and foraging habitat should be removed from the timber base. Similarly, the need to protect Marbled Murrelet habitat, including both occupied stands, and mature forest to be recruited as high quality nesting habitat indicates that all the mature forests within the range of the marbled murrelet should be removed from the timber base.

The PSQ needs to be recalculated to mitigate for the increasing intensity of management on non-federal lands as a result of the current boom in raw log exports. Harvest rotations are getting shorter and ecological and watershed values are declining and habitat for the Northern Spotted Owl and Marbled Murrelet continue to be lost, so management of federal forest lands must be adjusted to compensate.

In addition, the Rule and accompanying Economic Analysis and Environmental Assessment fail to analyze a range of management options that could meet the objective of ecological restoration and forest resilience while also minimizing harm to the Northern Spotted Owl. For
example, conservation groups have released a report *Ecologically Appropriate Restoration Thinning in the Northwest Forest Plan Area* identifying twenty-years of non-controversial thinning projects in Oregon and Washington that do not rely on removing owl habitat. We urge the Service consider this option as opposed to allowing regeneration of mature forests that are already providing suitable Northern Spotted Owl habitat.

**Economic Analysis of the Draft Critical Habitat Designation**

The *Draft Economic Analysis* has substantial flaws and fails to provide the Secretary with a sound basis for determining if the economic benefits of excluding any area from the Critical Habitat designation outweigh the economic benefits of including it. Instead, it provides a poorly informed, incomplete, and biased description of these benefits. Consequently, the *Draft Analysis* does not provide a reasonable basis for any determination by the Secretary to exclude any area from the final designation.

The *Draft Analysis* narrowly focuses on how the designation of critical habitat would affect the timber industry, disregarding its other effects on the economy. Extensive evidence confirms that timber constitutes a small percentage of the total value of goods and services provided by forests in this region. With its limited focus and pro-timber bias, the *Draft Analysis* cannot provide the Secretary with a solid foundation for weighing the full economic benefits of designating lands against the full economic benefits of excluding them.

The *Draft Analysis* misconstrues the designation’s timber-related benefits. The *Draft Analysis* measures the benefits of increased timber production with one eye closed, looking only at the market value of the additional logs and ignoring the costs of producing them.

The *Draft Analysis* fails to comply with the requirements of Executive Order 12866. This executive order requires the Secretary, before adopting a final rule to designate critical habitat for the Northern Spotted Owl to describe for the public and base his decision on “the best reasonably available...economic...information concerning the need for and consequences of the intended regulation.”

The *Draft Analysis* overlooks far too much of the best, readily available economic information to provide a full picture of the economic consequences of excluding areas from the designation. This conclusion is reinforced by comparing the *Draft Analysis* against the requirements of OMB Circular A-4, which provides guidance for complying with Executive Order 12866.

This guidance requires the Secretary to “consider any important ancillary benefits and countervailing risks” before making any decision to exclude areas from the designation, using “the same standards of information and analysis quality that apply to” the analysis of timber-related impacts.” In stark contrast, The *Draft Analysis* arbitrarily focuses on how the designation

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1 Executive Order 12866, Section 1(7).
(or exclusion) of different areas would affect timber production, and applying dramatically
different standards of information and analysis to describe the other important ancillary
benefits of designation. Thus, the Secretary would violate Executive Order 12866 if he were to
rely on the Draft Analysis as the basis for a decision to exclude any area from the
designation.

These are the findings of Dr. Ernie Niemi who has drafted “Comments on the Draft Economic
Analysis of Critical Habitat Designation for the Northern Spotted Owl.” These comments
are included in the appendix.

Active management has economic and environmental costs not accounted for in the draft Rule and accompanying documents.

**Active Management in Critical Habitat**

The draft Critical Habitat rule includes extensive language supporting active management in all
areas of owl Critical Habitat, including regeneration harvest in moist Westside forests. The
draft goes so far as to suggest that forest management goals can take precedence over owl
conservation, and that the conservation of this endangered species must be “compatible with
broader landscape management goals”:

*We strongly encourage the application of ecosystem management principles and active forest
management to ensure the long-term conservation of the Northern Spotted Owl and its habitat,
as well as other species dependent on these shared ecosystems. (p. 13)*

*In conclusion, the designation and management of critical habitat for the spotted owl must be
compatible with these broader landscape management goals if it is to conserve the spotted owl
as required by the Act. It is therefore important to emphasize that spotted owl critical habitat
should not be a “hands off” reserve in the traditional sense. Rather, it should be a “hands on”
ecosystem management landscape that should include a mix of active and passive actions to
meet a variety of forest conservation goals that support long-term spotted owl conservation. It
would be inconsistent with the stated purposes of the Act, the Revised Recovery Plan (USFWS*
2011), and the goals of the Northwest Forest Plan (NWFP) if spotted owl critical habitat was narrowly managed and, in so doing, discouraged land managers from implementing scientifically justified measures for conserving forest ecosystem functions and health.(p.15)

Likewise, in moist and some mixed forests, management of spotted owl critical habitat should be compatible with broader ecological goals, such as the retention of high-quality older forest, the continued treatment of young or homogenous forest plantations, and the conservation or restoration of complex early seral forest habitat (Spies et al. 2007b, pp. 57–63; Betts et al. 2010, pp. 2117, 2126–2127; Swanson et al. 2010, entire). In general, actions that promote ecological restoration and those that apply ecological forestry principles as described in the Revised Recovery Plan (USFWS 2011, pp. III-11 to III-41) are likely to be consistent with the conservation of the Northern Spotted Owl and the management of its critical habitat.

Recommendation for moist Westside forests:

“Regeneration harvest, if carried out, should consider ecological forestry principles.” (p.131)

For example, some restoration treatments may have an immediate neutral or beneficial effect on existing Northern Spotted Owl habitat (e.g., roads management, some prescribed fire prescriptions). Other treatments, however, may involve reductions in stand densities, canopy closure, or ladder fuels (understory vegetation that has the potential to carry up into a crown fire)—and thus affect the physical or biological features needed by the species. At the stand scale, this can result in a level of conflict between conserving existing Northern Spotted Owl habitat and restoring dry-forest ecosystems. We typically cannot expect to meet both objectives on the same acre if that acre currently functions as suitable Northern Spotted Owl habitat. We can reconcile this conflict, however, by managing at the landscape scale.

This approach has raised the concern of Society for Conservation Biology, The Wildlife Society, and American Ornithologists’ Union who wrote:

“These proposed policy changes have the potential to adversely impact federal lands in the Pacific Northwest to the detriment of spotted owls and other federally threatened and endangered species....we are especially concerned about the potential habitat impacts of adopting untested “active management” forestry technique.”

The groups are asking the Department of the Interior to prepare and Environmental Impact Statement to prepare a scientific approach to test active management forestry’s impact on spotted owl prior to being used at a commercial or landscape scale. We agree with this assessment and urge an end to owl take until the agency can offer an analysis showing what the acceptable limits to owl take and habitat loss are while still providing a high degree of certainty of owl recovery.
Adverse Modification of Habitat

The draft Critical Habitat rule further states that if projects have considered ecological forestry principles, that in general these activities would not be considered adverse modification of owl habitat by the Service. As a result of this provision, the normal protections provided by critical habitat to prevent adverse modification may not apply at the discretion of the Service.

In general, silviculture prescriptions that apply ecological forestry principles to address the conservation of broader ecological processes are compatible with maintaining the proposed critical habitat’s essential features in the long term (USFWS 2011, p. III-14).

We would anticipate that in most cases, restoration and thinning actions (see Special Management Actions and Considerations) at or below this size (500 acres) will likely not adversely affect a given critical habitat subunit; however, such a determination would have to be made on a case-by-case basis, after careful consideration of the specific conditions of the proposed action.

The Service should evaluate adverse modification at the appropriate scale of individual owl home ranges as geographically defined for each proposed project action, particularly active management; determine jeopardy at the scale of the subunit (approximately 100,000 acres), and cumulative effects need to be evaluated to avoid a level of excessive loss that is currently not quantified.
The Northwest Forest Plan protects water quality, threatened salmon runs, and habitat for the Marbled Murrelet. Willamette National Forest, Oregon.

The 1993 Report of the Scientific Analysis Team (SAT) ironically, already thoroughly reviewed the risks associated with logging in suitable owl habitat, and concluded “intentions to selectively cut forest stands to create conditions favorable for spotted owls, represents increased risks to the viability of the spotted owl (SAT p. 145).”

The issue of short-term losses versus long-term habitat gains was also analyzed and the scientists concluded “that the short-term effect of these actions on habitat loss may be much more significant than the long-term predicted habitat gains.”

The Scientific Analysis Team report said:

“Lacking experience with selective cutting designed to create spotted owl habitat, such practices must be considered as untested hypotheses requiring testing to determine their likelihood of success. ... Given the uncertainty of achieving such expectations, it is likely that some silvicultural treatments, which have been characterized as largely experimental, may well have an opposite effect from that expected. Consequently, such treatments may hinder the development of suitable habitat or they may only partially succeed, resulting in development of marginal habitat that may not fully provide for the needs of spotted owls. Results which fall short of the expected conditions could occur because of delay or failure to regenerate stands that have been cut, increased levels of wind throw of remaining trees, mechanical damage during logging to trees remaining in the logging unit, the spread of root rot and other diseases. Increased risk of wildfires associated with logging operations that increase fuels and
usually employ broadcast burning to reduce the fuels also increase the risk of not attaining expected results. Such events may spread to areas adjacent to stands that are logged, thereby affecting even more acreage than those acres directly treated.” [SAT p 147-148]

“The combined risks associated with treatment of spotted owl habitat or stands expected to develop into suitable habitat for spotted owls, as discussed above, will likely result in situations where either habitat development is inhibited or only marginal habitat for spotted owls is developed. The exact frequency of these partial successes or failures is unknown. Given the likely cumulative relationship among the risks for each factor, it appears to us that the overall risk of not meeting habitat objectives is high. ... Members of the Interagency Scientific Committee indicated that, because a plan (the Interagency Scientific Committee’s Strategy) was put forth which proposes to reduce the population of a threatened species by as much as 50 percent, providing the survivors with only marginal habitat would be extremely risky and certainly in their minds not ‘scientifically credible’ (USDA 1991:45).” [SAT p 151].

“The transition period (1-50 years) between implementation of the Interagency Scientific Committee’s Strategy and achievement of an equilibrium of habitat and spotted owls is a critical consideration. ... Given the existing risks that face owl populations and the sensitivity of the transition period, the short-term effect of these actions on habitat loss may be much more significant than the long-term predicted habitat gains. We further conclude that, although research and monitoring studies are presently being initiated, no significant new data exist which suggest that the degree of certainty that is expressed in the Bureau of Land Management Draft Resource Management Plans for developing owl habitat silvicultural treatments is justified. Therefore, it is our opinion that the course prescribed in the Interagency Scientific Committee’s Strategy, pertaining to timber harvest in Habitat Conservation Areas, remains the most likely course to result in superior habitat conditions within reserves (i.e., Old-Growth Emphasis Areas). The approach prescribed by the Interagency Scientific Committee’s Strategy preserves options for adjustments in the course of management under a philosophy of adaptive management.” [SAT p 151-152].

Olympic National Park, Washington State
According to forest policy expert Doug Heiken of Oregon Wild, “The SAT indicates that these comments apply equally to density management and patch cutting, both of which are being promoted as tools to enhance owl habitat. The SAT also cited concerns about the effect of logging on snags and down woody debris which are essential features of owl habitat. The authors of the Northwest Forest Plan took all this into account and determined that 80 years is a useful place to draw the line between younger forests that are likely to benefit from careful thinning and older forests that are likely to experience net negative consequences. There is no new science to change that conclusion.” ABC urges the Service to not allow for adverse modification of Northern Spotted Owl Habitat by active management or ecoforestry in stands greater than 80 years.

Lack of Scientific Evidence for Active Management

While early-seral habitats are desirable for some species, logging is not the best means to establish early-seral habitat within the range of the Northern Spotted Owl. We recommend that agency utilize natural disturbances and refrain from post-fire logging which has the potential to create abundant high-quality early-successional habitats.

In the draft Rule land managers are encouraged to develop early seral habitat to benefit a variety species but no evidence is presented showing the Northern Spotted Owl benefits from the creation of early seral habitat, nor is there analysis showing what potential harm may come to the threatened species if various levels of direct take and habitat loss or degradation were to occur.

The draft Environmental Assessment identified two endangered species, Fender’s blue butterfly and Oregon silverspot butterfly whose open, early seral habitat such as grasslands, meadows, oak woodlands, or aspen woodlands may conflict with Northern Spotted Owl management intended to maintain closed canopy forests (p. 52). But the assessment notes that listed plant and butterfly species and their closely associated open habitats are explicitly not included in the proposed critical habitat revision (p.50). The Service concludes on page 62: “that designation of critical habitat for the Northern Spotted Owl in this alternative would have a neutral effect on those species associated with open, early seral habitats.”

We see no justification to convert nesting, roosting, and foraging habitat of the Northern Spotted Owl to early-seral. Under the Northwest Forest Plan restoration of owl habitat, when it occurs, should hasten creation of owl habitat, not set it back by many decades. This provision is unrelated to owl recovery or sound forest management and should be removed from the final designation.

Other listed species may also be harmed by the proposed active management such as the Marbled Murrelet. The draft Environmental Assessment found that “Active forest management that is in the vicinity of murrelet nesting stands may be detrimental to the species survival and recovery.” (p. 61) This results from increased fragmentation and opening the forests to crows, ravens, and jays, increasing predation pressure on nesting murrelets. Despite this, there is no prohibition in the draft Rule on the proposed active management to ensure murrelet nesting stands will not be disturbed.

The draft Rule on page 8 on the other hand states: “Consistent with the best available science and the adaptive management principles outlined in the Revised Recovery Plan for the Northern Spotted Owl, we strongly encourage the application of ecosystem management principles and active forest management to ensure the long-term conservation of the northern spotted owl and its habitat, as well as other species dependent on these shared ecosystems.”

In reality, active management, if conducted near nesting murrelets would be harmful. There is also indications the prey base of the Northern Spotted Owl could also be harmed by active management including thinning, but these factors appear to be glossed over by the draft Rule. And unlike the Northwest Forest Plan, there is no detailed analysis how other listed species will fair under the active management being proposed by the draft Rule.

Studies by Hanson (2009 and 2010) and Miller (2012) have found that dry forests on the Eastside and in Northern California have not seen an increase in severe, high-intensity fires. Most of the acreage burned has been low to moderate severity with generally beneficial ecological effects. The risk of fire to owls also appears to be exaggerated in the final Owl Recovery Plan and draft Critical Habitat rule.

The agency recommends conserving old-growth trees and forests on wherever they are found, including in the matrix lands. This is the most positive development stemming from the final Recovery Plan and draft Critical Habitat rule.
The Rule recommends that for the moist forests in the West Cascades/Coast Ranges of Oregon and Washington “...to conserve stands that support northern spotted owl occupancy or contain high-value northern spotted owl habitat (USFWS 2011, p. III-17). Silvicultural treatments are generally not needed to accomplish this goal.”

However despite this clear statement that active management is not needed in these moist forests, the Draft recommends “dynamic management” in threatened forest types that conserves all stages of forest development where tradeoffs between short-term and long-term risks are better balanced, and recognize the Northwest Forest Plan is now an integrated conservation strategy that contributes to all components of sustainability.

In plain language that says the Service is approving a more discretionary management approach that reduces protections to increase the amount of logging in owl habitat.

**Presidential Memorandum**

President Barack Obama issued a memorandum to Secretary of the Interior Ken Salazar stating that logging should be allowed and considered an acceptable practice in Northern Spotted Owl Critical Habitat. The memo is of great concern because it is not based on the best available science and makes exaggerated claims about the evidence supporting the Service’s position. It appears to prejudge the outcome and effects of a federal rulemaking and seek a predetermined outcome before the public had even been given a chance to review or comment on the draft Rule. The text of a portion of the memo signed by President Barack Obama follows:

Importantly, the proposed rule recommends, on the basis of extensive scientific analysis that areas identified as Critical Habitat should be subject to active management, including logging, in order to produce the variety of stands of trees required for healthy forests. The proposal rejects the traditional view that land managers should take a "hands off" approach to forest habitat in order to promote species health; on-going logging activity may be needed to enhance forest resilience.

In order to avoid unnecessary costs and burdens and to advance the principles of Executive Order 13563, consistent with the ESA, I hereby direct you to take the following actions:

(1) publish, within 90 days of the date of this memorandum, a full analysis of the economic impacts of the proposed rule, including job impacts, and make that analysis available for public comment;

(2) consider excluding private lands and State lands from the final revised critical habitat, consistent with applicable law and science;

(3) develop clear direction, as part of the final rule, for evaluating logging activity in areas of critical habitat, in accordance with the scientific principles of active forestry management and to the extent permitted by law;
(4) carefully consider all public comments on the relevant science and economics, including those comments that suggest potential methods for minimizing regulatory burdens;

(5) give careful consideration to providing the maximum exclusion from the final revised critical habitat, consistent with applicable law and science; and

(6) to the extent permitted by law, adopt the least burdensome means, including avoidance of unnecessary burdens on States, tribes, localities, and the private sector, of promoting compliance with the ESA, considering the range of innovative ecosystem management tools available to the Department and landowners.

The Society for Conservation Biology, The Wildlife Society, and American Ornithologists’ Union raised the same concern about the President’s memo stating:

“We are concerned that this memorandum overstates the quality and quantity of scientific research on the potential benefits of active forest management, especially in the Pacific Northwest on a federally threatened species. In particular, we are unaware of any substantial or significant scientific literature that demonstrates that active forest management enhances the recovery of spotted owls.”

Additional Areas Where Critical Habitat Should Be Designated

ABC believes all occupied and suitable owl habitat should be designated Critical Habitat. Tribal lands important for the recovery of Northern Spotted Owl, such as the 5,400 acre Coquille forest have been excluded. Similarly, portions of the Coos Bay Wagon Road lands and the Cascade-Siskiyou National Monument area in Oregon have also been excluded with little explanation.

We urge the agency to allocate additional critical habitat in prime Northern Spotted Owl habitat adjacent and near to the Monument to include as much dispersal/connectivity habitat as possible. The Monument currently seems to be a functional island of designated Critical Habitat in its surrounding landscape.

Dave Willis, a local conservationist familiar with the area recommends some specific additions we believe beneficial to the Northern Spotted Owl and would urge their inclusion.

“Some of the best canopy in the area is located outside the Monument in and NNW of the Monument’s “missing northwest quadrant” in the western half of T39S, R3E. This forest canopy and Northern Spotted Owl habitat is as good or better quality than anything in the Monument CHU itself north of Highway 66. Yet the document designates only ~200 acres of CHU in the far extreme northwest Section 6 corner of the western half of T39S, R3E. The gap in CHU between northern CSNM CHU in ECS2 and the most southeastern CHU in Klamath East Subunit 5 is quite strange – skipping over and excluding some of the best forest canopy in the region. Likewise, in
addition to the gap in CHU designation NNW of the Monument highlighted above, CHU
designation on the Monument’s east and west sides are also deficient.

Noting the inadequacy of the Monument’s current boundaries, a group of scientists with much
research and on-the-ground experience in the Cascade-Siskiyou National Monument area has
recommended expansion of the Monument in exactly this outside-the-current-Monument area
between the Green Springs Summit and Grizzly Peak. (See: Frost, Odion, Trail, Williams et al,
Interim Report – Cascade-Siskiyou National Monument Boundary Study: Identification of Priority
Areas for Monument Expansion, April 2011.) Rather than aid this needed biological bolstering
outside current Monument boundaries, the current lack of CHU designation adjacent and near
to the Monument undercuts the considered and informed recommendations of this site-
specific scientific report – and degrades the habitat connectivity function of the existing
Monument itself by further isolating it.”

Coos Bay Wagon Road Lands

Similarly, here is a concern being raised by Francis Eatherington, a local expert regarding the
lack of designation on federal lands with likely merit. We believe these lands should be
reviewed and the occupied and suitable Northern Spotted Owl designated as Critical Habitat.

“Many of the sections of Coos Bay Wagon Road (CBWR) lands with mature and old growth
forests were left out of proposed Critical Habitat, even though these lands had been designated
in 1992. Out of 74,500 acres of Coos Bay Wagon Road in Coos Bay and Roseburg BLM Districts,
only about 14,000 acres were proposed for critical habitat. The remaining 60,000 contain areas
of significant old growth forests and mature forests over 120 years old. For instance, section 1,
T28, R11, or section 1, T29, R10, or sections 5 and 19, T28, R7.

14,000 acres of critical habitat that was designated was in current LSR in Coos County.
However, no CBWR lands in Douglas County were proposed for critical habitat, not even in the
LSR or the ACEC lands managed by Roseburg BLM, where significant old growth forest exists.
In Coos County, and on Coos Bay BLM District lands, only some of the existing LSR was
proposed a critical habitat. None of the existing matrix was proposed, even though these lands
were critical habitat in 1992, and still contains significant stands of mature and old growth
forests.”

Exclusions

The draft has identified 13,962,449 acres of potential Critical Habitat, a significant increase in
acreage above the 5.3 million acres currently designated. The Administration is recommending
that some identified lands be exempted from Critical Habitat designation because they argue
the lands are already being conserved or that conservation purposes can better be achieved
through exclusion. Here’s a brief summary of the proposed and potential exclusions:
Private lands with conservation agreements such as Habitat Conservation Plans (HCPs), and Safe Harbor agreements are proposed for exclusion 711,803 acres

State land with conservation agreements are proposed for exclusion 225,013 acres

State park lands are proposed for exclusion 164,776 acres

Congressionally reserved natural areas are proposed for exclusion 2,631,736 acres

Private lands without formal conservation agreements 555,901 acres

State lands without formal conservation agreements 281,247 acres

The draft includes language favoring the general exclusion of state and private lands, to exclude the proposed lands, and to strongly consider the exclusion of other state and private lands unless it is absolutely essential for owl conservation. Private and state lands without formal conservation agreements are also under consideration for exclusion. Private lands in Oregon were not included the modeling analysis.

If all exclusions were granted, a total of 9,391,973 acres would remain. ABC supports designating all 13,962,449 acres plus additional acres where occupied or suitable Northern Spotted Owl habitat is found.

Private and state land HCPs and Safe Harbor agreements are a means of encouraging landowner support and participation in species conservation. Providing an exemption in this case creates an incentive for landowners that have been cooperative and developed HCP or Safe Harbor Agreement. However, in regard to the Northern Spotted Owl stronger steps to ensure recovery are needed. This exemption should not be granted and all conservation agreements updated to include recovery goals in areas with proposed critical habitat.

Funding shortfalls have led to the potential closing of many California state parks. Some states have made severe cuts in environmental programs and public lands and their management have become increasingly politically polarized. Proposals to privatize public lands are being offered in many state legislatures. As a result, there is no assurance these state park lands will be managed for conservation purposes in the future.

Similarly, political polarization and ongoing efforts to boost logging in owl habitat, dispose of federal lands and to de-designate Wilderness and other conservation designations raise concern that these lands cannot assure the conservation benefits they currently provide. As a result of these threats, the owl should have the added assurance of all occupied and suitable habitat receiving the protection of critical habitat designation.

Private and state lands without conservation agreements should not be excluded. The Owl Recovery Plan states that an additional contribution to owl habitat protection is needed on
private and state lands.

Oregon State Forests in particular are failing to comply with the owl recovery plan. On the Elliot State Forest, the Oregon Department of Forestry (ODF) has abandoned its HCP and its plans fail to comply with the recovery plan with sale proposals in violation of recovery actions 10, 19 and 32. The Elliot’s Forest Management Plan says it will only “consider” the recovery plan, but to date, there is no indication it is being followed. ODF now claims forests as young as 51 years old can be suitable nesting habitat, while the agency is clearcutting forests 130-150 years old. In addition, any notion of adaptive management improvements over time is currently impossible. ODF admits that there is no budget for the monitoring necessary for adaptive management, and there is still not even a draft monitoring plan for the Elliott.

Legal Issues Related to Exemptions and Adverse Modification

A review of the draft Rule by Earthjustice found a number of concerns that also influenced ABC’s decision to oppose the proposed exemptions. Here is a brief summary of their analysis which is included in full in the appendices.

The proposed critical habitat rule proposes exemptions and active management in designated critical habitat not supported by the law or the best available science. It is recommended that the Service designate all lands, both federal and non-federal, identified as suitable habitat exclusions, and to adopt a much more cautious approach toward logging in designated critical habitat by eliminating or modifying language related to active management in the draft rule. The scale at which adverse modification of critical habitat will be assessed must be clarified to be at the appropriate subunit scale to comply with the intent of the ESA and provide for owl recovery.

Analysis: Draft Rule Lowers the Bar for Habitat Protection

The provisions in the draft plan encouraging unproven thinning and restoration logging, combined with the expansive definition of adverse modification that allows degradation of owl habitat, have the potential to allow for logging of areas that should be conserved to provide the additional habitat needed to stabilize Northern Spotted Owl populations and provide for recovery. This Rule, combined with the elimination of late-successional reserves could allow logging in areas now protected by the Northwest Forest Plan, including mature forests that the Plan had intended to become old-growth.

These provisions, which were repeated numerous times in the draft, appear to allow an increase of timber harvest in the region while minimizing habitat protection, in terms of both total acreage by encouraging unwarranted exclusions, and lax management standards weaker than the standards and guidelines of the Northwest Forest Plan.
This language encouraging active management in Northern Spotted Owl Critical Habitat, particularly on combination with the elimination of reserves has the potential to allow excessive logging to the detriment of the Northern Spotted Owl population and may foreclose recovery by not providing adequate late-successional forest necessary to ensure high quality habitat in the future. Changes to land management plans such as the proposed Okanogan-Wenatchee Forest Plan are being influenced by the Final Recovery Plan, and Draft Critical Habitat rule’s and Environmental Assessment’s encouragement of a reserve-less strategy.

We urge the Service to reconsider. This approach of allowing the land management agencies broad discretion for active management across the landscape was tested in the decades prior to the Northwest Forest Plan and proved disastrous to the Northern Spotted Owl and Marbled Murrelet and left only fragments of the old-growth ecosystem remaining.

**Recommended Changes**

We urge that the Final Critical Habitat Rule make clear that eliminating the system of late-successional reserves would be detrimental to owl recovery and is not a recommended outcome of this rulemaking, or the Environmental Assessment and Economic Analysis.

The proposal encouraging adverse modification of habitat for ecoforestry purposes is not supported by the best available science. We recommend it be removed from the final rule.

We recommend that the determinations of adverse modification be at the appropriate fine scale to ensure ESA compliance.

We recommend that the standards and guidelines of the Northwest Forest Plan late-successional and riparian reserve systems be used to preclude inappropriate or unsustainable management practices. The Northwest Forest Plan allows for restoration and provides standards and guidelines that are more protective of owls and better suited to experiments in ecological restoration.

Prescriptive requirements to retain trees above a certain age or size to restore the deficiency in old forests, and mapping where large blocks of closed canopy forests will be retained and allowed to mature is necessary to ensure these values will be not become subject to mismanagement or overcutting.

Active management in owl habitat should be considered experimental, conducted on a small scale, and monitored to determine its impact on Northern Spotted Owls. The necessity and benefits of active management in owl habitat remains in dispute.

We recommend the Service develop an environmental impact statement to devise a research strategy that addresses this question.
Bureau of Land Management
Resource Management Plan for Western Oregon
March 2014 Public Information and Input Sessions

Public Comment Form

Please note that the following comments will be recorded as official public comment as part of the National Environmental Policy Act official public comment period for BLM’s Resource Management Plan for Western Oregon Planning Criteria. General response to comments will be provided in the Draft Environmental Impact Statement. Thank you for your input!

Name: ___ Colleen Roberts __________________________ Email: _______________________
Address: _PO. BOX 28 __________________________ City: _Prospect
Phone #: (541) 560-3247_______ Organizational Affiliation: ____________________________

I would like to be added to the RMP for Western Oregon mailing list: □ Yes X No

Please use the space below to provide your comments on aspects of the Planning Criteria, draft Preliminary Alternatives, and/or today’s Public Session. Before including address, phone number, email-address, or any other personal identifying information in your comments, be advised that your entire comment, including personal identifying information, may be made publicly available at any time. While individuals may request that the BLM withhold personal identifying information from public view, the BLM cannot guarantee it will be able to do so. If you wish us to withhold your personal information you must state this prominently at the beginning of your comment. We will make all submissions from organizations or businesses available for public disclosure in their entirety.

Additional comments on the draft Planning Criteria can be submitted until March 31, 2014.

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It appears that BLM has established their own criteria to manage public land “for us” with many preparations to close lands for the use by the people—Protection & management are two different things—The BLM should be considering alternatives that meaningfully reduce fuel loads through active timber management—not creating more basis for public land closures—

Natural animal life cycles & decreased burned up forests is what would balance Western Oregon’s public resources.
Dear BLM Planning Team:

Any plans for BLM forests in the Pacific Northwest should maximize their carbon sequestration potential. This would mean restricting or prohibiting cutting, thinning, or use for biofuels of any older forests since those in Oregon and Washington store more carbon per acre than almost any other forest in the world. Our forests are extremely important for moderating climate change—this service our forests do for us needs to be recognized as protected.

Max Gessert
Ernest O’Byrne
Kate Gessert
M.O’Byrne
Rev. John E. Pitney
And 2 unreadable signatures
Bureau of Land Management
Resource Management Plan for Western Oregon
March 2014 Information and Input Sessions

Participant Session Evaluation

LOCATION: BLM Office Medford OR         DATE: 3-12-14

Your feedback is important to us – thank you in advance for sharing your thoughts!
Please use this form to provide feedback on your experience in the public listening session.

The purpose of today’s listening session was:
1) To share with the public the overall Resource Management Plan process: What are each of the planning documents and how are they used by BLM? What are the ‘alternatives’ and how are they used? How can the public engage? Who makes the final decision and how?
2) To gather public input about whether the spectrum of Preliminary Alternatives is comprehensive or whether BLM should consider additional alternatives.

How useful were the following?  

<table>
<thead>
<tr>
<th>Activity</th>
<th>Not Useful</th>
<th>Somewhat Useful</th>
<th>Extremely Useful</th>
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<tr>
<td>BLM &amp; Planning Process Overview from the District Manager</td>
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<td>Overview of Planning Criteria &amp; Next Steps from Project Manager</td>
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<td>Videos on Purpose and Need &amp; Preliminary Alternatives</td>
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<td>Interactive Small Group Discussions</td>
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1. Overall, what do you feel was most valuable about this session and why?
   
   Showed which areas were for hikers, OHV, miners and etc. The Maps were very helpful

2. What suggestions would you have for improving the next public outreach effort?
   
   Have comment period where one person does not control the whole session.

3. Was there enough opportunity for you to:  
   
   Ask questions?    Yes   X    No   ___
   Express your views?    X    ___
   Learn from others?    X    ___
   Engage in useful dialogue?    X    ___
   Have your input acknowledged?    X    ___

4. Is there anything else you would like us to know?
   When will this ve totally final?
Public Comment Form

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Name: __Claudia Beausoleil__  
Email: meditation.center@oigp.net

Address: ___4495 Cedar Flat Rd________________City: Williams OR 97544__

Phone #: __(541) 846-6092___  
Organizational Affiliation: _____________________________

I would like to be added to the RMP for Western Oregon mailing list: □ Yes □ No

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(http://www.blm.gov/or/plans/rmpswesternoregon/)

1-Retain OG (Old Growth) Habitat for Owl recovery & other species dependant OG.

2-Retain forest over 80 yrs to provide habitat for late successional reserves.

3-Retain RIP areas w/ck buffers up to 500’ for all species.

4- Thin for fuels mgmt. in dry forest & plantations.

5-Eliminate clear cutting & modernize the 1872 mining laws

6-Analyze climate change & water for multi cities & watersheds for clean water in next 50 yrs w/impacts of mgmt.
7-Continue “No Action Plan” NWFP Continue fuels mgmt. in dry forest, NO CLEAR cutting in dry or wet/moist forest
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Name: Charlie Larson  Email: karsies09@yahoo.com
Address: 1060 E 36th Ave  City: Eugene
Phone #: (541)345-9384  Organizational Affiliation: Oregon Citizen Otys

I would like to be added to the RMP for Western Oregon mailing list: ☑ Yes  ☐ No

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I submit the following planning criteria recommendations
☐ Please see attached
I submit four policy recommendations for BLM to consider in its planning criteria.

#1 Question the way of life and better judgment of a people who see Mother
nature's resources so some business can profit before the needs of the whole
community are met.

#2 Consider the rights of all Oregonians, including future generations not yet born,
and choose a management plan that nurtures forests and wildlife habitat, streams
and watersheds, to maintain their healthy, natural integrity on-going into the distant
future.

#3 Consider the global ecology and environmental context and place a real value on
what forests, especially our old growth forests, contribute to the health and well
being of the planet.

#4 Don't buy the industry's hurry to cut trees just so they can keep building bigger
and bigger cutting machines. Trees sold cheap today will never bring the price their
worth will be when they are gone.

#5 If you plan to use the internet for comments and feedback, make it so the
website functions and when the form is submitted there's a confirmation you
received the comment or form rather than a URL 404 - Not Found.

Charlie Larson 3/24/2014
1060 E 36th Ave
Eugene, OR 97405
Please note that the following comments will be recorded as official public comment as part of the National Environmental Policy Act official public comment period for ELM's Resource Management Plan for Western Oregon Planning Criteria. General response to comments will be provided in the Draft Environmental Impact Statement. Thank you for your input.

Name: Charlie Larson  
Email: lawson@blm.gov  
Address: 1600 E 36th Ave  
City: Eugene  
Phone: (541) 345-9384  
Organizational Affiliation: Oregon Citizens Of Today

I would like to be added to the RMP for Western Oregon mailing list: (Yes) (No)

Please use the space below to provide your comments on aspects of the Planning Criteria, draft Preliminary Alternatives, and/or today's Public Session. Before including address, phone number, email-address, or any other personal identifying information in your comments, be advised that your entire comment, including personal identifying information, may be made publicly available at any time. While individuals may request that the BLM withhold personal identifying information from public view, the BLM cannot guarantee it will be able to do so. If you wish us to withhold your personal information you must state this prominently at the beginning of your comment. We will make all submissions from organizations or businesses available for public disclosure in their entirety.

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Charlie Larson
1060 E 36th Ave
Eugene, OR 97405

3/24/2014
WHY FORESTS NEED TO BE ENLISTED IN CLIMATE CHANGE ACTIONS

Dominick A. DellaSala, Ph.D., Chief Scientist
Geos Institute (www.geosinstitute.org; dominick@geosinstitute.org)

“Forests have a vital role to play in overcoming this challenge. Rainforests store vast amounts of carbon. That’s true across the planet, and in America, too. Our Tongass National Forest, a temperate Alaskan rainforest comprises only 2% of America’s forest land base, but may hold as much as 8% of all the carbon contained in the forests of the United States.”
Secretary of Agriculture, Tom Vilsack
http://www.usda.gov/blog/usda/entry/h2_the_urgent_need_to 12.17.2009

FORESTS AND CARBON CYCLES

Forests are a critical part of the global atmospheric carbon cycle that contribute to climate stabilization by absorbing (sequestering) and storing vast amounts of carbon dioxide (CO₂) in trees (live and dead), soils, and understory foliage. Photosynthesis is the process by which forests fix carbon – that is, plants absorb CO₂ and use light energy and water to manufacture carbohydrates as food, releasing oxygen as a byproduct.

As a forest ages, it continues to accumulate and store carbon, functioning as a net carbon “sink” for centuries. Ongoing carbon accumulation and storage have been measured in old forests that are >800
years old\(^1\).

When an old-growth forest is cut down, much of this stored carbon is released as CO\(_2\) – a global-warming pollutant – switching it from a sink to a “source” or “emitter” of CO\(_2\). For instance, nearly 60% of the carbon stored in an old-growth forest is emitted as CO\(_2\) when it is converted to young growth, via decomposition of logging slash, fossil-fuel emissions from transport and processing, and decay or combustion (within 40-50 years) of forest products, often in landfills\(^2\). Planting or growing young trees does not make up for this release of CO\(_2\) from a logged forest. Indeed, after a forest is clearcut, it remains a net CO\(_2\) emitter for its first 15 or more years, and even if not cut down again will not reach the levels of carbon stored in an old forest for centuries. Globally, deforestation and forest degradation contribute about 17% of the world’s annual greenhouse gas emissions.


pollutants\(^3\), more than the entire global transportation network, which is why many countries are seeking ways to reduce greenhouse gas emissions from logging.

**ENLISTING CARBON RICH FORESTS IN CLIMATE CHANGE ACTIONS**

Scientists and many countries have increasingly recognized that if we are to avoid catastrophic effects of global warming within this century, we must take a comprehensive approach to reducing greenhouse gas pollution overall. Part of the solution to global warming must come from reducing emissions from forest losses, as recognized by the United Nations REDD+ (Reduce Emissions from Deforestation and Forest Degradation\(^4\)) Programme in developing countries. The U.S. can provide these countries with a leadership example by conserving its own older forests.

Forests in the United States, especially older carbon dense ones, can play a critical role in reducing climate change impacts through sequestering and storing carbon for centuries if undisturbed. New forest and inventory and analysis (FIA) data from the USDA Forest Service demonstrates that the U.S. forests store the equivalent of around 21% of the nation’s emissions\(^5\). Notably, National Forests store approximately 28% more carbon than private lands and therefore are important as carbon sinks.

Naturally carbon dense forests in moist areas with long fire return intervals (green areas on the map are preliminary estimates) maintain carbon stores for centuries if they are undisturbed.

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\(^3\) Intergovernmental Panel on Climate Change. 2007. Synthesis report. An assessment of the IPCC on climate change.

\(^4\) [http://www.un-redd.org](http://www.un-redd.org/)

Importantly, forests in the Pacific Northwest are nationally significant carbon stores⁶, mostly because of the strategic role older forests provide as carbon sinks. Additionally, mature moist forests on public lands in Oregon and Washington store the equivalent of nearly 130 times the state’s annual greenhouse gases⁷.

Alaska’s Tongass rainforest is also a global champion in storing carbon (green areas on map). These rainforests store the equivalent of nearly 80 times Alaska’s annual emissions⁸.

For more information go to http://www.geosinstitute.org/banking-on-forests.html

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**FOREST CARBON FACT FINDER:**

- Managing forests to optimize carbon stores through preservation or lengthened timber rotations would provide co-benefits for climate adaptation, including clean water, climate refugia, and connectivity across fish and wildlife habitat.
- More carbon is removed by thinning than the most severe forest fires because, in order to influence fire behavior, forests need to be thinned over large landscapes resulting in cumulative losses of stored carbon and emissions from fossil fuels, including biomass conversion.
- Accurate assessment of whether a forest practice yields carbon benefits requires managers to conduct a life-cycle analysis of “upstream” and “downstream” carbon losses, as well as gains.

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⁶ [www.fs.fed.us/rmrs/forest-carbon/](http://www.fs.fed.us/rmrs/forest-carbon/)

⁷ Over 9 million acres of older carbon dense forests have been identified in Oregon and Washington (Krankina in review). These 9 million acres store about 450 metric tons of carbon per acre or 15 billion metric tones of CO₂ (e) total. By comparison, Oregon and Washington emitted about 115 million metric tones of CO₂ (e) in 2010.

⁸ 5 million acres of old-growth rainforest store about 234 metric tons of carbon per acre or 4 billion metric tons of CO₂ (e). By comparison, Alaska emitted 55.2 million metric tons of CO₂ (e) in 2010.
October 24, 2013

The Honorable Barack Obama  
President of the United States of America  
The White House  
1600 Pennsylvania Avenue, NW  
Washington, D.C. 20500

Dear President Obama,

American Bird Conservancy wishes to thank you and your administration for developing a Climate Action Plan, and for the first-ever proposed regulation of greenhouse gas emissions. We were pleased to see the Plan recognize the role that forests and sound forest management can play in mitigating carbon emissions. Approximately 12% of U.S. carbon emissions are currently offset by forests.

We would like to offer several suggestions on how forests can continue to play this important role. These steps are critically important because U.S.D.A. Forest Service projections indicate that forests will steadily lose their current capacity to store carbon, and by mid-century become carbon emitters, primarily due to the loss of private forests to urbanization.

We would also like to bring to your attention the fact that the U.S. has forests that can store more carbon per acre than any others in the world. From the Redwoods in California to the rainforests of Southeast Alaska, we already possess a vast carbon storehouse in the mature and old-growth forests on federal lands.

We urge that the draft climate action report be amended to include the carbon storage benefits of the Northwest Forest Plan. Studies confirm that since the Northwest Forest Plan was implemented, forests in the Pacific Northwest have gone from being a source of emissions to a carbon sink. This is a significant success story that should not be overlooked.

Forest carbon scientists have concluded that these magnificent forests are only half full, in that they could store considerable more carbon if allowed to grow. Conversely, losing these forests would create a carbon debt as their stored carbon is returned to the atmosphere; a debt which would take centuries to repay.

We respectfully recommend that the final Climate Action Plan be amended to ensure that forests will continue to make a strong contribution in the effort to reduce atmospheric carbon:
• Preserve existing carbon stores such as the mature and old growth forests on federal lands in California, Oregon, Washington and Alaska.
• Develop and continue plans such as the Northwest Forest Plan that result in carbon storage through the growth of forests.
• Expand programs such as the Land and Water Conservation Fund and Forest Legacy to prevent the loss of forests to urbanization.
• Identify appropriate growing areas, such as the Mississippi Delta, for the planting of extensive new forests.

We believe these steps to reduce atmospheric carbon would also provide many additional economic and environmental benefits including job creation, clean water supplies, wildlife habitat, and recreational opportunities. We look forward to working with your administration to solve the climate challenge and to discussing these ideas with your team.

Sincerely,

Steve Holmer
Senior Policy Advisor
American Bird Conservancy
Christopher Long  Laser1319@yahoo.com
1319 Maple St., Myrtle Point
(541) 808-4473  President of North Bend Prospectors, Inc.

I am proud to be a descendent of the Long Family who helped settle Oregon and write it's Constitution. I have family members buried all over Oregon. We are also proud of our history of standing and fighting for people's rights.

First I would like to note that the land that BLM is supposed to manage is not BLM's, but the people of Oregon.

I am a fisherman, hunter, miner and outdoors man. Been a logger and farmer also. Worked hard all of my life loving this country and the people. Retired after 20 years of Navy Service.

I was a bit confused when people started talking about Old Growth Timber, but when questioned as to how to identify an Old Growth I got several answers, non-which fit either my knowledge or understand of Fir Trees in South Western Oregon.

New Growth: Seed to 10" Stump
Second Growth: 10"+ Stump to 3' Stump
Third Growth: 3'+ Stump and up
Old Growth is a dying tree. The way to tell is when you look at the top it is dead. These trees are very dangerous. Both for humans and animals. Ground coverage under an old growth stand is very sparse. Animals avoid old growth timber, not only because of the danger, but the lack of food. Old third growth will have a lot of the same features on the ground as the old growth. At this stage the trees will be reaching total maturity and some will even be beginning to die.

Most trees located in South Western Oregon have very shallow root systems. There is several reasons for this. One is the type of soil and land make-up. Sand stone and hard rock usually is only a few feet down which helps hold the water table high. Hydraulic land slippage happens continuously no matter the ground cover because of the shallow earth. So trying to protect streams from landslides is a futile effort at best. Even streams located within Old Growth and Old Third Growth timber will run dirty brown during the rainy season. This is once more because of the poor ground cover under these trees.

Understand that the Indians used to burn the forest in late fall. There were several reasons for doing this.
1: Protect the family during summer storms.
2: Provide food for the animals they hunted.
3: Provided areas to live, hunt and farm.

I for one like many Americans do not except the UN Science Study or any other study about Global Warming. Everything I have read and studied from different agencies fails to apply any real science. I say this for several reasons.
1: Recorded records of climate isn't but about 200 hundred years in many areas.
2: Failure to note the sun and its activities as to effects on the earth.
3: Carbon dioxide one of the most prevalent gases, is used and required by almost every living thing. Required by plants to produce oxygen and so much more. Yet reported by UN Scientists to be the biggest cause of so called Global Warming.

Mother Nature (Earth) has been evolving now for tens of millions of years. Real science has shown that the earth has gone from hot to cold several times during this time. So how can we take 1/2000 or less information and claim it to be fact? Anyone one with a bit of common sense and a little thought should be able to figure it out.

I am very upset that BLM has gated and/or blocked so many roads in Southwestern Oregon. Stopping people from using the forest. This prohibits people from searching for natural recourses such as minerals within the ground. It also restricts hunting and fishing in many areas. People used to make livings gathering these natural resources.

Logging needs to be treated like farming. The forest need to be managed and harvested just as a farmer does with his crops. Fact is if we had started from the very beginning here in Oregon treating the Forest like a farm product we would still have vast amounts of aging timber waiting to be harvested. Failure to do so results in a poor balance of production and great loss of product. This country was actually built on three things, farming, logging and mining.

I for one do not approve of designated Recreational Areas within public lands. It's called public land because we the people are supposed to be able to use it! I understand that we have people who haven't a clue as to how to live and survive within a forest or how to visit that forest and leave without creating problems. So how do we fix this problem? Create camp and recreation areas? Guess what it doesn't work! While growing up in Coos County Oregon I could name and show you the locations of many county parks. Almost all of them have been removed because of cost to maintain and locations. It's not cost effective! Most people today who travel from the cities expect to hook-up when they arrive. Power, water and sewer systems for their big fancy RV's. The more remote the Recreational Location the higher the cost! Along with maintaining bigger and wider roads that are paved and guttered. BLM can't maintain the paved roads built during the Kennedy years.

Now let’s move on to fish habitat. Once again during the 60’s Fish and Wildlife determined that all the streams needed to be cleared by the loggers. How did they do this? Well Fish and Wildlife instructed the loggers to use their Cats to push and clear everything from the creeks and streams when they finished a logging. This of course destroyed the fish habitat and really messed things up. Large rock as big as houses was moved, plunge holes were filled in. This was all from the action of Government! People who don't have a clue as to how things should really be.

As far as mining goes, it may not be visually appealing while it is being done. Yet within the creeks and streams where much of the modern mining is taking place good things are happening. First off the suction equipment used creates plunge holes that fish like to gather in while moving the coble. These coble piles are fresh spawning beds for salmon and steelhead. Many times I have seen salmon and steelhead move directly to the fresh coble piles to spawn when only a few feet away was a large smooth gravel bar that we hadn't worked up. While suction mining within the stream, it isn't anything to have dozens of fish moving around you eating and enjoying themselves. I have never seen a fish sucked into the nozzle and if it did happen I doubt if the fish would be hurt because we use a hydro jet to created suction. For the little bit of gold I have recovered, I have removed many pounds of lead along with mercury and other heavy metals. It should be noted here that much of the mercury blamed on old mining is in fact a natural element present where ever you find gold. Mercury and gold gather together in
nature. It should also be noted that much of the silt and dirt being moved while suction mining is mostly organic and fish feed on it for days if not weeks after the miner moves on.

From what I learned at the meeting in Coos Bay is this. Government Agency looking to spend more tax dollars. Dollars that could and should be used by the people for their schools, roads and so much more. Billions of dollars in forest money has been removed from Oregon with very little return. The plans I saw will cost the loggers even more. Costing in lost jobs and revenue to the State and Counties. It is a broad approach to fix something that isn't really broken. Because people don't like to drive along a river or stream and see clear cut areas of forest, not understanding that their homes and much of their furniture was produced from the wood harvested. These same people can drive the same route 5 years later and not even realize that the young (New Growth) timber is the same spot as the clear cut. Ground erosion on clear cuts would be a normal thing if the stand of timer had burned in a forest fire. Fire kills everything as we well know and at least a clear cut leaves some ground cover for the start of the New Growth. Game animals quickly move into these areas because it's easy food.

I almost forgot the Spotted Owl and Spotted Snowy Plover along with a dozen other protected species. The Spotted Owl started migrating into Oregon in the early 60's and is not native. So why are we protecting it, when it is so prevalent in other areas. As far as their nesting goes, it is a proven fact that they will nest anywhere. Business signs to holes in the ground. The Spotted Snowy Plover has several Colons located throughout the Western United States. One of the biggest is known to exist in Idaho and these birds travel from colony to colony as food and weather dictate.

Government Agencies seem to forget one thing while doing the "Balancing of Public Resources" and that is the human factor. Damage done to families who are broken apart because of the loss of jobs and the chance to live a better life. The human factor should be first on all lists and not the last.

I could continue to write a lot more. However I think I have made a few good points.

Respectfully Signed:

Christopher A Long
President of North Bend Prospectors, Inc.
Commander Veterans of Foreign Wars Lee Ray Post #2928
Retired Navy Chief Petty Officer
Retired Business Owner
Retired Contractor
Active Fisherman
Active Hunter
Active Miner
FAX COVER SHEET

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COVER MESSAGE

This email is free from viruses and malware because avast! Antivirus protection is active.
http://www.avast.com
RESOURCE MANAGEMENT PLANS
FOR WESTERN OREGON

Bureau of Land Management
Resource Management Plan for Western Oregon
March 2014 Public Information and Input Sessions

Public Comment Form

Please note that the following comments will be recorded as official public comment as part of the National Environmental Policy Act official public comment period for BLM’s Resource Management Plan for Western Oregon Planning Criteria. General response to comments will be provided in the Draft Environmental Impact Statement. Thank you for your input!

Name: Brenna Recca-Sullivan      Email: kjreeca@jeffnet.org
Address: 326 Roosevelt St #11     City: Klamath Falls
Phone #: 541-708-1056  Organizational Affiliation: 

I would like to be added to the RMP for Western Oregon mailing list: ☐ Yes ☐ No

Please use the space below to provide your comments on aspects of the Planning Criteria, draft Preliminary Alternatives, and/or today’s Public Session. Before including address, phone number, email-address, or any other personal identifying information in your comments, be advised that your entire comment, including personal identifying information, may be made publicly available at any time. While individuals may request that the BLM withhold personal identifying information from public view, the BLM cannot guarantee it will be able to do so. If you wish us to withhold your personal information you must state this prominently at the beginning of your comment. We will make all submissions from organizations or businesses available for public disclosure in their entirety.

Additional comments on the draft Planning Criteria can be submitted until March 31, 2014.

Visit the BLM RMP for Western Oregon website to submit comments
(http://www.blm.gov/or/plans/rmpswesternoregon/)

Public forests are a public resource. They have a role and a purpose. They are for the public. It is possible for public forests to be logged while maintaining the balance and health of the overall ecosystem, by carefully treading, avoiding clearcuts, and replanting a diverse seed-set.

Additionally, All roads should remain un-gated and open to travel. The forests are for public use and enjoyment, and thus, camping, motorcycling, hiking, and other activities should be encouraged in all areas.
Attached are my comments and concerns pertaining to the Draft Planning Guidance Document and the Purpose and Need meeting held March 6, 2014 in Salem. I had some difficulty in sending this by e-mail, so here is a hard copy. I request that I be placed on your mailing list for future review and comment on the RMP's as they are developed.

John P. Bacho
4877 Towhee Ct. S.
Salem, OR 97302
I attended the Purpose and Need meeting on March 6, 2014 in Salem, Oregon. The following are my comments concerning this meeting and input to the future development of these plans.

I don't believe that the Preliminary Alternatives as presented (A-D) will meet the requirements of the O&C Act. The reserve areas are so extensive that the areas for sustained yield timber production would be inadequate to yield enough economic benefit to comply with the O&C Act.

Reserves throughout the Checkerboard ownership of older forest stands (120 and older) and the extensive Riparian reserves put an extreme limitation on the area available for sustained yield timber production. It appears that an ultra conservative biological approach is leading these plans. It is questionable that identifying all older forest habitat throughout the checkerboard ownership, benefits protected species.

Declaring any sustained yield timber production on such a limited area will not meet the O&C Act, or its intent to provide social and economic benefit to the 18 counties. The current state of economics of the counties can attest to the failure of the 95 NWFP even had it been fully implemented. There is a need to provide emphasis wherever possible to meet the intent of the O&C Act.

Reserving Older Forest Habitat in large blocks doesn't address the needs of the species requiring early successional habitats. The ESA emphasis (as applied) for a limited number of species, to the exclusion of other species, is not the intent of the law. Consideration of early successional species, and their habitats, needs to be analyzed throughout their range, including the large block reserve areas.

NEED:

Another alternative is needed, in this plan, to place emphasis on the O&C Act. Areas capable of yielding sustainable timber production of adequate size (80 year rotation in the moist forest and 120 years in the dry forest) must have operability to sell, cut, remove, and regenerate forests for continuous sustained yield. The land base needs to be large enough to produce a quantity of timber to provide economic benefit to the counties, for example the 2008 RMP Preferred Alternative-ROD. At least one third of the land base in all districts capable of producing timber should be allocated, if not more.

Any retention of forest components (green trees, snags and downed logs) in areas designated for sustained yield should be limited to 15% or less. Retention is a limitation on forest production and should be considered when planning this alternative.

The Riparian Reserves are extensive in all proposed alternatives. Those areas considered for sustained yield production should have the minimum reserve size required to meet the Clean Water Act. The State Forest Practices Act riparian requirements should be followed in formulating this alternative for timber production.

Recognition and analysis of early successional habitat should be completed for this alternative and all alternatives purposed for this RMP. This should specifically include any large block reserves. Early successional species should be considered throughout their biological range also. There is a possibility that Elk and Deer are being impacted (State F&W are limiting hunting opportunities) in the Cascade and Coast Range, where, for the last two decades large block reserves have been implemented by the US Forest Service and BLM. They are dependent on early successional habitat and are indicators for other species. All alternatives should use the Western Oregon Elk Model (developed by the USFS & PNW) to analyze the impact on these species and other early successional species. To say that early successional species needs are met on private lands would be an inadequate answer. Their management practices of short rotations for timber production, lack of retention, and vegetation management (herbicides) do not provide a complete early successional habitat.

GENERAL COMMENTS:
Discretion in planning and decision making has its place, but too conservative does not provide the balance that is necessary to meet the requirements of the laws. The NWFP of 1995 is a good example because it errored too conservatively for protection and lead to not fulfilling the O&C Act for nearly two decades. The ASQ, even if fully implemented in that plan, was too low to adequately meet the economic needs of the counties. It had too few acres dedicated to sustained yield, which were restricted by too many reserves, in particular the extensive riparian reserves.

Other Federal Agencies (USFW & NFMS) using the ESA and the CWA have been ultra conservative in administering these laws and their requirements for the recovery plans and designating critical habitats. These laws also require those agencies to consider other laws and their requirements, particularly the social and economic impacts of their plans, and the requirements of other laws, like the O&C Act. They should work with the land management agencies to recovery for species, and strive for the balance required to achieve the demands of many laws. Setting aside more habitat for the NSO doesn’t ensure that the species will recover, and in particular, when a competitor like the Barred Owl may have a greater impact. Also, including the Marbled Murrelet, whose desired nesting habitat is just onshore but occupied by other species, and trying to provide protection on the extreme limits of its biological range, conflicts with other uses and legal demands. There needs to be some balance here.

I request to be on the mailing list for all future RMP planning information and would like the opportunity to review and comment as the process moves forward.

John P Bacho
March 26, 2014

Emailed to: blm_or_rmps_westernoregon@blm.org

Bureau of Land Management Resource Management Plan Western Oregon

Subject: Public Comment on Western Oregon Resource Mgmt. Plan (RMP) - Recreation Planning Criteria

I have been a resident of Foots Creek Road for the past 25 Years. I grew up with the total peace and quiet that the Johns Peak/Timber Mountain affords. This area is not suited for the purpose of an OHV Emphasis area, as it is closely interspersed with private lands and trespassing by the OHV users will undoubtedly occur causing untold conflict. The Risk of inevitable forest fires increases substantially with OHV use. This is a concern for all residents in this area, as we are located in an "Extreme Fire Danger Area" as designated by ODF. For decades I have hunted, hiked, fished and rode horses in the heart of Johns Peak/Timber Mountain. To designate it an OHV Emphasis area, will without doubt jeopardize all other activities. In addition to the loss of recreation activities, OHV use will damage and severely impact and reduce the wildlife habitat and pollute our streams.

Another Huge concern that I have is the increase in traffic on the local roads. Left Fork of Foots Creek Road is a very narrow gravel road that is not suitable for the traffic increase that would be generated by this designation. As it is, this road is very dangerous due to dust in the summer months, and the unwanted OHV users park on the side of what is a one and a half car vehicle road at a very dangerous blind corner. Increased traffic will increase the risk of accidents and injury as well as increasing the dust and air pollution. The noise from the OHV use will reduce the quality of life for the residents impacted by it. The BLM needs to and has to include all the data, petitions and letters submitted by the residents over the past 10 years in the BLM Western Oregon RMP Planning Criteria. BLM needs to listen to the voices of the people that this designation impacts!

I not only urge but request that BLM remove the 1995 RMP OHV Designation from Johns Peak/Timber Mountain in Southern Oregon as it has violated 43 CFR 8342.2a "Public Participation". The noise of the OHV’s screaming in the hills, will destroy the life and tranquility of the residents. This is something we cannot and should not have to live with.

OHV users drive recklessly on our roads endangering our families, children and horse riders. Unless BLM intends to fund a full time enforcement army of officers in each of the affected communities surrounding this area, it will be an unmanageable situation. This is not the right place for an OHV Emphasis Area, and at the very least BLM should remove the Foots Creek, Birdseye Creek, Galls Creek and surrounding areas and ridges from the OHV Emphasis Area including modifying maps and web information to show the OHV users that this is an non-motorized area.
Privately owned acreage far exceeds the BLM’s scattered ownership at Johns Peak/Timber Mountain area, yet BLM seems insistent to force the OHV emphasis Area, even at the cost of harming thousands of residents, to only benefit a single special interest group. Please do the honorable and right thing and find and OHV area that we can all support, other than the Johns Peak/Timber Mountain area.

Regards,

Sandra J. Hanis
686 Fooots Creek Road
Gold Hill, OR 97525
541-582-8162
March 26, 2014

Emailed to: blm_or_rmps_westernoregon@blm.org

Bureau of Land Management Resource Management Plan Western Oregon

Subject: Public Comment on Western Oregon Resource Mgmt. Plan (RMP) - Recreation Planning Criteria

I have been a resident of Foots Creek Road for the past 3 years. I grew up spending summers at my grandparents home in the heart of the Johns Peak/Timber Mountain area. In fact, going into my Senior Year of High School, I requested to move to Oregon, to get away from Las Vegas, NV. We were fortunate enough to be able to move back onto Foots Creek Road. This area is not suited for the purpose of an OHV Emphasis area, private lands and trespassing by the OHV users will undoubtedly occur, causing untold conflict. The risk of forest fires substantially increases with OHV use. This is a concern in this is area, as we are located in an "Extreme Fire Danger Area" as designated by ODF.

A huge concern that I have is the increase in traffic on the local roads. Left Fork of Foots Creek Road is a very narrow gravel road that is not suitable for the traffic increase that would be generated by this designation. The increased traffic will increase the risk of accidents and injury as well as increasing the dust and air pollution. The noise from the OHV use will reduce the quality of life for the residents impacted by it. The BLM needs to and has to include all the data, petitions and letters submitted by the residents over the past 10 years in the BLM Western Oregon RMP Planning Criteria. BLM needs to listen to the voices of the people that this designation impacts!

I not only urge but request that BLM remove the 1995 RMP OHV Designation from Johns Peak/Timber Mountain in Southern Oregon as it has violated 43 CFR 8342.2a "Public Participation". The noise of the OHV's screaming in the hills, will destroy the life and tranquility of the residents.

Privately owned acreage exceeds the BLM's scattered ownership at Johns Peak/Timber Mountain area, yet BLM seems insistent to force the OHV emphasis Area, even at the cost of harming thousands of residents, to only benefit a single special interest group. Please do right thing and find an OHV area that we can all support, other than the Johns Peak/Timber Mountain area.

Regards,

Samantha J. Hanis
686 Foots Creek Road
Gold Hill, OR 97525
702-538-6461
March 20, 2014

Jerome E. Perez, Esq.
State Director: Oregon/Washington
Bureau of Land Management

Submitted via: jpeerez@blm.gov; BLM_OR_RMPs_WesternOregon@blm.gov

Re: Geos Institute’s Comments on BLM’s Resource Management Plans (RMPs) Planning Criteria

Thank you for this opportunity to comment on the RMP planning criteria that will form the basis for BLM’s Western Oregon Plan Revisions. Geos Institute’s mission is to use science to help people predict, reduce, and prepare for climate change. Notably, our work on climate change spans several of the BLM’s planning criteria and related “issues” presented in the RMP alternatives, particularly those that include conservation strategies such as large reserve designs, climate change adaptation and mitigation, fire ecology and management, carbon sequestration and storage, and endangered species management. Moreover, our comments primarily call for use of best science in plan revisions to more effectively ensure that BLM can meet its stated vision and goals as the public’s land steward overseeing 2.5 million acres in western Oregon (RMP p. 4).

However, while the O&C Act’s provisions of “sustained yield” and recent lawsuits create conflicting interpretations, BLM’s timber dominance interpretation has been debated in the courts and literature. For instance, the O&C statute states that the O&C lands:

shall be managed…for permanent forest production, and the timber thereon shall be sold, cut, and removed in conformity with the principal [sic] of sustained yield for the purpose of providing a permanent source of timber supply, protecting watersheds, regulating stream flow, and contributing to the economic stability of local communities and industries, and providing recreational facilities. Id. § 1181a.

The O&C statute contains more than a “timber first” mandate because it embodies multiple-use, sustained yield, and protective water quality/watershed standards as well (Scott and Brown 2007, Blumm and Wiginton 2013). BLM explicitly recognized its multiple management responsibilities in the Resource Management Plans (“RMPs”) adopted for
the Medford and Roseburg districts. In so doing, BLM projects an “estimate” of annual timber harvest that the agency explains is “neither a minimum level that must be met nor a maximum level that cannot be exceeded” (Swanson v. Salazaar Defendant-Intervenors US District Court of Columbia).

Thus, we believe BLM’s overemphasis on timber management historically and currently is a narrow interpretation of the O&C Act in the RMP Planning Criteria that de-emphasize other values otherwise equally recognized in the statute has created inconsistencies, particularly with its vision to: “contribute to the social well-being of the human population and to help enhance and maintain the ecological health of the environment.” Specifically, decades of overharvest by BLM and other landowners in the region has placed ecological values at risk, including wild salmon runs, water quality, Northern Spotted Owls, Marbled Murrelets, and other late-successional species. Should this continue to occur through cumulative losses as proposed by BLM’s stepped-up logging alternatives in combination with increased logging by surrounding landowners, then BLM cannot possibly achieve its vision as the very foundation of success needs to be pinned to the integrity of forest ecosystems already significantly stressed by decades of over use.

Instead, it would be prudent for BLM to embrace science-based principles in conservation biology, forest carbon management, restoration ecology, and aquatics management as discussed in our comments in order to constrain an otherwise over zealous timber management emphasis. Additionally, since the onset of the O&C Act (1937), landmark laws and policies now govern BLM’s planning cycles, including it must tier to the Northwest Forest Plan (especially the Late-Successional Reserves, Riparian Reserves and associated standards and guidelines of the Aquatic Conservation Strategy) and critical habitat and recovery plans (spotted owls, Marbled Murrelets) to meet its statutory obligation under the ESA, the Clean Water Act, and the fact that many of the state’s waterways are already water quality limited due, in part, to too much logging and road building, and more recent policies such as President Barack Obama’s Climate Action Plan of June 2013 and its emphasis on carbon storage, sequestration, and forest resilience. Simply put, BLM’s continued emphasis on timber dominance with a narrow and antiquated O&C interpretation creates a conflict of interest that makes implementation of its broader vision and related statutes and policies impossible. Its view of its O&C obligations will compromise other assets it has on public lands, especially ecosystem services such as carbon, soil productivity, fisheries, and water quality.

To help BLM better achieve a broader vision, our comments are focused on: (1) compliance with the Endangered Species Act and the importance of BLM lands in recovery; (2) improvements in BLM’s interpretation of fire’s ecological role, forest carbon management, and climate change resilience; and (3) streamside protections as required under the Aquatic Conservation Strategy of the Northwest Forest Plan.

**BLM’s Management of Federally listed Species is At Odds with the Endangered Species Act and Recovery Obligations**
BLM lands in western Oregon are some of the last remaining low-elevation mature and old-growth forests in the region (Staus et al. 2010). These lands also contain the majority of remaining intact watersheds, high carbon stores in older forests (Krankina et al. in review, Appendix 1), Coho Salmon Evolutionary Significant Units, murrelet and spotted owl mature-forest habitat, and north-facing older forests that are likely to function as important climate refugia (Staus et al. 2010, Olson et al. 2012, Krankina et al. in review). Moreover, BLM lands are dispersed in a highly fragmented “checkerboard” of intensive logging by nonfederal landownerships and are therefore the only functional landscape connections for spotted owls and other late-seral species dispersing from the Coast Range inland (especially just south of Roseburg) and from the Siskiyou’s south (especially into northern California) and west to the Coast Range. BLM has yet to recognize these special attributes nor any of the studies that document their importance as referenced herein. We therefore request that you include another “issue” in the RMPs that addresses the unique landscape and wildlife features that BLM western Oregon lands include in the context of the heavily altered checkerboard.

Two species that depend on high integrity of BLM lands (Northern Spotted Owl, Marbled Murrelet), in particular, are listed as threatened under the Endangered Species Act and one, the spotted owl, is a flagship species for hundreds of other species that also use mature and old-growth forests in the Northwest Forest Planning area. Spotted owl populations have been declining precipitously range-wide due to ongoing and historical habitat losses, including on BLM lands, but especially on nonfederal lands due to high rates of logging (Anthony et al. 2006). Competitive pressure from Barred Owls has exacerbated spotted owl declines (Dugger et al. 2012, Wiens et al. 2012). However, none of BLM’s alternatives are sufficient in contributing to the recovery of spotted owl populations largely because all alternatives: (1) assume fire is a threat to owls, yet this has yet to be documented for Northern Spotted Owls and does not appear to be the case for California Spotted Owls that also occur in fire-dependent dry forests (Bond et al. 2009, 2013; Lee et al. 2012; DellaSala et al. 2013); (2) thinning is benign or a short-term risk to owls, yet this is unlikely given it reduces habitat for the owls’ closed-canopy dependent prey species (see Gomez et al. 2005, Carey 2011, et al. 2011, Manning et al. 2012); (3) there is no mention of the bigger threat of post-fire logging to owls even though BLM gets a significant amount of timber from this practice (Clark et al. 2013, DellaSala et al. 2013 for review); (4) the alternatives reduce riparian reserve buffers from two tree heights down to one (discussed below), yet there is no discussion on impacts to spotted owls (and Barred Owls) that use riparian areas; (5) all alternatives, because of their emphasis on timber dominance, will increase forest fragmentation from roads and clearcuts, thereby contributing to cumulative mature forest losses (in combination with nonfederal logging) that will increase risk of competitive exclusion from Barred Owls (Dugger et al. 2012, Wiens et al. 2012); and (6) increased reliance on regeneration and variable retention harvests in the proposed alternatives as they will not only contribute to greater habitat fragmentation but will likely raise fire hazards from slash remaining after logging operations and conversion of fire-dependent mature forests to fire-prone plantations (see Odion et al. 2004 for susceptibility of plantations to severe fires – this needs to be addressed in the “issues”).
BLM’s emphasis on planning and analysis at multiple spatio-temporal scales (RMP p. 2) needs to include anticipated cumulative losses from habitat fragmentation to both Northern Spotted Owls and Marbled Murrelets, the latter of which is known to decline in fragmented forests due to increased nest-site predation by corvids (Malt and Lank 2009). These risks will accumulate in space and time from BLM’s timber management and surrounding land management actions and they need to be addressed in all alternatives (i.e., cumulative effects).

In sum, the more BLM pushes its timber dominance interpretation of the O&C Act, the greater the chances of a jeopardy decision by the U.S. Fish & Wildlife Service and/or the need for up-listing the owl and murrelet to endangered due to increased threats and declining populations. BLM, therefore, needs to demonstrate in its planning analysis how increased logging inside or outside critical habitat as well as in suitable owl habitat will not conflict with recovery actions related to protection of older forests and nest-sites (including those that burn in a fire). It needs to show explicitly how increasing timber management (clearcuts) in the context of similar management in the surroundings will not impair owl or murrelet recovery.

**Fire Assumptions are based on Biased Estimators and Limited Reviews**

The BLM assumes in all RMP alternatives that: (1) fire is a risk to spotted owls; (2) fires are burning uncharacteristically, particularly severe ones; (3) thinning is likely to contain fire occurrence and intensity; and (4) suppression is compatible with BLM’s stewardship responsibilities. However, BLM presents a biased interpretation of the scientific literature on the ecological benefits of fire and provides no evidence that fire is actually contributing to spotted owl declines, particularly in comparison to thinning impacts to owl prey species and known impacts from post-fire logging as discussed herein.

BLM states fire increases definitively as if this is settled in the scientific community when it clearly is not (see Hanson et al. 2009, Odion et al. 2014), nor does the agency present any empirical data to back its suppositions that fire is increasing. For instance, using satellite images from the 1980s to present years, Hanson et al. (2009) did not detect a statistically significant increase in the severity of fires, nor were fires deemed a significant risk to older forests when rates of forest recruitment into older age classes were included in a transition state-model, including factoring in presumed increases in fire related to climate change effects. In addition, using a similar state-model, Odion et al. (in review, Appendix 2) and (Raphael et al. 2014) independently concluded that thinning at the scale of what is being proposed in the owl recovery plan and by Franklin and Johnson (2012), also referenced in the BLM RMP, was a bigger risk to owl habitat (likely to trigger population bottlenecks) than presumed fire-related habitat losses. Thus, at a minimum, we recommend that you include a transition-state model that includes mature forest ingrowth in the stochastic fire events modeling (RMP p. 30) and not just the presumed habitat losses from fire. In fact, it cannot be assumed that fire is even a habitat loss to owls as there are no empirical data on this in Oregon (other than the Clark et al. 2013 study that
was confounded by post-fire logging effects) and owls in California appear to be quite robust to fires, even severe fire, that is used for foraging (Bond et al. 2009, 2012; Lee et al. 2012).

