PART 4: SCOPING OUTCOME SUMMARY

4.1 SUMMARY OF THE SCOPING PROCESS

The Notice of Intent (see Appendix 4-A) to prepare the Eddy Gulch Late-Successional Reserve (LSR) Project Environmental Impact Statement was published in the *Federal Register* on April 1, 2008—publication of the notice initiated the scoping process for the project. The scoping period ended on May 5, 2008.

4.1.1 SCOPING NOTIFICATIONS

Newsletter. The second issue of the project newsletter served as the scoping letter (see Appendix 1-C). The newsletters were mailed on April 1 and 2, 2008, to everyone on the project mailing list—there are 1,190 names on the list. Only one newsletter was returned due to no forwarding address.

Legal Notice. The legal notice (see Appendix 4-A) was published in the Siskiyou Daily News on March 31, 2008.

Newspaper Article. The Siskiyou Daily News published an article about the Eddy Gulch LSR Project on April 14, 2008.

4.1.2 COMMENT DOCUMENTS RECEIVED

The newsletter provided two methods for people to submit comments: email or regular mail. Seven documents were received during the scoping period—three by regular mail and four by email. Of the seven documents, one asked about the date for close of the comment period and another asked if there was a map of "burn units produced in topo format." These two documents were inquiries and not considered comment documents, although the senders did receive an email response to acknowledge receipt of their correspondence. The other five comment documents expressed issues or suggestions.

The Interdisciplinary Team (ID Team) reviewed the five comment documents and identified numerous comments in each document. The Team organized the comments by topic, and a response was prepared for each comment (see "Disposition of Comments" in Appendix 4-B). Copies of the comment documents, with individual comments bracketed and numbered, are contained in Appendix 4-C.

4.1.3 SIGNIFICANT ISSUES

- The only issue that the ID Team considered significant was that of temporary roads. One commenter felt temporary roads should be kept in the proposal; other comments stated no temporary roads.

4.1.4 HOW COMMENTS WILL BE USED

The ID Team will use the comments to develop a second action alternative to address the significant issue of temporary road construction, refine the Proposed Action, and ensure the environmental impact statement is balanced and thorough.

4.1.5 AVAILABILITY OF THIS SCOPING OUTCOME SUMMARY

This document will be uploaded to the project's public webpage (http://www.eddylsrproject.com).

PART 4 APPENDICES

4-A: Copies of the Notice of Intent, Legal Notice, and Newspaper Article

4-B: Disposition of Comments

4-C: Copies of Bracketed Comment Documents

APPENDIX 4-A
COPIES OF THE NOTICE OF INTENT, LEGAL NOTICE, AND NEWSPAPER ARTICLE

Appendix 4-A

[3410-11]

DEPARTMENT OF AGRICULTURE

Forest Service

Klamath National Forest, **California**, **Eddy Gulch Late-Successional Reserve Fire / Habitat Protection Project**

AGENCY: Forest Service, USDA.

ACTION: Notice of Intent to prepare an Environmental Impact Statement.

SUMMARY: The Klamath National Forest will prepare an environmental impact statement (EIS) to document and publicly disclose the environmental effects of implementing mechanical, manual, and prescribed burn treatments in the Eddy Gulch Late-Successional Reserve (LSR).

DATES: Comments concerning the scope of the analysis must be received within 30 days of the publication of this notice in the Federal Register. The draft EIS is expected in late fall of 2008, and the final EIS and Forest Service Record of Decision are expected in spring of 2009.

ADDRESSES: Send written comments to RED, Inc. Communications, the contractor hired by the Forest Service to conduct project planning and prepare the EIS. The mailing address is RED, Inc. Communications, P.O. Box 3067, Idaho Falls, ID, 83403, ATTN: Eddy Gulch LSR Project. The address for emailing comments is eddylsr@redinc.com. The project website is http://www.eddylsrproject.com.

FOR FURTHER INFORMATION: Visit the project website at http://www.eddylsrproject.com or contact Ray Haupt, Scott and Salmon River District Ranger, Klamath National Forest, 11263 N. Highway 3, Fort Jones, California 96032 or call 530.468.5351

SUPPLEMENTARY INFORMATION:

Background

On July 1, 2007, the Eddy Gulch LSR Project was included under the category of "developing proposal" in the Klamath National Forest's Schedule of Proposed Actions, which was posted on the Klamath National Forest's website. The Healthy Forest Restoration Act, Northwest Forest Plan (as incorporated in the Klamath National Forest Land and Resource Management Plan of 1995), and National Fire Plan direct agencies to conduct projects for habitat restoration and protection from catastrophic wildfire. Section 7(a)(1) of the Endangered Species Act directs federal agencies to carry out programs for the conservation of threatened and endangered species.

The Eddy Gulch LSR is on the Scott-Salmon River Ranger District, Klamath National Forest, Siskiyou County, California. The LSR is located mostly west of Etna Summit, south of North Russian Creek and the town of Sawyers Bar, east of Forks of Salmon, and north of Cecilville. The LSR encompasses much of the area between the North and South Forks of the Salmon River, as well as headwaters of Etna Creek. Elevations range from 1,100 feet to about 8,000 feet. The LSR is about 61,900 acres in size, making it one of the largest LSRs on the Klamath National Forest. The Assessment Area (37,239 acres) for the EIS is the Eddy Gulch LSR minus the portions in designated roadless areas and that portion of the LSR east of Etna Summit.

The goal of the Eddy Gulch Late-Successional Reserve Fire / Habitat Protection Project (Eddy Gulch LSR Project) EIS is to present an ecosystem-based approach for ensuring the safety of persons and communities and maintaining, protecting, and improving conditions of late-successional forest ecosystems, which serve as habitat for late-successional-associated species. This would be accomplished through fuels reduction and habitat development treatments using mechanical, manual, and prescribed file treatment methods.

The initial mailing list for the project contained entities and individuals who were interested in past Klamath National Forest projects. Names and addresses were added to the mailing list based on zip codes in the vicinity of the Eddy Gulch LSR and attendance records from citizen collaboration meetings. The current mailing contains approximately 1,200 names and addresses of potentially affected Native American tribes, individuals, agencies with special expertise, organizations, and businesses. The first project newsletter was mailed in October 2007 to members of the mailing list, and a webpage was developed to provide additional information on the project: http://www.eddylsrproject.com.

On December 3, 2003, President Bush signed into law the Healthy Forests Restoration Act to reduce the threat of destructive wildfires while upholding environmental standards and encouraging early public input during review and planning processes. The legislation is based on sound science and helps further the President's Healthy Forests Initiative pledge to care for America's forests and rangelands, reduce the risk of catastrophic fire to communities, help save the lives of firefighters and citizens, and protect threatened and endangered species. The Healthy Forests Restoration Act contains a variety of provisions to speed up hazardous fuels reduction and forest restoration projects on specific types of federal lands that are at risk of wildland fire and/or insect and disease epidemics. The Healthy Forests Restoration Act established important objectives to fulfill that pledge; a few of those objectives are to

1. Strengthen public participation in developing high-priority forest health projects by providing opportunities for earlier participation, thus accomplishing projects in a more timely fashion.
2. Reduce dense undergrowth that fuels catastrophic [stand-replacing] fires through thinning and prescribed burns.
3. Select projects on a collaborative basis, involving local, tribal, state, and federal agencies and nongovernmental entities.
4. Focus projects on federal lands that meet strict criteria for risk of wildfire.

The potential for large, high-intensity fire is a primary concern in the Eddy Gulch LSR. Current management issues [needs] include the reduction of high fire hazard conditions, protection and/or development of late-successional habitat, and the protection of areas that may have watershed-related features at risk. Also of concern is the protection of private property and emergency access routes that pass through the LSR. The Proposed Action addresses these management needs.

The proposed treatment locations and treatments were developed in response to protection targets identified in the Salmon River Community Wildfire Protection Plan, Black Bear Ranch Cooperative Fire Safe Plan, Rainbow Cooperative Fire Safe Plan, the Stewardship Fireshed Analysis that was conducted for the Eddy Gulch LSR Project, citizen collaboration workshops for the Fireshed Analysis and Eddy Gulch LSR Project, and direction provided by the U.S. Fish and Wildlife Service in Yreka, California. Numerous Forest Service documents guided development of the Proposed Action: the Klamath National Forest Forest-wide Late-Successional Reserve Assessment, Klamath National Forest Land and Resource Management Plan, Upper South Fork Ecosystem Analysis, North Fork Ecosystem Analysis, and Callahan (Main Salmon) Ecosystem Analysis.

Purpose of and Need for Action

Three primary objectives (purposes) for the Eddy Gulch LSR Project were developed based on differences between existing and desired resource and social conditions (need for the project) in the Eddy Gulch LSR, pertinent laws, and Forest Service direction.

1. *Community Protection*—to reduce wildfire threat to communities and municipal water supplies and increase public and firefighter safety. There is a need, consistent with objectives set forth in the Healthy Forests Restoration Act, to protect wildland-urban interface (WUI) structures, and related improvements and community access routes, from the threat of high-intensity wildfire outside, or emanating from, the Eddy Gulch LSR. Current and developing conditions in the LSR and along sections of all access roads will likely lead to moderate- and high-intensity fires caused by weather-related events (such as lightening) that will threaten structures, improvements, water sources, and travel routes.

2. *Habitat Protection*—to protect existing and future late-successional habitat from threats (of habitat loss) that occur inside and outside the Eddy Gulch LSR. There is a need to reduce fuel loading and develop a control strategy to reduce the size and severity of future wildfires in the Eddy Gulch LSR in order to continue to meet LSR

and Key Watershed objectives for late-successional habitat and the delivery of high-quality cold water. The Eddy Gulch LSR is also within the Salmon River Key Watershed identified under the Northwest Forest Plan as critical for at-risk fish species—the watersheds provide high-quality water and fish habitat. Current risks to forest health throughout the Key Watersheds include vegetative stocking density, insects, and diseases. The exclusion of fire, combined with climatic conditions, has created overstocked stands. Due to fire exclusion and other policies that required the control of all fires, there have been changes in stand structures, including higher densities of ground and ladders fuels such as brush, small trees, and shade-tolerant tree species. Past fire suppression policies of controlling all fires have interrupted the historic role of fire as a thinning agent and for maintaining the volume of ground fuels. This has increased accumulation of dead and down woody material and organic debris (duff and litter) and has led to larger and more intense wildfires in the Klamath Mountains. These intense wildfires can permanently damage soil, degrade watersheds, and remove a high proportion of all vegetation over large areas, thereby slowing natural recovery and increasing impacts. Fire modeling, using current conditions, indicates that under 90th percentile weather (a hot dry August day), 50 percent of the LSR would experience active or passive crown fire. These models indicate the LSR would benefit from treatments to reduce the potential for lethal fire behavior to a level that would be more consistent with LSR, Key Watershed, and community protection objectives.

3. *Habitat Development*—to promote the continued development of late-successional characteristics. There is a need to accelerate the development of late-successional

forest characteristics in some existing mid-successional forest stands. Approximately 45,220 acres of the 61,900-acre Eddy Gulch LSR (73 percent) are capable of producing late-successional habitat. Currently, 18,780 acres (or about 42 percent of the 45,220 acres) are currently vegetated by late-successional habitat. The combined acres vegetated by late- and mid-successional forest total 35,710 acres (or about 79 percent of the 45,220 acres). Based on interpretation of stand conditions, past management, expected fire losses, early photos, and an understanding of the disturbance regimes, it has been estimated that the amount of late-successional forest reasonably sustainable in the Eddy Gulch LSR is 45–65 percent of the capable area at any one time. The LSR would be considered functioning if it falls within this identified range. The Klamath National Forest Land and Resource Management Plan specifies that LSRs are to be managed to maximize the amount of late-successional forest to a level reasonably sustainable because surrounding areas of Matrix and private lands are expected to contain relatively little late-successional forest habitat.

The above three objectives helped guide the development of the proposed treatments and activities designed to maintain or establish a trend towards desired resource and social conditions.

Proposed Action

The Proposed Action has been designed to meet the purpose (objectives) of the Eddy LSR Project and satisfy the need for action by using mechanical, manual, and prescribed burn treatments.

The proposed treatment acres across the Eddy Gulch LSR Assessment Area are summarized below. The various treatment areas overlap, so the total area proposed for treatment is less than the sum of the acreages shown below:

1,999 acres in 69 mechanical treatment areas in the 20 proposed Fuel Reduction Zones (FRZs)

8,583 acres of underburning in the 20 FRZs

17,808 acres of underburning in the 11 prescribed burn areas (areas other than in FRZs)

2,251 acres in 6 mechanical treatment areas in the 11 prescribed burn areas

102 acres in 6 mechanical treatment areas not in an FRZ or prescribed burn area

70 miles of mechanical treatments along roads

4.5 miles of temporary road construction to access 885 acres in 14 of the mechanical treatment areas

Twenty Fuel Reduction Zones. An FRZ is a strategically located and designed strip of land on which a portion of the surface fuels (both living and dead), ladder fuels, and canopy fuels are treated (removed, burned, or masticated) in order to limit the potential size of and loss of resources (including homes) from large, high-intensity wildfire. FRZs are wide enough to capture most short-range spot fires within the treated areas and are designed to bring crown fires into surface (ground) fire conditions, as well as to provide safe locations for fire-suppression personnel to take fire-suppression actions during 90th percentile weather conditions.

Eighty-one Mechanical Treatment Areas. *Thinning to reduce density*—mechanical treatments would be used to remove or rearrange fuels to reduce crown, ladder, and ground fuels and to shorten the time to reach the desired future conditions compared to the use of prescribed fire alone. Stands would be thinned to reduce stand densities, thereby reducing canopy cover (and the potential for passive and active crown fires. The resulting fuels from thinning would be removed or piled and burned. Thinning activities would also provide an opportunity for biomass utilization of the material. *Thinning to reduce ladder fuels*—thinning smaller diameter trees would increase the distance between the lower limbs of residual trees and brush or ground fuels. Ladder fuels consist of denser conifer vegetation and brush near the forest floor that can extend into residual trees. Ladder fuels increase the likelihood of a ground fire creating enough heat to ignite the ladder fuels (torching), with the subsequent fire reaching the crowns of the largest trees. Crown fires are more intense, harder for firefighters to suppress, and result in more devastating effects. In an effort to reduce the potential for crown fires, ladder fuels would be mechanically treated. After mechanical treatments, the fuels would be removed and treated with prescribed fire or masticated. *Thinning to develop habitat*—Overstocked mid-successional stands experience inter-tree competition that slows the stand's development into late-successional habitat. Thinning these stands from below would maintain or increase growth on the residual trees, thus accelerating the stand's development into late-successional habitat. In an LSR, stands would be considered for treatment only where thinning would increase, by 30 years, the stand's development into late-successional habitat, when compared to the stand's projected natural (unthinned) development.

Eleven Prescribed Burn Treatment Areas. Prescribed fire would be used to reduce hazardous fuels and interrupt the horizontal, and sometimes vertical, continuity of flammable materials on the forest floor. *Pile burning*—naturally occurring fuels and thinning residues (branches and limbs) would be piled and burned. *Underburning*—a prescribed burn under an existing canopy of trees (hardwoods or conifers) would be designed to reduce excess live and dead vegetation and scorch to kill vegetation to reduce ladder fuel conditions. Firelines would be constructed by mechanical or manual treatment methods.

The mechanical, manual, and prescribed burn treatments are proposed for the following locations:

1. Along ridges—these are the FRZs, which contain plantations, Riparian Reserves, roads, and habitat development areas.
2. Along roads—emergency access routes, open National Forest System roads, and county roads (roads occur inside and outside FRZs). Treatments would occur 200 feet above and 200 feet below roads; some areas along roads could be less than 200 feet due to variability in fuel types (such as brush, grass, or barren areas).
3. CWPP and other fire plan/community protection areas, FWS priority areas, and northern spotted owl activity centers.
4. Areas outside FRZs—includes the underburn areas, which contain plantations; Riparian Reserves; mechanical treatment areas and roads; and owl habitat development areas.

RESPONSIBLE OFFICIAL:

Patricia Grantham, Acting Forest Supervisor, USDA Forest Service, 1312 Fairlane Road, Yreka, California 96097, will prepare and sign the Record of Decision at the conclusion of the NEPA review.

Nature of Decision to Be Made

The Forest Service is the lead agency for the Project. Based on the results of the NEPA analysis, the Forest Supervisor's Record of Decision regarding the Eddy Gulch LSR Project will recommend implementation of one of the following: (1) The proposed action and mitigation necessary to minimize or avoid adverse impacts; (2) an alternative to the proposed action and mitigation necessary to minimize or avoid adverse impacts, or (3) the no-action alternative. The Record of Decision will also document the consistency of the proposed action with the Klamath National Forest Land and Resource Management Plan (Forest Plan) (1995, as amended).

Collaboration Process

The Forest Service and contractor facilitated 14 collaboration meetings during the planning phase (September 2007-March 2008) for the Proposed Action. The meetings were held in the communities of Sawyers Bar, Forks of Salmon, Orleans, Fort Jones, and Yreka, California. Numerous collaboration meetings were also held with the U.S. Fish and Wildlife Service in Yreka, California. Comments and suggestions provided at the collaboration meetings were used, in part, to design the Proposed Action. Scoping comments will be used to refine the Proposed Action, as will additional data collected during extensive field reconnaissance during the spring and early summer of 2008.

Scoping Process–Comments Requested

Publication of this Notice of Intent initiates the scoping process for the Eddy Gulch LSR Project. The public is encouraged to take part in the process by reading the scoping information that was distributed by mail, with additional information and maps available on the project website (http://www.eddylsrproject.com). Comments are welcome throughout the environmental analysis process, but to be most useful for refining the Proposed Action, comments should be post-marked by April 28, 2008.

Early Notice of Importance of Public Participation in Subsequent Environmental Review

Following the 30-day scoping period announced in this notice, the Forest Service and Contractor will begin preparation of the draft EIS. The comment period on the draft EIS will be 45 days from the date the Environmental Protection Agency publishes the notice of availability in the Federal Register. The Forest Service believes, at this early stage, it is important to give reviewers notice of several court rulings related to public participation in the environmental review process. First, reviewers of draft EISs must structure their participation in the environmental review of the proposal so that it is meaningful and alerts an agency to the reviewer's position and contentions. Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 533 (1978). Also, environmental objections that could be raised at the draft environmental impact statement stage but that are not raised until after completion of the final EIS may be waived or dismissed by the courts. City of Angoon v. Hodel, 803 F.2d 1016, 1022 (9th Cir. 1986) and Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 (E.D. Wis 1980). Because of these court rulings, it is very important that those interested in this proposed action participate by the close of the 45- day comment period so that substantive comments and objections are made available to the Forest Service at a time when it can meaningfully consider them and respond to them in the final EIS.

To assist the Forest Service in identifying and considering issues and concerns on the proposed action, comments on the draft EIS should be as specific as possible. It is also helpful if comments refer to specific line and page numbers of the draft statement.

Comments may also address the adequacy of the draft EIS or the merits of the alternatives formulated and discussed in the statement. Reviewers may wish to refer to the Council on Environmental Quality Regulations for implementing the procedural provisions of the National Environmental Policy Act at 40 CFR 1503.3 in addressing these points. Comments received, including the names and addresses of those who comment, will be considered part of the public record on this proposal and will be available for public inspection.

(**Authority:** 40 CFR 1501.7 and 1508.22; Forest Service Handbook 1909.15, Section 21)

/s/ Patricia A. Grantham	*March 25, 2008*
PATRICIA A. GRANTHAM	(Date)

Deputy Forest Supervisor, Klamath National Forest

Legal Notice

Klamath National Forest to prepare Eddy Gulch Late-Successional Reserve Fire/Habitat Protection Project Environmental Impact Statement

The Klamath National Forest announces its intent to prepare an environmental impact statement (EIS) to document and publicly disclose the environmental effects of implementing mechanical, manual, and prescribed burn treatments in the Eddy Gulch Late-Successional Reserve (LSR). This notice initiates the scoping process, which guides the development of the EIS.