BLM also does not cite any of the relevant science showing the myriad of ecosystem benefits from fires, even severe ones (Hutto 2008, Swanson et al. 2011). Therefore, BLM’s fire-assumptions are biased toward one view on fire and thinning and the agency has not considered new information that has developed more recently (Odion et al. 2014), that challenges BLM’s fire assumptions about presumed increases in severity or extent. In addition, fire severity in the Klamath-Siskiyou ecoregion is complex and it cannot be assumed that as the time between fire cycles increases the severity of fire increases accordingly. In fact, Odion et al. (2004) found that as the time between fire cycles increased for mixed evergreen forests of the Klamath-Siskiyou, the severity of fire decreased presumably due to shading of dominant overstory trees of flammable shrubs. Thus, mature forests in this region should not be a priority for fuels reduction but rather the flammable tree plantations should be given first and foremost attention, as plantations are most likely to burn uncharacteristically severe (Odion et al. 2004). This particular study needs to be cited and factored into the appropriate fire “issues” of the RMP as BLM needs to prioritize fuel treatments to where they are needed most – the flammable tree plantations that it has helped to foster across large blocks of lands.

The BLM states that it will use “the results of monitoring and research to make changes or adjustments to achieve its vision” (RMP p. 4). We request that you consider a broader review of the ecosystem benefits from fire, even severe ones (Hutto 2008), the impacts of thinning to owls compared to fires and post-fire logging (see Clark et al. 2013), the low probability that treatments will intersect a fire during the period when fuels are reduced (see Rhodes and Baker 2008), and the likelihood that post-fire logging (Donato et al. 2006), thinning and variable retention harvests (DellaSala et al. 2013) will elevate fire hazards due to logging slash left untreated on site (references already provided throughout). In addition, BLM needs to give greater protection priority from salvage to the higher habitat quality originating from complex early seral forests produced by natural disturbances given post-fire logging nearly always is a detriment to successional processes (see DellaSala et al. 2006, Noss and Lindenmayer 2006, Swanson et al. 2011, DellaSala et al. 2013). This relevant information needs to be incorporated into the “issues” under each of the RMPs related to pre- and post-fire management. Moreover, BLM should consider in its transportation planning the need to seasonally or permanently close and obliterate roads to reduce the probability of human-caused fires as roads can be a cumulative source of ignitions. As it stands, the agency has over emphasized fuels reduction while placing minimal emphasis on human-related ignitions—i.e., the very high density of roads throughout the planning area.

**Aquatic Buffers Need to Follow the Aquatic Conservation Strategy of the Northwest Forest Plan**

*(the following is excerpted from a paper in review, of which DellaSala is a co-author)*
The Aquatic Conservation Strategy “default” widths of Riparian Reserves, within which the conservation of aquatic and riparian-dependent terrestrial resources receives primary emphasis, are two site-potential tree heights (ca. 328 feet for most of the region) on either side of fish-bearing streams and one tree height (ca. 164 ft) on non-fish bearing streams. Beyond this core area, Riparian Reserves must be drawn to protect additional areas susceptible to channel erosion and mass wasting by encompassing “the body of water, inner gorges, all riparian vegetation, 100-year floodplains, landslides and landslide-prone areas.” The size of the Riparian Reserves, especially along small headwater streams, was determined both by ecosystem process considerations (FEMAT 1993, Olson et al. 2007), and by population viability and habitat considerations that FEMAT complied for seven groups of salmonids and a large number of terrestrial species, including spotted owl, marbled murrelet, pine marten, red tree vole, a suite of amphibians, bats, goshawk, fisher and others.

BLM’s RMP alternatives have inappropriately proposed greatly reducing default Riparian Reserve widths, especially for smaller and headwater streams, primarily arguing that ACS defaults included “non-riparian vegetation” and that summer stream shade and large wood recruitment to fish-bearing streams could be mostly maintained with narrower buffers, allowing for commercial timber harvest in Riparian Reserves. As an example of a comparable failed attempt at shrinking buffers, the narrowed analysis and basis for the decision in BLM’s earlier WOPR were heavily criticized by the public and scientists, and in 2009 were withdrawn by BLM because they were deemed unlikely to survive when subject to consultations with ESA enforcement agencies (NMFS and USFWS). However, in 2013 the BLM released its “Analysis of the Management Situation” pursuant to a renewed attempt to revise its management plans, wherein the BLM explicitly argued again that “Riparian Reserve boundaries extend out beyond the water influence zone and are wider than necessary for water quality protection.” Thus, the prior failed WOPR attempt to shrink buffer widths is once again carried forward by this RMP process.

From the perspective of temperature protection, we have several misgivings about this rationale for shrinking Riparian Reserves. First, redundancy: current analyses rest on static view of riparian stand structure—that is, shade is modeled as a function of the existing standing trees only. The nearest tree to the stream margin is attributed as the contributor to shade, even though one or more trees standing behind it, slightly farther from the stream, may contribute shade as well. But we know that riparian forests are highly dynamic; particularly after adjacent stands are disturbed by logging, near-stream trees become increasingly prone to root throw, wind breakage, and bank or slope erosion. When trees fall or die in the so-called “inner zone,” then the “outer zone” trees become the replacement source of shade. Obviously, if the outer zone trees have been logged, that functional redundancy is lost and any riparian disturbance is likely to lead a relatively large ratcheting down of stream surface shade—and an increase in stream temperatures. Second, while we measure canopy shade with fixed-resolution instruments, little is known about how measurements of shade translate to actual solar penetration. “Redundant” tree canopies create a shade structure that is dense compared to that of a single tree, and this may
substantially affect the actual solar energy reaching the water surface in ways that we do not currently measure.

Third, thermal response is affected in numerous ways by near-surface groundwater, which affects both surface streamflow rate and the temperature of water at the point of delivery. After initial increases in base flow following logging, summer base flow can decline for many years as a consequence of rapidly re-growing second-growth vegetation and its evapotranspiration demand (Hicks et al. 1991); logging in the outer areas of Riparian Reserves can contribute to or conceivably magnify this effect. In some watersheds in the Pacific Northwest, stream temperature is more strongly associated with to catchment-wide logging than with streamside vegetation conditions (Pollock et al. 2009). Stream warming in such watersheds (often they contain areas of gently sloping or hilly terrain and numerous forested wetlands) appears to be influenced by reduced canopy shade over large areas of near-surface groundwater (but may also be influenced by changes in shallow groundwater flux rates and water table). Hence, stream temperatures become warmer (in spring, summer and fall) at their point of origin. Other research has established the importance of the hyporheic flow exchange in determining surface water thermal regime (Poole and Berman 2001, Baxter and Hauer 2001). The hyporheic zone may include extensive areas of shallow subsurface flow within montane alluvial valleys, in summer this subsurface pool may be dominated by spring snowmelt or cool rain runoff that cools surface streams when it discharges in midsummer (Poole and Berman 2001, Wondzell 2011). The spatial extent of hyporheic storage and exchange bears uncertain relationship to surface landforms, and to date land management agencies lack both the methods and incentive to accurately map these critically important areas, which arguably could or should be included in default ACS Riparian Reserves. Given this uncertainty, any management change that increases the extent of logging in such watersheds could contribute to undesired stream warming. Finally, winter and spring stream temperatures can be of comparable importance to summer temperatures in meeting the habitat needs of many species. In particular, winter temperatures of seasonably intermittent streams (even though they may not be fish-bearing in summer) can be important for salmon (Wigington et al. 2006) and other species, and are directly and indirectly influenced by riparian canopy shade and forest conditions.

Considering the full range of ecological factors and processes that affect stream temperature and contribute to the conservation of biologically optimal stream temperatures in natural streams, and further considering that temperature conservation is but one of many functional factors influenced by streamside forests, we cannot find scientific support for the reduction of Riparian Reserve default widths smaller than those specified in the current ACS for any stream type. In some watersheds, larger areas of forest protection are warranted prevent warming of shallow groundwater that is increasingly important for climate change considerations.

Importantly, by virtue of their high density across the landscape, headwater streams with seasonal flow receive a large portion of the nutrients mobilized by up-slope disturbance (Gomi et al. 2002, Freeman et al. 2007); therefore full protection of wide Riparian Reserves along even the smallest stream channels (and surface-connected wetlands) is necessary for effective retention.
Channel network expansion from gully erosion (Reid et al. 2010) or roads (Wemple and Jones 2002) and channel simplification through loss of woody debris or sediment increases may also reduce retention efficiency of headwater systems. Moreover, thinning or other disturbance of vegetation or soils within the Riparian Reserve could short-circuit the benefit of riparian forest buffers, by creating a near-stream source of nutrients to soil water and runoff that is not exposed to retention capacity of the full-width riparian zone.

More research is certainly needed in the Pacific Northwest on nutrient retention, but existing science suggests that continuous, no-cut Riparian Reserves exceeding 100-150 ft or more along all streams and wetlands may be needed to mitigate the effects of up-slope logging on nutrient loading to freshwater systems. Moreover, cessation of livestock grazing in Riparian Reserves and road network reduction and reconfiguration of remaining roads reduce their hydrologic connectivity to surface waters are also likely necessary to reduce downstream nutrient loading. We also recommend that the agencies rectify past oversight, and include analysis of the effects of management actions on nutrient loading to streams, wetlands, and downstream receiving waters in all Environmental Assessments, Environmental Impact Statements, Watershed Analyses, and Endangered Species Act Consultations for Aquatic Species.

As discussed above, the agency presents findings on stream hydrology and shading in relation to its proposed reduced stream buffers to accommodate more timber extraction. However, it does not consider any alternative to increase buffers in lieu of more intense storms likely to take place in the region due to climate change. More rain on snow events and flooding is anticipated and this is especially critical given the planning area is in a transition zone (Dalton et al. 2013). Thus, the increased likelihood of storms should provide justification for wider buffers in order to meet the intent of resilience and climate-ready riparian areas.

**Climate Resilience Approaches Need to Include Anthropogenic Stressors**

BLM’s RMP criteria appropriately include managing for forest resilience. This is a noteworthy improvement in RMPs writ-large; however, we doubt that it will achieve the goal of resilience in lieu of the numerous ongoing and cumulative stressors to ecosystems from livestock grazing, mining, roads, logging, and fire suppression activities that will continue. A common and scientifically supported approach to resilient ecosystems in the face of climate change is to reduce the stressors on those ecosystems coming from human activities. However, BLM seems to think that it can continue these activities, and actually increase some of them like timber management, and still abide by scientifically sound principles of resilience. However, increased timber management and the aforementioned stressors are likely to act synergistically and cumulatively to reduce resilient properties of ecosystems, limiting their ability to adapt to climate change. If BLM is aware of science that supports these actions as compatible with resilience and not as conflicting stressors, then it needs to present a more cogent case using the ecological literature and empirical evidence to back its claims.
As an example of a pervasive, and under-emphasized stressor, Beschta et al. (2013) conducted a meta-analysis of livestock grazing on public lands concluding that it was the dominant stressor acting in synergy and cumulatively with climate change. Yet, BLM fails to even take notice of this relevant ecological literature, instead it continues grazing as if this were consistent with ecosystem resilience. Thus, we request that you include a more comprehensive analysis of the pervasive stressor of livestock grazing and how it acts cumulatively with other stressors (invasives, roads, soil compaction, carbon losses, altered fire regimes, etc) in exacerbating climate change and reducing adaptive capacity of native ecosystems and species.

**Carbon Storage Analysis and Planning Needs to Link to Best Science and Related Federal Policies**

The BLM has made progress in addressing carbon management in the RMP. However, it falls short on meeting best science related to carbon stores and fluxes. There are several relevant simulations that compare carbon fluxes from fire, thinning, and no harvest scenarios (Law et al. 2001, Hudiburg et al. 2009, Meigs et. al. 2009, Campbell et al. 2011, Mitchell et al. 2009, 2012). Notably, each of the active management scenarios has a larger carbon footprint than even severe fires and BLM should include these results and analyses in its efforts to analyze carbon costs of the proposed alternatives, particularly with increased logging being proposed.

We also call attention to a new analysis in review by Dr. Olga Krankina (Appendix 1) that documents substantial carbon stores on BLM lands in the planning area. We request that you include this new analysis to demonstrate the need to protect these carbon stores (generally associated with mature forests) from timber management that would otherwise increase carbon fluxes to the atmosphere. In particular, BLM forest management practices, because they will log large older trees having high carbon stores, have the potential to switch forests from a known sink (Krankina et al. 2012) to source of emissions, which is inconsistent President Obama’s June 2013 Climate Action Plan.

On a technical note, it is unclear why BLM would set its carbon stores estimate at the fixed level of 0.039 MgC per 100 ft2 (RMP p. 36). BLM should instead used more relevant published or site-specific sources such as those derived from FIA plots (see Appendix 1). This is because forests differ greatly in carbon stores depending on site potential and no single value is appropriate.

As noted, BLM also needs to abide by President Obama’s climate change executive order (November 2013) and related June 2013 Climate Action Plan. That plan emphasizes forests for their carbon stores and sequestration potentials. It is unclear how this will occur if BLM continues to harvest in high biomass forests. Carbon losses from this type of harvest cannot simply be traded for increased sequestration in young forests or carbon stored in wood products as the science shows those losses are not compensatory (Harmon et al. 1990).

**CONCLUSIONS**
We are disappointed in BLM’s adherence to its interpretation of a timber dominance paradigm but also understand the pressure the agency is under as it juggles conflicting lawsuits, ESA obligations, forest carbon policies, and the public interest in stewarding some of Oregon’s most important legacy forests. Our comments are meant to show where there is a need to improve the science, particularly as it relates to: (1) fire assumptions that are outdated and biased; (2) foregone conclusions that fire is a threat to owls and thinning a solution without supporting evidence; (3) under-emphasis on stressors (grazing, roads, ORVs, logging, post-fire logging) as a cumulative impact that will impede resilience; (4) lack of coordination with President Obama’s Climate Action Plan and executive order; and (5) lack of reference to new analyses and studies on forest carbon (Krankina et al. 2012, in review), historical and current fire regimes (Odion et al. 2014) and risks from flammable plantations (Odion et al. 2004), chronic grazing impacts (Beschta et al. 2013), inadequate stream buffers, and inadequate planning for climate change (Dalton et al. 2013) by a failure to reduce human-caused stressors.

By submission of our comments, we request that you consider this relevant information in the Draft Environmental Impact Statement expected this year and that you maximize protection of all remaining older forests (>80 years as recommended by FEMAT 1993) in the preferred alternative. Thus, we request that you modify the alternatives to include the following: (1) protect all remaining older forests originally recognized by FEMAT (1993) as late-seral forests (>80 yrs); (2) prohibits post-fire salvage logging as antithetical to resilience and listed species recovery needs; (3) reduces stressors such as mining, logging, roads, grazing, forest fragmentation, and ORVs to comply with resilience objectives; (4) comply with the Aquatic Conservation Strategy and reserve network (LSRs, Riparian Reserves) of the Northwest Forest Plan; and (5) tier all alternatives to the President’s emphasis on protecting forest carbon stores and reducing carbon losses from management.

Sincerely,

Dominick A. DellaSala, Ph.D.
Chief Scientist

**Literature Cited**


Krankina, O., D.A. DellaSala, J. Leonard, and M. Yatskov. In review. High-biomass forests of the Pacific Nortwhest: who manages them and how much is protected?


Odion, D.C., C.T. Hanson, D.A. DellaSala, W.L. Baker, and M.L. Bond. In review. Effects of fire and commercial thinning on future habitat of the northern spotted owl.


Appendix 1 – Excerpts from Krankina et al. in review – high-biomass forests: where are they and who manages them?

Abstract

To examine ownership and protection status of forests with high biomass stores (>200 Mg/ha) in the Pacific Northwest (PNW) region of the United States we used the latest versions of publicly available datasets. Overlay, aggregation, and GIS-based computation of forest area in broad biomass classes in the PNW showed that Forest Service lands contained the largest area of high-biomass forests (48.4% of regional total), but the area of high-biomass forest on private lands was important as well (22.8%). Between 2000-08 the loss of high-biomass forests to fire on Forest Service lands was 7.6% (236 thousand ha) while the loss of high-biomass forest to logging on private lands (364 thousand ha) exceeded the losses to fire across all ownerships. Many remaining high-biomass forest stands are vulnerable to future harvest as only 20% are strictly protected from logging while 26% are not protected at all. The level of protection for high-biomass forests varies by state, for example, 31% of all high-biomass federal forests in Washington are in high protection status compared to only 9% in Oregon. Across the conterminous US, high-biomass forest covers <3% of all forest land and the PNW region holds 56.8% of this area or 5.87 million ha. Forests with high biomass stores are important to document they are scarce, often threatened by harvest and development, and their disturbance including timber harvest results in net C losses to the atmosphere that will take a new generation of trees many decades or centuries to offset.

Table 1. Area estimates by ownership class for Forest Service Region 6 (Oregon and Washington combined; thousand ha).

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<th>Ownership class</th>
<th>Total land area</th>
<th>Total forest area</th>
<th>Forest area disturbed from 2000-2008</th>
<th>Forest area in biomass classesa</th>
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Appendix 2 – Effects of fire and commercial thinning on future habitat of the northern spotted owl (Odion et al. in review)

ABSTRACT

The Northern Spotted Owl (Strix occidentalis caurina) is an emblematic, threatened raptor associated with dense, late-successional forests in the Pacific Northwest, USA. Concerns over high-severity fire and reduced timber harvesting have led to programs to commercially thin forests, and this may occur within habitat designated as “critical” for spotted owls. However, thinning is only allowed under the U.S. Government spotted owl guidelines if the long-term benefits clearly outweigh adverse impacts. This possibility remains uncertain. Adverse impacts from commercial thinning may be caused by removal of key habitat elements and creation of forests that are more open than those likely to be occupied by spotted owls. Benefits of thinning may accrue through reduction in high-severity fire, yet whether the fire-reduction benefits accrue faster than the adverse impacts of reduced late-successional habitat from thinning remains an untested hypothesis. We found that rotations of severe fire in spotted owl habitat since 1996, the earliest date we could use, were 362 and 913 years for the two regions of interest: the Klamath and dry Cascades. We calculated the future amount of spotted owl habitat that may be maintained with these rates of high-severity fire and ongoing forest regrowth rates with and without commercial thinning. Over 40 years, habitat loss would be far greater than with no thinning because, under a “best case” scenario, thinning reduced 3.4 and 6.0 times more dense, late-successional forest than it prevented from burning in high-severity fire in the Klamath and dry Cascades, respectively. Even if rates of fire increase substantially, the requirement that the long-term benefits of commercial thinning clearly outweigh adverse impacts is not attainable with commercial thinning in spotted owl habitat. It is also becoming increasingly recognized that exclusion of high-severity fire may not benefit spotted owls in areas where owls evolved with reoccurring fires in the landscape.

Figure 3a-c. Amounts of the four forest types (early-, mid-, late-successional, and thinned) in the landscape over a 40-year period based on the states shown in (Fig. 1) and transition rates (Table 2) for the Klamath province, California, and Oregon, and the following scenarios: A) no treatment; B) one-time treatment of 21% of late-successional forests (>27.5 m²/ha live-tree basal area) and 42% of mid-successional forests (= total of 22% of landscape treated) followed by recovery in 20 years to late-successional forest; C) treatment of 21% of late-successional forests
(>27.5 m²/ha live-tree basal area) and 42% of mid-successional (= total of 22% of landscape treated) forests with future maintenance. We converted proportions of forest types from modeling output to km² using the area estimate from FIA for the Klamath study region.

Figure 3
March 26, 2014

Emailed to: blm_or_rmgs_westernoregon@blm.org

Bureau of Land Management Resource Management Plan Western Oregon

Subject: Public Comment on Western Oregon Resource Mgmt. Plan (RMP) - Recreation Planning Criteria

I have spent every summer with my grandparents on the Left Fork of Foots Creek Road. They live in the heart of the Johns Peak/Timber Mountain area. I looked forward to my Summer vacations, as it was a chance to unwind from the city life of Las Vegas, Nevada. I now send my son to my mothers home on Foots Creek to spend time, and for him to enjoy and experience what I was able to.

I am vehemently opposed to OHV users in this area. I sincerely request that BLM take the Johns Peak/Timber Mountain Area off the OHV list and preserve the wilderness as it is and as it was meant to be.

Please don’t ruin the tranquility that thousands of residents on Foots Creek alone enjoy for one special interest group to destroy. I have seen the destruction that wildfires cause, having been through more than a few of them in the Johns Peak/Timber Mountain proposed OHV area. Who is going to be there to check for spark arrestors on all the OHV’s, and most importantly, who is going to to take responsibility for the loss of property and possible lives when the inevitable forest fire starts.

I am very worried about the increase of traffic on the local roads. The Left Fork of Foots Creek Road is an extremely narrow, graveled road, that in the summer months is dusty to the point of zero visibility when one vehicle drives down the road. Increased traffic will only increase the risk of accidents and injury as well as increase the air pollution and dust.

OHV users drive recklessly on the roads, speeding to the BLM posted designated OHV area. This only endangers the children, families and pets that live there.

I not only urge but strongly request that BLM remove the 1995 RMP OHV Designation from the Johns Peak/Timber Mountain area in Southern Oregon as it has violated 43 CFR 8342.2a "Public Participation". It appears the OHV user group has all the inside information, where the residents in the area, that will be severely impacted, are left in the dark.

Regards,

James R. Mahood
United States Air Force
224 Lincoln Drive
Great Falls, MT 59405
702-499-2140
Dear BLM,

The following are my comments regarding the Planning Criteria and draft alternatives recently released for the Resource Management Plan revision for Western Oregon Bureau of Land Management (BLM). The western Oregon BLM lands provide important habitat for wildlife, provide clean water and recreation opportunities along with resource extractions. Any BLM plan should protect our native forests, maintain functional riparian buffers, and enhance the biodiversity wildlife of our State. The Northwest Forest Plan (NFP) should be maintain and improved.

*Riparian Buffers. Riparian buffers need to follow NFP guidelines. The alternatives need to address not just the fisheries protection. These buffers provide for terrestrial protection for wildlife. Also these buffers provide wildlife corridor. Also the tree roots provide land stability against erosion, mudslides etc. Larger buffers protect against invasive weeds and disease traveling down stream.

*Mineral extraction. Advocate mineral redraw in all ACEC and in the botanical rich Illinois Valley.

*Off Highway Vehicles(OHV). As a long time resident (40 years) of Josephine County I have seen OHV use increase to the point that OHV will go off trail or road if there is a way. There is resource damage with erosions from ruts, with vegetation removal, with dumping and trash, damage to rare plants, and invasive weeds. Barriers are removed or gone around. There is no BLM enforcement or signage. There is no public education from the BLM so the OHV treat BLM lands as their playground. The BLM lands should be considered Closed to OHV unless signage states that the areas is Open or Limited. This would prevent signs being removed by OHV users. This OHV culture is driven by companies that profit from the OHV sales. Private lands would not freely sacrifice their land to this abuse thus the BLM should not feel require to do so either. Keep OHV on existing roads and designated trails. The criteria talks about recreational use in terms of OHV but where in the alternatives will it address the walking recreational trails needed. In the alternatives should show the cost of maintaining open lands for OHV. OHV use in the alternatives should show the cost of fixing resource damages, educating the public, signage, eradicating invasive plants and animals, cleaning up trash, enforcement, and cost from losing a diverse ecological system. BLM should not let our public forestland become a playground for thrill seekers. If there is a demand for this active then let the private industry use their land for this destructive sport. Why does some users have to wash their cars and feet before entering public lands while other user do not?

*Invasive wildlife. Need an alternative that is proactive with invasive species. "They displace native species and lower biodiversity, decrease forage and agricultural production, alter soil nutrients and water cycling....."(New Invaders of the Northwest). Every management program effects the rate invasive species introduction on BLM lands.
*Sudden Oak Disease. In the criteria you state that "Sudden oak death spread is via natural conditions (movement in moist air) and not from events based on human-assisted transport..." I have found in information from UC Davis and the state of Oregon that human activity can spread sudden oak syndrome. The following is from a 2013 Oregon pamphlet EC 1608: "People can spread Phytophthora ramorum across long distances by moving infected plants either purchased at a nursery or collected in the wild, or by moving infected wood, leaves, stems, or soil." The RMP needs to have the consequence of resources uses and remedies that prevents or slows the continual spread of this disease.

*Forest. Which lands do the BLM want to convert from hardwood to softwood. Just as serial forest are important to wildlife and soil health so are hardwood and brush lands important. If BLM plans to convert O&C lands to timberland than what are the consequences of this monoculture on wildlife, soil and fires. The dry forest vs. wet forest is a new concept that has not been tested in the multitude of ecological niches. There are dry forest that get 100" of rain a year! O&C Act is up for interpretation and in the past multiple use has been applied. BLM did not have a timber program on these lands until 1962, thirty years after the act was establish. Historical it shows that no cutting was an option for almost 30 years. Sustain yielded in the O&C Act is open for interpretation by BLM and by the public.

*Visual Management. Visual management is very important for the economy of Oregon. What are the economic consequence in valuing timber over retention of our scenic landscape? Have the BLM plans include cell tower sites?

*Wild and Scenic Rivers. All rivers or creeks eligible for wild and scenic should be evaluated in this plan, especially Rough and Ready Creek.

*ACEC. When analyzing the potential Waldo-Takilma ACEC, please keep in mind that this area is composed of PD lands only and that there are multiple confirmed fisher, red tree vole and northern spotted owl detections in this area. The ACEC potential in the Illinois Valley is high because its diversity of landscape. Alternatives should address the economical and cultural loss of degrading unique landscape.

*Culture: BLM needs to map and discuss the value of restoring or at least not destroying historical trails.

*Recreation: Road closed by gates to protect resources does still allow for foot and other means of travel.

*Grazing. All alternatives should evaluate the impact of grazing on native plants and animals and on water quality.

*Fire: There are studies on the Klamath Province that show that opening up the canopy can result in drying out the forest and increasing speed of fire in a forest. I have seen forest thinned for fuel reduction resulting in all the pines dying in the stand. Please include up to date studies in your plan. I believe that the present larger fires are due to how fires are fought and the lack of initial attack resources. Also prescribe fires can be use on the landscape to reduce fuel loads.

*Large Woody Debris: Does any of the alternative address the importance of large woody debris?

"On federal lands, the reduction in harvest volumes beginning in the 1980s reduced the availability of early serial habitats typically preferred by black-tailed deer on a significant portion of their range in western Oregon" This statement is not correct. There was a recession in the early 80's which created a slump in the timber harvest but by the mid 80's harvesting levels increase to high levels of cutting.(http://www.oregon.gov/odf/state_forests/frp/docs/oregonstimmerharvests.pdf)
Oregon's BLM lands are the refuge for wildlife, source of clean water and a place to escape our technical world. Private timberlands which are cut down to the raw earth and then herbicide to rid the land of any other plant species are not longer forest but agricultural timber land. As I review this plan I go to Google earth and from space see the BLM forest land squares in Oregon. These squares are surrounded by cut over monoculture private timberlands. Our federal forest represent the only refuge for native plant and animal species of our state.

Please consider my comments

Christie Dunn
Please consider the following requests as you develop a DEIS for the Western OR RMPs:

1. Please analyze and develop an alternative that examines all the ACECs (existing, potential and proposed) in the Illinois Valley and include protections that recommend mineral withdrawal, off road ORV use prohibited and no programmed timber harvest (only restoration timber prescriptions).

I read on pg. 8 (The O&C Act & FLPMA; WORRMP-PC) that ACECs will be subject to the O&C Act. I would like to suggest, in the analysis and formulation of alternatives, a more liberal interpretation of the O&C Act. The document states:

"Based on the language of the O&C Act, the O&C Act’s legislative history, and case law, it is clear that sustained-yield timber production is the primary or dominant use of the O&C lands in western Oregon. In managing the O&C lands for that primary or dominant use, the BLM must exercise its discretion to determine how to manage the forest to provide for sustained-yield timber production, including harvest methods, rotation length, silvicultural regimes under which these forests would be managed, or minimum level of harvest. In addition, the BLM must conduct this management “for the purpose of providing a permanent source of timber supply, protecting watersheds, regulating stream flow, and contributing to the economic stability of local communities and industries, and providing recreational facilities.” Finally, when implementing the O&C Act, BLM must do so in full compliance with a number of subsequent laws that direct how the BLM accomplishes the statutory direction."

I may be mistaken, but it appears that the document (WORRMP-PC) then gives direction that indicates that every single acre of O&C land that is suitable for commercial production of timber must be "on the timber base" and "contribute to the sustained yield". If BLM is making this argument, my opinion is that this is a "reach". It is my opinion that the BLM should analyze issues and formulate alternatives without requiring that every acre of BLM land contribute to an "ASQ" or that every acre be subjected to commercial timber harvest. Past interpretation of the O&C Act has allowed BLM to take this route re: ACECs and I don't know any case law that forbids some O&C acreage to be "out of the timber base."

2. When analyzing the potential Waldo-Takilma ACEC, please keep in mind that this area is composed of PD lands only and that there are multiple confirmed fisher, red tree vole and northern spotted owl detections in this area. Please examine the "Remarkable and Important Values" of this area. It is my contention that the "Remarkable and Important Values" for the Waldo-Takilma ACEC include botanical and ecological values. These "R&I" Values are not just for rare and listed plants on the ultramafic soils but are for a scientifically and "remarkable and important" interplay between the land patches of ultramafic soils (and their plants and plant communities) and the land patches of "closed canopy" forests (including late successional forests). This very diverse landscape (along with the discreet parts of it) deserves recognition and conservation due to its "remarkable and important value".
3. Please analyze and develop at least one alternative that contains an "Illinois Valley Salmon and Botanical Special Interest Area". As the title indicates, such an area would 1) recognize the very special and unique botanical resource of the Illinois Valley and its BLM lands and 2) recognize the significant fisheries contribution (particularly for chinook and ESA listed coho salmon) of the Illinois Valley.

In recognition of the IV's exceptional botanical values, the Medford District RMP (1984) allocated much of the IV's BLM lands to the Illinois Valley Special Use Botanical Area. The 1984 IV Botanical Area had very weak management directive. Please include in the current RMP an IV Botanical Area with provisions similar to the 1984 Cascade/Siskiyou Ecological Emphasis Area provisions (please refer to Oct., 1994 Final RMP/EIS - Chapter 2-35). Such provisions would protect the outstanding botany and preserve the unique interplay of the various plant communities and allow natural process to operate.

a. Botanical Wonderland - The valley, particularly on its ultramafic soils and on oak-pine woodlands and chaparral dominated landscapes, is know for spectacular wildflower displays, endemic plant species, listed plant species (including ESA listed species), and varied and unusual plant communities. The biological diversity of the general landscape is very high. The interplay of varied plant communities is of great biological and scientific interest. The small patch size of distinct vegetation types (due to fire history, aspect, and, especially, geologic diversity) contributes to the biological and scientific values. This includes the interplay of "open" ultramafic landscapes and patches of "closed-canopy forest" (As mentioned in point 2).

b. Wild Salmonid Stronghold - The Illinois Basin is a stronghold for ESA listed "transboundary" population coho salmon and is also an important basin for "lower Rogue-Illinois River" stock of fall chinook salmon.

The best spawning and rearing habitats for these two stocks are in the "alluviated" Illinois Valley. Coho utilize the smaller, low-gradient streams while the Chinook more often utilize the mainstem and larger forks and tribs. Much of these river and stream reaches are on private ownership where habitat impacts are to be expected. This is why it is important for BLM to identify and protect the salmon habitat on public lands. ACEC and RNA allocations can help and the Aquatic Conservation Strategy also is an important part of BLM salmon conservation. But BLM should consider an additional allocation that will protect fisheries spawning and rearing habitat.

4. Socio-economics - Economy and Quality of Life - When analyzing the economic impacts of alternatives, please try to quantify and give fair value to the economy that depends on the natural environment of the Illinois Valley and remember that the BLM parcels on and adjacent to the valley floor are a very important and a critical contributor to what many of us consider a very high quality of life.

The economy of the Illinois Valley depends on small, "footloose business"; retiree population, and public sector employment. The individuals and businesses that comprise this economy are often able to locate in many places. The Illinois Valley is a home for many because of qualities that include scenery, "piece and quiet", recreational opportunities (trails for hiking, dog walking, etc.), wildflower & wildlife viewing, and open space. The economic benefits associated with the amenity values are not necessarily compatible with industrial style logging in the suburban interface. While logging jobs are relatively easy to calculate, the amenity related jobs are more difficult. Yet they may account for appreciably more employment and economic stimulus.

5. Off Road Vehicle Recreation - Please analyze and incorporate into alternatives ORV regulations that ban ORVs from going "off road" & "off trail". Please analyze monetarily and in environmental impacts,
the cost of ORV use in alternatives and the savings when the machines are keep from driving "off road". The world class botanical values on BLM lands are at risk from off-road abuse.

I do not believe there is an imperative or obligation for BLM to provide off road users a land base to tear up the ground. I do not believe that the problems associated with off road vehicle use will be lessened by BLM allocating (at great expense) an Off-road sacrifice area. It's more likely such an area will spawn more trespass and more habitat degradation. As a valley resident for the last 43 1/2 years, I know that the current ORV phenomena is a relatively new (but growing) one that is NOT a part of the "traditional culture" of this valley.

Please designate the Illinois Valley BLM lands as "Closed to Motorized Use". I assume this is only "closed" for off-road use and road systems will still be accessible to public vehicle use (unless physically closed with a barrier or gated).

6. Please analyze the Port Orford Cedar Root Disease issue - Data should be current with maps of the infected and infection-free POC stands. Infection is a dynamic condition and PO Cedar is an essential ingredient to our aquatic habitats especially.

I am including below the scoping comments I submitted on 7/2/2012 so that the issues can be incorporated into this phase of planning when appropriate.

Thank you for the opportunity to comment.

Romain Cooper

Scoping from Romain Cooper on the Western OR RMP - July 2, 2012:

7/2/2012
To: Bureau of Land Management <BLM_OR_RMPs_WesternOregon@blm.gov>
Re: Scoping for Western Oregon Resource Management Plans

Dear BLM,

Please consider the following scoping comments:

- The Illinois Valley (IV) has an incredibly diverse and interesting botanical resource. Ultramafic communities, oak woodland communities and closed canopy mixed evergreen forests (both xeric and mesic) are co-mingled in small patches to create an outstanding botanical landscape. The IV has high plant species diversity and a concentration of endemic and "listed" species. Much of the Illinois River "interior valley" (and adjacent near-valley slopes) is in private ownership. However, BLM ownership (both O&C and PD) is co-mingled with the private ownership. In recognition of the IV's exceptional botanical values, the Medford District RMP (1984) allocated much of the IV's BLM lands to the Illinois Valley Special Use Botanical Area. The 1984 IV Botanical Area had very weak management directive. Please include in the current RMP an IV Botanical Area with provisions similar to the 1984 Cascade/Siskiyou Ecological Emphasis Area provisions (please refer to Oct., 1994 Final RMP/EIS - Chapter 2-35). Such provisions would protect the outstanding botany and preserve the unique interplay of the various plant communities and allow natural process to operate.
• BLM utilizes ACECs and RNAs as land allocations to protect BLM situated landscapes and ecosystems that have remarkable ("relevant & important") values. In the WOPR ROD, several "potential" ACECs and RNAs, were officially allocated.
  o This new analysis should include & analyze all of the potential ACECs & RNAs that were contained in the WOPR. All the nominations are "on file" with the BLM.
  o This new analysis should consider additional protections (from those suggested in and/or afforded by the WOPR). This is for the potential and existing ACECs/ RNAs. Especially important in Southwest OR are provisions that recommend withdrawal from mineral entry. (Due to the language in the 1892 Mining Act, it is virtually impossible to protect natural values from mining.)
  o This new analysis should consider additional areas for ACEC and/or RNA allocation. Citizen nominations should be included but also nominations should come from within BLM.

• Specific to the Illinois Basin, all ACECs and RNAs should be considered for mineral withdrawal. The relevant and important values of all existing and "potential" (nominated) ACECs and RNAs can NOT be protected from mining activities.

• The Waldo-Takilma ACEC (WT ACEC) was "finalized" in the WOPR ROD. However, since the decision is now "pulled", the WT ACEC is (I presume) now back in "potential" category. Please include analysis of this remarkable landscape in the new analysis. BLM has the nomination and its own WOPR internal documents on file. If more information is needed or desired, please contact me.

• Though the above scoping issues relate mainly to botanical resources, Wildlife and Fish resources are often of great importance and these values can be furthered through an ACEC / RNA system and, in the IV, an ACEC/ RNA system that is "backed up" by an IV Special Interest Botanical Area".

• The Illinois River contains regionally important salmon stocks. The valley is a stronghold for the ESA listed Transboundary Coho stock. Additionally, the Illinois River Fall Chinook stock is important but precarious. The best spawning and rearing habitats for these two stocks are in the "alluviated" Illinois Valley. Coho utilize the smaller, low-gradient streams while the Chinook more often utilize the mainstem and larger forks and tribs. Much of these river and stream reaches are on private ownership where habitat impacts are to be expected. This is why it is important for BLM to identify and protect the salmon habitat. ACEC and RNA allocations can help and the Aquatic Conservation Strategy also is an important part of BLM salmon conservation. But BLM should consider an additional allocation that will protect fisheries spawning and rearing habitat.

• Regarding the larger Western Oregon area, the Aquatic Conservation strategy should be "codified" in the new plan. Additionally, BLM should identify and protect fish habitat and, especially, anadromous fish habitat. A "new" allocation to protect aquatic resources should be considered.

Please keep me informed throughout this planning exercise.

Thank you very much for considering my input.

Romain Cooper - 10398 Takilma Road - Cave Junction, OR 97523  541-592-2311  <romain@frontiernet.net>
31 March 2014

TO: blm_or_rmps_westernoregon@blm.gov

Subject: BLM Planning Criteria - Comments

Dear BLM:

Please accept the following comments from Oregon Wild concerning the proposed BLM Planning Criteria for the revision of the Western Oregon RMPs. Oregon Wild represents over 10,000 members and supporters who share our mission to protect and restore Oregon’s wildlands, wildlife, and water as an enduring legacy. Our goal is to protect areas that remain intact while striving to restore areas that have been degraded. This can be accomplished by moving over-represented ecosystem elements (such as logged and roaded areas) toward characteristics that are currently under-represented (such as roadless areas and complex old forest).

Our recommendations for planning criteria can be summarized as follows:

- The planning criteria need to recognize the need to protect our public forests to provide public values: clean water, store carbon, conserve fish & wildlife, recover endangered species, provide recreation, and maintain quality of life that is a cornerstone of Oregon’s economic future;
- The planning criteria need to recognize the essential role of BLM lands in the Northwest Forest Plan (NWFP) - protecting valuable low-elevation habitats and connecting habitat areas in the Cascades, Coast Range, and Klamath Mountains;
- The planning criteria need to consider a broader range of alternatives that enhance the conservation elements of the NWFP;
  - The planning criteria need to recognize the need to protect all mature & old-growth forests; this is necessary in order to meet all the purposes of the NWFP and address new information such as the need to store carbon and reduce global warming, and increase the likelihood that barred owls can co-exist with spotted owls;
- The planning criteria need to recognize the need to maintain wide stream buffers to meet the needs of both aquatic and terrestrial organisms;
• The planning criteria need to recognize the fact that clearcutting and “regen” harvest is inconsistent with social values and inconsistent with the scientific evidence on the ecological needs of our forests. Clearcutting or "regen" harvest will increase fire hazard; pollute streams, increase carbon pollution, remove important habitat and jeopardize threatened & endangered species, spread weeds, cause landslides; and degrade quality of life;
• The planning criteria need to strengthen and improve the conservation approach of the Northwest Forest Plan, which was the bare minimum level of protection allowed by law;
• The planning criteria need to recognize all the ways in which the conservation approach of the Northwest Forest Plan represents a good first step toward a plan for preparing forests for climate change. Efforts to reduce reserves and increase logging will degrade the value of forests for habitat connectivity and the ability of watersheds to buffer increasing storms;

Ecological Importance of BLM lands

The planning criteria need to fully account for the evidence in publications and reports up to and including the Northwest Forest Plan show the ecological importance of western Oregon BLM lands. The ISC Report said —

[T]he checkerboard land ownership pattern of BLM lands within the range of the owl increases the risk for long-term owl viability in these areas. BLM lands are, nevertheless, extremely important for connectivity between populations of owls in the Cascade, Klamath, and Coast Range provinces in Oregon...¹

The SAT Report said —

[T]he Oregon Coast Range Physiographic Province has been identified as an area of concern, where the density of northern spotted owls is one-eighth of that recorded in other coastal areas. Habitat conditions on lands administered by the Bureau of Land Management within the Oregon Coast Range Province are critical for maintaining a well-distributed, connected network of nesting, roosting, and foraging habitat.²

The 1992 designation of critical habitat for the spotted owl said —

The majority of owls and owl habitat (about 85 percent) are currently found on Federal lands. These lands are particularly important in the State of Oregon because very little owl habitat remains on non-Federal lands in that state. The Oregon and California lands, managed by the Bureau are more crucial to owl conservation than many other lands.³

Maintain Stream Protection

¹ 1990 Interagency Scientific Committee (ISC) Report, p 382.
² 1993 Scientific Analysis Team (SAT) Report, Ch 2, p 69.
BLM’s preferred alternative needs to maintain current protection for water and streams as prescribed in the Aquatic Conservation Strategy of the Northwest Forest Plan. The NWFP adopted wide buffers to meet several compelling objectives that remain important today:

- To “buffer the buffer” and maintain near-natural microclimate and levels of wood input not just in the stream but an area extending some distance from the stream where a variety of non-aquatic species find refuge;
- Spotted owls and marbled murrelets both depend disproportionately on the lower third of slopes;
- Large buffers help mitigate for past practices (e.g., logging, roads, mining, grazing) which continue to have significant adverse effects on streams;
- Wider buffer help limit the area available for logging and reduce adverse cumulative effects of widespread logging within watersheds;
- Wider buffers give salmon and trout more than a minimum chance of recovery;
- Wider buffers help prepare watersheds for climate change which is expected to amplify the hydrologic cycle;

All but the last of these purposes is explicit in the administrative record supporting the Northwest Forest Plan. BLM cannot go from the NWFP to a new system of aquatic conservation without explaining the basis for the change. This requires directly confronting the original purposes of the large buffers and explaining why they are no longer needed.

BLM’s rationale for reducing stream buffers is extremely weak. There is no new information to justify the reduction of stream buffers adopted in the NWFP. BLM should avoid making the same mistakes as the deeply flawed report by Reeves et al. See Heiken, D. 2013. Riparian Reserves Provide Both Aquatic & Terrestrial Benefits - A Critical Review of Reeves, Pickard & Johnson (2013).
[https://dl.dropboxusercontent.com/u/47741/Heiken%202013.%20Review%20of%20Reeves%20et%20al%20Riparian%20Proposal.pdf](https://dl.dropboxusercontent.com/u/47741/Heiken%202013.%20Review%20of%20Reeves%20et%20al%20Riparian%20Proposal.pdf) This report addresses only a small subset of the many reasons that wide stream buffers were adopted. The report makes no effort to address the abundant evidence that continues to support large stream buffers.

The Planning Criteria address wood recruitment in riparian reserves under “fisheries.” This places an unduly narrow focus on the analysis. Wood plays many important roles, not just within the stream, but also in stream-side forests. The planning criteria need to consider the important of dead wood for amphibians, mollusks, fungi, spotted owls, fishers, all of which disproportionately rely on dead wood in areas near streams.

The planning criteria (p 50) cite some evidence that streamside forests are more dense than they used to be:

- Poage and Tappenier (2002) estimated that riparian stands developed under naturally low densities with little self-thinning – ranging from 40 to 60 trees per acre.
• Therefore, most existing stand densities in previously harvested (second growth) riparian stands are believed to be artificially high (150-300 trees per acre).
• Current stand densities in these areas can be three to four times higher than those likely found there prior to harvest, when the previous stands were of a similar age. This suggests that the available source of small functional wood is currently much higher than what existed in these areas naturally.

BLM needs to account for several things. BLM needs to look at the full range of sources to understand the typical density of forests near streams. The stands studied by Poage and Tappenier are not representative of all BLM forests. Their study sites were along the eastern foothills of the coast range where fire probably crept in from the valleys. Also, the fire history of these stands may not have been natural but cultural, so the low stand density may have been an artifact of cultural fire. These naturally low density stands also presumably put more site resource into fewer stems, so BLM needs to account for the fact that we may have relatively similar amounts of wood, just distributed differently. If BLM reduces the number of trees in order to match the historic number of stems, BLM will be exporting wood and creating a mis-match in terms of the total volume of wood in the in streamside zone that can recruit to streams and streamside forests. It may be ecologically more desirable to maintain the amount of wood than the number of stems. Fish value wood, several small pieces can function similar to one large piece. BLM should look at “wood density” instead of “stem density.” The number of stems will eventually sort itself out though natural processes such as competitive mortality and natural disturbance.

Rosenfeld & Huato (2003) found that large wood formed pools more reliably than small wood. Wood >24” dbh formed pools 42% of the time, while wood 6-12” dbh formed pools 6% of the time. However, from this one can conclude that the cumulative influence of several pieces of small wood can approach the pool-forming function of large wood. For instance, seven pieces of small wood are just as likely to form a channel-spanning pool as a large piece of wood. Rosenfeld, J. S., and Huato, L. 2003. Relationship between LWD characteristics and pool formation in small coastal British Columbia streams. North American Journal of Fisheries Management 23:928–938.

BLM must also account for the fact that streams are currently experiencing a severe shortage of wood as a result of past and ongoing logging in riparian areas, as well as riparian land conversion on federal and non-federal lands (including roads in riparian reserves). BLM must account for the fact that the kind of logging suggested by this planning criteria will result in significant cumulative impacts.

All BLM’s legal mandates taken together do not support a “timber dominant” approach.

BLM needs to harmonize ALL of its legal mandates which necessitates abandoning the "timber dominant" viewpoint. Meeting FLPMA, Clean Water Act, and the Endangered Species Act and other laws, including other requirements of the O&C Act itself, such as
watershed protection, recreation and community stability, require BLM to apply a multiple use legal framework.

BLM must stop relying on outdated interpretations of the O&C Act. The planning criteria a deeply flawed when they assert that various public values must be subservient to the timber-dominant view expressed in the O&C Act. The O&C Act itself embraces a conservative view where logging is not maximized but harmonize with conservation values like watershed protection and recreation. Congress passed many subsequent laws that further constrain logging. BLM must harmonize the requirement of the O&C Act with all of its other mandates under the FLPMA, Endangered Species Act, Clean Water Act, Migratory Bird Treaty Act, etc. All these layers of legal requirements taken together translate to a form of multiple-use.

To understand its legal mandates, BLM must look at and harmonize all of the applicable statutes, all of the case law, all of the secretarial policies, and all of the evidence. BLM cannot rely on an overly broad reading of the holding in Headwaters case. The facts in the Headwaters case arose before the spotted owl was listed under the ESA. BLM should read the dissent in the Headwaters case which provides an explanation of how BLM’s legal mandates have changes after the listing of the spotted owl. The Headwaters case is about a particular timber sale, not about plan-level decisionmaking. The case did not address the question of timber dominance in the context of RMP revision. It did not address the question of whether BLM has discretion to adopt an RMP that devotes productive forest areas to purposes other than timber production.

BLM should reaffirm the view adopted by the Secretary of Interior when the Northwest Forest Plan was adopted. This was by far the most compelling effort to integrate and harmonize BLM’s mandates under various laws. The 1994 Record of Decision clearly states that forest conservation on BLM land, including efforts to set aside forests in order to conserve habitat for species that are not yet listed, are consistent with the O&C Act because they help maintain viable populations and minimize future management constraints that would frustrate O&C Act objectives. The ACS was also considered entirely compatible with the O&C Act’s mandate for watershed protection. If then, why not now.

BLM can meet the requirements of the O&C Act by conserving all mature & old-growth forests. Mature & old-growth forests help protect watersheds, provide favorable conditions of water flow, offer recreation facilities (such as hiking and wildlife viewing opportunities), and, as explicitly recognized in the Northwest Forest Plan ROD, and protecting habitat for species that are not yet listed helps reduce future management constrains that might interfere with attainment of O&C Act objectives.

Conservation of sensitive species should not be secondary to timber production. The Northwest Forest Plan adopted a policy that the O&C Act mandate for permanent timber production is furthered by avoiding additional species listings, so it makes sense to protect species before they become threatened.
The purpose and need for this plan revision is not supported by the evidence.

The Planning Criteria state that the need for this RMP revision is the "substantial long-term departure from timber management outcomes." However, the Northwest Forest Plan identified a PSQ of approximately 200 mmbf/yr for BLM, and the latest BLM factbook says that has volume target been achieved on average over the last 5 years. This seriously undermines the purpose and need to substantially increase logging on BLM lands.

The PSQ for BLM lands under Option 9 (which was adopted in the ROD) was 201 mmbf/yr (1994 FSEIS, p 3&4-265)

Table 3&4-43. Historical federal harvest levels and annual probable sale quantities (PSQ) in the first decade by alternative

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<tr>
<td>Oregon/California</td>
<td>915 573 41 142 149 158 188 167 412 290 201 196</td>
<td></td>
</tr>
<tr>
<td>Total Owl forests</td>
<td>4,524 2,389 114 624 685 712 930 811 1,645 1,232 958 958</td>
<td></td>
</tr>
</tbody>
</table>

BLM offered an average of more than 200 mmbf/yr over the last five years.

Western Oregon

Western Oregon Annual Volume ⁷ – Offered 2007 - 2012

<table>
<thead>
<tr>
<th>District</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
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</thead>
<tbody>
<tr>
<td>Coos Bay</td>
<td>53.8</td>
<td>47.2</td>
<td>50.8</td>
<td>37.0</td>
<td>41.2</td>
<td>41.7</td>
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<tr>
<td>Eugene</td>
<td>41.8</td>
<td>49.4</td>
<td>50.9</td>
<td>50.9</td>
<td>51.6</td>
<td>51.0</td>
</tr>
<tr>
<td>Lakeview (O&amp;C)</td>
<td>5.0</td>
<td>5.0</td>
<td>3.2</td>
<td>5.4</td>
<td>3.1</td>
<td>5.3</td>
</tr>
<tr>
<td>Medford</td>
<td>15.8</td>
<td>27.8</td>
<td>16.2</td>
<td>34.4</td>
<td>21.6</td>
<td>22.3</td>
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<tr>
<td>Roseburg</td>
<td>30.2</td>
<td>44.0</td>
<td>26.3</td>
<td>40.9</td>
<td>28.2</td>
<td>28.0</td>
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<tr>
<td>Salem</td>
<td>49.0</td>
<td>56.8</td>
<td>56.4</td>
<td>65.3</td>
<td>51.2</td>
<td>57.2</td>
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<tr>
<td>Total</td>
<td>195.6</td>
<td>230.2</td>
<td>203.8</td>
<td>233.9</td>
<td>196.9</td>
<td>205.4</td>
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</table>

FEMAT evaluated several options with greater levels of logging, but these were rejected as ecologically unacceptable and extreme. BLM should carefully review FEMAT and the 1994 FSEIS to consider and evaluate the evidence showing why conservation approach of the NWPF was adopted and why higher rates of logging were rejected. We are not aware of any substantial evidence indicating that the reasons for adoption of the NWFP lack support.

Furthermore, instead of being disappointed about some small deviations from its timber objectives, BLM should be thrilled with the progress it has made. BLM should recognize that it exists within a dynamic environment –

- with changing social values that no longer support logging of mature & old-growth forests;
- a dynamic economy where the housing market has crashed and it is not wise to create another bubble;
- variable budget allocations from Congress;
- climate change it upon us and demands greater conservation of those features of the forest (such as mature and old-growth) that may be hard to recreate in a warmer and more unsettled climate. Climate change also demands greater conservation of streams and watersheds in order to accommodate the expected amplification of the hydrologic cycle;
- changing populations of wildlife, such as invading barred owls, increasing concerns about species since the NWFP was adopted (dusky red tree vole, fisher, various ESUs of salmon, etc);
- counties are mostly decoupled from timber receipts that it would be desirable to keep it that way;
- highly stochastic fire regimes and insect outbreaks;
- changing policies, such as new ESA listings, critical habitat, recovery plans,

Instead of looking at slightly variable timber outputs as a failure leading BLM to weaken the conservation objectives of the NWFP, BLM should adjust its unreasonable expectations of even flow timber production. In light of the dynamic environment that BLM operates within, BLM has done quite well in terms of meeting timber objectives over the last 20 years. See Jack Ward Thomas 1997. The Instability of Stability, http://web.archive.org/web/20001201174000/http://coopext.cahe.wsu.edu/~pnrec97/thomas2.htm

Conservation of BLM Lands Provides Regulatory Stability. Increased logging is destabilizing.
The NWFP provided the bare minimum level of environmental protection in order to facilitate the maximum allowable level of logging on federal lands. The planning criteria should account for the fact that reduced conservation on BLM forest lands will destabilize the regulatory environment that the Forest Service and private landowners operate within. Increased logging on BLM land may trigger reduced logging on FS and/or private forest land which is a threat to community stability.
BLM’s participation in the Northwest Forest Plan helps provide some measure of regulatory stability for private timberland owners and the timber industry. In 1994 Judge Dwyer said the Northwest Forest Plan represents the bare legal minimum. He said, 

The Secretaries have noted, however, that the plan ‘will provide the highest sustainable timber levels from Forest Service and BLM lands of all action alternatives that are likely to satisfy the requirements of existing statutes and policies.’ ROD at 61. In other words, any more logging sales than the plan contemplates would probably violate the laws.


Similarly, the Oregon Department of Forestry says —

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

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

**Forest Carbon and Climate Mitigation**

Global warming is a global problem caused by local actions occurring all over the world. Greenhouse gases are emitted from fossil fuels, but forest management also contributes to the problem when carbon-rich old forest are converted to carbon-depleted young forest, or when young forests are prevented from re-growing to regain their former carbon-rich condition.

To grasp the importance of forests and forestry in our region, consider that in the century preceding 1990, the conversion of old-growth forests to short rotation forestry in western Washington and western Oregon caused more than 1.5 billion metric tonnes of net carbon emissions. This region represents only .017% of global land area but emitted an astounding 2% of global carbon emissions from land use during that period. Put another way, liquidating the old-growth on the westside of Oregon and Washington caused 100 times more carbon emissions from land use activities compared to the global average for similar sized areas. Also note that wood products are not a good place to store carbon. Of the 1,692 million metric tonnes of carbon removed via timber harvest in Oregon and Washington from 1900 to 1992, only 23% is contained in forest products (including landfills), the other 77% has likely been released to the atmosphere, so, for every unit of carbon in our houses and landfills, there is another 3 units in the atmosphere.

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4 A metric “tonne” is 1000 Kg or 2205 lbs.


When the Northwest Forest Plan was adopted in 1994, global climate change was not widely understood to be a significant issue as it is today. Conservation of older forests (and allowing younger forests to grow old) provides tremendous benefits to the climate, because trees capture carbon from the atmosphere and keep carbon out of the atmosphere. Through landscape forest conservation, the NWFP provides tremendous climate benefits, but it could do even better if there were more protection for mature & old-growth forests, and if more young forests were allowed to grow instead of being clearcut. This issue is quite relevant to the RMP Revision because increased logging has carbon consequences. A 100 year rotation stores only 50% as much carbon as an old-growth forest, and a 50 year rotation stores only about 38% as much carbon as old-growth.7

In Oregon forests that are recovering from past logging (i.e. forests enjoying a respite from logging as a result of the Northwest Forest Plan) net forest growth currently sequesters 51% of Oregon's total carbon emissions from all sources.8 Scaling net ecosystem production and net biome production over a heterogeneous region in the western United States.9 This result accrues without an active policy of forest carbon storage (other than the conservation community's continuous efforts to turn back repeated attempts to dismantle the Northwest Forest Plan).

There is no de minimus, insignificant, or “safe” level of additional net carbon emissions. To avoid significant adverse global effects, net carbon emissions must be stopped AND reversed. In between glacial episodes, CO2 concentrations are typically around 280 ppm. Current atmospheric concentrations are around 390 parts per million and raising rapidly. Experts say we need to reduce that to around 350 ppm.

If BLM approves increased logging, the climate benefits of the NWFP will be greatly diminished, resulting in carbon emissions that could be avoided if BLM would just let our forests grow.

While highest priority must be given to curtailing fossil fuel use, forest conservation can also play an important role in sequestering carbon and bringing atmospheric levels down. Implementation of RMP Revisions that increase logging will make things worse, while improved forest conservation will make things better.

**The NWFP Represents Climate-Centered Conservation Strategy for SW Oregon.**

Not only does forest conservation contribute significantly to carbon storage and help reduce the effects of climate change, but forest conservation also helps ecosystems and communities deal with the effects of climate change that are already “committed” and unavoidable.

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The planning criteria need to recognize all the ways in which the conservation approach of the Northwest Forest Plan represents a good first step toward a plan for preparing forests for climate change. Efforts to reduce reserves and increase logging will degrade the value of forests for habitat connectivity and the ability of watersheds to buffer increasing storms.

Global climate change is an issue that will affect the planet and its inhabitants for hundreds if not thousands of years to come. People are just coming to recognize the profound effect of climate change on social, economic, and ecological systems, and what we can do to prepare for and reduce the effects of climate change.

Retaining and improving the Northwest Forest Plan and conservation of species associated with late successional forests represents a sound strategy to prepare for and mitigate global climate change.

Forests are an integral part of the global carbon cycle. Past forest management has contributed to the carbon overload in the atmosphere, and future forest management can either make that situation worse or begin reversing the flow of carbon from the atmosphere back to the forest. In addition, forests will be affected by climate change as it manifests and we must anticipate and prepare for those changes.

The Pacific Northwest, with its strong maritime influence, relatively long fire return intervals, and somewhat shorter history of economic exploitation, has some of the most carbon-rich forests in the country if not the world. Concern over the loss of old growth forests and the decline of the northern spotted owl, marbled murrelet, and Pacific salmon lead to the adoption of the Northwest Forest Plan in 1994 before concern over climate had risen to the forefront. This plan calls for the protection and restoration of a functional integrated network of late-successional old-growth forest ecosystems on 24 million acres of federal forests in western Washington, western Oregon, and northwestern California.

The NW Forest Plan is by happenstance an excellent starting-place for a strategy for climate change preparation and adaption, but this plan is also under threat and could be strengthened and improved upon. The following elements of the NW Forest Plan (NWFP) make it a good climate strategy:

1. The plan spans a large dynamic landscape; The plan covers large contiguous federal ownerships which may permit the restoration of natural disturbance processes such as fire that can diversify the landscape, optimize carbon storage consistent with the carbon carrying capacity, and facilitate climate-driven changes in vegetation communities.
2. The plan includes a system of forest reserves that are large, well-distributed, redundant, and the spacing among reserves was consciously intended to facilitate dispersal of mobile organisms (and has a safety net for species that are less mobile). The reserve system is arranged along north-south gradients including the coastal ranges, and Cascades, as well as across elevational gradients and topographically diverse areas. This will help species move with changing climes.
The reserves are managed under a rule set intended to protect and restore late successional ecosystems that have inherent ecological inertia, resistance, and resilience.

3. The Plan has an emphasis on maintaining biodiversity which is necessary to maintain the adaptive capacity of natural systems over the long term. The Plan helps maintain relatively large populations of imperiled species (viable populations instead of populations on the verge of jeopardy) which helps ensure that long-term persistence of species, populations, and genes.

4. The Plan helps reduce non-climate stressors by reducing the rate of logging and other activities, and imposing standards and guidelines that help minimize environmental impacts.

5. The Plan includes a variety of requirements for Watershed Analysis, Reserve Assessments, and monitoring that can act as an early warning sign for climate driven shifts in natural systems.

6. The forests covered by the NWFP contain a large amount of carbon that needs to be protected from logging and these forest landscapes have the capacity to store far more carbon if young forests are allowed to grow;

7. The plan emphasizes interagency cooperation and involves BLM lands that provide critical linkages between the Oregon Coast Range and Oregon Cascades.

8. There is an Aquatic Conservation Strategy that will help make hydrologic systems and aquatic ecosystems more resilient to climate change by moderating cumulative watershed effects, reducing the extent of the road system, emphasizing maintenance of riparian areas, shade, floodplain processes, recruitment of large wood from both near stream areas and unstable slopes, and connectivity and fish passage.

Western Oregon plays a critical role in the Northwest Forest Plan. Western Oregon, ad especially SW Oregon is a crossroads that links the Coast Range, Cascades, and Klamath-Siskiyou Mountains. SW Oregon is recognized for its high biodiversity that includes species from moist Oregon, Mediterranean California, and the dry great basin. The wild areas such as the Kalmiopsis Wilderness, Siskiyou Wild Rivers, Cascade Siskiyou National Monument, Upper and Lower Klamath Wildlife Refuges, spotted owl critical habitat, and the associated Late Successional Reserves established under the Northwest Forest Plan are all integral to the success of climate preparation and mitigation.

The BLM owns a significant area of forests managed under the Northwest Forest Plan in SW Oregon. There is strong political pressure (albeit misplaced) to allow BLM to take a divergent path away from the NWFP in order to increase logging and support the counties that may receive shared receipts from BLM timber sales. BLM's continued participation in the NWFP is critical to achievement of objectives related to climate and endangered species recovery.

The emphasis on active management in the Final Revised Recovery Plan for the Northern Spotted Owl is another potential threat to the NWFP. The plan contains a misguided recommendations that de-emphasize the reserve system and increase active management
(i.e., logging) of owl habitat in order to reduce the threat of fire. These are not supported by the best available science.

BLM should consider an alternative that improves upon the NWFP by:

- closing some of the loopholes such as logging unprotected late-successional old-growth forests in the "matrix;"
- expanding the reserve system by protecting unroaded areas >1,000 acres (including those that straddle FS and BLM land) and other protected designations;
- reforming post-disturbance management practices such as salvage logging in order to protect complex early seral forests and facilitate diversity, resiliency, climate change adaptation, and carbon storage;
- adding an explicit goal to harmonize carbon storage, climate preparation, and ecological structure, function, and process; and
- reaffirming that commodity production is a by-product of restoration, and climate preparation and mitigation.

- placing greater emphasis on reducing the extent of the road system and storm-proofing the roads that are needed in order to prepare for an accelerated hydrologic cycle.

From a climate standpoint, there is a great need to maintain NWFP conservation measures and improve upon them wherever possible.

**Protect Mature forests**

Oregon Wild has prepared a white paper explaining the wide variety of reasons that BLM should conserve not only old growth but also mature forests. Please review Heiken, Doug. 2009. The Case for Protecting Both Old Growth and Mature Forests, Version 1.8. Oregon Wild.  

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

1. There is a serious region-scale deficit in mature and old-growth forest habitat. Over time, the Northwest Forest Plan seeks to re-establish 3.44 million acres of mature and old-growth forest  
[http://web.archive.org/web/20030402090844/http://www.fs.fed.us/land/fm/oldgrow/oldgrow.htm](http://web.archive.org/web/20030402090844/http://www.fs.fed.us/land/fm/oldgrow/oldgrow.htm). By continuing to log mature forests we are significantly delaying this recovery. If we are going to make a timely recovery from that deficit, and give struggling species a chance to survive the habitat bottleneck that we have created, we must protect mature forests so that they can become old-growth, and we must manage young forest so they can become mature.

2. The transition from mature forest to old growth is a process that takes time and varies depending on factors such as location and species and disturbance events. In a mature forest, all the ingredients are there to make old growth (e.g., large
trees) and the scientists agree that these forests need protection to help meet the current old-growth forest deficit.

3. The architects of the Northwest Forest Plan found that many of our best large intact forest landscapes are mature forests, not old-growth. Some large forest fires burned westside forests between 1840 and 1910 and many such areas were skipped over by the timber harvest planners because they were more intent on converting the very old forests to tree plantations. These former fire areas, now mature forests, offer some of our best hopes of recreating large blocks of intact older forest.

4. Cutting mature forests is not needed for ecological reasons. These forests are already exhibiting the characteristics that provide excellent habitat and they continue to develop and improve without human intervention. As recognized in the Northwest Forest Plan standards and guidelines for Late Successional Reserves, stands over 80 years old do not need to be manipulated to become old-growth. All the ingredients are there, they just need time.

5. Mature forests provide essential habitat for the species we are most concerned with such as: spotted owl, marbled murrelet, Pacific salmon, and most of the “survey and manage” species.

6. Protecting mature and old-growth forest leads to a real ecological solution, while protecting only old-growth is merely a partial solution to an ecological problem that is bigger than just old-growth.

7. Cutting mature forest will remain controversial and socially unacceptable. If we seek to resolve conflict over management of older forests, protecting the old-growth while leaving mature forests unprotected would be only half a solution and would lead to more conflict. Shifting to a restoration paradigm gets everyone at the table working toward the same goal.

8. If mature forest is left unprotected, some members of the environmental community will distrust the agencies and oppose them on many fronts.

9. Leaving mature forests unprotected would leave substantial areas of roadless lands subject to future conflict. Many westside roadless areas may not qualify as old-growth, but still provide important values as roadless and mature forests.

10. Complicated environmental analysis will be required for logging mature forests compared to thinning plantations. Wildlife surveys will be needed. Environmental Impact Statements will more often be needed instead of abbreviated Environmental Assessments. Formal consultation under the Endangered Species Act will more often be triggered.

11. We do not need to log mature forest to provide jobs. Less than 2% of the jobs in Washington and Oregon are in the lumber and wood products sectors, and only a small fraction of those are on federal land and only a fraction of those are related to mature forest logging. Many more environmentally benign jobs are available in restoring roads, streams, thinning young plantations, and managing fire and recreation.
12. We do not need to log mature forest to prop up the economy. The NW economy has greatly diversified in the last decade. Our economy typically creates more new jobs every year than exist in the entire lumber and wood products sectors.

13. We do not need to log mature forest to prop up the timber industry. Less than 10% of the logging in Oregon and Washington in recent years has been on federal lands. Only a fraction of that is mature forest. Much more environmentally benign and socially acceptable timber can be derived from thinning young plantations or small diameter fuel reduction where it is appropriate.

14. Since managing these stands is not "needed" for any ecological reason or any economic or social reason, what would be the objective?

15. Standing in a mature forest, once gets the distinct feeling that “this beautiful place should not be destroyed by logging.”

**Marbled Murrelet Conservation**

The planning criteria seem to build its alternatives around the new spotted owl critical habitat maps, but BLM needs to give equal consideration to the critical habitat already established for the marbled murrelet.

BLM should follow the 1997 Marbled Murrelet Recovery Plan, page 143, which calls for protection of mature forests for recruitment habitat:

"Consistent with the Forest Plan Record of Decision, thinning within Late-Successional Reserves should be restricted to stands younger than 80 years....

3.2.1.2 Protect 'recruitment' nesting habitat to buffer and enlarge existing stands, reduce fragmentation, and provide replacement habitat for current suitable nesting habitat lost to disturbance events. Stands (currently 80 years old or older) that will produce suitable habitat within the next few decades are the most immediate source of new habitat and may be the only replacement for existing habitat lost to disturbance (e.g., timber harvest, fires, etc.) over the next century. Such stands are particularly important because of the vulnerability of many existing habitat fragments to fire and wind and the possibility that climate change will increase the effects of the frequency and severity of natural disturbances. Such stands should not be subjected to any silvicultural treatment that diminishes their capacity to provide quality nesting habitat in the future. Within secured areas, these "recruitment" stands should not be harvested or thinned."

**Spotted Owl Conservation**

New information has emerged since the adoption of the NWFP indicating a need for greater forest conservation, rather than greater forest exploitation. More forest conservation is needed to increase the chances that spotted owls can co-exist with invading barred owls, and more forest conservation is needed to address climate change by storing more carbon in forests and keeping more carbon out of the atmosphere. See Heiken, Doug. 2009. The Case for Protecting Both Old Growth and Mature Forests, Version 1.8. Oregon
All suitable habitat should be protected, not just high quality habitat. The barred owl threat is simply greater than can be mitigated by protecting only the high-quality subset of owl habitat. The barred owl is dramatically increasing in numbers throughout the range of the spotted owl. The current NWFP does not account for the effects of barred owls which compete with spotted owls and exclude spotted owls from otherwise suitable habitat. The barred owl is barely mentioned in the 1994 SEIS. The invasion of the barred owl undermines a critical assumption underlying the Northwest Forest Plan – i.e., the assumption that all suitable owl habitat is available to spotted owls. Tens of thousands of acres old forest owl habitat (which was in short supply before the barred owl arrived) are now occupied and defended by barred owl to the exclusion of spotted owls. The logical response now is to protect and restore more habitat to reach spotted owl population goals; Implications: Based on well-established species/areas relationships the agencies need to protect more suitable habitat is needed to ensure that these two owl species can co-exist, and to decrease the likelihood of competitive exclusion. This recovery action is intended to reduce competitive pressures between spotted and barred owls, but unfortunately an analysis has not been done to show how much additional habitat needs to be protected to help assure co-existence of the competing owls. Protecting just a subset of high quality habitat is not enough.
BLM should carefully consider the implication of a recent telemetry study which showed that in fragmented landscapes barred owls have a survival advantage relative to spotted owls, but that survival advantage diminishes in landscapes with a higher proportion of older forest. In other words, conservation of mature & old-growth forest should be favored because spotted owls are able to compete nearly equally with barred owls in landscapes with a high proportion of old forest.