The Eddy Gulch LSR is on the Scott-Salmon River Ranger District, Klamath National Forest, Siskiyou County, California. The LSR is located mostly west of Etna Summit, south of Sawyers Bar and north of Cecilville. The LSR encompasses much of the area between the North and South Forks of the Salmon River, as well as the waters of Etna Creek. Elevations range from 1,100 feet to about 8,000 feet. The LSR is about 61,900 acres in size. The Assessment Area for proposed treatments contains approximately 37,239 acres.

The goal of the Eddy Gulch Late-Successional Reserve Fire/Habitat Protection Project EIS is to present an ecosystem-based approach for ensuring the safety of persons and communities and maintaining, protecting, and improving conditions of late-successional forest ecosystems, which serve as habitat for late-successional-associated species. This would be accomplished through fuels reduction and habitat development treatments using mechanical, manual, and prescribed fire treatment methods. The proposed action includes:

- 1,999 acres in 69 mechanical treatment areas in the 20 proposed Fuel Reduction Zones (FRZs)
- 8,583 acres of underburning in the 20 FRZs
- 17,808 acres of underburning in the 11 prescribed burn areas (areas other than in FRZs)
- 2,251 acres in 6 mechanical treatment areas in the 11 prescribed burn areas
- 102 acres in 6 mechanical treatment areas not in an FRZ or prescribed burn area
- 70 miles of mechanical treatments along roads
- 4.5 miles of temporary road construction to access 885 acres in 14 of the mechanical treatment areas

DATES: Comments concerning the proposed action or scope of the environmental analysis must be received within 30 days of publication of the Notice of Intent in the Federal Register, expected to be April 4, 2008. The draft EIS is expected to be released in late fall of 2008, and the final EIS and Forest Service Record of Decision are expected in spring of 2009.

ADDRESSES: Send written comments to RED, Inc. Communications, the contractor hired by the Forest Service to conduct project planning and prepare the EIS. The mailing address is RED, Inc. Communications, P.O. Box 3067, Idaho Falls, ID, 83403, ATTN: Eddy Gulch LSR Project. The address for emailing comments is eddylsr@redinc.com.

FOR FURTHER INFORMATION, visit the project website at http://www.eddylsrproject or contact Ray Haupt, Scott-Salmon River District Ranger, Klamath National Forest, 11263 N. Highway 3, Fort Jones, CA 96032 or call 530.468.5351.

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SISKIYOU DAILY NEWS
Siskiyou County's News Source Since 1859
www.siskiyoudaily.com 47 cents
Yreka, California
Monday, April 14, 2008 Vol. 148 No. 73

Klamath National Forest: Project would preserve Eddy Gulch

YREKA – Natural resource specialists on the Klamath National Forest will begin an environmental analysis that will ensure the public safety in nearby communities, while protecting and improving conditions of a late-successional forest, a recent KNF press release stated.

The project area is located between the north and south forks of the Salmon River, west of Etna Summit, south of Sawyers Bar and north of Cecilville.

According to the release, on April 1, a Notice of Intent to prepare an Environmental Impact Statement (EIS) to document and publicly disclose the environmental effects of implementing mechanical, manual and prescribed burn treatments in the Eddy Gulch Late-Successional reserve (LSR) was published in the Federal Register. Local fire safe councils, Siskiyou County and the U.S. Fish and Wildlife Service provided input. Comments about the proposed action or scope of the environmental analysis must be received within 30 days of the publication of the notice in the Federal Register.

The project includes 1,999 acres in mechanical treatments in Fuel Reduction Zones (FRZs), 8,583 acres of underburning in FRZs, 17,808 acres of underburning in prescribed burn areas, 2,251 acres in mechanical treatment areas in the prescribed burn areas, 102 acres in mechanical treatment areas not in an FRZ or prescribed burn area, 70 miles of roadside mechanical treatments

See EDDY, page 3

Eddy

Continued from page 1

and 4.5 miles of temporary road construction.

"The goal of the Eddy Gulch Late-Successional Reserve Fire/Habitat Protection Project EIS is to present an ecosystem-based approach for ensuring the safety of persons and communities while maintaining, protecting and improving conditions of late-successional forest ecosystems that provide habitat for late-successional-associated species," Ray Haupt, acting deputy forest supervisor, said in the release. "The proposed actions protect what's already there and promotes habitat in the long term. Additionally, these proposed treatments will help to protect private property and access routes for private and emergency vehicles."

The public is invited to comment on this proposed action. Comments that are received before April 30 will be most helpful. Comments should be addressed to RED, Inc. Communications, P.O. Box 3067, Idaho Falls, ID, 83403, ATTN: Eddy Gulch LSR Project. The address for e-mailing comments is eddylsr@redinc.com.

For further information, visit http://www.eddylsrproject or contact Ray Haupt, Scott-Salmon River district ranger at 468-5351.

APPENDIX 4-B
DISPOSITION OF COMMENTS

Appendix 4-B
Disposition of Comments

Comment Document Number	Commenter Name
1.	Rick Svilich – American Forest Resource Council
2.	Christopher Len (Klamath Siskiyou Wildlands Center), Regina Chichizola (Klamath Rivers Keepers), Kimberly Baker (Klamath Forest Alliance), Scott Greacen (Environmental Protection Information Center)
3.	Kimberly Baker – Klamath Forest Alliance
4.	Kaete King – California Regional Water Quality Control Board
5.	Laura Fujii – U.S. Environmental Protection Agency (no comment provided)

The issues have been categorized as follows:

- **Procedural**: Related to NEPA process.
- **Other Concerns**: Concerns that did not express a clear disagreement, debate, or dispute with the Proposed Action based on some anticipated environmental effect.
- **Question**. General question.
- **Nonsignificant**. Comments that express a dispute/debate about environmental effects of the Proposed Action but that are outside (1) the scope of the project; (2) already addressed by law, regulation, or higher plan; (3) are irrelevant to the decisions; or (4) not supported by scientific evidence.
- **Significant Issues**. Does not fit any of the above.

<u>Please Note</u>: The first digit in the comment number in the table refers to the comment document number; the second digit refers to the comment number within that comment document. A comment document is either an email or letter sent via regular mail. See Appendix 4-C for copies of the comment documents.

Comment Number	Issue/Resource Category	Comment	Comment Disposition (ID Team Response)
Analysis			
1.9	Analysis: Air Quality	. . . highlight the potential carbon release into the atmosphere through the proposed underburning.	**Procedural.** The environmental impact statement (EIS) will discuss this topic in the section titled, "Fire, Fuels, and Air Quality."
4.4	Analysis: Cumulative Watershed Effects	Issues that should be addressed in the environmental document are . . . cumulative watershed effects . . . identification of areas of geologic concern	**Procedural.** The EIS will address these issues.
3.16	Analysis: Disclose Thinning Volume	Please include all trees possibly extracted in the estimated volume, this includes landings, corridors ect. [etc.]	**Procedural.** The estimated volume will be determined from forest inventory data collected during the 2008 field season and during project implementation
3.3	Analysis: Effects on northern spotted owl	We suggest that the DEIS be explicit in detailing the survey results, protocol, LOP's and deep discussion of effects of all activities NSO.	**Procedural.** These topics will be included in the EIS and wildlife biological assessment (BA).
3.13	Analysis: Landings	Please be specific in the DEIS as to location, size and proposed needed construction [of landings].	**Procedural**. The location and size of landings will be estimated during the 2008 field season. Actual locations will be determined under the timber sale contract.
4.7	Analysis: Maps	[provide] detailed maps of project activities	**Procedural**. The final Proposed Action and EIS will contain detailed maps, as will resource reports.
3.12	Analysis: Methods/Effects	The DEIS and Wildlife/Plant/Fisheries BA/BE should give an explicit analysis of surveys (data collection), population, habitat and effects of proposed activities on these species.	**Procedural.** These topics will be included in the EIS and wildlife/plant/fisheries BA/biological evaluation (BE) to the extent necessary to evaluate impacts
3.10	Analysis: Riparian Reserves	Riparian Reserves are significant especially in these watersheds, serving as refugia and as wildlife corridors. All means should be taken to protect these areas and the headwaters of these areas. The DIES [DEIS] should map out each area and explain every entry that is proposed.	**Procedural.** These issues will be addressed in the EIS and wildlife/fisheries BA/BE.
4.6	Analysis: Riparian Reserves	Issues that should be addressed in the environmental document are . . . proposed activities within Riparian Reserves	**Procedural.** These issues will be addressed in the EIS and wildlife/fisheries BA/BE.
3.5	Analysis: Scenery / Visual Quality Objectives	. . . the DEIS should discuss and consider if these ridge tops have Visual Quality Objectives.	**Procedural.** Most of the Eddy LSR, including the ridge tops, are seen from high-elevation viewpoints in the surrounding Wilderness Areas. As such, they have a designated Visual Quality Objective of middle ground **Partial Retention.** The ridge top treatment areas may also be along a moderately sensitive road and would also be managed as foreground **Partial Retention.** All

Comment Number	Issue/Resource Category	Comment	Comment Disposition (ID Team Response)
			of this will be evaluated and discussed in the EIS section on Scenery.
3.11	Analysis: Stand Description	. . . please be as detailed as possible in the DEIS as to stand (unit) descriptions by including vegetation type, seral stage, history, volume ect. [sic]	**Procedural.** Stand data will be collected to determine vegetation type, which includes dominant species, volume, size, and density.
Habitat			
3.9	Development	Habitat Development Areas. Please be more specific in DEIS and discuss location, guidelines and desired condition in these areas.	**Procedural.** The final Proposed Action / EIS will provide detailed information.
3.2	Fragmentation	We are also concerned about harvesting snags along ridge tops and ridge top roads and how that may lead to habitat fragmentation. Please analyze this when preparing the DEIS.	**Procedural.** Snags and fragmentation will be discussed in the EIS. Snag retention will meet the standards and guidelines described in the Klamath National Forest Land and Resource Management Plan (LRMP).
3.8	Connectivity	We are concerned that all the haul roads/emergency access routes and ridge top commercial thinning will have an effect on wildlife and connectivity.	**Procedural.** The EIS will evaluate the effects of modifying vegetation along emergency access roads.
Hardwoods			
1.3	Hardwoods	In those areas where hardwoods are emphasized for retaining it will be very important to develop an adequate prescription that will allow for long term hardwood maintenance within the stands.	**Procedural.** The stand prescriptions will address hardwood maintenance. Hardwood components are also an important part of sensitive foregrounds of both roads and trails—this will be analyzed in the "Scenery" sections of EIS.
3.14	Hardwoods	Is this project considering possible oak/hardwood/ meadow restoration? It would be helpful if the DEIS or the website would contain maps and old aerial photos and explain meadow/hardwood component in further detail.	**Nonsignificant.** Meadow restoration is not part of the Purpose and Need for this project.
Project Design / Mitigation			
3.4	Canopy Closure/Cover	As mentioned in the Scoping notice KFA recommends at least 80% canopy cover on Northerly slopes and at least 60% canopy on Southerly slopes. Please detail reasoning and marking guidelines in the DEIS. . . . canopy directly relates to fire risk.	**Procedural.** Canopy cover will be addressed in the stand prescriptions and be consistent with the LRMP.

Comment Number	Issue/Resource Category	Comment	Comment Disposition (ID Team Response)
1.10	Canopy Closure / Treatment Effectiveness	We believe in order for these treatments to be totally effective both ground and aerial vegetation needs to be treated. Canopy closure needs to be open, 25-40%, and the treatments need to provide for long term effectiveness. There will be many instances when larger diameter trees (>12" dbh) will need to be removed in order to fully meet your roadside and FRZ objective.	**Nonsignificant**. Canopy closure will be driven by the existing conditions and desired conditions. The proposed treatments were designed to support project objectives (purpose) and satisfy the need for the project. Canopy will be addressed in the stand prescription**s** and be consistent with the LRMP and the Klamath National Forest Forest-wide Late-Successional Reserve Assessment (LSRA).
4.1	Cumulative Impacts / Threshold of Concern	The Eddy Gulch LSR Project should contain project features and mitigation measures that are designed to minimize and/or reduce cumulative impacts to below thresholds of concern.	**Procedural**. Project features and mitigation measures will be included in the final Proposed Action.
4.9	Cumulative Watershed Effects	Issues that should be addressed in the environmental document are . . . any mitigation measures to offset cumulative watershed effects . . .	**Procedural.** Mitigation measures (resource protection measures) will be incorporated in the final Proposed Action.
2.2	Diameter Limits	. . . our organizations have advocated small diameter thinning as a positive way to improve forest health and maintain an ecologically and economically sensible timber economy. While we recognize the value and encourage the thinning of ground and ladder fuels, we encourage the Forest Service to resist the temptation to remove larger diameter trees.	**Procedural.** The size of trees to be removed to meet objectives will be addressed in the stand prescriptions and will conform to standards and guidelines contained in the LRMP.
3.15	Diameter Limits/ Disclosure	As this is an HFRA project within LSR, we highly recommend disclosing diameters of trees, especially over 24" that would be marked for extraction.	**Procedural.** The size of trees to be removed to meet objectives will be described in the stand prescriptions and comply with standards and guidelines contained in the LRMP and LSRA.
4.8	Erosion	Issues that should be addressed in the environmental document are . . . wet weather operations, erosion control on roads and landings, long term road maintenance for both system and non-system roads . . .	**Procedural.** The Klamath National Forest has developed operating guidelines or applies best management practices for the listed items.
3.1	Snags and LWD/CWD	As this project is in an LSR (73%) please make sure that LWD that is currently down does not get removed or disturbed and that guidelines for both snags and LWD/CWD are followed, perhaps even greater than guidelines.	**Procedural.** The EIS will address large woody debris (LWD) and snag retention and will meet standards and guidelines contained in the LRMP.
3.6	Stand Density Index	Blanket SDI marking guidelines do not always adequately address fuels issues.	**Procedural.** The EIS will include specific language to describe prescriptions using surface, ladder, and crown fuels as indicators.

Comment Number	Issue/Resource Category	Comment	Comment Disposition (ID Team Response)
		Please be a specific as possible in DEIS as to what marking guidelines/Rx is for each stand and also amount of volume in each stand.	
1.1	Timeframe and Long-Range Desired Conditions	When developing the prescriptions we ask that you identify the long range desired condition, how long you want the proposed treatments to be effective, and then design the Rx to meet the desired condition and time frame for the LSR land allocation. It must be clearly identified in the analysis if the proposed treatments will achieve these long range desired conditions or if future treatments will be necessary to meet the stated goals.	**Procedural.** The EIS will disclose the long-range desired conditions for each resource analyzed. The final Proposed Action will include prescriptions designed to achieve desired conditions and will disclose if future treatments would be necessary to achieve long-range desired conditions.
4.3	Timeframe for Implementation	Issues that should be addressed in the environmental document are . . . timing of project implementation . . .	**Procedural.** The timeframe for project implementation will be disclosed in the final Proposed Action.
2.3	Treatment: Avoiding Damage to Resources	While we generally support thinning small-diameter trees in the project area, particularly near homes and communities, it is critical to recognize that widespread logging may not influence fire and fuel hazard in the manner that the Forest Service predicts. Hence we urge the agency to proceed with caution and avoid excessive damage to forest resources from harmful practices like road construction, tractor yarding, and yarding through riparian reserves.	**Procedural.** The LRMP has standards and guidelines for the referenced activities. The guidelines will be included in the logging plan that will be developed after the 2008 field season.
3.7	Treatment Method: Manual vs. Machine Piling	We strongly suggest manual piling. Please be detailed in DEIS on where and how much, if any, machine pilling is proposed.	**Procedural.** Slash treatments will be identified and documented during the 2008 field season. Hand piling is often a much-preferred treatment along sensitive road and trail foreground. This topic will be addressed in the "Scenery" section of the EIS.
4.5	Treatment Method: Yarding	Issues that should be addressed in the environmental document are . . . yarding methods	**Procedural.** Yarding methods will be discussed and analyzed in the EIS.
1.09	Treatment Type: Underburning	We believe the underburning in many cases will actually increase fuel hazards and condition class as additional vegetation is killed but not consumed.	**Procedural.** The effects of underburning will be evaluated in the EIS.
4.2	Water Quality	The Project should be designed and implemented in a manner that complies with the Basin Plan [Water Quality Control Plan for the North Coast Region (Basin Plan), Order R1-2004-00150], restores and maintains	**Procedural.** The project will be consistent with the Basin Water Plan, which includes compliance with Section 303d (TMDL) of the Clean Water Act.

Comment Number	Issue/Resource Category	Comment	Comment Disposition (ID Team Response)
		riparian corridors, and maintains all vegetation that provides shade to water bodies in order to help achieve the TMDL. Issues that should be addressed in the environmental document are . . . the Salmon River TMDL for temperature . . .	
Project Feasibility / Implementation			
1.7	Allowable Burn Days	The proposed action identifies approximately 26,400 acres of planned underburning. We question the feasibility of such a proposal. Historically, the Klamath National Forest has been lucky to burn even a tenth of those acres on a yearly basis. Based on historical burning accomplishments and the number of allowable burn days we believe these underburning proposals are totally unrealistic.	**Procedural.** This project is designed to facilitate the large amount of underburning. The District has conducted underburning over large acreages in the past, such as in 1998 (over 6,000 acres). The interdisciplinary team will consider a sequence for implementing underburns and the historic availability of burn days (the percent of allowable burn days).
1.2	Desired Conditions for Late-successional Habitat	It is our contention the current proposed prescriptions, canopy closure and tree size restrictions, will prevent the project from achieving the long-term desired condition for late-successional habitat with this one entry and may not allow for these conditions to ever be achieved.	**Nonsignificant.** The desired conditions are identified in the LSRA. This project strives to reach a balance between the short- and long-term goals of the LSR. The stated issues will be addressed in the EIS and through consultation with the U.S. Fish and Wildlife Service—this will be documented in the Wildlife BA. If further treatments are considered to be necessary in order to respond to changed conditions, they will be analyzed in a separate environmental document.
1.4	Economic Viability	Since you have designated two systems as part of the proposed action we ask that you do an in-depth economic analysis in order to make sure your proposal is economically viable	**Procedural.** An economic analysis will be prepared for the project, and the “Socioeconomics” section in the EIS will address the economic effects of the Proposed Action, no-action alternative, and any other action alternative that may be developed.
1.5	Limited Operating Periods	Limited operating periods also affect implementation economics. The time period available for operations also has the potential to be significantly affected by Project Activity Level (PAL). These factors need to be included in your logging cost assessment.	**Procedural.** PAL is required by policy and is affected by existing and projected weather conditions. Other “limited operating periods” will be included in the resource protection measures, as needed. The EIS will include a qualitative analysis of impacts of limited operating periods, including PAL, on logging costs.

Comment Number	Issue/Resource Category	Comment	Comment Disposition (ID Team Response)
		We ask that you carefully assess and review proposed restrictions and mitigation items.	
1.12	Project Size	We feel this project needs to treat as many acres as possible in order to fully meet your designated purpose and need. We encourage you not to reduce the project (total acreage, total volume, and volume per acre). This portion of the Klamath National Forest already has a limited infrastructure available.	**Procedural.** The size of the project will be determined by the management objectives for the Eddy Gulch LSR and the project objectives.
3.17	Stewardship/Monitoring	We also encourage and would like to participate in monitoring and developing a monitoring plan.	**Other Concern**. If a monitoring plan is developed, the Klamath National Forest will collaborate with the public.
1.6	Temporary Roads	Temporary roads can allow for more effective and efficient management of the publics land. They can provide for better economics and in many cases reduce environmental impacts as compared to alternative treatments such as long skids and large clearings for helicopter landings. . . . we also ask that serious consideration be made for including temporary road construction that will assist with the implementation of this project.	**Procedural.** The Proposed Action includes temporary road construction.
2.1	Temporary Roads	. . . we think it imperative that you examine an alternative that builds no roads. We believe that upon examining a roadless alternative, you will conclude that a fair cost/benefit analysis will strongly suggest a road-free project is the superior course of action.	**Significant Issue.** This issue is considered significant because of the considerable differences of opinion concerning the need for roads to accomplish the purpose of the project and satisfy the need. The EIS will analyze the impacts of such roads on forest resources, including water quality. A second action alternative will be developed to address this issue.
2.4	Temporary Roads	Please note that while new road construction is often described by the agency as "temporary," that all new road construction results in long-term impacts to soil health and productivity.	**Procedural.** The effects of temporary road construction will be analyzed in the EIS. A second action alternative will be developed to exclude construction of temporary roads. The EIS will analyze effects of potential wildfire if certain treatments were not implemented because temporary roads were not constructed.

Comment Number	Issue/Resource Category	Comment	Comment Disposition (ID Team Response)
		To better inform your decision-making, we have attached an article by Trombulack and Frissell (2000) detailing some of the negative impacts of road construction and use on Terrestrial and Aquatic ecosystems. The Forest Service must address and avoid the harmful impacts detailed in this study. The EIS should consider risks to slope stability posed by new road construction. The NEPA document must anticipate risks posed by building new roads, including the possibility of road failure and resulting damage to downstream resources (see Gucinski et al. 2001, p. 19).	

APPENDIX 4-C
COPIES OF BRACKETED COMMENT DOCUMENTS

AMERICAN FOREST RESOURCE COUNCIL

April 22, 2008

Ray Haupt, District Ranger
Scott and Salmon River Ranger District
11263 N. Highway 3
Fort Jones, CA 96032

Dear Ray:

Thank you for the opportunity to comment on the proposed Eddy LSR project. AFRC represents over 90 forest product businesses and forest landowners in twelve western states. Our mission is to create a favorable operating environment 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 that determine or influence the management of all lands. Many of our members have their operations in communities within and adjacent to Siskiyou County and the management on these lands ultimately dictates not only the viability of their businesses, but also the economic health of the communities themselves. We would like to highlight a few comments on the proposed project.

There are three identified purpose and needs for the project:

1. **Community Protection** – to reduce wildfire threat to communities and municipal water supplies and increase public and firefighter safety. Current and developing conditions in the Late-Successional Reserve (LSR) and along sections of all access roads will likely lead to moderate- and high-intensity fires caused by weather-related events.
2. **Habitat Protection** – to protect existing and future late-successional habitat from threats (of habitat loss) that occur inside and outside the Eddy Gulch LSR. Current risks to forest health include hazardous fuel conditions, vegetative stocking density, insects, and diseases.
3. **Habitat Development** – to promote the continued development of late-successional characteristics. There is a need to accelerate the development of late-successional forest characteristics in some existing mid-successional forest stands.

SCOPING COMMENTS

ISSUE #1 – PROJECT EFFECTIVENESS

- The analysis needs to display time frame effectiveness for the proposed treatments in terms of meeting the designed purpose and need. Commercial thinning is the dominant prescription (Rx) for the commodity removal portion of your project. When developing 1.1 . . .

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the prescriptions we ask that you identify the long range desired condition, how long you want the proposed treatments to be effective, and then design the Rx to meet the desired condition and time frame for the LSR land allocation. We have seen too many times, following treatment completion, that more trees should have been cut as either the designed treatment results were not achieved or established effectiveness time frames were not met.

Late-Successional Reserve (LSR) Allocation:

- This analysis is especially important for the LSR allocation. There are designed long range desired conditions identified in the Klamath National Forest Late-Successional Reserve Assessment (LSRA). Some of those desired conditions are described below:
  - On north and east aspects it is desirable to have dense stands with total canopy closure >60%. Canopy closure of 40-60% would be more common on the upper slopes. This condition should be variable across the landscape. The desired basal area for most of the late seral and old growth stands on north and east slopes should be in the range of 70-80% of normal (Dunning & Reineke, 1933) and should apply to stands generally in the range of 150-200 years. After the 200 year time frame, basal area should not be a concern in order to allow decadence and increased mortality to occur naturally.
  - On south and west aspects it is desirable to have stands that are more open grown with total canopy closure ranging from 40-60%. Canopy closure in mixed conifer stands on the upper 1/3-1/2 may be as low as of 25%. In the Douglas fir/white fir zone canopy closure may be as low as 30% on the upper 1/3-1/2 of the slope. The desired basal area for most of the late seral and old growth stands on south and west slopes should be in the range of 60-70% of normal (Dunning & Reineke, 1933) and should apply to stands generally in the range of 150-200 years. After the 200 year time frame, basal area should not be a concern in order to allow decadence and increased mortality to occur naturally.
  - Table 3/1, page 3-4, of the Forest-wide LSRA assessment described expected late-successional attributes on the north and east aspects. It highlights the number of trees expected per acre range from 25-50 trees per acre, depending on vegetation type. Desired basal area levels, snag levels, and coarse woody debris (CWD) are also displayed by vegetation type and site class.
  - Table 3/2, page 3-5, of the Forest-wide LSRA assessment described expected late-successional attributes on the south and west aspects. It highlights the number of trees expected per acre range from 20-45 trees per acre, depending on vegetation type. Desired basal area levels, snag levels, and CWD are also displayed by vegetation type and site class.
- It must be clearly identified in the analysis if the proposed treatments will achieve these long range desired conditions or if future treatments will be necessary to meet the stated goals. If additional treatments are necessary we ask that the analysis display when those treatments will be needed. 1.1

It is our contention the current proposed prescriptions, canopy closure and tree size restrictions, will prevent the project from achieving the long-term desired condition for late-successional habitat with this one entry and may not allow for these conditions to ever be achieved. 1.2

Hardwood Retention:

- Hardwoods have always been an important component within this landscape. Treatments should propose to increase wildlife structural and species diversity through the maintenance and improvement of hardwoods within treated stands. In those areas where hardwoods are emphasized for retaining it will be very important to develop an adequate prescription that will allow for long term hardwood maintenance within the stands. Hardwoods are generally early seral (pioneer) species that tend to be removed as stands develop over time. In order to meet the objective of retaining hardwoods for structural and species diversity, considerable space will need to be left to provide adequate sunlight, water, and nutrients for the remaining hardwoods. Over the long term, in order for these treatments to be effective a considerable amount of conifer material may need to be removed during project implementation. 1.3

<u>ISSUE #2 – PROJECT ECONOMICS</u>

- Economic consideration is very important for successful implementation of this project. There is quite a cost difference in the two logging systems proposed. As you are aware, tractor logging is the cheapest with skyline logging being more expensive. As stands are assessed it will be very important to assess the feasibility of each logging system in relation to volumes per acre, size of trees being removed, distance to landing, species of tree being removed, current delivered log prices, etc. Since you have designated two systems as part of the proposed action we ask that you do an in-depth economic analysis in order to make sure your proposal is economically viable. Logging costs, fuel costs, and haul costs have all increased dramatically over the last year. Lumber prices have fallen dramatically as these other costs have increased. We ask that you take these recent increases and decreases into consideration in your economic analysis. 1.4
- The following highlights considerations for harvest systems that need to occur during the NEPA phase of the analysis:
    - Conventional harvesting (tractor) should have at least 3-5 mbf/acre as a minimum to help pay for associated logging costs.
    - When proposing to utilize skyline harvesting there should be an average of 7-10 mbf per acre to enable the harvest method to pay for itself. Smaller volumes per acre generally do not pay for the expense of move in, set-up, getting logs to the landing, hauling to a mill site, and move out. Minimum volume for a project proposing to utilize skyline harvesting should be between 1-2 mmbf.
    - Species, yarding distance, haul distance, and size all play into the amount of volume needed to economically skyline harvest.
    - Other considerations for skyline harvesting besides volume per acre are the locations and proximity to other units utilizing the same harvest method. It

becomes cost prohibitive to use this logging system if the units are spread out over a great distance requiring numerous moves. Moving costs and the associated down time gets very expensive when units are not compactly located. It appears, by looking at the attached map, that many units are not compactly located. Units that are spread out over great distances may causes a significant economic concern associated with any of the logging system feasibility.

- It is very important the selected decision produce a viable project. Siskiyou County is currently in a depressed situation and every opportunity to generate revenues for the county schools and roads should be undertaken. This is particularly important since the Rural Schools Act has not been reauthorized.

ISSUE #3 – LIMITED OPERATING PERIODS AND PROJECT MITIGATION

Limited operating periods also affect implementation economics. There could potentially be several limited operating periods identified in the proposed action. Many of these restrict operations between February 1 and September 15. This does not allow much time for harvest activities to occur prior to the wet weather period. These restrictive limited operating periods will have significant increases in logging costs as contractors cannot afford to utilize very expensive equipment for such a short time period. It is also more difficult to hire employees with such a short guarantee for work. The time period available for operations also has the potential to be significantly affected by Project Activity Level (PAL). These factors need to be included in your logging cost assessment. 1.5 . . . 1.5 . . .

We ask that you carefully assess and review proposed restrictions and mitigation items. It must be clearly documented they are needed. Additional mitigation items will require contractors to incur additional costs for a project that may have marginal economics. 1.5

ISSUE #4 – TEMPORARY ROAD CONSTRUCTION AND LANDINGS

We are very aware there will be undue pressure put on the decision maker to not develop any temporary roads for this project. We take the opposite view point. Temporary roads can allow for more effective and efficient management of the publics land. They can provide for better economics and in many cases reduce environmental impacts as compared to alternative treatments such as long skids and large clearings for helicopter landings. 1.6 . . .

- It is important an adequate road system be developed and utilized in order to effectively and efficiently harvest products from this project. While decommissioning unneeded roads is understandable and supportable we also ask that serious consideration be made for including temporary road construction that will assist with the implementation of this project. We encourage the building of temporary spurs where feasible to reduce the harvest costs and more effectively treat the land base. Closing these roads following treatment should have no additional resource impact when compared to other alternative treatment methods. 1.6
- Insure landing size is adequate to support the proposed harvest systems. If whole tree yarding is proposed make sure landings can accommodate the merchantable and unmerchantable material.

ISSUE #5 – UNDERBURNING FEASIBILITY AND AIR QUALITY ISSUES

- The proposed action identifies approximately 26,400 acres of planned underburning. We 1.7 . . . question the feasibility of such a proposal. Historically the Klamath National Forest has been lucky to burn even a tenth of those acres on a yearly basis. This project is just one of many being proposed on the Forest that contain large acreages of proposed underburning. The Thom/Seider project alone proposes an additional 22,000 acres of underburning. Based on historical burning accomplishments and the number of 1.7 allowable burn days we believe these underburning proposals are totally unrealistic. Other factors need to be considered and addressed when proposing such high levels of underburning. They include but are not limited to:
    - There is potential for a significant amount of carbon to be emitted into the atmosphere with the planned large scale underburning. The Pacific Southwest Region is part of the California Climate Action Registry and should account for both carbon sequestration and emissions. It would be worthwhile in the analysis to highlight the potential carbon release into the atmosphere through the proposed 1.8 underburing.
    - In many of the stands the current vegetative conditions associated make it unlikely a condition class change will occur with one burn. We believe the 1.9 underburning in many cases will actually increase fuel hazards and condition class as additional vegetation is killed but not consumed.
    - If such large acreages are proposed for underburning we ask that an assessment be made on the number of conifer trees that will potentially be killed and what the disposition (remove and leave on site) of those killed trees may be. Trees left onsite will also contribute additional carbon releases into the atmosphere (see attached article).

ISSUE #6 – EFFECTIVE ROADSIDE AND FUEL REDUCTION ZONE TREATMENTS

- Part of the proposed action includes roadside fuel treatments and the creation of fuel treatment zones (FRZs). The objective of the roadside and FRZ treatments is to reduce ladder and ground fuels and canopy fuel levels in order to limit the potential size of and loss of resources from large, high-intensity wildfire. The FRZs should be wide enough to capture most short-range spot fires within the treated areas and are designed to bring crown fires into surface fires as well as provide safe locations for fire-suppression personnel.

  We believe in order for these treatments to be totally effective both ground and aerial 1.10 vegetation needs to be treated. Canopy closure needs to be open, 25-40%, and the treatments need to provide for long term effectiveness. There will be many instances when larger diameter trees (>12” dbh) will need to be removed in order to fully meet your roadside and FRZ objective. It would also provide additional commercial volume and provide additional revenue back to the project as well as the local communities and county.

CONCLUSION

We feel this project needs to treat as many acres as possible in order to fully meet your designated purpose and need. We encourage you not to reduce the project (total acreage, total volume, and volume per acre). Industry infrastructure is very important in terms of implementing your project. This needs to be a consideration when assessing economics and project design. As project size and volumes shrink during the NEPA analysis it may not individually seem to have any impact on industries ability to implement. But cumulatively, as all projects shrink, it has a major impact on the ability to maintain adequate infrastructure to accomplish your land management activities. This portion of the Klamath National Forest already has a limited infrastructure available. 1.11 . . . 1.11

I have attached an article detailing emissions associated with wildfires. This article highlights the need to treat existing biomass concentrations, reduce tree densities, and store potential carbon releases as commercial wood products in order to reduce catastrophic carbon emissions created during and after wildfire.

As a forest industry and being professional foresters we are very concerned that good forestry be practiced on the Forest Service land base. We ask you to develop prescriptions that truly meet the particular needs of the stands and land base. We have recently seen too many instances where prescriptions are developed to address public concerns from entities that have personal agendas and biases and have no background or knowledge of the forest environment and ecosystem. Prescriptions developed in these instances do not meet the needs of the stands, land allocation standards and guides, project purpose and need, and long term forest protection and health.

AFRC wants to go on record in support of an economically feasible Eddy LSR project. Thank you for the opportunity to comment on the proposed project and please keep us informed on the progress of NEPA. We are also interested in any field trips that may be set up for this project.

Sincerely,

/s/***Richard J. Svilich***

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FCEM

Forest Carbon and Emissions Model

Scoping Comment Document #1

GREENHOUSE GAS EMISSIONS FROM FOUR CALIFORNIA WILDFIRES: OPPORTUNITIES TO PREVENT AND REVERSE ENVIRONMENTAL AND CLIMATE IMPACTS

FCEM Report No. 2

By
Thomas M. Bonnicksen, Ph.D.

March 11, 2008

Prepared for
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Citation

Bonnicksen, T.M. 2008. Greenhouse gas emissions from four California wildfires: opportunities to prevent and reverse environmental and climate impacts. FCEM Report 2. The Forest Foundation, Auburn, California. 19 p.

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The author also gives special thanks to Dr. Bruce Krumland, consultant in statistical design and analysis, forest inventory, and modeling, and Klaus Scott, Air Pollution Specialist, California Air Resources Board (CARB), for their review, analysis, and suggestions in the development of FCEM. Thanks also to Dr. Mark Nechodom, USDA Forest Service Sierra Nevada Research Center and Dr. Chris Dicus, Wildland Fire & Fuels Management, California Polytechnic State University (Cal Poly), San Luis Obispo, for their helpful comments and suggestions. Thanks also to Neva Lowery, Emissions Inventory staff (CARB) and Richard Bode, Chief Emissions Inventory Branch (CARB), for taking time for consultation on estimating greenhouse gas emissions using FCEM.

The author also appreciates the thorough proofreading of this report done by Suzanne Stone, freelance writer/editor in Carmichael, California. A grant from The Forest Foundation, in Auburn California, funded this project.

Executive Summary

Forests and forestry are playing an increasingly important role in sequestering carbon and reducing greenhouse gas emissions, especially during a period of rising concerns about global warming. The Forest Carbon and Emissions Model (FCEM) used in this study estimates forest carbon storage, sequestration, and greenhouse gas (GHG) emissions using equations from recognized scientific sources.

The purpose of this report is to provide estimates that illustrate the impact of wildfires on greenhouse gas emissions and the importance of thinning forests to protect forests and communities, and to prevent emissions from combustion and decay. It also focuses on the significance of removing dead trees and replanting to restore forests and recover greenhouse gases released by wildfire.

Reducing the Threat of Wildfires

Some people argue that we have to live with fire. On the contrary, an industrialized world can’t live with fire. We would have to move out of our forests to be safe and get out of our cars to eliminate tailpipe emissions to make up for the greenhouse gases that wildfires emit into the atmosphere, and that isn’t realistic. The only solution is to fight global warming and protect our communities and forests by reducing the threat of catastrophic wildfires.

The Angora Fire of 2007 blackened 3,100 acres of forest and destroyed 254 homes in the Tahoe Basin because most of the forest was so dense. Using pre-fire data for the forest, FCEM estimates that combustion emissions could have been lowered from 46.2 tons per acre to 12 tons per acre if the density of trees had been reduced from 273 per acre to the more natural density of 60 per acre.

A fire burning in the same forest after thinning would not have been catastrophic. It would have killed few large trees, covered less acreage, and left adjacent communities relatively unharmed. That is what could have been, but it also illustrates the opportunity that still exists to fight global warming and protect the rest of the Tahoe Basin as well as other forests and communities in California and the West.

Climate Impacts of Wildfires

This report analyzes four catastrophic California wildfires using FCEM: the Angora, Fountain, Moonlight, and Star Fires. Together these wildfires burned over 144,825 acres of forestland.

Those who have not stood in the midst of flames 200-feet high, felt the overwhelming heat from a temperature more than 3,000 degrees Fahrenheit, and smelled the smoke and gases released, cannot fully appreciate a catastrophic wildfire. It is awesome and terrible, and firefighters who brave these conditions deserve our respect.

The catastrophic wildfires that ravage California each year don’t resemble the historic fires that took place in these forests for millennia. Most natural fires didn’t sweep across landscapes destroying whole forests as wildfires do today. The underlying cause of modern catastrophic wildfires is too many trees.

The four forests burned by these wildfires were overcrowded with trees — with trees of all sizes intermixed to form a uniform mass of fuel spreading over the landscape. They averaged 350 trees per acre when 50-60 trees per acre would be natural. They also contained unnaturally heavy surface fuels composed of litter, duff, down dead wood, shrubs, and small trees that ranged from an estimated 25 to 40 tons per acre. Tree density, especially young trees growing under larger trees as ladder fuel, and surface fuels are the two most important contributors to the size and severity of wildfires.

Consequently, when the massive amounts of fuel in these forests burned, they released an estimated 9.5 million tons of greenhouse gases into the atmosphere just from combustion. That is an average of about 63 tons per acre. However, combustion is only part of the story because dead trees also gradually release CO2 as they decay. CO2 emissions from decay are generally three times greater than emissions from combustion because large quantities of wood and other plant material remain unburned after a forest fire.

Combining combustion and decay emissions, FCEM estimates that these four fires will emit a staggering 38 million tons of greenhouse gases into the atmosphere. The fires released one fourth of the gases during combustion, and post-fire decay will release the remainder during the next 100 years, most of it during the next 50 years.

To put these emissions from combustion and decay into perspective, they are equivalent to adding an estimated 7 million more cars onto California's highways for one year, each spewing tons of greenhouse gases out the tailpipe. Stated another way, this means 50 percent of all cars in California would have to be locked in a garage for one year to make up for the global warming impact of these four wildfires.

Opportunities for Action

One way to compensate for greenhouse gas emissions from wildfires is to lower the amount of biomass available for decay. Removing dead trees and storing the carbon they contain in the solid wood products consumers need can reduce total CO2 emissions by as much as 15 percent. Planting a young forest to replace one killed by wildfire and letting the growing trees absorb CO2 from the atmosphere through photosynthesis is another way. Doing both, especially with interim harvests for wood products after planting, effectively reverses the impact of wildfire emissions on global warming.

This report estimates accomplishments, planned and completed, to reduce and recover greenhouse gas emissions from four areas blackened by catastrophic wildfires in California. So far, FCEM estimates that these actions, in combination, will compensate for 42 to 114 percent of the actual and potential CO2 losses caused by three of the four wildfires.