The final Recovery Plan for the Northern Spotted Owl has partially addressed the barred owl issue by adopting Recovery Action 32 which urges the FS and BLM to “Maintain substantially all of the older and more structurally complex multi-layered conifer forests on Federal lands outside of MOCAs…” based on the idea that “protecting these forests will not further exacerbate competitive interactions between spotted owls and barred owls as would occur if the amount of shared resources were decreased.” (FRP p 34). The revised critical habitat for the northern spotted owl was also expanded to “… increase the likelihood that spotted owls would be able to persist in areas where barred owls are also present. … [A]dditional critical habitat may allow for coexistence of the two species, potentially reducing competition (Dugger et al. 2011; Forsman et al. 2011).” FWS 2012. CHU draft EA, p 53, 62. [http://www.fws.gov/oregonfwo/Species/Data/NorthernSpottedOwl/Documents/CH_DRAFTEnvAssmnt_6.1.12.pdf](http://www.fws.gov/oregonfwo/Species/Data/NorthernSpottedOwl/Documents/CH_DRAFTEnvAssmnt_6.1.12.pdf). In considering this recommendation the agencies must prepare NEPA analysis which considers the full potential of suitable habitat quantity and quality and its mediating influence on the interactions between spotted owls and barred owls.
Maintaining a subset of suitable habitat as recommended by the recovery plan is one option, but the agencies must consider the full benefits of protecting all suitable habitat, not just a subset, and providing additional mitigation in matrix areas such as managing the matrix to enhance habitat for owl prey species. The recovery plan is not a NEPA document and FWS was not required to consider all reasonable alternatives. Action agencies like the FS and BLM on the other hand are required to fully consider alternatives. It would be wise to do so at a range-wide level, but until that is done, the agencies should not adversely modify any suitable habitat. The recovery plan purports to offer the agencies an exception to the recommendation in Recovery Action 32 (“Land managers have made significant investments of time and resources in planning projects that may have been developed prior to the approval of this Recovery Plan, thus some forests meeting the described conditions might be harvested…” (FRP p 35)), however, FWS cannot exempt the action agencies from NEPA. Protection of additional suitable habitat in order to reduce competitive interactions between the two owls is now a recognized tool in the toolbox and represents significant new information about any proposal to modify suitable habitat regardless of how far the planning process may have proceeded.

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

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


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


The effects of habitat availability on competing species was explored by expert wildlife population modelers who found — The territorial occupancy model developed by Lande (1987), extended here to include two competing species, represents a useful tool for evaluating how equilibrium breeding numbers could be affected by changes in habitat availability, demographic parameters, dispersal behavior and interspecific competition … Its application shows that increases in the exclusive suitable habitat of each species is the best option to maintain viable populations of territorial
competitors in a same area, given that it reduces competition for territories. Increases in habitat overlap by reducing the exclusive habitat available for one species strongly affected the outcome of competition, resulting in extinction of the species for which exclusive habitat had been eliminated.


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

This view is corroborated by owl biologist David Wiens who was interviewed on the Lehrer NewsHour. He said: “The more habitat you protect, the more you're going to alleviate the competitive pressure between the species. Rather than reducing it and increasing the competitive pressure between these two species, we need to provide as much habitat as possible for them.” DAVID WIENS. NewsHour interview. “Biologists Struggle to Save the Spotted Owl.” December 18, 2007. http://www.pbs.org/newshour/bb/science/july-dec07/owl_12-18.html. Robert Anthony agrees, “If you start cutting habitat for either bird, you just increase competitive pressure.” Welch, Craig. 2009. The Spotted Owl’s New Nemesis. Smithsonian Magazine. January 2009. http://www.smithsonianmag.com/science-nature/The-Spotted-Owls-New-Nemesis.html?c=y&page=2 And in the same article Eric Forsman added "You could shoot barred owls until you're blue in the face," he said. "But unless you're willing to do it forever, it's just not going to work."

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

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10 Put another way, when threatened with extinction, “the best defense is a strong offense” that is, species are more likely to persist if they have a large, well-distributed population size and if we minimize all manageable threats. Dunham, Jason. 2008. Bull trout habitat requirements and factors most at risk from climate change. http://www.fs.fed.us/rm/boise/AWAE/projects/bull_trout/bt_Dunham.html
barred owl may competitively exclude and extirpate the spotted owls. Similar results are
demonstrated in resource competition models described by Tilman, Lehman, and
http://www.cedar creek.umn.edu/biblio/fulltext/t1694.pdf. See also, Tilman, D. and P.
Karieva, Eds. 1997. Spatial Ecology: The Role of Space in Population Dynamics and
Interspecific Interactions. Monographs in Population Biology, Princeton University
Press. 368 pp. and Valenti D., Fiasconaro A., Spagnolo B. Pattern formation and spatial
correlation induced by the noise in two competing species

BLM Must Consider the Very Low Probability of Net Benefits When Proposing to
Use Logging to Protect Habitat From Fire

The planning criteria (p 176) ask the question whether BLM fuel reduction efforts may
"reduce the loss of habitat due to catastrophic wildfire throughout the northern spotted
owl’s range?" BLM says this question will be addressed by inquiries, but in any case they
are not responsible for monitoring this issue. The Planning Criteria say “BLM’s
evaluations of Conservation Needs 1, 2 and 4, also address Conservation Need 3. • No
additional analysis is needed”. We are not convinced that this question will be adequately
addressed by other evaluations.

The question of whether logging habitat to save it from fire is an effective owl
conservation strategy requires careful analysis that considers probability. The analysis
cannot be answered at the stand scale; it must be addressed at the landscape scale. Given
that we have incomplete knowledge of where and when fire will occur, fuel treatments
must therefore be widespread and many sites will be logged unnecessarily. The adverse
effects of scatter-shot logging to reduce fuels will likely be worse than the effects of fire.
This question can be answered fairly readily without "monitoring." It can be modeled,
which can and should be done as part of the RMP NEPA process. In fact, this is the main
subject of Oregon Wild’s white paper: Heiken, D. 2010. Log it to save it? The search for
an ecological rationale for fuel reduction logging in Spotted Owl habitat. Oregon Wild. v
result: The adverse effects of landscape logging for fuel reduction (plus the unavoidable
effects of fire) are likely far worse than the effects of fire alone. If you are a spotted owl,
you probably safer trying to deal with fire, rather than logging plus fire.

When logging intended to benefit habitat will also reduce the quality of habitat, the
NEPA analysis must include some evaluation of ecological costs and benefits — e.g., the
probability that logging will degrade habitat vs. the probability that fuel reduction
treatments will interact favorably with fire and thus benefit habitat. This evaluation
requires an estimate of the probability of future wildfire. To assume, as many analyses
do, a 100% chance of future wildfire over-estimates the likelihood of treatments will
interact with fire, thus over-estimating the ecological value of fuel treatments, and under-
estimating the ecological effects of logging on habitat.
There appears to be strong (but misplaced) interest among the federal land management agencies in conducting widespread logging in suitable spotted owl habitat in order to reduce the effect of fire. The agencies view fuel reduction logging as beneficial to owl habitat because modeling shows that fire behavior is moderated by fuel reduction, but proponents never seem to conduct a careful evaluation of the relative probability, and the relative harms, of logging versus wildfire. Strangely, the probabilistic aspects of this issue have been largely ignored in the owl science literature, but recently explored in the forest-carbon literature which recently showed that although thinning can modify fire behavior, logging to reduce fire effects is likely to remove more carbon by logging than will be saved by modifying fire. Mitchell, Harmon, O'Connell. 2009. Forest fuel reduction alters fire severity and long-term carbon storage in three Pacific Northwest ecosystems. Ecological Applications. 19(3), 2009, pp. 643–655
http://www.fs.fed.us/pnw/pubs/journals/pnw_2009_mitchell001.pdf. The reason for this seemingly counterintuitive outcome is a result of the “law of averages.” As explained by Cathcart et al 2009 —

The question is—if the implementation of fuels treatments within the Drews Creek watershed had the beneficial effect of reducing the likelihood of wildfire intensity and extent as simulated in this study, why is the expected carbon offset from fuels treatment so negative? The answer lies in the probabilistic nature of wildfire. Fuels treatment comes with a carbon loss from biomass removal and prescribed fire with a probability of 1. In contrast, the benefit of avoided wildfire emissions is probabilistic. The law of averages is heavily influenced that given a wildfire ignition somewhere within the watershed, the probability that a stand is not burned by the corresponding wildfire is 0.98 (1 minus the average overall conditional burn probability …

Thus, the expected benefit of avoided wildfire emissions is an average that includes the predominant scenario that no wildfire reaches the stand. And if the predominate scenario for each stand is that the fire never reaches it, there is no avoided CO2 emissions benefit to be had from treatment. So even though severe wildfire can be a significant CO2 emissions event, its chance of occurring and reaching a given stand relative to where the wildfire started is still very low, with or without fuels treatments on the landscape.


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

In an effort to advance the discussion and help the agencies conduct better risk assessments in the NEPA context we have prepared a white paper in an attempt to clarify the critical considerations in a probabilistic risk assessment that compares the risk of logging versus wildfire. Heiken, D. 2010. Log it to save it? The search for an ecological rationale for fuel reduction logging in Spotted Owl habitat. Oregon Wild. v 1.0. May
This report is most relevant in SW Oregon but the proposed evaluative framework is applicable in the east Cascades, northern California, and elsewhere. This report focuses on carbon and spotted owl habitat, but the analysis is relevant for any species or forest value that requires relatively dense forest cover, such as American marten, Pacific fisher, pileated woodpecker, northern goshawk, etc. See for instance, Aubry et al. 2013. Meta-Analyses of Habitat Selection by Fishers at Resting Sites in the Pacific Coastal Region. The Journal of Wildlife Management 77(5):965–974; 2013; DOI: 10.1002/jwmg.563.

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

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

<table>
<thead>
<tr>
<th>Framework for Assessing the Risk of Wildfire vs Fuel Reduction Logging</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Likelihood of event</strong></td>
</tr>
<tr>
<td>Wildfire</td>
</tr>
<tr>
<td>Logging</td>
</tr>
</tbody>
</table>

The white paper is organized around these risk evaluation parameters.

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

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

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

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

Similar conclusions were reached by The Wildlife Society (TWS) peer review of the 2010 Draft Recovery Plan for the Spotted Owl. The draft plan called for extensive logging to reduce fire hazard ("inaction is not an option"). TWS used state-and-transition model to evaluate the effects of opening dry forests to reduce fire hazard versus the effects of wildfire.

The results of running the model with 2/3rds of the landscape treated leads to open forest becoming predominant after a couple of decades, occupying 51 percent of the forested landscape, while mature, closed forest drops to 29 and 24 percent of the Klamath and dry Cascades forests, respectively (Appendix A, Figure 5, shows the Cascades). Treatments that maintain open forests in 2/3rds of the landscape put such a limit on the amount of closed forest that can occur, even if high severity fires were to be completely eliminated under this scenario, there would only be 35 percent of the landscape occupied by closed forests. In contrast, to the extensive treatment scenario, treating only 20 percent of the landscape reduces mature, closed canopy forest by about 11 percent (Appendix A, Figure 6).

One justification for the extensive treatment scenario promoted in the 2010 DRRP is that it is needed because of increased fire hypothesized to occur under climate change. By doubling the rate of high severity fire by 2050 with 2/3rds of the landscape treated, closed canopy forest is reduced to 25 percent in the Klamath compared to 60 percent without treatment and 23 percent in the dry Cascades compared to 54 percent without treatment.

Under what scenario might treatments that open forest canopies lead to more closed canopy spotted owl habitat? The direct cost to close forests with treatments that open them is simply equal to the proportion of the landscape that is treated. This reduction in closed canopy forest can only be offset over time if the ratio of forest regrowth to stand-replacing fire is below 1 (5-8 times more fire than today), and shifts to above 1 with the treatments (and most or all stand replacing fire in treated sites is eliminated, as modeled here). Another scenario that allows closed forests to increase would be if treating small areas eliminated essentially all future stand replacing fire, not only in treated areas, but across the entire landscape. This scenario obviously relies on substantially greater control over fire than is currently feasible, and it would increase impacts of fire exclusion if effective.

…
In sum, to recognize effects of fire and treatments on future amounts of closed forest habitat, it is necessary to explicitly and simultaneously consider the rates of fire, forest recruitment, and forest treatment over time, which has not yet been done by the Service.

The potential impacts of fuel treatments on spotted owls are not considered. … We also know little about the impacts of fire, yet this has been treated as a major threat, leading to proposing more fuel treatments. However, it is uncertain at this time which is a bigger threat, fires or treatments to reduce risk of fires. … If the plan intends to use the best available science to describe ongoing impacts to spotted owl habitat, information and literature about disturbances to reduce fuels should be included.

… there has been no formal accounting of how closed canopy forests can be maintained with the widespread treatments that are being proposed.


This analysis is consistent with the findings of Raphael et al (2013) used a state-and-transition model to explore the effects of landscape fuel reduction logging on spotted owls and found:

Active fuel reduction activities in moderate habitat contributed to substantial short-term (simulation years 0 to 30) population declines under the larger area, higher intensity scenarios. … The combination of BDOW interactions and high-intensity, larger-area treatments contributed to the most substantial NSO population bottlenecks. The combined effects of aggressive fuel reduction treatment approaches and interactions with BDOWs have the potential to contribute to increased extinction risk for NSOs in both analysis areas. … It appears that management regimes that take out owl habitat through treatments (either current or potential future) do not reduce the amount of habitat that is lost to wildfire enough to make up for the habitats lost through treatments.

Principle Investigator: Dr. Martin G. Raphael. Project Title: Assessing the Compatibility of Fuel Treatments, Wildfire Risk, and Conservation of Northern Spotted Owl Habitats and Populations in the Eastern Cascades: A Multi-scale Analysis. JFSP 09-1-08-31 Final Report, Page 19. http://www.firescience.gov/projects/09-1-08-31/project/09-1-08-31_final_report.pdf. This study also highlights the fact that natural landscapes (under the influence of natural forces like climate, photosynthesis, and natural disturbance) have a lot of ecological inertia, and well-intentioned management interventions are unlikely to significantly change the trajectory.

call for more rigorous analysis of the consequences before widespread adoption of logging as a means of habitat management.

[W]e are concerned that the decision to move forward with untested “active management” of federally owned forest lands at the landscape level prior to validation through the scientific peer-review process represents a potentially serious lapse in the application of the scientific process. This decision may conflict with the DOI’s scientific integrity policy as well as the mandates of several environmental laws …

The Department of the Interior’s Fish and Wildlife Service (FWS) considers active forest management as including those techniques that involve aggressive forest thinning and associated forest canopy reductions in dry forests and modified regeneration harvests in mature moist forests. Given that the primary driver of the spotted owl’s decline has been the destruction of old-growth forest habitat by logging, which will be the means used to achieve the anticipated forest thinning and regeneration harvests, we are especially concerned about the potential habitat impacts of adopting untested “active management” forestry technique. Accordingly, we request that the DOI prepare an Environmental Impact Statement (EIS) under NEPA to provide a rational, scientific approach for the testing of active management forestry in order to ensure that such techniques are validated through the peer-review process prior to their utilization at any commercial or landscape scale in the spotted owl’s critical habitat.

…

The Presidential Memorandum accompanying the proposed critical habitat designation also noted: “on the basis of extensive scientific analysis, areas identified as critical habitat should be subject to active management, including logging in order to produce the variety of stands of trees required for healthy forests. The proposal rejects the more conservative view among conservation biologists that land managers should take a “hands off” approach to such forest habitat in order to promote this species’ health.” We are concerned that this memorandum overstates the quality and quantity of scientific research on the potential benefits of active forest management, especially in the Pacific Northwest on a federally threatened species. In particular, we are unaware of any substantial or significant scientific literature that demonstrates that active forest management enhances the recovery of spotted owls.

…

after a full scientific peer-review of the data collected, the FWS and DOI would be able to make a fully informed decision regarding short- and long-term management of critical habitat. We believe that such an approach is clearly warranted given that the spotted owl is a closed canopy dependent species and active management may degrade habitat for the owl and encourage further expansion of the barred owl. Notably, recent evidence has shown spotted owl extirpation rates related to barred owl invasions are highest for spotted owls with low levels of old growth habitat in nesting areas or high levels of forest fragmentation[fn]. Scaling up logging activities throughout the Pacific Northwest, particularly on BLM lands in western Oregon where “active management” is ostensibly going to be integral to pending resource
management plan revisions, is therefore premature and not representative of the best available science.


William Baker has told the FWS …

Recent decadal estimates of high-severity fire rotations are long … Ratios of old-forest recruitment to high-severity area are currently high … Thus, dramatic increase in high-severity fire (e.g., 5-10 times as many huge fires per decade) would need to occur for net declines in old forest to begin. … [Reserveless strategy in the 2008 Recovery Plan is] based on incorrect fire-risk estimates. Fire risk, if anything, is currently low, and dynamism rather slow. Fuel treatments on up to 65-70% of dry forests premature and incompatible with recent science. Widespread fuel treatments based on incorrect notion that forests were generally open and park-like because of low-severity fires (see Hessburg et al. 2007, Williams and Baker, for evidence that this is incorrect).


Fire Hazard Reduction

BLM must give equal consideration to the fuel hazard effects of thinning and regeneration harvest. The planning criteria focus on the WUI and dry forest resilience, but they do not explicitly address the problem of regen harvest increasing fire hazard. BLM must recognize that many types of logging actually increase fire hazard. All regen harvest followed by replanting likely increase fire hazard. In addition, logging in the unique forest types of SW Oregon tends to stimulate the growth of ladder fuels, so canopy reduction tend to increase fire hazard.

Fire-regime condition-class may not be an accurate way to predict fire hazard in SW Oregon, because it assumes incorrectly that “time-since-fire” is an accurate indicator of fire hazard. There is compelling evidence that time-since-fire has exactly the opposite effect, that is, in some areas, fires may burn more severely in early-seral vegetation, and
burn less severely in closed-canopy forests. This may be related to the fact that closed canopy forests maintain a cool-moist microclimate that helps retain higher fuel moisture and more favorable fire behavior. Canopy cover also helps suppress the growth of ladder fuels. The significance of this is that it may make sense to variably retain more canopy cover while thinning and don’t focus on treatment of canopy fuels except to provide some well-spaced “escape hatches” for hot gases generated by surface fires.

Fuel reduction projects in SW Oregon must consider the implications of Odion, D.C., E.J. Frost, J.R. Strittholt, H. Jiang, D.A. DellaSala and M.A. Moritz. 2004. Patterns of fire severity and forest conditions in the western Klamath Mountains, California. Conservation Biology 18(4): 927-936. http://nature.berkeley.edu/moritzlab/docs/Odion_et al _2004.pdf. (“We found evidence for important changes in combustibility over time because the probability of stand-replacing fire was lower in long-unburned forests. A number of factors may contribute to this pattern. [Page 934] … The much greater fire severity we found in early successional, nonforest vegetation will tend to favor the persistence of this vegetation. In the long absence of stand-replacing fire, however, it is replaced by forests (Wills & Stuart 1994). Multi-aged, closed forests become less combustible with time since fire, and therefore become more likely to persist when fire does occur following a long fire-free interval. Temporal heterogeneity in fire, like its spatial counterpart, appears to be important to the maintenance of both successional types and a naturally patchy landscape structure in our study area. [Page 934] … Plantations of any age are more receptive to combustion than co-occurring forests in our study area.”)


The planning criteria indicates that BLM seeks to reduce catastrophic wildfires with this RMP Revision. This goal is in conflict with BLM's desire to increase timber harvest via regeneration harvest which creates dense young plantations that represent a hazardous fuel condition, especially in comparison to mature forest.

The 2000 National Forest Roadless Area Conservation FEIS (p 3-92 -93) noted the fire hazard associated with regen logging:

> Early successional vegetative growth often forms into dense thickets that create a highly flammable situation. New tree growth, whether from natural regeneration or planted nursery stock, produces needles and twigs that become the fine fuel that contributes to wildland fire spread. … Post-harvest fuel conditions commonly found in some managed forests prompt many scientists to conclude that harvested forests have a higher propensity for large, severe wildland fires than forests that have not been harvested. A recent report by the National Research Council (2000) speaks to the issue of post-harvest fuel management in Pacific Northwest forests.

> “Logging has been proposed as a possible surrogate for fire in reducing fuel accumulation with the added benefit of economic return (Agee 1993), but logging and clearcutting do not necessarily reduce flammable fuels…rapid regeneration of early-successional shrubs and trees can create highly flammable fuel conditions within a few years of cutting. Without adequate treatment of small woody residues, logging may exacerbate fire risk rather than lower it (Agee 1993)…”

Two fires in 2002 on the Umpqua National Forest were evaluated for their effect on the forest. Excerpts from the March 2003 Wildfire Effects Evaluation Project by the Umpqua N.F. make clear the impact of creating more tree plantations:

> "Plantations had a tendency to increase the rate of fire spread and increased the overall area of stand-replacement fire effects by spreading to neighboring stands." Page 4

> "Fire burned most plantations with high intensity and spread rapidly through the canopy of these young stands." Page 20.

> "Plantation mortality is disproportionately high compared to the total area that plantations occupied within the fire perimeter. Page 26-27.

> "Crown fire spreads readily through these young stands: rates of fire spread can be high, and significant areas or mortality can occur in and adjacent to these stands." Page 32.

Finally, the report says that the fire behavior in forest that had not been converted to tree farms was normal. "The pattern of mortality in the unmanaged forest resembles historic stand-replacement patch size and shape." Page 64.

The 2013 BAER Report for the Douglas Complex Fires in SW Oregon said “While the severity varied throughout the fire area, young timber plantations carried the fire while older stands tended to be more resistant. This is mostly due young timber plantations having a high density of ground fuels.” HSG9 – Douglas Complex Fire Burned Area Emergency Rehabilitation Plan. BLM Douglas Complex BAER Team. Sept 5, 2013. (p 12).

Basically, a beneficial surface fire is unlikely to occur in a dense young plantation because the fuel is too close to the ground. The fuel conditions in dense young plantations set the stage for fast moving stand-replacing fire. If a “good fire” were to occur in adjacent mature forest areas, fire suppression would almost certainly be required to prevent destruction of the plantation, even though the fire might otherwise be allowed to burn beneficially through the older stands. This is an often unaccounted for “cost” of regeneration harvest.

**Regen harvest is not ecologically necessary**

If BLM is considering regen logging based on the premise that it’s needed for early seral habitat, BLM must carefully consider the evidence that regen logging to create early seral forest is not needed.

Logging proponents say that regen harvest of mature forest is needed to enhance early seral forest which is in short supply, but this assertion is not well supported.

Any species that find optimum habitat in burned forests must have had the dispersal and reproductive capabilities to find and reproduce in these dispersed and infrequent patches of habitat. In general, species associated with early-successional conditions are good dispersers, have high reproductive rates, and are able to persist in small patches of habitat that result from small-scale disturbance (Hunter 1990, Smith 1966)....

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

1994 NWFP FSEIS, pp 3&4-203 – 204.

Also, there is no shortage of early seral forest. In fact, there’s already too much early seral in the Oregon Coast Range. Janet Ohmann. Trends in Early Seral Forest at the Stand and Landscape Scale. [http://www.slideshare.net/ecoshare/janet-l-ohmann-trends-in-early-seral-forest-at-the-stand-and-landscape-scale](http://www.slideshare.net/ecoshare/janet-l-ohmann-trends-in-early-seral-forest-at-the-stand-and-landscape-scale) (Slides 12, 29 show there is “no shortage of early seral” in Coastal Oregon, and early seral “exceeds the HRV” [historic range of variability].)

There are many ways of enhancing early-seral habitat without sacrificing mature forests, for instance, we could:

- Modify the way we fight fire and how we react after fire, e.g., leave areas to recover naturally after fire instead of salvage logging and replanting which more closely resembled industrial clearcutting;
- Modify practices on non-federal lands to encourage greater retention of live and dead trees during harvest, tolerate slower conifer re-establishment and greater diverse of native vegetation, e.g., discourage herbicide spraying to control competing native vegetation;
- Embed structure-rich “gaps” (e.g. patches of very heavy thinning) in our young stand thinning projects.
- Extend the early seral character of existing very young stands that are starting to become dominated by conifers.

As an example, the Salem BLM’s 2013 decision on the Molalla Late-Successional Reserve Habitat Enhancement Project thins 2000 acres of young plantations (less than 40 y.o.) to variable canopy of 80-120 tpa. The goal is to set stand on a trajectory to develop multiple canopy layers and increase stand diversity. Within treated stands, BLM will create 1-5 acre patches with density reduced to 20 tpa, with the goal to develop of high-quality early seral habitat in near term while enhancing late successional diversity over the long-term.

Here is a map showing fire perimeters in eastern and western Oregon over the last two decades. There is presumably a significant amount of early seral habitat associated with these fires.
Oregon Wild’s scoping 2011 comments on the Coos Bay Wagon Road and Rosebrug BLM Secretarial Pilot Projects shed further light on this issue:

**Complex early seral forest**

One of the primary restoration objectives we keep hearing for these projects is the need to restore *complex early seral forest*. This may well be an important goal. However, this goal needs to be validated and if valid, alternative means of meeting the goal must be explored. With a little thought and creativity one can see that many ways to increase rare early seral habitat without sacrificing rare mature & old-growth forests.

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

Natural disturbance processes continue to operate across the landscape, including fire, wind, ice storms, landslides, floods, volcanoes, native insects, native disease,

etc. Each of these helps create various sized patches of early seral forests every year. Many predict that climate change will increase the frequency of these natural events, suggesting that any shortage of early seral conditions might just take care of itself. "Ecologically, increased distribution and frequency of disturbances may result in increased distribution and dominance of early successional ecosystems dominated by fire adapted species..." Lemieux, Christopher J., Daniel J. Scott, Rob G. Davis and Paul A. Gray. 2008. Changing Climate, Challenging Choices: Ontario Parks and Climate Change Adaptation. University of Waterloo, Department of Geography: Waterloo, Ontario


[fn/ Conversely, it may become harder to maintain existing late-seral ecosystems and species, so existing late-successional old-growth forests should be retained in order to avoid making the shortage of late seral forest worse.]

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

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

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

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

Goal: create more diverse early seral forest without increasing landowner cost or regulatory burden

Ideas:

- Remove free-to-grow requirement
- Remove regeneration requirement in its entirety
- Allow substitution of an invasives eradication plan, enhanced wildlife tree plan, or logging debris retention plan

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

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

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

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

All these alternative methods would allow meaningful restoration of early seral forest conditions without unnecessarily sacrificing mature forests.
In addition, climate change may increase early seral and obviate the need to create it artificially. "Ecologically, increased distribution and frequency of disturbances may result in increased distribution and dominance of early successional ecosystems dominated by fire adapted species..." Lemieux, Christopher J., Daniel J. Scott, Rob G. Davis and Paul A. Gray. 2008. Changing Climate, Challenging Choices: Ontario Parks and Climate Change Adaptation. University of Waterloo, Department of Geography: Waterloo, Ontario
http://web.archive.org/web/20101023221023/http://www.fes.uwaterloo.ca/geography/faculty/danielscott/PDFFiles/NRCAN-Report-FINAL.pdf. Conversely, it may become harder to maintain existing late-seral ecosystems and species, so existing late-successional old-growth forests should be retained in order to avoid making the LSOG shortage worse.

Retain legacies, live and dead


If BLM continues to consider regen harvest, they must maintain the current matrix requirements for retention of abundant legacies, both clumped and dispersed. The NWFP also viewed unlogged riparian reserves as an important mitigation for regen logging. So if BLM reduces stream buffers they need to compensate by increasing retention rates within regen units.

The SAT, FEMAT, and the NWFP all provide voluminous rationale for legacy retention within harvest areas. BLM should consider this as well as new information in other sources such as:

WOPR Comments Incorporated by Reference.

BLM should not rely on the flawed analysis supporting the 2008 Western Oregon Plan Revision. Before relying on any aspect of the WORP analysis, BLM should carefully review the entire WOPR record and address the relevant critiques of the WORP analysis. Oregon Wild hereby incorporates by reference all of our comments and submissions from the WOPR.

BLM should also more carefully review the comments and documents that Oregon Wild has already submitted (RMP Evaluation comments, scoping comments, etc). The planning criteria do not reflect the information that we have previously offered.

Other notes:

BLM should report volumes in cubic feet and board feet.

“Annual productive capacity” must be adjusted to account for all the public values that the public demands form these forests: clean water, carbon storage, species recovery, recreation, quality of life, conservation of mature & old-growth forests, protection of unroaded areas, protection of drinking watersheds, etc.

There are already too many roads on the landscape. BLM should define all areas that are inaccessible form roads as unsuitable for timber production because more roads are unacceptable.

The “hydrology” section fails to discuss the need for wood recruitment for all the biophysical functions of wood, (wood is important for more than just “fisheries”).

BLM needs to continue the survey and manage program adopted by the NWFP. The courts have repeatedly rejected BLM’s efforts to circumvent these requirements. If BLM can’t eliminate this species conservation program in a focused effort with a big EIS, they certainly cannot do it hidden in another NEPA process with little or no supporting analysis. BLM needs to carefully address all the purposes of the survey and manage program and the analytic deficiencies identified by the courts when BLM previously tried and failed to eliminate the program.

The planning criteria need to recognize that if slash is going to be diverted to biomass energy, then soil carbon may be adversely affected. BLM’s assumption may need to be adjusted.

The planning criteria need to recognize that wind energy development in forested areas tend to have a lot more bird and wildlife conflicts. Siting of wind development is strongly advised to avoid forested areas.

BLM’s planning criteria should not undermine congressional intent with respect to the Coquille Tribal Land Grant. Congress clearly intended that these lands would be
managed consistent with the Northwest Forest Plan in order to ensure some regard for conservation. If BLM creates a special “doughnut” around these tribal forests with relaxed management requirements, this will undermine Congressional intent both on the tribal land and the “sacrifice zone” on surrounding BLM lands.

**Conclusion**

BLM should not weaken the conservation elements of the NWFP. The planning criteria need to recognize the well supported science and information supporting the Northwest Forest Plan, which was identified as the bare legal minimum, and allowed the maximum amount of logging possible while complying with all the laws.

- Science still supports the principle that reserves work best when they are larger and more closely spaced, and protected species that are associated with older closed canopy forests will suffer if reserves are smaller and more widely spaced in order to facilitate more logging that removes important habitat elements.
- BLM lands play a critical role in east-west habitat connectivity between the Coast Ranges and the Cascades, as well as north-south connectivity along low-elevation foothills of the Coast Ranges and Cascades.
- In light of the invasion of the barred owl, and the fact that it occupies and defends large areas of spotted owls habitat, LSRs and riparian reserves and all mature & old-growth forests all need greater protection than before in order to increase the changes that the two owl species can co-exist instead of competitively exclude each other.
- BLM should avoid regen harvest. There are already too many clearcuts on non-federal lands, and fires are doing just fine creating ample early seral habitat via fire and other disturbance events. Regen logging on BLM lands will increase fire hazard. Mature forests are more fire resilient compared to dense young planted stands that follow regen logging. Regen logging also has significant long-term adverse effects on forest carbon storage (creating a carbon deficit that does not reach “carbon parity” for a very long time) so it exacerbates global climate change and ocean acidification.
- The highly-productive low-elevation publicly-owned forests managed by BLM are highly valuable for carbon storage and climate mitigation. The public does not have to pay anyone to store carbon on these forests we already own them. BLM just has to let the forests grow. Carbon storage should become a primary emphasis of future management of these forests, and that goal harmonizes quite well with clean water, wildlife habitat, recreation, quality of life, natural disturbance regimes, community stability, watershed protection, permanent forest production, recovery of threatened & endangered species, fire hazard reduction (by maintaining relatively more resilient mature & old-growth forests), etc.
- BLM should strive to achieve community stability by providing ecosystem services, providing clean water, maintaining quality of life, helping communities diversify their economy, and avoiding destabilizing pressures: like climate uncertainty, regulatory uncertainty, local economies that are too dependent on cyclic boom-bust industries like timber, etc.
• Sustained yield logging should be kept to a bare minimum. BLM planning criteria should recognize that private interests with economic motives already controls more than half of the productive capacity of Oregon forest landscape. Private lands provide plenty of wood and jobs and profit. BLM lands play a critical role providing what private lands do not provide, i.e., high quality water, wildlife habitat, recreation, quality of life, or carbon storage. These public values must be the focus of public land management.

Note: If any of these web links in this document are dead, they may be resurrected using the Wayback Machine at Archive.org. [http://wayback.archive.org/web/](http://wayback.archive.org/web/)

Sincerely,

Doug Heiken

Attached:
To: BLM Oregon                                                                                             3/25/14
Attn: RMPs for Western Oregon Planning Team
1220 S.W. 3rd Avenue
Portland, OR 97204 blm_or_rmps_westernoregon@blm.gov
Attn: BLM Outdoor Recreation Planner -- RMP Western Oregon Planning Team

From: Dr. and Mrs. Gilbert Hice
953 Foots Creek,
Gold Hill, OR 97525 audoc@q.com (please use email to update)

Subject: Request removal of Johns Peak Timber Mountain in Western Oregon from an OHV Emphasis Area listing or to include it on a list of alternatives so that it may be voted on with the option to “reject” its OHV conversion by citizens directly impacted by such a designation.

To whom this may concern:

We have an adjoining property (own 80 acres) to the proposed Johns Peak Timber Mountain OHV. For years this proposed designation has been an on-going concern. We have attended BLM meetings, where it was obvious that we were invited only to listen to what “was going to be done by BLM” regardless of our concerns for safety from increased fire danger, trespassers and increased traffic through the area. I was once told point blank by BLM staff that “the decision has already been made”.

Now at 61 years of age I can still remember the beauty of the area when I was a boy. Dwindling, natural treasures here still exist-- biofluourescent larvae found In autumn leaves after sunset (which no one has identified though a specimen was given to the entomology department at SOU, which they lost) and the Franklin bumble bee (who some think extinct but I believe still exists in this area and believe I saw at least one last year) are just two examples of natural possible victims for which this area is a sanctuary. As a boy I fought lightning fires in the proposed area; because of the area’s ruggedness they were difficult to contain; the ODF has listed this rightfully as being an extreme fire danger area. Conditions seem to be worsening each year, especially with more people and homes in the surrounding area. We’ve heard proponents assure us that our safety should not be further compromised by the OHV designation – it will be significantly! Also, to my understanding, additional extended water right allowances for private properties in this watershed have not been granted for years (since about 2003) by the Oregon Water Resources Department, Salem, OR because of the locally stressed hydraulics that directly impact Foots Creek and the Rogue River and the associated salmon and aquatic populations. Increased soil erosion from increased activity will certainly add to a “water” negative for the salmon and wildlife. Our concern for this area’s quick natural demise if not protected is very real and disconcerting. If designated as anything, this area should be a preserve. We still have islands of Oak Savannah Biome that are rare and natural in the area, where the natives hunted acorns and deer. There is a lot more to lose here for local citizens and our country’s heritage than would be gained by the destructive recreational use of special-interest groups.

This is a sensitive ecosystem that, in our opinion, is hanging by a thread which the OHV designation seems ready to cut. The plans for this area are misconceived for recreation and have been obviously supported by BLM in spite of real concerns about sanctioned atv and motor-cycle access. Please allow the residents who are impacted here to have a voice, for the record. At the very least, allow us to vote on this area with the independent option of it not being considered for RMP OHV designated area.

Respectfully, Gilbert and Patricia Hice
BLM Oregon
Attn: RMPs for Western Oregon Planning Team
1220 S.W. 3rd Avenue
Portland, OR 97204

3/31/2014

RE: Resource Management Plans for Western Oregon

Thank you for the opportunity to provide public comment on BLM Resource Management Plans for Western Oregon. Beyond Toxics's mission is to work for all Oregonians to find causes of toxic pollution and help communities find solutions that protect human and environmental health.

We request that the Natural Selection Alternative (NSA) be included in the alternatives to be fully evaluated in the EIS for the new RMPs for Western Oregon. The Natural Selection Alternative is based on the best available science and offers a solution for long term economic stability and social health. The NSA will best achieve BLM stated objectives while minimizing environmental impacts.

In December 2013, Beyond Toxics published the report "Oregon's Industrial Forests and Herbicide Use: A Case Study of Risk to People, Drinking Water and Salmon." This report makes clear that forestry methods currently favored in Western Oregon (on private land) threaten forestry ecosystems and rural community health. Although the data in the report applies to private forestry management, we cite this report as a demonstration of poor resource management. Private timber operations lack of good research and alternative management strategies that will help implement needed modernization: It is important that our federal government provide sound forestry management models that can serve as examples for state and private forestry practices. Natural Selection Alternative will best promote and monitor new scientific information related to forest health and resiliency; carbon sequestration and climate change; and the socio-economic needs of western Oregon communities.

Compared to other options, and compared to what is currently allowed on state and private forest lands in Western Oregon, the Natural Selection Alternative, will promote the recovery of threatened and endangered species, provide clean water, restorefire adapted ecosystems, produce a sustained yield of timber products, and provide for recreation opportunities.

I request that the BLM include the NSA in the EIS for the revised RMPs, to be evaluated for the great many opportunities to enhance the economic vitality of the Western Oregon counties in a manner consistent with environmental health and community well being of local communities envisioned by the O&C Act. The NSA meets all environmental protection legal requirements as it places forest health first.

Please enter our entire report, linked here, into the public record. We look to the BLM to lay the foundation for all forest products and uses at a sustainable level, providing community long term economic stability and social health. The BLM plays the key role to help Western Oregon forests enter a new era of sustainable management for the good of future generations.

Sincerely, Lisa Arkin, Executive Director
respects to drugs and that such information submitted to FDA is available to all interested persons in a timely fashion.

II. Comments

Interested persons may submit either electronic comments regarding this document to http://www.regulations.gov or written comments to the Division of Dockets Management (see ADDRESSES). It is only necessary to send one set of comments. Identify comments with the docket number found in brackets in the heading of this document. Received comments will be posted to the docket at http://www.regulations.gov and may be seen in the Division of Dockets Management between 9 a.m. and 4 p.m., Monday through Friday.


Leslie Kux,
Assistant Commissioner for Policy.
[FR Doc. 2013–08120 Filed 4–8–13; 8:45 am]
BILLING CODE 4160–01–P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

Endangered and Threatened Wildlife and Plants; 90-Day Finding on a Petition to List Two Populations of Black-Backed Woodpecker as Endangered or Threatened

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of petition finding and initiation of status review.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce a 90-day finding on a petition to list the Oregon Cascades-California population and Black Hills population of the black-backed woodpecker (Picoides arcticus) under the Endangered Species Act of 1973, as amended (Act), as subspecies or distinct population segments (DPSs) that are endangered or threatened, and to designate critical habitat concurrent with listing. Based on our review, we find that the petition presents substantial scientific or commercial information indicating that listing the Oregon Cascades-California and Black Hills populations of the black-backed woodpecker as subspecies or DPSs may be warranted. Therefore, with the publication of this notice, we are notifying the public that, when funds become available, we will be initiating a review of the status of the two populations to determine if listing either or both the Oregon Cascades-California population and the Black Hills population as either subspecies or DPSs is warranted. To ensure that this status review is comprehensive, we are requesting scientific and commercial data and other information regarding these two populations. Based on the status review, we will issue a 12-month finding on the petition, which will address whether the petitioned action is warranted, as provided in section 4(b)(3)(B) of the Act.

DATES: We request that we receive information on or before June 10, 2013. The deadline for submitting an electronic comment using the Federal eRulemaking Portal (see ADDRESSES section, below) is 11:59 p.m. Eastern Time on this date. After June 10, 2013, you must submit information directly to the Division of Policy and Directives Management (see ADDRESSES section, below). Please note that we might not be able to address or incorporate information that we receive after the above requested date.

ADDRESSES: You may submit information by one of the following methods:

(1) Electronically: Go to the Federal eRulemaking Portal: http://www.regulations.gov. Search for Docket No. FWS–R8–ES–2013–0034, which is the docket number for this action. Then click on the Search button. You may submit information for consideration in our status review by clicking on “Comment Now!”

(2) By hard copy: Submit by U.S. mail or hand delivery to: Public Comments Processing, Attn: FWS–R8–ES–2013–0034; Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 N. Fairfax Drive, MS 2042–PDM; Arlington, VA 22203.

We will not accept emails or faxes. We will post all information we receive on http://www.regulations.gov. This generally means that we will post any personal information you provide us (see the Request for Information section below for more details).


SUPPLEMENTARY INFORMATION:

Request for Information

When we make a finding that a petition presents substantial information indicating that listing a species may be warranted, we are required to initiate review of the status of the species (status review). For the status review to be complete and based on the best available scientific and commercial information, we request information on the Oregon Cascades-California population and the Black Hills population of the black-backed woodpecker from governmental agencies, Native American tribes, the scientific community, industry, and any other interested parties. We seek information on:

(1) The species’ biology, range, and population trends, including:
(a) Habitat requirements for feeding, breeding, and sheltering;
(b) Genetics and taxonomy of the Oregon Cascades-California and the Black Hills populations of the black-backed woodpecker, including information that would pertain to whether either, or both, populations can be listed under the Act (16 U.S.C. 1531 et seq.) as either subspecies or DPSs;
(c) Historical and current range including distribution patterns, and presence or absence of physical, physiological, or behavioral barriers to movement between populations;
(d) Historical and current population levels, and current and projected trends; and
(e) Past and ongoing conservation measures for the species, its habitat, or both.

(2) The factors that are the basis for making a listing determination for a species under section 4(a) of the Act, which are:
(a) The present or threatened destruction, modification, or curtailment of its habitat or range;
(b) Overutilization for commercial, recreational, scientific, or educational purposes;
(c) Disease or predation;
(d) The inadequacy of existing regulatory mechanisms; or
(e) Other natural or manmade factors affecting its continued existence.

If, after the status review, we determine that listing either an Oregon Cascades-California population or a Black Hills population of the black-backed woodpecker is warranted, we will propose critical habitat (see definition in section 3(5)(A) of the Act) under section 4 of the Act, to the maximum extent prudent and determinable at the time we propose to list the species. Therefore, we also request data and information on:
(1) What may constitute “physical or biological features essential to the conservation of the species,” within the geographical range currently occupied by the species;
(2) Where these features are currently found;
(3) Whether any of these features may require special management considerations or protection;
(4) Any areas outside the geographical area occupied by the species that are “essential for the conservation of the species” and why; and
(5) What, if any, critical habitat you think we should propose for designation if the species is proposed for listing, and why such habitat meets the requirements of section 4 of the Act.

Please include sufficient information with your submission (such as scientific journal articles or other publications) to allow us to verify any scientific or commercial information you include. Submissions merely stating support for or opposition to the action under consideration without providing supporting information, although noted, will not be considered in making a determination. Section 4(b)(1)(A) of the Act directs that determinations as to whether any species is an endangered or threatened species must be made “solely on the basis of the best scientific and commercial data available.”

You may submit your information concerning this status review by one of the methods listed in the ADDRESSES section. If you submit information via the Commission will post on the Web site. If your submission is made via a hardcopy that includes personal identifying information, you may request at the top of your document that we withhold this personal identifying information from public review. However, we cannot guarantee that we will be able to do so. We will post all hardcopy submissions on http://www.regulations.gov.

Information and supporting documentation that we received and used in preparing this finding is available for you to review at http://www.regulations.gov, or by appointment, during normal business hours, at the U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office (see FOR FURTHER INFORMATION CONTACT).

Background

Section 4(b)(3)(A) of the Act requires that we make a finding on whether a petition to list, delist, or reclassify a species presents substantial scientific or commercial information indicating that the petitioned action may be warranted. We are to base this finding on information provided in the petition, supporting information submitted with the petition, and information otherwise available in our files. To the maximum extent practicable, we are to make this finding within 90 days of our receipt of the petition and publish our notice of the finding promptly in the Federal Register.

Our standard for substantial scientific or commercial information within the Code of Federal Regulations (CFR) with regard to a 90-day petition finding is “that amount of information that would lead a reasonable person to believe that the measure proposed in the petition may be warranted” (50 CFR 424.14(b)). If we find that substantial scientific or commercial information was presented, we are required to promptly initiate a species status review, which we subsequently summarize in our 12-month finding.

Petition History

On May 8, 2012, we received a petition dated May 2, 2012, from the John Muir Project of the Earth Island Institute, the Center for Biological Diversity, the Blue Mountains Biodiversity Project, and the Biodiversity Conservation Alliance (EII et al. 2012, pp. 1–16) (petitioners), requesting that the Oregon Cascade-California population and the Black Hills population of the black-backed woodpecker each be listed as an endangered or threatened subspecies, and that critical habitat be designated concurrent with listing under the Act. The petition also requested that, should we not recognize either population as subspecies, we consider listing each population as an endangered or threatened distinct population segment (DPS). The petition clearly identified itself as such and included the requisite identification information for the petitioners, required at 50 CFR 424.14(a). In a June 29, 2012, letter to the John Muir Project of the Earth Island Institute, we responded that our initial review of the information presented in the petition did not indicate that an emergency regulation temporarily listing the species under section 4(b)(7) of the Act was warranted. We also stated that we were required to complete a significant number of listing and critical habitat actions pursuant to court orders, judicially approved settlement agreements, and other statutory deadlines, in Fiscal Year 2012, but that we secured funding for Fiscal Year 2012 to allow us to respond to the petition in Fiscal Year 2012. In addition, we stated that we anticipated making an initial finding in Fiscal Year 2013 as to whether the petition contains substantial information indicating that the petitioned action may be warranted. This finding addresses the petition.

Previous Federal Actions

There are no previous Federal actions involving the black-backed woodpecker, or any subspecies or populations of black-backed woodpecker.

Species Information

The black-backed woodpecker is similar in size to the more common American robin (Turdus migratorius) and is heavily barred with black and white sides. Its flanks have nearly solid black upper parts, and it has a white throat (Dawson 1923, pp. 1007–1008). Males and young have a yellow crown patch, while the female crown is entirely black. Its sooty-black dorsal plumage camouflages it against the black, charred bark of the burned trees upon which it preferentially forages (Murphy and Lehnhausen 1998, p. 1366; Dixon and Saab 2000, p. 1). The black-backed woodpecker has only three toes on each foot instead of the usual four. This is one of several adaptations, including skull modifications, that makes it among the most specialized of birds for delivering hard blows to dig out wood-boring insect larvae, although at the expense of reducing their tree-climbing ability (Bock and Bock 1974, p. 397; Goggans et al. 1989, p. 2).

Diet and Foraging

Black-backed woodpeckers have a narrow diet, consisting mainly of larvae of wood-boring beetles and bark beetles (Cerambycidae, Buprestidae, and Scolytidae) (Goggans et al. 1989, pp. 20, 34; Villard and Beninger 1993, p. 73; Murphy and Lehnhausen 1998, pp. 1366–1367; Powell 2000, p. 31; Dudley and Saab 2007, p. 593), which are available following large-scale disturbances, especially high-severity fire (Nappi and Drapeau 2009, p. 1382). In burned forests, black-backed woodpeckers feed primarily on wood-boring beetle larvae (Villard and Beninger 1993, p. 73; Murphy and Lehnhausen 1998, pp. 1366–1367; Powell 2000, p. 31). Most wood-boring beetles are unable to attack living trees, and concentrate heavily in fire-killed wood (reviewed in Powell 2000, p. 78), although they also are found in other recently killed trees (Bull et al. 1986, p. 13; Bonnot et al. 2009, pp. 220–225). Wood-boring beetle larvae lay eggs soon after disturbance; larvae live inside the sapwood and emerge as adults approximately 4 years later. Wood-boring beetles are an efficient food...
source for the woodpecker because, where habitat is appropriate, they are abundant in small areas and can be exploited with hard blows, but little climbing (Goggins et al. 1989, p. 2; Nappi and Drapeau 2009, p. 1387). The black-backed woodpecker consumes bark beetle larvae from trees during beetle infestations (Goggins et al. 1989, pp. 20, 34; Powell 2000, pp. 77–79).

Utilization of live or dead trees for foraging may differ, depending on site or disturbance type. In a bark-beetle infestation in Oregon, Bull et al. (1986, p. 13) found that black-backed woodpeckers used live and dead trees for foraging in approximately equal proportions. In the Sierra Nevada Range, black-backed woodpeckers have been found to forage preferentially on large trunks of snags in burned forests (Hanson and North 2008, p. 780).

Although they forage on several species of live trees, they use snags (dead trees) more than expected based on snag availability (Raphael and White 1984, pp. 33–36).

Breeding

The black-backed woodpecker is a cavity-nesting bird. It nests in late spring, with nest excavation generally occurring from April to June, depending on location and year. Clutch size averages three to four eggs. Both parents incubate the eggs and brood the young; adults collect insect prey for the young within several hundred meters of the nest. The black-backed woodpecker nests in live and dead trees of various species (including Douglas-fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*), ponderosa pine (*Pinus ponderosa*), red fir (*Abies magnifica*), and quaking aspen (*Populus tremuloides*), depending upon local forest type and condition (see review in Dixon and Saab 2000, pp. 11–14). Bull et al. (1986, p. 9) conclude that the black-backed woodpecker prefers to nest in dead pines because pines have a thicker layer of sapwood, which decays more quickly than heartwood and thus should be more suitable for excavation. They also conclude that trees less than 50 centimeters (cm) (20 inches [in]) diameter at breast height are preferred because they contain a higher percentage of sapwood than do larger trees. In the Sierra Nevada Range, nests are found primarily in dead trees and secondarily nests are found in the dead portions of live trees (Raphael and White 1984, p. 19). Black-backed woodpeckers select nest sites in stands where tree densities are greater than average, respectively (1986, pp. 423–425), and select, unlogged burned forests over logged, burned forests for nesting (Saab et al. 2007, pp. 100–101, 103). Nest sites in burned forests are positively correlated with areas of high pre-fire canopy cover and high wood-boring insect abundance (Raphael and White 1984, pp. 55–57; Russell et al. 2007, p. 2603–2604; Bonnot et al. 2009, pp. 225–227).

**Range**

The black-backed woodpecker occurs across dense, closed-canopy boreal and montane coniferous forests of North America (Winkler et al. 1995, p. 296; Dixon and Saab 2000, p. 4). They are resident from western Alaska to northern Saskatchewan and central Labrador, south to southeastern British Columbia, central northwestern Wyoming, southwestern South Dakota, central Saskatchewan, northern Minnesota, southeastern Ontario, and northern New England (Dixon and Saab 2000, pp. 2–3; NatureServe 2008, pp. 5–6). In the Rocky Mountains and to the east, the species reaches its southernmost distribution in northwest Wyoming and the Black Hills, and is apparently absent from the central and southern Rocky Mountains, where the pine forests may be too poorly developed to attract the species (Bock and Bock 1974, p. 397; Dixon and Saab 2000, pp. 2–3).

In Washington State, the black-backed woodpecker occurs mainly on the eastern side of the Cascade Range and in the Blue Mountains (Dixon and Saab 2000, p. 2), although range maps also place them in the Rocky Mountains where the range transects the northeastern portion of the State (NatureServe 2008). In Oregon, the species is found mainly on the eastern side of the Cascade Range, throughout the Blue Mountains and Wallowa Mountains in northeastern Oregon, and the Siskiyou Mountains in southwestern Oregon. From Oregon, the range continues south into California along the higher elevation eastern slopes of the Cascade and Sierra Mountains to eastern Tulare County; the California range also extends west through the Siskiyou and Klamath Mountains and east to the Warner Mountains (Dawson 1923, p. 1007; Grinnell and Miller 1944, p. 248; Dixon and Saab 2000, p. 2).

The black-backed woodpecker’s breeding range generally corresponds with the location of boreal and montane coniferous forests throughout its range. East of the Rocky Mountains, the species breeds south to central Alberta, Saskatchewan, and Manitoba to the northern portions of Minnesota, Wisconsin, and Michigan (Dixon and Saab 2000, p. 2). In Oregon, the breeding range predominantly occurs in montane lodgepole pine and lodgepole pine-dominated mixed-conifer forest, but also includes burned and unburned ponderosa pine forest (Dixon and Saab 2000, p. 4). The breeding habitat of the black-backed woodpecker in the Black Hills is predominantly ponderosa pine forest (Vierling et al. 2008, p. 422).

The black-backed woodpecker is mainly sedentary (does not leave the range where resident) during the winter and does not have a regular latitudinal migration. However, the species is subject to periodic irruptions southward from the boreal forest into southern Ontario and the northern United States (from Minnesota to New England) during the fall and winter months. These irruptions can vary in magnitude from a few wandering birds to very irregular irruptions involving large numbers of individual birds. During winter irruptions, birds move to areas south of the eastern boreal breeding range to opportunistically forage on outbreaks of wood-boring beetles.

Winter records have occurred south to midwestern States, Pennsylvania, and New Jersey (Dixon and Saab 2000, pp. 2–4), with some individuals remaining in the southern locations for up to 193 days (Yunick 1985, p. 139; Winkler et al. 1995, p. 296; Dixon and Saab 2000, pp. 3–4). Such irruptions demonstrate the species’ ability to move long distances over unforested habitats. In the Sierra Nevada Range, some sources suggest that black-backed woodpeckers may move downslope in winter (Siegel et al. 2010, p. 7).

**Habitat**

At the landscape scale, while not tied to any particular tree species, the black-backed woodpecker generally is found in older conifer forests comprised of high densities of larger snags (Bock and Bock 1973, p. 400; Russell et al. 2007, p. 2604; Nappi and Drapeau 2009, p. 1388; Siegel et al. 2012, pp. 34–42). The species is closely associated with standing dead timber that contains an abundance of snags (Dixon and Saab 2000, pp. 1–7, 15). Black-backed woodpeckers appear to be most abundant in stands of trees recently killed by fire (Hutto 1995, pp. 1047, 1050; Smucker et al. 2005, pp. 1540–1543) and in areas where beetle infestations have resulted in high tree mortality (Bonnot et al. 2009, p. 220). In the western United States, black-backed woodpeckers show a strong association with burned forest conditions (Siegel et al. 2010, p. 9; Hutto 2008, p. 1831); in the northern Rockies, they are 16 times more likely to be found in burned forest than in the next most commonly occupied vegetation type (Hutto 2008, p. 1833).
and Saab (2000, p. 3) have reported that literature does contain limited (AOU 1957, p. 330), although earlier published subspecies names in 1957 black-backed woodpecker were pp. 392–393), and no subspecies of the woodpecker as a species (AOU 1983, p. 392), the black-backed woodpecker. First described by Swainson and Richardson in 1832 (American Ornithologists’ Union (AOU) 1983, p. 392), the black-backed woodpecker probably evolved in North America from an ancestor in common with the three-toed woodpecker, *Picoides tridactylus* (Bock and Bock 1974, pp. 402–403). The scientific community recognizes the black-backed woodpecker as a species (AOU 1983, pp. 392–393), and no subspecies of the black-backed woodpecker were included at the time that AOU last published subspecies names in 1957 (AOU 1957, p. 330), although earlier literature does contain limited references to different taxonomy. Dixon and Saab (2000, p. 3) have reported that in 1900, Bangs described a more slender-film form (*tenuirostris*) in the Cascades and the Sierra Nevada. In their *Distribution of the Birds of California,* Grinnell and Miller (1944, p. 248) note the names black-backed three-toed woodpecker and Sierra three-toed woodpecker (*Picoidea arctica tenuirostris* and *Picoidea tenuirostris*) as synonyms for the species, but do not provide additional information on taxonomy. They describe the species’ range as being of small extent and interrupted nature, chiefly in the Cascade Mountains and the high northern and central Sierra Nevada Range.

The petition (EII et al. 2012, pp. 12–15) included as supporting information a recent genetic study (Pierson et al. 2010) that identifies three distinct genetic groupings of the black-backed woodpecker: A large, genetically continuous population that spans the northern continuous forest (boreal forest) from the northern Rocky Mountains and Alberta, Canada, to Quebec (“boreal” population hereafter); a small and isolated population in the Black Hills of southwestern South Dakota and northeastern Wyoming; and a population in the Cascade Range of Oregon (Pierson et al. 2010, pp. 1, 3, 6–13). The Washington Cascades are mapped as part of the boreal population (Pierson et al. 2010, pp. 3, 8; see also NatureServe 2008, p. 5). The petitioners have relied on the Pierson et al. (2010) study results to propose that this new information may warrant a revised interpretation of the taxonomic description of the species (EII et al. 2012, pp. 13–16). The findings by Pierson et al. (2010, entire) are discussed in the “Classification of Listable Entities” section below.

### Population Status and Trend

No systematic, long-term, rangewide surveys have been conducted for the black-backed woodpecker. However, despite its widespread breeding distribution, the black-backed woodpecker is considered locally rare (Dixon and Saab 2000, p. 1), with low densities and large home ranges (Dudley and Saab 2007, p. 593). Some indication of population trend is based on anecdotal observations that indicate the species was at least locally “common” over 100 years ago (Cooper 1870, p. 385), but is considered “rare” by more current sources (Dixon and Saab 2000, p. 1; EII et al. 2012, pp. 38–39, 41). However, despite its rarity, the information provided by the petitioners does not indicate a clear decrease in the species’ current range compared to its historical range, although patterns of genetic structure may suggest some changes in the species over time (Pierson et al. 2010, pp. 10, 12). References provided by the petitioners also suggest that intensive human impacts to habitat within the species’ range may have reduced suitable habitat within the mountain ranges of the Oregon Cascades-California and Black Hills populations (Shinneman and Baker 1997, pp. 1278–1286; Vierling et al. 2008, pp. 422, 423; Cahall and Hayes 2009, p. 1127). In the Black Hills, for example, nearly every acre is reported to have been logged or thinned at least twice since the late 1800s, with widespread logging and human-caused fires having occurred in the Black Hills by 1891 (Shinneman and Baker 1997, pp. 1278–1279).

Black-backed woodpeckers are opportunistic in response to changes in forest structure and composition that are created by fire and insect outbreaks, and that provide the specialized food and nesting resources utilized by the species (Dixon and Saab 2000, p. 15). Thus, black-backed woodpecker populations are subject to significant fluctuations. Their numbers may be low in unburned or undisturbed forests, but increase rapidly following fires or other disturbance, in response to increased populations of wood-boring beetles and bark beetles (Dixon and Saab 2000, p. 15). Abundance of black-backed woodpeckers is thus thought to be strongly influenced by the extent of fires and insect outbreaks (Dixon and Saab 2000, p. 15).

In the Sierra Nevada Range, two large-scale, annual bird monitoring programs, the Breeding Bird Survey and the Monitoring Avian Productivity and Survivorship Program, have detected black-backed woodpeckers throughout the region in small numbers, but data are too sparse for estimating regional populations (see Siegel et al. 2008, p. 4). Siegel et al. (2010, pp. 1–3, 44–45) have found that black-backed woodpeckers are relatively rare, yet widely distributed over the 10 national forests in the Sierra Nevada. In their study of 51 fire areas between 1 and 10 years after fire occurred on the 10 national forests, they used survey results combined with modeling to estimate that approximately 81,814 ha (202,167 ac) of the 323,356 ha (799,035 ac) of burned forest were occupied by the woodpecker, and found that results indicating that the species is most common within a few years after high-severity fire were in general agreement with published studies from elsewhere within the species’ range. They provide preliminary estimates that this occupied habitat could contain 470, 538, or 1,341 pairs, based on varying home-range size estimates reported elsewhere within the species’ range, but they caution that estimates are not reliable until home
range sizes are determined for the Sierras.

In the Black Hills, the black-backed woodpecker population is thought to be quite small. Bonnot et al. (2008, p. 450) report that the South Dakota Department of Game, Fish, and Parks lists the species as locally rare and vulnerable to extinction. A baseline population study in 2000 estimated approximately 1,200 black-backed woodpeckers in the Black Hills at that time (USDA 2005a, p. III–241). Small population size is supported by the findings of Pierson et al. (2010, p. 12) that the population has a small genetically effective population size.

Evaluation of Listable Entities

Under section 3(16) of the Act, we may consider for listing any species, including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature (16 U.S.C. 1532(16)). Subpopulations are considered eligible for listing under the Act (and, therefore, are referred to as listable entities) if we determine that they meet the definition of an endangered or threatened species. The petitioners have requested that the Oregon Cascades-California population and the Black Hills population of the black-backed woodpecker each be listed under the Act as either a subspecies or as a distinct population segment.

Evaluation of Information Provided in the Petition and Available in our Files Regarding Subspecies Status for the Oregon Cascades-California and Black Hills Populations

The petitioners have requested that we consider each population as a separate subspecies based on the results of Pierson et al. (2010, p. 11) indicating that genetic samples from black-backed woodpeckers in the Oregon Cascades and the Black Hills display a degree of genetic differentiation from the boreal population, and from each other, that is similar to the genetic differentiation found between subspecies or clades of other birds occupying similar ranges. Additionally, Pierson et al. (2010, p. 10) suggested low genetic diversity patterns within the Oregon Cascades and Black Hills populations indicate that each population has a shared ancestry with the boreal population, without much current gene flow. According to Pierson et al. (2010, pp. 2, 3), the eastern Cascade Range of Oregon and the Sierra Nevada Range of California are geographically separated from the remainder of the species’ range, but not from each other, suggesting that further resolution of populations in California, Oregon, and Washington is needed. Pierson et al. (2010), however, did not propose subspecies status for any populations.

The AOU, the recognized authority for taxonomy of North American birds, has not listed subspecies since 1957, stating space limitations, and also noting that the validity (in the sense of their distinguishability) of many described avian subspecies still needs to be evaluated, as does the potential for unrecognized subspecies (AOU 1983, p. 284; AOU 1998, pp. 1–19). The 1957 AOU checklist did not list subspecies of black-backed woodpecker (p. 330), and neither the Oregon Cascades-California nor the Black Hills population of the black-backed woodpecker has since been proposed or recognized as a subspecies. Given the recent genetic information published by Pierson et al. (2010, p. 11), the information available to us at this stage is not clear as to whether these populations may qualify as subspecies. We request further information should it become available, and will revisit this question when conducting our status review.

Evaluation of Information Provided in the Petition and Available in our Files Regarding Distinct Population Segment Status for the Oregon Cascades-California and Black Hills Populations

In determining whether an entity constitutes a DPS, and is therefore a listable entity under the Act, we follow the Policy Regarding the Recognition of Distinct Vertebrate Population Segments Under the Endangered Species Act (DPS Policy) (61 FR 4722; February 7, 1996). Under our DPS Policy, we analyze three elements prior to making a decision to establish and classify a possible DPS: (1) The discreteness of the population segment in relation to the remainder of the taxon; (2) the significance of the population segment to the taxon to which it belongs; and (3) the population segment’s conservation status in relation to the Act’s standards for listing (i.e., is the population segment, when treated as if it were a species, endangered or threatened?) (61 FR 4722). This finding considers whether the petitioned Oregon Cascades-California population or the Black Hills population of the black-backed woodpecker may be considered a DPS under our 1996 DPS policy.

Under our DPS Policy, a population segment of a vertebrate species may be considered discrete if it satisfies either one of the following conditions: (1) It is markedly separated from other populations of the same species as a consequence of physical, physiological, ecological, or behavioral factors (quantitative measures of genetic or morphological discontinuity may provide evidence of this separation); or (2) It is delimited by international governmental boundaries within which significant differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist (61 FR 4722).

If a population segment is considered discrete under either of the conditions described in our DPS policy, we then consider its biological and ecological significance to the taxon to which it belongs. This consideration may include, but is not limited to, the following: (1) Persistence of the discrete population segment in an ecological setting that is unusual or unique for the taxon; (2) Evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon; (3) Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historical range; or (4) Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics (61 FR 4722).

Oregon Cascades-California Population Discreteness—The petitioners provide recent genetic information (Pierson et al. 2010, pp. 1–16) to support their presentation of the Oregon Cascades-California population as markedly separated, or discrete, from the boreal and Black Hills populations of the black-backed woodpecker. They rely on the conclusions of Pierson et al. 2010 (pp. 10–13) that genetic results indicate that large gaps among forested sites apparently act as behavioral barriers to movement of females, and create a higher resistance to movement for males. Pierson et al. (2010, pp. 6–11) conclude that the geographic locations of sharp discontinuities in gene flow match breaks in the large forested areas between the Rocky Mountains and Oregon, and also conclude that a barrier likely exists between Oregon and the boreal forest to the north. However, they further note that, for conservation planning purposes, it will be important to determine if the Oregon population is connected to the California or Washington populations (Pierson et al. 2010, pp. 11, 13). The authors note that irruptions indicate that the species is physiologically capable of long-distance movements, but also note that because the irruptions occurred almost exclusively outside of the breeding season, they do not represent natal or breeding dispersal. The petitioners did
not present, nor do we have, additional information on the genetics of black-backed woodpecker populations that would provide additional evidence of marked separation of the Oregon Cascades-California population.

Various materials provided by the petitioners indicate gaps in forested habitat may support a potential behavioral or geographic separation between the eastern Oregon Cascades and the Washington populations (Winkler et al. 1996, p. 296; Pierson et al. 2010, p. 3; EII et al. 2012, p. 17). Ecotone and forest mapping (USDA 2008, pp. 4, 5) indicate that between the eastern Oregon Cascade Range and the Blue and Wallowa Mountains of northeastern Oregon, there may be gaps in dense, montane forest cover, which is the type of habitat in which the species typically occurs. Range maps provided by the petitioners show differing degrees of continuity in the species’ range in Washington and Oregon, with more recent maps showing discontinuity in the species’ range between the Washington and Oregon Cascades, where the Columbia Basin bisects the mountain range, and also between the Oregon Cascades and the Blue and Wallowa Mountains in the northeastern portion of the State (Bock and Bock 1974, p. 399; Winkler et al. 1995, p. 296; Dixon and Saab 2000, p. 1; National Geographic Society 2008, unpaginated; NatureServe 2009, unpaginated). These range maps show the distribution of the black-backed woodpecker in the Oregon Cascades as continuous with the species’ range in California (Winkler et al. 1995, p. 296; Dixon and Saab 2000, p. 1; National Geographic Society 2008, unpaginated; NatureServe 2009, unpaginated).

In consideration of the information the petitioners presented indicating continuity of the Oregon Cascades and California portions of the species’ range, and in the absence of contradictory information, we are including black-backed woodpeckers throughout their California range along with black-backed woodpeckers throughout their range in the Cascade Range of Oregon as one potential DPS. We conclude that the petitioners have presented substantial information to indicate that black-backed woodpecker population segment in the Oregon Cascades and California may be markedly separated from other populations of the species, due to a combination of physical and ecological factors. Genetic data are presented as quantitative evidence of this separation. 

Significance—The petitioners state that the Oregon Cascades-California population meets two of the DPS significance criteria because (1) loss of the population would result in a significant gap in the range of the species, specifically at the periphery of the range of the black-backed woodpecker; and (2) the population differs markedly from other populations of the species in its genetic characteristics (EII et al. 2012, pp. 14–16). The petitioners rely on Service documents (71 FR 56228, 56233; September 26, 2006; and 76 FR 63720, 63732; October 13, 2011), and the references cited therein, to note that there are several reasons why populations at the edge of a species’ range may be important, and why a gap in the range would be significant: Peripheral populations maintain opportunities for speciation and future biodiversity, which allow adaptation to future environmental changes; they may represent refugia for a species as the species’ range is reduced; and genetically divergent peripheral populations are often disproportionately important to the species in terms of maintaining genetic diversity and, therefore, the capacity for evolutionary adaptation (EII et al. 2012, p. 15).

Based on a review of the information in the petition and available in our files, the petitioners have presented substantial information to indicate that loss of the Oregon Cascades-California population may result in a significant gap in the range of the species. Loss of the population would result in the loss of that portion of the range west of the Rocky Mountain corridor and south of the Columbia River (the southwesternmost extent of the range), including the Sierra Nevada Range south to Tulare County, the southern-most portion of the species’ entire range. Additionally, the petitioners cited genetic analyses by Pierson et al. (2010, pp. 1–16) that provide evidence that the Oregon Cascades-California population may differ markedly from other populations of the species in its genetic characteristics.

Black Hills Population

Discreteness—As with the Oregon Cascades-California population, the petitioners provide information that the Black Hills population is genetically distinct from other sampled black-backed woodpecker populations, relying on the recent genetic information in Pierson et al. (2010, pp. 1–16) to support their statement that the Black Hills population is markedly separated, or discrete, from the boreal and Oregon Cascades-California populations because large gaps between forested sites act as behavioral barriers to birds’ movements (Pierson et al. 2010, pp. 10–13). Pierson et al. (2010, p. 11) conclude that, because the black-backed woodpecker’s distribution closely follows the distribution of the boreal forest, gaps in forested habitat are likely to be the ultimate cause of the limited gene flow between geographic regions.

The petitioners state that the Black Hills population also meets the discreteness criterion based on geographic separation as a result of the large gap in forested habitat between the Black Hills and the nearest boreal population (Pierson et al. 2010, p. 3) (EII et al. 2012, pp. 14–16). Range maps consistently show the Black Hills as clearly separated from the boreal and northern Rocky Mountain portions of the range (Bock and Bock 1974, p. 399; Winkler et al. 1995, p. 296; Dixon and Saab 2000, p. 1; National Geographic Society 2008, unpaginated; NatureServe 2009, unpaginated). The Black Hills population is separated from the main range by approximately 200 miles (USDA 2005a, p. III–238). The Black Hills are an isolated, forested mountain range located within the Great Plains in western South Dakota and northeastern Wyoming (Shinneman and Baker 1997, p. 1278; Vierling et al. 2008, pp. 422, 425). The Black Hills portion of the black-backed woodpecker’s range covers a relatively small area of approximately 15,500 square kilometers (5,984 square miles) (Pierson et al. 2010, p. 12). Thus, the petitioners have presented substantial information to indicate that the Black Hills population may be markedly separated from the other populations of the species, due to a combination of physical and ecological factors. Genetic data are presented to provide quantitative evidence of this separation.

Significance—The petitioners state that loss of the Black Hills population would be considered a significant gap at the periphery of the species’ range (EII et al. 2012, pp. 14–16). The petitioners present information to indicate that loss of this population, which would occur at the southern edge of the center of its range, would result in the loss of a disjunct population that is located within the Great Plains. In addition, the Black Hills population may differ markedly from other sampled populations of the species in its genetic characteristics (Pierson et al. 2010, pp. 3–10). Consequently, the petitioners have provided substantial information to indicate that the Black Hills population may meet the significance element of the 1996 DPS policy.
Listable Entity Determination for the Oregon Cascades-California and Black Hills Populations

Based on current knowledge from genetic studies and distribution information presented in the petition and readily available in our files, we determine that the petitioners have presented substantial information indicating that the Oregon Cascades-California population of black-backed woodpecker and the Black Hills population of black-backed woodpecker may be listable entities under the Act either as subspecies or as DPSs.