Even so, opportunities still exist to do even more to restore two of the four forests burned and fight global warming. In particular, removing dead trees and planting national forest lands burned by the 2007 Angora and Moonlight Fires could recover an estimated 98 to more than 100 percent of the CO2 losses they caused. Equally important, these actions would help protect surrounding communities from a second wildfire or re-burn, which often occurs in forests that become dead-tree filled brush fields.

The immensity of greenhouse gas emissions from just these four wildfires is a warning. Clearly, we must make every effort to reduce the amount of excess biomass in forests to prevent catastrophic wildfires. That means decreasing the number of trees by thinning to make them more resistant to crown fires, which will also restore the natural health and diversity of our forests. Reducing the number and severity of wildfires may be the single most important action we can take in the short-term to lower greenhouse gas emissions and fight global warming.

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This report analyzes four California wildfires using the Forest Carbon and Emissions Model (FCEM) (Bonnicksen 2008, also see Appendix A). They include the Angora, Fountain, Moonlight, and Star Fires. The purpose of this report is to illustrate the impact of wildfires on greenhouse gas emissions and the importance of thinning forests to prevent wildfire emissions, as well as the significance of removing dead trees and replanting to restore forests and recover greenhouse gases emitted by wildfires.

The 2007 Angora and Moonlight Fires also illustrate an opportunity that is still available to remove dead trees from public forestlands and to manufacture solid wood products before the trees lose their economic value. The money could be used to help pay for planting. This would restore these forests at minimal cost to the public, reduce and recover greenhouse gases from these wildfires, protect nearby communities from another wildfire, and help fight global warming.

Wildfires Analyzed Using FCEM

The Angora Fire: The Angora Fire burned from June 24 to July 10, 2007, sweeping across 3,100 acres of dense forest largely on national forest land west of South Lake Tahoe. The fire killed about 80 percent of the big trees and destroyed 254 homes. As of March 2008, the U.S. Forest Service has not taken action to remove dead trees and plant young trees to restore the forest.

The Fountain Fire: Recognized as one of the worst fires in California history, the Fountain Fire destroyed 59,840 acres of mostly private forestlands and more than 300 homes in the Sierra Nevada, about 40 miles east of Redding in August 1992. Unlike many other burned forests, this forest is well on its way to a full recovery because private forest landowners harvested fire-killed trees and planted young trees.

The Star Fire: The Star Fire burned 16,171 acres (about 11,930 acres of public land and 4,241 acres of private land) in September 2001 in the Tahoe and Eldorado National Forests in the northern Sierra Nevada. Fire-killed trees were harvested on 93 percent of private forestlands and young trees were planted on 52 percent. The Forest Service removed dead trees on 39 percent of their burned land and planted young trees on 19 percent.

The Moonlight Fire: The Moonlight Fire burned 65,714 acres (47,174 acres of public lands and 18,540 of private lands) in September 2007 in the Plumas National Forest in the northern Sierra Nevada, spreading smoke throughout the Sacramento Valley. Private forest landowners are removing dead trees and planting young trees, but as of March 2008, the Forest Service hasn’t released a plan to restore public forestlands.

Data Sources

Data used in this report come from personal on-site visits, aerial and other photographic evidence, published materials, first-person accounts, private forest landowners, and government representatives.

FCEM requires a minimum of input data to analyze the climate impacts of wildfire. The first step is to describe the forest as it was before a wildfire. This provides the initial conditions that contributed to the size and severity of a wildfire.

Describing Pre-fire Forests

Input data specified by the user to describe the pre-fire forest and use FCEM include total acres, percent of acres occupied by conifers, the number of trees per acre, and the percent of trees by species (i.e., species composition) of the conifer forest. The forest can be even-aged or uneven-aged. The default forest is uneven-aged. The four wildfires analyzed in this report burned mostly in uneven-aged forests, with trees of all sizes intermixed, creating an extreme fire hazard.

If present, the user also specifies shrub and/or chaparral percent cover as well as the percentage of the acreage in shrubs, chaparral, and/or Western oak. Shrubs are normally a part of forests, occupying small openings and growing in the understory when the overstory is relatively open. Table 1 shows the proportion of four vegetation types in each burned forest.

Table 2 shows the species composition of the four forests that burned in these wildfires. It also illustrates that these are mixed-conifer forests with slightly different mixes of species.

Table 1. Vegetation types in burned forests.

Vegetation Type	Angora Fire (%)	Fountain Fire (%)	Star Fire (%)	Moonlight Fire (%)
Conifer-oak	95.0	100.0	86.2	96.3
Shrubs	5.0		2.0	2.8
Chaparral			4.8	
Western oak			7.0	0.9

Table 3 shows the specified acreage burned, density of trees greater than or equal to 2 inches in diameter at breast height (dbh), and estimated weight of surface fuels in each forest.

Table 2. Species composition of burned forests.

Species	Angora Fire (%)	Fountain Fire (%)	Star Fire (%)	Moonlight Fire (%)
Coast redwood				
Douglas-fir		13.0	37.6	15.56
Cedar	2.0	29.0		22.34
Lodgepole pine	5.0			0.03
Ponderosa/Jeffrey pine	59.0	7.0	52.6	22.95
Sugar pine		3.0		7.01
True fir/hemlock	34.0	38.0	9.9	27.43
Oak/tanoak		10.0		4.68

In addition, Table 3 makes clear that all four pre-fire forests were too dense. These overcrowded forests formed a uniform mass of fuel spreading over the landscape. They averaged 350 trees per acre when

50-60 trees per acre would be natural. They also contained unnaturally heavy surface fuels composed of litter, duff, down dead wood, shrubs, and small trees that ranged from an estimated 25 to 40 tons per acre. Tree density, especially young trees growing under larger trees as ladder fuel, and surface fuels are the two most important contributors to the size and severity of wildfires.

Even so, these forests were less dense than some forests in the Sierra Nevada that have as many as 1,000 trees per acre, including areas within the Tahoe Basin. In addition, much of the private forestlands burned in these four wildfires were in an early phase of a transition to well managed forests that would have been less vulnerable to fire.

The catastrophic wildfires that ravage California each year don't resemble the historic fires that took place in these forests for millennia. Natural fires set by lightning and Native people were frequent and light, burning mainly surface fuels and igniting only scattered small groups of trees (Bonnicksen 2000, 2007). They didn't sweep across landscapes destroying whole forests, killing wildlife, destroying habitat, baking soils into hardened clay that can't absorb rainwater, and causing massive erosion as modern wildfires do today. Unlike the overcrowded and unhealthy forests we see now, most historic forests were open, diverse, and more resistant to catastrophic fires.

Table 3. Area burned, density, and FCEM estimates of surface fuels in burned forests.

Wildfire	Area Burned (acres)	Density (trees/acre)	Surface Fuels* (tons/acre)
Angora Fire	3,100	273	25.4
Fountain Fire	59,840	301	24.5
Star Fire	16,171	400	39.7
Moonlight Fire	65,714	428	37.6

* Surface fuels include litter, duff, down dead wood, small understory trees, shrubs, and chaparral.

Mortality

Computations for estimating greenhouse gas emissions from wildfires in FCEM require the user to specify percent mortality for understory and overstory vegetation. Other factors that affect greenhouse gas emissions, such as biomass consumption by fuel component, and emissions by greenhouse gas type and fuel component are part of FCEM. These factors, as well as equations, can change as new information becomes available.

Table 4. Understory and overstory mortality in burned forests used in FCEM.

Wildfire	Understory Mortality (%)	Overstory Mortality (%)
Angora Fire	95	80
Fountain Fire	100	100
Star Fire	100	81
Moonlight Fire	95	90

Table 4 shows the percent mortality specified in FCEM for each wildfire based on available information. Even so, computer simulations show that minor changes in percent mortality have little effect on estimated greenhouse gas emissions.

Greenhouse Gas Emissions from Combustion

Table 5 shows greenhouse gas emissions from combustion caused by the four wildfires analyzed in this report. The average is 62.8 tons of greenhouse gases emitted per acre. This is typical for California fires burning in today's overcrowded forests. They exceed emissions that would have occurred in historic fires because the biomass available to burn is so much greater than it was in natural forests.

Table 5. FCEM estimates of greenhouse gas emissions from combustion by wildfire.

Wildfire	Greenhouse Gases* (tons)	Greenhouse Gases* (tons/acre)	GWP** Emissions (tons CO2e)	GWP** Emissions (tons CO2e/acre)
Angora Fire	143,129.0	46.2	156,169.7	50.4
Fountain Fire	3,196,172.2	53.4	3,489,198.2	58.3
Star Fire	1,240,688.5	76.7	1,354,463.2	83.8
Moonlight Fire	4,910,941.6	74.7	5,360,989.1	81.6

* Carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).
** GWP means Global Warming Potential. CO_2 is the baseline at a value of 1. CH_4 has a GWP of 21x CO_2, and N_2O has a GWP of 321x CO_2 (Houghton et al. 1996, U.S. Environmental Protection Agency 2002).

The emissions in Table 5 are large and difficult to interpret without comparisons. Therefore, Table 6 shows how many cars would be added to California's highways for one year, each spewing tons of greenhouse gases out of the tailpipe, to equal combustion emissions. Seen another way, it shows how many cars in total and cars per acre burned that would have to be taken off the road and locked in a garage for one year to make up for the global warming impact of these four wildfires.

Greenhouse Gas Emissions from Combustion and Decay

Combustion emissions occur during a wildfire, but they are only part of the story because dead trees also gradually release CO2 as they decay. Dead trees generally decompose within about 100 years, most of the decay occurring in the first 50 years. As a conservative estimate, FCEM considers dead biomass left after a fire as carbon that will decay in 100 years and computes the amount of CO2 released accordingly.

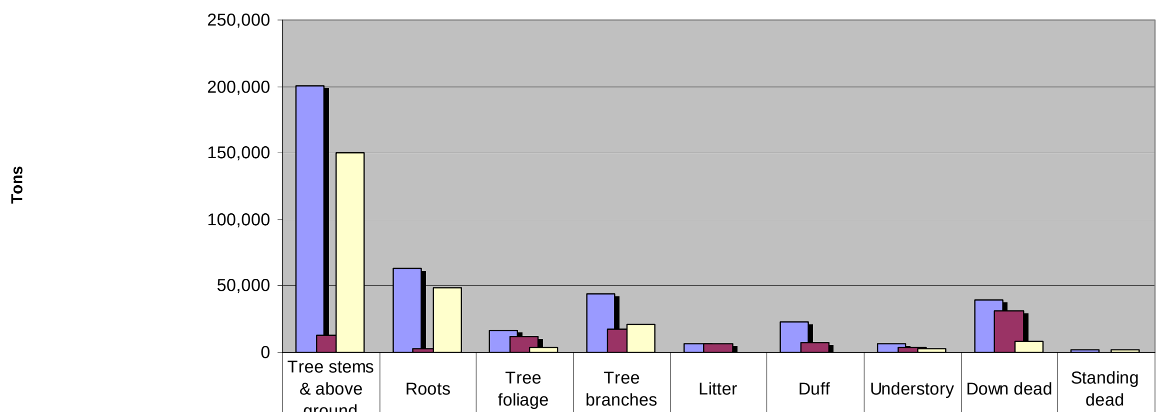
Greenhouse gas emissions from decay are generally larger than combustion emissions. The reason is that 3.67 times the carbon content of biomass is released as CO2 during decomposition. Therefore, forests emit more CO2 when they decay than when they burn because large quantities of biomass remain in the forest after combustion. However, chaparral and brush fields burn more completely, so combustion emissions can exceed decay emissions.

Table 6. FCEM estimates of passenger car equivalents for combustion emissions by wildfire.

Wildfire	Passenger Car Emission Equivalents* for Combustion (cars)	Passenger Car Emission Equivalents* for Combustion (cars/acre)
Angora Fire	28,166	9
Fountain Fire	629,294	11
Star Fire	244,284	15
Moonlight Fire	966,880	15

* Based on the average passenger car emitting 5.03 metric tons of CO2e (CO2 equivalent) per year (U.S. Environmental Protection Agency 2005).

Figure 1 demonstrates the pre-fire biomass and the amount consumed by combustion and decay in the Angora Fire, which shows relative amounts typical of the four wildfires. In FCEM, the unburned or post-fire biomass decomposes after a catastrophic wildfire in proportion to the percent overstory and understory mortality.



	Tree stems & above ground	Roots	Tree foliage	Tree branches	Litter	Duff	Understory	Down dead	Standing dead
Pre-fire biomass	200,531.56	63,564.10	16,913.00	44,281.92	6,862.10	22,642.12	6,818.41	39,593.25	1,798.71
Biomass consumed by fire	12,666.63	2,544.90	12,177.36	17,712.77	6,518.99	7,313.41	3,886.49	30,843.14	128.16
Biomass consumed by decay	150,372.22	48,719.04	3,788.51	21,255.32			2,785.32	8,312.60	1,587.02

Figure 1. FCEM estimates of pre-fire biomass and biomass consumed by combustion and post-fire decay by forest component in the forest burned by the Angora Fire.

Combining combustion and decay emissions provides a more complete picture of the impact of wildfires on global warming. In general, CO_2 emissions from decay after a forest fire are three times the amount emitted during combustion. Table 7 shows the magnitude of CO_2 emissions for the four forest fires analyzed, including passenger car equivalents.

Table 7. FCEM estimates of CO2 emissions from combustion and decay and passenger car equivalents by wildfire.

Wildfire	CO2 Emissions from Combustion & Decay* (tons)	CO2 Emissions from Combustion & Decay* (tons/acre)	Passenger Car Equivalents for Combustion & Decay (cars)	Passenger Car Equivalents for Combustion & Decay (cars/acre)	Proportion of Annual Passenger Car Emissions** (%)
Angora Fire	571,543.2	184.4	105,503	34	0.75
Fountain Fire	13,044,610.0	218.0	2,407,094	40	17.19
Star Fire	4,457,242.9	275.6	825,021	51	5.89
Moonlight Fire	19,657,975.0	299.1	3,629,015	55	25.9

* Includes roots, but not soil. Decay emissions occur over a 100-year period.
** Based on 14 million passenger cars on the road in California in 2005 (California Air Resources Board 2006).

The immensity of greenhouse gas emissions illustrated in Table 7 from just these four wildfires is a warning. Clearly, we must make every effort to reduce the amount of excess biomass in forests to prevent catastrophic wildfires. That means thinning trees to restore the natural health and diversity of forests and to make them more resistant to crown fires. Reducing wildfires maybe the single most important action we can take in the short-term to reduce greenhouse gas emissions and fight global warming.

Wood Products and Recovering Emissions

FCEM computes biomass, carbon, and CO_2 stored in solid wood products produced by removing trees through thinning and harvesting or dead tree removal after a wildfire or insect infestation. Estimated amounts of CO_2 stored in wood (as the CO_2 equivalent of the carbon content) is deducted from decomposition emissions because the wood is no longer available for decay.

These estimates are conservative. In addition, this approach doesn't consider the use of wood waste, a renewable resource, for generating electricity that can substitute for electrical energy produced by burning non-renewable fossil fuels. The savings in greenhouse gas emissions can be significant.

Table 8 shows the estimated amount of CO_2 recovered by removing fire-killed trees from the four burn areas analyzed in this report. In this case, recovery means preventing CO_2 from being released during decay by storing the carbon content of dead trees in solid wood products.

Table 8. Area of dead tree removal on private and public forestlands burned by four wildfires and FCEM estimates of CO_2 recovered by storing it in solid wood products (as the CO_2 equivalent of the carbon content of wood) and preventing losses from decay.

Wildfire	Dead Tree Removal (acres)	Dead Tree Removal**** (% burned area)	CO2 Recovered (tons)	CO2 Recovered (% of loss)
Angora Fire*	0	0	0	0
Fountain Fire**	59,840	100	1,927,038.1	14.8
Star Fire	8,633	76.5	493,880.0	11.1
Moonlight Fire***	17,613	31.1	915,419.4	4.7

* The Forest Service removed some hazard trees and an unaffiliated organization removed dead trees on a small area of the burn, but data are unavailable.
** This excludes non-industrial private forestlands.
*** Dead trees removed and planned for removal only from private forestlands.
**** The total acreage burned is reduced in proportion to the percent overstory mortality. Therefore, the percent of burned area is the percent of the area with overstory mortality.

Planting and Recovering Emissions

Planting a young forest to replace one killed by wildfire or insects can recover most — if not all — the CO_2 lost to the atmosphere from combustion and decay. FCEM uses the plant and minimal-management strategy for public lands because the Forest Service rarely uses herbicides, which is the most effective way to release seedlings overtopped by shrubs. Even so, FCEM considers planted areas on public lands as future forest even though many areas will become permanent brush fields.

FCEM considers unplanted areas as future brush fields because most catastrophic wildfires in California kill nearly all seed trees, as was the case in the four wildfires analyzed in this report. This aspect of FCEM can be adjusted for particular forests.

Private forest landowners use a plant and intensive-management strategy that usually succeeds. Likewise, this strategy grows trees more quickly than the plant and minimal-management strategy. That means trees absorb CO_2 from the atmosphere through photosynthesis at a greater rate as well.

The plant and intensive-management strategy also includes the storage of CO_2 in solid wood products (as the CO_2 equivalent of the carbon content of wood) because private forest landowners usually harvest trees within 40 to 80 years after planting. In addition, CO_2 absorbed from the atmosphere by replanting more than makes up for emissions from decomposition of biomass left on the ground after harvest.

Given past experience, it is unlikely that the Forest Service will harvest trees after planting. Therefore, FCEM excludes potential storage of CO_2 in solid wood products from planted public forestlands.

FCEM uses only the biomass, carbon, and CO_2 stored in stems, branches, foliage, and roots of trees on the acres planted for both the plant and minimal-management strategy and the plant and intensive-management strategy. CO_2 absorbed from the atmosphere by the planted trees and storage in solid wood products is deducted from combustion and decomposition emissions to assess the amount recovered.

Table 9 shows the area planted, and CO_2 recovered from absorption and storage in solid wood products consumers need from a single harvest on private post-fire planted forestlands. Table 9 doesn't include the removal of dead trees. Table 10 summarizes what has been accomplished and what is planned, in total, to recover greenhouse gases.

Table 9. Area planted on private and public forestlands after four wildfires, including FCEM estimates of CO2 absorbed and stored in solid wood products (as the CO2 equivalent of the carbon content of wood) from interim harvests on private lands.

Wildfire	Planted Private Land (acres)	Planted Public Land (acres)	Plantings on Burned Land (% area)	CO2 Recovered from Absorption (tons)	CO2 Recovered from Future Harvest (tons)	Total CO2 Recovered (tons)	Total CO2 Recovered (% of loss)
Angora Fire*	0	0	0	0	0	0	0
Fountain Fire**	59,840	0	100	10,954,924.3	1,988,954.3	12,943,878.6	99.2
Star Fire	2,230	2,185	39.1	1,589,327.5	164,083.3	1,753,410.8	39.3
Moonlight Fire***	17,613	0	31.1	6,188,153.6	1,132,210.9	7,320,364.5	37.2

* The Forest Service has no known plans to plant trees on burned areas.
** This excludes non-industrial private forestlands.
*** The Forest Service has no known plans to plant trees on burned areas. Tree planting on private forestlands is underway.

The most important question is: Can we recover from our mistake of letting forests become unnaturally overcrowded with trees and vulnerable to catastrophic wildfires? The answer is "yes", if we care about restoring our forests and fighting global warming. The results in Table 10 make the point.

Table 10. FCEM estimates of total CO2 recovered from dead tree removal, planting, and an interim harvest of planted trees on private forestlands for the four wildfires analyzed.

Wildfire	Grand Total of CO2 Recovered (tons)	Grand Total of CO2 Recovered (% of loss)
Angora Fire	0	0
Fountain Fire	14,870,916.7	114.0
Star Fire	2,247,290.9	50.4
Moonlight Fire	8,235,783.8	41.9

This report documents accomplishments, planned and completed, to reduce greenhouse gas emissions from four areas blackened by catastrophic wildfires. Even so, opportunities still exist to do even more to restore these burned forests and fight global warming. The Fountain Fire is already a success story and private forest landowners and the Forest Service are restoring much of the area burned by the Star Fire. However, forests burned by the Angora and Moonlight Fires still present opportunities for action.