We base the DPS findings on information indicating the Oregon Cascades-California and the Black Hills populations may meet both the discreteness and significance elements of the Service’s 1996 DPS policy. The populations may meet the discreteness element of the DPS policy because information indicates that each population segment may be markedly separated from each other and from the boreal black-backed woodpecker population as a consequence of physical and ecological factors, and as indicated by genetic differences between black-backed woodpeckers in the Oregon Cascades, Black Hills, and boreal populations. The populations may meet the significance element of the DPS policy because loss of each population may result in a significant gap in the range of the black-backed woodpecker, and because each population segment may differ markedly from other populations of black-backed woodpeckers in its genetic characteristics.

We will further evaluate the weight of evidence available to support subspecies or DPS status for the Oregon Cascades-California and the Black Hills populations during the status review.

Evaluation of Information for this Finding

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations at 50 CFR part 424 set forth the procedures for adding a species to, or removing a species from, the Federal Lists of Endangered and Threatened Wildlife and Plants. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section 4(a)(1) of the Act:

(A) The present or threatened destruction, modification, or curtailment of its habitat or range;

(B) Overutilization for commercial, recreational, scientific, or educational purposes;

(C) Disease or predation;

(D) The inadequacy of existing regulatory mechanisms; or

(E) Other natural or manmade factors affecting its continued existence.

In considering what factors might constitute threats, we must look beyond the mere exposure of the species to the factor to determine whether the species responds to the factor in a way that causes actual impacts to the species. If there is exposure to a factor, but no response, or only a positive response, that factor is not a threat. If there is exposure and the species responds negatively, the factor may be a threat and we then attempt to determine how significant a threat it is. If the threat is significant, it may drive or contribute to the risk of extinction of the species such that the species may warrant listing as endangered or threatened as those terms are defined by the Act. This does not necessarily require empirical proof of a threat. The combination of exposure and some corroborating evidence of how the species is likely impacted could suffice. The mere identification of factors that could impact a species negatively may not be sufficient to compel a finding that listing may be warranted. The information shall contain evidence sufficient to suggest that these factors may be operative threats that act on the species to the point that the species may meet the definition of endangered or threatened under the Act.

In making this 90-day finding, we evaluated whether information regarding threats to either the Oregon Cascades-California population or the Black Hills population of the black-backed woodpecker, as presented in the petition and other information available in our files, is substantial, thereby indicating that the petitioned action may be warranted. Our evaluation of this information is presented below.

A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Information Provided in the Petition

The petitioners state that black-backed woodpecker habitat is directly eliminated, and indirectly reduced or degraded, by management actions that are widely conducted on public and private forests throughout the range of the species. They specify that habitat is systematically lost through post-disturbance salvage logging, active fire suppression, and pre-disturbance tree and brush thinning to reduce fire risk or beetle-induced tree mortality (EII et al. 2012, pp. 45–67).

The petitioners provide little addressing the species in the boreal range, the Black Hills, the eastern Oregon Cascades, and the Sierra Nevada Range to support the identified threats (Hutto 1995, pp. 1053–1054; Dixon and Saab 2000, p. 15; Hoyt and Hannon 2002, p. 1887; Vierling et al. 2008, pp. 426–427; Saab et al. 2007, p. 106; Hutto 2008, pp. 1931–1833; Hanson and North 2008, pp. 779–781; Bonnot et al. 2009, p. 227). References cited by the petitioners indicate that current management prescriptions in black-backed woodpecker habitat are likely insufficient to protect and prevent further declines of the species (Hutto 1995, p. 1054; Hanson and North 2008, pp. 780–781; Cahall and Hayes 2009, pp. 1125–1127). The petitioners also state that future climate change may further reduce habitat availability; this potential threat is evaluated in Factor E, below.

Salvage Logging—The petitioners state that salvage logging of fire- and beetle-killed trees is likely the most important and most well-documented threat to the persistence of black-backed woodpecker throughout its range. They add that every study conducted that has examined the effects of salvage logging on black-backed woodpeckers has documented significant declines in abundance, nest densities, and presence of foraging birds in salvage-logged forests, compared to unlogged post-disturbance forests (EII et al. 2012, pp. 57–60).

The petitioners provide a variety of study results showing that post-fire salvage logging results in lower black-backed woodpecker nest densities, lower foraging presence, and lower overall abundance, compared to levels of the same activities in unlogged burned areas (Hutto 1995, pp. 1047–1050; Caton 1996, pp. 96–111; Murphy and Lehnhansen 1998, pp. 1359, 1362–1368; Saab and Dudley 1998, pp. 6, 11; Hutto and Gallo 2006, p. 825; Saab et al. 2007, pp. 100–101; Cahall and Hayes 2009, pp. 1125–1127).

The petitioners provide information to indicate that salvage logging affects foraging habitat by removing snags that support wood-boring beetle larvae, and that management prescriptions leave insufficient numbers of snags to support adequate foraging resources (see Hanson and North 2008, pp. 780–781). Information provided by the petitioners indicates that black-backed woodpeckers were absent or nearly absent from salvage-logged areas of burned forests in California (Hanson and North 2008, pp. 779–781; Siegel et al. 2012 [see Fig. 10]). The petitioners present a study indicating that, in the eastern Oregon Cascades, salvage logging reduces of black-backed woodpeckers (Cahall and Hayes 2009, pp. 1125–1127). Similarly, the
petitioners cite a study in which the authors found that in areas with high tree mortality due to beetle infestations in the eastern Oregon Cascades, 99 percent of all foraging observations were in beetle-killed forests that had not been salvage-logged, and that the black-backed woodpecker was nearly absent from areas subject to post-disturbance salvage logging (Goggans et al. 1989, Table 8, p. 26). The petitioners provide a number of U.S. Forest Service (USFS) documents that describe recent and planned salvage logging operations in recently burned or beetle-killed areas on national forests in California and Oregon (USDA 2005c, entire; USDA 2005d, entire; USDA 2005e, entire; USDA 2006a, entire; USDA 2009a, entire; USDA 2009b, entire; USDA 2010a, entire; EII et al. 2012, pp. 68–95).

For the Black Hills, the petitioners provide several studies that measure forest stand characteristics associated with nesting in recently burned habitat and in beetle-killed forests, but do not address effects of salvage logging itself, although they present study results that suggest that reductions in snags result in reduced densities of the species (Vierling et al. 2008, pp. 426, 427; Bonnot et al. 2008, p. 455, 456; Bonnot et al. 2009, pp. 224, 225).

The petitioners provide information that indicates fires have occurred regularly and within the relatively recent past within the Black Hills (Shinneman and Baker 1997, pp. 1279–1281; Piva et al. 2005, p. 6; Bonnot et al. 2009, pp. 220, 221). The petitioners indicate that the current fire rotation guidelines in the Black Hills National Forest Plan are not adequate to maintain a viable population of the black-backed woodpecker, based on research addressing effects of salvage logging on the species (Hutto 2006, pp. 988–989; Bonnot et al. 2009, p. 226; Hutto and Hanson 2009, unpaginated).

**Changed Fire Regime Due to Fire Suppression**—The petitioners state that black-backed woodpecker habitat is created by high-intensity fire and large-scale insect outbreaks that kill most of the trees across large areas of dense mature forest (EII et al. 2012, p. 69). They provide information to indicate that fire- and beetle-killed trees generally only support beetle larvae for about 5 years after the disturbance (Dixon and Saab 2000, pp. 4–14). The petitioners state that widespread fire suppression is a threat to the black-backed woodpecker because it has reduced fire frequency and intensity, and the annual extent of area burned. The petitioners present information on historical and current fire acreage, frequency, and severity from California and Oregon. They also provide references to support the information in the petition, and assert that historically there were 3 to 4 times more high-intensity fires within the Oregon and California range of the black-backed woodpecker than there are currently (EII et al. 2012, pp. 60–63).

The petitioners present literature to indicate that in the eastern Oregon Cascades and California, the amount of area burned by fire per year has decreased substantially, and the fire return interval has increased substantially since pre-European conditions, largely as a result of fire suppression (Bekker and Taylor 2001, pp. 23–26; Stephens et al. 2007, pp. 210–213; Hanson et al. 2009, pp. 1316–1317; Baker 2012, pp. 15–22). The petitioners estimate that current high-intensity fire rotation intervals in the Sierra Nevada Range, based on fires from 2002 to 2011, is over 700 years, compared to some studies from the Sierra Nevada that show a high-intensity fire rotation interval historically of 150–350 years (high-intensity fire rotation refers to how often a site would, on average, experience high-intensity fire) (EII et al. 2012, p. 62).

The petitioners conclude that the reduction in fire frequency and intensity is the result of fire suppression activities (EII et al. 2012, pp. 60–67), and this large decline in high-intensity fires since the 19th century likely can be expected to correspond with a similar decline in black-backed woodpecker populations within their range in Oregon and California (EII et al. 2012, pp. 62–65).

For the Black Hills, the petitioners assert that at the turn of the last century, large expanses of forests experiencing high beetle-induced tree mortality and high-intensity fire were a natural part of the ecology in the area that is now the Black Hills National Forest (Shinneman and Baker 1997, p. 1284; Bonnot et al. 2009, p. 220; EII et al. 2012, p. 65), with high-intensity fire typically occurring in intervals of less than 100 years in a given area (Shinneman and Baker 1997, pp. 1279–1281). The petitioners state that since 1980, 225,554 acres (91,278 ha) have burned in the Black Hills National Forest, and this represents a rotation interval for all fire intensities of about 90–100 years. The petitioners state, however, that a majority of the fire acreage has sustained only low-intensity and moderate-intensity fires, and they conclude that the high-intensity fire rotation interval for the Black Hills is at least 300 years, which indicates that suitable burned habitat for black-backed woodpeckers has been greatly reduced (EII et al. 2012, p. 65).

**Forest Thinning**—The petitioners propose that forest thinning also not only prevents higher-intensity fire (or high levels of beetle-caused tree mortality) from occurring in the first place, but also greatly reduces or eliminates post-fire habitat suitability, even if a thinned area does burn (EII et al. 2012, pp. 65–66). They indicate that in addition to the extent to which the thinning reduces fire intensity (by reducing understory trees, and by removing mature trees, thereby increasing spacing between tree crowns) or significant beetle-caused tree mortality (by removing small and mature trees to reduce competition between trees, thereby reducing tree mortality), thinning also affects habitat by reducing pre-disturbance tree densities and canopy cover, forest stand characteristics that are correlated with higher post-disturbance occupancy rates and nest densities for the black-backed woodpecker (Russell et al. 2007, pp. 2603–2608; Vierling et al. 2008, pp. 424–426; Bonnot et al. 2009, p. 226; Saab et al. 2009, pp. 156–158; EII et al. 2012, pp. 65–67).

The petitioners describe several major forest thinning projects in the Oregon Cascades that they think threaten habitat of the black-backed woodpecker. These projects are described as targeting the few remaining dense, older forests on national forest lands, specifically to prevent moderate- and high-intensity fire and to reduce the potential for any significant tree mortality from beetles, which results in reducing suitable habitat for the black-backed woodpecker (EII et al. 2012, pp. 91–95). The petitioners provide numerous environmental and forest planning documents that provide information on planned forest thinning proposals within the range of the Oregon Cascades-California population (USDA 2001, pp. 34–54; USDA 2006b, entire; USDA 2007, entire; USDA 2009a, entire; USDA 2010b, entire; USDA 2011a, entire; USDA 2011b, entire; USDA 2012a, entire; USDA 2012b, entire).

The petitioners state that in the Black Hills, the scale and intensity of two proposed logging projects, the Mountain Pine Beetle Response Program and the Vestal Project, will largely eliminate suitable black-backed woodpecker habitat in the Black Hills National Forest (EII et al. 2012, pp. 96–98; see also Bonnot et al. 2009, pp. 220, 221).

The petitioners provide information that the Black Hills National Forest proposes to remove insect-infested trees, as well as thin trees to reduce future beetle...
outbreaks and to reduce fire frequency and severity.

Evaluation of Information Provided in the Petition and Available in Service Files

A review of the information provided by the petitioners supports the petitioners’ description of the black-backed woodpecker as a habitat specialist that is most often associated with dense conifer stands that have been killed by high-intensity fire or large-scale insect outbreaks within the previous 5 years. Information provided by the petitioners also supports descriptions of declines in fire frequency and fire severity in Oregon, California, and the Black Hills since the 19th century. The petitioners have presented numerous studies that indicate a negative correlation between black-backed woodpecker nesting, foraging, and abundance, and reduced abundance of standing dead trees. The petitioners have provided a variety of USFS documents that indicate that salvage logging, fire suppression, and thinning activities are either planned or being implemented on multiple forests within the respective ranges of the populations. As noted above, the petitioners have provided studies from Oregon, California, and the Black Hills that support their arguments that the Oregon Cascades-California and Black Hills populations are negatively affected by these activities. The scope of these activities suggests that they have the potential to affect a large portion of the range of each of the two populations.

In summary, we conclude that the information provided in the petition or in our files present substantial scientific or commercial information indicating that the petitioned action may be warranted for the Oregon Cascades-California and Black Hills populations of the black-backed woodpecker due to the present or threatened destruction, modification, or curtailment of the populations’ habitat or range as a result of salvage logging, tree thinning, and fire suppression activities throughout their respective ranges.

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Information Provided in the Petition

The petitioners state that there are no specific regulations that prohibit the hunting or killing of the black-backed woodpecker in Oregon, in California, or in the Black Hills, and that there are no available records of the numbers of black-backed woodpeckers that are killed annually through hunting, research, or for other reasons (EII et al. 2012, p. 67); however, the petitioners provide no information to indicate that overutilization for commercial, recreational, scientific, or educational purposes threatens either the Oregon Cascades-California or the Black Hills population of the black-backed woodpecker.

Evaluation of Information Provided in the Petition and Available in Service Files

The materials provided in the petition or available in our files do not indicate that the black-backed woodpecker is hunted. Take is prohibited under the Migratory Bird Treaty Act of 1918 (16 U.S.C. 703–712). Further, the petitioners did not provide, nor do we have in our files, any information on overutilization for scientific research, education, or any other purposes. We find that the information provided in the petition and available in our files does not present substantial scientific or commercial information indicating that the petitioned action may be warranted due to overutilization of the Oregon Cascades-California or Black Hills populations for commercial, recreational, scientific, or educational purposes. We are requesting additional information regarding overutilization of the Oregon Cascades-California and Black Hills populations, and will further evaluate Factor B during the status review for each population and present our findings in the subsequent 12-month finding on this petition.

C. Disease or Predation

Information Provided in the Petition

The petitioners state that predation was a leading cause of nest failures in the Black Hills (EII et al. 2012, p. 67), citing two studies that documented nest failure rates in post-disturbance habitat there (Bonnot et al. 2008, p. 453; Vierling et al. 2008, pp. 424–425). The petitioners also note that predation rates in newly burned areas tend to increase over time as burned areas recover. They provided limited additional information on the potential for predation by raptors (Dixon and Saab 2000, p. 11; EII et al. 2012, pp. 67–68). The petitioners also identified interspecific interactions with other avian species as a threat (EII et al. 2012, p. 68), which we address under Factor E.

The petitioners provide information to indicate that mortality due to nematode parasitism may be a potential threat (Siegel et al. 2012b, p. 421), but further note that more information is needed to determine the extent to which nematode parasitism occurs in black-backed woodpeckers, and the extent to which black-backed woodpeckers may be vulnerable to parasites (EII et al. 2012, p. 68). One bird was reported to have been lost due to nematode parasitism in the Oregon Cascades-California population (Siegel et al. 2012b, pp. 421–424), but no further information was presented regarding the incidence of disease or parasites in either population.

Evaluation of Information Provided in the Petition and Available in Service Files

Review of the information presented by the petitioners suggests that predation and parasitism may have individual-level effects, but no information was provided on what effects, if any, predation and parasitism have at the population level. We found no information in the petition or information readily available in our files to indicate that disease or predation (or parasitism) is negatively impacting the status of the Oregon Cascades-California or the Black Hills populations of the black-backed woodpecker. Therefore, we do not find that there is substantial information to indicate that the Oregon Cascades-California or the Black Hills populations of the black-backed woodpecker may warrant listing due to disease or predation. However, we are requesting any additional information available on the role that predation and parasitism may have on the status of the Oregon Cascades-California and Black Hills populations, and will further evaluate this factor during our status review for each population.

D. The Inadequacy of Existing Regulatory Mechanisms

Information Provided in the Petition

The petitioners state that existing regulatory mechanisms are inadequate to protect the black-backed woodpecker on Federal and private lands in the Oregon Cascades-California and Black Hills populations. As discussed under Factor A, the petitioners explain that the black-backed woodpecker is a habitat specialist that is vulnerable to the impacts of salvage logging, as well as forest thinning and fire suppression activities, which are implemented to reduce occurrence of the high-intensity fire and beetle infestations that create the habitat upon which the species depends. The petitioners provide information on Federal regulatory mechanisms that address forest management, including the National Forest Management Act (NFMA; 16 U.S.C. 1600 et seq.; April 9, 2012 at 77 FR 21162), the 2012 National Forest...
System Land Management Planning Rule (2012 planning rule), the Sierra Nevada Forest Plan Amendment (SNFPA) and its 2004 and 2010 amendments, the Northwest Forest Plan (NWFP), several national forest land and resource management plans (LRMPs) in Oregon, and the Black Hills National Forest LRMP Amendment. They also provide information on State regulatory mechanisms, including the California Forest Practices Rule and the Oregon Forest Practices Act (EII et al. 2012, pp. 68–98). They indicate that there are no regulations that prohibit hunting or killing the species in Oregon, California, and the Black Hills (EII et al. 2012, p. 67).

The petitioners explain that the 2012 planning rule may threaten the black-backed woodpecker, because the rule eliminates the 1982 NFMA planning rule requirement that the USFS maintain viable populations of all native vertebrate species where those species are found on national forest lands (EII et al. 2012, pp. 68–77; http://www.fs.usda.gov/planningrule). The petitioners assert that these changes will affect the vast majority of the habitat in the range of each population, because the NFMA governs forest management activities on all national forests, including those in Oregon, California, and the Black Hills. They state that national forests support over half of the habitat for the Oregon Cascades-California population, and 98 percent of the habitat for the Black Hills population (EII et al. 2012, p. 69).

The petitioners state that the 2004 and 2010 amendments to the 2001 SNFPA have eliminated or weakened standards and guidelines that set and land resource management plans (LRMPs) for national forests in the Sierra Nevada eco-region no longer require national forests to retain black-backed woodpecker habitat (USDA 2001, Appendix A, Standards and Guidelines; USDA 2004, pp. 1–72; USDA 2010c, pp. 1–56; EII et al. 2012, pp. 71–75). Similarly, the petitioners list standards and guidelines from the 1994 NWFP and from national forests in the eastern Cascades, concluding that standards and guidelines for snag retention, fire suppression, salvage logging, and clear-cutting are not adequate to conserve the species (EII et al. 2012, pp. 82–89). The petitioners further assert that the standards provided by the California Forest Practices Rule and the Oregon Forest Practices Act, which govern forest management on private lands in California and Oregon, respectively, are also inadequate to protect black-backed woodpecker habitat, because they do not provide for adequate snag retention (EII et al. 2012, pp. 75–77, 89–91).

Evaluation of Information Provided in the Petition and Available in Service Files

Federal Regulations—Information in our files documents that the Migratory Bird Treaty Act of 1918 (MBTA) (16 U.S.C. 703–712), (which prohibits hunting, taking, capturing, or killing, or attempting to do so, any migratory bird, part, nest, or egg) provides protection for the black-backed woodpecker, including the Oregon Cascades-California and Black Hills populations. The black-backed woodpecker is included under the MBTA based on its inclusion in the 1916 convention between the United States and Canada, which prohibits hunting insectivorous birds (USFWS Digest of Federal Resource Laws, http://www.fws.gov/laws/lawsdigest/treaties.html).

Information in our files also documents that the USFS published a final rule for the 2012 planning rule (77 FR 21162, April 9, 2012), which revises land management planning regulations for national forests. The planning rule provides new regulations to guide the development, amendment, and revision of management plans for all Forest System lands. These revised regulations, which became effective on May 9, 2012, replace the 1982 planning rule. The 1982 planning rule provided for the maintenance of viable populations of species, without providing for the discretion of regional foresters. The 2012 planning rule requires that the USFS maintain viable populations of species of conservation concern at the discretion of regional foresters. As individual forest plans are revised, the changed viability language in the 2012 planning rule might thereby affect viability-related guidance for the black-backed woodpecker on those national forests.

The petitioners provide a substantial number of regional, national forest, and project-specific planning documents that provide regulatory mechanisms that may apply to the black-backed woodpecker. Regional planning documents, such as the Sierra Nevada Forest Plan Amendment (SNFPA), amend existing LRMPs by establishing desired management direction and goals; land allocations; desired future conditions; standards and guidelines; and inventory, monitoring, and adaptive management strategies (USDA 2004, p. 15). The SNFPA provides management objectives for reducing fire intensity and acres burned, and reducing the risk of insect mortality by managing stand density. It provides standards and guidelines for canopy cover and snag retention (USDA 2004, pp. 40–51). Forest planning documents for national forests in the Oregon Cascades and Sierra Nevada Range that were provided by the petitioners establish the black-backed woodpecker as a management indicator species (USDA 2005e, p. 3–201) that is addressed in numerous plans to salvage fire-killed trees or reduce fuels (USDA 2005e, pp. EX–1–EX–12; USDA 2006a, pp. 1–3; USDA 2007, pp. 153, 187).

The petitioners provided an internet link to Black Hills National Forest planning documents. The Black Hills National Forest Land and Resource Management Plan (LRMP) lists the black-backed woodpecker as a management indicator species (USDA 2005a, pp. III–238–III–247). The 2005 Black Hills LRMP promotes a reduction of forest density in many areas, both to reduce the incidence of high-intensity wildfires and to reduce the likelihood of outbreaks of bark beetles (USDA 2005b pg. ROD 1–3).

Information provided by the petitioners provides recent research-driven concerns that salvage logging and snag retention guidelines may be inadequate, although newer guidelines that are appropriate for snag-dependent species exist (Hutto 2006, pp. 987–990; Hutto and Hanson 2009, unpaginated). Study results from the Sierra Nevada indicate that current USFS salvage prescriptions there do not provide for sufficient snag retention and may adversely impact foraging for the species (Hansot et al. 2009, p. 220, 226) note that regulation of insect populations via salvage logging will reduce key food resources for the black-backed woodpecker and that snag retention guidelines for salvage logging may need to be revisited.

State Regulations—Information in our files indicates that California Forest Practices Rules generally provide protections for wildlife during timber harvest through such measures as snag retention, although the rules permit immediate harvest of fire-killed or damaged timber, or insect-infested timber upon application through an emergency notice (Cal Pub. Res. Code 4592; 14 CCR 919, 919.1. 939.1. 959.1). Information provided by the petitioners indicates that the Oregon Forest Practices Act provides for retention of two snags per acre (Oregon Forest Practices Act 527.676).

The petitioners have provided a substantial literature of planning documents for national forests comprising the majority of the populations’ ranges. We will carefully
evaluate all information regarding the adequacy of existing regulatory mechanisms, and make a determination on whether this factor may pose a threat to the Oregon Cascades-California or Black Hills populations. We will make this determination in the 12-month finding on this petition.

E. Other Natural or Manmade Factors Affecting Its Continued Existence.

Information Provided in the Petition

The petitioners indicate that small population size, interspecific competitive interactions, and climate change may also threaten the Oregon Cascades-California and Black Hills populations of the black-backed woodpecker. The petitioners include the ephemeral nature of black-backed woodpecker habitat as a threat under this factor; however, the nature of the woodpecker’s association with habitats having short duration is discussed in the context of loss of that habitat under Factor A and will not be discussed further here.

Evaluation of Information Provided in the Petition and Available in Service Files

The petitioners state that within the black-backed woodpecker’s range in Oregon and California, less than 2 percent of the area is existing suitable habitat for the species, and that less than 1 percent of that area supports current moderate-to-high-quality habitat (areas with less than 5 years since disturbance), providing maps to demonstrate the fragmented nature of likely habitat (EII et al. 2012, pp. 47–56, 69–70). They also indicate that in the Black Hills, such existing suitable habitat is likely only 5 to 8 percent of the area within the population’s range (EII et al. 2012, p. 70). Given estimates of current suitable habitat, the petitioners estimate that approximately 700 to 1,000 pairs of black-backed woodpeckers occur in the Oregon Cascades-California population and approximately 411 pairs occur in the Black Hills population (EII et al. 2012, p. 43). Their estimates are based on information on black-backed woodpecker home range size, utilization of available habitat, and nest-density estimates, along with estimates of the amount of current acreage of burned, beetle-killed, and unburned habitat in the range of each population (Dudley and Saab 2007, pp. 597–598; Siegel et al. 2008, pp. 9–15; Siegel et al. 2010, pp. 19–46; EII et al. 2012, pp. 42–45).

The petitioners state that both populations are inherently vulnerable to extinction because the two population sizes are below the threshold at which there is a significant risk of extinction in the near future, based on modeled minimum viable populations for several hundred species (Reed et al. 2003, pp. 23–34; Traill et al. 2007, pp. 163–165; Traill et al. 2010, pp. 30–33; EII et al. 2012, pp. 98–100). Information provided by the petitioners indicates that, based on analyses for 48 bird species, minimum viable populations for bird species range between 2,544 and 5,244 individuals (Traill et al. 2007, pp. 163–165).

As noted under Population Status and Trend above, black-backed woodpeckers within the Sierra Nevada Range are detected in small numbers, but not frequently enough for regional population estimates (Siegel et al. 2008, p. 4). However, the estimate given by the petitioners for the Oregon Cascades-California population is roughly consistent with preliminary breeding pair estimates of 470, 538, or 1,341 given by Siegel et al. (2010, pp. 1–3, 44–45) for occupied habitat on the 10 national forests in the Sierra Nevada Range, although it may underestimate the number for the population as a whole.

In the Black Hills, the South Dakota Department of Game, Fish, and Parks has the black-backed woodpecker listed as locally rare and vulnerable to extinction (see Bonnot et al. 2008, p. 450). In addition, Pierson et al. (2010, p. 12) find that the population is likely quite small based on a small genetically effective population size (see Traill et al. 2010, p. 30), and the relatively small area of the Black Hills, coupled with the bird’s occupancy of large territories. The final environmental impact statement for the revised Black Hills National Forest Land and Resource Management Plan indicates that a baseline population study by Mohren in 2000 provided an estimate of approximately 1,200 black-backed woodpeckers in the Black Hills in that year (USDA 2005a, p. III–241). Several large burns and beetle outbreaks occurred between 2000 and 2005, which led to increased densities, although no forest-wide estimates are given. Populations were thought to be doing well at the time of the plan, and were expected to decline to numbers similar to those in 2002 during periods of low fire and insect activity (USDA 2005a, pp. III–241—III–245).

The petitioners present information indicating that competitive interactions with other cavity-nesting birds sometimes cause the displacement of black-backed woodpeckers as a result of aggressive behavior by the other species (Villard and Benninger 1993, p. 75; Dixon and Saab 2000, pp. 10–11; EII et al. 2012, p. 68). However, the petitioners provide no further information, nor do we have information in our files, to indicate that such competitive interactions negatively affect reproduction and recruitment, or have population-level effects on either the Oregon Cascades-California or the Black Hills populations.

The petitioners also briefly address climate change, noting that with climate change the incidence of wildfire will likely decrease at higher elevations in the forests of the Sierra Nevada and the eastern Cascades, rather than increase (EII et al. 2012, pp. 101–102). In part this decrease in fire activity is expected to be due to vegetation changes that will reduce the abundance of fire-prone vegetation and lead to reduced fire activity in the forests of the Sierra Nevada and the eastern Cascades (EII et al. 2012, p. 101).

Information presented by the petitioners appears to conflict with a study of wildfire in the western United States available in our files, which documents a positive correlation between wildfire frequency and regional spring and summer temperature, and finds that the average number of large wildfires between 1987 and 2003 was four times the average between 1970 and 1986, with 60 percent of that increase occurring in the Rocky Mountains, and 18 percent occurring in the Sierra Nevada, Cascades, and coastal ranges of Oregon and California (Westerling et al. 2006, p. 941; see also Spracklen et al. 2009, p. 14). Other literature is provided by the petitioners suggests that over the period since 1880, high-severity fire intervals have not become shorter in the last three decades than they were historically (Williams and Baker 2012, p. 8). However, predictions by Spracklen et al. (2009, p. 14) also indicate that in western forests area burned will increase by 54 percent by 2055, as compared to the 10-year period ending in 2005. The largest increases in area burned are projected for the Pacific Northwest (78 percent) and the Rocky Mountain (175 percent) eco-regions, while little change is predicted for the eastern Rocky Mountains and Great Plains region because there increases in precipitation are expected to compensate for increases in temperature (Spracklen et al. 2009, p. 14).

Information in our files on climate change modeling for the Sierra Nevada eco-region also suggests that climate change is likely to favor larger and more intense fires in a number of vegetation regions in the Sierra Nevada Range, but that over the long term these conditions may lead to vegetation changes that
support less severe fire regimes, with projected threats to wildlife from loss of conifer-dominated vegetation (red fir, lodgepole pine, and subalpine conifer), especially at the higher elevations (PRBO Conservation Science 2011, pp. 24, 25). Global climate change models suggest that fires may decrease in these forests before the end of this century, and the authors caution that current perceived increases in fire throughout many parts of western North America may be too simplistic (Krawchuk et al. 2009, pp. 7–9). Modeling of vegetation response to climate change indicates that total area burned in all of California may increase from 9 to 15 percent above the historic norm before the end of the century. However, while annual biomass consumption may initially be greater, it will be at or below the historic norm by the end of the century, and both conifer forest, and in the Sierra Nevada Range, alpine and subalpine forest cover, will likely decline significantly by 2070–2099, while grassland and mixed conifer will increase (Lenihan et al. 2008, pp. S220–S227; see also PRBO Conservation Science 2011, p. 25).

In summary, we conclude that the information provided in the petition and available in our files provides substantial scientific or commercial information indicating that the petitioned action may be warranted due to small population sizes for the Oregon Cascades-California and Black Hills populations, and due to climate change for the Oregon Cascades-California population. However, neither the petition nor information in our files presents information on the effect of interspecific competitive interactions on the Oregon Cascades-California and Black Hills populations, or on the effect of climate change on the Black Hills population. The petitioners did not mention the Black Hills when discussing climate change, and we do not have literature in our files that addresses climate change effects on black-backed woodpecker habitat in the Black Hills. Spracken et al. (2009, p. 14) suggest that climate change may not result in increased wildfires within that region. We request any available information on these issues and will thoroughly evaluate this information during our status review.

Finding

On the basis of our determination under section 4(b)(3)(A) of the Act, we find that information in the petition and readily available in our files presents substantial scientific or commercial information indicating that listing the Oregon Cascades-California population and the Black Hills population of the black-backed woodpecker may be warranted. This finding is based on information provided in the petition, in addition to information readily available in our files, on the possible loss of black-backed woodpecker habitat due to salvage logging, fire suppression, and forest thinning, and on the possible negative population effects due to small population size and climate change. We will initiate a status review to determine whether listing each population as endangered or threatened under the Act is warranted.

The “substantial information” standard for a 90-day finding, under section 4(b)(3)(A) of the Act and 50 CFR 424.14(b) of our regulations, differs from the Act’s “best scientific and commercial data” standard that applies to a status review to determine whether a petitioned action is warranted. A 90-day finding does not constitute a status review under the Act. We will report our finding on whether a petitioned action is warranted in a 12-month finding, after we have completed a thorough status review of the species. The status review is conducted following a substantial 90-day finding. Because the Act’s standards for 90-day and 12-month findings are different, a substantial 90-day finding does not mean that the 12-month finding will result in a warranted finding.

References Cited

A complete list of references cited is available on the Internet at http://www.regulations.gov and upon request from the Sacramento Fish and Wildlife Office (see FOR FURTHER INFORMATION CONTACT).

Authors

The primary authors of this notice are the staff members of the Sacramento Fish and Wildlife Office.

Authority

The authority for this action is the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.).

Dated: March 26, 2013.

David Cottingham,
Acting Director, U.S. Fish and Wildlife Service.

[FR Doc. 2013–07897 Filed 4–8–13; 8:45 am]

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Use of Geospatial Data and Models in Natural Resource Management

By Lee Benda

20 July 2012

GIS data: Advantages and limitations

During the last decade, there has been a proliferation of geospatial data in natural resource management including in the disciplines of forestry, fishery management, geology, geomorphology, hydrology, wildfire and climate change (Miller 2003, Wing and Bettinger 2008). Geographical information system (GIS) data and associated model output are only as good as the measurement technologies from which they are derived (e.g., aerial photographs, satellite imagery, laser altimetry, field surveys, digitizing, etc.). Important attributes about GIS data include their spatial (three dimensional) resolution (90 m, 10 m, and <10 m), accuracy, and precision. In addition, GIS information derived from predictive numerical models is also only as good as the model and the data that go into the model.

GIS data used in natural resource management can include hillslope gradients, aspects, stream networks, stream gradients, vegetation and other watershed features. In general, across the western U. S., 10-m digital elevation models (DEMs) are used within GIS-based numerical models to derive these and other watershed attributes such as slope stability, debris flow potential, and channel and fish habitat characteristics (Benda et al. 2007, Burnett et al. 2007). Forest growth models (FVS, Zelig, ORGANON) that use plot-scale field data are used to create predictions about stand structure over time. These model predictions, as well as others that use a single year’s remote sensed data on stand structure, can be used to forecast the recruitment of wood to channels (using yet other models), and those predictions can be used to predict changes to fish habitat quality and abundance.

It is important to remember that GIS raster or cell-based data are relatively ‘coarse grained’ which means that data, such as vegetation type, is represented by square cells with sides of length, for example 90 m or 10 m with cell areas of 8100 m$^2$ or 100 m$^2$, respectively. These types of data are not accurate down to a more human scale of meters (e.g., while standing in the field); an exception is GIS information that utilizes sub-meter resolution LIDAR. Forest data at coarse scales are generalized, or averaged, and thus GIS information of forest structure will be only accurate in an averaged sense. Nevertheless, this type of coarse-grained information could be used effectively to plan timber harvest and or forest restoration activities across a large watershed over the next 50 years.

Another type of GIS information is vector (line) data such as stream channels that are derived either from digitizing paper (USGS) maps or from numerical models that use DEMs and roads (typically digitized from paper maps or aerial photographs). The accuracy of stream lines depends on the accuracy of the original map product (such as U.S.G.S. 1:24,000-scale topographic maps or the resolution of DEMs). If channel network extraction models are used...
(Miller and Burnett 2007), the accuracy of the delineated channel network will be much better using 10-m versus 90-m digital elevation data. Similarly, the stream attributes so derived (e.g., gradient, floodplain width, orientation, etc.) will also depend on the DEM resolution and on the robustness of the numerical model itself. For example, if the delineated channel segments are 100 m in length, then the predicted channel gradients will be an average over that length scale.

The spatial accuracy of road lines is dependent on the care with which the locations of roads were digitized from maps or photos. The attributes that are extracted from roads, such as road gradients and drainage points, are also dependent on the digitizing accuracy.

Given the necessary coarse grain and, thus, approximate nature of most GIS data and numerical model predictions, the relative difference among values (whether grid cells, lines, points or polygons) is likely more accurate compared to the absolute value of any single data point. For instance, predictions of slope stability typically reveal a large range of failure potential across a watershed. The value of any site specific prediction (pixel scale) is only a rough approximation of reality (because of model limitations and uncertainty in governing parameters). The relative difference between areas of high and low instability, however, can provide a more accurate accounting of hillslope stability (or erosion potential) across a watershed and this type of knowledge is suitable for planning purposes.

Watershed- to landscape-scale GIS information about topography, stream networks, forest vegetation, erosion potential, and aquatic habitat has provided an unprecedented ability to consider entire watersheds (and landscapes) in the implementation of forestry and fishery management (Spies and Johnson 2007), and also to quantitatively forecast outcomes, including cumulative effects of forest practices (Dunne et al. 2001). Prior to advanced GIS, numerical models, and computer technology, this capability did not exist. Given the limitations of GIS information and associated numerical models, but also the advantages of these information systems, it is important to ask the following question: How do resource managers and analysts apply geospatial data and models in their day-to-day work?

**GIS data and the resource manager**

The obvious advantage of GIS for land use managers is its ability to provide spatial information at watershed and landscape scales and thus to provide the ‘big picture’ of where certain watershed attributes are located and how they relate (spatially) to other attributes (see www.netmaptools.org for numerous examples; Benda et al. 2007). For instance, where are the unstable hillslopes located and are they in close proximity to the best aquatic habitats? Where is the most fire prone vegetation located with respect to the most erosion prone soils, and where do these areas overlap with sensitive fish habitats? Which segments of roads are located on unstable ground, and if a failure occurs, could it enter a fish bearing stream? Thus, first and foremost, land managers use GIS information, analysis, and associated model predictions for screening (e.g., to get the big picture) and for watershed scale planning. For instance, when planning stream or road restoration, GIS maps of potential impacts of roads on aquatic habitats can be used to prioritize field surveys.
One key recommendation is that as management plans built with GIS support are implemented, site-specific information (at the scale of an individual timber harvest plan or an individual stream reach restoration project) should be collected to fine tune management activities (or the projection of effects) in specific areas, and thus plans should be adjusted as necessary. For example, GIS information and analysis tools could be used to forecast forest growth and the effects of thinning on future forest stand structure, which affects shade from solar radiation and the amount and size distribution of wood in streams. To offset the predicted reduction of wood in streams due to thinning in riparian areas, other models are used to forecast how trees directionally felled into streams will increase wood storage and hence improve fish habitats across entire watersheds. This type of GIS analysis can support the development of forest plans and their evaluation across entire watersheds. When specific components of the management plan are implemented (for example, thinning along a certain stretch of stream), then a field reconnaissance or more detailed field measurements should be obtained to determine the exact structure of the forest stand to make more detailed site specific harvest (and tree felling) prescriptions at that site. In other words, after the planning stage that utilized GIS information (and associated model forecasts), the implementation phase will require some type of validation step, that might include collecting site-specific information (on existing forest structure and aquatic habitat condition) to make adjustments as necessary to the management activities.

The same recommendation also applies to the use of GIS information in other activities involving riparian management, slope stability, road restoration, and wildfire risk assessment. Consider slope failure potential and the use of GIS information. Increasingly, management planning is taking place at the watershed scale (or at the scale of an entire national forest). Thus, there is a need to consider slope stability conditions at that scale to help guide placement of harvest units for a 10-year forest plan. First, we accept the premise that the application of one or more slope stability models utilizing 10-m DEMS provide acceptable results (Montgomery and Dietrich 1994, Miller and Burnett 2007). From a watershed scale perspective, a map of slope stability indicates where the unstable areas are located and their proximity to roads, stream channels, or high quality fish habitat. This information can be used to plan placement of new forest roads (or conversely locations where to abandon roads) and to plan forest harvest or forest restoration activities. In other words, watershed-scale maps are important guides to watershed-scale forest management planning.

How does GIS information, or associated modeling results about slope stability, get used in project specific planning? If geologists were asked to review or help design the placement of a forest road on a particular hillslope, the watershed-scale GIS maps would be very useful as a guide or screening tool, allowing them to see the big picture (e.g., the physical characteristics of a single hillslope compared to all the other surrounding hillslopes in the vicinity). At the project level, more site-specific information is needed. Is the hillslope sufficiently steep to be of concern (e.g., is the GIS information on slope gradient accurate)? Are there other instability features such as slope convergence, evidence of previous failures or ground cracking? What is the likelihood of a failure, and would the associated sediment would impact important resources, including sensitive fish habitats? It is likely that the remotely sensed data and model predictions would match, approximately, what is found in the field. However, attributes such
as evidence of previous failures would not be included in model predictions, but they can help with a final determination.

**Summary**

For land use analysts and planners, it is important to understand the limits in accuracy and precision of GIS information, including data derived from remote sensing, field surveys, or digitizing, and from numerical models. Although GIS information is often approximate and coarse grained (particularly if derived from remote sensing and numerical model predictions), it offers unprecedented ability to plan (and evaluate through modeling) watershed-scale plans for forestry, restoration, road rehabilitation, conservation, wildfire planning, and to consider climate change impacts. For example, a GIS map of fish habitat quality can be used to prioritize where analysts will go into the field to plan inventory, monitoring, and restoration projects.

When implementing such plans at the scale of individual hillsides, stream reaches, or road segments (e.g., timber harvest, fuel treatments, forest restoration-thinning, placement of wood in streams for restoration, and road maintenance or abandonment), site-specific information should be obtained on the relevant parameters (e.g., forest stand condition, channel characteristics, hillslope conditions, and road attributes and conditions). Once field observations or data have been collected, site-specific management prescriptions can be tailored or modified as necessary from the original predictions made using GIS information. In that way, GIS information and field information are compatible, and when used together, they provide a robust method for implementing forest management or fishery management at scales ranging from the watershed down to the particular hillside, stream reach, or road segment.

**References**


Appendix C – Annotated Bibliography of Literature Describing the Effects of Riparian Management on Stream Shade and Stream Temperature

Peter Leinenbach – USEPA Region 10

1.1 - Variable Buffer Widths and Water Quality – Ripstream Project – 1

Groom J. D., L. Dent, L. and Madsen. 2011a. Stream temperature change detection for state and private forests in the Oregon Coast Range. Water Resources Research 47

**Location:** Western Oregon coast range (45° Latitude)

**Abstract:** Oregon’s forested coastal watersheds support important cold-water fisheries of salmon and steelhead (Oncorhynchus spp.) as well as forestry-dependent local economies. Riparian timber harvest restrictions in Oregon and elsewhere are designed to protect stream habitat characteristics while enabling upland timber harvest. We present an assessment of riparian leave tree rule effectiveness at protecting streams from temperature increases in the Oregon Coast Range. We evaluated temperature responses to timber harvest at 33 privately owned and state forest sites with Oregon’s water quality temperature antidegradation standard, the Protecting Cold Water (PCW) criterion. At each site we evaluated stream temperature patterns before and after harvest upstream, within, and downstream of harvest units. We developed a method for detecting stream temperature change between years that adhered as closely as possible to Oregon’s water quality rule language. The procedure provided an exceedance history across sites that allowed us to quantify background and treatment (timber harvest) PCW exceedance rates. For streams adjacent to harvested areas on privately owned lands, preharvest to postharvest year comparisons exhibited a 40% probability of exceedance. Sites managed according to the more stringent state forest riparian standards did not exhibit exceedance rates that differed from preharvest, control, or downstream rates (5%). These results will inform policy discussion regarding the sufficiency of Oregon’s forest practices regulation at protecting stream temperature. The analysis process itself may assist other states and countries in developing and evaluating their forest management and water quality antidegradation regulations.

**Riparian Stand and Harvest Conditions:**

**Sites:** Thirty three (33) first and third order streams on 18 private sites and on 15 State forest sites.

**Stand Conditions:** Dominated by Douglas fir and red alder. Forest stands were 50-70 years old and were fire- or harvest regenerated. Mean measured tree height was 25.7 m. Sites with evidence of debris torrent or beaver disturbance were excluded. Pre-treatment buffer basal area (m^2/ha) was 41 and 43 for state and private sites, respectively.

**Stream Conditions:** First to third order streams. Average BFW was 4.6 and 4.1 meters for state and private sites, respectively. Average wetted width was 2.3 and 2.0 meters for state and private sites, respectively.
Harvest conditions: There was an upstream control reach for each sample reach (average length of 684 m). There was also a downstream “recovery” reach for many of these sites. Average “no touch” buffer width for the private sites was 26 m (85 ft), and ranged from 14 to 36 m (The reported mean distance was 31 m and was defined as “the perpendicular distance from the stream bank to the first stump encountered within 10 m of the observer, measured every 60 m along the treatment reach.”) It was assumed that, on average, that the perpendicular distance of the stump to the stream will be 5 meters further from the stream than the observer (i.e., $31 \text{ m} - 5 \text{ m} = 26 \text{ m}$). Using a similar calculation, the average “no touch” buffer width for the state sites was 46.8 m (154 ft), and ranged from 20 to 56 m. Thirteen (13) of the 15 State sites had harvest on only one bank of the river, and 4 of the 18 private sites had harvest on only one bank of the river.

Stream Length Logged: Average treatment length was 800 and 600 meters for state and private sites, respectively. Minimum treatment length target was 300 m.

Time line: 2002 through 2008 - Two years of preharvest data and five years of post harvest data. Temperature analysis was limited to all of the pre-harvest data (two years for most sites and more at others) and two years of post-harvest data.

Summary of Results:

This is the initial article in 2011 from Groom et al which describes the results associated with the Ripstream project. The project determined that timber harvested along medium or small fish-bearing streams on private lands resulted in a 40.1% probability that a preharvest to postharvest comparison of 2 years of data will detect a temperature increase of > 0.3 C (i.e., violate the Protecting Cold Water (PCW) criterion: The PCW criteria is defined as “Anthropogenic activities are not permitted to increase stream temperature by more than 0.3 C above its ambient temperature.”). State forest riparian stands did not exhibit exceedance rates that differed from preharvest, control, or downstream rates (i.e., 5%). The authors did not report on temperature recovery.
1.2 - Variable Buffer Widths and Water Quality – Ripstream Project - 2


**Location:** Western Oregon coast range (45° Latitude)

**Abstract:** A replicated before–after-control-impact study was used to test effectiveness of Oregon’s (USA) riparian protection measures at minimizing increases in summer stream temperature associated with timber harvest. Sites were located on private and state forest land. Practices on private forests require riparian management areas around fish-bearing streams; state forest’s prescriptions are similar but wider. Overall we found no change in maximum temperatures for state forest streams while private sites increased pre-harvest to post-harvest on average by 0.7 °C with an observed range of response from ~0.9 to 2.5 °C. The observed increases are less than changes observed with historic management practices. The observed changes in stream temperature were most strongly correlated with shade levels measured before and after harvest. Treatment reach length, stream gradient, and changes in the upstream reach stream temperature were additionally useful in explaining treatment reach temperature change. Our models indicated that maximum, mean, minimum, and diel fluctuations in summer stream temperature increased with a reduction in shade, longer treatment reaches, and low gradient. Shade was best predicted by riparian basal area and tree height. Findings suggest that riparian protection measures that maintain higher shade such as the state forests were more likely to maintain stream temperatures similar to control conditions.

**Riparian Stand and Harvest Conditions:**

**Sites:** Thirty three (33) first and third order streams on 18 private sites and on 15 State forest sites.

**Stand Conditions:** Dominated by Douglas fir and red alder. Forest stands were 50-70 years old and were fire- or harvest regenerated. Mean measured tree height was 25.7 m. Sites with evidence of debris torrent or beaver disturbance were excluded. Pre-treatment buffer basal area (m^2/ha) was 41 and 43 for state and private sites, respectively.

**Stream Conditions:** First and third order streams. Average BFW was 4.6 and 4.1 meters for state and private sites, respectively. Average wetted width was 2.3 and 2.0 meters for state and private sites, respectively.

**Harvest conditions:** There was an upstream control reach for each sample reach (average length of 684 m). There was also a downstream “recovery” reach for many of these sites. Average “no touch” buffer width for the private sites was 26 m (85 ft), and ranged from 14 to 36 m (The reported mean distance was 31m and was defined as “the perpendicular distance from the stream bank to the first stump encountered within 10 m of the observer, measured every 60 m along the treatment reach.” It was assumed that, on average, that the perpendicular distance of the stump to the stream will be 5 meters further from the stream than the observer (i.e., 31 m – 5 m = 26 m).). Using a similar calculation, the average “no touch” buffer width for the state sites was 46.8 m (154 ft), and ranged from 20 to 56 m. Thirteen (13) of the 15 State sites had harvest on only one bank of the river, and 4 of the 18 private sites had harvest on only one bank of the river.
Stream Length Logged: Average treatment length was 800 and 600 meters for state and private sites, respectively. Minimum treatment length target was 300m.

Time line: 2002 through 2008 - Two years of preharvest data and five years of post harvest data. Temperature analysis was limited to all of the pre-harvest data (two years for most sites and more at others) and two years of post-harvest data.

Summary of Results:

Vegetation Response - Average post-treatment buffer basal area \((m^2/ha)\) for state sites was 42, which is an increase over pre-harvest levels (i.e., Pre-harvest levels were 41 \(m^2/ha\)). This result was most likely a result of two factors: 1) the “no-touch” buffer associated with state sites was 51.8 m, and 2) Only limited selective harvest occurred outside of this zone at many of these sites. Average private site post-harvest basal area were reduced by around half (i.e., Pre-harvest levels were 43 \(m^2/ha\) and post-harvest levels were 25 \(m^2/ha\)). Reductions at private sites may be occurring for two reasons: 1) The average “no-touch” buffer zone width was 26 m; and 2) Harvest activities outside of this zone were all “clearcut”. Thus, basal area reductions following harvest is primarily a result of vegetation removal in the outer zone of the riparian zone (The riparian area was defined in this study as a 170 ft (53 m) distance from the stream, which corresponds to the riparian management area (RMA)).

Stream Shade Response - Private site post-harvest stream shade values differed significantly from pre-harvest values (mean change in Shade from 85% to 78%); however, only a small difference was observed for state site stream shade values (mean change in Shade from 90% to 89%). The shade model BasalXHeight which included parameters for basal area per hectare (BAPH), tree height, and their

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### Table 5

<table>
<thead>
<tr>
<th>Variable</th>
<th>State</th>
<th>Private</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Range</td>
</tr>
<tr>
<td>Gradient (%)</td>
<td>6.5</td>
<td>1.5-13.2</td>
</tr>
<tr>
<td>Treatment Length (km)</td>
<td>0.8</td>
<td>0.3-1.5</td>
</tr>
<tr>
<td>Elevation (m)</td>
<td>250</td>
<td>160-570</td>
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<tr>
<td>Watershed area (ha)</td>
<td>222</td>
<td>72-593</td>
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<tr>
<td>Crown ratio</td>
<td>0.43</td>
<td>0.30-0.56</td>
</tr>
<tr>
<td>Buffer width (m)(^a)</td>
<td>51.8</td>
<td>25-61</td>
</tr>
<tr>
<td>Basal area (m/ha)</td>
<td>4.6</td>
<td>2.7-7.9</td>
</tr>
<tr>
<td>Wetted width (m)</td>
<td>2.3</td>
<td>1.3-3.7</td>
</tr>
<tr>
<td>Thalweg (cm)</td>
<td>17</td>
<td>9-30</td>
</tr>
<tr>
<td>Basal area (m/ha)</td>
<td>Pre-harvest</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>Post-harvest</td>
<td>42</td>
</tr>
<tr>
<td>Trees per ha</td>
<td>TPH pre</td>
<td>368</td>
</tr>
<tr>
<td></td>
<td>TPH post</td>
<td>387</td>
</tr>
<tr>
<td></td>
<td>Tree height (m)</td>
<td>26</td>
</tr>
</tbody>
</table>

\(^a\) Means reported in Groom et al. (2011); 95% CI for State sites = 45.6 m, 58.0 m; 95% CI for Private sites = 26.7 m, 35.3 m.
interaction was best-supported: Its model weight ($\omega = 1.00$) indicated strong relative support for this model and virtually no support for the remaining models. (BAPH and Height variables were calculated by using vegetation plot data from the edge of the bank to a perpendicular distance of 30 m, a distance at which they surmise that tree canopies have likely ceased to influence stream shade during daily periods of the greatest radiation intensity (mean measured tree height = 25.7 m).) Accordingly, stream shade conditions were shown to be a function of tree height and stand density (i.e., basal area - BAPH). Between 68% and 75% of variability in post-harvest shade may be accounted for by basal area within 30 m of the stream, tree height, and possibly blowdown. Sites with wider uncut buffers, or fewer stream banks harvested had greater basal area (i.e., BAPH). Sites with higher basal area within 30 m of the stream resulted in higher post-harvest shade.

**Stream Temperature Response** - The authors determined that maximum, Average, Minimum, and Diel Fluctuation stream temperatures increased as a consequence of timber harvest. Particularly, ranking models determined that by far the most critical driver for stream temperature change was shade. In addition, they generally observed an increase in maximum temperature pre-harvest to post-harvest for sites that exhibited an absolute change in shade of > 6%; otherwise, directionality appears to fluctuate. A comparison of within-site changes in maximum temperatures from pre-harvest to post-harvest indicated an overall increase in Private site temperatures while observed changes at State sites were as frequently positive as negative: The average observed maximum change at State sites was 0.0 °C (range = −0.89 to 2.27 °C); and the average observed maximum temperature change at Private sites averaged 0.73 °C (range = −0.87 to 2.50 °C), and Private sites exhibited a greater frequency of post-harvest increases from 0.5 to 2.5 °C compared to State sites. They repeated this comparison while controlling for the effects of control reach temperature change, treatment reach length, and gradient by plotting differences in partial residuals from the Maximum temperature model Grad_Shade (each datum = model residuals + predicted effect of Shade). They found that State site differences became less extreme for positive increases (<1.5 °C) while private comparisons appeared to occupy the same range of responses. Using a linear mixed effects model (“HarvestPrivate”) the authors determined that maximum temperatures at Private sites increased relative to State sites on average by 0.71 C, mean temperatures increased by 0.37 C, Minimum temperatures by 0.13 C, and Diel Fluctuation increased by 0.58 C.

The authors did not report on temperature recovery.
1.3 - Vegetation Buffers and Water Quality – Coast Range of Washington Study


Location: Coast Range, Washington

Abstract: We evaluated changes in channel habitat distributions, particle-size distributions of bed material, and stream temperatures in a total of 15 first-or second-order streams within and nearby four planned commercial timber harvest units prior to and following timber harvest. Four of the 15 stream basins were not harvested, and these streams served as references. Three streams were cut with unthinned riparian buffers; one was cut with a partial buffer; one was cut with a buffer of non-merchantable trees; and the remaining six basins were clearcut to the channel edge. In the clearcut streams, logging debris covered or buried 98 percent of the channel length to an average depth of 0.94 meters. The slash trapped fine sediment in the channel by inhibiting fluvial transport, and the average percentage of fines increased from 12 percent to 44 percent. The trees along buffered streams served as a fence to keep out logging debris during the first summer following timber harvest. Particle size distributions and habitat distributions in the buffered and reference streams were largely unchanged from the pre-harvest to post-harvest surveys. The debris that buried the clearcut streams effectively shaded most of these streams and protected them from temperature increases. These surveys have documented immediate channel changes due to timber harvest, but channel conditions will evolve over time as the slash decays and becomes redistributed and as new vegetation develops on the channel margins.

Riparian Stand and Harvest Conditions:

Sites: fifteen first and second order streams in the coast range of Western Washington. Four of the 15 streams basins were not harvested, and these streams served as references. Four for each harvest type ("Reference", clearcut, full buffer, and non-merchantable buffer)

Stand Conditions: Not described

Stream Conditions: 1st and 2nd order streams

Harvest conditions: No adjacent harvest (reference stream), standard clearcut, full riparian buffer and a non-merchantable harvest (There was very little non-merchantable vegetation so these effectively became clearcut harvest.). Widths of buffers applied to the buffered streams were dictated by operational considerations, and the buffer widths were around 8 to 10 meters on each side of the stream.

Stream Length Logged: Not described

Time line: Two years of water temperature data – one pre and one post-harvest

Summary of Results:

Streams with no buffer did not have a statistically significant temperature response as a result of the streams being buried by a layer of slash that was deposited over these streams. Four of the five buffered streams became warmer (+2.0, 2.6, 2.8 and 4.9 C), and one became slightly cooler (-0.5 C) (Site 17E). The year following harvest at Site 17E had blowdown of some of the riparian vegetation, which
buried 29% of the sample reach. This covering up of the stream channel confounded the temperature response for this sample reach (added additional shade), and thus it could be expected that the response temperature may have been warmer without the blowdown vegetation lying on top of 29% of the stream reach length.

Temperature recovery is not observable because there was only one year of post harvest data. However, “significant” blowdown was observed in the year following this study period (2000), indicating that temperatures may have increased due to potentially elevated solar loading from the low shade levels following blowdown of the riparian vegetation. In a follow-up study, Jackson et al 2007 reported that blowdown ranged from 33 to 64% of buffered trees with attendant effects on canopy cover.
1.4 - Variable Buffer Widths and Water Quality – Malcolm Knapp Research Forest Study - 1


**Location:** Coastal British Columbia (49° Latitude)

**Abstract:** Riparian trees regulate aquatic ecosystem processes, such as inputs of light, organic matter and nutrients, that can be altered dramatically when these trees are harvested. Riparian buffers (uncut strips of vegetation) are widely used to mitigate the impact of clear-cut logging on aquatic ecosystems but there have been few experimental assessments of their effectiveness. Forests along 13 headwater stream reaches in south-western British Columbia, Canada, were clear-cut in 1998, creating three riparian buffer treatments (30-m buffer, 10-m buffer and clear-cut to the stream edge), or left as uncut controls, each treatment having three or four replicates. We predicted that periphyton biomass and insect consumers would increase as buffer width decreased, because of increased solar flux. We used two complementary studies to test this prediction. In one study, we compared benthic communities before and after logging in all 13 streams; a second study focused on periphyton and insect colonization dynamics over 6-week periods in each of four seasons in four streams, one in each treatment. Photosynthetically active radiation, and mean and maximum water temperature, increased as buffer width narrowed. Periphyton biomass, periphyton inorganic mass and Chironomidae abundance also increased as buffer width narrowed, with the largest differences occurring in the clear-cut and 10-m buffer treatments. Photosynthetically active radiation, water temperature, periphyton biomass and periphyton inorganic mass were significantly greater in the 30-m buffer treatment than in controls during some seasons. We have shown that a gradient of riparian buffer widths created a gradient in light and temperature that led to non-linear increases in periphyton biomass and insect abundance. For example, Chironomidae abundance was generally greater in the 10-m and 30-m buffer treatments than in controls, whereas this was not always the case in the clear-cut treatment. This pattern may be due to the high sediment content of the periphyton mat in the clear-cut treatment, which potentially limited the response of some insects to increased food resources. Overall, our results indicate that uncut riparian buffers of 30-m or more on both sides of the stream were needed to limit biotic and abiotic changes associated with clear-cut logging in headwater, forested watersheds.

**Riparian Stand and Harvest Conditions:**

**Sites:** 13 headwater streams in South-Western British Columbia, Canada.

**Stand Conditions:** 550-650 trees/ha, average dbh 40 cm, average height 45 m, average age 70 years, and western hemlock, western red cedar, and Douglas-fir were the dominate species.

**Stream Conditions:** headwater streams

**Harvest conditions:** Riparian no-touch buffer widths of 10m and 30m, zero m, and control (unharvested).

**Stream Length Logged:** Ranged from 215 to 650 meters

**Time line:** Pre-harvest data and one year of post-harvest data collection.
Summary of Results:

Mean solar flux (Photosynthetically active radiation – PAR) reaching streams with clear-cut (zero meters), 10-m, and 30-m buffers was 58, 16, and 5 times greater, respectively compared to the control sites. This corresponds with an approximate reduction of 2.6 and 25.9 units of shade associated with the 30 m and 10 m buffers, respectively, as compared to the control. Authors concluded that “our observations suggest that additional light penetration comes through the sides of the buffer” and that there was a significant relationship between light levels and buffer width along small streams.

Compared with controls, mean daily maximum summer water temperatures increased by 1.6, 3.0, and 4.8 degrees Celsius for the 30 m, 10 m and zero meter (clearcut) harvest treatments, respectively.
1.5 - Variable Buffer Widths and Water Quality – Malcolm Knapp Research Forest Study - 2


Location: Coastal British Columbia (49° Latitude)

Abstract: A 6-year study document the effects of clear-cut harvesting with and without riparian buffers (10m and 30m wide) on headwater stream temperature in coastal British Columbia. The experiment involved a replicated paired catchment design. Pretreatment calibration relations between treatment and control streams were fitted using theme series of daily minimum, mean, and maximum temperature. Generalized least squares (GLS) regression was used to account for auto correlation in the residuals. While water temperature in streams with 10 and 30 m buffers did not exhibit marked warming, daily maximum temperature in summer increased by up to 2 – 8 C in the streams with no buffer. The effectiveness of the buffers may have been maximized by the north-south orientation of the streams, which meant that the streams would be well shaded from late morning to early afternoon by the overhead canopy, even under the 10 m buffer. The variation in response for the no-buffer treatments is consistent with the differences in channel morphology that influence their exposure to solar radiation and their depth. Relations between treatment effect and daily maximum air temperature suggested that recovery toward pre-harvest temperature conditions occurring, with rates appearing to vary with stream and by season

Riparian Stand and Harvest Conditions:

Sites: Ten locations: Three control sites, four sites at zero buffer, one site at 10m buffer, and two sites at 30m buffer.

Stand Conditions: Not presented (from Kiffney et al., 2003 - 550-650 trees/ha, average dbh 40 cm, average height 45 m, average age 70 years, and western hemlock, western red cedar, and Douglas-fir were the dominate species.)

Stream Conditions: BFW ranged from 0.5 to 4.0 meters

Harvest conditions: Riparian buffer width 10m, 30m (No logging in riparian buffers.) and zero meter buffers.

Stream Length Logged: 215 to 650 meters

Time line: Six Years: Two years pre- harvest, and post-harvest was four years.

Summary of Results:

The sites used in this analysis were similar to that of Kiffney et al., 2003. They had to remove two 10m and one 30m treatment streams in the study because these sites had less than one year of pre-treatment stream temperature data. This left only one 10 m, and two 30m buffered streams for this study. Treatment effects from harvesting were most strongly expressed for daily maximum temperature, particularly in summer. The summer daily maximum temperature increased 4.1 C for the 10m buffer, which indicated a significant treatment effect. The 30 m buffers resulted in a 1.1 and 1.8 C increase of the daily maximum temperatures: 1.8 C treatment effect was statistically significant, but the 1.1 C treatment effect was not.

Temperature recovery rates were not presented for the riparian buffered streams.
1.6 - Variable Buffer Widths and Water Quality – Westside Type N Buffer Study – CEMR


Location: Western Washington

Executive Summary Conclusions: This study provides insights into the harvest unit-scale effects of the westside Type Np riparian prescriptions on riparian stand condition, and riparian processes and functions including tree fall, wood recruitment, channel debris, shade, and soil disturbance. The nature and magnitude of responses varied, depending on whether the reaches were clear-cut or buffered, and in the case of the buffered reaches, on the magnitude of post-harvest disturbance from wind-throw. The study evaluated prescription effectiveness by comparing the treatments with unharvested reference sites of similar age. Since many of the FFR resource objectives for Type Np streams are intended to protect amphibians and downstream fish and water quality, the results of this study do not provide a complete story of prescription effectiveness. Combining the results of this study with sub-basin scale studies that examine the effects of the prescription on aquatic organisms and exports of heat, sediment and nutrients to fish-bearing streams will provide a more complete assessment of prescription effectiveness.

Riparian Stand and Harvest Conditions:
Sites: 24 non-fish bearing headwater streams in the western hemlock zone of western Washington

Stand Conditions: Randomly selected sites to provide an unbiased estimate of variability associated with the prescriptions when applied in an operational timber harvest setting under a range of site conditions across western Washington. Mean common tree height was 95 feet, and ranged from 60 to 128 feet. The mean site index was 122.

Stream Conditions: Mean bankfull width was 6 feet, and ranged from 3.1 to 11.4 feet.

Harvest conditions: Eight sites had clear-cut harvest to the edge of the stream (clear-cut patches), thirteen had 50 foot wide no-cut buffers on both sides of the stream (50-ft buffers), and three had circular no-cut buffers with a 56 foot radius around the perennial initiation point (PIP buffers). An unharvested reference reach was located in close proximity to each treatment site (not within 100 feet of the treatment site).

Stream Length Logged: Both sides of a Type Np stream had to be harvested under the westside Type Np riparian buffer prescriptions for at least 300 ft (except for circular perennial initiation point buffers) without a stream adjacent road.

Time line: Data were collected one year after harvest (2004), again in 2006 (three years after harvest), and in 2008 (five years after harvest).

Summary of Results:
The first year following harvest stream shade decreased 13.4 units of shade for the 13 sites with a 50-ft buffer.
In the years following harvest, tree mortality rates exceeded 50% at three of the 50-ft buffer sites. Mean tree mortality was 68.3% for these buffers over the five year period, and exceeded 90% in one case. The mean density of the remaining live trees was 62.8 trees/acre. The channels received a large pulse of LWD input from wind-thrown trees, however most wood was suspended over or spanning the channel and mortality has reduced the supply of trees available to provide future LWD. Mean overhead shade five years after harvest was about 30 units of shade lower than the reference reaches; however cover from understory plants and channel debris increased. Soil disturbance from uprooted trees in the first five years after harvest was over five times the rate for the reference reaches, but most root-pits did not deliver sediment.

The majority of 50-ft buffers (10 of 13) had tree mortality rates less than 33% over the five year post-harvest period. Mean tree mortality for these buffers was 15%, and the mean density of live trees was 140 trees/acre five years after harvest (range 59-247). Overhead shade in this group of buffers was reported 10-13 units of shade less than the reference reaches. These buffers had minimal soil disturbance from uprooted trees in the first five years after harvest.

Table 49. Descriptive statistics for stream shade metrics by patch type; one year (2004), three years (2006) and five years (2008) after harvest.

<table>
<thead>
<tr>
<th>Patch Type</th>
<th>n</th>
<th>Overhead Cover (viewed from stream)</th>
<th>Percentage of Channel Obscured by Understory Plant Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>2004</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference</td>
<td>14</td>
<td>89.3 % (4.4 %)</td>
<td>14.3 % (8.3 %)</td>
</tr>
<tr>
<td>50-ft buffer</td>
<td>13</td>
<td>75.9 % (15.7 %)</td>
<td>28.9 % (16.8 %)</td>
</tr>
<tr>
<td>Clear-cut</td>
<td>8</td>
<td>12.0 % (12.7 %)</td>
<td>17.8 % (13.1 %)</td>
</tr>
<tr>
<td>PIP buffer</td>
<td>3</td>
<td>54.9 % (21.2 %)</td>
<td>37.3 % (26.4 %)</td>
</tr>
<tr>
<td>2006</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference</td>
<td>13</td>
<td>93.3 % (4.9 %)</td>
<td>13.3 % (4.7 %)</td>
</tr>
<tr>
<td>50-ft buffer</td>
<td>12</td>
<td>80.8 % (19.9 %)</td>
<td>31.3 % (20.2 %)</td>
</tr>
<tr>
<td>Clear-cut</td>
<td>7</td>
<td>14.0 % (14.4 %)</td>
<td>38.7 % (31.1 %)</td>
</tr>
<tr>
<td>PIP buffer</td>
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<td>65.0 % (13.2 %)</td>
<td>29.4 % (14.6 %)</td>
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<tr>
<td>Reference</td>
<td>14</td>
<td>90.2 % (4.6 %)</td>
<td>16.0 % (16.8 %)</td>
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<tr>
<td>50-ft buffer</td>
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<td>80.6 % (15.7 %)</td>
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<td>Clear-cut</td>
<td>8</td>
<td>36.5 % (27.6 %)</td>
<td>41.2 % (24.4 %)</td>
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<tr>
<td>PIP buffer</td>
<td>3</td>
<td>61.7 % (21.4 %)</td>
<td>47.4 % (38.1 %)</td>
</tr>
</tbody>
</table>

1 SD = standard deviation
1.7 - Variable Buffer Widths and Water Quality – Rogue River Siskiyou National Forest Study


**Location**: Rogue River Siskiyou National Forest, Oregon

**Abstract**: A study was conducted on the Rogue River Siskiyou National Forest measuring changes in Angular Canopy Density (ACD) as a result of thinning in a riparian stand. The study established varying widths of no treatment riparian buffers and measured ACD before and after thinning. The intent of the study was to add to the 1972 Brazier and Brown ACD data set and to apply the specified no-treatment widths defined by Table 3 of the Northwest Forest Plan Temperature Strategy (NFPTS) to verify that ACD remains unchanged after thinning. Digital photography was used to generate light histograms to measure ACD. The study site was clearcut in the early 1960s and was planted with Douglas-fir. The trees were 40 years old, 95 feet tall on a slope less than 30 percent and the trees were over dense and in need of overstory thinning. Thinning to the stream without a no-treatment buffer reduced ACD by 14% to 24%. As expected as the width of the no-treatment buffer increased, the loss of ACD was reduced. There was no change in ACD before and after the thinning treatment with a no treatment buffer of 50 feet. This validates the specified no-treatment width recommended in Table 3 of the NFPTS for the tree height and percent hill slope of the study site.

**Riparian Stand and Harvest Conditions:**

**Sites**: One stream with various stream buffer management scenarios applied at different locations

**Stand Conditions**: The study site, clearcut in the early 1960s and planted with Douglas-fir, had trees 40 years old, 95 feet tall on a slope less than 10 percent. The trees were 220 stems per acre. The stand was 98% Douglas-fir with a small mix of alder and cedar.

**Stream Conditions**: Not directly described in the draft report, however an image in the report indicate that the bankfull width is narrow (≈< 3 feet).

**Harvest conditions**: Thinning maintained the dominate trees and removed 80 to 100 stems per acre. Various “no-touch” buffer widths were maintained (i.e., 20, 40, 60, and 80 feet) with thinning occurring outside of this zone to distance of 180 ft from the stream.

**Stream Length Logged**: One hundred feet

**Time line**: Not specified

**Summary of Results**:

Thinning the stand from 220 stems per acre to around 120 to 140 stems per acre increased the Angular Canopy Density (ACD) over the stream by 14% in one plot and 24% in another plot (Each treatment had two reported plot values). ACD reductions were observed for at least one plot at each of the “no-touch” buffer widths (up to 80 feet). The magnitude of decrease was lower as the “no-touch” buffer width increased, with average reductions in ACD near zero with a “no-touch buffer” of 60 feet.
1.8 - Variable Buffer Widths/Thinnings and Water Quality – Stuart-Takla Study


**Location:** Interior sub-boreal forests of northern British Columbia (55° Latitude)

**Abstract:** Stream temperature impacts resulting from forest harvesting in riparian areas have been documented in a number of locations in North America. As part of the Stuart–Takla Fisheries–Forestry Interaction Project, we have investigated the influence of three variable-retention riparian harvesting prescriptions on temperatures in first-order streams in the interior sub-boreal forests of northern British Columbia. Prescriptions were designed to represent a range of possible harvesting options outlined by the Forest Practices Code of B.C., or associated best management practice guidelines. Five years after the completion of harvesting treatments, temperatures remained four to six degrees warmer, and diurnal temperature variation remained higher than in the control streams regardless of treatment. Initially, the high-retention treatment acted to mitigate the temperature effects of the harvesting, but 3 successive years of windthrow was antecedent to reduced canopy density and equivalent temperature impacts. We speculate that late autumn reversals in the impacts of forest harvesting also occur. Temperature impacts in this study remained within the tolerance limits of local biota. However, even modest temperature changes could alter insect production, egg incubation, fish rearing, migration timing, and susceptibility to disease, and the effects of large changes to daily temperature range are not well understood.

**Riparian Stand and Harvest Conditions:**

**Sites:** Eight first order streams in British Columbia Canada. Five harvested streams were compared to 3 control streams

**Stand Conditions:** Sub-Boreal Spruce biogeoclimatic zone (Engelmann Spruce Subalpine Fir zone at high elevations)

**Stream Conditions:** BFW range 0.6 to 3.2 meters

**Harvest conditions:** Three harvest conditions: 1) Low Retention Buffer – remove all merchantable timber (>15 cm and >20 cm dbh for pine and spruce-pine respectively) within 20 m of stream, 2) High Retention Buffer – Remove all large merchantable timber > 30 cm dbh within the 20-30m zone and 3) Patch cut – a high-retention along the lower 60% of the stream and removal of all riparian vegetation in the upper 40% of the watershed. Forest harvest actions outside of these buffer areas were not presented.

**Stream Length Logged:** 185 m to 810 m

**Time line:** 1.5 years before and 5 years after harvest

**Summary of Results:**

The authors concluded that summer stream temperatures clearly increased following forest harvesting and found that water temperatures were still elevated 5 years following treatment for all riparian buffers used in the analysis.
Canopy density conditions over the stream were shown to decrease following harvest activities, from an average condition of 76 in the control group, to 17 and 9 percent canopy density for “High” Retention buffer (B3) and “Low” Retention buffer (B5), respectively.

Summer maximum mean weekly temperature increased by an average of 2.4°C and 5°C for the “low” retention buffers. For the “high” retention buffers, summer maximum mean weekly temperature increased by an average of 0.3°C and 1.7°C. Several years of blowdown associated with the second listed high retention buffer and patch retention buffer increased the temperature response from this treatment. Before the blowdown event, this buffer had a temperature increase of over 1°C for the weekly average temperature condition, and it increased to near 2°C following the blowdown events. The other high retention buffer in this study had around a 0.5°C temperature increase following harvest. This reach was the largest stream, and had very little stream length exposed to cutblocks (375 m). No temperature recover was observed after five years and windthrow in the years following harvest had resulted in higher stream temperatures.

**Location:** Western Maine (45° Latitude)

**Abstract:** We evaluated the effect of timber harvesting on summer water temperature in first-order headwater streams in western Maine. Fifteen streams were assigned to one of five treatments: (1) clearcutting with no stream buffer; (2) clearcutting with 11-m, partially harvest buffers, both sides; (3) clearcutting with 23-m, partially harvested buffers; (4) partial cuts with no designated buffer; and (5) un-harvested controls. Over a 3-year period we measured summer water temperature hourly before and after harvesting, above and below the harvest zone. Streams without a buffer showed the greatest increase in mean weekly maximum temperatures following harvesting (1.4-4.4 °C). Stream with an 11-m buffer showed minor, but not significant, increases (1.0-1.4 °C). Streams with a 23-m buffer, partial harvest treatment, and control streams showed no changes following harvest. The mean weekly maximum temperatures never exceeded the thermal stress limit for brook trout (25 °C) in any treatment group. The mean daily temperature fluctuations for streams without buffers increased from 1.5 °C/day to 3.8 °C/day, while with 11-m buffers fluctuations increased nonsignificantly by 0.5-0.7 °C/day. Water temperatures 100 m below the harvest zone in the no-buffer treatment were elevated above pre-harvest levels. We concluded that water temperature in small headwater streams is protected from the effects of clearcutting by an 11-m buffer (with >60% canopy retention).

**Riparian Stand and Harvest Conditions:**

**Sites:** 15 Study Streams

**Stand Conditions:** No harvest within the last 20 years. Trees at least 15 m tall and mature closed-canopy cover (>85%).

**Stream Conditions:** Headwater streams draining small watersheds. Mean BFW – 1.9 to 4.2 m.

**Harvest conditions:** Fifteen streams were assigned to one of five treatments: (1) clearcut with no stream buffer (less than 6.8 m²/ha residual basal area); (2) a thinned 11-m buffer (thinning target of 13.7 m²/ha) and clearcut outside of this zone; (3) a thinned 23-m buffer (thinning target of 13.7 m²/ha) and clearcut outside of this zone; (4) partial cuts with no designated buffer (retaining at least 13.7 m²/ha residual basal area in the harvest zone); and (5) un-harvested controls. There were three replicates of each treatment.

**Stream Length Logged:** 300 m and was on both sides of the stream

**Time line:** 3 years – 2001 (Pre-harvest) and Postharvest (2002 and 2003)

**Summary of Results:**

**Vegetation Response -** Basal area values associated with “Clearcut harvest” stands in this study were reduced to levels well below the minimum target (retain at least 6.9 m²/ha). The basal associated with the partial-harvest treatment ranged from 14.0 to 18.9 m²/ha. Thinning targets associated with the buffered streams (11 m and 23-m) exceeded the 13.8 m²/ha target in 5 of the 6 streams (only one was slightly below 13.5 m²/ha).
Stream Shade Response - Canopy cover measured in the middle of the stream channel was reduced following harvesting efforts for the 11m thinned buffers (Average canopy cover was 94 before treatment and 84 following treatment.) Canopy closure reduced by 4 units following harvesting efforts for the 23m thinned buffers (Average canopy cover was 94 before treatment and 90 following treatment.)

Stream Temperature Response - The temperature increase associated with the 11m buffer ranged from 1.0 to 1.4 C. They did not report a temperature increase associated with the 23 m and partial harvest buffers. They speculated that high subsurface groundwater flow significantly mitigated the effects of canopy removal by slowing temperature increases.

No apparent temperature recovery was observed after 3 years.

<table>
<thead>
<tr>
<th>Stream</th>
<th>Treatment</th>
<th>Cut block basal area Mean (min, max) m²/ha</th>
<th>Riparian buffer basal area Mean (min, max) m²/ha</th>
<th>% Canopy closure Mean (min, max)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre harvest</td>
<td>Post harvest</td>
<td>Pre harvest</td>
<td>Post harvest</td>
</tr>
<tr>
<td>Kibby</td>
<td>0 m</td>
<td>23.9 (7.8, 46.8)</td>
<td>1.5 (0.0, 6.2)</td>
<td>30.1 (26.5, 32.7)</td>
</tr>
<tr>
<td>Pierce 1</td>
<td>0 m</td>
<td>28.6 (6.2, 49.9)</td>
<td>1.3 (0.0, 12.5)</td>
<td>22.9 (9.4, 37.4)</td>
</tr>
<tr>
<td>Skinner 1</td>
<td>0 m</td>
<td>25.9 (10.9, 40.0)</td>
<td>2.1 (0.0, 9.4)</td>
<td>22.3 (17.2, 28.1)</td>
</tr>
<tr>
<td>Bald Mt.</td>
<td>11 m</td>
<td>22.0 (6.2, 35.9)</td>
<td>0.0 (0.0, 0.0)</td>
<td>24.9 (15.6, 39.0)</td>
</tr>
<tr>
<td>Carlisle</td>
<td>11 m</td>
<td>33.9 (20.3, 51.5)</td>
<td>1.7 (0.0, 9.4)</td>
<td>19.3 (10.9, 34.3)</td>
</tr>
<tr>
<td>Skinner 2</td>
<td>11 m</td>
<td>26.0 (10.9, 39.0)</td>
<td>1.9 (0.0, 9.4)</td>
<td>21.8 (17.2, 28.1)</td>
</tr>
<tr>
<td>Mass 2</td>
<td>23 m</td>
<td>32.7 (12.5, 54.6)</td>
<td>0.7 (0.0, 3.1)</td>
<td>29.6 (18.7, 42.1)</td>
</tr>
<tr>
<td>Roxbury</td>
<td>23 m</td>
<td>21.8 (0.0, 34.3)</td>
<td>1.1 (0.0, 6.2)</td>
<td>21.3 (15.6, 28.1)</td>
</tr>
<tr>
<td>Sanderson</td>
<td>23 m</td>
<td>20.4 (3.1, 42.1)</td>
<td>1.0 (0.0, 9.4)</td>
<td>24.9 (18.7, 29.6)</td>
</tr>
<tr>
<td>Mass 1</td>
<td>Partial</td>
<td>24.3 (3.1, 48.3)</td>
<td>18.9 (3.1, 37.4)</td>
<td>17.3 (9.4, 24.9)</td>
</tr>
<tr>
<td>Pierce 2</td>
<td>Partial</td>
<td>25.1 (12.5, 40.5)</td>
<td>14.9 (3.1, 37.4)</td>
<td>24.9 (17.2, 29.6)</td>
</tr>
<tr>
<td>UpCup</td>
<td>Partial</td>
<td>33.8 (14.0, 59.3)</td>
<td>16.1 (3.1, 51.5)</td>
<td>22.3 (17.2, 29.6)</td>
</tr>
<tr>
<td>Appleton</td>
<td>Control</td>
<td>22.3 (6.2, 37.4)</td>
<td>21.3 (6.2, 34.3)</td>
<td>14.6 (3.1, 21.8)</td>
</tr>
<tr>
<td>Bryant</td>
<td>Control</td>
<td>23.1 (10.9, 32.7)</td>
<td>24.1 (14.0, 37.4)</td>
<td>19.2 (18.7, 28.3)</td>
</tr>
<tr>
<td>Daid</td>
<td>Control</td>
<td>24.5 (12.5, 37.4)</td>
<td>23.8 (6.2, 34.3)</td>
<td>18.7 (14.0, 24.9)</td>
</tr>
</tbody>
</table>

**Location:** Western Washington (46.5° Latitude)

**Abstract:** We examined stream temperature response to forest harvest in small (<9 ha) forested headwater catchments in western Washington, USA over a seven year period (2002–2008). These streams have very low discharge in late summer (mean $\approx 0.3 \text{ L s}^{-1}$) and many become spatially intermittent. We used a before–after, control-impacted (BACI) study design to contrast the effect of clearcut logging with two riparian buffer designs, a continuous buffer and a patch buffer. We focused on maximum daily temperature throughout July and August, expecting to see large temperature increases in the clearcut streams ($n = 5$), much smaller increases in the continuously buffered streams ($n = 6$), with the patch-buffered streams ($n = 5$) intermediate. Statistical analyses indicated that all treatments resulted in significant ($\alpha = 0.05$) increases in stream temperature. In the first year after logging, daily maximum temperatures during July and August increased in clearcut catchments by an average of 1.5 °C (range 0.2–3.6 °C), in patch-buffered catchments by 0.6 °C (range 0.1–1.2 °C), and in continuously-buffered catchments by 1.1 °C (range 0.0–2.8 °C). Temperature responses were highly variable within treatments and, contrary to our expectations, stream temperature increases were small and did not follow expected trends among the treatment types. We conducted further analyses in an attempt to identify variables controlling the magnitude of post-harvest treatment responses. These analyses showed that the amount of canopy cover retained in the riparian buffer was not a strong explanatory variable. Instead, spatially intermittent streams with short surface-flowing extent above the monitoring station and usually characterized by coarse-textured streambed sediment tended to be thermally unresponsive. In contrast, streams with longer surface-flowing extent above the monitoring station and streams with substantial stream-adjacent wetlands, both of which were usually characterized by fine-textured streambed sediment, were thermally responsive. Overall, the area of surface water exposed to the ambient environment seemed to best explain our aggregate results. Results from our study suggest that very small headwater streams may be fundamentally different than many larger streams because factors other than shade from the overstory tree canopy can have sufficient influence on stream energy budgets to strongly moderate stream temperatures even following complete removal of the overstory canopy.

**Riparian Stand and Harvest Conditions:**

**Sites:** Five streams with clearcut harvest, six streams with continuously buffer streams, and five stream with patch-buffered streams.

**Stand Conditions:** Even aged stands ranging from 50 to 100 years, dominated by Douglas-fir and western hemlock. Conifers in all catchments were approximately 40 m tall. The forest canopy was closed, and was “providing dense shade throughout the catchment before logging”. Red alder was the dominant hardwood species, and was more common in riparian areas.

**Stream Conditions:** Headwater streams draining small watersheds (average of 4.9 hectare size for continuous buffered streams). Mean BFW for the continuous buffered streams was 0.6 m, and the flow
rate was around 0.01 cfs (i.e., 0.3 Ls⁻¹) in the late summer. The valley floor associated with these sites was generally only a few meters wide and often the bankfull stream channel occupied the fully width of the valley floor.

**Harvest conditions:** In small forested watershed (< 9 ha) the following three treatments were applied: (1) clearcut (n=5); (2) continuous buffered (n= 6); and (3) patch-buffered streams (n=5). In all three treatments, the upland portions of the catchments were clearcut harvested so that these treatments differed only in the way the riparian zone was harvested. The continuous riparian buffers reported in this study range from 10 to 15 meters on each side of the stream. Correspondences with the lead author of this study clarified the following widths of the continuous “no-touch” buffer: The no-touch buffer widths were variable, but on average the continuously buffered streams were around 20 meters on each side of the stream (estimated by the lead author through the use of aerial imagery). For patch buffers, portions of the riparian forest approximately 50-110 m long were retained in distinct patches along some portions of the headwater stream channel, with the remaining riparian area clearcut harvest. There was substantial variation in the locations of the patch treatments. For clearcut treatments, overstory trees were harvested from the catchment, including the entire riparian zone.

**Stream Length Logged:** The mean stream length of continuous buffered treatment streams was 279 meters, however only 43% of the stream length (on average) was observed to be flowing in the first post harvest year.

**Time line:** A seven year monitoring period (2002-2008), with three years of post harvest temperature data collection activities.

**Summary of Results:**

**Stream Shade Response** – Stream shade was calculated from hemispherical photography, and included both canopy and topography. Shade averaged 94% over the stream channel before logging and measured shade did not differ significantly between reference and treatment reaches. Stream shade in reference sites did not change substantially (average = 94%) after logging activities. Stream shade decrease on average to 86% for the continuous buffer treatment reaches. This corresponds to an average reduction of 8 units of stream “shade” associated with this treatment.

**Stream Temperature Response** – The temperature statistic used in this analysis was maximum daily temperature averaged over July and August. For continuous buffered catchments, temperature changes were significantly greater than zero (α = 0.05) in the first two post-treatment years. In the third post-treatment year, the magnitude of the temperature change estimated from the statistical model was significantly different for most of the monitoring period but not significantly different from zero after Julian day 228 (~15th August). However, the absolute temperature response is still greater than zero during the last two weeks of the monitoring period. The July –August average temperature change for the three post-treatment years for the continuous buffered streams was 0.8 °C (i.e., (1.06+0.89+0.38)/3 = 0.8 °C). Temperature response was highest at the start of the evaluation period (i.e., July) and decreased in latter parts of the summer (i.e., July 1st average temperature response was approximately 1.3 °C, 1.1 °C and 0.8 °C in post-treatment year one, two and three, respectively). Accordingly, the estimated average July 1st temperature change for the three post-treatment years was 1.1 °C.
The observed variability of temperature response among catchments of the continuous buffer catchments, ranged from 0 to 2.8 °C in the first year after logging. Wetted stream length was shown to be a significant factor influencing the temperature response associated with riparian treatments, with greater responses associated with longer wetted stream lengths. In addition, the type of substrate was also shown to be a significant factor influencing temperature response, with a low response associated with coarse-substrate channels, and a large response associated streams with fine-texture streambed sediments. Shorter stream segment lengths were associated with coarse-substrate channels. The authors concluded that overall, the area of surface water exposed to the ambient environment best explained aggregated temperature response.

Temperature response successively decreased in the three years following the treatment; however there was still a significant response in temperature at post-harvest year 3.
1.11 - Vegetation Buffers and Water Quality – Oregon Department of Forestry Stream Shade Study


Location: Coast Range of Oregon (45° Latitude)

Synopsis: The Oregon Department of Forestry implemented a shade monitoring project in basins within the north coast and northeastern regions of Oregon (ODF Blue Mountain and Coast Range georegions). Discussions in this document will focus on sites associated with the Coast Range georegion. Data were collected on both harvested stream reaches and those with no recent history of harvest. One goal of this project was to determine the range of shade levels provided over streams under varying forest management scenarios. A second goal was to investigate possible links between site and stand characteristics and shade. The authors stated that the results from the Coast Range georegion are most appropriately applied to sites managed with a no-cut buffer.

Riparian Stand and Harvest Conditions:

Sites: 30 sites in the Coast Range of Oregon, of which 16 sites were managed with a “no-cut” buffer (however only 13 of these sites had both shade and buffer width data collect at them).

Stand Conditions: Riparian areas are typically dominated by an alder overstory and a salmonberry/sword fern understory. Riparian conifer species typically include western hemlock, western redcedar, and/or Sitka spruce. Douglas-fir is more prevalent farther away from the stream. Pre-harvest stand ages averaged 65 years.

Stream Conditions: The average stream width was 6.6 feet, and ranged from 3.2 to 12.8 feet.

Harvest conditions: The 13 sites in the Coast Range managed with a “no-cut” buffer had an average “no-cut” buffer width of 49.3 feet (15 m). Clearcut harvest occurred outside of this no-cut zone. Unharvested stand data were collected at sites adjacent, or in close proximity, to harvested stands in order to sample shade conditions that may have existed prior to entry. In order to collect data on a wide range of unharvested stands, this sample includes both young, intensively managed areas, as well as older stands.

Stream Length Logged: The plot had a minimum length of 500 feet and maximum length of 1000 feet.

Time line: Not described

Summary of Results:

Stream Shade Response - Thirteen of 16 no-cut sites in the Coast Range georegion had both shade measurements (collected by hemispherical photography at 3 feet over the stream surface) and the buffer width measurements. Buffer width was defined as the distance from the highwater mark to the first cut tree measured every 200 feet along the sample reach. The black circles on Figure 11 in the ODF report (shown below) depict these 13 no-cut sites for the Coast Range.
Information for these 13 sites was obtained from Appendix A and B in this ODF technical report, along with the Microsoft Access database associated with this project (USEPA partially funded this project and the project database was a project deliverable). The image below illustrates this information for the 13 no-cut Coast Range sites. There is a difference in shade conditions at one of the sites presented below – The Microsoft Access database verified all of the information within Appendix A and B of this ODF technical report, except for this one shade measurement.

These 13 sites were located along small (11 sites) and medium (2 sites) stream size classes. The average stream width for these sites was 6.6 feet, and ranged from 3.2 to 12.8 feet. There were five small and medium sized unharvested streams in the Coast Range. The average shade measured at these unharvested sites was 89 % (i.e., 95, 85, 89, 93, and 83). The average difference in shade conditions associated with these 13 no-cut streams in the Oregon Coast Range was 14.5 units of shade, ranging from 4 to 27 units. The response would have been 16 units of shade reduction without the shade measurement correction described above.

**Stream Temperature Response -** Not measured
2.1 - Riparian Thinning with “Warm” Headwater Conditions – North Central B.C. Project


Location: North-Central British Columbia (55° – Latitude)

Abstract: Although the future timber supply in the northern hemisphere is expected to come from boreal and subboreal forest, little research has been conducted in these regions that examines the temperature responses of small, lake-headed streams to streamside timber harvesting. We examined the temperature patterns of two subboreal outlet streams in north-central British Columbia for 1 year before and 3 years after clearcut logging and found only modest changes (averaging 0.05-1.1 °C) with respect to summer daily maximum and minimum temperatures, diurnal fluctuations, and stream cooling. A multi-stream comparative survey conducted in the same geographic region revealed that streams headed by small lakes or swamps tended to cool as they flowed downstream, and headwater streams warmed, regardless of whether or not timber harvesting took place. Stream cooling was attributed to a combination of warm outlet temperatures (promoted by the presence of the lakes) and cold groundwater inflows. A regression model revealed that summertime downstream warming or cooling in headwater and outlet streams could be predicted by upstream maximum summer temperatures and canopy cover. Lentic water bodies and groundwater inflows are important determinants of stream temperature patterns in subboreal forests and may subsequently moderate their responses to streamside harvesting.

Riparian Stand and Harvest Conditions:

Sites: Three small, lake headed, forested streams. Two streams were harvested and one was a no-cut control.

Stand Conditions: Located in subboreal spruce biogeoclimatic zone. Canopy cover > 70%.

Stream Conditions: Three small, lake headed, forested streams, <2 m BFW, headed by a small (<20 ha), relatively shallow lake.

Harvest conditions: Two sites (118/16 and 118/48) had thinning out all mature commercial timber (>15 cm dbh for lodgepole pine and >20 cm dbh for spruce and subalpine fir) within a 30 m buffer surrounding the stream and clearcut occurred outside of this zone. The third site was an unharvested control. Harvested 40 ha and 36 ha around the stream, representing 13 to 9% of the drainage area at the downstream sites.

Stream Length Logged: 607 m and 372 m for the treatment reaches and 430 m for the unharvested reach.

Time line: Four year – one year pre-harvest, and three years of post-harvest data.

Summary of Results:

Harvesting removed around 50% of streamside vegetation. Following harvest, canopy cover over the stream decreased from 88% to 48% and 51% for sites 118/16 and 118/48, respectively.
Maximum stream temperatures and diurnal fluctuations increased as a result of harvesting, but the magnitude of change was lower than expected because the water entering the treatment reach was warm lake water discharge and therefore the treatment reach was a “cooling” reach.

Relative to pre-harvest patterns, maximum temperatures for the two treatment streams increased by a net average of 0.4 C, and diurnal fluctuations increase by a net average of 1.1 C. The authors concluded that these are modest changes (compared with literature values) may reflect the effect of headwater lakes on outlet stream temperature.

The dominate downstream cooling observed both before and after harvest was attributed to the combination of warm source temperature associated with the lakes and the strong cooling effect of ground water inflow through the clear-cut, as well as the residual shade provided by the partially logged riparian buffer.

No apparent temperature recovery was observed over three years.

**Location:** Ontario, Canada (48° Latitude)

**Abstract:** As part of a larger study to examine the operational feasibility, ecological benefits, and environmental impacts of partial-harvest logging in riparian buffers along boreal mixedwood forest streams, we determined the effects on summer stream temperatures. Three logged study reaches were compared with three reference reaches over two prelogging and two postlogging summers. Partial-harvest logging resulted in an average removal of 10%, 20%, and 28% of the basal area from riparian buffers at the three logged sites. At the two more intensively logged sites, there were small (<10%) reductions in canopy cover (P = 0.024) and no significant changes in light at stream surfaces (P > 0.18). There were no measurable impacts on stream temperatures at two of the three logged sites. At the most intensively logged site, daily maximum temperatures were significantly higher (~4°C) for about 6 weeks in the first summer after logging than in prelogging years or at the reference sites (P < 0.001). Temperature increases were attributed to a logging-induced temporary disruption of cool water inputs from ground disturbance in a lateral-input seep area. Our results indicate that partial-harvest logging in riparian buffers of boreal mixedwood forest streams can sustain effective canopy cover and mitigate logging-induced water temperature increases.

**Riparian Stand and Harvest Conditions:**

**Sites:** Six sites - Three sites had not been previously been logged and serve as reference conditions. Three sites were logged.

**Stand Conditions:** Boreal mixwoods, defined as various proportions of at least two of five species: white spruce, black spruce, balsam fir, trembling aspen, and white birch. Six study blocks located with a 120 km² area. Reference sites had not been previously logged, although not discussed, it could be assumed that the “harvest” were in similar condition.

**Stream Conditions:** All streams originated from beaver ponds and flowed downstream through the harvest or reference blocks. Stream-reach length (distances between the beaver pond and bottom of the study reach) ranged from 240 to 600 m. Average BFW ranged from 2.6 to 6.4 meters. During the summer, wetted widths were 30-50% of the BFWs. None of the beaver ponds were “headwater” ponds.

**Harvest conditions:** Thirty to 100m wide riparian buffers were “thinned” to basal area reduction of 20.4% (Site WR1), 28.6% (WR2), and 10.8% (WR6) (It is important to note that the preharvest basal area volume was not presented.). There was a 5 m no entry zone. These levels were assessed by postlogging measurements of residual trees and stumps.

**Stream Length Logged:** 600 m, 840m and 550m.

**Time line:** Four years – Site WR6 was harvested during the second year so there was only one year of preharvest data for this site, and three years of post-harvest data. The other two harvest sites (WR1 and WR2) had two years of pre-harvest data and two years of post-harvest data.
Summary of Results:

All streams originated from beaver ponds and flowed downstream through the harvest or reference blocks. Accordingly, all sites exhibited as much as 6-8 C of cooling in the forested reaches over the 240-600m distances between upstream pond outflows and downstream locations during the monitoring period. This is an expected condition (Mellina et al., 2002; Story et al., 2003). The only site that had reduced cooling during the post harvest summer period was WR2 (28.6% of basal area removed). The authors inferred that is possible that shallow groundwater inflow temperatures were elevated by increase solar radiation and soil warming in the upland clearcut and parts of the riparian forest around this site.

Site WR1 (20.4% of basal area removed) had a 12% reduction of canopy cover but no increase in ambient light (PAR) reaching the stream surface. WR2 (28.6% of basal area removed) had no detectable change in canopy cover removed but average light reaching the stream surface increase (but not significantly). Canopy density and PAR were not measured for site WR6 because the “logging occurred in only small sections of one side of the stream, and mature streamside trees at WR6 tended to be further removed from the stream edges than at WR1 or WR2.”

Instream temperature downstream of WR 2 (28.6% of basal area removed) increased by around 4.4 C in the first post-logging year. Temperatures returned to pre-harvest levels by the second post-harvest year. Stream temperatures at WR1 (20.4% of basal area removed) became more variable following harvest, but were within the range of “preharvest weekly temperatures”. Stream temperatures at WR6 (10.8% of basal area removed) were elevated in one of the three post-harvest monitoring years.

The authors summarized that the temperature impacts were not observed on the second post harvest year (i.e., the last year of the study).
2.3 - Riparian Buffer with “Warm” Headwater Conditions – Copper Lake Watershed Study


**Location:** Western Newfoundland, Canada (48.5° Latitude)

**Abstract:** The thermal regimes in streambed substrate used by brook trout, *Salvelinus fontinalis* Mitchell, for incubation of embryos were examined in reference and treatment (0- and 20-m riparian buffer strips) streams in a clear-cut harvested, northern temperate forest of western Newfoundland. In these streams, incubation habitats (redds) were primarily composed of down welling surface waters with variable but minor mixing of upwelling groundwater. The result in incubation temperature were cold (<1 °C) and surface water temperatures were accurate predictors of red temperatures. Both treatment streams displayed evidence of warming in the fall and spring of the 2 years beginning the year of initial harvesting. The increase was most pronounced in the stream without a riparian buffer strip. Clear-cut harvesting with and without a riparian buffer strip altered the thermal regime of surface water and the hyporheic zone in this northern temperate forest where, in addition to salmonid incubation, many biological processes take place. The potential for impacts on stream ecosystems is estimated to be high for the managed forest of the region. Future studies should strive to enhance our understanding of the hydrological connections between forests and streams on this landscape to determine the full effects of timber harvesting on the hydrology and biology of a watershed and its streams.

**Riparian Stand and Harvest Conditions:**

**Sites:** Four headwater streams originating from ponds/marshes.

**Stand Conditions:** Northern temperate forest dominated by balsam fir and black spruce.

**Stream Conditions:** Headwater streams that range from 2.5 to 5.0 m wide. Upstream areas are pond/march systems and therefore the boundary temperatures are elevated.

**Harvest conditions:** 19 ha were harvested in one stream without a buffer strip (Site T1-1). A harvest area of 33 ha with a 20 m buffer strip was applied to another stream. The 20m buffer strip was primarily on one side of the stream (Site T1-2). There was a control (no harvest) watershed.

**Stream Length Logged:** Not Provided


**Summary of Results:**

Harvest reaches were downstream of lakes and therefore stream temperatures entering the reach are elevated.

Because this study was focusing on affects to brook trout, the evaluation period was fall, winter, and spring. Summer period results were not presented.

Stream temperatures trends in the control (no harvest) basin paralleled air-temperature trends.

Compared to control reach, spring stream temperatures in 20m buffer increased by an average of 2.7 °C in the three years following treatment activities. Authors speculate the warming of stream water in the
20 m buffer stream suggests “the mechanism of temperature change was related to groundwater flow to the stream and not direct solar inputs, i.e., there was forest buffer zone to protect the stream from solar radiation.” That is, temperature increases are a result of elevated surface temperature associated with the clearcut zones warming up the groundwater which enters the stream.

The authors observed a temperature recover in the last year of the study, however it appeared that the spring period during this last year was an extremely cool period (i.e., the clearcut harvest treatment reach was cooler than pre-harvest temperature conditions.)
3.1 Stream Shade Modeling – Effects of Riparian Buffer Width, Density and Height


Location: Modeled shade conditions (40°N Latitude)

Abstract: A theoretical model was developed to explore impacts of varying buffer zone characteristics on shading of small streams using a path-length form of Beer’s law to represent the transmission of direct beam solar radiation through vegetation. Impacts of varying buffer zone height, width, and radiation extinction coefficients (surrogate for buffer density) on shading were determined for E-W and N-S stream azimuths in infinitely long stream sections at 40°N on the summer solstice. Increases in buffer width produced little additional shading beyond buffer widths of 6-7 m for E-W streams due to shifts in solar beam pathway from the sides to the tops of the buffers. Buffers on the north bank of E-W streams produced 30% of daily shade, while the south-bank buffer produced 70% of total daily shade. For N-S streams an optimum buffer width was less-clearly defined, but a buffer width of about 18-20 m produced about 85-90% of total predicted shade. The model results supported past field studies showing buffer widths of 9-11 m were sufficient for stream temperature control. Regardless of stream azimuth, increases in buffer height and extinction coefficient (buffer density) were found to substantially increase shading up to the maximum tree height and stand density likely encountered in the field. Model results suggest that at least 80% shade on small streams up to 6-m wide can be achieved in mid-latitudes with relatively narrow 12-m wide buffers, regardless of stream azimuth, as long as buffers are tall (=30 m) and dense (leaf area index =6). Although wide buffers may be preferred to provide other benefits, results suggest that increasing buffer widths beyond about 12 m will have a limited effect on stream shade at mid-latitudes and that greater emphasis should be placed on the creation of dense, tall buffers to maximize stream shading.

Riparian Stand and Harvest Conditions:

Sites: Sensitivity analysis of shade production for a theoretical stream at a 40°N Latitude

Stand Conditions: 30 m tall trees (variable height for the tree height modeling)

Stream Conditions: 3 m wide BFW, which results a buffer height / stream width ratio = 10 (This was used in order to produce results where the majority of energy reaching the stream centerline was transmitted by vegetation.) Variable stream aspects were modeled.

Harvest conditions: The riparian buffer was modified to illustrate the effects of various buffer attributes and resulting shade conditions.

Stream Length Logged: None

Time line: One day – summer solstice
Summary of Results:
Although the magnitude and response and the shape of the relationship might be different from field measurements, the general principles still apply: 1) vegetation closer to the stream has a greater potential to provide shade (i.e., the tree behind tree principle), and that 2) there are different intrinsic potential for shade production for streams with different aspects, but these differences vary depending on the season.

Vegetation on the north bank buffer of an east-west aspect stream can produce up to 30% of the daily shade occurring on the stream surface.

Stream Shade and Buffer Density –

![Graph showing the relationship between extinction coefficient and shade percentage.](image)

**FIGURE 9.** Effects of Increasing Radiation Extinction Coefficients (surrogate for buffer density) in Beer's Law (Equation 1) on Shading by Buffer Zones for Two Stream Azimuths at 40°N on the Summer Solstice. Conditions represent a small 3-m wide stream shaded by a 12-m wide and 30-m tall buffer.

The authors reported that model results suggest that buffer density is one of the most important controls on buffer shading. Relatively high shading was only achieved with the high buffer densities. The author noted that Beer’s law (used in the model in this study to estimate radiation transition through the vegetation) may underestimate total shading by buffers, as dense natural forests are known to produce >90% shading.
Stream Shade and Buffer Width –

Shading by vegetation along a N-S aspect stream gradually increased as buffer width was increased, with 88% of the total occurring in the first 18-20 meters of buffer. The “outer” buffer from 20 meters to 30 m was responsible for the remaining of the shade production (12%). Alternatively, shading by vegetation along an E-W aspect stream increased relatively rapidly for the model scenario used in his study. The author concluded that buffer widths of only about 6-7 m were needed to and further increases in buffer width up to about 30 m had little additional effect. It is important to point out that the modeling period was summer solstice. It is also important to point out that the distance associated shade production in an E-W stream becomes similar to a N-S stream as the sun is located lower in the sky during the later summer period (see image below). (Shade values in the image below were calculated using the Washington Ecology shade model - www.ecy.wa.gov/programs/eap/models.html, using 30m tall trees, canopy density of 85%, and BFW of 3.0m). In both scenarios, buffers wider than 30 meters resulted in very little change in stream shade conditions and are directly related with shade length of the modeled riparian vegetation (i.e., 30 m).
For N-S aspect streams, shading is primarily associated with the top of the vegetation (i.e., shadow length) at narrower buffer widths (< 10 meters). Beyond a 10m buffer width, sunlight traveling through the side of the buffer increases in importance towards shade production. When sunlight travels through the side of the buffer, the density of the buffer become important toward shade production. At around an 18 m buffer width, shade associate with side part of the buffer becomes the dominant shade producing feature.

Overall for E-W streams, the north-bank buffer accounted for 30% of the total shading, and south-bank buffer accounted for the remaining 70%. Shading patterns were similar to trends just described, however the transition between a top dominated vs. side dominated shading system was around an 8 m buffer width. Once again these scenarios are for the summer solstice and results would be expected to different in later summer periods.
Stream shading increased rapidly with increased buffer height regardless of stream azimuth. In contrast to shading due to buffer width changes, increased buffer height for N-S streams gradually increases shading along solar tracks through the tops of buffers and becomes dominant after a height of about 19 m. A similar trend was observed for an E-W stream except the transition from side dominated to top dominated occurred at around 6 meters.
3.2 Stream Shade Modeling – Potential Shadow Length Associated with Riparian Vegetation

Leinenbach, P, 2011. Technical analysis associated with this project to assess the potential shadow length associated with Riparian vegetation

Location: Modeled shadow length of riparian vegetation (45.7°N Latitude)

Abstract (Synopsis): Results indicate that a tree located on a flat hillslope along the stream within a distance of its height can be influential on shade production (i.e., the shadow length associated with the tree is long enough to reach the stream), and ultimately on stream temperature during the summer period (July/August). However, there are commonly occurring situations which trees outside of this distance can contribute to shade production (For example, a 100 foot tall tree located on a hillslope of 20 degrees can cast a 169 foot long shadow at 4 PM during the late summer.).

Riparian Stand and Harvest Conditions:

Sites: Sensitivity analysis of shadow length associated with vegetation at a 45.7°N Latitude

Stand Conditions: Variable tree height

Stream Conditions: Not Relevant (Only determining shadow length)

Harvest conditions: Not Relevant (Only determining shadow length)

Stream Length Logged: None

Time line: Estimates during the spring, summer, and fall period.

Summary of Results:

The distance of a shadow cast by a tree can be estimated by the following trigonometric equation:

\[
\text{Shadow Length} = \frac{\text{Tree Height} \times \cos(\text{Hillslope Angle})}{\tan(\text{Sun Angle} - \text{Hillslope Angle})} - \text{Tree Height} \times \sin(\text{Hillslope Angle})
\]

Solving this equation provides insight into the distance from a stream a tree could potentially provide stream shade. The tree will not have any effect of stream shade production when it is located further away from the stream than the calculated shadow length. The figure below shows that the shadow distance associated with a 100’ tall tree varies throughout the course of the day, along with the season.

The shadow distance increases as the sun is lower in the sky during the mid morning (9 am to 11 am) and mid afternoon (2 pm to 4 pm) periods. The figure also indicates that shadow lengths are longer during late spring and late summer, than during the summer equinox.

---

1 See Attachment A below for the derivation of this equation.
2 The “Altitude of the Sun” reference location associated with analysis was within the Tillamook Forest and the model used to determine the “Altitude of the Sun” (i.e., SolRad) was obtained from Washington Ecology’s TMDL model webpage - http://www.ecy.wa.gov/programs/eap/models.html
Stream temperatures are often at a maximum during the July to August period and therefore stream shade is particularly important at this time\(^3\). The table below presents the average shade length associated with riparian vegetation during these summer months. On a flat stream bank, the shadow length can equal the height of the tree in the afternoon, when stream temperatures are often at their daily maximum and potential solar heat loading is still high (i.e., 4 pm conditions). The table below also shows that the shadow length increases for vegetation located on sloped stream banks.

<table>
<thead>
<tr>
<th>Height of Tree</th>
<th>9 am</th>
<th>10 am</th>
<th>11 am</th>
<th>12 pm</th>
<th>1 pm</th>
<th>2 pm</th>
<th>3 pm</th>
<th>4 pm</th>
<th>5 pm</th>
<th>6 pm</th>
</tr>
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<tbody>
<tr>
<td>Flat Hillslope</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>20 Degree Hillslope</td>
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<td>115</td>
<td>152</td>
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<td>2337</td>
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</tbody>
</table>

\(^3\) July and August (and sometimes September) conditions are often associated with low stream flows, long days, and warm air temperatures, which can result in high stream temperatures. Therefore, rivers/streams often have lower assimilative capacity for the addition of heat loads.
Attachment A – Estimating Shadow Distances

Case 1: Ground has Zero Slope

\[
tan(\theta) = \frac{h}{d} \implies d = \frac{h}{\tan(\theta)}
\]

Case 2: Ground is sloped, with a slope angle = \(A_L\) and assume that the tree grows vertically

\[
tan(\theta - A_L) = \frac{h_1}{(d_1 + d)}
\]

\(A_S\) = sun angle above the horizon, not the ground surface, \(h_1\) = height of the line drawn from the tree tip, perpendicular to the ground, and \(d_1\) = distance from interception of that line with the ground, to the base of the tree.

Using the same argument as in Case 1,
Solve this for \( d \), the shadow distance:

\[
d = \frac{h}{\tan(A_S - A_L)} - d_1
\]

Since,

\[h_1 = h * \cos(A_L) \text{ and } d_1 = h * \sin(A_L)\]

Thus,

\[
d = \frac{h * \cos(A_L)}{\tan(A_S - A_L)} - h * \sin(A_L)
\]

In other words,

\[
\text{Shadow Length} = \frac{\text{Tree Height} \times \cos(\text{Hillslope Angle})}{\tan(\text{Sun Angle} - \text{Hillslope Angle})} - \text{Tree Height} \times \sin(\text{Hillslope Angle})
\]

Note: When \( A_L = 0 \) (flat ground), this equation reduces to Case 1, because \( \sin(0) = 0 \), and \( \cos(0) = 1 \).
3.3 Stream Shade and Temperature Modeling - Variable Buffer Widths/Thinnings and Water Quality


Location: Water quality modeling of Canton Creek, North Umpqua Basin, Western Oregon

Abstract (Synopsis): The ODEQ evaluated the Western Oregon Plan Revision (WOPR) Alternatives using the mathematical model Heat Source Version 7.0. Heat Source simulates open channel hydraulics, flow routing, heat transfer, effective shade, and stream temperatures. Modeling was performed for a stream segment roughly 18 km in length. Modeling simulated base conditions were verified with empirical data sets for surface and instream temperature. Alternatives varied vegetation only.

This simulation suggested that for this reference stream segment (i.e., Canton Creek): (1) Current (baseline) conditions are 1-2° C above “natural thermal potential” conditions; (2) A 46 m (150 ft) no-touch buffer width produced only very small changes in stream temperature; (3) A 31 m (100 ft) no-touch buffer width produced changes in stream temperature in excess of 0.5° C; (4) and a 31 m (100 ft) variable retention buffer (i.e., 18 m (60 ft) no-touch buffer, with a 12 m (40 ft) 50% canopy cover outside of the “no-touch” zone) produced changes in stream temperature in excess of 0.6° C. Stream temperatures are expressed as the maximum change in the seven day average of the maximum daily temperature during the modeling period (July 12th through July 31st).

Shade and temperature response to buffer width changes was site was highly variable along the stream reach.

Riparian Stand and Harvest Conditions:

Sites: Canton Creek, North Umpqua Basin, Western Oregon

Stand Conditions: “System Potential Vegetation” which represented riparian vegetation at a mature state. The authors acknowledged that natural disturbance would reduce system potential vegetation and that it is not possible for an entire stream to be at its maximum potential everywhere, all the time. In this analysis system potential vegetation was disturbed by modeling a 50 year interval historical disturbance regime. The severity of disturbance ranged from low to very high. Pre-thinning canopy associated with large conifers is 80%.

Stream Conditions: 3rd order stream

Harvest conditions: A 46 m (150 ft) no-touch buffer width, a 31 m (100 ft) no-touch buffer width, and a 31 m (100 ft) variable retention buffer (i.e., 18 m (60 ft) no-touch buffer, with a 12 m (40 ft) 50% canopy cover outside of this zone).

Stream Length Logged: BLM administered land along the riparian zone of Canton Creek (Approximately 5 kilometers)

Summary of Results:
The 46 m (150 ft) no-touch buffer width produced only very small changes in stream shade and temperature.
The 31 m (100 ft) no-touch buffer had shade reductions of over 10 units at several locations, while other areas had only minimum reductions (i.e. 1 unit of percent shade). There were many more areas with only 1 unit of shade reduction than as observed for the 46 m no-touch buffer.

The 31 m no-touch buffer produced changes in stream temperature in excess of 0.5° C, expressed as the maximum change in the seven day average of the maximum daily temperature during the modeling period (July 12th through July 31st). In addition, temperature increases of over 0.2 C were observed at several other locations.
The 31 m (100 ft) variable retention buffer (i.e., 18 m (60 ft) no-touch buffer, with a 13 m (40 ft) 50% canopy cover outside of the “no-touch” zone) had shade reduction of over 12 at several locations along the river, with two regions of the river approaching a reduction of 20 units of shade. There were many more areas with only 1 unit of shade reduction than as observed for the 46 m and 31 m no-touch buffers.

A 31 m variable retention buffer produced changes in stream temperature in excess of 0.6° C, expressed as the maximum change in the seven day average of the maximum daily temperature during the modeling period (July 12th through July 31st). In addition, temperature increases of over 0.2 C were observed at several other locations.
3.4 Stream Shade and Temperature Modeling - Variable Buffer Widths/Thinnings and Water Quality

Oregon Department of Environmental Quality Memorandum. 2008. Modeling result reporting
document – Evaluation WOPR FEIS Riparian Area Land Use Allocation. Obtained from Ryan Mitchie at
ODEQ.

Location: Water quality modeling of Canton Creek, North Umpqua Basin, Western Oregon

Abstract (Synopsis):
The ODEQ evaluated the Western Oregon Plan Revision (WOPR) Alternatives using the mathematical
model Heat Source Version 7.0. Heat Source simulates open channel hydraulics, flow routing, heat
transfer, effective shade, and stream temperatures. Modeling was performed for a stream segment
roughly 18 km in length. Modeling simulated base conditions were verified with empirical data sets for
surface and instream temperature. Alternatives varied vegetation only.

This simulation suggested that for this reference stream segment (i.e., Canton Creek): (a) A 46 m (150 ft)
variable retention buffer (i.e., 18 m (60 ft) no-touch buffer, with a 28 m (90 ft) 50% canopy cover outside
of the “no-touch” zone) produced changes in stream temperature approaching 0.2° C. Stream
temperatures are expressed as the maximum change in the seven day average of the maximum daily
temperature during the modeling period (July 12th through July 31st).

Shade and temperature response to buffer width changes was site was highly variable along the stream
reach.

Riparian Stand and Harvest Conditions:

Sites: Canton Creek, North Umpqua Basin, Western Oregon

Stand Conditions: “System Potential Vegetation” which represented riparian vegetation at a mature
state. The authors acknowledged that natural disturbance would reduce system potential vegetation
and that it is not possible for an entire stream to be at its maximum potential everywhere, all the time.
In this analysis system potential vegetation was disturbed by modeling a 50 year interval historical
disturbance regime. The severity of disturbance ranged from low to very high. Pre-thinning canopy
associated with large conifers is 80%.

Stream Conditions: 3rd order stream

Harvest conditions: A 46 m (150 ft) variable retention buffer (i.e., 18 m (60 ft) no-touch buffer, with a 28
m (90 ft) 50% canopy cover outside of the “no-touch” zone).

Stream Length Logged: BLM administered land along the riparian zone of Canton Creek (Approximately
5 kilometers)

Summary of Results:
The 46 m (150 ft) variable retention buffer (i.e., 18 m (60 ft) no-touch buffer, with a 28 m (90 ft) 50% canopy cover outside of the “no-touch” zone) had shade reductions of around 4 units at several locations along the river. There were many more areas with only 1 unit of shade reduction than observed for the 46 m “no-touch” buffer.

The 46 m variable retention buffer produced changes in stream temperature approaching 0.2° C, expressed as the maximum change in the seven day average of the maximum daily temperature during the modeling period (July 12th through July 31st).
3.5 Stream Shade and Temperature Modeling - Variable Buffer Widths and Water Quality


Location: Water quality modeling for streams in Western Washington

Abstract: To evaluate the effects of converting riparian hardwood-dominated stands to coniferous-dominated stands on western Washington stream temperatures, we combined a shade model and water quality model to explore the stream heating potentials of three buffer-width scenarios. Changing one variable at a time, we then ran a series of model simulations for various buffer-width (30-75 feet) and harvest-length (500-1500 feet) scenarios. Results of each simulation were expressed as the change in maximum daily temperature relative to the unharvested state (i.e., upstream boundary condition).

When a 500-foot harvest unit and 50-foot buffer were then applied to our model channel, the downstream temperature of the 10-foot-wide stream increased 0.13°C relative to the upstream state. Temperature continued to rise as harvest-unit length increased, with the 1500-feet-long unit showing the most change (+0.36°C, or approximately +0.12°C per 500 feet of harvest length). Wider buffers (75 feet), in contrast, continued to dampen temperature increases for the 10-foot stream, even at a harvest-unit length of 1500 feet. Results for the 20-foot-wide stream showed a similar pattern, but temperature increases in response to harvest-unit length were higher: 0.15°C (500 feet) – 0.60°C (1500 feet), or about 0.18°C per 500 feet of harvest length. Temperature of the 10-foot-wide stream was more sensitive to buffer width than the 20-foot-wide stream. In contrast, all buffer scenarios cooled the 20-foot-wide stream less effectively, with predicted downstream temperatures converging somewhat when harvest-unit length reached 1000 feet. Inferences vary depending on the shade curve used.

Overall, results indicated that, for the stream scenarios analyzed, riparian vegetation and harvest-unit length exerted greatest control on stream temperature at lower flow rates. Conditions favoring high daily maximum stream temperatures include: shallow and wide streams, north-south channel orientation, low groundwater influx or hyporheic exchange with the channel, and low gradient.

Riparian Stand and Harvest Conditions:

Sites: Modeled streams which were designed to represent streams in western Washington (46.65° Latitude).

Stand Conditions: Represent baseline stand condition for red alder (50 ft tall). Assumed uniformed canopy closure in buffer, and a uniformed buffer width.

Stream Conditions: Variable stream widths (10 ft and 20 ft), and stream aspects (zero, 45 and 90).

Harvest conditions: Variable “no-touch” buffer widths were tested (i.e., 30ft, 50 ft, and 75 ft) with a vegetation height of 50 feet tall (represents baseline stand condition for red alder). Harvest unit on only one side of the stream. Angular canopy density for each buffer width condition was estimated using two models (Brazier and Brown, 1973; Steinblums et al., 1984), which was used as an estimate of canopy cover condition in the “Shade.xls” model. Shade conditions associated with the various channel width and buffer combinations were modeled for temperature response using QUAL2Kw.
<table>
<thead>
<tr>
<th>Buffer Width (feet)</th>
<th>Angular Canopy Density (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Brazier and Brown, 1973</td>
</tr>
<tr>
<td></td>
<td>Steinblums et al., 1984</td>
</tr>
<tr>
<td>30</td>
<td>55</td>
</tr>
<tr>
<td>50</td>
<td>70</td>
</tr>
<tr>
<td>75</td>
<td>75</td>
</tr>
</tbody>
</table>

Stream Length Logged: Fiver Lengths – 500 ft, 750 ft, 1000 ft, 1250 ft, and 1500 ft  
Time line: Modeled August 1\textsuperscript{st}

Summary of Results:

Effective Shade – The effect of riparian density has a very dramatic effect on stream shade conditions for both 10- and 20 foot wide streams. N-S aspect stream channels have the lowest shade conditions during mid day which is associated with maximum air temperatures and solar loading is near the daily peak values. E-W aspect streams may experience a "double sunrise and sunset": One daily maximum solar loading in the early morning; and the other maximum solar loading in the late afternoon.

![Graphs showing daily effective shade for three channel orientations provided by a 120-foot buffer of canopy cover varying from 25% to 85%. Channel width is 10 feet.](image)
Stream Temperature –

The baseline vegetation conditions used in the temperature modeling scenarios was a 50’ tall tree. The canopy cover associated with the modeling was calculated using two different canopy cover models (Brazier and Brown (1973) and Steinblums et al. (1984)). There were two channel widths in the analysis. Effective shade conditions were calculated for each of these scenarios, and was an input parameter into the temperature model (Qual2kw).

<table>
<thead>
<tr>
<th>Channel Width (feet)</th>
<th>Riparian Buffer Differences</th>
<th>Brazier and Brown (1973) Canopy Cover (CC) Model</th>
<th>Steinblums et al. (1984) Canopy Cover (CC) Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Shade Change (A 1500’ long channel)</td>
<td>Shade Change (A 1500’ long channel)</td>
</tr>
<tr>
<td>10</td>
<td>23m to 15 m</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>23m to 9 m</td>
<td>12</td>
<td>16</td>
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<tr>
<td></td>
<td>23m to 9 m</td>
<td>16</td>
<td>18</td>
</tr>
</tbody>
</table>

Figure 8. Daily effective shade for three channel orientations provided by a 120-foot buffer of canopy cover varying from 25% to 85%. Channel width is 20 feet.
Canopy density was shown to be more influential on stream temperature response in the narrow 10 ft channel, than it was observed for the wider channels (20 ft).

For a 10 foot wide stream channel, stream temperatures increased between 0.11 and 0.17 °C as the riparian buffer width was reduced from 23 m to 15 m for a 472 m channel length. The corresponding change in shade conditions was 4 to 8 units of shade reduction, respectively. As riparian buffers width was reduced from 23 m to 9 m for a 472 m channel length, stream temperatures increase from 0.27 to 0.33 °C. The corresponding change in shade conditions was 12 to 16 units of shade reduction, respectively.

Temperature results associated with the 20ft channel indicate that the “shadow length” from the 50’ tall vegetation was not sufficient to cast a proper shadow across the stream leading to very low shade conditions (see image below). Accordingly, despite greater shade conditions associated with the wider riparian buffers, the temperature response was muted in the 20ft stream channel. In other words, shade levels for the 20ft stream are low for all buffer width conditions and therefore stream temperature increases are high for all scenarios.

![Stream temperature response](image)

**Figure 11.** Stream temperature response in the (a) 10-foot-wide and (b) 20-foot-wide streams for different buffer widths and shading curves.
4.1 - Effects of Riparian Thinning - Density Management Study - 1


**Location:** Western Oregon

**Abstract:**
A large-scale operational study has been undertaken to investigate variable density management in conjunction with riparian buffers as a means to accelerate development of late-seral habitat, facilitate rare species management, and maintain riparian functions in 40–70 year-old headwater forests in western Oregon, USA. Upland variable retention treatments include matrices of four thinning intensities embedded with patch openings and leave islands. Additionally, four types of streamside buffer delineation are being examined. The study includes 13 sites, each averaging about 100 hectares. Metrics of stand structure and development, microclimate, aquatic ecology, invertebrate populations and biology, lichens, and bryophytes, are being evaluated with respect to overstory thinning, patch openings and riparian buffer treatments. Results of this study can contribute to a development of riparian buffer delineations based on ecological functions and linkages to upland forest conditions. Early findings suggest that the near-stream riparian environment provides critical functions and habitat for diverse populations of organisms. Using large, operational experimental plots we are able to demonstrate statistically significant initial responses to a complex suite of treatments for selected vegetation and environment parameters. It remains to be determined if the experimental design will be robust for long-term temporal trends in vegetation and microclimate, or synthesis with companion studies focusing on invertebrates or aquatic-dependent fauna. Meaningful interdisciplinary inferences are more likely achieved if integration is explicitly incorporated into study design and implementation, rather than post-study component synthesis. Conducting a large-scale interdisciplinary study with adaptive management implications requires a strong commitment to collaboration between management and research partners.

**Riparian Stand and Harvest Conditions:**

**Sites:** The DMS includes 12 sites dispersed among BLM lands in both the Coast Range and the west-side of the Cascade Mountains in western Oregon. On seven sites, the prescribed thinning treatments were first entries to the regenerating stands. Thinning treatments were applied to an additional five sites that had been previously thinned.

**Stand Conditions:** Characteristics of 40-to70 year old forests on BLM lands throughout western Oregon.

**Stream Conditions:** Not specifically presented but assume similar to Anderson et al (2007) description - First and 2nd order streams and active channel ranged from 0.2 to 3.7 m (averaged 1.1 m). Nearly 70% of the streams were summer intermittent.

**Harvest conditions:** The Density Management Study (DMS) consists of four thinning treatments, each applied to 20 ha or larger treatment units within 80 ha or larger sites. The thinning treatments include: 1) Unthinned control – 500 to 750 trees per ha (tph) greater than 12.7 cm dbh. 2) High density retention – 70 to 75% of area thinned to 300 tph, 25 to 30% unthinned Riparian Reserves or leave islands. 3)
Moderate density retention – 60 to 65% thinned to 200 tph, 25 to 30% unthinned Riparian Reserves or leave islands, 10% circular patch openings. 4) Variable density retention – 10% thinned to 100 tph, 25 to 30% thinned to 200 tph, 25 to 30% thinned to 300 tph, 20 to 30% unthinned Riparian Reserves or leave islands, 10% circular patch openings.

Stream Length Logged: Not specifically presented but assume similar to Anderson et al (2007) description - Variable – results summarized from 40 transects and results for each transect was a discrete value (i.e., there was no cumulative effect).

Time line: None presented

Summary of Results:
This is an initial document associate with the Density Management Study describing the first year of data.

Thinning to 200 tph decreased stand density by up to 70%, but only increased available light from 13–19% in the unthinned buffer to about 29% in the thinned buffer. The increase in light (~10% absolute increase) associated with heavy thinning to 200 tph is small relative to the number of trees removed. Light values derived from the hemispherical canopy images indicate that upland thinning to 200 tph increases available light within the first 20 m of the adjacent riparian buffer. Thus, thinning may result in some significant (but potentially transitory) changes in stand light and microclimate conditions.
4.2 - Effects of Riparian Thinning - Density Management Study - 2


**Location:** Western Oregon

**Abstract:**

**Riparian Stand and Harvest Conditions:** (assumed similar to that of Chan et al 2004b)

**Sites:** The DMS includes 12 sites dispersed among BLM lands in both the Coast Range and the west-side of the Cascade Mountains in western Oregon. On seven sites, the prescribed thinning treatments were first entries to the regenerating stands. Thinning treatments were applied to an additional five sites that had been previously thinned.

**Stand Conditions:** Characteristics of 40-to70 year old forests on BLM lands throughout western Oregon.

**Stream Conditions:** Not specifically presented but assume similar to Anderson et al (2007) description - First and 2nd order streams and active channel ranged from 0.2 to 3.7 m (averaged 1.1 m). Nearly 70% of the streams were summer intermittent.

**Harvest conditions:** The Density Management Study (DMS) consists of four thinning treatments, each applied to 20 ha or larger treatment units within 80 ha or larger sites. The thinning treatments include (Fig. 3): 1) Unthinned control – 500 to 750 trees per ha (tph) greater than 12.7 cm dbh. 2) High density retention – 70 to 75% of area thinned to 300 tph, 25 to 30% unthinned Riparian Reserves or leave islands. 3) Moderate density retention – 60 to 65% thinned to 200 tph, 25 to 30% unthinned Riparian Reserves or leave islands, 10% circular patch openings. 4) Variable density retention – 10% thinned to 100 tph, 25 to 30% thinned to 200 tph, 25 to 30% thinned to 300 tph, 20 to 30% unthinned Riparian Reserves or leave islands, 10% circular patch openings.

**Stream Length Logged:** Not specifically presented but assume similar to Anderson et al (2007) description - Variable – results summarized from 40 transects and results for each transect was a discrete value (i.e., there was no cumulative effect).

**Time line:** None presented
Summary of Results:

At basal area (BA) ≥ 160 ft²/ac, and RD ≥ 40, light levels average about 10% of open conditions, similar to those of unthinned stands. The corresponding BA of 120 and 160 ft²/ac, in units of m²/ha, is 28 and 37, respectively.

Figure 7a. Basal area and corresponding percent skylight derived from 6 Density Management Study sites during summer conditions. Scatter points represent individual plot values while squares represent means.

Figure 7b. Percent skylight in relation to Curtis' Relative Density. Derived from six Density Management Study sites during summer conditions. Scatter points represent individual plot values while squares represent means.

Commercial thinning substantially increased understory light when stand density was decreased to a basal area (BA) less than 120 ft²/ac, or in other terms, below a relative density (RD) of 30. At BA ≥ 160 ft²/ac, and RD ≥ 40, light levels average about 10% of open conditions, similar to those of unthinned stands. The corresponding BA of 120 and 160 ft²/ac, in units of m²/ha, is 28 and 37, respectively.

**Location:** Western Oregon

**Abstract:** Thinning of 30- to 70-year-old Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco) stands is a common silvicultural activity on federal forest lands of the Pacific Northwest, United States. Empirical relationships among riparian functions, silvicultural treatments, and different riparian buffer widths are not well documented for small headwater streams. We investigated buffer width and density management effects on riparian microclimates of headwater streams in western Oregon. Spatial variations in stand density, canopy cover, and microclimate were measured along transects extending from stream center upslope into thinned stands, patch openings, or unthinned stands, with riparian buffers ranging from <5 m up to 150 m width. For treated stands, summer mean daily air and soil temperature maxima increased, and mean daily humidity minima decreased with distance from stream. Microclimate gradients were strongest within 10 m of stream center, a distinct area of stream influence within broader riparian areas. Thinning resulted in subtle changes in microclimate as mean air temperature maxima were 1 to 4°C higher than in unthinned stands. With buffers 15 m or greater width, daily maximum air temperature above stream center was less than 1°C greater, and daily minimum relative humidity was less than 5% lower than for unthinned stands. In contrast, air temperatures were significantly warmer within patch openings (+6 to +9°C), and within buffers adjacent to patch openings (+3°C) than within unthinned stands. Buffers of widths defined by the transition from riparian to upland vegetation or topographic slope breaks appear sufficient to mitigate the impacts of upslope thinning on the microclimate above headwater streams.

**Riparian Stand and Harvest Conditions:**

**Sites:** Five sites – Four along the Oregon Coast Range, and one site in the western edge of the Cascade Range in Oregon. In total, data from 40 transects distributed among 26 reaches across five sites were used in the analysis.

**Stand Conditions:** All sites were within the western hemlock vegetation zone and Douglas-fir dominated the 45- to 65 year old forests. Other vegetation in the stands included western hemlock and western red cedar. Basal area in unthinned stands ranged from about 44 to 58 m^2/ha.

**Stream Conditions:** First and 2nd order streams and active channel ranged from 0.2 to 3.7 m (averaged 1.1 m). Nearly 70% of the streams were summer intermittent.

**Harvest conditions:** There were two no-cut buffer treatments with clearcut harvest occurring outside of this inner zone: 1) “B1-P” – The no-cut buffer width average 69m; and 2) “VB-P” - The no-cut buffer width average 22m wide. There were several no-cut buffer treatments with thinning activities occurring outside of this inner zone: 1) “B1-T” (average 69m inner zone no-cut width); 2) “VB-T” (average 22m inner zone no-cut width); and “SR-T” (average 9m inner zone no-cut width). Thinning was to a density of 198 tree per hectare (tph). Unharvested controls reaches had around 500 to 750 tph (Chan et al., 2004). Unharvested control treatments were also included in the study (“UT”).
Stream Length Logged: Variable – results summarized from 40 transects and results for each transect was a discrete value (i.e., there was no cumulative effect).

**Time line:** None presented

**Summary of Results:**

![Graph showing basal area and visible sky](image)

*Figure 3. Treatment least-squares means (±1 standard error) for (a) basal area and (b) percentage visible sky as measured over stream center, within buffers, and within the upslope stands. Values are back-transformed from model estimates based on log-transformed data.*

**Stream Shade Response** - Clearcut harvest outside of the 69m no-touch buffer ("B1-P") did not result in a significantly different light condition over the stream than the unharvested condition ("UT") and appears to be decreasing less than 1 unit of percent visible sky.

Clearcut harvest outside of the 22m no-touch buffer ("VB-P") resulted in significantly higher light conditions over the stream ($p = 0.002$), increasing 5.1 units of percent visible sky.

**Stream Temperature Response** - Not measured
4.4 - Effects of Riparian Thinning Over Time - Oregon Coast Range Project


Location: Oregon Coast Range

Abstract: Douglas-fir (Pseudotsuga menziesii (Mirb.) Franco) forests managed for timber in western Oregon frequently lack structure and diversity associated with old-growth forests. We examined thinning effects on overstory and understory development for 8 years after treatment. Three 30- to 33-year-old Oregon Coast Range plantations were partitioned into four overstory treatments: unthinned (~550 trees/ha) and lightly (~250 trees/ha), moderately (~150 trees/ha), and heavily (~75 trees/ha) thinned. Within each overstory treatment, two understory treatments were established: underplanted with Douglas-fir and western hemlock (Tsuga heterophylla (Raf.) Sarg.) or not underplanted. Thinning increased overstory stem growth, crown expansion, and retained crown length. Thinned overstory canopies began to close rapidly the third year after thinning, decreasing % skylight by approximately 2%/year, whereas % skylight in unthinned stands increased slightly. All seedlings planted in unthinned stands died, whereas eighth year survival in thinned stands averaged 88%. Natural regeneration densities and distributions were highly variable. Understory shrub cover was reduced by harvesting disturbance but recovered by the fifth year. Thinning increased understory plant species diversity, and no shrub species were lost. Thinning to low densities and underplanting has the potential to accelerate development of multilayered stands characteristic of old-growth Douglas-fir forests.

Riparian Stand and Harvest Conditions:

Sites: Three forest blocks in the Oregon Coast Range

Stand Conditions: Thirty to 35 year old Douglas-fir plantation on highly productive sites on the west slope of the Oregon Coast Range

Stream Conditions: Not Available

Harvest conditions: (1) Unthinned (=550 trees/ha (i.e., tph)); (2) light thinning (=250 tph); (3) moderate thinning (=150 tph); and heavy thinning (=75 tph).

Stream Length Logged: Not Available

Time line: Eight years since thinning activities

Summary of Results:

Thinning reduced basal area (BA) by 51%, 67%, and 84% in lightly, moderately, and heavily thinned stands, respectively. Tree densities in thinned stands were reduced in the moderate and heavily thinned stands by windthrow and stem breakage during severe winter storms in the first 4 years of the study. Immediately after thinning, % skylight through the canopy ranged from 2% in unthinned stands to 48% in heavily thinned stands. After 8 years, % skylight in lightly thinned stands was similar to levels in unthinned stands, and % skylight in moderately thinned stands had diminished to levels similar to those in lightly thinned stands just after thinning. Percent skylight for the moderate and heavy thinned stands were elevated above unthinned stand conditions for the eight year period associated with this study.
Table 2. Stand densities before thinning, immediately after thinning (year 1), and 4 and 8 years after thinning.

| Density measure | Treatment       | Prethinning | Year 1  | Year 4  | Year 8  | % Change
|-----------------|-----------------|-------------|---------|---------|---------|-----------
|                 |                 |             |         |         |         | Years 1–4 | Years 5–8 |
| Trees/ha        | Unthinned       | 547 (493–601) | 547 (493–601) | 510 (454–568) | 496 (435–558) | -6.8     | -0.3     |
|                 | Light           | 686 (556–816) | 252 (225–279) | 244 (215–274) | 242 (212–273) | -3.2     | -0.8     |
|                 | Moderate        | 598 (512–683) | 138 (120–156) | 128 (119–138) | 126 (117–136) | -7.2     | -1.6     |
|                 | Heavy           | 671 (526–816) | 72 (68–77)    | 70 (64–75)    | 68 (63–73)    | -2.8     | -2.9     |
| Basal area (m²/ha) | Unthinned       | 44 (40–47) | 44 (40–47) | 45 (40–51) | 49 (44–54) | 2.3      | 8.9      |
|                 | Light           | 47 (43–50) | 23 (21–26) | 27 (23–31) | 31 (27–35) | 17.4 | 14.8 |
|                 | Moderate        | 43 (39–46) | 14 (11–16) | 15 (13–18) | 18 (16–21) | 7.1      | 20.0     |
|                 | Heavy           | 45 (40–50) | 7 (6–8) | 8 (7–9) | 10 (8–13) | 14.3 | 25.0 |
| Relative density | Unthinned       | 7.7 (7.2–8.2) | 7.7 (7.2–8.2) | 7.8 (6.9–8.7) | 8.2 (7.4–9.0) | 1.3 | 5.1 |
|                 | Light           | 8.6 (7.7–9.4) | 4.0 (3.6–4.3) | 4.4 (3.8–5.0) | 4.9 (4.3–5.5) | 10.0 | 11.4 |
|                 | Moderate        | 7.7 (7.0–8.4) | 2.3 (1.9–2.7) | 2.4 (2.0–2.8) | 2.8 (2.4–3.1) | 4.3 | 16.7 |
|                 | Heavy           | 8.3 (7.2–9.4) | 1.2 (1.1–1.3) | 1.3 (1.1–1.5) | 1.6 (1.3–1.9) | 8.3 | 23.1 |

Note: The percentage of change in density was calculated for the first 4 years (years 1–4) and the second 4 years (years 5–8) post-thinning.

Relative density = (BA/QMD)³, where BA is the basal area (m²/ha) and QMD is the quadratic mean diameter (cm, Curtis 1982); RD (Imperial) = 6.94528 × RD (metric).

Fig. 4. Changes over 8 years in % skylight through the canopy by thinning treatment. Error bars are 95% confidence intervals. Data points are slightly offset for presentation.

Example of % Skylight for 1 and 8 years after thinning within each stand.

<table>
<thead>
<tr>
<th></th>
<th>Post-thin</th>
<th>Year 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unthinned (= 550 tph)</td>
<td>2%</td>
<td>6%</td>
</tr>
<tr>
<td>Light thin (= 250 tph)</td>
<td>14%</td>
<td>8%</td>
</tr>
<tr>
<td>Moderate thin (= 150 tph)</td>
<td>29%</td>
<td>16%</td>
</tr>
<tr>
<td>Heavy (= 75 tph)</td>
<td>44%</td>
<td>26%</td>
</tr>
</tbody>
</table>
4.5 – Effects of Riparian Harvest on Microclimate Gradients – Western Washington


**Location:** Western Washington

**Abstract:** Riparian zones are vital components of the landscape. Much attention has been focused on the question of how wide a buffer is needed to protect the original riparian environment. We sampled five streams 2-4 m wide and associated riparian ecosystems before and after clearcutting in western Washington. Buffers ranging from 17 to 72 m wide were left intact at all sites when harvesting. Our objectives were: (1) to characterize pre-harvest microclimatic gradients across riparian ecosystems, from the stream to the upland; (2) to identify effects of harvesting on these gradients; and (3) to describe effects of buffer width and near-stream microclimate on stream microclimate. Six weather stations measuring air temperature, soil temperature, surface air temperature, relative humidity, short-wave solar radiation, and wind speed were installed along transects running across the stream and into the upland, and two reference stations were established, one in an upland clearcut and one in an upland interior forest. Pairwise comparison tests were used to evaluate statistical differences between stations along transects for determination of gradient extent. Pre-harvest riparian gradients existed for all variables except solar radiation and wind speed, and values generally approached forest interior values within 31-62 m from the stream. After harvesting, microclimate values at the buffer edge and each subsequent location toward the upland began to approximate clearcut values instead of forest interior values, indicating an interruption or elimination of the stream-upland gradient. In addition, regression analyses showed that stream microclimate was affected to some degree by buffer width and microclimate in the surrounding area. We conclude that a buffer at least 45 m on each side of the stream is necessary to maintain a natural riparian microclimatic environment along the streams in our study, which were characterized by moderate to steep slopes, 70-80% overstory coverage (predominantly Douglas-fir and western hemlock), and a regional climate typified by hot, dry summers and mild, wet winters. This buffer width estimate is probably low, however, since it assumes that gradients stabilize within 30 m from the stream and that upslope edge effects extend no more than 15 m into the buffer (a low estimate based on other studies). Depending on the variable, required widths may extend up to 300 m, which is significantly greater than standard widths currently in use in the region (i.e., ~10-90 m). Our results indicate that even some of the more conservative standard buffer widths may not be adequate for preserving an unaltered microclimate near some streams. Additional site-specific data are needed for different site conditions in order to determine whether generalizations can be made regarding near-stream microclimate.