The Angora Fire

The Angora Fire of 2007 charred 3,100 acres of forest in the Tahoe Basin because the trees were so dense. High winds hurled burning embers as far as two miles ahead of the fire front. The sky rained fire on homes and forests, setting them ablaze and covering everything in ash and smoke. Many homeowners had no chance to save their houses, even with defensible space.

Using pre-fire data for the forest burned in the Angora Fire, FCEM estimates that combustion emissions could have been lowered from 46.2 tons per acre to 12 tons per acre if the density of trees had been reduced from 273 per acre to the more natural density of 60 per acre. A fire burning in the same forest after thinning would have killed few large trees, covered far less acreage, and left adjacent communities relatively unharmed.

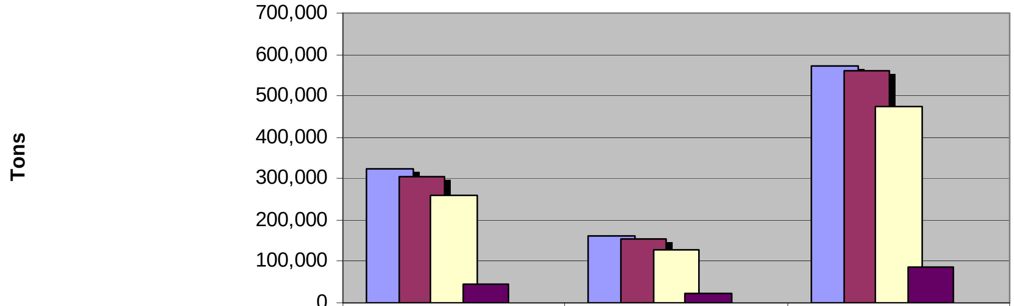
That is what could have been, but it also illustrates the opportunity that still exists to protect the rest of the Tahoe Basin, especially Lake Tahoe, and prevent massive greenhouse gas emissions. The Angora Fire illustrates a disaster that will occur again in the Tahoe Basin, but on a larger scale and with far more devastating consequences if the forest isn't restored to its historic crown-fire resistant condition.

The next question is: What do we do on the area burned by the Angora Fire? FCEM provides estimates of the climate-related benefits of taking action now to restore the forest before the opportunity slips away.

Fire-killed trees decay rapidly. The window of opportunity for removing dead trees while they still have economic value lasts about two years, and one year has already been wasted. That means that harvesting trees in 2008 could provide the money needed to plant a new forest. Waiting another year will be too late because the trees will decay and lose their economic value. As a result, the area probably won't be planted because the government can't afford it.

Either way, it is essential to remove dead trees. Not only does it make it safe to plant, but it also reduces emissions from decay by storing CO_2 in solid wood products. Equally important, removing dead trees and replanting would help protect surrounding communities from a second wildfire, which is called a re-burn, that often occurs in fire-killed forests that become brush fields filled with dead trees.

Figure 2 illustrates what could be accomplished to recover greenhouse gas emissions from the Angora Fire. These estimates are based on 80 percent overstory mortality, which means about 2,356 acres of the forested portion of the 3,100 acres burned in the fire are available for dead tree removal and planting. FCEM estimates that 98 percent of CO_2 lost in the wildfire could be recovered during a 100-year period by removing dead trees before they decay, converting them into solid wood products, and planting young trees that absorb carbon from the atmosphere.



	Total Biomass (no soil)	Total Carbon (no soil)	Total CO2 (no soil)
Loss (combustion & decay)	323,057.5	161,528.7	571,543.2
Total recovered (trees & wood)	305,356.1	152,678.0	560,328.4
Recovered (planted trees)	258,993.4	129,496.7	475,253.0
Recovered (dead tree wood)	46,362.6	23,181.3	85,075.4
Recovered (harvested wood)	0.0	0.0	0.0

Figure 2. FCEM estimates of biomass, carbon, and CO2 lost from combustion and decay in the Angora Fire and the amount that could be recovered from converting dead trees into solid wood products (computed as the CO2 equivalent of the carbon content of wood) and absorption from the atmosphere by photosynthesis from planted trees. (This is a national forest, so it is unlikely that CO2 will be stored in solid wood products from the future harvest of trees planted in burned areas.)

The Moonlight Fire

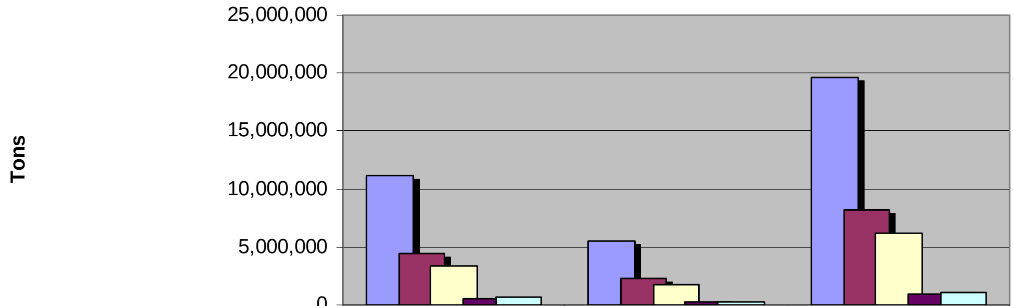
The 2007 Moonlight Fire burned 65,714 acres in the Plumas National Forest in the northern Sierra Nevada. This was a catastrophic wildfire. Private forest landowners are removing dead trees and planting young trees on their forestland. As of winter 2007-2008, the Forest Service hasn't released a plan to restore public forestlands.

Even so, the opportunity still exists to recover all the CO2 lost in the Moonlight Fire if the process of dead tree removal and planting begins in the summer of 2008. After that, it is unlikely that anything will be done on public lands because of the enormous cost.

Without money made available from harvesting and selling fire-killed trees, there is little chance that the Forest Service will be able to pay to remove dead trees, plant young trees, and manage the young forest by releasing overtopping brush to ensure that a brush field doesn't take over the area.

The Moonlight Fire killed about 90 percent of the larger trees, which means 56,972 acres of the forested portion that burned in the fire are available for dead tree removal and planting. Private forest landowners are removing dead trees and replanting on 17,613 acres, which is 95 percent of their acres. The Forest Service has 39,359 acres available for dead tree removal and planting.

Figure 3 illustrates what could be accomplished, including what private forest landowners are already doing, to recover greenhouse gas emissions from the Moonlight Fire if the Forest Service takes action to restore their forestland. FCEM estimates that 112.7 percent of the CO2 lost in the wildfire could be recovered in 100 years by removing dead trees, converting them into solid wood products, planting young trees that absorb carbon from the atmosphere, and in several decades, creating wood products from harvesting trees from replanted private forestlands.



	Total Biomass (no soil)	Total Carbon (no soil)	Total CO2 (no soil)
Loss (combustion & decay)	11,113,808.1	5,556,904.0	19,657,975.0
Total recovered (trees & wood)	4,488,165.6	2,244,082.8	8,235,783.8
Recovered (planted trees)	3,372,290.8	1,686,145.4	6,188,153.6
Recovered (dead tree wood)	498,866.2	249,433.1	915,419.4
Recovered (harvested wood)	617,008.6	308,504.3	1,132,210.9

Figure 3. FCEM estimates of biomass, carbon, and CO2 lost from combustion and decay in the Moonlight Fire and the amount that could be recovered from converting dead trees into solid wood products (computed as the CO2 equivalent of the carbon content of wood) and absorption from the atmosphere by photosynthesis from planted trees. (This estimate includes CO2 stored in solid wood products from the future harvest of trees planted on private forestlands.)

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Appendix A: The Forest Carbon and Emissions Model (FCEM)

Only recently has it been possible to estimate greenhouse gas emissions from wildfires and insect infestations. The Forest Carbon and Emissions Model (FCEM) used in this study is at the forefront of making these estimates (Bonnicksen 2008). The model is unique among available carbon models because of its simplicity and relevance to forest management. Even so, there is no accepted standard model for greenhouse gas emissions and carbon sequestration.

FCEM is a deterministic biomass-based model that uses an Excel spreadsheet to compute estimates. The model calculates estimates by systematically linking existing equations, ratios, and conversion and emission factors from a variety of recently published peer-reviewed scientific and other technical sources. The latter sources include non-peer-reviewed reports from universities, government agencies, and consulting firms.

In particular, FCEM computes above ground tree biomass using generalized allometric equations approved by the California Climate Action Registry (2007) as shown in FCEM Report 1 (Bonnicksen 2008) and reports cited by California Climate Action Registry (Brown et al. 2004a, 2004b, 2004c). FCEM computes estimates based on formulas and data from specific areas rather than relying on extrapolating results from case studies or generic forests and applying them to other places that may or may not be similar.

FCEM is a tool for conducting preliminary inventories of forest biomass, carbon, and CO2 stored in a particular forest, now or in the future, including tree stems, roots, foliage, branches, litter, duff, understory, down dead, standing dead, and soil. Other more comprehensive models should be used for scientific investigations and carbon accounting.

FCEM also includes four scenarios for estimating the impacts of fire and insect infestations, the benefits of removing dead trees and converting them into solid wood products, thinning, and planting. The model also estimates the relative impacts of wildfire and prescribed fire on emissions, before and after thinning, and thinning with and without prescribed fire. FCEM compares impacts and benefits in terms of greenhouse gas emissions and carbon sequestration and storage.

The goal behind the Forest Carbon and Emissions Model (FCEM) is to create an awareness of the impact of wildfire and insect infestations on greenhouse gas emissions and opportunities to prevent and recover from these disasters.

Scoping Comment Document #2

RED, Inc. Communications
P.O. Box 3067
Idaho Falls, ID 83403
Attn: Eddy Gulch LSR Project

RE: Eddy Gulch Late-Successional Reserve Fire/Habitat Protection Project Environmental Impact Statement

By Email and US Mail

Dear Sir or Madam:

We hereby comment on the scoping notice for the Eddy Gulch Late-Successional Reserve Fire/Habitat Protection Environmental Impact Statement. While we have some concerns with how this project will be implemented, we are happy that the Forest Service has proposed a plan that, by and large, will improve habitat, reduce fire danger and provide environmentally sensible wood fiber. Thank you for accepting these comments on behalf of KS Wild, the Environmental Protection Information Center, the Klamath Forest Alliance and the Klamath Riverkeeper. Contact information for our organizations may be found at the conclusion of this document.

The Klamath Siskiyou Wildlands Center is a 501(c)(3) certified environmental non-profit group that, over the past ten years, has dedicated itself to the preservation and rehabilitation of the remaining wild spaces of Northwest California and Southwest Oregon. KS Wild is an advocate for the forests and wildlife of the Klamath and Rogue River watersheds. We use environmental law, science, collaboration and education to defend healthy ecosystems and help build sustainable communities. The KS Wild has several hundred dues-paying members in Northern California.

In evaluating this proposal, we note with satisfaction the three resource objectives expressed in the introduction of the Proposed Action:

1. Community Protection – reduce wildfire threat to communities and municipal water supplies and increase public and firefighter safety.
2. Habitat Protection – Protect existing and future late-sucessional habitat from threats (of habitat loss) that occur inside and outside LSRs.
3. Habitat Development – Promote the continued development of late-successional characteristics.

We believe that the construction of 4.5 miles of temporary road is counterproductive to all three resource objectives; we trust that after careful review that you will agree. In our comments, we will address why we feel these are important goals and how the project will best address them. Given the numerous negative impacts that forest roads can have on all of the above resource objectives, we think it imperative that you examine an alternative that builds no 2.1
roads. We believe that upon examining a roadless alternative, you will conclude that a fair cost/benefit analysis will strongly suggest a road-free project is the superior course of action.

We Support Understory Burning

Our organizations have advocated for controlled burn fire management and environmentally sensitive thinning projects for many years. The Klamath-Siskiyou region is largely comprised of mixed evergreen forests that consist of fire-adapted conifers, hardwoods and chaparral. Wildland fire is an important natural disturbance in mixed evergreen forests, influencing their structure, composition, soil nutrient cycles, wildlife habitat and hydrology. Indigenous species evolved with fire, indeed, the life history of many *requires* fire.

Natural fire disturbances have historically ranged from gentle combustion to intense conflagrations. Such varied fire effects yield a mixed fire regime (Agee 1993) and produces a patchy mosaic of forest stands with ever-changing tree density, tree age and species composition (Willis & Stuart 1994). Patches now exhibiting “old-growth” character survived relatively frequent fires of low and moderate severity. However, very severe fires eventually interrupt this pattern and initiate new forest patches, enhancing the landscape mosaic (Taylor & Skinner 1998).

The mixed fire regime is a key contributor to local forests' unusual biodiversity (Martin & Sapsis 1992). It follows that biodiversity conservation depends on the active function of wildland fire throughout the ecosystem. Reintroduction of fire is the most important action to restore local forests because fire enables ecological processes like soil nutrient cycling. Most plant and animal communities in the region are adapted to, if not dependent on, fire disturbances. We are happy that the Forest Service agrees with us that carefully managed and administered fire is an irreplaceable element in the local ecology.

Additionally, our organizations strongly support fuel management near communities at-risk from wildfire. Authentic fuel reduction focuses on surface fuels and small trees in dense and previously logged forests. Controlled burning and cutting of low-hanging branches on standing trees can decrease the risk of fire traveling from the ground into tree crowns.

The need for fuel management varies across the landscape. As a result of industrial logging, livestock grazing and 50 years of effective fire suppression, some local forests have fuel complexes vulnerable to undesirable fire effects. Intentional burning is the most effective way to reduce hazardous fuels and calm wildfire behavior. The amount, continuity and moisture content of the smallest fuels on the ground surface (twigs, needles, grass) determine the rate of fire spread and the intensity of its heat energy release. Prescribed fire consumes dry and dead surface fuels and disrupts the continuity of "ladder fuels" that carry fire from the ground into tree crowns.

Prescribed burning is cost-effective. Investments of $300 per acre can burn several hundred acres at a time, although costs increase when pre-treatments of ladder fuels are needed for worker safety. Economic benefits of subsidies for hazardous fuel reduction include savings in future wildfire suppression costs, which exceeded $1 billion in 2000 and 2002.

The short period of effective fire suppression in Klamath Kiskiyou forests (~50 years) and the similarity of fire severity patterns experienced in recent wildfire events to historic conditions argue for wider use of naturally-ignited wildfires in less-than-extreme weather conditions to accomplish forest restoration. This suggests that, in addition to using prescribed fires, permitting wildfires to burn under specific conditions is compatible with conservation of biological diversity. We anticipate that once the Forest Service has completed its work in Eddy Gulch, that the area will be able to safely and productively withstand natural fire events.

We Support Small Diameter Thinning

For a number of years, our organizations have advocated small diameter thinning as a positive way to improve forest health and maintain an ecologically and economically sensible timber economy. While we recognize the value and encourage the thinning of ground and ladder fuels, we encourage the Forest Service to resist the temptation to remove larger diameter trees. 2.2 Fire behavior and severity depend on fuel properties and their spatial arrangement. Fuel bed structure plays a key role in fire ignition and spread, and is central to developing an effective fuel management strategy (Graham et al. 2004). The bulk density (weight within a given volume) of *surface fuels* consisting of grasses, shrubs, litter and dead woody material in contact with the ground are critical frontal surface fire behavior (heat output and spread rate - intensity) compared to simple fuel loading (weight per unit area) (Sandberg et al. 2001). High surface fire intensity usually increases the likelihood of overstory canopy ignition and torching (Scott and Reinhardt 2001).

The shrub and small tree fuel stratum also is important to crown fire ignition because it supports surface fire intensity and serves as *ladder fuel* that facilitates vertical movement of fire from the ground surface into the canopy. The size of the gap between the ground and tree canopies is critical to ignition of crown fire from a surface fire (*Id.*, Graham et al. 2004). Van Wagner (1977) reports that crown fires are ignited after a surface fire reaches critical fire line intensity relative to the height of the base of aerial fuels in the crown. This crown ignition can become a running crown fire if its spread rate surpasses a certain canopy density threshold. Agee (1996) suggests a *canopy bulk density* threshold of 0.1 kg/ha as a general determinant for crown fire activity under extreme weather conditions. However, Keyes and O'Hara (2002) note the incompatibility of such open forest conditions with key forest management objectives including wildlife conservation and prevention of understory initiation and ladder fuel development, especially in the absence of an institutional commitment to stand maintenance.

Omi and Martinson (2002) found that height to live crown, the variable that determines crown fire initiation rather than propagation, had the strongest correlation to fire severity in the areas we sampled. They also found the more common stand descriptors of stand density and basal area to be important factors. But especially crucial are variables that determine tree resistance to fire damage, such as diameter and height. Thus, "fuel treatments" that reduce basal area or density from above (i.e., removal of the largest stems) will be ineffective within the context of wildfire management.

A key implication of the study is the importance of treating fuels "from below" in order to prevent widespread occurrence of stand replacing wildland fires. Keyes and O'Hara (2002) concur that increasing a stand's crown base height is critical and argue, "pruning lower dead and live branches yields the most direct and effective impact." "To reduce fire damage from wildfires, future thinning operations must concentrate on small trees with operations called low thinning, removing the trees that have invaded these sites since fire exclusion began, and cleaning up the debris…By leaving the largest trees and treating fuels, fire tolerant forest conditions are created, so that fire severity can be significantly reduced." (Agee 1997)

Much of the observed high-severity "reburn" effects happened where post-fire salvage logging in 1977 had left behind flammable slash and tree plantations. Tree plantations, which typically follow high-severity fires under traditional forestry practices, exhibited "twice the burn severity" of closed canopy forests (20 percent), even though they accounted for only four (4) percent of the study area. The relative combustibility of structurally homogenous tree plantations supports a self-reinforcing "feedback" dynamic of high-severity fires, and the authors anticipate continued high-severity fires in roaded and planted portions of the landscape.

While we generally support thinning small-diameter trees in the project area, particularly 2.3
near homes and communities, it is critical to recognize that widespread logging may not influence fire and fuel hazard in the manner that the Forest Service predicts. Hence we urge the agency to proceed with caution and avoid excessive damage to forest resources from harmful practices like road construction, tractor yarding, and yarding through riparian reserves.

We Believe that Road Construction is Contrary to the Project's management Objectives

We draw attention, once again, to the resource objectives to the proposed action: 2.4 . . .
Community protection, habitat protection and habitat development. As discussed above, we feel that controlled burns and small diameter thinning are excellent methods for achieving these objectives. On the contrary, road building is likely to frustrate all three of these objectives. Under community protection, the project summary indicates a need to protect community water supplies; roads contribute to sedimentation and pollution of water supplies. Roads, rather than

protecting “existing and future late-successional habitat,” are, themselves, one of the greatest threats to the continued viability of LSR habitat. Similarly, road construction leads to the degradation, rather than the continued development of late-successional characteristics.

Please note that while new road construction is often described by the agency as "temporary," that all new road construction results in long-term impacts to soil health and productivity. Further, once trees are removed from the roadway, they cannot be put back. Please note that the joint BLM and USFS Biscuit Fire Recovery Project DEIS found that "Creation of temporary logging roads is an irreversible commitment of the soil resource, as such areas rarely regain their former productivity." 2.4 . . .

To better inform your decision-making, we have attached an article by Trombulack and Frissell (2000) detailing some of the negative impacts of road construction and use on Terrestrial and Aquatic ecosystems. The Forest Service must address and avoid the harmful impacts detailed in this study. The abstract for the article reads as follows: 2.4 . . .