**Riparian Stand and Harvest Conditions:**

**Sites:** Five streams in three locations in Western Washington

**Stand Conditions:** Canopy cover was 70-80%, Douglas Fir, western hemlock

**Stream Condition:** width ranged - 2-4 meters

**Harvest conditions:** Variable no cut riparian buffer width: 23 m (and 17m on other bank), 17m(23m), 25m (60m), 60m (25m), and 60m (25m).
Stream Length Logged: Not relevant
Time line: One year of pre-harvest and one year of post-harvest data collection

Summary of Results:
They found that solar radiation and relative humidity did appear to have some association with buffer width. Edge influences appeared to allow solar load to penetrate the forest buffer and affect stream microclimate. Accordingly, they surmise that as the buffer widens the amount of solar radiation able to penetrate the vegetation and reach the stream station would decrease.

They did not find any relationship between water temperature and buffer width. The water temperature response associated with each treatment was not presented so it is not possible to determine the impact of various riparian buffer widths on stream temperature.

They observe a strong influence of soil temperature in the surrounding land area on water temperature, even for sites well away from the stream. They concluded that this suggests that activity in the watershed up to or more than 180 m away may affect stream microclimate even when a buffer strip is left intact.

Authors conclude that a buffer at least 45 m on each side of the stream is necessary to maintain a natural riparian microclimatic environment along the stream.
4.6 - Effects of Riparian Harvest on Blowdown – Coast Range of Washington Study


Location: Coast Range, Washington

Abstract: Abiotic and biotic responses of 15 first-order streams to timber harvest were monitored at four sites in Washington's Coast Ranges (six watersheds clearcut to streambanks; four clearcut with stream buffers; and four references). Surveys of geomorphology, macroinvertebrates, and amphibians were conducted in 1998 (baseline), 1999 (immediately postharvest), 2000 (macroinvertebrates only) and 2001. Logging slash immediately covered or buried clearcut channels with 0.5 to 2 meters of slash, increasing roughness and trapping fine sediments, and slash still dominated channel conditions in 2001 when fine sediment fractions remained elevated relative to reference streams. In buffered and reference streams, particle size distributions were almost unchanged. Buffer blowdown was extensive (33% to 64%); increased light stimulated streamside vegetation. In 1999, clearcut streams supported higher macroinvertebrate densities of collectors and shredders, likely due to increased detrital resources. Collector response persisted into 2001, and new responses included higher overall macroinvertebrate biomass in buffered streams. No macroinvertebrate groups declined significantly in the three summers after harvest. Clearcutting to stream channels appeared to have short-term negative effects on local giant salamander and tailed frog populations but not torrent salamanders.

Riparian Stand and Harvest Conditions:

Sites: fifteen first and second order streams in the coast range of Western Washington. Four of the 15 streams basins were not harvested, and these streams served as references. Four for each harvest type (“Reference”, clearcut, full buffer, and non-merchantable buffer)

Stand Conditions: Not described

Stream Conditions: 1st and 2nd order streams

Harvest conditions: No adjacent harvest (reference stream), standard clearcut, full riparian buffer and a non-merchantable harvest (There was very little non-merchantable vegetation so these effectively became clearcut harvest.). Widths of buffers applied to the buffered streams were dictated by operational considerations, and the buffer widths were around 8 to 10 meters on each side of the stream.

Stream Length Logged: Not described

Time line: Two years of water temperature data – one pre and one post-harvest

Summary of Results:

This study was a follow-up to the Jackson et al., 2001 which described the immediate effects of harvest activities on stream channel and riparian conditions on small headwater streams. The salient information provided in this new study concerns the effects of blowdown on the buffer stand condition in years following harvest activities. Buffer blowdown was extensive in 2001 (two years following harvest activities associated with buffered streams). Blowdown ranged from 33 to 64% of buffered trees with attendant effects on canopy cover. After blowdown, the newly fallen trees either spanned
the channels or lay beside the channels, so blow down trees were not adding woody debris to the channels or altering channel structure at the time of the study.

Table 4. Summary of buffer blowdown and canopy cover as measured by a spherical densitometer

<table>
<thead>
<tr>
<th>Stream</th>
<th>Buffer type</th>
<th>Blowdown (2001)</th>
<th>Canopy cover¹ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(%)</td>
<td>1998 (pre)</td>
</tr>
<tr>
<td>21W</td>
<td>Non-merchantable</td>
<td>44</td>
<td>90</td>
</tr>
<tr>
<td>21M</td>
<td>Full</td>
<td>52</td>
<td>93</td>
</tr>
<tr>
<td>17E</td>
<td>Full</td>
<td>33</td>
<td>92</td>
</tr>
<tr>
<td>13E</td>
<td>Full</td>
<td>64</td>
<td>87</td>
</tr>
<tr>
<td>12E</td>
<td>Partial (within buffer of fish-bearing stream)</td>
<td>42</td>
<td>95</td>
</tr>
</tbody>
</table>

¹ These canopy cover estimates should be used with caution. The densitometer readings were taken within the survey section. However, both the buffers and the blowdown of the buffers were patchy, so these numbers are not an average for the whole stream.
² The buffer on 21M was much wider and denser downstream of the survey reach where these densitometer measurements were taken.
³ Canopy coverage on 13E in 2001 was provided by dense scrub-shrub vegetation growing adjacent to the channel. On this stream the channel-adjacent herbaceous vegetation had grown to a height of 2 meters in many places.
Appendix B – Consolidated Summary of Literature Describing the Effects of Riparian Management on Stream Shade and Stream Temperature

Peter Leinenbach - USEPA Region 10
<table>
<thead>
<tr>
<th>Project</th>
<th>Buffer/Harvest</th>
<th>Vegetation Response</th>
<th>“Shade” Response</th>
<th>Water Temperature Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 and 1.2 - Variable Buffer Widths and Water Quality Ripstream Project – 1 and 2 Oregon Coast Range</td>
<td>18 “Private” Sites – Average “no-touch” buffer of 26m, and clearcut harvests were generally outside of this zone. Four sites had harvest only on one bank of the river. Average treatment length for “Private” sites was 600 m.</td>
<td>Average “Private” site post-harvest basal area were reduced by around half (i.e., Pre-harvest levels were 43 m²/ha and post-harvest levels were 25 m²/ha). Average post-treatment buffer basal area (m²/ha) for “State” sites was 42, which is an increase over pre-harvest levels (i.e., Pre-harvest levels were 41 m²/ha).</td>
<td>“Private” site post-harvest stream shade values differed significantly from pre-harvest values (mean change in Shade from 85% to 78%); however, very little difference was found for “State” site stream shade values (mean change in Shade from 90% to 89%). The shade model BasalXHeight which included parameters for basal area per hectare (BAPH), tree height, and their interaction was best-supported: Its model weight (ω = 1.00) indicated strong relative support for this model and virtually no support for the remaining models. Accordingly, stream shade conditions were shown to be a function of tree height and stand density (i.e., basal area - BAPH). Sites with wider uncut buffers, or fewer stream banks harvested had greater basal area (i.e., BAPH). Sites with higher basal area within 30 m of the stream resulted in higher post-harvest shade.</td>
<td>Authors observed an increase in maximum temperature pre-harvest to post-harvest for sites that exhibited an absolute change in shade of &gt; 6%; otherwise, directionality appears to fluctuate. “Private” sites pre-harvest to post-harvest temperatures increased on average by 0.7 °C with an observed range of response from −0.9 to 2.5 °C. In addition, mean temperatures increased by 0.37 C, minimum temperatures by 0.13 C, and diel fluctuation increased by 0.58 C. Timber harvested on “Private” sites had a 40.1% probability that the daily maximum temperature response will be &gt;0.3 C (i.e., exceed the Protect Cold Water (PCW) criteria). “State” forest riparian stands did not exhibit exceedance rates of the PCW criteria that differed from preharvest, control, or downstream rates (i.e., 5%). Observed temperature changes at “State” sites were as frequently positive as negative: The average observed maximum change at “State” sites was 0.0 °C, however there were several sites with temperature increases near 1.5 °C due to harvest activities.</td>
</tr>
<tr>
<td>Groom et al., 2011a and Groom et al., 2011b</td>
<td>15 “State” Sites - Average “no-touch” buffer of 47m, and thinning was the dominate harvest activities outside of this zone. Thirteen sites had harvest on only one bank of the river. Average treatment length for “State” sites was 800 m. Two years of pre-harvest and two years of post-harvest data was used in this analysis.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Authors observed an increase in maximum temperature pre-harvest to post-harvest for sites that exhibited an absolute change in shade of > 6%; otherwise, directionality appears to fluctuate.

“Private” sites pre-harvest to post-harvest temperatures increased on average by 0.7 °C with an observed range of response from −0.9 to 2.5 °C. In addition, mean temperatures increased by 0.37 C, minimum temperatures by 0.13 C, and diel fluctuation increased by 0.58 C. Timber harvested on “Private” sites had a 40.1% probability that the daily maximum temperature response will be >0.3 C (i.e., exceed the Protect Cold Water (PCW) criteria).

“State” forest riparian stands did not exhibit exceedance rates of the PCW criteria that differed from preharvest, control, or downstream rates (i.e., 5%). Observed temperature changes at “State” sites were as frequently positive as negative: The average observed maximum change at “State” sites was 0.0 °C, however there were several sites with temperature increases near 1.5 °C due to harvest activities.
### Project  Buffer/Harvest  Vegetation Response  “Shade” Response  Water Temperature Response

<p>| 1.3 - Vegetation Buffers and Water Quality | Four stand conditions: (1) No adjacent harvest (reference stream), (2) standard clearcut, (3) full riparian buffer, and (4) a non-merchantable harvest (There was very little non-merchantable vegetation so these effectively became clearcut harvest.). Widths of buffers applied to the buffered streams were dictated by operational considerations and the widths of the linear buffers ranges from 8 to 10 meters on each side of the channel. The stream length harvested was not presented. It appears that there was two years of water temperature data collect - one year of pre-harvest data and one year of post-harvest data. | Not Presented | Not Presented | Streams with no buffer did not have a statistically significant temperature response as a result of the streams being buried by a layer of slash that was deposited over these streams. Four of the five buffered streams became warmer (+2.0, 2.6, 2.8 and 4.9 C), and one became slightly cooler (-0.5 C). The year following harvest at Site 17E had blowdown of some of the riparian vegetation, which buried 29% of the sample reach. This covering up of the stream channel confounded the temperature response for this sample reach (added additional shade), and thus it could be expected that the response temperature may have been warmer without the blowdown vegetation lying on top of 29% of the stream reach length. Temperature recovery is not observable because there was only one year of post harvest data. However, “significant” blowdown was observed in the year following this study period (2000), indicating that temperatures may have increased due to potentially elevated solar loading from the low shade levels following blowdown of the riparian vegetation. |</p>
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<tr>
<th>Project</th>
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<th>Vegetation Response</th>
<th>“Shade” Response</th>
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<td><strong>1.4 - Variable Buffer Widths and Water Quality</strong></td>
<td>Riparian no-touch buffer widths were 10m and 30m. There were control (no harvest) and a zero meter buffer (clearcut to stream). Stream treatment length ranged from 215 to 650 meters. Appears to have pre-harvest data and one year of post-harvest data collection.</td>
<td>Not Presented</td>
<td>Mean solar flux (i.e., photosynthetically active radiation – PAR) reaching the stream with a clear-cut (zero meters), 10-m, and 30-m treatment buffers were 58, 16, and 5 times greater than compared with the control, respectively. This corresponds with an approximate reduction of 3 and 26 units of shade associated with the 30 m and 10 m buffers, respectively, as compared to the control. Authors concluded that “our observations suggest that additional light penetration comes through the sides of the buffer” and that there was a significant relationship between light levels and buffer width along small streams.</td>
<td>Compared with controls, mean daily maximum summer water temperatures increased by 1.6, 3.0, and 4.8 degrees Celsius for the 30 m, 10 m and zero meter (clearcut) harvest treatments, respectively.</td>
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<td>Malcolm Knapp Research Forest Study - 1</td>
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<td>Coastal British Columbia (49° Latitude)</td>
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<td>Kiffney et al., 2003</td>
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<td><strong>1.5 - Variable Buffer Widths and Water Quality</strong></td>
<td>Riparian no-touch buffer widths were 10m and 30m. There were control (no harvest) and a zero meter buffer (clearcut to stream). Stream treatment length ranged from 215 to 650 meters. The sites used in this analysis were similar to that of Kiffney et al., 2003. Time line was six years: Two years of pre-harvest, and post-harvest was four years.</td>
<td>Not presented for buffered streams.</td>
<td>Not Presented</td>
<td>The summer daily maximum temperature increased 4.1 C for the 10m buffer site, which indicated a significant treatment effect. The two 30 m buffer sites resulted in a 1.1 and 1.8 C increase of the daily maximum temperatures: 1.8 C treatment effect was statistically significant, but the 1.1 C treatment effect was not.</td>
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<td>Malcolm Knapp Research Forest Study - 2</td>
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<td>Coastal British Columbia (49° Latitude)</td>
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<td>Gomi et al., 2006</td>
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<td><strong>1.6 - Variable Buffer Widths and Water Quality</strong></td>
<td>Eight sites had clear-cut harvest to the edge of the stream (clear-cut patches), thirteen had 50 foot wide no-cut buffers on both sides of the stream (50-ft buffers), and three had circular no-cut buffers with a 56 foot radius around the perennial initiation point (PIP buffers). An un-harvested reference reach was located in close proximity to each treatment site (not within 100 feet of the treatment site). Stream treatment length was a minimum of 300 ft. Standing tree data were collected in 2006 (three years after harvest), and in 2008 (five years after harvest).</td>
<td>In 50 ft buffered stands with minimum windthrow induced mortality (n=10), mean tree mortality for these buffers was 15%, and the mean density of live trees was 140 trees/acre five years after harvest (range 59-247). In 50 ft buffer stands with high windthrow induced mortality (n=3), mean tree mortality was 68.3% for these buffers over the five year period, and exceeded 90% in one case. The mean density of the remaining live trees was 62.8 trees/acre.</td>
<td>The first year following harvest stream shade decreased 13.4 shade units. In 50 ft buffered stands with minimum windthrow induced mortality (n=10), overhead shade in this group of buffers was 10-13 units of shade less than the reference reaches five years after harvest activities. In 50 ft buffer stands with high windthrow induced mortality (n=3), mean overhead shade five years after harvest was about 30 units of shade lower than the reference reaches five years after harvest activities.</td>
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<td><strong>1.7 - Variable Buffer Widths and Water Quality</strong></td>
<td>Thinning maintained the dominate trees and removed 80 to 100 stems per acre. Various “no-touch” buffer widths were maintained (i.e., 20, 40, 60, and 80 feet) with thinning occurring outside of this zone to distance of 180 ft from the stream.</td>
<td>Reduced the stems per acre from around 220 to between 120 and 140 within the “thinned” zone.</td>
<td>Thinning the stand from 220 stems per acre to around 120 to 140 stems per acre increased the Angular Canopy Density (ACD) over the stream by 14% in one plot and 24% in another plot (Each treatment had two reported plot values). ACD reductions were observed for at least one plot at each of the “no-touch” buffer widths (up to 80 feet). The magnitude of decrease was lower as the “no-touch” buffer width increased, with average reductions in ACD near zero with a “no-touch buffer” of 60 feet.</td>
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<td>1.8 - Variable Buffer Widths/Thinnings and Water Quality</td>
<td>Three harvest conditions: 1) Low Retention Buffer – remove all merchantable timber (&gt;15 cm and &gt;20 cm dbh for pine and spruce-pine respectively) within 20 m of stream, 2) High Retention Buffer – Remove all large merchantable timber &gt; 30 cm dbh within the 20-30m zone and 3) Patch cut – a high-retention along the lower 60% of the stream and removal of all riparian vegetation in the upper 40% of the watershed. Forest harvest actions outside of these buffer areas were not presented. Stream treatment length ranged from 185 to 810 meters. There are two reaches for the low and high retention buffers, and three control (unharvested) reaches. There was around 2 years of pre-harvest data, and 5 years of post harvest data.</td>
<td>Not Presented</td>
<td>Canopy density conditions over the stream were shown to decrease following harvest activities, from an average condition of 76 in the control group, to 17 and 9 percent canopy density for “High” Retention buffer (B3) and “Low” Retention buffer (B5), respectively.</td>
<td>The authors concluded that summer stream temperatures clearly increased following forest harvesting and found that water temperatures were still elevated 5 years following treatment for all riparian buffers used in the analysis. Summer maximum mean weekly temperature increased by an average of 2.4°C and 5 °C for the “low” retention buffers. For the “high” retention buffers, summer maximum mean weekly temperature increased by an average of 0.3°C and 1.7 °C. Several years of blowdown associated with the second listed high retention buffer and patch retention buffer increased the temperature response from this treatment. Before the blowdown event, this buffer had a temperature increase of over 1 C for the weekly average temperature condition, and it increased to near 2 C following the blowdown events. The other high retention buffer in this study had around a 0.5 C temperature increase following harvest: This reach was the largest stream, and had very little stream length exposed to cutblocks (375 m). No temperature recover was observed after five years.</td>
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Fifteen streams were assigned to one of five treatments: (1) clearcut with no stream buffer (less than 6.8 m²/ha residual basal area); (2) a thinned 11-m buffer (thinning target of 13.7 m²/ha) and clearcut outside of this zone; (3) a thinned 23-m buffer (thinning target of 13.7 m²/ha) and clearcut outside of this zone; (4) partial cuts with no designated buffer (retaining at least 13.7 m²/ha residual basal area in the harvest zone); and (5) un-harvested controls.

Stream treatment length was 300m and was on both sides of the stream.

There were three replicates of each treatment.

Time line was 3 years: one year of pre-harvest data and two years of post-harvest data.

Basal area values associated with “clearcut harvest” stands in this study were reduced to levels well below the minimum target (retain at least 6.9 m²/ha).

The basal associated with the partial-harvest treatment ranged from 14.0 to 18.9 m²/ha.

Thinning targets associated with the buffered streams (11 m and 23-m) exceeded the 13.8 m²/ha target in 5 of the 6 streams (only one was slightly below 13.5 m²/ha).

Canopy closure measured in the middle of the stream channel was reduced by average of 11% in the 11m group (i.e., average canopy cover was 94 before treatment and 84 following treatment), and 4% the 23m group (Average canopy cover was 94 before treatment and 90 following treatment.).

The temperature increase associated with the 11m buffer ranged from 1.0 to 1.4 C.

They did not report a temperature increase associated with the 23 m and partial harvest buffers. They speculated that high subsurface groundwater flow significantly mitigated the effects of canopy removal by slowing temperature increases.

No apparent temperature recovery was observed after 3 years.
In small forested watershed (< 9 ha) the following three treatments were applied: (1) clearcut (n=5); (2) continuous buffered (n= 6); and (3) patch-buffered streams (n=5). In all three treatments, the upland portions of the catchments were clearcut harvested so that these treatments differed only in the way the riparian zone was harvested. The buffer width associated with the continuous buffer treatment was 20 meters on both side of the stream. The average stream treatment length for continuous buffer streams was 279 m, however only 43% of the stream length (on average) was observed to be flowing in the first post harvest year.

There were 6 continuous buffer treatment sites, each with a paired reference site.

A seven year monitoring period (2002-2008), with three years of post harvest temperature data collection activities.

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| 1.10 - Vegetation Buffers and Water Quality | In small forested watershed (< 9 ha) the following three treatments were applied: (1) clearcut (n=5); (2) continuous buffered (n= 6); and (3) patch-buffered streams (n=5). In all three treatments, the upland portions of the catchments were clearcut harvested so that these treatments differed only in the way the riparian zone was harvested. The buffer width associated with the continuous buffer treatment was 20 meters on both side of the stream. The average stream treatment length for continuous buffer streams was 279 m, however only 43% of the stream length (on average) was observed to be flowing in the first post harvest year. There were 6 continuous buffer treatment sites, each with a paired reference site. A seven year monitoring period (2002-2008), with three years of post harvest temperature data collection activities. | Not Presented | Stream shade was calculated from hemispherical photography, and included both canopy and topography. Stream shade averaged 94% over the stream channel before logging and did not differ significantly between reference and treatment reaches. Stream shade in reference sites did not change substantially (average = 94%) after logging activities occurred in the other sample reaches.
Stream shade decrease to 86% on average for the continuous buffer treatment reaches. This corresponds to an average reduction of 8 units of stream “shade” associated with this treatment. | For continuous buffered catchments, temperature changes were significantly greater than zero (α = 0.05) in the first two post-treatment years. In the third post-treatment year, the magnitude of the temperature change estimated from the statistical model was significantly different for most of the monitoring period, however it was shown to not be significantly different from zero after Julian day 228 (=15th August) (It is important to point out that the absolute temperature response is still greater than zero during this last two week period).

Temperature response was highest at the start of the evaluation period (i.e., July) and decreased in latter parts of the summer. The July-August average temperature change for the three post-treatment years for the continuous buffered streams was 0.8 °C, and the estimated average July 1st temperature change for the three post-treatment years was 1.1 °C. The authors concluded that overall, the area of surface water exposed to the ambient environment best explained aggregated temperature response. Shorter stream segment lengths were associated with coarse-substrate channels and shorter exposure lengths, and these streams tended to be thermally unresponsive to management activities. |
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<td><strong>1.11 - Vegetation Buffers and Water Quality</strong></td>
<td>The 13 sites in the Coast Range managed with a “no-cut” buffer had an average “no-cut” buffer width of 49.6 feet (15 m). Clearcut harvest occurred outside of this no-cut zone. The average stream width for these sites was 6.6 feet, and ranged from 3.2 to 12.8 feet. The plot had a minimum length of 500 feet and maximum length of 1000 feet. Unharvested stand data were collected at sites adjacent, or in close proximity, to harvested stands in order to sample shade conditions that may have existed prior to entry. A time line was not presented</td>
<td>Not Presented</td>
<td>The average shade measured at the unharvested sites in the Coast Range was 89% (i.e., 95, 85, 89, 93, and 83). The average difference in shade conditions associated with the 13 no-cut streams in the Oregon Coast Range was 14.5 units of shade, ranging from 4 to 27 units.</td>
<td>Not Presented</td>
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The Oregon Department of Forestry Stream Shade Study

Coast Range of Oregon (45° Latitude)

*Allen and Dent, 2001*
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<tr>
<td>2.1 - Riparian Thinning with “Warm” Headwater Conditions</td>
<td>Three small, lake headed, forest streams. Two sites (118/16 and 118/48) had thinning out of all mature commercial timber (&gt;15 cm dbh for lodgepole pine and &gt;20 cm dbh for spruce and subalpine fir) within a 30 m buffer surrounding the stream and clearcut occurred outside of this zone. The third site was an unharvested control.</td>
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<td>North Central British Columbia Project</td>
<td>Stream treatment length was 607 m and 372 m for the treatment reaches and 430 m for the unharvested reach. The time line was four years: One year of pre-harvest data, and three years of post-harvest data.</td>
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<td>North-Central British Columbia (55° – Latitude)</td>
<td>Harvesting removed around 50% of streamside vegetation.</td>
<td>Following harvest, canopy cover over the stream decreased from 88% to 48% and 51% for sites 118/16 and 118/48, respectively.</td>
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<td>Mellina et al., 2002</td>
<td>Maximum stream temperatures and diurnal fluctuations increased as a result of harvesting, but the magnitude of change was lower than expected because the water entering the treatment reach was warm lake water discharge.</td>
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<td>Relative to pre-harvest patterns, maximum temperatures for the two treatment streams increased by a net average of 0.4 C, and diurnal fluctuations increase by a net average of 1.1 C. The authors concluded that these are modest changes (compared with literature values) may reflect the effect of headwater lakes on outlet stream temperature.</td>
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<td>The dominate downstream cooling observed both before and after harvest was attributed to the combination of warm source temperature associated with the lakes and the strong cooling effect of ground water inflow through the clear-cut, as well as the residual shade provided by the partially logged riparian buffer.</td>
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<td>No apparent temperature recovery was observed over three years.</td>
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Thirty to 100m wide riparian buffers were “thinned” to basal area reduction of 20.4% (Site WR1), 28.6% (WR2), and 10.8% (WR6). (It is important to note that the preharvest basal area volume was not presented.) There was a 5 m no entry zone. These levels were assessed by postlogging measurements of residual trees and stumps. Three sites had not been previously been logged and serve as reference conditions.

Stream treatment length was 600 m (WR1), 840 m (WR2) and 550m (WR6).

Site WR6 was harvested during the second year so there was only one year of preharvest data for this site, and three years of post-harvest data. The other two harvest sites (WR1 and WR2) had two years of pre-harvest data and two years of post-harvest data.

Site WR1 (20.4% of basal area removed) had a 12% reduction of canopy cover but no increase in ambient light (PAR) reaching the stream surface.

WR2 (28.6% of basal area removed) had no detectable change in canopy cover removed but average light reaching the stream surface increase (but not significantly).

Canopy density and PAR were not measured for site WR6 because the “logging occurred in only small sections of one side of the stream, and mature streamside trees at WR6 tended to be further removed from the stream edges than at WR1 or WR2.”

All streams originated from beaver ponds and flowed downstream through the harvest or reference blocks. Accordingly, all sites exhibited as much as 6-8 C of cooling in the forested reaches over the 240-600m distances between upstream pond outflows and downstream locations during the monitoring period. This is an expected condition (Mellina et al., 2002: Story et al., 2003). The only site that had reduced cooling during the post harvest summer period was WR2 (28.6% of basal area removed). The authors inferred that is possible that shallow groundwater inflow temperatures were elevated by increase solar radiation and soil warming in the upland clearcut and parts of the riparian forest around this site. Instream temperature downstream of WR 2 (28.6% of basal area removed) increased by around 4.4 C in the first post-logging year. Temperatures returned to pre-harvest levels by the second post-harvest year. Stream temperatures at WR1 (20.4% of basal area removed) became more variable following harvest, but were within the range of “preharvest weekly temperatures”. Stream temperatures at WR6 (10.8% of basal area removed) were elevated in one of the three post-harvest monitoring years. The authors summarized that the temperature impacts were not observed on the second post harvest year.
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<td><strong>2.3 - Riparian Buffer with “Warm” Headwater Conditions</strong>&lt;br&gt;Copper Lake Watershed Study&lt;br&gt;Western Newfoundland, Canada (48.5° Latitude)&lt;br&gt;<em>Curry et al., 2002</em></td>
<td>19 ha were harvested in one stream without a buffer strip (Site T1-1). A harvest area of 33 ha with a 20 m buffer strip was applied to another stream. The 20m buffer strip was primarily on one side of the stream (Site T1-2). There was a control (no harvest) watershed. Time line was five years (1993 through 1997). Harvest occurred November 1994 through January 1995, along with June and July 1996.</td>
<td>Not Presented</td>
<td>Authors stated that “there was forest buffer zone to protect the stream from solar loading” associated with the 20m buffer stream. However, there was no information to support this claim.</td>
<td>Harvest reaches were downstream of lakes and therefore stream temperatures entering the reach are elevated. Because this study was focusing on affects to brook trout, the evaluation period was fall, winter, and spring. Summer period results were not presented. Stream temperatures trends in the control (no harvest) basin paralleled air-temperature trends. Compared to control reach, spring stream temperatures in 20m buffer increased by an average of 2.7 °C in the three years following treatment activities. Authors speculate the warming of stream water in the 20 m buffer stream suggests “the mechanism of temperature change was related to groundwater flow to the stream and not direct solar inputs, i.e., there was forest buffer zone to protect the stream from solar radiation.” That is, temperature increases are a result of elevated surface temperature associated with the clearcut zones warming up the groundwater which enters the stream. The authors observed a temperature recover in the last year of the study, however it appeared that the spring period during this last year was an extremely cool period (i.e., the clearcut harvest treatment reach was cooler than pre-harvest temperature conditions.)</td>
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<td>3.1 - Stream Shade Modeling</td>
<td>Not specifically outlined in the analysis. The riparian buffer was modified to illustrate the effects of various buffer attributes and resulting shade conditions.</td>
<td>Input parameter in model</td>
<td>Vegetation on the north bank buffer of an east-west aspect stream can produce up to 30% of the daily shade occurring on the stream surface. The <strong>density</strong> of the buffer is one of the most important controls on buffer shading. Relatively high shading was only achieved with the high buffer densities. Shading by vegetation along a stream increased as <strong>buffer width</strong> was increased. Shading is primarily associated with the top of the vegetation (i.e., shadow length) at narrower buffer widths. Outside of this “inner” zone, sunlight traveling through the side of the buffer increases in importance towards shade production. Stream shading increased rapidly with increased <strong>buffer height</strong>. Shading is primarily associated with the side of the vegetation at shorter vegetation heights. Outside of this “inner” zone, sunlight traveling through the top of the vegetation (i.e., shadow length) increases in importance towards shade production.</td>
<td>Not Presented</td>
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<td><strong>3.2 - Stream Shade Modeling</strong></td>
<td>Not specifically outlined in the analysis. Vegetation height was modified to illustrate the potential shadow length associated with various tree height conditions at various hillslope angles and at various months of the year along a stream situated at a latitude of 45.7°N.</td>
<td>Input parameter in model</td>
<td>Results indicate that a tree located on a flat hillslope along the stream <strong>within a distance of its height</strong> can be influential on shade production (i.e., the shadow length associated with the tree is long enough to reach the stream), and ultimately on stream temperature during the summer period (July/August). However, there are commonly occurring situations which trees outside of this distance can contribute to shade production (For example, a 100 foot tall tree located on a hillslope of 20 degrees can cast a 169 foot long shadow at 4 PM during the late summer.).</td>
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<td>3.3 and 3.4 - Stream Shade and Temperature Modeling</td>
<td>Four buffer conditions were evaluated for BLM administered lands along Canton Creek, Oregon (North Umpqua Basin): (1) A 46 m (150 ft) no-touch buffer width; (2) A 31 m (100 ft) no-touch buffer width; (3) A 31 m variable retention buffer (i.e., 18 m (60 ft) no-touch buffer, with a 13 m (40 ft) 50% canopy cover outside of the “no-touch” zone); and (4) A 46 m variable retention buffer (i.e., 18 m (60 ft) no-touch buffer, with a 28 m (90 ft) 50% canopy cover outside of the “no-touch” zone). Clearcut occurred outside of this zone. Pre-thinning canopy cover associated with large conifers was 80%. Calculated shade conditions associated with the various buffer combinations were modeled for shade and temperature response using Heat Source 7.0.</td>
<td>Input parameter in model</td>
<td>Very little shade reduction was observed associated with the 46 m “no-touch” buffer (maximum reduction was 1 unit of percent shade). The 31 m no-touch buffer had shade reductions of over 10 units at several locations, while other areas had only minimum reductions (i.e. 1 unit of percent shade). There were many more areas with 1 unit of shade reduction than was observed for the 46 m no-touch buffer. The 31 m variable retention buffer had shade reduction of over 12 units of shade at several locations along the river, with two regions of the river approaching a reduction of 20 units of shade. There were many more areas with 1 unit of shade reduction than was observed for the 46 m and 31 m no-touch buffers. The 46 m variable retention buffer had shade reductions of around 4 units at several locations along the river. There were many more areas with 1 unit of shade reduction than was observed for the 46 m no-touch buffer.</td>
<td>Temperature response was expressed as the maximum change in the seven day average of the maximum daily temperature during the modeling period (July 12th through July 31st). Very little (less than 0.1 C) increase in water temperature was observed for the 46 m “no-touch” buffer. The 31 m no-touch buffer produced changes in stream temperature in excess of 0.5° C at one location along Canton Creek, and temperature increases of over 0.2 C at several other locations. The 31 m variable retention buffer produced changes in stream temperature in excess of 0.6° C at one location along Canton Creek, and temperature increases of over 0.2 C at several other locations. The 46 m variable retention buffer produced changes in stream temperature approaching 0.2° C.</td>
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</tr>
<tr>
<td>3.5 - Stream Shade and Temperature Modeling</td>
<td>Variable “no-touch” buffer widths were tested (i.e., 9m, 15m, and 23m) with a vegetation height of 15 m. Harvest unit on only one side of the stream. Angular canopy density for each buffer width condition was estimated using two models (Brazier and Brown, 1973; Steinblums et al., 1984), which was used as an estimate of canopy cover condition in the “Shade.xls” model. Calculated shade conditions associated with the various channel width and buffer combinations were modeled for temperature response using QUAL2Kw.</td>
<td>Input parameter in model</td>
<td>As the riparian buffer width was reduced from 23 m to 15 m, stream shade was reduced by 4 to 8 units of shade for a 3m wide stream channel. As the riparian buffer width was reduced from 23 m to 9 m on a 3 m wide stream, stream shade was reduced by 12 to 16 units of shade.</td>
<td>For a 3 m wide stream channel after 472m stream channel distance, stream temperatures increased between 0.11 and 0.17 C as the riparian buffer width was reduced from 23 m to 15 m. For a 3 m wide stream channel after 472m stream channel distance, stream temperatures increased between 0.27 and 0.33 C as the riparian buffer width was reduced from 23 m to 9 m. Temperature results associated with the 6m channel indicate that the “shadow length” from the 15 m tall vegetation was not sufficient to cast a proper shadow across the stream leading to very low shade conditions. Accordingly, despite greater shade conditions associated with the wider riparian buffers, the temperature response was muted in the 6m stream channel. In other words, shade levels for the 6m stream are low for all buffer width conditions and therefore stream temperature increases are high for all scenarios.</td>
</tr>
</tbody>
</table>
### 4.1 - Effects of Riparian Thinning

**Riparian Buffer Component of the Density Management Studies Project - 1**

Oregon Coast Range and west side of the Cascade Mountains in western Oregon.

*Chan et al., 2004a*

<table>
<thead>
<tr>
<th>Buffer/Harvest</th>
<th>Vegetation Response</th>
<th>“Shade” Response</th>
<th>Water Temperature Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thinning treatments include: 1) Unthinned control – 500 to 750 trees per ha (tph) greater than 12.7 cm dbh. 2) High density retention – 70 to 75% of area thinned to 300 tph, 25 to 30% unthinned Riparian Reserves or leave islands. 3) Moderate density retention – 60 to 65% thinned to 200 tph, 25 to 30% unthinned Riparian Reserves or leave islands, 10% circular patch openings. 4) Variable density retention.</td>
<td>Thinning to 200 tph decreased stand density by up to 70% (i.e., unthinned controls had 500 to 700 tph).</td>
<td>Thinning to 200 tph increased available light from 10 to 16 units of shade in the buffer (i.e., 13–19% in the unthinned buffer to about 29% within the thinned buffer). Light values indicate that upland thinning to 200 tph increases available light within the first 20 m of the adjacent riparian buffer. Thus, the authors conclude that thinning may result in some significant (but potentially transitory) changes in stand light and microclimate conditions.</td>
<td>Not Presented</td>
</tr>
</tbody>
</table>

### 4.2 - Effects of Riparian Thinning

**Riparian Buffer Component of the Density Management Studies Project - 2**

Oregon Coast Range and west side of the Cascade Mountains in western Oregon.

*Chan et al., 2004b*

<table>
<thead>
<tr>
<th>Buffer/Harvest</th>
<th>Vegetation Response</th>
<th>“Shade” Response</th>
<th>Water Temperature Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>See above for Chan et al., 2004a</td>
<td>Not Presented</td>
<td>Commercial thinning substantially increased understory light when stand density was decreased to a basal area (BA) less than 120 ft^2/ac, or in other terms, below a relative density (RD) of 30. At BA ≥ 160 ft^2/ac, and RD ≥40, light levels average about 10% of open conditions, similar to those of unthinned stands.</td>
<td>Not Presented</td>
</tr>
</tbody>
</table>

**Not Presented**
Three types of unharvested buffers were bounded by riparian harvest: (1) Streamside retention buffers (SR) – average 9 m wide, which consisted of retaining all trees having a portion of their crown extending directly over the stream; (2) Variable width buffers (VB) – averaged 22 m wide, with an minimum buffer of 12 m from the stream center and maximum width up to 32 m; and (3) One site potential tree height buffer (B1) – 69 m, and ranging from 53 to 73 meters. There were two harvest activities occurring outside of the buffer zone: (1) patch opening (i.e., small (0.4-ha) clearcut harvest); and (2) thinning to a density of 198 trees per hectare (tph). Unharvested controls reaches had around 500 to 750 tph (Chan et al., 2004)).

Basal areas of the thinned treatments were relatively constant over distance in the upslope, treated portions of the transects. Basal area reductions associated with the 0.4 ha patch treatments were observed.

Clearcut harvest outside of the 69 m no-touch buffer (“B1-P”) did not result in a significantly different light condition over the stream than the unharvested condition (“UT”) and appears to be decreasing less than 1 unit of percent visible sky.

Clearcut harvest outside of the 22 m no-touch buffer (“VB-P”) resulted in significantly higher light conditions over the stream (p = 0.002), increasing 5.1 units of percent visible sky.

Maximum air temperature above the stream for the SRT was similar to that of the thinned upslope and were 4 C warmer than observed for streams with unharvested stands. This indicates that the stream center and buffer microclimates were essentially the same as the upslope in the thinned stand. Although statistically insignificant, temperature maximum of the SRT treatment exceeded that for untreated stands by 4.5°C. Temperature increases above the stream associated with thinning retaining buffers of 22 m width (VBT) were approximately 1°C and statistically insignificant. Maximum soil and air temperatures were associated with the 0.4 ha circular patch openings for the patch sites and were the highest for all monitoring sites.
<table>
<thead>
<tr>
<th>Project</th>
<th>Buffer/Harvest</th>
<th>Vegetation Response</th>
<th>“Shade” Response</th>
<th>Water Temperature Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.4 - Effects of Riparian Thinning Over Time</td>
<td>Four Treatment Groups: (1) Unthinned (≈550 trees/ha (i.e., tph)); (2) light thinning (≈250 tph); (3) moderate thinning (≈150 tph); and (4) heavy thinning (≈75 tph). Stands were monitored over an eight year period.</td>
<td>Thinning reduced basal area (BA) by 51%, 67%, and 84% in lightly, moderately, and heavily thinned stands, respectively. Tree densities in thinned stands were reduced in the moderate and heavily thinned stands by windthrow and stem breakage during severe winter storms in the first 4 years of the study.</td>
<td>Immediately after thinning, % skylight through the canopy ranged from 2% in unthinned stands to 48% in heavily thinned stands. After 8 years, % skylight in lightly thinned stands was similar to levels in unthinned stands, and % skylight in moderately thinned stands had diminished to levels similar to those in lightly thinned stands just after thinning. Percent skylight for the moderate and heavy thinned stands was elevated above unthinned stand conditions for the eight year period associated with this study.</td>
<td>Not Presented</td>
</tr>
<tr>
<td>Project</td>
<td>Buffer/Harvest</td>
<td>Vegetation Response</td>
<td>“Shade” Response</td>
<td>Water Temperature Response</td>
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</tr>
<tr>
<td><strong>4.5 – Effects of Riparian Harvest on Microclimate Gradients</strong></td>
<td>Variable no cut riparian buffer width: 23m (and 17m on other bank), 17m(23m), 25m (60m), 60m (25m), and 60m (25m). One year of pre-harvest and one year of post-harvest data collection.</td>
<td>Not Presented</td>
<td>Solar radiation and relative humidity did appear to have some association with buffer width. Edge influences appeared to allow solar load to penetrate the forest buffer and affect stream microclimate. Accordingly, the authors surmise that as the buffer widens the amount of solar radiation able to penetrate the vegetation and reach the stream station would decrease.</td>
<td>They did not find any relationship between water temperature and buffer width. It is important to point out that the temperature response associated with each treatment was not presented so it is not possible to determine the exact impact of various riparian buffer widths on stream temperature. Observe a strong influence of soil temperature in the surrounding land area on water temperature, even for sites well away from the stream. The authors concluded that this suggests that activity in the watershed up to or more than 180 m away may affect the stream even when a buffer strip is left intact. Authors conclude that a buffer at least 45 m on each side of the stream is necessary to maintain a natural riparian microclimatic environment along the stream.</td>
</tr>
<tr>
<td>Project</td>
<td>Buffer/ Harvest</td>
<td>Vegetation Response</td>
<td>“Shade” Response</td>
<td>Water Temperature Response</td>
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<tr>
<td>------------------------------------------------------------------------</td>
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<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>4.6 – Effects of Riparian Harvest on Blowdown</td>
<td>Four stand conditions: (1) No adjacent harvest (reference stream), (2) standard clearcut, (3) full riparian buffer, and (4) a non-merchantable harvest (There was very little non-merchantable vegetation so these effectively became clearcut harvest.). Widths of buffers applied to the buffered streams were dictated by operational considerations and the widths of the linear buffers ranges from 8 to 10 meters on each side of the channel. The stream length harvested was not presented.</td>
<td>Buffer blowdown was extensive in 2001 (two years following harvest activities associated with buffered streams). Blowdown ranged from 33 to 64% of buffered trees with attendant effects on canopy cover. After blowdown, the newly fallen trees either spanned the channels or lay beside the channels, so blow down trees were not adding woody debris to the channels or altering channel structure at the time of the study.</td>
<td>Not Presented</td>
<td>See Jackson et al, 2001</td>
</tr>
</tbody>
</table>
Appendix A – Synopsis of Literature Describing the Effects of Riparian Management on Stream Shade and Stream Temperature

Peter Leinenbach - USEPA Region 10

Included in this literature review were original studies conducted on forest lands that used a BACI (Before-After/Control-Impact) design to investigated the effects of riparian buffers on stream shade and temperature conditions. Specifically, studies that included monitoring of both before and after treatment, and studies with untreated control sites were included in this review. In addition, only studies with a defined riparian buffer were included in the review; That is, studies that only investigated the effects of clearcut harvest up to the stream’s wetted edge. Finally, only studies that described forested conditions in North America (i.e., latitude between 40°N and 55°N), with an emphasis on streams in the Pacific Northwest, were included in this effort.

This appendix is separated into three sections.

The first section lists the individual studies included in this synopsis. The studies are grouped into four categories based on: (1) field studies; (2) field studies with “warm” headwater conditions; (3) stream shade and stream modeling studies; and (4) riparian management studies (i.e., these studies did not emphasize effects on stream shade and water temperature response).

The second section lists stream shade and temperature response reported in these studies. The information is presented in tables and it is categorized into three groups: (1) “No-cut” riparian buffer adjacent to clearcut harvest units; (2) Thinned riparian buffer adjacent to clearcut harvest units; and (3) “No-cut” riparian buffer adjacent to thinned riparian harvest units.

The third sections presents results associated with group 4 listed above (i.e., riparian management studies).
Section One – Listing of Studies

The studies are grouped into four groups.

The first group of studies are field efforts which investigated stream shade and temperature responses resulting from harvest activities at various “no-cut” buffer widths and thinned buffer regimes.

Group 1

1.1 - Variable Buffer Widths and Water Quality – Ripstream Project – 1
  Groom J. D., L. Dent, L. and Madsen. 2011a. Stream temperature change detection for state and private forests in the Oregon Coast Range. Water Resources Research 47

1.2 - Variable Buffer Widths and Water Quality – Ripstream Project – 2

1.3 - Vegetation Buffers and Water Quality – Coast Range of Washington Study

1.4 - Variable Buffer Widths and Water Quality – Malcolm Knapp Research Forest Study – 1

1.5 - Variable Buffer Widths and Water Quality – Malcolm Knapp Research Forest Study – 2

1.6 - Variable Buffer Widths and Water Quality – Westside Type N Buffer Study – CEMR

1.7 - Variable Buffer Widths and Water Quality – Rogue River Siskiyou National Forest Study

1.8 - Variable Buffer Widths/Thinnings and Water Quality – Stuart-Takla Study

1.9 - Variable Buffer Widths/Thinnings and Water Quality – Western Maine Project
The second group is similar to the first group except that the headwater condition associated with these studies were dramatically influenced by “warm” water sources as a result of lakes, ponds and/or impoundments. Accordingly, the elevated headwater temperature resulted in a “cooling” effect in the pre-harvest stream reach as the river re-entered forested conditions (i.e., in these forested areas there was high levels of shade, and potentially cool ground water). In other words, the effects of the harvest activities are “muted” by the natural occurring “cooling” phenomenon within these reaches. Thus, caution should be used to compare the relative magnitude of effects associated with harvest activities with this group and that with Group 1 study results.

Group 2

2.1 - Riparian Thinning with “Warm” Headwater Conditions – North Central B.C. Project

2.2 - Riparian Thinning with “Warm” Headwater Conditions – White River Harvest Impact Project

2.3 - Riparian Buffer with “Warm” Headwater Conditions – Copper Lake Watershed Study
The **third group** of studies are *modeling efforts* which investigated the effect of riparian buffer conditions on stream shade and water temperature conditions. Water quality modeling provides an excellent tool to investigate the relationship between riparian vegetation, stream shade, and the resulting temperature condition. The Canton Creek modeling effort verified simulated base conditions with empirical data sets for surface and instream temperature and therefore represent a potential pseudo-BACI design. The other modeling efforts in this group were essentially sensitivity analyses.

**Group 3**

3.1 - **Stream Shade Modeling** – Effects of Riparian Buffer Width, Density and Height  

3.2 - **Stream Shade Modeling** – Potential Shadow Length Associated with Riparian Vegetation  
Leinenbach, P, 2011. Technical analysis associated with this project to assess the potential shadow length associated with Riparian vegetation

3.3 - **Stream Shade and Temperature Modeling** - Variable Buffer Widths/Thinnings and Water Quality  

3.4 - **Stream Shade and Temperature Modeling** - Variable Buffer Widths/Thinnings and Water Quality  

3.5 - **Stream Shade and Temperature Modeling** - Variable Buffer Widths and Water Quality  
The fourth group of studies are field efforts which investigated the condition of the riparian stand resulting from both clearcut and thinning activities. Although these studies did not emphasize effects on stream shade and water temperature response, valuable attributes were measured during these efforts (i.e., air temperature and solar loading at the stream surface and within the harvest buffers, and resulting buffer canopy cover associated with harvest activities).

Group 4

4.1 - Effects of Riparian Thinning - Density Management Study – 1

4.2 - Effects of Riparian Thinning - Density Management Study – 2

4.3 - Effects of Riparian Thinning - Density Management Study – 3

4.4 - Effects of Riparian Thinning Over Time - Oregon Coast Range Project

4.5 – Effects of Riparian Harvest on Microclimate Gradients –Western Washington

4.6 – Effects of Riparian Harvest on Blowdown – Coast Range of Washington Study
Section Two - Summary of Stream Shade and Stream Temperature Response

Summary information is presented in tables and it is categorized into three groups: (1) “No-cut” riparian buffer adjacent to clearcut harvest units; (2) Thinned riparian buffer adjacent to clearcut harvest units; and (3) “No-cut” riparian buffer adjacent to thinned riparian harvest units.

Group One – “No-cut” riparian buffer adjacent to clearcut harvest units

There are five general buffer width categories associated with these harvest studies: 46m (150 feet), 30 m (100 ft), 20 m (66 ft), 15 m (50 ft), and 10 m (33 ft). The stream shade and temperature response was highly variable within each group, however the magnitude of change increased as the “no-cut” buffer width decreased. The least amount of effect was associated with the widest “no-cut” buffer width (i.e., 150 ft), and the largest was observed with the narrowest “no-cut” buffer width (i.e., 33 ft). Results for this group are illustrated in Figure 1.

46m “no-cut” riparian buffer adjacent to clearcut harvest units

There were very little reported changes in shade and temperature conditions associated with 47m (150ft) “no-cut” buffers.

<table>
<thead>
<tr>
<th>Buffer Dimensions</th>
<th>Shade Response</th>
<th>Temperature Response</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>47m no-cut buffer width (average condition) (n= 15 sites)</td>
<td>Little difference in shade was found for these sites (mean change in Shade from 90% to 89%).</td>
<td>These sites did not exhibit exceedance rates of the PCW criteria that differed from preharvest, control, or downstream rates (i.e., 5%). Observed temperature changes at these sites were as frequently positive as negative: The average observed maximum change at these sites was 0.0 °C.</td>
<td>1.1 Groom et al 2011a 1.2 Groom et al 2011b</td>
</tr>
<tr>
<td>46m no-cut buffer (modeled condition)</td>
<td>Very little shade reduction was observed associated with the 46m “no-cut” buffer (maximum reduction was 1 unit of percent shade).</td>
<td>Very little (less than 0.1 C) increase in water temperature was observed for the 46m “no-cut” buffer.</td>
<td>3.3 Science Team Review, 2008</td>
</tr>
<tr>
<td>69m no-cut buffer (Site Potential Tree Height)</td>
<td>The 69m no-cut buffer, with a patch clearcut outside of this zone, did not result in a significantly different light condition over the stream.</td>
<td>Not Reported</td>
<td>4.3 Anderson et al., 2007</td>
</tr>
</tbody>
</table>
Stream shade conditions have been shown to decrease up-to 10 units of shade with a 30m (100ft) riparian buffer. Similarly, Kiffney observed that solar flux (PAR) increased by 5 times over control conditions with a 30 meter buffer. Stream temperature response ranges from around 0.5 to 1.8°C. Groom et al 2001b observed an increase in maximum temperature pre-harvest to post-harvest for sites that exhibited an absolute change in shade of > 6%; otherwise, directionality appears to fluctuate.

<table>
<thead>
<tr>
<th>Buffer Dimensions</th>
<th>Shade Response</th>
<th>Temperature Response</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>26m no-cut buffer width (average condition) (n= 18 sites)</td>
<td>Post-harvest stream shade values differed significantly from pre-harvest values (mean change in Shade from 85% to 78%). Authors observed an increase in maximum temperature pre-harvest to post-harvest for sites that exhibited an absolute change in shade of &gt; 6%; otherwise, directionality appears to fluctuate.</td>
<td>Pre-harvest to post-harvest temperatures increased on average by 0.7 °C with an observed range of response from −0.9 to 2.5 °C. In addition, mean temperatures increased by 0.37 °C, minimum temperatures by 0.13 °C, and diel fluctuation increased by 0.58 °C. Timber harvested on these sites had a 40.1% probability that the daily maximum temperature response will be &gt;0.3 °C (i.e., exceed the Protect Cold Water (PCW) criteria).</td>
<td>1.1 Groom et al 2011a 1.2 Groom et al 2011b</td>
</tr>
<tr>
<td>30m no-cut buffer width (n = 3 sites)</td>
<td>Compared with controls mean solar flux (i.e., photosynthetically active radiation – PAR) reaching the stream was 5 times greater. This corresponds with an approximate reduction of 3 units of shade as compared to the control.</td>
<td>Compared with controls, mean daily maximum summer water temperatures increased by 1.6°C. Authors concluded that “our observations suggest that additional light penetration comes through the sides of the buffer” and that there was a significant relationship between light levels and buffer width along small streams.</td>
<td>1.4 Kiffney et al., 2003</td>
</tr>
<tr>
<td>30m no-cut buffer width (n = 2 sites)</td>
<td>Not Presented</td>
<td>The two 30 m buffer sites resulted in a 1.1 and 1.8 °C increase of the daily maximum temperatures: 1.8 °C treatment effect was statistically significant, but the 1.1 °C treatment effect was not.</td>
<td>1.5 Gomi et al., 2006</td>
</tr>
<tr>
<td>30m no-cut buffer width (modeled condition)</td>
<td>The 31 m no-cut buffer had shade reductions of over 10 units at several locations, while other areas had only minimum reductions (i.e. 1 unit of percent shade). There were many more areas with 1 unit of shade reduction than was observed for the 46 m no-cut buffer.</td>
<td>The 31 m no-cut buffer produced changes in stream temperature in excess of 0.5°C at one location along Canton Creek, and temperature increases of over 0.2 °C at several other locations.</td>
<td>3.3 Science Team Review, 2008</td>
</tr>
</tbody>
</table>
20m “no-cut” riparian buffer adjacent to clearcut harvest units

One study showed summer temperature increased and shade decreased following harvest activities. Another study showed a spring temperature increase following harvest activities (the study did not report on summer temperature conditions). Another study showed that stream shade conditions were statistically lower for 22m wide “no-cut” buffers, as compared to controls.

<table>
<thead>
<tr>
<th>Buffer Dimensions</th>
<th>Shade Response</th>
<th>Temperature Response</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>20m “no-cut” buffer width</td>
<td>Stream shade decrease on average from 94% to 86% for the continuously buffered treatment reaches.</td>
<td>Temperature response was highest at the start of the evaluation period (i.e., July) and decreased in latter parts of the summer. The July-August average temperature change for the three post-treatment years was 0.8 °C, and the estimated average July 1st temperature change for the three post-treatment years was 1.1 °C. The authors concluded that overall, the area of surface water exposed to the ambient environment best explained aggregated temperature response. Shorter stream segment lengths were associated with coarse-substrate channels and shorter exposure lengths, and these streams tended to be thermally unresponsive to management.</td>
<td>1.10 Janisch et al., 2012</td>
</tr>
<tr>
<td>(n = 6 site)</td>
<td></td>
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</tr>
<tr>
<td>20m no-cut buffer width on one side of the stream</td>
<td>Authors stated that “there was forest buffer zone to protect the stream from solar loading” associated with the 20m buffer stream. However, there was no information to support this claim.</td>
<td>Harvest reaches were downstream of lakes and therefore stream temperatures entering the reach are elevated. Because this study was focusing on affects to brook trout, the evaluation period was fall, winter, and spring. Summer period results were not presented. Compared to control reach, spring stream temperatures in 20m buffer increased by an average of 2.7 °C in the three years following treatment activities. Authors speculate the warming of stream water in the 20 m buffer stream suggests “the mechanism of temperature change was related to groundwater flow to the stream and not direct solar inputs, i.e., there was forest buffer zone to protect the stream from solar radiation.” That is, temperature increases are a result of elevated surface temperature associated with the clearcut zones warming up the groundwater which enters the stream.</td>
<td>2.3 Curry et al., 2002</td>
</tr>
<tr>
<td>(n = 1 site)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22m no-cut buffer (average condition) with patch treatment outside of this zone</td>
<td>The variable buffer (i.e., 22m) patch treatment resulted in a significantly lower canopy cover condition over the stream (p = 0.002) (Increased about 5 units of percent visible sky.).</td>
<td>Not Reported</td>
<td>4.3 Anderson et al., 2007</td>
</tr>
</tbody>
</table>
**15m “no-cut” riparian buffer adjacent to clearcut harvest units**

Shade conditions were lower at this “no-cut” buffer width. In addition, the effects of windthrow in the years following the harvest activities were shown to result in dramatically lower overhead shade conditions. Stream temperatures were also shown to increase as the “no-cut” buffer width was decreased from 75 ft to 50 ft.

<table>
<thead>
<tr>
<th>Buffer Dimensions</th>
<th>Shade Response</th>
<th>Temperature Response</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>15m (50 ft) “no-cut” buffer width</td>
<td>The first year following harvest stream shade decreased by 13.4 units of shade. Mean overhead shade conditions five years after harvest was about 30 units of shade lower than the reference reaches in stands with large amount of tree mortality due to windthrow (An average mortality of 68.3% for 3 sites). Mean overhead shade conditions five years after harvest was about 10-13 units of shade lower than the reference reaches in stands without a large amount of tree mortality due to windthrow (An average mortality of 15% for 10 sites).</td>
<td>Not Presented</td>
<td>1.6 Schuett-Hames et al., 2011</td>
</tr>
<tr>
<td>(n = 13 sites)</td>
<td></td>
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</tr>
<tr>
<td>15m (49.6 ft) “no-cut” buffer width</td>
<td>The average shade measured at the unharvested sites in the Coast Range was 89 % (i.e., 95, 85, 89, 93, and 83). The average difference in shade conditions associated with the 13 no-cut streams in the Oregon Coast Range was 14.5 units of shade, ranging from 4 to 27 units.</td>
<td>Not Presented</td>
<td>1.11 Allen and Dent, 2001</td>
</tr>
<tr>
<td>(n = 13 sites)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15m (50ft) no-cut buffer width</td>
<td>As the riparian buffer width was reduced from 23 m to 15 m, stream shade was reduced by 4 to 8 units of shade for a 3m wide stream channel.</td>
<td>For a 3 m wide stream channel after 472m stream channel distance, stream temperatures in creased between 0.11 and 0.17 C as the riparian buffer width was reduced from 23 m to 15 m.</td>
<td>3.5 Cristea and Janish, 2007</td>
</tr>
<tr>
<td>(modeled condition)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**10m “no-cut” riparian buffer adjacent to clearcut harvest units**

Large temperature increases (ranging from 2 to 5°C) were associated with 10m wide “no-cut” buffers. Light penetrating from the sides of the riparian buffer were cited as potential causes for these temperature increases (Kiffney et al., 2003 and Jackson et al., 2007\(^1\)). Kiffney et al (2003) reported that the solar flux associated with 10m buffers increased 16 times greater than control un-harvested conditions, which corresponds to an approximate reduction of 26 units of shade as compared to the control.

<table>
<thead>
<tr>
<th>Buffer Dimensions</th>
<th>Shade Response</th>
<th>Temperature Response</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>8m to 10m “no-cut” buffer width (n = 5 sites)</td>
<td>Not Presented</td>
<td>Four of the five buffered streams became warmer (+2.0, 2.6, 2.8 and 4.9 C), and one became slightly cooler (-0.5 C) (Site 17E). The year following harvest at Site 17E had blowdown of some of the riparian vegetation, which buried 29% of the sample reach. This covering up of the stream channel confounded the temperature response for this sample reach (added additional shade), and thus it could be expected that the response temperature may have been warmer without the blowdown vegetation lying on top of 29% of the stream reach length.</td>
<td>1.3 Jackson et al, 2001</td>
</tr>
<tr>
<td>10m “no-cut” buffer width (n = 3 sites)</td>
<td>Compared with controls mean solar flux (i.e., photosynthetically active radiation – PAR) reaching the stream was 16 times greater. This corresponds with an approximate reduction of 25.9 units of shade as compared to the control.</td>
<td>Compared with controls, mean daily maximum summer water temperatures increased by 3.0°C. Authors concluded that “our observations suggest that additional light penetration comes through the sides of the buffer” and that there was a significant relationship between light levels and buffer width along small streams.</td>
<td>1.4 Kiffney et al., 2003</td>
</tr>
<tr>
<td>10m “no-cut” buffer width (n = 1 site)</td>
<td>Not Presented</td>
<td>The summer daily maximum temperature increased 4.1 C for the 10m buffer site, which indicated a significant treatment effect.</td>
<td>1.5 Gomi et al., 2006</td>
</tr>
<tr>
<td>9m (30ft) “no-cut” buffer width (modeled condition)</td>
<td>As the riparian buffer width was reduced from 23 m to 9 m on a 3 m wide stream, stream shade was reduced by 12 to 16 units of shade.</td>
<td>For a 3 m wide stream channel after 472m stream channel distance, stream temperatures in creased between 0.27 and 0.33 C as the riparian buffer width was reduced from 23 m to 9 m.</td>
<td>3.5 Cristea and Janish, 2007</td>
</tr>
</tbody>
</table>

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**Group Two - Thinned riparian buffer adjacent to clearcut harvest units**

There are three general buffer width categories associated with these harvest studies: 30 m (100 ft), 20 m (66 ft), and 10 m (33 ft). Similar to results associated with the Group One, stream shade and temperature response was highly variable within each group, and the magnitude of change increased as the “thinned” buffer width decreased. The least amount of effect was associated with the wider “thinned” buffer width, and the largest was observed with the narrower “thinned” buffer width. In addition, greater thinning intensities generally resulted in larger shade reductions and greater temperature increases. Results for this group are illustrated in Figure 2.

**30m thinned riparian buffer adjacent to clearcut harvest units**

Maximum stream temperature response was shown to increase by 0.4°C (Mellina et al 2002) and by 4.4°C at one site in another study (Kreutzweiser et al., 2009). The authors in the first study concluded that the modest changes (compared with literature values) may reflect the effect of warm headwater temperatures on the temperature response associated with this thinned buffer. The authors in the second study reported that the large initial temperature response was a consequence of upslope harvest disturbance affecting groundwater inflow.

<table>
<thead>
<tr>
<th>Buffer Dimensions</th>
<th>Shade Response</th>
<th>Temperature Response</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>30m thinned buffer width</td>
<td>Following harvest, canopy cover over the stream decreased from 88% to 50%.</td>
<td>Relative to pre-harvest patterns, maximum temperatures for the two treatment streams increased by a net average of 0.4 C, and diurnal fluctuations increase by a net average of 1.1 C. The authors concluded that these are modest changes (compared with literature values) may reflect the effect of headwater lakes on outlet stream temperature.</td>
<td>2.1 Mellina et al., 2002</td>
</tr>
<tr>
<td>30m (to 100m) thinned buffer width</td>
<td>Site WR1 had a 12% reduction of canopy cover but no increase in ambient light (PAR) reaching the stream surface. WR2 had no detectable change in canopy cover removed but average light reaching the stream surface increase (but not significantly). Canopy density and PAR were not measured for site WR6.</td>
<td>Instream temperature downstream of WR 2 increased by around 4.4 C in the first post-logging year. Stream temperatures at WR1 became more variable following harvest, but were within the range of “preharvest weekly temperatures”. Stream temperatures at WR6 were elevated in one of the three post-harvest monitoring years. All streams originated from beaver ponds and flowed downstream through the harvest or reference blocks. Accordingly, all sites exhibited as much as 6-8 C of cooling in the forested reaches over the 240-600m distances between upstream pond outflows and downstream locations.</td>
<td>2.2 Kreutzweiser et al., 2009</td>
</tr>
</tbody>
</table>
20m thinned riparian buffer adjacent to clearcut harvest units

Temperature response was highly variable from no response to a 0.5 to 4°C response. The study which did not show a response (Wilkerson et al 2006) did not have a large reduction in stream shade following treatment (from 94 pre-harvest to 90 post-harvest). The post harvest canopy cover levels are still very high (≥ 90%) and therefore solar loading is low at these locations. The other study indicated that subsequent riparian vegetation blowdown dramatically reduced shade conditions and temperatures subsequently increased as a result of this blowdown (Macdonald et al., 2003). Finally, results associated with this study indicated that greater thinning intensities resulted in larger shade reductions and temperature increases.

<table>
<thead>
<tr>
<th>Buffer Dimensions</th>
<th>Shade Response</th>
<th>Temperature Response</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>20m thinned buffer width (remove all merchantable timber (&gt;15 cm and &gt;20 cm dbh for pine and spruce-pine respectively) within 20m of stream, 2) High Retention Buffer – Remove all large merchantable timber &gt; 30 cm dbh within the 20-30m zone) (n = 4 sites – 2 each)</td>
<td>Canopy density conditions over the stream were shown to decrease following harvest activities, from an average condition of 76 in the control group, to 17 and 9 percent canopy density for “High” Retention buffer (B3) and “Low” Retention buffer (B5), respectively.</td>
<td>The authors concluded that summer stream temperatures clearly increased following forest harvesting and found that water temperatures were still elevated 5 years following treatment for all riparian buffers used in the analysis. Summer maximum mean weekly temperature increased by an average of 2.4°C and 5 °C for the “low” retention buffers. For the “high” retention buffers, summer maximum mean weekly temperature increased by an average of 0.3°C and 1.7 °C. Several years of blowdown associated with the second listed high retention buffer and patch retention buffer increased the temperature response from this treatment. Before the blowdown event, this buffer had a temperature increase of over 1 C for the weekly average temperature condition, and it increased to near 2 C following the blowdown events. The other high retention buffer in this study had around a 0.5 C temperature increase following harvest: This reach was the largest stream, and had very little stream length exposed to cutblocks (375 m).</td>
<td>1.8 Macdonald et al., 2003</td>
</tr>
<tr>
<td>23m thinned buffer width (thinning target of 13.7 m²/ha) (n = 3 sites)</td>
<td>Canopy closure only slightly reduced following harvesting efforts for the 23m thinned buffers (Average canopy cover was 94 before treatment and 90 following treatment.)</td>
<td>They did not report a temperature increase associated with the 23 m and partial harvest buffers. They speculated that high subsurface groundwater flow significantly mitigated the effects of canopy removal by slowing temperature increases.</td>
<td>1.9 Wilkerson et al., 2006</td>
</tr>
</tbody>
</table>
10m thinned riparian buffer adjacent to clearcut harvest units

Shade (percent canopy cover) was reduced by 10 units and temperatures subsequently increased by 1.4 C.

<table>
<thead>
<tr>
<th>Buffer Dimensions</th>
<th>Shade Response</th>
<th>Temperature Response</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 m thinned buffer (thinning target of 13.7 m^2/ha)</td>
<td>Canopy closure was reduced following harvesting efforts for the 11m thinned buffers (Average canopy cover was 94 before treatment and 84 following treatment.)</td>
<td>The temperature increase associated with the 11m buffer ranged from 1.0 to 1.4 C.</td>
<td>1.9 Wilkerson et al., 2006</td>
</tr>
</tbody>
</table>
Group Three - “No-cut” riparian buffer adjacent to thinned riparian harvest units

The table on the following page presents summary information associated with these riparian management studies. There are several interrelated factors which influences the amount of shade produced by these buffer conditions: (1) the total distance associated with the Inner “no-cut” zone and the Outer “thinned” zone; (2) the distance associated with the Inner “no-cut” zone; (3) vegetation density within the “no-cut” zone; (4) the distance associated with the Outer “thinned” zone; and (5) the amount of vegetation remaining within the Outer “thinned” zone following harvesting activities.

The width of the inner “no-cut” riparian buffer was shown to affect the potential consequences of thinning in the “outer” buffer regions, with wider “no-cut” buffers resulting in lower reductions in stream shade conditions (Anderson et al. 2007, Science Team Review 2008, Park et al 2008). In addition, the vegetation density of the inner “no-cut” buffer zone appeared to have an ameliorating effect on thinning activities within the “outer” thinning buffer zone, with higher “protection” associated with greater vegetation densities in the inner zone. Finally, higher residual vegetation densities within the “outer” thinning zone were shown to result in less shade loss. Once again, the limited number of studies that have specifically evaluated these buffer conditions make it difficult to generalize, particularly given the many different possible combinations of thinning intensity and buffer width.
<table>
<thead>
<tr>
<th>Total Distance (m)</th>
<th>Inner “No-Cut” Zone Distance (m)</th>
<th>Inner “No-Cut” Zone Stand Condition</th>
<th>Outer “Thinned” Zone Distance (m)</th>
<th>Thinning Target</th>
<th>Resulting Units of “Shade” Reduction</th>
<th>Resulting Temperature Change (°C)</th>
<th>Number of Sites</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>22</td>
<td>500-750 tph</td>
<td>98</td>
<td>198 tph</td>
<td>≈ 2.5% Open Sky</td>
<td>Not Measured</td>
<td>4</td>
<td>Anderson et al 2007</td>
</tr>
<tr>
<td>120</td>
<td>9</td>
<td>500-750 tph</td>
<td>111</td>
<td>198 tph</td>
<td>5% Open Sky</td>
<td>Not Measured</td>
<td>5</td>
<td>Anderson et al 2007</td>
</tr>
<tr>
<td>46</td>
<td>18</td>
<td>65-80% CC</td>
<td>27</td>
<td>50% CC</td>
<td>4 ES</td>
<td>0.2 7DADM</td>
<td>1</td>
<td>ODEQ Memorandum 2008</td>
</tr>
<tr>
<td>31</td>
<td>18</td>
<td>65-80% CC</td>
<td>12</td>
<td>50% CC</td>
<td>12 ES</td>
<td>0.6 7DADM</td>
<td>1</td>
<td>Science Team Review 2008</td>
</tr>
<tr>
<td>55</td>
<td>24</td>
<td>530 tph</td>
<td>31</td>
<td>321 tph</td>
<td>-0.9 and 0.7 ACD^2</td>
<td>Not Measured</td>
<td>1</td>
<td>Park et al 2008</td>
</tr>
<tr>
<td>55</td>
<td>18</td>
<td>530 tph</td>
<td>37</td>
<td>321 tph</td>
<td>-0.3 and 0.2 ACD</td>
<td>Not Measured</td>
<td>1</td>
<td>Park et al 2008</td>
</tr>
<tr>
<td>55</td>
<td>12</td>
<td>530 tph</td>
<td>43</td>
<td>321 tph</td>
<td>1.8 and 2.0 ACD</td>
<td>Not Measured</td>
<td>1</td>
<td>Park et al 2008</td>
</tr>
<tr>
<td>55</td>
<td>6</td>
<td>530 tph</td>
<td>49</td>
<td>321 tph</td>
<td>2.9 and 9.3 ACD</td>
<td>Not Measured</td>
<td>1</td>
<td>Park et al 2008</td>
</tr>
</tbody>
</table>

^2 Harvest activates occurred on only one stream bank in this study (Park et al 2008), while the other two studies had harvest activities on both stream banks. Accordingly, a doubling of the “Shade” results associated with Park et al 2008 would allow for a more direct comparison of results with the other studies.

tph = trees per hectare; CC = Riparian Canopy Cover (Planar View); 7DADM = seven day moving average of daily maximum stream temperature; ACD = Angular Canopy Density
Section Three – Summary of Riparian Management Studies

The table below presents a summary of the “Shade” response associated with riparian thinning

<table>
<thead>
<tr>
<th>Buffer/Treatment</th>
<th>Vegetation Response</th>
<th>Shade Response</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thin riparian stands to 200 tph</td>
<td>Thinning to 200 tph decreased stand density by up to 70% (i.e., unthinned controls had 500 to 700 tph).</td>
<td>Thinning to 200 tph increased available light from 10 to 16 units of shade (i.e., 13–19% in the unthinned buffer to about 29% within the thinned buffer). Light values indicate that upland thinning to 200 tph increases available light within the first 20 m of the adjacent riparian buffer. Thus, the authors conclude that thinning may result in some significant (but potentially transitory) changes in stand light and microclimate conditions.</td>
<td>4.1 Chan et al., 2004a</td>
</tr>
<tr>
<td>Thin riparian stand to various levels</td>
<td>Not Presented</td>
<td>Commercial thinning substantially increased understory light when stand density was decreased to a basal area (BA) less than 120 ft^2/ac, or in other terms, below a relative density (RD) of 30. At BA ≥ 160 ft^2/ac, and RD ≥40, light levels average about 10% of open conditions, similar to those of unthinned stands.</td>
<td>4.2 Chan et al., 2004b</td>
</tr>
<tr>
<td>Four Treatment Groups: (1) Unthinned (=550 trees/ha (i.e., tph)); (2) light thinning (=250 tph); (3) moderate thinning (=140 tph); and (4) heavy thinning (=70 tph).</td>
<td>Thinning reduced basal area (BA) by 51%, 67%, and 84% in lightly, moderately, and heavily thinned stands, respectively. Tree densities in thinned stands were reduced in the moderate and heavily thinned stands by windthrow and stem breakage during severe winter storms in the first 4 years of the study.</td>
<td>Immediately after thinning, % skylight through the canopy ranged from 2% in unthinned stands to 48% in heavily thinned stands. After 8 years, % skylight in lightly thinned stands was similar to levels in unthinned stands, and % skylight in moderately thinned stands had diminished to levels similar to those in lightly thinned stands just after thinning. Percent skylight for the moderate and heavy thinned stands was elevated above unthinned stand conditions for the eight year period associated with this study.</td>
<td>4.4 Chan et al., 2006</td>
</tr>
</tbody>
</table>

Thinning riparian vegetation from 600 tph to 200 tph increased “view to sky” by 10 units (19% to 29%) (Chan et al., 2004a). This reduced vegetation levels has a direct effect on shade potential through a reduction in canopy density (DeWalle 2010). The authors also reported that light availability increased up to 20m from the thinning activities. The “view to sky” was shown to be maintained within riparian stands at various stand conditions, but below a certain level (i.e., ≤ 40 Residual Density (RD)) the percent view to sky was shown to increase, dramatically so below a RD of 30 (Chan et al 2004b). Once again, this has implications on the amount of shade produced by the riparian stand. At higher RD levels, riparian vegetation removal does not have a subsequent response in canopy density, and subsequently it does not have a large affect on shade conditions. In other words, the same amount of harvest from a stand with a lower initial RD will result in greater reduction in shade production.
In a separate study Chan et al (2006) found that a “light” forest thin (RD of 28 and tph of 252) increased skylight (%) around 12 units (i.e., from around 2% pre-harvest condition to 14% following harvest). (Preharvest condition was a RD of 54 and tph of 547.) This corresponds closely with the results associated the previous two reports: Thinning trees to around a 200 tph (or 30 RD) results in around a ten unit increase of open sky.

Chan et al (2006) also observed that skylight conditions were reduced dramatically with a “Moderate” (RD of 16) and “Heavy” (RD of 8) thin conditions, from around 2% skylight in pre-harvest condition to 29% to 44% following harvest, respectively. Once again, this follows the results of the previous two reports: Thinning below a RD of 30 results in a dramatically increasing “Open Sky” condition.

Eight years following treatment, the “light” thin stand had recovered skylight conditions (i.e., around 6%). However, both the “moderate” thin (RD 16) and “heavy” thin (RD 8) condition did not have a recovery of the percent skylight condition (Chan et al 2006). Shoal (2002) reported that thinning to a RD (Curtis) of 35 to 40 minimized excessive blowdown for Douglas-fir forest stands in the Olympic National Forest. It appears that the low RD conditions in the “Moderate” and “Heavy” thinning, which potentially resulted in the stand being more susceptible stand to blowdown, may have been a factor in the increased percent skylight in the subsequent years. Accordingly, from a shade production perspective, it is important to reduce both the current low canopy cover conditions, along with the potential low conditions in subsequent years as a result of blowdown.

Steinblums et al (1984) reported that trees which are susceptible to windthrow tend to be lost during the first few years following harvest. Jackson et al (2007) reported that windthrow two years following the creation of a 10m “no-cut” buffer resulted in a loss of 33 to 64% of buffered trees with attendant effects on canopy cover. MacDonald et al (2003) reported three successive years of riparian vegetation loss from windthrow on a 20m wide thinned buffer. They measured reduced shade conditions, which resulted in an increase in stream temperatures (≈1 C degree temperature increase), as a direct response to this riparian vegetation loss. Pollock and Kennard (1998) reported that narrow streamside buffers (< 23m) have a much higher probability of suffering appreciable mortality from windthrow than forests with wider buffers. Similarly, Grizzel and Wolff (1998) observed that, on average, windthrow affected 33 percent of buffer trees and ranged from 2 to 92 percent across the 40 sites (average buffer width of 26m). Finally, Schuett-Hames et al (2011) observed an average windthrow loss of 68% in several stands with a buffer width of 15m, which resulted in an additional loss of 20 units of shade on the stream.

Accordingly, the residual density of the thinned buffer, along with the width of the buffer, need to be maintained at a sufficient level to reduce the potential effects of windthrow of the riparian vegetation over time.

Additional Literature Cited in this Section


Figure 1. Observed shade and temperature response associated with “no-cut” riparian buffers with adjacent clearcut harvest.

(PAR = Photosynthetically Active Radiation; 7DADM = seven day moving average of daily maximum temperature)
Figure 2. Observed shade and temperature response associated with “thinned” riparian buffers with adjacent clearcut harvest.

(MW = Mean Weekly)
March 31, 2014

BLM Oregon
Attn: RMPs for Western Oregon Planning Team
1220 SW 3rd Ave.
Portland, OR 97204
email: blm_or_rmps_westernoregon@blm.gov

RE: AOL Comment on BLM Western OR Forest Plan—Proposed Planning Criteria

Dear Planning Team:

This letter is in response to the request for public comment on Proposed Planning Criteria, February 24, 2014 — Bureau of Land Management, Resource Management Plans for Western Oregon (Plan). We look forward to participating as a stakeholder in plan development. As current management of these lands is unacceptable, we anticipate that the new Plan leads toward more effective forest management of unhealthy forest conditions, which threaten neighboring properties and impair Oregon’s forest economy.

This comment letter is submitted on behalf of Associated Oregon Loggers, Inc. (AOL), which represents over 1,000 logging and allied forest business member companies. These companies play a major role in management of public & private forests throughout Oregon, as contractors and purchasers. These Oregon forest professionals employ approximately 10,000 workers in sustainable forest management.

AOL member companies are key stakeholders in actively conducting professional forest management of federal forests—and adjacent non-federal forests—within Oregon and neighboring states. These companies own or manage BLM-adjacent lands; and we are gravely concerned that the health of neighboring property is increasingly degraded by mismanaged and unhealthy BLM forestland. As such, AOL represents substantial expertise in BLM forest management. AOL members are directly impacted by the decisions that will be made as a result of the BLM’s Plan.

When wildfire, disease, pests or invasives spread from passively-managed BLM lands to surrounding non-federal property, serious negative consequences result that impact forest landowners and contractors in the region. The 2003 Timbered Rock Fire and the 2013 Douglas Complex Fire are two glaring examples of how BLM forests pose costly threats to neighboring private property, and how unhealthy BLM forests encumber the future sustainability of the region’s forest sector. Forest landowners and contractors suffered tens of millions of dollars in business losses surrounding these two catastrophic fires that spread onto private forests. Existing BLM forest plans are an abject failure at managing BLM forests to reduce the risk and impact of such BLM fires.

We appreciate the opportunity to comment, and are writing to urge you to proceed expeditiously with Plan development, while considering our suggestions concerning several aspects that would improve Plan viability, as well as the landscape outcomes after implementation. Please consider the following suggestions for developing Alternatives, and choosing your final recommended action:
Maximize O&C Act timber harvest volume annually

We urge that the BLM Plan be strictly responsive to the O&C Act of 1937. Please keep in mind that 2,151,200 acres of the land addressed by this revision has been directed by Congress to be managed under the O&C Act. The Act states in part that the land shall be managed, “for permanent forest production, and the timber thereon shall be sold, cut and removed in conformity with the principal of sustained yield for the purpose of providing a permanent source of timber supply, protecting watersheds, regulating stream flow, and contributing to the economic stability of local communities and industries and providing recreational facilities”. The O&C Act clearly directs these lands are to be managed for timber production for the benefit of local communities. Under the 1994 Northwest Forest Plan (NWFP), the BLM has failed to accomplish the O&C Act timber supply mandate for 20 years.

The BLM Planning Criteria and range of Alternatives considered is too narrow—in that the proposed Alternatives fail to include an Alternative(s) that would optimize/maximize O&C Act timber sale volume. There is not presently considered an Alternative that would sufficiently manage a majority of the O&C acreage primarily for sustainable timber growth and yield. The BLM Plan must include a wider range of Alternatives, including at least two Alternatives, which would address a maximum predictable & sustainable timber offer volume, on an annual basis to benefit West Oregon communities and industry. Furthermore, such “maximum harvest volume” Alternatives would also provide the greatest reduction in fire hazards and other forest health problem reduction.

The revision challenge is how to achieve the O&C timber mandate, while accommodating wildlife species habitat listed under the ESA. The status review for the n. spotted owl identified that there are numerous risks to the survival of the species—none of which was timber harvest. In fact, greater risks such as catastrophic wildfire can be mitigated with a proactive timber harvest program that reduces hazardous fuel loads, and restores more forest acreage to a healthy growing condition. Listed salmon species and the marbled murrelet should be protected using a combination of actively-managed forest landscapes and a few block reserves strategically located. Modern forest practices in use today largely provide, of foster future, habitat attributes necessary to recover and sustain these species. Extraordinary large block reserves envisioned by the NWFP and the proposed BLM Plan are excessive and in the long-term would lead toward increased forest catastrophic losses due to wildfire, pests, disease and storms.

There is urgent need to replace the current obstructive maze of conflicting standards, guidelines, District Resource Management Plans, NWFP, Survey & Manage Standards, plan amendments, State office guides, and other policies that confound forestry projects on the Western Oregon BLM forests. It is our opinion that current management of BLM forests is not sustainable from either an economic, social or an environmental basis.

Purpose and Need – suggested changes

AOL disagrees with the proposed 8 “Purposes” for this Plan, because it is wrongly biased to favor old tree ecological outcomes, at the expense of economic and social outcomes. For example of this bias, large old trees are favored by three of the 8 Purposes (2., 3. & 4.). Such old tree bias places these old shade-tolerant forest characteristics in preeminence—to the wrongful exclusion of the necessary ecosystem diversity of younger-open-smaller forests and trees, including shade intolerant vegetation. Additionally, the preeminence of old tree characteristics (by three “Purposes”) also discriminates against productive, healthy tree characteristics—to the wrongful exclusion of the necessary economic and societal benefits of forests managed to optimize timber, revenue, employment, and recreation outcomes.
The following proposed list of 8 biased purposes is incomplete and harmfully discriminates against important economic and social outcomes:

1. Provide sustained yield of timber
2. Conservation/recovery of TES species
3. Large blocks of old forest
4. Older structurally complex forests
5. Provide clean water
6. Provide recreation opportunities
7. Restore fire-adapted ecosystems
8. Coordinate with Coquille Tribe

We urge you to consider that the following four important additional “Purposes” be added to the list of 8 above, to fairly balance the action Alternatives with critical economic and social values—responsive to the O&C Act, FLMPA, forest users, timber industry, and communities:

a. Provide optimum non-declining revenue to reliably maintain vibrant forest industry, recreation and county government sectors
b. Provide prompt post-damage reforestation, harvest and restoration of forest condition
c. Maintain & improve road access investments for recreation use & forest management
d. Respect neighbor forest values of non-federal landowners during BLM management

**Sustainable timber supply -- first priority**
The Purposes should be placed in a different order, ranking first, those maintaining economies, revenues and social outcomes on a reliable/predictable basis. Purpose accomplishment should necessitate active land management. Over the last 20 years, management activities dropped-off substantially, putting forest health in decline and fire/pest/disease/storm losses on the increase. Also, the economic stability of our communities and the timber supply has been inadequate to support existing forest sector infrastructure. Additionally, with a trend toward larger more severe wildfires, the amenities that enhance communities as a safe place to live and work are more at a threat of loss. The resultant burned/dying landscapes—the likely result of the current proposed Alternatives—would neither enhance our communities, nor foster industry, nor spur recreation, nor beatify aesthetics, nor improve forest habitat or water.

**Alternatives A and B are inconsistent with purpose “Provide sustained yield of timber”**
Alternatives A & B are doomed to fail to reach plan purposes. These alternatives cannot meet any of the Plan purposes as stated above, because both would lead to more decadent and overcrowded forests. These in-turn would lead to even a greater threat to wildfires/disease/pests/windthrow than we have been experiencing and therefore more dead BLM forests. Such unhealthy forestlands would NOT yield sufficient timber harvest sustainably.

Furthermore, these Alts. would probably spread to neighboring properties including homes & personal property. The air quality would also suffer, and high intensity fires would negatively impact soil productivity, hydrology, habitat, and fisheries. A recent study by the Oregon Health Authority concluded that wildfire human health impacts from smoke pollution were unacceptably severe from the 2012 Pole Creek Fire, on the Deschutes National Forest.

These Alternatives fall outside of the O&C Act’s direction because of the insufficient timber, revenue and recreation outcomes. Additionally, stratifying the forest into various land use allocations, that prohibit sustainable timber harvest, would be against the Plan’s stated direction and application of the O&C Act.
**Improve Alternatives C and D**

Alternatives C & D are the only two alternatives even approach any small semblance of timber harvest volume under the O&C Act and court interpretations of the law. Therefore, I would suggest that the BLM look at additional Alternatives during the NEPA process that would include additional middle-ground (these two Alternatives). Alternatives C & D should be bolstered to increase harvest volume—using strategies such as narrower riparian buffers, and reducing the number of old trees reserves across the landscape—for example, retaining just 10%-30% of trees over 300 years old in each subwatershed.

As another example, both Alternatives suggest an unacceptable harvest tree age-prohibition that we oppose (120 & 160 years). We believe that the promised harvest volumes proposed under the 120 & 160 years harvest age-prohibition could never be accomplished, if either of these alternative age prohibitions were implemented. We strongly oppose blanket tree-age prohibitions because such gerrymandering causes three fatal problems: a) completely removes professional forest manager discretion from achieving multiple land objectives; b) harmfully dictates dysfunctional forestry that obstructs balanced resource goal achievement; and c) prohibits site-specific decisions necessary to optimize timber growth & yield. Why in your analysis do you suggest reserving stands greater than certain ages? This is a Defacto prohibition of unnecessary no-cut reserves, or land allocations that are not permitted under the O&C Act.

**Add three more Alternatives E and F and G**

AOL recommends three additional Alternatives that would focus on the highest timber achievement for the O&C Act and court interpretations of the law. We suggest that the BLM look at an additional Alternative G that would demonstrate a maximum “intensive wood fiber” management strategy—which optimizes timber and revenue yield from BLM lands. Such a strategy would not only utilize Oregon Forest Practices Act standards, it would craft new ‘take avoidance’ measures for federally-listed ESA species. The “rescinded guidelines” for the n. spotted owl would not be appropriate for this strategy, because they have been deemed ineffective and illegal. This alternative would propose a maximum acreage in timber production, and establish the maximum harvest “book-end”, which demonstrates the greatest economic accomplishment under the O&C Act.

We also recommend a second additional Alternative F that would represent the 2008 Western OR Plan Revision (WOPR) preferred alternative. This would accomplish a “alternative timber” management strategy—which would compare contrast the resource balance crafted by the WOPR. The Oregon public spent years and effort to help craft this alternative; and the BLM owes it to the stakeholders to consider their prior investment in public involvement time & energy.

We also recommend a third additional Alternative E that would accomplish a “high timber” management strategy—which would strike an aggressive balance between timber and reserved land allocations. Such a strategy could utilize Oregon Forest Practices Act standards for approximately 65%-70% of the acreage, while reserving a mosaic of 35%-40% of the landscape in riparian areas, structural forest blocks, unroaded recreation areas, and special habitats.

**Alternatives should address economic return to the counties**

Each Alternative when reviewed should also consider direct and indirect economic returns to the counties that the O&C Act intended. Fifty percent of receipts generated by selling and harvesting timber are returned to the counties. In 2000, the Secure Rural Schools and Community Self Determination Act was passed as a temporary “safety net” to last until the September 2006 to replace this money to our local counties. This subsidy money is subject to annual congressional appropriations battles—and reportedly will NOT be reauthorized in FY 2015. Therefore, it should be assumed that the counties will be going
back to the original 50% formula when you are assessing these Alternatives. O&C counties will be negatively impacted if the BLM does not quickly resume a robust timber sale program. The Social and Economic section of the AMS fails to adequately address the county reliance on funds generated from these lands. The question for each Strategy should be what’s the likely dollar return to the counties with each Strategy? What is the level and type of harvest that could generate the highest returns for the counties?

**Forest sector expansion possible**
The forest products sector has the ability to expand its capacity if the timber becomes available. It is foolhardy and presumptuous for the BLM to presume that the forest sector—or Oregon counties—could not absorb additional timber volume and revenue envisioned by a new BLM forest Plan. The infrastructure (mills and forest contractors) is operating at a level below capacity, due solely to the lack of supply. Oregon is importing logs. Over recent years, logs commonly come into Oregon from Arizona, Alaska, California, Washington, Idaho, and Canada. Even with these imported logs transported at great distance and cost to Oregon, there is more existing mill capacity than is currently being utilized. Mills operating “under capacity”, on a single-shift, are doing so in a very marginal economic manner—and are less comparative than those running two or three shifts.

**Plan needs to address how to deal with forest destructive agents**
The Plan’s effects analysis will be the foundation of the Environmental Impact Statement. I see three major subsections that are not addressed which should be modeled. That is the impacts and projections of natural forest destructive agents. These include catastrophic wildfire, insects, diseases, and storms. These destructive agents should be addressed. These agents are far more destructive in the absence of active forest management than when harvesting happens. Also, the Strategies should address how these destructive agents will be dealt with when they do occur. Will land be promptly salvaged and reforested in the wake of a wildfire, or and epidemic of insects or diseases, or a major timber blowdown event? What will be the impacts of not salvaging after one of these events? Will fuel levels and the risk of additional catastrophes increase if the areas are not salvaged?

**Plan should respond to unhealthy forest conditions & catastrophic losses**
Provisions in the Plan need to provide for promptly treating damaged forests after catastrophic events, which have been part of the historical development of western Oregon forests. In the past 100 years, we have witnessed floods, large-scale windstorms and large-scale fires—all of which prior to the early 1990’s resulted in timely restoration activities. More recently however legal gridlock and delay under NEPA challenges have prevented timely responses to catastrophic events. Something other than the standard NEPA process must be available and planned for in the new Plans to address how to restore the forest after a catastrophic event that damages a thousand of acres of forested lands.

**Direct rapid establishment of reforestation, “free-to-grow” after stand damage or harvest**
The current reforestation backlog of young, poorly stocked BLM stands is abysmal—and must be corrected to accomplish forest sustainability. Such a backlog is illegal for non-federal forest landowners in Oregon. Why do federal forests disregard Oregon reforestation law? Far too many acres of BLM forest remain poorly regenerated after stand disturbances occurring over the past 1-2 decades. Require prompt reforestation, young stand care, and establishment after any disturbance or management action reduces stocking. Apply all available & modern site preparation and regeneration practices, including prudent application of herbicides. BLM reforestation standards must comply with Oregon Forest Practices Act “Free-to-Grow” requirements.
O&C forests obligated to generate timber payments to counties
The temporary ‘Secure Schools’ safety net legislation reportedly will not be reauthorized in FY2015. The reauthorization of the safety net legislation is problematic, and local counties would suffer under the imminent loss of revenue from loss of this federal taxpayer subsidy. The O&C lands must be returned to a robust timber production level similar to those prior to the NWFP.

Economic and social contribution of BLM timber is vital
Offering a predictable and sustainable harvest volume is necessary to fulfill the community obligation of the O&C Act. Maintaining present wood products processing and forestry infrastructure must be a goal. Presently, in the Coos Bay/Roseburg/Eugene working circle there is over 1 billion bf of installed mill capacity [and 40% of that capacity is designed to process larger logs over 26” diam.]. In addition, these mills are designed to process all of the commercial tree species found on the O&C lands—including Douglas-fir, true fir, red-Port Orford-and incense cedars, red alder, and ponderosa & sugar pines. This milling diversity accommodates timber harvests representative of the O&C forests. If these BLM forests are to be actively managed to accomplish desired conditions, then these mills must be sustained by the wide range of all species and size harvested.

Forest sector economic contributions vital to Oregon economy
Oregon Forest Resources Institute prepared a report, ‘The 2012 Forest Report: An Economic Assessment of Oregon’s Forest & Wood Products Manufacturing Sector’, which is an excellent compilation of information and data about the forest sector’s contribution to Oregon’s economy. We encourage BLM planners to use it as a source for evaluating the economic tradeoffs of various alternatives for management. This is a valuable source of information for the BLM planning team. Over the last two decades, O&C lands have sadly failed to contribute to Oregon’s economy in a manner consistent to its 2.5 million acres of productive lands. The Plan must assure improved economic outputs from BLM forests.

Social and economic suggestions
Determining so-called “community resiliency” is a fruitless and misleading assessment of alternative consequences of BLM forest management on Oregon’s economy. Just because a community such as Salem or Eugene is labeled as “resilient” to perturbations in the forest product output, does not mean that a change of 10 million or a 100 million board feet of timber harvest would not affect their respective economies. This “community resiliency” metric is nothing more than a distraction that mischaracterizes the economic benefit or impact of timber harvest variations. Forest products derived employment, or similar metric, would be far more useful.

Invasive plant suggestions
Wildfire is the greatest single threat or disturbance agent likely to promote invasive plants. The Invasive Plant section did not address the use of herbicides as an effective control tool for invasive species. Though BLM may be currently limited in using herbicides, this forest Plan should embrace modern forest management tools, rather than shun or ignore them. Therefore, an assumption to have in your analysis may be, “What would the effect of herbicide use be in the control of invasive plants and noxious weeds?”

Fire and fuels / air quality suggestions
A recent study by the Oregon Health Authority concluded that wildfire human health impacts from smoke pollution were unacceptably severe from the 2012 Pole Creek Fire, on the Deschutes National Forest. Please refer to the January/Feb 2006 Journal of Forestry article titled, ‘Investment in Fuel Removals to Avoid Forest Fires Result in Substantial Benefits’, C.L. Mason et.al. The basic findings of this study are, “A cost/benefit analysis broadened to include market and non-market considerations indicates that the
negative impacts of crown fires are underestimated, and that the benefits of government investments in fuel reductions are substantial.” Please use this document as a reference for the Fire and Fuels section as well as Air Quality.

**Soils suggestions**

The presumed “detrimental disturbance” levels are over-reaching and misrepresent modern forest practices—thereby overstating the amount of damage. Literature citations are outdated, studies used outdated forest practices, and the Plan misinterprets the study conclusions cited. Road effects were included in studies, yet misrepresented by the Plan narratives as excluding rod effects. This abuse of science data is outlandish. Stated effects to be used as an analytical tool (ground based–35%; cable–12%; helicopter–6%) are inaccurate. This needs to be modified. Not all ground-based operations create these presumed disturbances; the same applies to other methods. Therefore, to make blanket assumptions using outdated information about “disturbance,” when it can be and often is avoided is misleading and wrong.

Furthermore, the determination by the Plan soils effects that all forest roads create a 40 foot wide corridor of acreage “unavailable for plant growth” is also outlandish. I know of nowhere in the US that a forest road is rocked and maintained for a 40’ wide running surface, and no plants can grow, and no tree crowns can encroach into this 40-foot zone. Such incorrect blanket assumptions about road “disturbance,” is misleading, overstated, and wrong.

**Road access investment must be maintained & improved**

A large, well-constructed, permanent road system has been developed to access the O&C and adjacent privately held timberlands. Focused management of the lands having this capital investment should utilize, maintain, and protect existing road facilities. In many cases this road system has fallen into disrepair because of the lack of an active BLM timber sale program. Because of brush encroachment, access for fire suppression to both O&C and the adjacent private lands places these lands at risk for a catastrophic fire. Yes, these roads can be opened with the proper equipment, but when a fire starts to make it’s run it is too late to bring in that equipment and start brushing roads. The new plans need to specifically bring this road system back up to the standards to which it was originally built.

**Desired condition of BLM Forests should yield sustainable timber outcomes**

To help the public understand the productive capacity of the O&C lands it would be very useful to provide historic annual timber harvests and accompanying timber revenue receipts paid to Counties. In addition, standing timber inventories at the beginning of each of the last 7 decades would be illustrative of that productivity. Finally, based on current site information, the average annual increment would be illustrative of the sustainable productive capability of the O&C forests. Such data would illustrate the true timber yield potential of BLM forestlands.

**Disparage the prescriptive obstacles of previous plans, which hobbled management action**

Previous standards, guides, and policies that dictate silvicultural applications must be avoided. Limiting management options by edicts, such as tree age, tree diameter, trees per acre or herbicide bans, is nonsensical. Structure Based Management that is being demonstrated on a large landscape scale on Oregon State Forests, while politically appealing, is proving to be ineffective for productive westside forests, such as the decadent O&C forests. This BLM Plan needs to clearly explain that regeneration harvest, and the prompt establishment of new forests must be an integral practice authorized by the Plan.

**Regeneration harvest is an essential tool**
The regeneration method and even-aged silvicultural applications must necessarily be authorized by the Plan to be commonly-used tools. Without a full suite of time-proven silvicultural tools—such as regeneration method and even-aged systems—the Plan’s economic and social Purposes cannot be accomplished.

**Active forest management is beneficial for long-term water quality**
The public has asked that clean water is held in high regard. The new plan needs to identify, not only how active forest management can be conducted to maintain water quality, but also how mistakes of past management have been mitigated and corrected under modern forest practices. The Plan can develop the basis to sustain water and riparian values without the exorbitant & confounding wide riparian buffers dictated needlessly by the NWFP aquatic strategy. Wide NWFP riparian buffers are unsubstantiated by contemporary science. Now emerging headwaters forest stream research conducted in three Oregon westside watersheds, by the Oregon State University-led ‘Watershed Research Cooperative,’ is finding that modern Oregon forest practices do not adversely affect fish—the protected stream resource. The BLM Plan should utilize the latest findings of the Cooperative, to temper the Plan’s proposed excessively-wide, homogenous, harmful, proposed riparian buffers.

**Delineate two new land categories: ‘Ownership Perimeter Zones’ and ‘Wildland-Urban Interface’**
BLM lands are surrounded by non-federal neighbors. There are also significant private timberland holdings in the alternating the checker-board O&C sections. These neighboring landowners share a road system with the BLM, which is used for access to manage their lands and to protect them from catastrophic wildfire. The plan revisions **MUST** address the major issue that poorly managed federal lands are a clear & present danger to adjacent property owners—unhealthy BLM forests, catastrophic hazards spreading from BLM, road access limits due to BLM, etc.

There must be a defined category that includes “Wildland-Urban Interface” AND “Ownership Perimeter Zones”, located near the BLM forest boundary [within 1 mile]. Such “Ownership Perimeter Zones” would address the forest protection values of adjacent non-federal landowners [roads, wildfire, pests, etc], and the impact of lacking BLM management on these neighboring non-federal lands. The BLM’s growing problem of BLM wildfire and pest hazards are an imminent danger to neighboring non-federal lands. These BLM Perimeter Zones should be placed into a category that allows application of a full array of modern and intensive forest management tools.

**Wildlife diversity relies on diverse forest structures—not just old growth**
Somehow, the ESA has been misconstrued and wildlife species management on federal lands became obsessed with n. spotted owls and marbled murrelets. It is about time that federal forests be managed for a mix of forest age structures—including young/open forests and mid-aged forests. While the Plan acknowledged a diversity of forest wildlife species, the Purposes and Alternatives are wrongly-driven by the destructive preeminence of a few old-forest ESA prima-donnas. The Plan should instead provide a balanced variety of forest structures/ages that can accommodate the prosperity of species diversity (such as 33% young; 33% mid-age; 33% old). A sustainable and diverse forest landscape should include a mosaic of a three age/structural conditions, including: open/young forest, dense-closed forest, layered forest, park-like stands, older forest structures, and a few reserves in sensitive habitats.

**Drop Adaptive Management Areas, unless truly laboratories for innovation**
NWFP Adaptive Management Areas are a patent failure because legal sufficiency was not authorized to allow activities any different than the remainder of the BLM forest. Either drop the concept, or truly authorized extraordinary authority to conduct innovative & different management trials or projects.
Favor conventional logging systems, with road construction where needed (helicopter yarding as least desirable option)

We recommend BLM Plan authorize sufficient logging/transportation designs that would facilitate all, or nearly all, logging by ground-based or cable systems. The Plan should construct roads (temporary or other) to facilitate conventional logging (ground/cable) for long-term management of the BLM lands—in consideration of reciprocal rights-of-way holder access—rather than hastily accepting helicopter yarding. Conventional logging with sufficient road access, built if necessary, would be far more economical and environmentally rational than helicopter yarding (especially low volume/acre). Furthermore, the Plan language should accommodate a full range of modern harvest technologies; rather than needlessly prescribing one specifically-limiting system or method. Express harvest objectives as outcomes, rather than prescriptive equipment requirements. For example, whole-tree logging, shovel logging, grapple skidding, and mechanized falling should be viable methods, subject to the professional discretion of the decision maker, considering real-time, on-site conditions. The Plan must not limit these sorts of operational decisions before the contract is offered.

Road access must not be prescriptive, or self-limiting

The Plan language should accommodate a full range of modern road and logging access technologies; rather than needlessly prescribing a narrow set of specifically-limiting methods. Forest roads are necessary; please fully disclose where and what they are proposed. Harvest cannot be successful without sufficient road development.

Harvest and slash treatments must be results-based; rather than prescriptive

The Plan language should accommodate a full range of modern logging systems and slash treatment technologies; rather than needlessly prescribing a narrow set of specifically-limiting methods that would obstruct management project contracts from achieving project objectives. Mechanized felling, whole-tree skidding, cable yarding, shovel logging, grapple piling, and machine piling should be allowable options. Also, machine fireline and site preparation should be allowable. Please make it “purchaser optional” for removal of unmerchantable material from the sale area—as removal of fiber is typically marginally-economical at best, and is week-to-week market-based. The Plan must not limit these sorts of operational decisions before the contract is offered.

Topical recommendations: Timber management

- All Alternatives should include authorizing provisions that assure post-damage salvage harvest, reforestation, and restoration of healthy forests
- Alternatives C & D need higher acreage in harvest land base timber production
- Add 3 Alternatives E, F, and G—to expand the economic range of Alternatives, to demonstrate the maximum legal Economic and social outcomes, while minimally achieving ecological outcomes. Current range of Alternatives fails to pursue the greatest economic potential that could legally be achieved.

Topical recommendations: Species conservation

- Change old-tree/older forest protection to retaining just 10%-30% of trees over 300 years old in each subwatershed (where possible entirely in riparian reserves, “large block forest”, and other special site allocations). In-stand wildlife tree/snag retention of 3-4 leave trees/acre within regeneration harvest units would leave additional large tree structure across the entire landscape. These tactics would retain sufficient old growth structure to achieve species needs.
• Public safety and worker safety must receive priority over all species needs—especially concerning eliminating hazards of leave trees, snags, wildlife trees, and hazard trees
• Must also define percentage of landscape in young/open forests and mid-aged forests; these age-classes should be in proportion to the old forest percentage
• The acreage of “large block forest” should be correspondingly different in each Alternative, relative to the tilting balance of economic vs. species
• Maximum timber Alternative should have relatively low acreage of “large block forest”
• Old trees should be retained across the landscape only in riparian reserves, “large block forest”, and other special site allocations

**Topical recommendations: Riparian reserves**

• Recommend fish stream treed buffer be defined as 50% of Site Potential Tree height, with a suggested 70’ to 105’ width each side. These are similar, but wider, to the OR Forest Practices Act buffers, which *Watershed Research Cooperative* science is finding sufficiently protects fish and water.
• Recommend non-fish stream treed buffer be defined as 30% of Site Potential Tree height, with a suggested 30’-50’ width each side. These are similar, but wider, to the OR Forest Practices Act buffers, which *Watershed Research Cooperative* science is finding sufficiently protects fish and water.
• Stream treed buffer be defined as slope distance.
• Incised gorge, non-fish stream channels expanded to 50’ width each side
• Alternatives C, D, E, F, and G have active management stream treed buffers, to be defined that authorize silviculturist-determined buffer design/width, subject to some guidelines—such as those suggested above
• Active management of riparian areas should be encouraged to promote habitat diversity, productivity and function for the designated use – fish or domestic or irrigation
• Small non-fish streams need only minimal buffering—primarily limited machine/log skid activity, wildlife tree location, 2-4 wildlife trees/acre along stream, vegetation retention, hardwood and reforestation incentives, etc.
• Fish streams without salmon, steelhead or bulltrout should receive significantly narrower treed buffer definition

**Topical recommendations: Recreation**

• Most Alternatives should specify open road conditions to facilitate recreation uses
• Allocate road and trail travel/vehicle preferences, or strategies to determine uses, open/closed, for effective recreation and public transportation
• Commercial transportation or strategies to determine conditions, open/closed, for effective logging or other commercial road use/transportation
• Recommend greater acreage of “Lands Not Designated”, in areas allocated for intensive timber management
• Focus areas compatible with recreation and wildlife uses
• Recreation development should not cannibalize funding for timber management

**Post damage Salvage/Restoration considerations in both ‘Timber’ and ‘Large Block’ stands**

1. Safe, long-term access must be assured on forest roads. Regeneration salvage harvest and reforestation should be planned for 300 feet on each side of forest roads in BLM fire-damaged stands.
Regeneration harvest and reforestation of these road corridors would accomplish five critical objectives: 1) reciprocal ROW agreement access for present and future; 2) safety of Oregon workers, as recommended by OR-OSHA; 3) public safety of recreationists, property neighbors, agency administrators, and special use permittees; 4) fire breaks and strategic firefighting access, as recommended by Douglas Forest Protective Association (BLM’s fire protection contractor); and 5) removal of future snag safety hazards that threaten future public and worker safety, firefighting and ROW agreements. These road access values should take precedence over the aquatic protections at stream crossings. Furthermore, these road corridors warrant equitable safety and economic consideration (300’ corridor, each side), as do the NW Forest Plan’s Aquatic Management Areas warrant for their riparian ecologic values.

2. Fire-safe, property boundaries must be assured along fire-damaged BLM stands. Salvage harvest—for the purpose of removing fire-killed trees—should be planned for 300 feet within the BLM side of private property boundaries in BLM fire-damaged stands. Salvage harvest (and reforestation if necessary) of these property boundary corridors would accomplish four critical objectives: 1) protection of neighboring non-federal properties from present and future BLM-originated wildfire, pest and disease problems; 2) safety of Oregon workers, impacted by BLM snag hazards while working on neighboring private lands in harvest and reforestation, as recommended by OR-OSHA; 3) fire breaks and strategic firefighting access, as recommended by Douglas Forest Protective Association (BLM’s fire protection contractor); and 4) removal of future snag safety hazards that threaten future public and worker safety, firefighting and ROW agreements.

3. Fire-safe BLM forest in a checkerboard landscape. Salvage harvest all snags—for the purpose of removing fire-killed trees—should be planned for the upper two-thirds of slopes in the in BLM fire-damaged stands of the project area. Salvage harvest (and reforestation if necessary) of these upper-slopes would accomplish four critical objectives: 1) protection of neighboring non-federal properties from present and future BLM-originated wildfire, pest and disease problems; 2) safety of Oregon workers, impacted by BLM snag hazards while working on BLM projects, as recommended by OR-OSHA; 3) fire breaks and strategic firefighting access, as recommended by Douglas Forest Protective Association (BLM’s fire protection contractor); and 4) removal of future snag safety hazards that threaten future public and worker safety, firefighting and ROW agreements.

4. Limit numbers and locations of snags left on the landscape. The project should plan to reduce the number of fire-killed trees remaining across the BLM landscape resulting from the Douglas Complex Fire. As recommended above, salvage harvest of most snags would accomplish several critical objectives. Any snags—fire-killed trees—remaining after project operations should be strategically located in clumps of one-acre in size or less, on lower slope locations, and suitably associated near or with riparian areas or wetlands. As required by OR-OSHA, safe snags for which Oregon workers can safely work near are those snags determined safe by the qualified person on-site of the work. Therefore, snag leave tree designation by “purchaser select” is the recommended method of individual snag designation.

5. Critical infrastructure sustained through maintenance improvements. The project necessarily must invest in important maintenance, repair, improvement, and protection measures, which will sustain critical infrastructure across the project area. Arterial and collector BLM forest roads should be reconstructed and improved to repair fire damages, to install needed watershed upgrades, to protect important fish habitat & water resources, and to assure long-term stability of those roads necessary for forest resource management, timber and recreational uses. Additionally, the project should rapidly salvage harvest and reforest burned forests necessary to protect those adjacent important infrastructure attributes, including
but not limited to those on BLM lands and neighboring non-federal lands, such as: roads, rights-of-ways, railroads, powerlines, gas lines, communication/electronic facilities & lines, traffic corridors, escape routes, homes, private property, water sources for firefighting, and registered water sources. Maintain and improve the existing forest road network to facilitate quick initial attack firefighting, to mobilize firefighting resources, and to provide for safety of forest workers, recreationalists, reciprocal ROW holders, and neighboring property owners.

6. **Harvest large, old trees necessary.** Harvesting many large and/or old trees [both dead and dying trees] is essential for the project to be feasible, to meet purpose & need, as well as to accomplish all the desired resource, reforestation, and safety objectives. There will be ample large & old dead trees remaining in un-harvested areas, in riparian areas, in LSR areas, and other reserved areas. Harvesting large trees must be a necessary component to implement this project. We strongly support your efforts to restore the project area toward the historic range of variability, to promptly reforest the area, and to recover valuable timber value in a timely manner before deterioration needlessly wastes timber volume; but, this simply cannot be accomplished without harvesting large and old trees.

7. **Urgent priority need to reforest this large landscape-scale fire-killed forest.** The long-term sustainability (and NWFP desired future condition) of these fire-killed forests is dependent upon prompt and successful reforestation. Salvage harvest, slash treatment, and reforestation—for the purpose of reforesting this large acreage of dead and dying forest—should be planned for all areas where stands are dead and where imminent mortality is projected by certified silviculturists. The NEPA document must clearly state the purpose and authority of the silviculturist and decision maker to define imminent mortality, where reforestation & slash treatment is prescribed, and where salvage harvesting and slash treatment is necessary to precede reforestation actions. Salvage harvest and reforestation of these dead and dying forests would accomplish numerous critical objectives, such as: restoration of sites to forested condition; future sustainable timber yield; future county timber revenue enhancement; improved fish & wildlife habitat long-term; consistent with the Oregon Forest Practices Act reforestation requirements; comply with the NWFP reforestation and sustained yield objectives; reducing fire hazards; reducing future firefighting costs; improving water quality; improving endangered species habitat long-term; enhancing recreational and aesthetic values; and so forth.

8. **Favor conventional logging systems, with road construction if needed; with helicopter yarding as the least desirable option.** We recommend BLM managers design sufficient logging/transportation plans that would facilitate all, or nearly all, logging by ground-based or cable systems. The Plan should construct roads (temporary or other) to facilitate conventional logging (ground/cable) for long-term management of the BLM lands—in consideration of reciprocal rights-of-way holder access—rather than hastily accepting helicopter yarding. Conventional logging with sufficient road access, built if necessary, would be far more economical and environmentally rational than helicopter yarding (especially low volume/acre). Furthermore, the Plan language should accommodate a full range of modern harvest technologies; rather than needlessly prescribing one specifically-limiting system or method. Express harvest objectives as outcomes, rather than prescriptive equipment requirements. For example, whole-tree logging, shovel logging, grapple skidding, and mechanized falling should be viable methods, subject to the professional discretion of the decision maker, considering real-time, on-site conditions. The Plan must not limit these sorts of operational decisions before the contract is offered.

9. **Access too prescriptive; very self-limiting.** The Plan language should accommodate a full range of modern road and logging access technologies; rather than needlessly prescribing a narrow set of
specifically-limiting methods. Forest roads are necessary; please fully disclose where and what they are proposed. Harvest cannot be successful without road development.

10. Harvest and slash treatments must be results-based; rather than prescriptive. The Plan language should accommodate a full range of modern logging systems and slash treatment technologies; rather than needlessly prescribing a narrow set of specifically-limiting methods that would obstruct the purchaser from achieving project objectives. Mechanized felling, whole-tree skidding, cable yarding, shovel logging, grapple piling, and machine piling should be allowable options. Also, machine fireline and site preparation should be allowable. Please make it purchaser optional for removal of unmerchantable material from the sale area—as removal of fire-charred fiber is typically marginally-economical at best, and is week-to-week market-based. The Plan must not limit these sorts of operational decisions before the contract is offered.

11. Economic feasibility relies on rapid salvage harvest of significant volume. Please remember that economic factors are critical to accomplish a viable forest management project. The economic means to help pay for the non-merchantable hazard and reforestation treatments of this project must be created by generating revenue from significant merchantable timber harvest. The rapid salvage harvest of fire-killed timber must be accomplished within 8-18 months, before significant timber deterioration occurs. Maximize the volume harvested per acre to optimize economic feasibility of the project. The decision maker should seek emergency project authority from the BLM Director, to facilitate expedited project objection process and implementation.

12. Salvage harvesting and reforestation to treat all burned acreage in Matrix. Across this large, landscape-scale fire damaged forest in Matrix, we recommend treating all fire-killed stands, and all stands having fire damage and imminent mortality that has reduced stocking below acceptable forest levels. Because of the checkerboard BLM ownership pattern of the Matrix lands (and where most stands and trees are dead), we recommend that the NW Forest Plan guidelines be waived for suggested late-successional patches, and waived for retained snags and green trees in harvest units.

13. Salvage harvesting and reforestation to treat a significant burned riparian reserves in Matrix. Across this large, landscape-scale fire damaged forest, we recommend that the fire-killed riparian reserves in Matrix located in fire-killed stands, be treated by salvage harvest and reforestation. Riparian reserves in Matrix having severe fire damage and imminent mortality—with reduced stocking below acceptable forest levels—should be treated by salvage harvest and reforestation. This important restoration of fire-killed riparian habitat can be most effectively and quickly completed—to restore these damaged forest riparian forests—through modern forest practices. Because of the checkerboard BLM ownership pattern of the Matrix lands (and where most stands and trees are dead, including riparian forests), we recommend that the NW Forest Plan guidelines be waived for the extremely-limiting riparian reserve salvage prescriptions—which frankly are outdated and the NWFP riparian limits would result in more tardy riparian regrowth and poor riparian function.

Thank you for the opportunity to comment about the proposed BLM Western Oregon Resource Management Plan. Please consider our enclosed comments about Planning Criteria and Alternatives.

Sincerely,

/s/ Rex D. Storm
Rex Storm, CF
Forest Policy Manager, Associated Oregon Loggers, Inc.
March 31, 2014

Via email:  blm_or_rmps_westernoregon@blm.gov

BLM Oregon
Attn: RMPs for Western Oregon Planning Team
1220 S.W. 3rd Avenue
Portland, OR 97204

In Reply To:  Planning Criteria for Resource Management Plans for Western Oregon

The following are the comments of the American Forest Resource Council (AFRC) on the Planning Criteria for Resource Management Plans for Western Oregon published in February, 2014 (“the Planning Criteria”).

AFRC is an Oregon nonprofit corporation that represents the forest products industry throughout Oregon, Washington, Idaho, Montana, and California. AFRC represents over 50 forest product businesses and forest landowners. AFRC’s mission is to create a favorable operating climate for the forest products industry, ensure a reliable timber supply from public and private lands, and promote sustainable management of forests by improving federal laws, regulations, policies and decisions regarding access to, and management of, forest lands. Many of our members have their operations in communities adjacent to BLM lands in western Oregon, and the management on these lands ultimately dictates not only the viability of their businesses, but also the economic health of the communities themselves. The state of Oregon’s forest sector employs approximately 76,000 Oregonians, with AFRC’s membership directly and indirectly constituting a large percentage of those jobs. Rural communities, such as the ones affected by BLM Resource Management Plan (RMP) decisions, are particularly sensitive to the forest product sector in that more than 50% of all manufacturing jobs are in wood manufacturing.

AFRC will focus its comments on the legal implications of the Planning Criteria for Revision of the Resource Management Plans for the BLM districts that contain lands subject to the O & C Act. Our comments are based on the legal conclusion explained below that the O & C Act does not permit the BLM to allocate any O & C timberlands to a land use allocation that precludes sustained yield timber production, and the Endangered Species Act (ESA) does not limit or restrict the operation of the O & C Act in any way.

The Planning Criteria are based on the stated Purpose and Need for the revision of the RMPs, and present Preliminary Alternatives “that cover the spectrum of possibilities within the parameters of the Purpose and Need statement.”
The Purpose and Need statement has the following language:

*Declining populations of species now listed under the Endangered Species Act have caused the greatest reductions and instability in the BLM’s supply of timber in the past. Any further population declines of listed species or new species listings would likely lead to additional reductions in timber harvest. Contributing to the conservation and recovery of listed species is essential to delivering a predictable supply of timber. Specifically, the BLM recognizes that providing large, contiguous blocks of late-successional forest and maintaining older and more structurally complex multi-layered conifer forests are necessary components of the conservation and recovery of the northern spotted owl.*

*The purpose of the action includes contributing to the conservation and recovery of threatened and endangered species within the planning area, including the northern spotted owl, marbled murrelet, and threatened and endangered anadromous fish. The Endangered Species Act requires agencies to ensure that their actions are not likely to jeopardize the continued existence of listed species or result in the adverse modification or destruction of critical habitat. Since the adoption of the Northwest Forest Plan, BLM has recognized that additional species listings could have the effect of further limiting the BLM’s ability to provide a sustained yield of timber under the O&C Act (Northwest Forest Plan ROD at pp 49-50) Using its discretion and authority under the O&C Act and the FLPMA, the BLM can direct sustained yield management of the O&C lands and public domain lands in western Oregon in a manner that contributes to the conservation and recovery of listed species and helps limit or avoid future listings, and thereby best ensures a permanency of timber production over the long-term, while, among other benefits of sustained yield, contributing to the economic stability of local communities. The purpose of contributing to the conservation and recovery of the spotted owl necessarily includes maintaining a network of large blocks of forest to be managed for late-successional forests and maintaining older and more structurally complex multi-layered conifer forests, based on the existing scientific information on the conservation needs of the northern spotted owl and the results of previous analyses as described below.*

AFRC disagrees with these statements. These parts of the Purpose and Need statement, and similar statements relating to other species and other conservation justifications for allocating O & C timberlands to land allocations that preclude, or significantly limit, sustained yield timber production, are in conflict with the O & C Act, for the reasons we present below:

In 1937 Congress enacted the O & C Act, requiring permanent timber production from the O&C lands based on the scientific forestry principle of “sustained yield,” with 50-75% of all timber sale receipts going to the Oregon counties containing the revested lands. The principle of sustained yield requires continual regulated logging of forest lands and subsequent reforestation of harvested tracts, in order to create and maintain a perpetual supply of timber.
Sustained yield timber management can be, and has been analogized to spending interest on a bank account, and one witness invoked that analogy at the 13 days of hearings held by the House Committee on Public Lands on the 1937 O & C Act:

_I think [sustained yield] can be defined in reasonably precise terms on the same basis as the realization of the interest on the principal; they conserve the principal while using the interest. The interest here is the annual growth of timber which can be cut. You may overcut one year and undercut next year but over a period of time as long-time policy it is perfectly practicable to operate a forest properly and you keep your stand of timber substantially unchanged year after year and take out of that forest each year what is being produced by the annual growth._

(Statement of W. B. Greeley) (April 13, 1937).

To implement the new policy, the O&C Act contains two key paragraphs of very specific direction to Interior:

[S]uch portions of the revested Oregon and California Railroad and reconveyed Coos Bay Wagon Road grant lands ... which have heretofore or may hereafter be classified as timberlands, and power-site lands valuable for timber, shall be managed . . . for permanent forest production, and the timber thereon shall be sold, cut, and removed in conformity with the principal [sic] of sustained yield for the purpose of providing a permanent source of timber supply, protecting watersheds, regulating stream flow, and contributing to the economic stability of local communities and industries, and providing recreational facilities.

The annual productive capacity for such lands shall be determined and declared as promptly as possible after the passage of this Act, but until such determination and declaration are made the average annual cut therefrom shall not exceed one-half billion feet board measure: Provided, That timber from said lands in an amount not less than one-half billion feet board measure, or the annual sustained yield capacity when the same has been determined and declared, shall be sold annually, or so much thereof as can be sold at reasonable prices on a normal market.

43 U.S.C. §1181a. These two paragraphs of the O & C Act impose four mandatory duties on the BLM:

1. All of the O & C lands classified as timberlands “shall be managed . . . for permanent forest production.”

2. The timber on those lands “shall be sold, cut, and removed in conformity with the princip[le] of sustained yield ....”
3. “The annual productive capacity for such lands shall be determined and declared.”

4. Once the capacity is determined, timber “in an amount not less than ... the annual sustained yield capacity ... shall be sold annually, or so much thereof as can be sold at reasonable prices on a normal market.”

As the Ninth Circuit explained half a century later: “[T]he O & C Act envisions timber production as a dominant use, and ... Congress intended to use ‘forest production’ and ‘timber production’ synonymously.” Headwaters, Inc. v. Bur. of Land Man., 914 F.2d 1174, 1184 (9th Cir. 1990), reh. denied, 940 F.2d 435 (9th Cir. 1991).

Following passage of the O&C Act, Interior immediately began marketing timber from the O&C lands, selling 593 million board feet (mmbf) of timber sales from the O&C lands in fiscal year 1940. (W. Horning, The O&C Lands and their Management, an Important Advance in Forest Conservation (General Land Office) (December 1940)). Interior also began to determine the inventory of standing timber and the proper classification of O&C lands as timberlands. By 1942, Interior determined that 2,446,000 acres of O&C lands were properly classified as timberlands. The annual sustained yield assessment was raised to "approximately six hundred million board feet." Id.

In the following decades, the BLM steadily increased the annual sustained yield capacity further until, starting in 1959, the BLM began selling an average of more than 1.1 billion board feet (bbf) of timber from the O&C lands in each of the next 32 years through 1990, with the peak sale level of 1.662 bbf occurring in 1960. In 1971 the annual allowable cut was set at 1.172 bbf, and in 1983 was raised again to 1.185 bbf. The BLM determined in 2008 that the current sustained yield productive level of the O & C lands as a whole is 1.201 bbf. As the BLM explained: “[T]his amount could be produced by focusing solely on the objective of maximizing timber production from the commercial forest lands managed by the BLM in the planning area.” By 2009, the volume of standing timber on the O & C lands had grown from the "45-50 billion" board feet estimated in 1937 to 73.3 bbf.

Congress has not changed the substantive provisions of the O & C Act since 1937. To the contrary, as the Planning Criteria notes, when Congress enacted the Forest Land Planning Management Act (FLPMA) in 1976 to adopt new national management rules for the BLM public domain lands, Congress preserved the O & C Act by providing in Sec. 1 of Pub. L. 94-579 that “[n]otwithstanding any provision of this Act, in the event of conflict with or inconsistency between this Act and the Act[] of August 28, 1937 ..., insofar as they relate to management of timber resources, and disposition of revenues from lands and resources, the latter Act[] shall prevail.” 43 U.S.C.A. § 1701 Savings Provision Note (West 2010).

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1 The BLM considers the terms “annual sustained yield capacity” and “annual productive capacity” to be synonymous.
The Endangered Species Act.

The ESA, enacted in 1973, protects fish, wildlife and plants through the process of “listing” a species as endangered or threatened. 16 U.S.C. §1533. Section 7 of the ESA, 16 U.S.C. §1536, requires federal agencies to avoid taking any action that is likely to jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated “critical habitat” of a listed species. 16 U.S.C. §1536(a)(2). Section 7 of the ESA also requires federal agencies to initiate “consultation” with the US Fish and Wildlife Service (FWS) (or, for certain predominantly marine species, the National Marine Fisheries Service (NMFS)) on any proposed federal action that “may affect” a listed species or critical habitat. 16 U.S.C. §1536(a),(b); 50 C.F.R. §402.14(a) (joint FWS/NMFS regulations); see Bennett v. Spear, 520 U.S. 154, 157-58 (1997).

In 2007 the Supreme Court significantly curbed the reach of the ESA, ruling in Nat. Assoc. of Home Builders, 551 U.S. 644, that Section 7 of the ESA does not apply to federal agency actions taken to implement a non-discretionary mandate imposed by a pre-existing statute that confers no authority to modify the mandated action on account of species protection. The Court upheld, and narrowly interpreted, an FWS/NMFS rule limiting federal agencies’ Section 7 duties to actions involving “discretionary Federal involvement or control.” 50 C.F.R. §402.03.

“[W]hen the statute's language is plain, the sole function of the courts - at least where the disposition required by the text is not absurd - is to enforce it according to its terms.” Lamie v. U. S. Trustee, 540 U.S. 526, 534 (2004). The D.C. Circuit adds:

[C]ourts must presume that a legislature says in a statute what it means and means in a statute what it says there. ... Thus, to defeat application of a statute's plain meaning, Respondents must show either that, as a matter of historical fact, Congress did not mean what it appears to have said, or that, as a matter of logic and statutory structure, it almost surely could not have meant it.


The plain meaning of the O & C Act prohibits Interior from establishing no-harvest reserves on O & C lands that could be managed for sustained yield timber production.

In describing the management program for “such portions of the [O & C] lands ... which are heretofore or may hereafter be classified as timberlands,” the first two sentences of the O & C Act, 43 U.S.C. §1181a, use the word “shall” four times: those lands “shall be managed...
for permanent forest production,” and the timber on those lands “shall be sold, cut, and removed in conformity with the principle of sustained yield .... The annual productive capacity for such lands shall be determined and declared as promptly as possible after the passage of this Act,” and “timber from said lands in an amount not less than ... the annual sustained yield capacity ... shall be sold annually, or so much thereof as can be sold at reasonable prices on a normal market.”


The O & C Act imposes these “discretionless obligations” on all of the 2,151,200 acres of the O & C lands that are currently classified as timberlands. The timber on all the O & C timberlands must be “sold, cut, and removed in conformity with the principle of sustained yield.” All the O & C timberlands must be managed for permanent forest production, and the allowable sustained yield capacity of timber from all the O & C timberlands must be offered for sale annually. The statute confers no discretion on Interior to do what it did here: designate 920,000 acres of O & C timberlands as wildlife and ecological reserves where no sustained yield timber management is permitted, thereby reducing the mandated annual harvest level from 1.201 bbf to 502 mmbf.

In Headwaters, 914 F.2d 1174, the Ninth Circuit held that the O & C Act prohibits the kind of no-harvest reserves created in this case:

We have previously observed that [t]he provisions of 43 U.S.C. § 1181a make it clear that the primary use of the [O & C Act] lands is for timber production to be managed in conformity with the provision of sustained yield. ...

... Headwaters argues that the phrase “forest production” in section 1181a encompasses not merely timber production, but also conservation values such as preserving the habitat of the northern spotted owl. However, Headwaters's proposed use – exempting certain timber resources from harvesting to serve as wildlife habitat – is inconsistent with the principle of sustained yield. As the statute clearly envisions sustained yield harvesting of O & C Act lands, we conclude that Headwaters's construction is untenable. There is no indication that Congress intended “forest” to mean anything beyond an aggregation of timber resources.

Id. at 1183 (underlining added; citations and quotations omitted).

Thus, the plain meaning of the O & C Act, revealed by its text, structure and purpose, forbids Interior from establishing reserves on O & C timberlands that prohibit timber from being “sold, cut, and removed in conformity with the principle of sustained yield.”
The legislative history of the O & C Act supports its plain meaning.

The legislative history of the O & C Act is also supports the plain meaning, as the Ninth Circuit found in *Headwaters*, 914 F.2d 1174: “Nowhere does the legislative history suggest that wildlife habitat conservation or conservation of old growth forest is a goal on a par with timber production, or indeed that it is a goal of the O & C Act at all.” *Id.* at 1184.

An initial O & C bill drafted by the Interior Department was introduced in the House of Representatives in 1936 to address revenue distribution mechanisms. The bill was withdrawn and reintroduced in March 1937 as H.R. 5858, including new provisions addressing management of the revested lands as well as revenue distribution. The bill was referred to the House Committee on the Public Lands, whose membership included Congressman James Mott of Oregon, whose district encompassed 90% of the O & C lands.

The only substantive congressional report on the 1937 O& C bill was the report of the House Committee on the Public Lands, H. Rep. 75-1119 (June 28, 1937). (The Senate Committee on Public Lands and Surveys simply adopted the House Report as its report on the bill on August 16, 1937.)

The House Report described the O & C lands with particular emphasis on their “saw-timber:”

> These lands contain a little more than 2½ million acres, all of which are situated in the State of Oregon. It is estimated that 87½ percent of the lands is covered with forest having a volume of approximately 46 billion board-feet of mature saw timber. This represents about 3 percent of the total present saw-timber supply of the United States.

The report stated that “all land” classified as timberland would be managed on “a sustained yield basis”:

> All land classified as timber in character will continue in Federal ownership and be managed for permanent forest production on what is commonly known as a sustained-yield basis. Under this plan the amount of timber which may be cut is limited to a volume not exceeding new growth, thereby avoiding depletion of the forest capital.

> This bill is intended as solution of the problems created by The Revestment Act of June 9, 1916, and the Act of July 13, 1926. The timber assets of these lands, which were there directed to be destroyed by early liquidation, are here required to be conserved and perpetuated. ... [The bill] establishes a vast self-sustaining timber reservoir for the future, an asset to the Nation and the State of Oregon alike.
In the House hearings, Interior’s witness described sustained yield management as a means to “grow a new crop of timber.” Interior’s written statement confirmed that “[s]ustained yield production of timber of commercial quality in the largest possible volume is the goal.”

While the O & C bill called for county revenues to be generated from sustained yield timber sales, the bill as introduced did not contain any requirement for a minimum timber sale level, and therefore provided no assurance of any annual payments to counties. Rep. Mott of Oregon stated that his support for the bill was subject to one “very important amendment” – to create a statutory minimum timber sale level. Rep. Mott then called as a witness Guy Cordon, representing the 18 O & C counties containing the revested lands, who offered the text of a proposed amendment. Mr. Cordon explained the amendment was “vitaly necessary” to create a “mandatory requirement that the timber on the lands be actually sold as rapidly as the same can be done on a sustained-yield plan”:

> Without the amendment it might be conceivable that the timber would be wholly or substantially withdrawn from sale and the proceeds accruing to the O. & C. land-grant fund would be greatly restricted or completely cut off, thus cutting off any contribution to the counties under the Stanfield Act. In that connection, attention is called to the fact that the payments to the counties, in lieu of lost taxes, is limited to the funds available in the O & C land-grant fund and that such funds accrue from the sale of the O & C timber.

The presiding committee member at the hearing asked: “The purpose of that amendment is to make it so there has to be a certain amount of timber sold annually; is that it?” Mr. Cordon replied: “Yes sir, that is the purpose of the amendment.” In response to a clarifying question from another committee member, Rep. Mott explained:

> As the paragraph stands now, there is simply a maximum limit beyond which the timber cannot be sold. This proposed amendment leaves that provision as it is, but, in addition, it requires that the timber be sold up to that amount if it can be sold at a reasonable price on a normal market. Otherwise there would be no guarantee that whatever agency operated this land would sell anything.

Mr. Cordon’s minimum sale amendment was thereafter incorporated into the revised bill later introduced as H.R. 7618, and enacted in the second paragraph of the O & C Act.

Interior emphasized that all of the O & C timberlands, including areas not yet cut as well as areas that had previously been logged, would be managed together under sustained yield: “Of the 87½ percent which is covered with tree growth, approximately 70½ percent of the entire area is covered with mature saw timber having volume of 46 billion board feet ... Approximately 17 percent of Oregon and California lands is covered with young forests in various stages of development ranging from young seedlings on recently logged areas up to the hundred year-old trees.” Interior explained that sustained yield forestry techniques would be used to determine “the volume of timber which may safely be cut from the area as a whole on continuing sustainable basis.” Interior anticipated a future increase in “the sustained yield of the entire Oregon and California area.” Interior advised Congress that calculating the sustained yield
timber harvest level for a forested area requires two principal data points: the volume of standing timber and the proper “rotation” age (the time for a tree to grow from a seedling to optimum harvest size): "In determining the volume of timber which may safely be cut from the area as whole on a continuing sustainable basis, certain assumptions have to be made. Perhaps the most important is the rotation age ...." The volume of standing timber is divided by the years in the rotation period to calculate the allowable annual sustained yield timber harvest, which can then continue in perpetuity.

Interior presented in detail how it made the interim capacity determination of 500 mmbf per year: "Assuming 100 years to be a satisfactory rotation age and allowing that period of time for complete cutting of the entire estimated 46 billion board feet of timber, the average annual cut of virgin timber would be 460 million board feet." "New growth which is occurring in the immature stands of young timber is of unknown quantity but undoubtedly it is safe to assume that this will be enough to increase the allowable cut to at least 500 million board feet." To increase the sustained yield level, all bare lands capable of reforestation would be reforested, and almost eight hundred thousand acres of timber producing areas previously misclassified as agricultural lands under the 1916 law would be returned to timberland status. All of the O & C timberlands would be uniformly managed for sustained yield timber production.

**Interpretations of the O & C Act by Interior soon after passage of the law further confirm the plain meaning of the O & C Act.**

In 1940, the Secretary of Interior asked his Solicitor whether the President could designate O & C timberlands as a national monument. The Solicitor’s answer, based on the O & C Act, was “the President does not have that authority.” He reasoned:

... Congress has specifically provided a plan of utilization of the Oregon and California Railroad Company revested lands. This plan among other things involves the disposal of lands and timber and the distribution of the moneys received from such disposition. It must be concluded that Congress has set aside the lands for the specified purposes.

... There can be no doubt that the administration of the lands for national monument purposes would be inconsistent with the utilization of the O & C lands as directed by Congress. It is well settled that where Congress has set aside lands for specific purpose the President is without authority to reserve the lands for another purpose inconsistent with that specified by Congress.

(March 9, 1940).

In December 1940, the new head of the O & C office in Oregon issued a report to the public confirming that under the O & C Act “all the lands best suited for the growing of timber will now be ... kept at work producing crops of timber.”

In 1943, the Solicitor of Interior described the O & C Act’s requirements “that the timber ‘shall be sold’ and that ‘not less than the annual sustained yield capacity when the same has been
determined and declared shall be sold annually or so much thereof as can he sold at reasonable
prices on normal market’” as “mandatory language.”

In 1955, the Interior Regional Solicitor for Oregon was asked whether Interior could withdraw a small area of O & C timberlands at the request of the State of Oregon “for use as a park and recreational area.” (May 17, 1955). Relying on the March 9, 1940 Interior legal opinion quoted above, the Solicitor concluded:

*It is apparent that the use of these O & C lands for State park purposes, as set forth in the State’s application, would be inconsistent with the intent of Congress to have such lands managed for permanent forest production and the timber sold, cut and removed in conformity with the principles of sustained yield. It is, therefore, our opinion that these O & C lands cannot be withdrawn by the Secretary for recreational and park purposes.*

**The ESA does not repeal or amend the O & C Act, and cannot justify no-harvest reserves within O & C timberlands.**

The Supreme Court’s 2007 decision in *Nat. Assoc. of Home Builders*, 551 U.S. 644, establishes that the ESA does not repeal or amend non-discretionary duties in earlier-enacted statutes such as those in the O & C Act. *Home Builders* involved a challenge to a decision by the Environmental Protection Agency (EPA) approving the transfer to the State of Arizona of regulatory authority under a Clean Water Act (CWA) provision enacted before the 1973 ESA. CWA gives the EPA a non-discretionary duty to approve a state’s request for transfer of CWA regulatory power if EPA finds that nine statutory criteria have been met, none of which involve species protection. EPA believed the absence of species-related discretion meant that Section 7(a)(2) of the ESA did not obligate the agency either to consult with FWS on the regulatory transfer, or to determine whether the transfer would result in jeopardy to any listed species or adverse modification of critical habitat. *Id.* at 654. On review, the Ninth Circuit disagreed, interpreting the ESA broadly. *Id.* at 656.

The Supreme Court reversed, finding that requiring EPA to comply with the ESA’s jeopardy and adverse modification requirements had the effect of amending the CWA by adding avoidance of jeopardy and adverse modification as additional conditions to the transfer of regulatory power. *Id.* at 662. The Supreme Court commented that this broad interpretation of Section 7 “would thus partially override every federal statute mandating agency action by subjecting such action to the further condition that it pose no jeopardy to endangered species.” *Id.* at 664. The Court found that this interpretation of Section 7 conflicts with the Court’s historic reluctance to find legislative repeals by implication:

*While a later enacted statute (such as the ESA) can sometimes operate to amend or even repeal an earlier statutory provision (such as the CWA), repeals by implication are not favored and will not be presumed unless the intention of the legislature to repeal [is] clear and manifest. ... We will not infer a statutory repeal unless the later statute expressly contradict[s] the original act or unless such a construction is absolutely necessary ... in order that [the] words[of the*
later statute] shall have any meaning at all. ... Outside these limited circumstances, a statute dealing with a narrow, precise, and specific subject is not submerged by a later enacted statute covering a more generalized spectrum.

Id. at 662-63 (citations and quotations omitted; brackets in original).

The Court ruled that the tension between the plain meaning of the ESA and the court’s established rule against implied statutory repeals created an ambiguity in the statutory words, and deferred to the agencies’ regulation interpreting the statute:

We must therefore read §7(a)(2) of the ESA against the statutory backdrop of the many mandatory agency directives whose operation it would implicitly abrogate or repeal if it were construed as broadly as the Ninth Circuit did below. When §7(a)(2) is read this way, we are left with a fundamental ambiguity that is not resolved by the statutory text. ...

In this situation, it is appropriate to look to the implementing agency’s expert interpretation, which cabins §7(a)(2)’s application to “actions in which there is discretionary Federal involvement or control.” 50 CFR §402.03. This reading harmonizes the statutes by applying §7(a)(2) to guide agencies’ existing discretionary authority, but not reading it to override express statutory mandates.

Id. at 666.

The Court also addressed the proper interpretation of the “discretionary Federal involvement or control” regulation that it upheld, rejecting the lower court’s conclusion “that, even if § 7(a)(2) is read to apply only to ‘discretionary’ agency actions, the decision to transfer NPDES permitting authority to Arizona represented such an exercise of discretion[;] ... that the EPA’s decision to authorize a transfer is not entirely mechanical; [and] that it involves some exercise of judgment as to whether a State has met the criteria set forth in [the CWA]” Id. at 671. The Court found, in reliance on the view of FWS and NMFS, see id. at 660 n.5, that the ESA applies only when there is statutory discretion that relates to protection of endangered species:

While the EPA may exercise some judgment in determining whether a State has demonstrated that it has the authority to carry out§402(b)’s enumerated statutory criteria, the statute clearly does not grant it the discretion to add another entirely separate prerequisite to that list. Nothing in the text of §402(b) authorizes the EPA to consider the protection of threatened or endangered species as an end in itself when evaluating a transfer application.

Id. at 671. The Court also held that the existence of statutory discretion at a later stage of regulatory oversight, even discretion which may trigger ESA compliance at that later point, did not transform the approval decision itself into a discretionary decision requiring §7(a)(2) compliance:
But the fact that the EPA may exercise discretionary oversight authority—which may trigger §7(a)(2)’s consultation and no-jeopardy obligations—after the transfer does not mean that the decision authorizing the transfer is itself discretionary.

_Id._ at 672 n. 11.

Thus, _Home Builders_’ interpretation of the “discretionary Federal involvement or control” regulation, 50 CFR §402.03, compels two key conclusions here:

First, while the O & C Act gives BLM discretion in areas other than species protection in developing plans and making its annual productive capacity decisions, such as determining “harvest methods, rotation length or silviculture regimes,” that discretion does not make the plan or capacity decisions discretionary under the ESA, because, in the words of _Home Builders_, “[n]othing in the text of [the O & C Act] authorizes the [BLM] to consider the protection of threatened or endangered species as an end in itself when [managing the O & C timberlands],” _Home Builders_, 551 U.S. at 671.

Second, while the BLM also has discretion, after the agency adopts its plans and makes its annual productive capacity decisions, to decide which particular areas will be logged each year, that post-decision discretion also does not make the plan and capacity decisions discretionary under the ESA. _Home Builders_ at 671, 672. The BLM has no discretion to manage an area of O & C timberland as a no-harvest reserve to protect imperiled species or their habitats, and therefore has no ability—and thus no duty—to comply with Section 7 of the ESA.

This legal analysis demonstrates that the Purpose and Need statement and the four preliminary alternatives presented in Planning Criteria violate the O & C Act. AFRC requests the BLM to revise the Planning Criteria, amend the Purpose and Need statement to remove statements inconsistent with the O & C Act, and present a new set of alternatives that comply with the O & C Act.