> Roads are a widespread and increasing feature of most landscapes. We reviewed the scientific literature on the ecological effects of roads and found support for the general conclusion that they are associated with negative effects on biotic integrity in both terrestrial and aquatic ecosystems. Roads of all kinds have seven general effects: mortality from road construction, mortality from collision with vehicles, modification of animal behavior, alteration of the physical environment, alternative of the chemical environment, spread of exotics, and increased use of areas by humans. Road construction kills sessile and slow-moving organisms, injures organisms adjacent to a road, and alters physical conditions beneath a road. Vehicle collisions affect the demography of many species, both vertebrates and invertebrates; mitigation measures to reduce roadkill have been only partly successful. Roads alter animal behavior by causing changes in home ranges, movement, reproductive success, escape response, and physiological state. Roads change soil density, temperature, soil water content, light levels, dust, surface waters, patterns of runoff, and sedimentation, as well as adding heavy metals (especially lead), salts, organic molecules, ozone, and nutrients to roadside environments. Roads promote the dispersal of exotic species by altering habitats, stressing native species, and providing movement corridors. Roads also promote increased hunting, fishing, passive harassment of animals, and landscape modifications. Not all species and ecosystems are equally affected by roads, but overall the presence of roads is highly correlated with changes in species composition, population sizes, and hydrologic and geomorphic processes that shape aquatic and riparian systems. More experimental research is needed to complement post-hoc correlative studies. Our review underscores the importance to conservation of avoiding construction of new roads in roadless or sparsely

roaded areas and of removal or restoration of existing roads to benefit both terrestrial and aquatic biota.

-Trombulak, S.C. and C.A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. Conservation Biology 14(1): 18-30.

The LSR Project proposes four and a half miles of new road construction that will increase soil erosion. Road location, design, construction and engineering practices have improved over time, but few studies have systematically and quantitatively evaluated whether newer practices result in lower erosion rates (Gucinski et al. 2001). Even with improved practices and maximum mitigation, total accelerated erosion and sediment yields are still at least 50 percent or more than natural yields over time (Gucinski et al. 2001, Megahan et al. 1995).

The EIS should consider risks to slope stability posed by new road construction. Road construction on any hill slope, particularly at mid-slope locations, inevitably decreases site stability for a number of reasons: 2.4 . . .

- Cuts and fills make slopes steeper and decrease their stability.
- Cutslope excavation undercuts hillside support.
- Surface and subsurface water drainage paths change and concentrate.
- Vegetation and anchoring root systems disappear from the road prism.

The NEPA document must anticipate risks posed by building new roads, including the possibility of road failure and resulting damage to downstream resources (see Gucinski et al. 2001, p. 19). 2.4 . . .

Proposed road construction will harm water quality

Roads contribute more sediment to streams than any other land management activity (Gibbons and Salo 1973). Substantial increases in sedimentation are unavoidable even when the most cautious road construction methods are used (Gucinski et al. 2001, McCashion and Rice 1983). On granitic landtypes, the volume of sediment produced is directly proportional to road distance. Researchers attribute 91 percent (66,000 cubic yards) of the annual sediment production by land-use activities (72,200 cubic yards total) in the South Fork of the Salmon River to roads and logging skid trails (Arnold and Lundeen 1968, cited in Gucinski et al. 2001). Roaded and logged watersheds in the same basin also feature significantly higher channel bed substrate embeddedness than do undeveloped watersheds (Burns 1984, cited in Gucinski et al. 2001). In other words, roads harm fish habitat.

Road-stream crossings inevitably cause significant sedimentation, largely resulting from channel fill around culverts and subsequent road crossing failures (Furniss et al. 1991, Trombulak and Frissell 2000). Plugged culverts and fill slope failures frequently happen and lead to "catastrophic increases" in stream channel sediment (Weaver et al. 1995). Road-stream crossings create unnatural channel widths, slope and streambed form both upstream and downstream from the crossings, and these alterations of channel morphology can persist for long periods (Heede 1980). Channelized stream sections resulting from rip-rapping roads adjacent to stream channels are directly affected by sediment from side casting and road grading, and such activities can trigger fill slope erosion and failures (Gucinski et al. 2001).

Conclusion

The literature is rife with proof that roads, even temporary ones, cause long-lasting harm to habitat values and water quality. We don't feel that the above observation is seriously in dispute. In fact, the Service's own study has concluded, "High open road density in some areas of the watershed contributes to habitat fragmentation, disturbance to wildlife, increased sedimentation, and changes in runoff patterns." Lower South Fork Salmon Ecosystem Analysis, Table 6-7. Further, "Roads increase the potential for mass wasting and channel scour by altering the flow of water and decreasing slope stability. The cut and fill slopes with steepened slopes and lack of vegetation contribute to slope failure. The road surface increases flow during storms. The increased runoff from roads contributes to mass wasting and channel scour...Roads also greatly increase soil erosion." North Fork Salmon Ecosystem Analysis 5-7. We agree with the Forest Service's analysis. We believe that the plain conclusions of these documents, as the pertain to roads, should cast a strong presumption against road construction.

In view of the fact that the Service's stated aim in this project is to protect current habitat, 2.4
improve future habitat and protect water supply, we feel that the Service must seriously consider an alternative that accomplishes the proposed thinning without road building. Because the permanent impacts of temporary roads frustrate the purposes of the project, we encourage the service to examine how it can meet its goals without them.

Thank you once again for conducting this project, and considering our comments.

Sincerely,

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Appendix A

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Appendix B

Review of Ecological Effects of Roads

from

Conservation Biology

(Feb. 2000)

Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities

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Abstract: *Roads are a widespread and increasing feature of most landscapes. We reviewed the scientific literature on the ecological effects of roads and found support for the general conclusion that they are associated with negative effects on biotic integrity in both terrestrial and aquatic ecosystems. Roads of all kinds have seven general effects: mortality from road construction, mortality from collision with vehicles, modification of animal behavior, alteration of the physical environment, alteration of the chemical environment, spread of exotics, and increased use of areas by humans. Road construction kills sessile and slow-moving organisms, injures organisms adjacent to a road, and alters physical conditions beneath a road. Vehicle collisions affect the demography of many species, both vertebrates and invertebrates; mitigation measures to reduce roadkill have been only partly successful. Roads alter animal behavior by causing changes in home ranges, movement, reproductive success, escape response, and physiological state. Roads change soil density, temperature, soil water content, light levels, dust, surface waters, patterns of runoff, and sedimentation, as well as adding heavy metals (especially lead), salts, organic molecules, ozone, and nutrients to roadside environments. Roads promote the dispersal of exotic species by altering habitats, stressing native species, and providing movement corridors. Roads also promote increased hunting, fishing, passive harassment of animals, and landscape modifications. Not all species and ecosystems are equally affected by roads, but overall the presence of roads is highly correlated with changes in species composition, population sizes, and hydrologic and geomorphic processes that shape aquatic and riparian systems. More experimental research is needed to complement post-hoc correlative studies. Our review underscores the importance to conservation of avoiding construction of new roads in roadless or sparsely roaded areas and of removal or restoration of existing roads to benefit both terrestrial and aquatic biota.*

Revisión de los Efectos de Carreteras en Comunidades Terrestres y Acuáticas

Resumen: *Las carreteras son una característica predominante y en incremento de la mayoría de los paisajes. Revisamos la literatura científica sobre los efectos ecológicos de las carreteras y encontramos sustento para la conclusión general de que las carreteras están asociadas con efectos negativos en la integridad biótica tanto de ecosistemas terrestres como acuáticos. Las carreteras de cualquier tipo ocasionan siete efectos generales: mortalidad ocasionada por la construcción de la carretera; mortalidad debida a la colisión con vehículos; modificaciones en la conducta animal; alteración del ambiente físico; alteración del ambiente químico; dispersión de especies exóticas e incremento en el uso de áreas por humanos. La construcción de carreteras elimina a organismos sésiles y a organismos de lento movimiento, lesiona a organismos adyacentes a la carretera y altera las condiciones físicas debajo ella misma. Las colisiones con vehículos afectan la demografía de muchas especies tanto de vertebrados como invertebrados; las medidas de mitigación para reducir la pérdida de animales por colisiones con vehículos han sido exitosas solo de manera parcial. Las carreteras alteran la conducta animal al ocasionar cambios en el rango de hogar, movimientos, éxito reproductivo, respuesta de escape y estado fisiológico. Las carreteras cambian la densidad del suelo, temperatura, contenido de agua en el suelo, niveles de luz, polvo, aguas superficiales, patrones de escurrimiento y sedimentación, además de agregar metales pesados (especialmente plomo), sales, moléculas orgánicas, ozono y mutrientes a los ambientes que atraviesan. Las carreteras promueven la dispersión de especies exóticas al alterar los hábi-*

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tats, al estresar a las especies nativas y proveer corredores para movimiento. Las carreteras también promueven el incremento de la caza y la pesca, el hostigamiento pasivo de animales y modificaciones del paisaje. No todas las especies ni todos los ecosistemas son afectados por las carreteras de igual forma, pero en general la presencia de carreteras está altamente correlacionada con cambios en la composición de especies, los tamaños poblacionales y los procesos hidrológicos y geomorfológicos que afectan a la estructura de sistemas acuáticos y reparios. Se necesita más investigación experimental para complementar estudios correlativos post-hoc. Nuestra revisión hace énfasis en que en trabajos de conservación es importante evitar la construcción de nuevas carreteras en áreas carentes de ellas o en áreas con pocas carreteras, además de remover o restaurar carreteras existentes con la finalidad de beneficiar tanto a la biota acuática como la terrestre.

Introduction

Among the most widespread forms of modification of the natural landscape during the past century has been the construction and maintenance of roads (Diamondback 1990; Bennett 1991; Noss & Cooperrider 1994). As conservation biologists seek to understand the forces that influence the viability of populations and the overall health of ecosystems, it is important that we understand the scope of the ecological effects of roads of all types, especially important as conservation biologists are asked to participate in the development and implementation of strategies to protect or restore elements of biological diversity and integrity.

Roads of all kinds affect terrestrial and aquatic ecosystems in seven general ways: (1) increased mortality from road construction, (2) increased mortality from collision with vehicles, (3) modification of animal behavior, (4) alteration of the physical environment, (5) alteration of the chemical environment, (6) spread of exotic species, and (7) increased alteration and use of habitats by humans. These general effects overlap somewhat. In some cases animals modify their behavior and avoid roads because of concentrated human activity along roads. Roads may facilitate the spread of invasive species by disrupting native communities and changing physical habitats. Roads may fragment populations through roadkill and road avoidance. Despite the difficulty of categorizing discretely the causal basis in every example, these seven categories provide a useful framework for assessing what is known and unknown about the ecological effects of roads.

Selective road removal, relocation, or remediation may provide ecological benefits in certain situations. Yet, although roads are commonly identified as important correlates or indicators of loss of ecological health (e.g., Noss & Cooperrider 1994), the specific mechanisms by which biota are affected are often complicated or uncertain. Therefore, mitigation or treatment of specific effects, whether during road design or in post-construction remediation, can be costly and fraught with uncertainty.

Mortality from Road Construction

Road construction kills any sessile or slow-moving organism in the path of the road. The extent to which road construction contributes to direct mortality has not been estimated as has direct mortality from other forms of habitat destruction (e.g., Petranka et al. 1993). The fact that road construction kills individual organisms is obvious, however. The magnitude of such construction is not trivial; the 13,107,812 km of road lanes of all types in the conterminous United States, with an average width of 3.65 m per lane, have destroyed at least 4,784,351 ha of land and water bodies that formerly supported plants, animals, and other organisms (U.S. Department of Transportation 1996). The actual number is likely much higher because this estimate does not include shoulder pavement and land peripheral to the roadbed that is cleared during construction.

Construction may physically injure organisms adjacent to the path of construction. Roads built for extraction of white fir result in damage to trees that is visible up to 30 m from the road (Trafela 1987). Such damage contributes to a decline of up to 30% in forest productivity per rotation, due in part to a decline in growth of damaged trees. Construction also alters the physical conditions of the soil underneath and adjacent to the road. Riley (1984) showed that road construction increases soil compaction up to 200 times relative to undisturbed sites. These changes likely decrease the survival of soil biota that are not killed directly. Direct transfer of sediment and other material to streams and other water bodies at road crossings is an inevitable consequence of road construction (Richardson et al. 1975; Seyedbagheri 1996). High concentrations of suspended sediment may directly kill aquatic organisms and impair aquatic productivity (Newcombe & Jensen 1996).

Mortality from Collision with Vehicles

Mortality of animals from collision with vehicles is well documented. Many reviews of the taxonomic breadth of the victims of vehicle collision have been published (e.g., Groot Bruinderink & Hazebroek 1996). Few if any terrestrial species of animal are immune. Large mammals ranging in size from moose (*Alces alces*) to armadillos (*Dasypus novemcinctus*) are the best-documented roadkills, probably due to interest in their demography and to their size (Bellis & Graves 1971; Puglisi et al. 1974;

Reilly & Green 1974; Holroyd 1979; Wilkins & Schmidly 1980; Bashore et al. 1985; Davies et al. 1987; Bangs et al. 1989; Palomares & Delibes 1992).

Roadkill among many other species includes American Kestrels (*Falco sparverius*; Varland et al. 1993), Barn Owls (*Tyto alba*; Newton et al. 1991), Northern Saw-whet Owls and Eastern Screech Owls (*Aegolius acadicus and Otis asio*; Loos & Kerlinger 1993), tropical forest birds (Novelli et al. 1988), garter snakes (Dalrymple & Reichenbach 1984), granivorous birds (Dhindsa et al. 1988), American crocodile (*Crocodylus acutus*; Kushlan 1988), green iguanas (*Iguana iguana*; Rodda 1990), desert snakes (Rosen & Lowe 1994), toads (van Gelder 1973), plus a wide range of invertebrates, especially insects (H. C. Seibert & Conover 1991).

This form of mortality can have substantial effects on a population's demography. Vehicle collision is the primary cause of death for moose in the Kenai National Wildlife Refuge in Alaska (Bangs et al. 1989) and for Barn Owls in the United Kingdom (Newton et al. 1991), the second highest form of mortality for Iberian lynx (*Felis pardina*) in southwestern Spain (after hunting; Ferreras et al. 1992), and the third highest form for white-tailed deer (*Odocoileus virginianus*) in New York (Sarbello & Jackson 1985) and wolves (*Canis lupus*) in Minnesota (Fuller 1989). Roadkill is a limiting factor in the recovery of the endangered American crocodile in southern Florida (Kushlan 1988) and is contributing to the endangerment of the prairie garter snake (*Thamnophis radix radix*; Dalrymple & Reichenbach 1984). Roadkill is often nonspecific with respect to age, sex, and condition of the individual animal (e.g., Bangs et al. 1989).

Amphibians may be especially vulnerable to roadkill because their life histories often involve migration between wetland and upland habitats, and individuals are inconspicuous and sometimes slow-moving. Roads can be demographic barriers that cause habitat and population fragmentation (Joly & Morand 1997). In the Netherlands, for example, roads with high traffic volume negatively affect occupancy of ponds by moor frogs (*Rana arvilis*; Vos & Chardon 1998). In Ontario, the local abundance of toads and frogs is inversely related to traffic density on adjacent roads, but the incidence of roadkill relative to abundance is higher on highly trafficked roads (Fahrig et al. 1995). Thus, even though populations in high-traffic areas have apparently already been depressed from cumulative road mortality, they continue to suffer higher proportionate rates of roadkill.

Mitigation measures have been employed in different locations with varying degrees of success (e.g., Yanes et al. 1995). For example, underpasses on Interstate 75 have been only partially successful in reducing roadkill of Florida panthers (*Felis concolor coryi*; Foster & Humphrey 1991). Despite mitigation efforts, roads are likely to be a persistent source of mortality for many species. In general, mortality increases with traffic volume (e.g., Rosen & Lowe 1994; Fahrig et al. 1995). Some species are less likely to be killed on high-speed roads than on medium-speed roads because the former usually have vegetation cleared back further from the road's shoulder, creating less attractive habitat and greater visibility for both animals and drivers. Other species, however, are attracted to the modified habitat alongside and in the meridians of high-speed roads (Cowardin et al. 1985), making them population sinks.

Modification of Animal Behavior

The presence of a road may modify an animal's behavior either positively or negatively. This can occur through five mechanisms: home range shifts, altered movement patterns, altered reproductive success, altered escape response, and altered physiological state.

Black bears (*Ursus americanus*) in North Carolina shift their home ranges away from areas with high road densities (Brody & Pelton 1989), as do grizzly bears in the Rocky Mountains (*Ursus horribilis*; McLellan & Shackleton 1988). Elk (*Cervus elaphus*) in Montana prefer spring feeding sites away from visible roads (Grover & Thompson 1986), and both elk and mule deer (*Odocoileus hemionus*) in Colorado in winter prefer areas >200 m from roads (Rost & Bailey 1979). Wolves will not establish themselves in areas with road densities greater than a region-specific critical threshold (Jensen et al. 1986; Thurber et al. 1994), probably as a result of a relationship between road density and hunting pressure. Mountain lion (*Felis concolor*) home ranges are situated in areas with lower densities of improved dirt roads and hard-surface roads (Van Dyke et al. 1986), suggesting that either mountain lions avoid these areas or road construction tends to avoid their prime habitat. Elephants (*Loxodonta africana*) in northeastern Gabon preferentially locate in forests away from both roads and villages (Barnes et al. 1991). Both Black Vultures (*Coragyps atratus*) and Turkey Vultures (*Cathartes aura*), on the other hand, preferentially establish home ranges in areas with greater road densities (Coleman & Fraser 1989), probably because of the increase in carrion.

Roads may also alter patterns of animal movement. Caribou (*Rangifer tarandus*) in Alaska preferentially travel along cleared winter roads that lead in the direction of their migration (Banfield 1974). Although the road may enhance caribou movement, it results in increased mortality from vehicle collisions and predation by wolves. After calving, female caribou with calves avoid roads (Klein 1991). The land snail *Arianta arbustorum* avoids crossing roads, even those that are unpaved and as narrow as 3 m (Baur & Baur 1990), and extend their movements along road verges. Reluctance to cross roads is also seen in white-footed mice (*Peromyscus *leucopus*; Merriam et al. 1989) and many other rodent species (Oxley et al. 1974), even when the road is narrow and covered only with gravel. Cotton rats (*Sigmodon hispidus*) and prairie voles (*Microtus ochrogaster*) avoid roads as narrow as 3 m (Swihart & Slade 1984). Black bear almost never cross interstate highways in North Carolina (Brody & Pelton 1989) but will cross roads with less traffic volume. Roads act as barriers to gene flow in the common frog (*Rana temporaria*) in Germany, leading to significant genetic differentiation among populations (Reh & Seitz 1990). Other animals that show a reluctance to cross roads include pronghorn antelope (*Antilocapra americana*; Bruns 1977) and mountain lions (Van Dyke et al. 1986).

Some animals seem unaffected by the presence of roads, at least at some spatial scales. Based on a study of 20 wolverines, Hornocker and Hash (1981) concluded that the sizes and shapes of home ranges of wolverines where they are still found in northwestern Montana are independent of the presence of highways. Similarly, the presence of highways explained none of the allelic differentiation among populations of brown hares (*Lepus europaeus*) in Austria (Hartl et al. 1989).

Roads may affect an animal's reproductive success. Productivity of Bald Eagles (*Haliaeetus leucocephalus*) in Oregon (Anthony & Isaacs 1989) and Illinois (Paruk 1987) declines with proximity to roads, and they preferentially nest away from roads. Golden Eagles (*Aquila chrysaetos*) also prefer to nest away from human disturbances, including roads (Fernandez 1993). The reduced nesting success of eagles in proximity to roads may be more a function of the presence of humans than of the road itself; nesting failure by Golden Eagles in Scotland correlates with how easy it is for people to approach but not with proximity to roads themselves (Watson and Dennis 1992). Relative to habitat availability, Sandhill Cranes (*Grus canadensis*) avoid nesting near paved and gravel public roads (Norling et al. 1992); they do not avoid private roads with low-traffic volume (Norling et al. 1992) and can habituate to roads over time (Dwyer & Tanner 1992). Mallards (*Anas platyrhynchos*) in North Dakota, on the other hand, prefer road rights-of-way for nesting (Cowardin et al. 1985), perhaps because of a lower level of predation there.

Roads can also alter escape responses. Pink-footed Geese (*Anser brachyrhynchus*) in Denmark are more easily disturbed when feeding near roads, flying away when humans approach within 500 m, a greater distance than when feeding in areas without roads (Madsen 1985). Both the Lapwing (*Vanellus vanellus*) and Black-tailed Godwit (*Limosa limosa*) are more easily disturbed near roads and have disturbance distances of 480–2000 m depending on traffic volume (Van der Zande et al. 1980). Less well known is the effect of roads and vehicles on an animal's physiological state. MacArthur et al. (1979) showed that heart rate and therefore metabolic rate and energy expenditure of female bighorn sheep (*Ovis canadensis*) increase near a road independent of any use of the road. Roads contribute to fragmentation of populations through both increased mortality and modification of behavior that makes animals less likely to cross roads. Fragmentation may be accelerated by roads when spatially critical habitat patches (e.g., "stepping stones") become unoccupied as a result of increased local mortality or reduced recolonization.

Disruption of the Physical Environment

A road transforms the physical conditions on and adjacent to it, creating edge effects with consequences that extend beyond the time of the road's construction. At least eight physical characteristics of the environment are altered by roads: soil density, temperature, soil water content, light, dust, surface-water flow, pattern of runoff, and sedimentation.

Long-term use of roads leads to soil compaction that persists even after use is discontinued. Soil density on closed forest roads continues to increase, particularly during winter months (Helvey & Kochenderfer 1990). Increased soil density can persist for decades: logging skid trails in northeastern California over 40 years old have soil that is 20% more compacted than soil in nearby areas that have not been used as trails (Vora 1988).

The reduction of water vapor transport on a road with a hard surface increases the surface temperature of a road compared to bare soil, an effect that increases with thickness of the road surface (Asaeda & Ca 1993). The heat stored on the road surface is released into the atmosphere at night, creating heat islands around roads. Animals respond to these heat islands: small birds (Whitford 1985) and snakes, for example, preferentially aggregate on or near warm roads, increasing their risk of being hit by cars and, at their northern range limits, reducing energetic demands for breeding.

During the dry season, the moisture content of soils under roads declines even if the roads are not in use (Helvey & Kochenderfer 1990), probably in response to changes in soil porosity. Roads through forests also increase the amount of light incident on the forest floor. The amount of increase depends on how much of the original canopy and lower strata remain, which depends in turn on the width of the road and roadside verge. The increase in light increases the density of species that preferentially grow where light levels are high, such as early-successional, disturbance-adapted species such as the North American orchid *Isotria medeoloides* (Mehrhoff 1989).

Road traffic mobilizes and spreads dust, which when settled on plants can block photosynthesis, respiration, and transpiration and can cause physical injuries to plants (Farmer 1993). These effects are sufficient to alter plant community structure, especially in communities dominated by lichens and mosses (Auerbach et al. 1997). Although most sediment enters water bodies through overland flow or mass failure, dust from highly trafficked roads can serve as a source of fine sediments, nutrients, and contaminants to aquatic ecosystems (Gjessing et al. 1984).

Roads and bridges can alter the development of shorelines, stream channels, floodplains, and wetlands. Because of the energy associated with moving water, physical effects often propagate long distances from the site of a direct road incursion (Richardson et al. 1975). Alteration of hydrodynamics and sediment deposition can result in changes in channels or shorelines many kilometers away, both down- and up-gradient of the road crossing. The nature of such responses to channel and shoreline alteration is not always predictable; it may depend on the sequence of flood and sedimentation events after the alteration is made. Roads on floodplains can redirect water, sediment, and nutrients between streams and wetlands and their riparian ecosystems, to the detriment of water quality and ecosystem health. Roads are among the many human endeavors that impair natural habitat development and woody debris dynamics in forested floodplain rivers (Piégay & Landon 1997).

Road crossings commonly act as barriers to the movement of fishes and other aquatic animals (Furniss et al. 1991). Although many headwater populations of salmonid fishes are naturally migratory, they often persist today as fragmented headwater isolates, largely because of migration barriers created by road crossings and other human developments that fail to provide for fish passage (Kershner et al. 1997; Rieman et al. 1997). Salmonids and other riverine fishes actively move into seasonal floodplain wetlands and small valley-floor tributaries to escape the stresses of main-channel flood flows (Copp 1989), but valley-bottom roads can destroy or block access to these seasonally important habitats (Brown & Hartman 1988). Persistent barriers may encourage local selection for behaviors that do not include natural migration patterns, potentially reducing both the distribution and productivity of a population.

Roads directly change the hydrology of slopes and stream channels, resulting in alteration of surface-water habitats that are often detrimental to native biota. Roads intercept shallow groundwater flow paths, diverting the water along the roadway and routing it efficiently to surface-water systems at stream crossings (Megahan 1972; Wemple et al. 1996). This can cause or contribute to changes in the timing and routing of runoff (King & Tennyson 1984; Jones & Grant 1996; Ziemer & Lisle 1998), the effects of which may be more evident in smaller streams than in larger rivers (Jones & Grant 1996). Hydrologic effects are likely to persist for as long as the road remains a physical feature altering flow routing—often long after abandonment and revegetation of the road surface. By altering surface or subsurface flow, roads can destroy and create wetland habitats.

Changes in the routing of shallow groundwater and surface flow may cause unusually high concentrations of runoff on hillslopes that can trigger erosion through channel downcutting, new gully or channel head initiation, or slumping and debris flows (Megahan 1972; Richardson et al. 1975; Wemple et al. 1996; Seyedbagheri 1996). Once such processes occur, they can adversely affect fishes and other biota far downstream for long periods of time (Hagans et al. 1986; Hicks et al. 1991). Roads have been responsible for the majority of hillslope failures and gully erosion in most steep, forested landscapes subject to logging activity (Furniss et al. 1991; Hagans et al. 1986). Because most of these more catastrophic responses are triggered by the response of roads during infrequent, intense storm events, lag times of many years or decades pass before the full effects of road construction are realized.

Chronic effects also occur, however. The surfaces of unpaved roads can route fine sediments to streams, lakes, and wetlands, increasing the turbidity of the waters (Reid & Dunne 1984), reducing productivity and survival or growth of fishes (Newcombe & Jensen 1996), and otherwise impairing fishing (Buck 1956). Existing problem roads can be remediated to reduce future erosion potential (e.g., Weaver et al. 1987; Harr & Nichols 1993). The consequences of past sediment delivery are long-lasting and cumulative, however, and cannot be effectively mitigated (Hagans et al. 1986).

Alteration of the Chemical Environment

More has been written about the effects of roads on the chemical environment than on all other effects combined. Maintenance and use of roads contribute at least five different general classes of chemicals to the environment: heavy metals, salt, organic molecules, ozone, and nutrients.

A variety of heavy metals derived from gasoline additives and road deicing salts are put into the roadside environment. The most widely documented is lead, but others include aluminum, iron, cadmium, copper, manganese, titanium, nickel, zinc, and boron (Garcia-Miragaya et al. 1981; Clift et al. 1983; Gjessing et al. 1984; Oberts 1986; Araratyan & Zakharyan 1988).

Heavy metal contamination exhibits five patterns. First, the amount of contamination is related to vehicular traffic (Goldsmith et al. 1976; Dale & Freedman 1982; Leharne et al. 1992). Second, contamination of soils, plants, and animals decreases exponentially away from the road (Quarles et al. 1974; Dale & Freedman 1982). Most studies indicate that contamination declines within 20 m but that elevated levels of heavy metals often occur 200 m or more from the road. The pattern of decline is influenced by prevailing wind patterns (Haqus & Hameed 1986). Once metals reach aquatic environments, transport rates and distances increase substantially (Gjessing et al. 1984).

Third, heavy metals can be localized in the soil, either close to the surface if downward transport has not occurred (Indu & Choudhri 1991) or deep below the surface if pollution levels in the past exceeded those in the present (Byrd et al. 1983). Transportation and localization is largely affected by the physical properties of the soil (Yassoglou et al. 1987). Metals and other persistent chemicals fixed to soils may become remobilized once they are inundated or transported to freshwater environments by wind, water, or gravity.

Fourth, heavy metals accumulate in the tissues of plants (Datta & Ghosh 1985; Beslaneev & Kuchmazokova 1991) and animals (Collins 1984; Birdsall et al. 1986; Grue et al. 1986). As with soil, contamination of plant tissue occurs up to at least 200 m from a road and is greatest for individuals along roads with high traffic volume.

Fifth, heavy metal concentrations in soil decline over time where use of leaded gasoline has been stopped and surface-water flow carries the metal ions away (Byrd et al. 1983; Tong 1990). After they leave the terrestrial environment, however, the mobilized metals may cause additional harm to aquatic biota. Also, some of the processes of metal demobilization may be reversed rapidly if environmental conditions, such as acidity of the soils, sediments, or water, change (Nelson et al. 1991).

Deicing salts, particularly NaCl but also $CaCl_2$, KCl, and $MgCl_2$, contribute ions to the soil, altering pH and the soil's chemical composition (Bogemans et al. 1989). As with lead, discontinuation of the use of deicing salts allows plants damaged by salt stress to recover (Leh 1990). The effects on aquatic biota of temporary surges of salt that often accompany runoff from roads to surface and groundwaters have received little study. Deicing salts on roadways elevate chloride and sodium concentrations in streams (Molles & Gosz 1980; Hoffman et al. 1981; Peters & Turk 1981; Mattson & Godfrey 1994) and in bogs, where road salts can alter patterns of succession in aquatic vegetation (Wilcox 1986). Accumulation of salts from chemicals used for road deicing or dust control can disrupt natural stratification patterns and thus potentially upset the ecological dynamics of meromictic lakes (Hoffman et al. 1981; Kjensmo 1997).

Organic pollutants such as dioxins and polychlorinated biphenyls are present in higher concentrations along roads (Benfenati et al. 1992). Hydrocarbons may accumulate in aquatic ecosystems near roads (Gjessing et al. 1984). In one stream along a British highway, numerous contaminants were present at elevated levels in the water column and sediments, including copper, zinc, and various hydrocarbons, but polycyclic aromatic hydrocarbons associated with stream sediments accounted for most of the observed toxicity to aquatic amphipods (Maltby et al. 1995). Comparatively little research has focused on the questions of the fate and effects of the organic chemicals associated with roads.

Vehicles produce ozone, which increases the concentration of this harmful molecule in the air, especially in areas where vehicle exhaust accumulates (Flueckiger et al. 1984). Roads are also especially important vectors of nutrients and other materials to aquatic ecosystems, because the buffering role normally played by riparian vegetation (Correll et al. 1992) is circumvented through direct runoff of materials in water and sediment where roads abut or cross water bodies. Water moving on and alongside roadways can be charged with high levels of dissolved nitrogen in various forms, and sediment brings a phosphorus subsidy when it reaches surface waters. Road deicing salts are an additional source of phosphorus (Oberts 1986). The degree to which roads directly contribute to eutrophication problems in aquatic ecosystems has been little investigated. Because roads deliver nutrients that originate in the contributing slope area, the nutrient burden is probably largely controlled by surrounding vegetation and land use. An increased density of road crossings of water bodies can be expected to increase delivery of nutrients.

The alteration of the chemical environment by roads results in a number of consequences for living organisms. First, in the terrestrial environment the chemical composition of some woody plants changes in response to pollution. These changes include increased concentrations of chemicals produced by plants, such as terpenoids, which help them resist the toxic effects of pollution (Akimov et al. 1989) and salts (Bogemans et al. 1989), and decreased production of other chemicals, such as soluble protein and chlorophyll *a*, which are necessary for plant function (Banerjee et al. 1983).

Second, organisms may be killed or otherwise displaced as a result of chemical exposure. Virtually all measures of soil biotic diversity and function decline in contaminated soil, including abundance, number of species, species composition, index of species diversity, index of equability, and bulk soil respiration (Muskett & Jones 1981; Guntner & Wilke 1983; Krzysztofiak 1991).

Third, the growth (Petersen et al. 1982) and overall physical health (Flueckiger et al. 1984; Moritz & Breitenstein 1985) of many plants is depressed, even to the point of death (Fleck et al. 1988). The sensitivity of plants to pollutants may change during development; for example, seedlings are more sensitive to salt than are adults (Liem et al. 1984), which influences juvenile recruitment. Pollutants may affect plant health by damaging fine roots, mycorrhizae (Majdi & Persson 1989), and leaves (Simini & Leone 1986) and by changing salt concentrations in plant tissues (Northover 1987). Secondary effects on plant health include decreased resistance to pathogens (Northover 1987), causing further declines. In aquatic environments, plant (and animal) assemblages may change due to direct and indirect responses to nutrient increases and due to growth suppression or mortality caused by other chemicals introduced by roads.

Fourth, plants (Graham & Kalman 1974; Nasralla & Ali 1985; Dickinson et al. 1987; Guttormsen 1993) and animals (Robel et al. 1981; Collins 1984; Harrison & Dyer 1984; Krzysztofiak 1991; Marino et al. 1992), including those cultivated or raised for agriculture, may accumulate toxins at levels that pose health hazards, including those for humans that consume exposed organisms (Jarosz 1994).

Fifth, increased concentrations near roadsides of some pollutants, particularly salt, attract large mammals, putting them more at risk of being killed by vehicles (Fraser & Thomas 1982). Spills of edible products from trucks and trains also attract wildlife to roadsides. Finally, evolutionary processes may be affected through altered selection pressures that result in local differentiation of populations of both plants (Kiang 1982) and animals (Minoranskii & Kuzina 1984).

Spread of Exotic Species

Roads provide dispersal of exotic species via three mechanisms: providing habitat by altering conditions, making invasion more likely by stressing or removing native species, and allowing easier movement by wild or human vectors. It is often difficult to distinguish among these factors. Soils modified during road construction can facilitate the spread of exotic plants along roadsides (Greenberg et al. 1997). Some exotic plants establish themselves preferentially along roadsides and in other disturbed habitats (Wester & Juvik 1983; Henderson & Wells 1986; Tyser & Worley 1992; Wein et al. 1992). The spread of exotic diseases (Dawson & Weste 1985; Gad et al. 1986) and insects (Pantaleoni 1989; Schedl 1991) is facilitated by increased density of roads and traffic volume. Road construction that alters the canopy structure of forests promotes invasion by exotic understory plants, which affects animal communities (Gaddy & Kohlsaat 1987). Some roadside verges have been invaded by maritime plants because of their ability to tolerate saline soil (Scott & Davison 1982). Feral fruit trees are found preferentially along roadsides, and some populations are maintained solely by seeds in fruit waste thrown from vehicles (Smith 1986).

Exotic species are sometimes introduced along roadsides for the purpose of erosion control (Niordson 1989). Native species are now more widely preferred for this purpose, but Dunlap (1987) argues that in some cases the need for rapid establishment of plant cover requires the use of exotic species.

In another form of deliberate introduction, roads provide easy access to streams and lakes for fishery managers to stock nonnative hatchery fish (Lee et al. 1997), which adversely affect native biota and disrupt aquatic ecosystems in many ways (Allan & Flecker 1993). Unsanctioned, illegal, and unintentional introductions of fishes, mollusks, plants, and other aquatic organisms also occur frequently (Allan & Flecker 1993), and they are facilitated by public road access to water bodies.

The dispersal of a biological agent such as a pathogen along a roadway can affect both terrestrial and aquatic ecosystems far from the road. In northern California and southwest Oregon, for example, vehicle traffic and roadway drainage along logging and mining roads during the wet season disperse spores of an exotic root disease (*Phythoptera lateralis*) that infects the endemic Port Orford cedar (*Chamaecyparis lawsoniana*; Zobel et al. 1985). Transfer of the water-borne spores from forest roads into headwater stream crossings can result in the infection and nearly complete mortality of Port Orford cedars along a much larger network of downstream channel margins and floodplains, even deep inside otherwise roadless areas. The progressive loss of this important conifer species from riparian ecosystems may engender substantial long-term consequences for the integrity of stream biota, including endangered salmon species, for which the Port Orford cedar provides shade, large and long-lasting coarse woody debris, and stabilization of channels and floodplains.

Changes in Human Use of Land and Water

Roads facilitate increased use of an area by humans, who themselves often cause diverse and persistent ecological effects. New roads increase ease of access by humans into formerly remote areas. Perhaps more important, roads often increase the efficiency with which natural resources can be exported. At least three different kinds of human use of the landscape, made increasingly possible by roads, can have major ecological effects: hunting and fishing, recreation, and changes in use of land and water.

Roads open up areas to increased poaching and legal hunting. Hunting reduces population sizes of many game species, including brown bear (*Ursus arctos*; Camarra & Parde 1990), Iberian lynx (Ferreras et al. 1992), wolves (Fuller 1989), black bear (Manville 1983), and Egyptian mongooses (*Herpestes ichneumon*; Palomares & Delibes 1992). Roads also increase both legal and illegal fishing in streams and lakes. Native fish populations in previously inaccessible areas are often vulnerable to even small increases in fishing effort. Increased fishing then often gives rise to public demand for fish stocking as an attempt to artificially compensate for the effects of unsustainable harvest, at the further expense of native fishes and other species (e.g., Gresswell & Varley 1988).

Visitors increase when roads make areas more accessible, leading to increased passive harassment of animals—such as elk on Mount St. Helens in Washington State (Czech 1991) and the Oregon Coast Range (Witmer & DeCalesta 1985), brown bear in Europe (Del Campo et al. 1990), and mountain goats (*Oreamnos americanus*) in Montana (Pedevillano & Wright 1987)—and damage to plant communities (Matlack 1993).

Roads are often built into areas to promote logging, agriculture, mining, and development of homes or industrial or commercial projects. Such changes in land cover and land and water use result in major and persistent adverse effects on the native flora and fauna of terrestrial (Van Dyke et al. 1986; Karnefelt & Mattsson 1989; P. Seibert 1993) and freshwater ecosystems (Schlosser 1991; Allan & Flecker 1993; Roth et al. 1996).

Numerous studies have demonstrated declines in stream health associated with roads. Because the nature and extent of land use within a region tend to be highly correlated with road networks, however, it is often difficult or impossible to separate the direct ecological effects of roads from those of the accompanying land-use activities. For example, Eaglin and Hubert (1993) reported that trout biomass and streambed habitat quality in Wyoming streams declined in relation to the number of road crossings and to the proportion of area logged in the contributing catchment. Findlay and Houlahan (1997) found that herptile species diversity in wetlands declined in relation to the density of roads within 2 km of the perimeter. Among streams in the Pacific Northwest, the status or abundance of bull trout populations has been inversely correlated to road density (Rieman et al. 1997; Baxter et al. 1999); these studies used roads as the best available general proxy of cumulative effects associated with land use and human access. On the other hand, some studies (e.g., Roth et al. 1996) have demonstrated correlations of stream biotic integrity with land-use patterns across large catchments but did not investigate the specific roles that roads might play in mediating the causes and effects.

It appears that roads can serve as useful indicators of the magnitude of land-use changes, but it remains unclear to what degree the associated ecological responses result directly from roads themselves. If roads are largely responsible, effects could be ameliorated through altered road design, placement, remediation, or road removal. Strong interactions between roads and land use are likely, however. Forest roads in Idaho, for example, are less prone to erosion when the surrounding landscape remains in natural forest cover (Seyedbagheri 1996).