**The Purpose and Need Statement in the Planning Criteria is unlawfully narrow.**

The CEQ regulations state that the agency’s purpose and need determines the range of alternatives and provides a basis for the selection of an alternative in a decision. In selecting a purpose and need, the BLM must “always consider the views of Congress” as expressed in applicable statutes—here the O & C Act. _Theodore Roosevelt Conservation Partnership v. Salazar_, 661 F.3d 66, 73 (D.C. Cir. 2011). A court “will reject an unreasonably narrow definition of objectives that compels the selection of a particular alternative.” _Id._ In this case, every alternative identified by the BLM will contain large reserves designed to contribute to the theoretical recovery of the northern spotted owl—in violation of the O & C Act, thus “compelling the selection” of a resource management plan that will contain such unlawful reserves. The preliminary alternatives are therefore unlawfully narrow and must be expanded to include at least one alternative with no reserves for spotted owl recovery, and all O & C timberlands assigned to sustained yield timber production as the O & C Act requires.
In this case, AFRC believes that the preliminary alternatives constitute final agency action that is judicially reviewable because the preliminary alternatives define the permissible scope of the alternatives that can be selected for analysis in the environment impact statement (EIS) that must accompany the new RMPs. Without a doubt, the BLM’s decision of alternatives for its draft EIS will be judicially reviewable and ripe final agency action because the decision of alternatives for the draft EIS will define the permissible scope of the final decision that can be made by BLM at the conclusion of the decision-making process. The BLM can only select an alternative that falls within the range of alternatives evaluated in the EIS. If the BLM only selects EIS alternatives with large reserves for the theoretical recovery of the northern spotted owl, the BLM will be constrained to select a plan with such reserves or, at a minimum, with the reserves currently designated in the 1995 plans which will constitute the no action alternative. All of these choices violate the O & C Act, as shown above (and as demonstrated by the comments of the Association of O & C Counties dated March 26, 2014, which AFRC incorporates by reference into these comments).

The CEQ regulations provide that an agency must consider a reasonable alternative even if the agency believes it may not permissibly adopt that alternative. 40 C.F.R. § 1502.14(c). Even if BLM disagrees with AFRC’s interpretation of the O & C Act (which is the same as the BLM’s interpretation of the O & C Act for the first fifty plus years of the law’s existence), BLM nonetheless has the obligation to select and analyze at least one alternative in its EIS that is based on AFRC’s interpretation of the O & C Act as presented herein. Including such an alternative will broaden the scope of permissible outcomes of the decision-making process and give the BLM genuine choice about its final decision, which is lacking in the unlawfully narrow range of alternatives currently outlined. AFRC also agrees with the Association of O & C Counties that the 2008 Western Oregon Plan Revisions should be included as another reasonable alternative. Nothing has changed since 2008 that would allow the BLM to conclude that the plan the BLM actually adopted in 2008 has become unreasonable in 2014.

Finally, if any of the alternatives contain large reserves intended to achieve the theoretical recovery of the northern spotted owl, BLM must analyze in its EIS the likelihood that creating such reserves would in fact contribute to the recovery of the northern spotted owl. The ongoing invasion of northern spotted owl habitat by the barred owl, and the barred owl’s displacement of spotted owls from that habitat, raise a fundamental issue as to whether creating more northern spotted owl habitat on BLM lands is simply creating more barred owl habitat – which there is no shortage – and does nothing to help recover the northern spotted owl. Recent analyses by spotted owl biologists at FWS and elsewhere have strongly suggested that when barred owl encounter rates with northern spotted owls hit a certain level, no additional amount of northern spotted owl habitat can stabilize the northern spotted owl population. If the barred owl encounter rate on BLM’s western Oregon lands has already hit that level, as is likely creating northern spotted owl reserves on BLM land would not contribute to the recovery of the northern spotted owl, and would therefore be unlawful. BLM must consider this issue in its EIS.

The Department of Interior must be aware that political winds do not change the meaning of a statute. As much as political appointees in Washington, D.C. may wish to repeal the O & C Act by converting the O & C lands into a vast northern spotted owl reserve, the O & C Act
forbids that outcome. AFRC will be persistent is seeking all means of relief to enforce the plain meaning of the O & C Act.

**Analysis of Resources, Resource Uses and Issues.**

The Analytical Methodology to be used in the planning process comprise 208 of the 234 page document. These identify 20 resources and resource uses as well as 85 individual issues associated with these. There are only 2 resources and resource uses and 6 issues that address timber supply and economic support to local governments as mandated by the O&C Act. In contrast, there are 21 issues devoted to just one resource and resource use, wildlife. This imbalance clearly shows that the planning criteria do no focus on the primary purpose of the O&C Act. Furthermore, there is no analysis that will show how each alternative will affect the actual size of the spotted owl population.

The Planning Criteria should incorporate an analysis of how each alternative meets the first three of the four mandatory duties imposed by the O&C Act as stated above. These are:

1. All of the O & C lands classified as timberlands “shall be managed . . . for permanent forest production.”

2. The timber on those lands “shall be sold, cut, and removed in conformity with the princip[le] of sustained yield ....”

3. “The annual productive capacity for such lands shall be determined and declared.”

A new resource and resource use titled "O&C Act Compliance" should be added. Potential issues associated with this could be:

1. What portion of the timberlands as defined in the O&C Act are assigned to the harvestable land base of each alternative?

2. How much of the sustained yield associated with all of the timberlands is associated with the harvestable land base of each alternative?

3. What modifications to silvicultural prescriptions were incorporated in the alternative that reduced the sustained yield from its maximum potential?

4. What is the annual productive capacity of the alternative as compared to the annual productive capacity of all timberlands?

5. How much revenue will be generated by the alternative compared to the revenues that would be generated if all timberlands were incorporated into the harvestable land base?
6. What modifications in silvicultural prescriptions were incorporated in the alternative that reduced revenues from its maximum potential?

7. What modifications in logging methods were incorporated in the alternative that reduced net revenues from its maximum potential?

8. How many jobs will be generated by the alternative compared to the jobs that would be generated if all timberlands were incorporated into the harvestable land base?

The Planning Criteria should incorporate an analysis of how each alternative will affect the size of the spotted owl population. All of the issues being proposed to be analyzed to assess the effects of the alternatives on spotted owls focus on habitat and ignore the fact that, due to the barred owl invasion, maintaining and increasing habitat alone will not lead to an increase in the population of spotted owls. The issues concerning the spotted owl should focus on the effects on population not on habitat. The issues associated with the spotted owl should be changed to the following:

**Wildlife: Spotted Owls**

Issue 1: How would the BLM alternatives large block system of nesting, roosting and foraging habitat affect the reproductive success and size of the spotted owl population?

Issue 2: How would the BLM alternatives creation of habitat conditions within and surrounding large blocks of nesting, roosting, and foraging habitat affect the reproductive success and size of the spotted owl population?

Issue 3: Would the BLM alternative contribute to a coordinated, adaptive management effort to reduce the loss of habitat due to catastrophic wildfire throughout the northern spotted owl’s range?

Issue 4: In areas of significant population decline, would the BLM alternative affect the reproductive success and size of the spotted owl population?

Issue 5: How would the BLM alternative delineation of at least one reserved land use allocation in the moist forest that would be managed for structural complexity and biological diversity affect the reproductive success and size of the spotted owl population?

Issue 6: How would the BLM alternative to conserve spotted owl sites and high value spotted owl habitat affect the reproductive success and size of the spotted owl population and how many spotted owl are actually using these areas?

Issue 7: In lands where management is focused on the development of spotted owl habitat, would the BLM alternative concentrate post-fire silvicultural activities on conserving and restoring habitat elements that take a long time to develop (e.g., large
trees, medium and large snags, downed wood) and how would this affect the reproductive success and size of the spotted owl population?

Issue 8: How would the BLM alternative maintenance and restoration of well-distributed, older and more structurally complex multi-layered conifer forests on BLM-administered lands in western Oregon affect the reproductive success and size of the spotted owl population?

Issue 9: What is the projected size and distribution of the barred owl and spotted owl over the first 50-100 years of each of the alternative?

AFRC is pleased to be involved in the planning, environmental assessment (EA), and decision making process for the Western Oregon Resource Management Plan update. Should you have any questions regarding the above comments, please contact me at 503-222-9505 or at tpartin@amforest.org.

Sincerely,

Tom Partin, President

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Baker, Rowan. J.
DellaSala, Dominick A.
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EXECUTIVE SUMMARY

Introduction

The Aquatic Conservation Strategy (ACS) of the 1994 Northwest Forest Plan was adopted for the Pacific Northwest federal public lands to improve management schemes for lands managed for multiple uses. Recent agency and legislative proposals would substantially reduce protective provisions of the ACS and NFP, in large part to increase commercial logging. In this paper we review relevant science emerging since the 1993 development of the ACS to ascertain whether the proposed changes including reduced riparian protections, and a substantially lowered burden of proof for watershed-disturbing activities, are justified.

Components of the ACS and Recently Proposed Changes

The architecture of the ACS recognized the dynamic and variable nature of aquatic environments. The ACS has four major components: (1) a spatially explicit network of Key Watersheds offering the greatest potential for recovering at-risk aquatic species; (2) spatially explicit Riparian Reserves along streams where aquatic and riparian objectives receive primary emphasis and where certain activities are constrained; (3) Watershed Analysis, an assessment protocol to tailor management priorities and actions to individual watersheds; and (4) a
program of *Watershed Restoration*, including decommissioning roads and modification of in-stream and near-stream habitat.

At present two active bills in Congress would substantially reshape management on the large block of lands managed by the BLM in western Oregon, and the BLM is working on its second EIS with the intent of replacing the Plan with new administrative decisions. The Forest Service is embarking on revision of its National Forest Management Plans under guidance that substantially alters key elements of the ACS. These efforts appear principally motivated by the goal of increasing commercial timber production.

Land allocations outside the ACS, including Late Successional Reserves, Wilderness, and other congressionally designated or “administratively withdrawn” lands, and inventoried roadless areas, confer additional protection to watersheds. They prevent or retard road network expansion and limit logging, allowing natural ecosystem recovery processes to proceed and limiting the spatial extent of watershed and stream network disturbance across the landscape. Proposals that strip or diminish these conservation allocations render watersheds more vulnerable to cumulative impacts.

*Management After Wildfire, Disease, and Other Disturbances*

Soon after the Northwest Forest Plan was adopted in 1994, numerous scientific syntheses issued precautionary advice against post-fire logging on a wide range of causal grounds. More recent work has identified the potential importance of trophic pulses following high-
severity wildfire. Syntheses based on plant and landscape ecology have also broadly
called into question the effectiveness of logging insect-infested trees for attempted control
of, or response to, insect outbreaks.

Despite the reality that salvage logging is not restorative. Unfortunately, salvage logging
was not expressly ruled out in the Plan and ACS. Because political demand for this activity
remains high, large salvage logging projects have been pursued by the USFS and BLM.
Such projects continue despite their negative consequences for forest ecosystem health
and aquatic and riparian ecological integrity. Because federal agencies have statutory
obligations to maintain forest ecosystem integrity, functional watershed conditions, and
fish and wildlife habitat, post-disturbance logging should be prohibited in Riparian
Reserves, Key Watersheds, Late Successional Reserves, and other areas where
conservation is a dominant emphasis. Post-disturbance actions should prioritize road
decommissioning or major road and culvert improvements to reduce harm under
increased hydrological stresses expected from post-disturbance watershed processes and
climate change.

Forest Thinning Intended to Reduce Tree Stem Density or Wildfire Fuels

While ACS rules provide for forest thinning within Riparian Reserves, the agencies carry a
site-specific burden to establish that need and outcomes are restorative. In recent years
the USFS and BLM have proposed larger thinning projects to reduce the number of site-
specific analyses, have increased use of mechanical harvesting methods in conjunction
with commercial timber sales, and increasingly thinned trees in Riparian Reserves and other conservation priority areas.

A recent federal agency science review concluded that thinning commonly produces unusually low-stem density forests and causes long–term depletion of snag and wood recruitment that is ecologically detrimental in most Riparian Reserves. The effect of thinning on fire behavior in riparian areas has been little studied, but relevant science indicates ambivalent and conditional results of mechanical fuels treatments on fire severity and rate of spread. More important, the probability of a fire burning through a treated stand within the time window of potential effectiveness of a fuels treatment has been shown to be very small, and ecological studies indicate numerous ways that streams benefit in key respects from natural occurrences of high-severity fire in riparian areas.

Considering the tradeoffs, thinning and fuels reduction by means of mechanized equipment or for commercial log removal purposes should be prohibited in Riparian Reserves and Key Watersheds. Any light thinning or fuels treatment that does occur as a restorative treatment in Riparian Reserves (e.g., to remove non-native tree species from a site) should retain all downed wood debris on site.

**Riparian Reserves for Protecting Stream Temperature.**

The premise that the present ACS “overprotects” streams from the thermal point of view has become a primary rationale for proposals by BLM and in congressional bills to reduce default Riparian Reserve widths for some stream types, with the intent of increasing the area available for commercial logging. We that several scientific bases counter this
hypothesis of “overprotection.” Most current analyses of stream temperature rest on a static view of riparian stand structure and function, but riparian forests are highly dynamic. When trees that provide shade in the near-stream zone by fall or die by natural processes, trees in the outer zone of the riparian reserve, which previously seemed redundant, can become the only source of shade to that portion of the stream. Existing measures of shade are oversimplified, and do not effectively capture the effect of shade density, which is maximized by overlapping layers of canopy interception. In some Pacific Northwest watersheds, stream temperature is more strongly associated with catchment-wide logging than with streamside vegetation conditions, as a result of warming of groundwater or alteration of groundwater flux by logging outside of riparian reserves. Finally, over time, channel migration can carry streams outside of narrow buffer strips in some valley types.

From the standpoint of protecting and restoring stream and wetland thermal regimes, we do not find sufficient scientific support for reducing current ACS Riparian Reserve default for any stream type. In some watersheds larger areas of forest protection are warranted to prevent warming of shallow groundwater, particularly given the likely trends of future climate change.

**Riparian Reserves and Nutrient Retention.**

Logging or fuels management treatments that disturb vegetation generate increased nitrogen leaching from forest soils that enters streams and wetlands by both surface and subsurface flow paths. Ground-disturbing activities and disturbed soil conditions can mobilize phosphorus via soil erosion. Logging disturbs vegetation and soils over large
areas, and initial disturbance of forested lands tends to generate larger proportional
increases in nutrient loading than repeat disturbances of agricultural or urban lands.
Nutrient loading to headwater streams tends to transfer downstream and accumulate in
larger rivers, lakes, estuaries, and nearshore marine ecosystems. Cumulative nutrient
impairment of downstream receiving waters can occur without violation of nutrient
standards in headwater streams, simply as a consequence of sustained increases in loading
from stormwater runoff from forest roads and periodic logging. In effect, logging alters
the entire regime of nutrient and sediment export. By virtue of their high density across
the landscape, headwater streams with seasonal flow receive a large portion of the
nutrients mobilized by up-slope disturbance. Therefore full protection of wide Riparian
Reserves along even the smallest stream channels (and surface-connected wetlands) is
necessary for effective nutrient retention.

Available science indicates that continuous, no-cut Riparian Reserves exceeding 30-50 m
(100-150 ft) or more along all streams and wetlands are needed to fully mitigate the
effects of up-slope logging on nutrient loading to freshwater systems. We suggest
cessation of livestock grazing in Riparian Reserves and road network reduction and
reconfiguration of remaining roads to reduce their hydrologic connectivity to surface
waters are needed to reduce downstream nutrient loading. We call for analysis of the
effects of management actions on nutrient loading to immediate downstream receiving
waters in NEPA planning and ESA Consultations.
**Road Networks and Their Management.**

*Roads* affect biota and water quality through many physical, chemical, and biological pathways. Roads are necessary to support logging, mining, grazing, and motorized recreation, but the existing federal forest road system far outstrips the extent of those demands, and far exceeds the ability of agencies to maintain them to prevent watershed damage. The magnitude of existing road impacts on watershed and streams in the Plan might equal or exceed the effect of all other activities combined. Existing road rules under the ACS and other policies have failed to produce needed systematic reduction in road systems on forested federal lands. New rules are needed to prevent the construction of new permanent or “temporary” roads in most circumstances, allow no net increase in road density in any watershed, strengthen road density restrictions for Key Watersheds, and establish unambiguous standards and metrics, and develop an inventory protocol sufficient to ensure real net road density reduction is achieved on the ground.

**Livestock Grazing.**

Where grazing occurs in mountainous landscapes, it has large impacts on streams because livestock tend to concentrate in streams, floodplains and alluvial valleys. Besides direct disruption of wetlands and stream beds and, and the suppression of woody vegetation, soil compaction by grazing in both riparian and upland areas degrades runoff quality, quantity, and watershed functions such as soil water storage and nutrient retention. Control of large carnivores to protect livestock alters the predator-prey relations (trophic cascades) that would naturally check the impact of wild herbivores on riparian areas and streams.
Measures to reduce the ecological impact of livestock grazing, primarily by fencing streamside areas and moving cattle frequently from site to site, are expensive and have met with variable success. Thus, livestock grazing should be excluded by rule from Riparian Reserves, Key Watersheds, and other lands where conservation is the primary management objective.

Chemical Use in Forests

Use of chemicals on federal lands is now increasing after a long period of reduced use. Besides direct application of chemicals like pesticides and fire retardants, toxic contaminants also originate from motor vehicles, road surface and road runoff into surface waters. Application of chemicals for forest management purposes should be minimized in time and space; for example, hand-application should be favored over aerial application when there is no feasible alternative to pesticide use, and fire retardant spill or drift to surface waters should be strictly avoided. The full range of environmental tradeoffs between the perceived benefits of chemical use and its possible harms should be carefully weighed in each case (in NEPA analysis and ESA consultations) before a decision is made to use chemicals in forest management. Implementation of wide, unthinned forested buffers in Riparian Reserves could help reduce exposure of fish and aquatic life to toxic chemicals. Thinned or narrow buffers can allow greatly increased aerosol penetration (chemical) from slopes to streams, and allow transport of toxins in surface runoff. Reducing road density and reducing the hydrologic connectivity of roads to surface waters should help control toxins originating from road use as well as those that are applied to vegetation up-slope.
Climate Change: Consequences and Adaptation.

Climate changes will likely exacerbate watershed degradation by affecting key processes or factors such as stream flows, thermal regimes groundwater and floodplain connectivity, landslide rates, fuels, fire, invasive species, and post disturbance human responses. Most climate change adaptation strategies call for strategic removal of non-climate stressors as these will likely be more tractable or remediable than climate stressors. Current ACS requirements are integral to assuring streams, wetlands, and other water bodies have the best possible resilience in the face of increasing climate stress. Wide Riparian Reserves provide not only shade, but essential protection and support for the natural processes that maintain and regenerate the suite of hydrologic and geomorphic elements that help buffer streams against climate forcing. Watershed resilience in the face of climate change can best be maintained by protecting and restoring the natural processes and conditions endemic to natural forested riparian areas and floodplains. Protecting and restoring the natural processes and conditions endemic to natural forested riparian areas and floodplains can best maintain watershed resilience in the face of climate change. Whittling away riparian protections on the basis of single-factor considerations such as stream shade undermines the comprehensive protection of stream and riparian processes that the ACS was designed to maintain and restore.

Monitoring and Adaptive Management.

Adaptive Management Areas established under the Northwest Forest Plan have failed to address monitoring and scientific concerns. Improved methods and designs for study of
natural and historical landscape experiments can provide much needed information about management cause and effect relations. The existing federal monitoring program for the ACS (AREMP) is constrained by design and sampling protocols that limit its capacity for drawing inferences about changes in habitat condition and processes over time. We recommend that monitoring of stream and watershed responses should be a required element of every forestry, resource development or active management project. Second, we call for an interagency scientific panel to review existing effectiveness monitoring efforts including the relevance of existing and potential data sets, and design recommendations for a new ACS monitoring program. An improved monitoring program should include increased emphasis on tracking ecological conditions and trends in Key Watersheds, which are disproportionately important to the survival and recovery of ESA-listed and other sensitive species.

Conclusions

Recent scientific advances raise many questions about the adequacy of the ACS and its implementation by the federal agencies, including logging and fuels treatments in riparian areas, the extent of riparian protection for headwater streams, road system downsizing and remediation, the adequacy of conservation priorities and delineations of Key Watersheds, and the robustness and utility of current monitoring programs. Anticipated climate change raises the level of concern we have about these issues. Because most larger watersheds in the region are of mixed federal and other ownership, and because progress in protection and restoration on private lands has been limited, federal lands will
likely continue to bear the brunt of watershed protection and aquatic habitat conservation burdens for the foreseeable future.

Attempts to reduce protections to watershed, riparian, and freshwater ecosystems by weakening major components of the ACS and Northwest Forest Plan are not justified by new and emerging science. Improved protections—and better monitoring of outcomes—are warranted across all land ownerships, including federal forest lands, if freshwater ecosystems and their biota, including salmon and other sensitive species and downstream water quality are to be effectively conserved.
ABSTRACT

The Aquatic Conservation Strategy (ACS) of the 1994 Northwest Forest Plan, adopted for the Pacific Northwest federal public lands, improved schemes for lands managed for multiple uses. Recent agency and legislative proposals would substantially reduce protective provisions of the ACS and NFP by increasing logging, including under the rubric of thinning to change forest structure. In this paper we review relevant science emerging since the 1993 development of the ACS to ascertain whether the proposed changes, including reduced riparian protections and a substantially lowered burden of proof for watershed-disturbing activities, are justified. Several strong threads of scientific evidence—particularly the ecosystem impacts of ongoing climate change—indicate the need to strengthen, not weaken key ACS protections. Extensive mechanical thinning activities, including those conducted within Riparian Reserves, cause ground disturbance in sensitive areas and generally require an extensive network of roads and landings. The resulting adverse direct and indirect impacts generally offset or exceed presumed restorative benefits. Wider Riparian Reserve areas, with greater protection than afforded by the ACS, particularly for headwater streams, remain essential to protect and restore aquatic systems. Ecological harm caused by roads has been widely recognized, but ACS measures should be substantially strengthened to effectively arrest and reduce road impacts. In addition, three topics that received limited direction in the ACS—post-disturbance logging (e.g., fire salvage), grazing, and aerial application of toxic chemicals—pose both acute and chronic harm to aquatic systems, and should be avoided or significantly curtailed. Ongoing climate
change and associated hydrologic stresses impose further need to strengthen
protection of watersheds and Riparian Reserves from land management stressors,
such as those from road systems and livestock grazing. A thorough scientific review
and synthesis to inform a future ACS is needed. It is clear that proposals to weaken
ACS and related Forest Plan provisions that help limit impacts to freshwater
ecosystems are not justified by new and emerging science.
The Aquatic Conservation Strategy of the Pacific Northwest Forest Plan

In 1994, region-wide social protest and court injunctions that curtailed federal forest timber sales--followed by a rare presidential “roundtable” summit- that changed the management of federal forest lands in the U.S. Pacific Northwest. In 1994 the federal agencies with primary land management responsibilities, The U.S. Forest Service (USFS) and U.S. Bureau of Land Management (BLM) jointly adopted a new, regional conservation framework, called the Northwest Forest Plan. At the time, the President called for development of a plan that would (1) satisfy the courts and lift the injunctions, (2) protect the environment, and (3) help stabilize the regional economy (GAO 1999). The Plan’s Record of Decision (1994) offered a “scientifically sound, ecologically credible, and legally responsible” long-term management strategy for federal lands within the range of the northern spotted owl (*Strix occidentalis cauria*). This region encompasses over 97,000 square km (24 million acres) within the highly productive forest zones of western Washington and Oregon and northern California. In addition to owls and other forest-dependent terrestrial and avian wildlife, federal forests in this area also harbor sensitive, declining, and federally listed salmon species (FEMAT 1993; ROD 1994). Declines in once-abundant salmon and other fish assemblages, amphibians and invertebrates (e.g., mussels) indicate substantial and persistent loss of aquatic ecosystem integrity (Hughes et al. 2004; Kaufmann & Hughes 2006).

As a consequence, the federal agencies convened a large interagency and interdisciplinary panel of scientists (FEMAT 1993), expressly to develop the rationale and options for conservation provisions of the Northwest Forest Plan (hereafter referred to as the “Plan”). Recognizing that terrestrial and freshwater species fundamentally share the same landscape,
FEMAT developed partially overlapping terrestrial reserve-based provisions within the Aquatic Conservation Strategy (“ACS”).

During the next 20 years, the Plan and its ACS established a benchmark in conservation planning and served as an influential model for conservation efforts elsewhere in the U.S and the world. The implementation of the ACS on the ground has evolved; at the same time, social and political pressure has mounted to significantly recast or eliminate the Plan, including key elements of its ACS. At present two active bills in Congress would substantially reshape management on the large block of lands managed by the BLM in western Oregon, and the BLM is working on its second EIS with the intent of replacing the Plan with new administrative decisions. The Forest Service is embarking on revision of its National Forest Management Plans under guidance that substantially alters key elements of the ACS. These efforts appear principally motivated by the goal of increasing commercial timber production (see Blumm and Wigington 2013, DellaSala et al. 2013 for related discussions).

ACS revision efforts have cited “new science” (work published since about 1993) as a basis for many proposed changes. Post-1993 scientific findings relevant to the ACS have not, however, been addressed in a systematic manner. We review the key ACS elements, briefly discuss proposed modifications, and summarize the likely impacts of proposed ACS modifications based on recent science. We also identify some potential improvements in the protection measures in the ACS as indicated by scientific knowledge, suggest the form a future ACS might take if it is to be responsive and robust to ongoing scientific considerations.

Core Design Elements of the Aquatic Conservation Strategy
The architecture of the ACS recognized the dynamic and variable nature of aquatic environment (Reeves et al. 1996), eschewing one-size-fits-all standards and establishing a process to tailor prescriptions to fit the needs of each watershed. Accordingly, FEMAT (1993) gave the ACS four components, two spatial and two programmatic: (1) a spatially explicit network of Key Watersheds meant to comprise hydrologically discrete areas harboring the remaining highest-quality aquatic habitat or otherwise offering the greatest potential for recovering at-risk fish species; (2) Spatially explicit (hydrologically continuous but variable-width) Riparian Reserves along streams where aquatic and riparian objectives receive primary emphasis and where certain activities are constrained; (3) Watershed Analysis, an assessment protocol designed to recommend how to tailor management priorities and actions to the biophysical limitations and perceived restoration needs of individual watersheds; and (4) a comprehensive, long-term program of Watershed Restoration, including road decommissioning, instream habitat modification, and other measures (ROD 1994). Although other land use allocations including Late Successional [forest] Reserves, Congressionally-designated reserves, and administratively withdrawn areas are not formal components of the ACS, they are recognized to provide additional important protection for the landscape that influences conditions in riparian and aquatic ecosystems (NOAA-NMFS 2004). The ACS also provides habitat and connectivity functions to a host of terrestrial and avian species (ROD 1994, p.7) that, for example, benefit from extensive roadless areas, require large trees or wood debris for nesting or other uses, or rely on moist riparian forests for refuge or dispersal.

Beyond land allocations, the ACS imposes constraints on habitat-degrading activities in two ways: 1) binding standards and guidelines explicitly constraining numerous potential management activities within riparian reserves and key watersheds; 2) requiring all
management activities on surrounding federal forestlands to maintain and restore nine narrative ACS objectives describing watershed functions and processes (Table 1). The activity-specific standards and guidelines were intended to “prohibit and regulate activities in Riparian Reserves that retard or prevent attainment of the [ACS] objectives” (see ROD 1994). It is beyond the scope of this paper to enumerate the many activity-specific standards and guidelines that comprise the ACS, but some specific examples will be discussed as they are affected by new or emerging scientific knowledge. However, the nine overarching ACS objectives also have binding force and constitute forest-wide standards and guidelines themselves (ROD 1994). This approach was explicitly intended to constrain activities in geomorphically, hydrologically, and ecologically sensitive areas while also limiting the cumulative impacts of activities throughout a watershed (FEMAT 1993, V-29). The identified goal was to maintain conditions within a broadly-conceived “range of variability” across multiple spatial and temporal scales, by evaluating avoiding, and mitigating management impacts at watershed and site-specific scales. The science of ecological restoration still dictates that avoidance of impacts is more effective than post-hoc remediation of impacts. This principle is further codified in the ROD (1994) Standard and Guideline for watershed restoration (guideline WR-3 clearly states: “Do not use mitigation or planned restoration as a substitute for preventing habitat degradation.

In the early years of the ACS, federal agencies argued that site-specific failure to meet ACS objectives was broadly acceptable if unacceptable outcomes would not be observed at larger scales. However, courts have validated that the conservation
burdens delineated in the ACS applies to both site- or project-specific as well as larger scales, such as a watershed, planning area, or national forest (PCFFA v. NMFS 1999). The powerful guiding language in the nine narrative objectives indicated in each case that managers are required to “maintain and restore” specifically named ecological conditions and functions. Hence management activities that will affect aquatic ecosystems may be pursued only under a reasonable assurance that they are restorative or protective in nature. It is not sufficient that management activities produce acceptably small adverse impact, or cause harms that can be plausibly mitigated by other measures.

Courts have ruled that FEMAT (1994) embodies the best available scientific information pertaining to the impacts of forestry activities on salmon and their habitat in the Pacific Northwest federal forests, and that the Plan and the ROD (1994) adequately integrate FEMAT’s scientific representations. Intervening scientific reviews (e.g., Spence et al. 1996, DellaSala and Williams 2006, Reeves et al. 2006a, Everest and Reeves 2006) have concluded that fundamentals and rationale of FEMAT and the ACS remained robust and largely unchallenged by new scientific information. This has been echoed in a litany of interagency consultations on ESA and Clean Water Act matters. However, no interagency scientific panel near the scope of FEMAT has been reconvened to address the question of new scientific implications comprehensively.
The ACS is directly enforceable by the federal agencies pursuant to the overarching resource planning statutes of the USFS and BLM. Implementation of the ACS has been tied to federal, state, tribal, and local agencies in their regional, programmatic, and project-specific determinations of compliance with the U.S Endangered Species Act (ESA) biological and Clean Water Act plans to reduce diffuse pollutant loadings. In keeping with the regional scope of the ACS, some of these binding regulatory conditions extend well beyond federal lands. For example, most Habitat Conservation Plans granted to private landowners in the Pacific Northwest explicitly rest on the premise of full implementation of the ACS on nearby federal lands, some on a time basis that may exceed 40-50 years. Similar expectations undergird the Oregon Plan for Salmon and Watersheds (http://www.oregon.gov/OPSW/pages/about_us.aspx).

Changes to the ACS Proposed by Administrative and Legislative Efforts

*Riparian Reserves:* The ACS-specified that “default” widths of Riparian Reserves, within which the conservation of aquatic and riparian-dependent terrestrial resources receives primary emphasis, are two site-potential tree heights (ca. 100 m or 330ft for most of the region) on either side of fish-bearing streams and one tree height (ca. 50 m or 160 feet) on non-fish bearing streams. Within these reserves, the conservation of aquatic and riparian-dependent terrestrial resources receives primary emphasis. Beyond these default widths, Riparian Reserves must be drawn to protect areas susceptible to channel erosion and mass wasting by encompassing “the body of water, inner gorges, all riparian vegetation, 100-
year floodplains, landslides and landslide-prone areas.” The Riparian Reserves widths were based on ecosystem process considerations (FEMAT 1993, Olson et al. 2007) and population viability and habitat considerations that FEMAT compiled for seven groups of salmonid fishes and a large number of terrestrial and avian species. Various sources (e.g., Johnson et al. 2012) have estimated that considering the high stream densities prevailing over much of the region, roughly 40% of total acres within the Plan area are located within the “default” Riparian Reserve system. However, only about 11% of the Plan area lies in Riparian Reserves associated with the “Matrix” land allocation, that is, where commercial logging is expected to be concentrated and where the Riparian Reserve allocation most directly restricts potential logging activity and other management-related disturbances. Watershed Analyses have been completed for most Key Watersheds and roadless areas, and many other watersheds as well; however very few watershed analyses provided a rationale for reducing default Riparian Reserve areas, and some identified the need to expand beyond standard default widths (Pacific Rivers Council 2008).

In 2008 the BLM’s Western Oregon Plan Revisions (WOPR), first proposed a new regime of management for the so-called “Oregon and California (O&C) Lands,” a category encompassing more than one million hectares (2.74 million acres) of these so-called revested forest lands managed by the BLM and scattered across a large swath of western Oregon (Blumm and Wigington 2013). BLM proposed greatly reducing default Riparian Reserve widths, especially for smaller streams, primarily arguing that ACS defaults included “non-riparian vegetation” and that summer stream shade and large wood recruitment to fish-bearing streams could be maintained relying on narrower buffers. Narrative objectives, standards and guidelines were also reduced
eliminated, for example, allowing commercial timber harvest in Riparian Reserves for pervasive “safety and operational” reasons. The analyses and rationale proposed in WOPR were criticized by the public and withdrawn by BLM in 2009 in part because they were deemed unlikely to survive consultations with ESA enforcement agencies (the National Marine Fisheries Service and US Fish and Wildlife Service). In a recent regional planning document, however, BLM (2013) argued again that “Riparian Reserve boundaries extend out beyond the water influence zone and are wider than necessary for water quality protection.”

That same presumption is embodied in two Congressional proposals for O&C lands, one of which (H.R. 1526, http://defazio.house.gov/issues/bipartisan-oc-forests-plan) would reallocate some 675,000 ha (1,667,000 acres) to an “O&C Trust” (Blumm and Wigington 2013). Riparian areas in that region would be managed at about half the widths of the current ACS default requirement for steams (with extremely limited buffers for springs, seeps, and wetlands). A current U.S. Senate bill would allocate about 50% of O&C ands to so-called “forestry emphasis areas,” cut default Riparian Reserve areas by half across all stream types (with provision for further narrowing if watershed analysis deems them “not ecologically important”). The bill would provide for potentially extensive commercial logging in the form of thinning within these buffers where stands are younger than 80 years of age, whereas stands older than 120 years would be protected from logging. These older stands remain only in scattered small patches across the O&C lands (DellaSala et al. 2013). Environmental review at the project level would also be
curtailed from current requirements, including but not limited to curtailing the need for project-level determinations of consistency with ACS requirements.

Meanwhile the USFS, managing the greater share of federal forest lands in the three states, encompassed by the Plan, has focused on incrementally replacing the ACS with new provisions in its upcoming National Forest revisions. The USFS in 2008 adopted regional planning guidance (USDA 2008) that generally retains the default riparian area widths and key watersheds allocations, but changes the narrative ACS Objectives, Watershed Analysis, and other guidance for management within reserve areas. These changes effectively provide the agency with expanded discretion to undertake a broader range of vegetation and ground-disturbing management activities within riparian reserves, including thinning and other commercial logging, livestock grazing, and others. The new language would allow actions that alter riparian reserve resources and goals, as long as a general argument can be made that those alterations are offset by other, beneficial actions or naturally-occurring improvements dispersed or averaged across time or space. The primary motivation appears to be to reduce the burden for NEPA analysis of such projects, and to pave the way for more aggressive implementation of mechanized and commercial thinning and other projects known to cause significant incremental harm within Riparian Reserves. This new USFS planning guidance illustrates our concern that changes proposed in one policy arena tend to “creep” into others, regardless of whether they have been subject to rigorous external review.

Departures from the Northwest Forest Plan ACS would trigger reinitiated ESA consultations with the USFWS and NMFS for numerous listed fish, wildlife and plant species on all
projects, plans, and policies that guide USFS management actions. This suggests a larger challenge: major changes in an existing conservation plan intended to boost resource extraction would destabilize administrative arrangements forged on longstanding regional scientific agreement, increasing uncertainty to the industries and communities dependent on those resources. The larger the scale of area covered by the plan, the greater the potential for such destabilization through uncertainty. In the Pacific Northwest, private and state land managers and other interests could be adversely affected by changes in federal land management that reduce protections for listed species and water quality.

Watershed Restoration needs are intended to be identified and prioritized in the ACS through Watershed Analysis, including activities such as silviculture and road treatments an emphasizing improved ecological conditions in Key Watersheds. Protection through passive restoration (Kauffman et al. 1997) of high-quality existing habitat is explicitly prioritized over active instream rehabilitation. Instream habitat-modifying projects are considered short-term measures that rely on concurrent long-term riparian and upslope protection and rehabilitation measures that cannot be claimed to mitigate for harmful and degrading management actions. By contrast, the current Senate Bill would prioritize $1 million annually for instream wood placement, allocate $5 million for road removal or improvement, and exclude these stream modification activities from environmental analysis under the NEPA within the BLM’s O&C land area. Moreover, the Senate and the House bills and the BLM (2013) all call for revising Key Watershed allocations in place under the current ACS. Many current Key Watersheds would apparently become defunct and simply unrecognized under the House bill.
While in some cases certain Key Watershed revisions in theory be beneficial to a particular species like ESA-listed coho salmon, this proposals raises an important unanswered question: Is the concept of prioritizing conservation efforts in Key Watersheds undermined when watershed-scale priorities are uprooted on a time frame that is decades shorter than the effective ecological time needed for watershed restoration to occur? Effective watershed restoration requires a commitment to consistent standards of protection and restoration investment for decades to centuries (FEMAT 1993). Whereas the current Senate bill would retain a process called Watershed Analysis for land dedicated to logging, it appears that process would not focus on conservation, but on what changes could be made increase commercial logging over that which might occur under the default prescriptions specified in the bill.

Changes in Terrestrial Land Allocations also Affect Watershed Integrity

Land allocations outside the ACS, including Late Successional Reserves, Wilderness, and other congressionally designated or “administratively withdrawn” lands, and inventoried roadless areas, all confer real and meaningful protection to watersheds. That is, to varying degrees all prevent or retard road network expansion and logging, allowing natural ecosystem recovery processes to proceed and limiting the spatial extent of watershed and stream network disturbance across the landscape. Many Key Watersheds are closely associated with such specially designated lands, though few are entirely or even largely nested within terrestrially-focused conservation delineations. When new proposals strip away the protection conferred by Late Successional
Reserves, roadless areas, or other administrative designations, the affected watersheds are placed at greater risk of impact from forestry activities. Land disturbance from roads, logging, grazing, or other actions can undermine the benefits of restoration and land protection elsewhere in the same watershed (Espinoza et al. 1997), depending on the geography of the watershed in question. The tradeoffs of cumulative risk and potential harm to important watersheds and sensitive or listed aquatic species from changes in land allocation have not been rigorously assessed in the Congressional and administrative proposals. Such tradeoffs amount to wholesale change in Plan land allocations for O&C lands.

**New Science that Informs Aquatic Conservation Strategy and Practice**

In the following section we discuss some new scientific advances since the convening of FEMAT (1993). We provide selected citations and briefly summarize our view of major implications for purposes of developing and improving an effective aquatic conservation framework. While our interpretations and recommendations focus on the ACS, many of the sources and their implications are derived from other regions and ecosystem types. Just as in FEMAT (1993), relevant scientific information that is critical to define and frame topics of crucial conservation concern sometimes originates from other similar regions, and it often spans a variety of disciplines.

*Management After Wildfire, Disease, and Other Disturbances.*

Salvage logging is the removal of large tree boles for commercial purposes (additional
impacts from yarding, roads, and log hauling also occur). Salvage logging of dead or dying trees after fires, insect outbreaks, and other disturbances in Pacific Northwest forests is a recurring concern. Soon after the NW Forest Plan was adopted in 1994, the scientific community began to weigh in on the inadvisability of post-disturbance logging. Scientists were cataloguing the critical importance of large standing trees and downed wood from fallen trees in the post-disturbance recovery of natural forests, including stand successional pathways, watershed processes, and wildlife and fish habitat (e.g., Gresswell 1999, Minshall 2003). Numerous scientific syntheses provided precautionary advice against post-fire logging on a wide range of causal grounds (e.g., Lindenmayer and Noss 2006, Beschta et al. 2004, Karr et al. 2004, Lindenmayer and Noss 2006). More recent work has identified the potential importance of trophic productivity pulses following high-severity wildfire (Malison and Baxter 2010) for persistence and recovery of aquatic and riparian species. Syntheses based on plant and landscape ecology broadly call into question the effectiveness of logging insect-infested trees for attempted control of insect outbreaks (e.g., Black et al. 2011, Six et al. 2014). Similar concerns apply to stands affected by any natural mortality agent, such as windthrow or volcanism. However, post-disturbance logging was not expressly ruled out in the Plan and ACS, and political demand for salvage logging remains high, so large logging projects have been pursued by the USFS and BLM in many areas.

Salvage logging is not restorative. We conclude that for forest ecosystem health, watershed conditions, fish and wildlife to be sustainable, and for inordinately costly planning controversies and litigation to be reduced, post-disturbance logging should be prohibited in Riparian Reserves, Key Watersheds, Late Successional Reserves, and other
areas where conservation is a dominant emphasis. Post-disturbance actions should prioritize road decommissioning or major road and culvert improvements to reduce harm under increased hydrological stresses expected from climate change.

**Forest Thinning Intended to Reduce Tree Stem Density or Wildfire Fuels.** Current ACS language allows the agencies to “apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain...objectives.” The agencies carry a project-specific burden to establish that need and outcomes are restorative, as required in the ACS Narrative Objectives. Recently the USFS and BLM have proposed larger thinning projects to reduce the number of site-specific analyses, to use mechanical harvesting methods in conjunction with commercial timber sales, and to thin trees in Riparian Reserves and other conservation priority areas. In wetter forest types, the primary claim that thinning is restorative rests on the concept that the growth rate and vigor of trees that are left might be improved, thereby potentially hastening the future development of larger-sized trees in the stand. In dryer forests, the primary rationale is that thinning is needed to reduce fuel loads, thereby reducing the risk of wildfire. In both cases, mechanized treatments in Riparian Reserves can disturb vegetation and soils in close proximity to surface waters, where the risk of sediment delivery and other impacts is demonstrably high (Rashin et al. 2006, Dwire et al. 2010). Logging activity that disturbs soils within Riparian Reserves short-circuits the benefit of sediment filtration functions (a function of distance of undisturbed vegetation to the
Logging also reduces the effectiveness of the reserve to retain sediment delivered from upslope sources. Bryce et al. (2010) reported that for sediment-sensitive aquatic vertebrates and macroinvertebrates, minimum-effect levels for % fines were 5% and 3%, respectively, meaning that small increases in fines can affect salmonids and their prey.

Substantial concerns exist about the putative ecological benefits of thinning and fuels reduction. Dispute among federal agencies about widely claimed ecological benefits of thinning in wetter forest types led to an interagency scientific review in 2012-13 (Spies et al. 2013). That panel concluded that increased tree growth might be most significantly obtained from thinning very young, high-density stands (which would likely not produce commercially saleable logs, Spies et al. [2013]). They concluded that thinning produces unusually low-stem density forests and causes long-term depletion of snag and wood recruitment that is likely detrimental in most Riparian Reserves (Spies et al. 2013, see also Pollock et al. 2012, Pollock and Beechie 2012). Continued depletion of wood recruitment in headwater streams can adversely affect the behavior of debris flows in Pacific Northwest watersheds in ways that further deplete wood debris over large river reaches (May and Gresswell 2002).

The effect of thinning on fire behavior in riparian areas has been little studied, but in general, the literature reports ambiguous and uncertain results regarding the effects of thinning and other mechanical fuels treatments on fire severity and rate of spread. Moreover, the probability of a fire burning through a treated stand within the time
window of potential effectiveness of a fuels treatment has been shown to be very small (Rhodes and Baker 2008). This is exacerbated in Riparian Reserve areas where vegetation regrows relatively quickly. We question whether managers should be striving to reduce fire severity in riparian areas at all, considering the natural role that high-severity fire plays in shaping riparian and stream ecosystems (Gresswell 1999, Minshall 2003, Malison and Baxter 2010). Six et al. (2014) questioned the scientific basis for longstanding policies that assume thinning is an effective defense against, or response to, pine beetle outbreaks. Finally, mechanized thinning and fuels operations usually require high-density road access to be feasibly implemented. Hydrological and ecological disruptions of such road systems (Jones et al. 2000, Trombulak and Frissell 2000, Gucinski et al. 2001), exacerbated by other effects of vehicle traffic, will likely outweigh any presumed restorative benefit to streams and wetlands accruing from thinning and fuels reduction. In recent years, the prospect of future thinning or fuels reduction projects often has become the basis for the USFS or BLM to avoid or delay decommissioning environmentally harmful roads, even when fiscal resources were available for the work.

Considering the difficult-to-justify costs and risks of inadvertent adverse impact associated with such operations in sensitive areas, balanced against the uncertain and ecologically ambivalent intentional results, we conclude the following: *Thinning and fuels reduction by means of mechanized equipment or for commercial log removal purposes should be generally prohibited in Riparian Reserves and Key Watersheds. Any light thinning or fuels treatment that does occur as a restorative treatment in Riparian Reserves (e.g., to remove non-native tree species from a site) should retain all downed*
wood debris on the ground.

**Riparian Reserves for Protecting Stream Temperature.** Conservation (including restoration) of natural thermal regimes of streams and rivers was but one of many factors considered when ACS default riparian reserve widths were determined in the initial design of the ACS. In recent years the land management agencies and others have commonly assumed shade from riparian vegetation is the predominant proximate control on stream temperature, and research has shown that trees within 30 m or so of the stream margin contribute over 90 percent of the effective shade (e.g., Reeves et al. 2013). Furthermore, it has been suggested that headwater streams that do not carry water in summer should presumably not need shade to conserve summer thermal maxima in downstream waters. These two premises of overprotection have become a primary rationale for proposals by BLM and in congressional bills to reduce default Riparian Reserve widths for some stream types, with the intent of increasing the area of Matrix land or equivalent that is subject to commercial logging. From the perspective of temperature protection, we have four concerns with this rationale for shrinking Riparian Reserves.

First, *redundancy*: most current analyses rest on a static view of riparian stand structure and function—that is, shade is modeled as a function of the existing standing trees only. The tree nearest to the stream margin is attributed as the contributor to shade, even though one or more trees standing behind it, slightly farther from the stream, may contribute shade as well. But we know that riparian forests are highly dynamic; particularly after adjacent stands are disturbed by logging, near-stream trees become increasingly prone to root throw, wind
breakage, and bank or slope erosion. When trees fall or die in the so-called “inner zone,” then the “outer zone” trees become a replacement source of shade. Obviously, if the outer zone trees have been logged, that functional redundancy is lost and any riparian disturbance may lead to incrementally reduced stream surface shade—and an increase in stream temperatures.

Second, density: whereas we measure canopy shade with fixed-resolution instruments, little is known about how measurements of shade translate to actual solar penetration. “Redundant” tree canopies create a shade structure that is dense compared to that of a single tree, and this may substantially affect the actual solar energy reaching the water surface in ways that we do not currently measure.

Third, thermal response is affected in numerous ways by near-surface groundwater, which affects both surface streamflow rate and the temperature of water at the point of delivery. After initial increases in base flow following logging, summer base flow can decline for many years as a consequence of rapidly re-growing second-growth vegetation and its evapotranspiration demand (Hicks et al. 1991). Logging in the outer areas of Riparian Reserves can contribute to or conceivably magnify this effect. In some Pacific Northwest watersheds, stream temperature is more strongly associated with catchment-wide logging than with streamside vegetation conditions (Pollock et al. 2009). Stream warming in such watersheds (often containing gently sloping or hilly terrain and numerous forested wetlands) appears to be influenced by reduced canopy shade over large areas of near-surface groundwater. They may also be influenced by changes in shallow groundwater flux rates
and the level of the water table. Hence, stream temperatures become warmer at their point of origin (in spring, summer and fall) following watershed logging. Other research has established the importance of the hyporheic flow exchange in determining surface water thermal regime (Poole and Berman 2001, Baxter and Hauer 2001). The hyporheic zone may include extensive areas of shallow subsurface flow within montane alluvial valleys, in summer this subsurface pool may be dominated by spring snowmelt or cool rain runoff that cools surface streams when it discharges in midsummer (Poole and Berman 2001, Wondzell 2011). The extent of hyporheic storage and exchange bears uncertain relationship to surface landforms, and to date land management agencies lack both the methods and incentive to accurately map these critically important.

Given this uncertainty, and the increased importance of such groundwater source areas under future climate changes, any management change that increases the extent of logging in such watersheds could contribute to undesired stream warming. Finally, winter and spring stream temperatures can be of comparable importance to summer temperatures in meeting the habitat needs of many species. In particular, winter temperatures of seasonably intermittent streams (even though they may not be fish-bearing in summer) can be important for salmon (Wigington et al. 2006) and other species, and are directly and indirectly influenced by riparian canopy shade and forest conditions. These thermal-hydrologic areas should be included in default ACS Riparian Reserves.

Fourth, *channel migration*: over time, stream channels migrate and even small streams have secondary channels that may flow only during the rainy season. However, existing side
channels and backwaters provide important rearing and refuge habitat for salmonids, and they are typically unmapped or mapped poorly. In addition, if riparian buffers are narrowed, some of these channels may migrate outside the narrowed buffer and be exposed to direct sunlight and substantially warmed.

Considering the multiple ecological factors and processes that affect stream temperature and considering that temperature conservation is but one of many significant functional factors influenced by streamside forests, we conclude the following. *We know of no sufficient scientific support for reducing current ACS Riparian Reserve default for any stream type.* In many watersheds larger areas of forest protection are warranted to prevent warming of shallow groundwater, particularly given the likely trends of future climate change.

**Riparian Reserves and Nutrient Retention.** The role of forested riparian buffers in retaining nutrients mobilized by upslope disturbance, or delivered to watersheds in precipitation and fertilization, is globally recognized. Forested buffers zones are commonly prescribed to reduce nutrient delivery to streams in agricultural landscapes. However, logging or fuels management treatments that disturb green vegetation generate increased nitrogen leaching from forest soils that enters streams and wetlands by both surface and subsurface flow paths (Wenger 1999, Gomi et al. 2002, Kubin et al. 2006). Any ground-disturbing activity or condition (such as a road network) tends to mobilize phosphorus in association with soil erosion. Logging disturbs vegetation and soils over large areas, and initial disturbance of forested lands tends to generate larger net increases in nutrient loading than repeat disturbances of already-altered agricultural or urban lands (Wickham et al.)
2008). Nutrient loading to headwater streams tends to transfer downstream and accumulate in larger rivers, lakes, estuaries, and nearshore marine ecosystems (Freeman et al. 2007). For all of these reasons, forestry operations have been identified as a major contributor to nutrient loading, eutrophication, and associated impairment of water quality in Pacific Northwest lakes (Blair 1994, Dagget et al. 1996, Oregon DEQ 2007), rivers and estuaries (Oregon DEQ 2007).

Cumulative nutrient impairment of downstream receiving waters can occur without violation of nutrient standards in headwater streams, simply as a consequence of sustained increases in loading from stormwater runoff from forest roads and periodic logging. In effect, logging alters the entire regime of nutrient and sediment export. Although nutrient losses to surface waters are endemic consequences of logging and watershed disturbance, the question of what role Riparian Reserves play in nutrient retention has received insufficient consideration in the Pacific Northwest. Research on the nutrient retention efficiency of various forested buffer widths from the Upper Midwest and other regions (Nieber et al. 2011; surprisingly, we know of no published field studies from the Pacific Northwest to inform this question) suggests that average phosphorus and nitrogen retention is around 80% for undisturbed buffer zones of 30 m (100 feet) wide. Extrapolation suggested buffers of 45 m (150 feet) or greater might be necessary to attain 90-99 percent retention of nutrients mobilized by upslope disturbance. These distances are too small for Pacific Northwest forests, where slopes are steeper, and soils tend to be more porous, and macropores or channeled flow from uplands are more common than in the Midwest (Nieber et al. 2011).
By virtue of their high density across mountainous landscapes, headwater streams with seasonal flow receive a large portion of the nutrients mobilized by up-slope disturbance (Gomi et al. 2002, Freeman et al. 2007). Therefore full protection of wide Riparian Reserves along even the smallest stream channels (and surface-connected wetlands) is likely necessary for effective nutrient retention. Channel network expansion from gully erosion (Reid et al. 2010) or roads (Wemple and Jones 2002) and channel simplification through loss of woody debris or sediment increases may also reduce retention efficiency of nutrients, sediment, and organic matter in headwater systems. Moreover, thinning or other disturbance of vegetation or soils within the Riparian Reserve could short-circuit the benefit of riparian forest buffers, by creating a near-stream source of nutrients that is not exposed to the retention capacity of the default-width riparian zone.

More research is certainly needed in the Pacific Northwest on nutrient retention, but existing science causes us to reach three conclusions. 1) Continuous, no-cut Riparian Reserves exceeding 30-50m (100-150 feet) or more along all streams and wetlands are likely needed to mitigate the effects of up-slope logging on nutrient loading to both freshwater ecosystems and downstream marine environments. 2) Cessation of livestock grazing in Riparian Reserves, road network reduction, and reconfiguration of remaining roads to reduce their hydrologic connectivity to surface waters are needed to reduce downstream nutrient loading. 3) Analysis of the effects of management actions on nutrient loading to immediate downstream receiving waters are needed in environmental assessments, environmental impact statements, watershed analyses, and ESA consultations for aquatic species.
**Road Networks and Their Management.** Roads are ecologically problematic in any environment because they affect biota, water quality, and a suite of biophysical processes through many physical, chemical, and biological pathways (Trombulak and Frissell 2000, Jones et al. 2000). The magnitude of existing road impacts on watershed and streams in the Plan may equal or exceeds the effect of all other activities combined. Firman et al. (2012) reported that density of spawning coho salmon across coastal Oregon streams was negatively associated with road density.

Roads are necessary to support logging, mining, grazing, and motorized recreation, but the existing federal forest road system far outstrips the extend of those demands. The number and poor condition of USFS and BLM roads, the agencies’ inability to prevent those roads from deteriorating and harming streams, and the pervasive effects of roads on the physical and biological environment were recognized in FEMAT (1993). In addition, forest roads have been the subject of high-profile national dialogue and policy reviews since the development of the Plan (Gucinski et al. 2001, Pacific Rivers Council 2008). The ACS’s primary means of protecting streams from roads and encouraging effective restoration are twofold: First, ASC objectives discourage locating roads within Riparian Reserves, and second, roadless areas are to be maintained and overall road density reduced in Key Watersheds. For a small number of Key Watersheds where road network reduction has been pursued aggressively, agency monitoring efforts have reported improvements of
certain instream habitat conditions, a response not detected elsewhere (Gallo et al. 2005, Reeves et al. 2006a)

How to substantially reduce road density in critical watersheds, improve road drainage, stream crossings, and other factors that affect streams and aquatic biota, while maintaining sufficient roads for other forest uses, remain central challenges to forest planning and management. The ACS and other operative policies have lacked sufficient means and impetus to accomplish this in the past 20 years. We therefore suggest five policy changes to achieve needed road reductions: 1) Prevent the construction of new permanent and “temporary” roads, except in limited instances were construction of a short segment of new road is coupled with and necessary for the decommissioning of longer and more damaging segments of existing road. 2) Allow no net increase in road density in any watershed. New “temporary” roads should be allowed only on the same alignment of previously existing roads. 3) Strengthen road density restrictions for Key Watersheds and establish unambiguous standards and metrics for net road density reduction. 4) Improve the system of classification and inventory to ensure that agency bookkeeping of road miles corresponds with actual field conditions. This provision is necessary because at present many roads can “disappear” when dropped from the inventory, but they in fact remain on the landscape causing watershed impacts. 5) Require each proposed forestry and other development project to meet a target of incremental reduction of the road system in all watersheds affected by the project. The goal should be road density reduction until road density in the affected watershed is under target established on the basis of biological response (e.g., 1 mile per square mile [0.62 km per square kilometer] for watersheds with Pacific salmon,
steelhead and cutthroat trout, and 0.5 miles per square mile for watersheds supporting bull trout).

**Livestock Grazing.** Whereas forestry predominates in the Northwest Forest Plan area, grazing affects a significant portion of the area as well; for example, the BLM (2008) reported that 22 percent of BLM lands were subject to livestock grazing in the early 2000s. A larger area was affected by historic grazing, where soil impacts may persist. Where grazing occurs in mountainous landscapes, it has large impacts on streams because livestock tend to concentrate in streams, floodplains and alluvial valleys (see Beschta et al. 2013 for a recent synthesis). Besides direct disruption of wetlands and stream beds and, and the suppression of woody vegetation, soil compaction by grazing in both riparian and upland areas degrades runoff quality and quantity and watershed functions such as soil water storage and nutrient retention.

In addition to these long-recognized direct impacts, new research shows that managing for livestock can indirectly alter ecosystem trophic cascades. For example, livestock range-related deaths commonly lead to programs to extirpate large native carnivores. Reduced numbers of carnivores in turn release native ungulates and other herbivores from predation, leading to declines of riparian vegetation and stream conditions even outside of livestock-grazed areas (Beschta and Ripple 2012). Removing livestock grazing from federal lands has high potential to increase the resilience of watersheds and streams to environmental stresses, including climate
change (Beschta et al. 2013, 2014). Measures to reduce the ecological impact of livestock grazing, primarily by fencing streamside areas and moving cattle frequently from site to site, have met with variable success (Rhodes et al. 1994). Implementation of these methods is limited by the high capital cost of building and maintaining extensive fencing, the wages of field personnel to manage herds, and the cost of necessary environmental review and monitoring. Livestock grazing in forests is a commercial use that is not restorative, and most often is marginal economically. We conclude that livestock grazing should be excluded by rule from Riparian Reserves, Key Watersheds, and other lands where conservation is the primary management objective.

**Chemical Use in Forests.** Only very recently has science begun to directly tackle the difficult questions of fate, effects, and toxicity of pesticides and other chemicals associated with forestland uses on stream biota. Toxic contaminants come from various sources, including stormwater runoff from roads (particularly those that discharge directly to surface waters pipes and ditches) (McCarthy et al. 2008, Feist et al. 2011). Herbicides are applied to tree plantations and roadsides to control unwanted vegetation. Until recently these activities were limited by court order on BLM and USFS lands, but now they are increasing in extent and frequency there, as well as continuing on adjacent private forest lands. The NMFS is reviewing the science concerning potential harm to listed species of Pacific salmon from application of commonly-used pesticides. For example, use following label restrictions of the herbicide 2,4-D was determined to jeopardize Pacific salmon (NMFS 2011). Forest fire retardants that are aerially dropped in large quantities during wildfire
suppression operations often reach surface waters, where they are toxic to salmon fishes (Buhl and Hamilton 1998, Gaikowski et al. 1996).

While the science on toxic chemicals is certainly advancing, we have five interim recommendations based on existing knowledge: 1) Application of chemicals for forest management purposes should be minimized in time and space by policy; for example, hand-application should be favored over aerial application when there is no feasible alternative to pesticide use. 2) The full range of environmental tradeoffs between the perceived benefits of chemical use and its possible harms should be carefully weighed in each case before a decision is made to use chemicals in forest management. 3) Implementation of wide, un-thinned forested buffers in Riparian Reserves could help reduce exposure of fish and aquatic life to toxic chemicals in many instances. Thinned or narrow buffers can allow greatly increased aerosol penetration (chemical) from slopes to streams, and narrower buffers may also allow more transport of toxins in surface runoff. 4) Reducing road density and reducing the hydrologic connectivity of roads to surface waters should help control toxins that originate from road use and maintenance, as well as those that are applied upslope but find their way to streams by way of surface runoff. 5) Possible effects of management actions in affecting the delivery of toxic chemicals to streams should be explicitly analyzed in every NEPA document and ESA consultation.

Climate Change: Consequences and Adaptation—An important new scientific endeavor in the past 15 years is the development of global circulation models and the refinement of
regional predictions of climate change under different atmospheric greenhouse gas scenarios. The operative question for forest planning and conservation is this: how will anticipated climate change alter the way we expect ecosystems to respond to forest management actions (Mote et al. 2003)? Luce and Holden (2009) documented that a pattern of declining summer streamflow has already set in at gauged stations across the Pacific Northwest. In general for this region climate models project increased warming (varying magnitude across the seasons); more intense winter precipitation events, including flood and wind disturbance of riparian forests; earlier snowpack melting except for the highest elevation watersheds; and likely increased intensity and duration of droughts (Battin et al. 2007, Dalton et al. 2013). In very general terms, these scenarios suggest larger and higher severity wildfires than seen in recent decades, and generally elevated evapotranspiration that could further reduce low summer streamflows.

Climate changes will likely exacerbate existing (ongoing) trends in watershed degradation by affecting key processes or factors (stream thermal regimes, flows and groundwater and floodplain connectivity, landslide rates, fuels, fire, invasive species, and post disturbance human responses, to name but a few). Most climate change adaptation strategies call for strategic removal of non-climate stressors as these will likely be more tractable or remediable than climate stressors (e.g., Furniss et al. 2010). No organized review of the ACS has apparently been conducted by the USFS or BLM to determine what, if any, science-based changes to the ACS best fit future climate scenarios. It is unlikely however that even a cursory review of the climate literature would support removal of currently protective provisions of the ACS.
The current ACS requirements are integral to assuring streams, wetlands, and other water bodies have the best possible resilience in the face of increasing climate stress. Extensive north-facing slopes can moderate climate influence on watersheds, and localized springs and extensive shallow alluvial aquifers that store water seasonally can moderate summer stream flows and both summer and winter temperatures (Poole and Berman, 2001, Wondzell 2011). Complex natural riparian vegetation communities and natural accumulations of large wood (resulting in concentrations of stored sediment) in and near floodplains are instrumental in creating and maintaining conditions that support hyporheic flow exchange. Wide Riparian Reserves provide not only shade, but essential protection and support for the natural processes that maintain and regenerate the suite of hydrologic and geomorphic elements that help buffer streams against climate forcing.

Natural watersheds likely have greater resilience and less vulnerability to climate change than highly altered watersheds with reduced alluvial groundwater storage and hyporheic buffering, and less intact native biota, particularly in the face of increasingly intense drought and flood extremes that heavily tax engineered systems such as roads. Watershed resilience in the face of climate change can best be maintained by protecting and restoring the suite of natural processes and conditions that characterize natural forested riparian areas and floodplains (Seavy et al. 2009, Furniss et al., 2010). This is exactly what the ACS was designed to accomplish. Whittling away riparian protections on the basis of single-factor considerations such as stream shade undermines the comprehensive protection of stream and riparian processes that the ACS was designed to maintain and restore. Finally, under
changing climate, some management practices that have appeared to produce desirable outcomes in the past may not do so in the future. For example, the effectiveness of stand thinning at altering fire behavior will become even more uncertain as climate change and weather extremes become more of a top-down driver of fire behavior.

Our overall recommendation is that ACS protections for Riparian Reserves should be sustained and strengthened to better protect and restore natural ecosystem processes that confer resilience to climate change, as detailed in our other recommendations. We also advocate an interagency scientific conservation design effort to expand and reconfigure some present Key Watersheds to ensure they better encompass specific areas that are likely to be topographically or hydrogeomorphically buffered from future climate change impacts. Finally, we recommend that the direct and indirect effects of management actions on the integrity and capacity of stream and watershed ecosystems for resilience to climate change be analyzed in every environmental assessment, environmental impact statement, watershed analysis, and ESA consultation.

**Monitoring and Adaptive Management.** Environmental monitoring data often prove to be useful, but we cannot always anticipate how those data will be useful. Monitoring can be especially valuable when coupled with available data from historical records and time series sampling (such as streamflow gauging and temperature recorder data strings) (Wissmar and Beschta 1988, Wissmar 1993). Substantial progress has been made in the past 20 years on sampling design and methods of data collection for monitoring streams, watersheds and
regions of watersheds (Steel et al. 2010). Today there are methods to integrally evaluate considerations of ecological scale, geographical nestedness, spatial and temporal continuity, and biological connectivity in data design and analysis.

The Northwest Forest Plan designated large Adaptive Management Areas where alternative means of management and conservation might be implemented and closely monitored. For many reasons this option failed. Public involvement was required, but in most cases the public could not agree on the need for trial and testing of management hypotheses (Gray 2000). Managers and scientists could seldom agree on hypotheses to test or what practices should be implemented. Without coherent and socially supported large-scale experimental proposals, funding never materialized. These failures are by no means endemic to the Plan—they characterize many, if not most aspirational attempts at large-scale adaptive management (Walters 1997).

We note, however, that ongoing management across multiple ownerships and with a multitude of natural background conditions creates a broad array of natural experiments that already exist on the landscape. Scientists can probably continue to learn much of what we need to know by creative monitoring of extant natural experiments, however imperfect they may be, rather than waiting for planned, large-scale experiments that are difficult or impossible to execute (and almost always far from the ideal themselves in terms of design).

The existing monitoring program for aquatic resources in the Northwest Forest Plan area (Aquatic and Riparian Effectiveness Monitoring Program, AREMP,
http://www.reo.gov/monitoring/reports/watershed/aremp/aremp.htm) in our view is constrained by design and sampling protocols. Both limit AREMP’s capacity for drawing important inferences about changes in habitat condition or processes over time at a location. Whereas AREMP can detect trends in some riparian or stream conditions over large areas, interpreting causal relations for responses requires information about changes at specific locations over time. AREMP is based on hydrologic units vs. true watersheds, which hinders making reliable inferences to true watershed condition as well as linking true watershed condition to stream responses (Omernik 2003). Also AREMP monitoring incorporates a statistically insufficient number of sites to yield useful confidence intervals needed for reliable stream assessments (Anlauf et al. 2011). Effectiveness monitoring is ineffective when the design or data preclude process or cause-effect inferences, or when assumed relationships between habitat indices and biological populations and assemblages remain untested.

We recommend three policy shifts in how monitoring is employed under the ACS. First, *monitoring of stream and watershed responses should be a required element of every forestry, resource development or active management project*. For every project that could potentially affect watershed and stream conditions, there should be a data set that sheds some light on key ecosystem responses to project implementation. Second, there needs to be a review and rededicated capital investment in a program of regional and watershed effectiveness monitoring. *We call for an interagency scientific panel to review existing effectiveness monitoring efforts, review other pertinent data sets that could be useful in drawing inferences, and, if deemed desirable, to recommend a new monitoring program.*
The monitoring program should be capable of assessing the effects of management actions and climate change on aquatic ecosystems and resources associated with BLM and USFS lands. Third, an improved monitoring program should include *increased emphasis on tracking ecological conditions*, including explicit biological condition measures, and *trends in Key Watersheds*. Key Watersheds are especially critical for the medium- and long-term conservation success of the ACS, and may be disproportionately important to the survival and recovery of ESA-listed and other sensitive species.

**Conclusions**

In this paper it was only possible to touch on high points of new and emerging science for the ACS, and doubtless we missed potentially important publications. However we remain fairly certain that deeper consideration of the topics we raised--and a broadened consideration of others--will strengthen our conclusion that the founding rationale, basic architecture, and core conservation elements of the ACS remain sound.

In our view, new science raises many concerns about the adequacy of present-day implementation of the ACS by the federal agencies. These concerns including logging and fuels treatments in riparian areas, the degree of riparian protection for headwater streams, road system downsizing and remediation, the adequacy of conservation priorities and delineations of Key Watersheds, and the usefulness of current monitoring programs. Anticipated climate change, while it does not fundamentally alter good conservation management, does raise the level of concern about specific
management issues, including overarching concepts such as the burden of proof for
management actions that balance known harms against presumed restorative benefits.
Most watersheds in the region are of mixed federal and other ownership to some
degree. Because progress in protection and restoration on private lands has been
limited (Stout et al. 2012), federal lands will likely continue to be the focus of
watershed protection and aquatic habitat conservation for the foreseeable future.
Finally, an increased emphasis on effectiveness monitoring from project to true
watershed scales—with overhauled designs and methods— is essential to determine
whether conservation of aquatic ecosystems and resources is occurring. In particular,
assessing the degree that Riparian Reserves buffer the effects of logging and roads on
Matrix Lands is essential. Research in disturbed ecosystem types has indicated that
watershed condition can affect fish assemblages more than riparian condition (Roth et
al. 1996; Wang et al. 2003; 2006; Saly et al. 2011; Marzin et al. 2012).

Attempts to reduce protections to watershed, riparian, and freshwater ecosystems by weakening
major components of the ACS and Plan are not justified by new and emerging science. Improved
protections--and better monitoring of outcomes--are warranted across all land ownerships,
including federal forest lands, if freshwater ecosystems and their biota, including salmon and
other sensitive species are to be effectively conserved in an era of increased ecological stress and
changing climate.
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[http://www.blm.gov/or/plans/wopr/final_eis/](http://www.blm.gov/or/plans/wopr/final_eis/)


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[online] URL:
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http://www.livingreviews.org/lrlr-2010-1.


TABLE 1. The nine narrative ACS Objectives describing watershed functions and processes, and which apply landscape-wide (ROD 1994 p. ?).

<table>
<thead>
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<th>ACS Objectives</th>
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<td>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.</td>
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<tr>
<td>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.</td>
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<td>3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.</td>
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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.
that off-road vehicle use in such locations will not adversely affect their natural, esthetic, scenic, or other values for which such areas are established.

This area is surrounded by residential communities. In 2007, 1655 residents signed a petition objecting to this area being designated as an OHV Emphasis area, because of noise pollution, highly erosive soils, endangered species, pollution to tributaries of the Rogue and Applegate Rivers, and because this area is designated as an Extreme Fire Hazard area. Having an OHV Emphasis Area in our back yards will obviously lower, not increase property values, which will have an adverse affect on property tax revenues, causing hardship to all of the residents of area.

The Johns Peak Timber Mountain area has been used for hunting, hiking, horseback riding, prior to OHVs being invented. Executive Order 11644 and 43 CFR 8342s require the BLM to ensure public ORV “Compatibility with existing conditions in populated areas, taking into account noise and other factors. The actual WOPR wording read: “Since off-highway vehicle emphasis areas are specially managed to accommodate motorized recreational activities, visitors seeking non-motorized forms of recreation would be dissuaded from using these area.” The BLM has not honored the Executive Order or CFR when there have been numerous documentations of private landowners being subject to blatant trespassing, streams being polluted, wildlife disruption, fragile soil damaged, and any visitor seeking non-motorized forms of recreation being dissuaded from using this area. There is even documentation on the BLM Website from 2007. The purpose of the emergency closure is to protect soils, water, and fisheries resources that are being adversely impacted by OHV use. The closure is also needed to protect public safety on Forest Creek County road.

I will never understand how one sentence, was used to designate 16,375 acres as an OHV Emphasis Area in the 1995 Medford District RMP completely bypassing the Public Process, without private land owners approval, a definition of where or what it was, no maps, or any notice to impacted communities. The fact that the BLM Employee who helped write this sentence is in charge of the ATV Fund at Oregon State Parks and Recreation shows the lack of impartiality in this designation.

Finding a more suitable location for an OHV Emphasis Area in Southern Oregon is my recommendation, as there are numerous reasons why it does not, and will not work at Johns Peak and Timber Mountain.

Sincerely,

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