Discussion and Conclusions

Roads have diverse and systemic effects on many aspects of terrestrial and aquatic ecosystems. The ecological effects of roads can resonate substantial distances from the road in terrestrial ecosystems, creating habitat fragmentation and facilitating ensuing fragmentation through support of human exploitative activities (Fig. 1a). Habitat deterioration is not widely appreciated as an aspect of ecological fragmentation in aquatic ecosystems. At the scale of an extensive landscape or stream network, however, roads produce a pattern of aquatic habitat loss that differs from the terrestrial pattern yet nevertheless results in the ecological fragmentation of aquatic ecosystems (Fig. 1b). We coin the term *hyperfragmentation* to describe the multidimensional view of ecological fragmentation and habitat loss that emerges when the consequences of roads or any habitat alteration for terrestrial and aquatic ecosystems are considered simultaneously (Fig. 1c). Hyperfragmentation is the result of a spatial footprint of ecological effect that propagates across the landscape differently in freshwater and

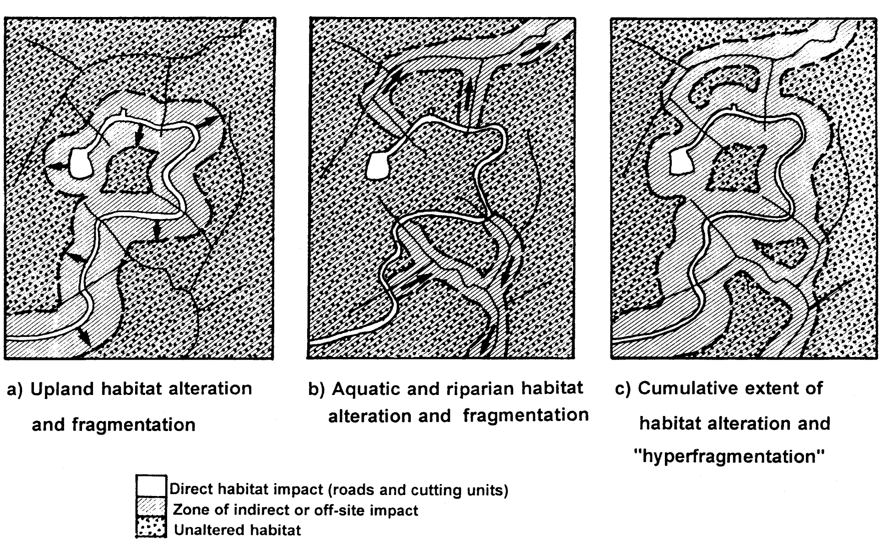

Figure 1. Spatial pattern of direct and indirect habitat alteration caused by human disturbance in a forested watershed: (a) classical forest edge effects contributing to terrestrial habitat fragmentation, (b) downstream-propagating hydrologic and biotic effects leading to large-scale fragmentation of freshwater habitats and populations, (c) combined terrestrial-aquatic view of landscape alteration that we term hyperfragmentation *because it considers multiple ecosystem dimensions on the same landscape. Arrows indicate predominant spatial vector of effects.*

aquatic ecosystems than in terrestrial systems. Even where only a small percentage of the land's surface is directly occupied by roads, few corners of the landscape remain untouched by their off-site ecological effects. The breadth of these effects cannot be appreciated unless one takes a broadly transdisciplinary view of ecosystems and biological communities.

Road design, management, and restoration need to be more carefully tailored to address the full range of ecological processes and terrestrial and aquatic species that may be affected. Deliberate monitoring is necessary to ensure that projects have robust ecological benefits and minimal adverse effects and that they are cost-efficient relative to their actual benefits (e.g., Weaver et al. 1987). Of course, such assessments require time and money that are usually unavailable. Most funds used to remediate problem roads are earmarked for actual field operations and are not available to support such assessment and monitoring. Few of the experts building roads or "restoring" them are trained to recognize and address the full spectrum of ecological issues that we have identified. Moreover, by their nature roads have systemic ecological effects that, even if recognized, cannot be overcome.

If a broad view of the ecological effects of roads reveals a multiplicity of effects, it also suggests that it is unlikely that the consequences of roads will ever be completely mitigated or remediated. Thus, it is critical to retain remaining roadless or near-roadless portions of the landscape in their natural state. Because of the increasing rarity of roadless areas, especially roadless watersheds, conservation efforts cannot rely entirely on protection of existing natural areas. But neither can conservation efforts depend entirely on tenuous and unexamined assumptions about the capability of site- and species-specific mitigation and remediation measures to reduce the ecological consequences of existing and proposed roads.

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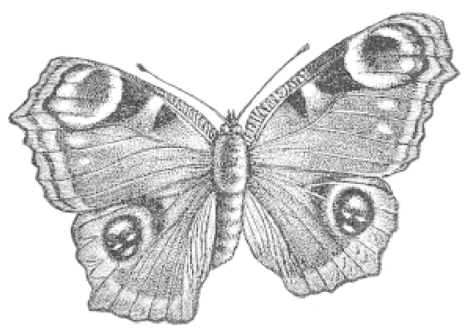

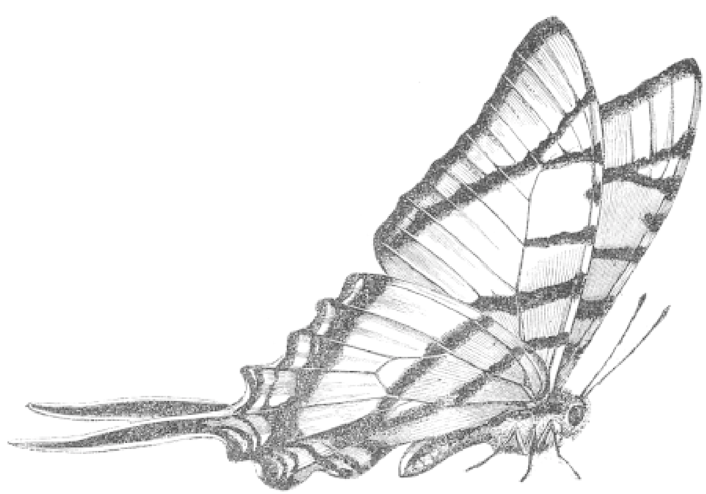

May 5, 2008

Scoping Comment Document #3

RED, Inc. Communications
PO Box 3067
Idaho Falls, ID 83403
ATTN: Eddy Gulch LSR Project

Dear ID Team,

Please accept these **scoping comments to the Eddy LSR project** from the Klamath Forest Alliance as an addendum to those previously submitted by KFA, KS Wild, EPIC, and the Klamath Riverkeeper.

Snags and LWD

As this project is in an LSR (73%) please make sure that LWD that is currently down does not get removed or disturbed and that guidelines for both snags and LWD/CWD are followed, perhaps even greater than guidelines. 3.1

In a recent and relevant court decision (ONRC v. Brong, July 24, 2007. No 05-35063) the Ninth Circuit Court of Appeals admonished the Medford District BLM for its illegal plan to log large diameter wildlife snags in an LSR by reminding the agency that:

> [S]nags play an integral role in the ecology of old-growth forests. Indeed, the NFP expressly states:
>
> > Tree mortality is an important and natural process within a forest ecosystem. Diseased and damaged trees and logs are key structural components of late-successional and old-growth forests. Salvage of dead trees affects the development of future stands and habitat quality for a number of organisms. Snag removal may result in long-term influences on forest stands because large snags are not produced in natural stands until trees become large and begin to die from natural mortality. Snags are used extensively by cavity-nesting birds and mammals such as woodpeckers, nuthatches, chickadees, squirrels, red tree voles, and American marten. Removal of snags following disturbance may reduce the carrying capacity of these species for many years.

Klamath Forest Alliance · PO Box 21 · Orleans, CA · 707-677-3358

NFP S&G at B-8; see also id at B-9 ("[T]rees injured by disturbance may develop cavities, deformed crowns, and limbs which are habitat components for a variety of wildlife species.").

The importance of snags, logs, and other CWD is also recognized in FEMAT (1993) scientific analysis. For example:

> *"Because of the important role of dead wood in late-successional and old-growth forest ecosystems, and because there is much to learn about the role of dead wood in the development of forests, only limited salvage is appropriate in Late-Successional Reserves . . . The Final Draft Recovery Plan* [for the NSO] *would allow removal of small-diameter snags and logs, but would also require retention of snags and logs likely to persist until the new stand begins to contribute significant quantities of coarse woody debris."* (FEMAT 1993, p. IV-37)

> *"Snags provide a variety of habitat benefits for a variety of wildlife species associated with late-successional forests. Accordingly, following stand-replacing disturbances, management should focus on retaining snags that are likely to persist until late-successional conditions have developed and the new stand is again producing large snags."* (FEMAT 1993, p. III-37)

In general the contribution of very large logs (e.g., 20 inches in diameter, or larger) to fire severity and intensity is almost negligible, as they are the fuels least available for combustion. When these large logs do burn, it is because the smaller fuels needed to ignite them and sustain combustion are present. Logs also burn mainly by smoldering combustion, which is not considered in the calculation of fire intensity. This is the reason why relatively high fuel loads comprised primarily of large-diameter woody material can be present without eliciting high intensity fire effects.

At C-40 the NFP informs the Forest Service:

> "A renewable supply of large down logs is critical for maintaining populations of fungi, anthropods, bryophytes and various other organisms that use this habitat structure. Provision of coarse woody debris is also a key standard and guideline for American marten, fisher, two amphibians, and two species of vascular plants…Coarse woody debris that is already on the ground needs to be retained and protected from disturbance to the greatest extent possible during logging and other land management activities that might destroy the integrity of the substrate. Scattered green trees will provide a future supply of down woody material as the stand regenerates and are important in providing for the distribution of this substrate through out the managed landscape."

We are also concerned about harvesting snags along ridge tops and ridge top roads and how that may lead to habitat fragmentation. Please analyze this when preparing the DEIS. 3.2

NSO (Northern Spotted Owl)

As there are multiple (Twenty-two) active nest sites within the project area. We suggest that the DEIS be explicit in detailing the survey results, protocol, LOP's and deep discussion of effects of all activities NSO. Because there are so many owls and multiple new threats, please note this as a significant issue. 3.3

Canopy

As mentioned in the Scoping notice KFA recommends at least 80% canopy cover on Northerly slopes and at least 60% canopy on Southerly slopes. Canopy and slope directly relate to amount of sunlight, ground fuel response, wind, blow down potential, rain on snow events potential and moisture within stands. Please detail reasoning and marking guidelines in the DEIS. 3.4 . . . 3.4 . . .

Ridge Top Thinning

As this area is mostly within LSR and is a HFRA project there are strict guidelines that cannot be trumped for commercial logging practices. As mentioned above canopy directly relates to fire risk. Wind speed dramatically increases on ridge tops, further effecting moisture ect. Also the DEIS should discuss and consider if these ridge tops have Visual Quality Objectives. 3.4 3.5

Stand Density Index

Blanket SDI marking guidelines do not always adequately address fuels issues. As we have seen from the Happy Camp HFRA project although the purpose is to reduce fuel loads, a blanket SDI prescription does not allow markers to consider distance in spacing, size of trees ect. Often times there were trees marked in stands that did not have fuels issues. Please be a specific as possible in DEIS as to what marking guidelines/Rx is for each stand and also amount of volume in each stand. 3.6 . . . 3.6

Machine Piling

As machine piling can affect aquatics and is very destructive to soils, fungi and other ground dwelling species we strongly suggest manual piling. Please be detailed in DEIS on where and how much, if any machine pilling is proposed. 3.7

Wildlife Habitat Fragmentation

We are concerned that all the haul roads/emergency access routes and ridge top commercial thinning will have an effect on wildlife and connectivity. Please address this issue in the DEIS. 3.8

Habitat Development Areas

The Scoping notice scantily mentions Habitat Development Areas. Please be more specific in DEIS and discuss location, guidelines and desired condition in these areas. 3.9

Riparian Reserves (RR)

Riparian Reserves are significant especially in these watersheds, serving as refugia and as wildlife corridors. All means should be taken to protect these areas and the headwaters of these areas. The DIES should map out each area and explain every entry is that proposed. 3.10

Forest Stands

In order for the decision maker and the public to make informed comments please be as detailed as possible in the DEIS as to stand (unit) descriptions by including vegetation type, seral stage, history, volume ect. 3.11

Plant and Wildlife Species

We are concerned with the effects of all proposed activities on TE&S, MIS, S&M and Neo-tropical migratory bird species. The DEIS and Wildlife/Plant/Fisheries BA/BE should give an explicit analysis of surveys (data collection), population, habitat and effects of proposed activities on these species. 3.12

Landings

We are also concerned with the environmentally destructive effects of landings. Please be specific in the DEIS as to location, size and proposed needed construction. Especially because the project area is within key one watersheds, in LSR, under HFRA authority and surrounded by NSO's we believe that landings would have a detrimental impact and multiple resources. 3.13

Hardwoods Restoration

Is this project considering possible oak/hardwood/meadow restoration? We appreciate the interest of the agency in looking at historical vegetative conditions and would encourage more work on this within the project area. It would be helpful if the DEIS or the website would contain maps and old aerial photos and explain meadow/hardwood component in further detail. 3.14 . . . 3.14

Diameter Disclosure/Marking/Volume

As this is an HFRA project within LSR, we highly recommend disclosing diameters of trees, especially over 24" that would be marked for extraction. Designation by 3.15

description is NOT encouraged. In order for the public to make informed comments trees must be marked prior to a Record of Decision. Also, please include all trees possibly extracted in the estimated volume, this includes landings, corridors ect. 3.16

Stewardship/Monitoring

We encourage the forest to continue working with the community. Doing this project through stewardship authorities makes sense. We also encourage and would like to participate in monitoring and developing a monitoring plan. 3.17

Conclusion

We greatly appreciate the level of thought in planning and participation between the agency and the Salmon River Restoration Council, local fire safe councils and the public. We look forward to much more discussion in the field as the NEPA is being developed.

Thanks for your consideration,

/s/ Kimberly Baker
Klamath Forest Alliance
PO Box 21
Orleans, CA 95556

California Regional Water Quality Control Board
North Coast Region
John W. Corbett, Chairman

Linda S. Adams
Agency Secretary

www.waterboards.ca.gov/northcoast
5550 Skylane Boulevard, Suite A, Santa Rosa, California 95403
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Arnold Schwarzenegger
Governor

April 30, 2008

Scoping Comment Document #4

RED, Inc. Communications
P.O. Box 3067
Idaho Falls, ID 83403
Attn: Eddy Gulch LSR Project

Dear RED, Inc. Communications:

Subject: Eddy Gulch LSR Project

File: USDA-USFS-Klamath National Forest

Staff of the North Coast Regional Water Quality Control Board (Regional Water Board) have reviewed the scoping newsletter for the Eddy Gulch Late-Successional Reserve (LSR) Project (Project). Pursuant to the Management Agency Agreement (MAA) between the U.S. Forest Service (USFS) and the California State Water Resources Control Board, the USFS will facilitate early State involvement in the project planning process for all projects that have a potential to impact water quality. We appreciate the opportunity to comment on the Eddy Gulch LSR Project and wish to remain on the project's mailing list.

The Project area is located within the Salmon River Hydrologic Area in between Matthews Creek and Whiskey Butte, California. The project will use mechanical, manual, and prescribed burn treatments to reduce the threat of wildfire over thousands of acres. Some of the information not included in the scoping letter that normally facilitates review is the legal description of the project area, total acreage, description of treatment types, and description of treatments proposed within riparian areas.

The scoping letter asked for input regarding the proposed Project. As background, State law assigns responsibility for protection of water quality within North Coast watersheds to the Regional Water Quality Control Board, North Coast Region ("Regional Water Board"). The Regional Water Board implements and enforces the Porter-Cologne Water Quality Control Act ("Porter-Cologne Act," California Water Code §13000 et seq.) and the Water Quality Control Plan for the North Coast ("Basin Plan"). All forest projects must comply with all substantive and procedural requirements of the Porter-Cologne Act and the Basin Plan. Additionally, the Eddy Gulch LSR Project must comply with the Regional Water Board's *Categorical Waiver*

For Discharges Related to Timber Harvest Activities On Federal Lands Managed by the United States Department of Agriculture, Forest Service in the North Coast Region, Order No.R1-2004-0015. The full text of Order R1-2004-0015, a guidance document, and pertinent forms may be accessed at the following web address:

http://www.waterboards.ca.gov/northcoast/publications_and_forms/available_documents/timber_waiver/

Order R1-2004-0015 requires that, prior to commencement of timber harvest activities, the USFS shall, in writing, file with the Regional Water Board a Notice of Intent (NOI), in which the USFS certifies they understand and intend to comply with all criteria and conditions of this Order and applicable water quality regulations. The NOI shall be signed by the Forest Supervisor or their duly authorized USFS representative. The waiver can be revoked at any time if the Regional Board's Executive Officer determines that the criteria and conditions set forth in the Categorical Waiver are not met.

One of the more important eligibility criteria is B.2., which states:

> "2. The USFS has conducted a cumulative watershed effects (CWE) analysis of the proposed Project and included specific measures in the proposed Project needed to reduce the potential for CWEs in order to assure compliance with applicable water quality control plans. The scale and intensity of cumulative watershed effects (CWE) analyses will be commensurate with the scale and intensity of the Projects seeking coverage under this waiver. Cumulative watershed effects analyses may range from qualitative reasoning to application and interpretation of quantitative models."

The Eddy Gulch LSR Project should contain project features and mitigation measures that are designed to minimize and/or reduce cumulative impacts to below thresholds of concern. 4.1

The Salmon River is USEPA 303(d) listed for temperature and provides habitat to anadromous salmonids, including coho salmon (*Oncorhynchus kisutch*). In the Salmon River watershed, coho salmon are a state and federally listed threatened species under the Endangered Species Act. In June 2005, the Regional Water Board adopted a Total Maximum Daily Load (TMDL) for Temperature and Implementation Plan through Resolution R1-2005-0058. Resolution R1-2005-0058 directs the Regional Water Board to adopt a Memorandum of Understanding (MOU) with the USFS as a means of implementing the TMDL. That MOU has yet to be developed and executed. In addition, the Basin Plan temperature water quality objective specifies that, "The natural receiving water temperature of intrastate water shall not be altered unless it can be demonstrated to the satisfaction of the Regional Water Board that such alteration in temperature does not adversely affect beneficial uses." The Project should be designed and implemented in a manner that complies 4.2 . . .

with the Basin Plan, restores and maintains riparian corridors, and maintains all vegetation that provides shade to water bodies in order to help achieve the TMDL.

Issues that should be addressed in the environmental document are the proposed Project's compliance with the Water Quality Control Plan for the North Coast Region (Basin Plan), Order R1-2004-0015 and the Salmon River TMDL for temperature, timing of the project implementation, cumulative watershed effects, yarding methods, proposed activities within riparian reserves, identification of areas of geologic concern, and detailed mapping of project area activities. Additional issues that should be addressed in the environmental document include: wet weather operations, erosion control on roads and landings, long term road maintenance for both system and non-system roads, any mitigation measures to offset cumulative watershed effects, and service areas for yarding equipment. 4.2 4.3 . . . 4.4 4.5 4.6 . . . 4.7 4.8 4.3 4.6 4.9

We look forward to working with the Project Team on the Eddy Gulch LSR Project. If you have any questions regarding these comments or other information in this letter, please contact me at (707) 576-2848 or Fred Blatt at (707) 576-2800.

Sincerely,

Kaete King
Environmental Scientist

043008_KNF Eddy LSR Project

cc: Mr. Ray Haupt, Salmon and Scott River Ranger Districts, Klamath National Forest, 11263 N. Highway 3, Fort Jones, CA 96032-9702

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

April 28, 2008

Ray Haupt
c/o RED, Inc. Communications
P.O. Box 3067
Idaho Falls, ID, 83403

Scoping Comment Document #5

Dear Mr. Haupt:

The Environmental Protection Agency (EPA) has reviewed the Notice of Intent to prepare an environmental impact statement (EIS) for the Eddy Gulch Late-Successional Reserve Fire/Habitat Protection Project, Scott and Salmon River Ranger District, Klamath National Forest, California. Our review is pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), and our NEPA review authority under Section 309 of the Clean Air Act.

EPA has no formal comments on the Notice of Intent at this time. Please send two copies of the Draft EIS (DEIS) to this office at the same time it is officially filed with our Washington D.C. Office. If you have any questions, please call me at (415) 972-3852.

Sincerely,

Laura Fujii
Environmental Review Office
Communities and Ecosystems Division

cc: Ray Haupt, Scott & Salmon River Ranger District