FUNDING REQUEST

DATE OF PROPOSAL: June 2, 2003

PROJECT TITLE: Density Management and Riparian Buffer Studies:
A. Microhabitats and microclimates of riparian and upland areas

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OBJECTIVES OF THE STUDY:

General Objective:

- Determine the effects of forest density management practices within and adjacent to Interim Riparian Reserves on stream habitats and fauna in headwater ecosystems in western Oregon.

Specific Objectives**:**

- Describe gradients and variability in site conditions associated with riparian and adjacent upland forests in both managed and unmanaged stands.
- Determine potential interactive effects of different riparian widths and density management on the microclimate and microsite of both riparian and upland forests.
- Test the effects of density management to accelerate stand development and understory diversity in riparian areas and upland forests.
- Collaborate with specialists to better define the associations between microsite and microclimate habitat with amphibians, lichens and bryophytes and arthropods.
- Provide the information to generate new sets of hypotheses that can ultimately help predict the outcomes of different riparian buffers and density management scenarios
- Leverage the scope and expand the relevance of our research by collaborating with investigators in other geographic regions and disciplines to integrate and synthesize information on riparian buffer widths and density management.

STATEMENT OF THE WORK:

This proposal is to complete final data analysis and reporting for Density Management Studies Component on Microhabitats and Microclimate of Riparian and Upland Forests, an on-going study addressing riparian management under the federal Northwest Forest Plan (NWFP) in

western Oregon. The BLM Density Management Studies (Thompson and Larson 2003) is a set of inter-related research projects testing the effectiveness of alternative silvicultural manipulations of early-successional forests in accelerating the development of late-successional forest structure (Tappeiner *et al.* 1997).

The microhabitat and microclimate component of the Density Management studies was designed as a three-year research project to 1) characterize biophysical conditions of undisturbed riparian forests and 2) to elucidate the effects of overstory thinning and riparian buffer delineation on biophysical conditions in riparian forests of western Oregon. Of specific interest are vegetation development and microclimate responses to the interactive influences of riparian stand composition and structure and upland forest thinning regimes.

Vegetation (composition and structure of both understory and forest canopy) and microclimate (temperature, relative humidity, canopy light transmittance) data have been collected at six study sites in 2001 and 2002, and will be completed in 2003. Vegetation and microclimate and vegetation data have been analyzed for sites measured through 2002. Data currently being collected will be analyzed following the 2003 field season.

To date several workshops and tours have been conducted in which preliminary results have been presented. A paper is being prepared for presentation at an international conference on large-scale forest ecosystem studies in August of 2003. In addition, two manuscripts are in preparation for journal submission in FY04.

The current proposal is for funding to complete:

1. Final comprehensive report of results and inferences from the research activities conducted from 2001 through 2003.
2. Presentation of findings to BLM and other stakeholders via site tours and regional conferences.

METHODS:

Field surveys. Field surveys were made to collect data on canopy vegetation structure (density, crown characteristics, LAI); understory vegetation density, cover and composition; and microclimate (light, temperature, and humidity) along transects originating from stream center and extending through riparian zones into adjacent upland forests. Stream reaches at seven sites were sampled with an emphasis on reaches associated with upland forest that was either thinned at moderate intensity or left uncut as controls. Five different combinations of riparian thinning treatment and buffer width delineation served as the principal experimental treatments. Data were collected 1-2 years following treatment and again after 4-6 years following treatment.

Data analysis. A variety of statistical methods will be employed. Buffer-type effects on individual vegetation and microclimate parameters will be evaluated by means of ANOVA with multiple sites representing blocks. Functional relationships among forest canopy structure, microclimate, and understory dynamics will be evaluated using both regression and multivariate statistical methods.

TIMELINE:

September 2003:
Complete data collection for year 5 post-treatment (Funded FY01-FY03).
Autumn-Winter 2003/2004:
Perform data reduction and analysis.
Spring-Summer 2004:
Prepare and complete final reports, manuscripts, and technology transfer.
August 2004: Limited circulation of draft final report for BLM and PNW review.
September 2004:
Submit final comprehensive report to BLM.

ACCOMPLISHMENTS/PRODUCTS:

Since initial funding in 2001, several products have been initiated and delivered. To date, the principal products have been presentation of early research results at a variety of conferences and field site visits. A manuscript for peer reviewed journal publication is nearing completion as part of an IUFRO meeting to be held in August 2003. Additional peer-reviewed manuscripts will be generated as a result of the final data analysis to be completed under this proposal.

Presentations and publications relevant to this research are summarized as an addendum to this proposal.

IS THIS PROJECT PART OF AN EXISTING PROJECT RELATED TO THE NWFP?

Yes, the Density Management Studies Component on Microhabitats and Microclimate of Riparian and Upland Forests was undertaken in response to standards and guidelines for riparian management and buffer delineation incorporated in the NWFP (USDA and USDI 1994). This research provides a critical evaluation of the effects of standards and guidelines on vegetation dynamics and productivity in riparian and adjacent upslope forests, and also provides information useful to associated research of standards and guidelines impacts on occurrence and productivity of riparian fauna.

DESCRIBE THE ABILITY OF THE RESEARCH FINDINGS OR PRODUCTS TO BE USED FOR A BROADER APPLICATION

The research findings will provide new information on the relationships between overstory vegetation structure and microclimate in riparian and adjacent upland forests. It will also provide new information on temporal developmental responses of understory vegetation to different riparian overstory thinning treatments and riparian buffer delineations. The results provide important information on microclimate and habitat that will be useful in interpreting results from associated DMS component studies on aquatic vertebrates and habitats (eg. study of Olson and Rundio).

WHAT ARE THE CAPABILITIES OF THE LEAD SCIENTISTS

Samuel S. Chan: Plant Physiologist, USDA Forest Service, PNW, Corvallis, OR.

- 15 years experience in physiology and ecology of forests of the Pacific Northwest with emphases on microclimate and riparian forest management.

Paul D. Anderson, Ph.D.: Supervisory Research Forester, USDA Forest Service, PNW, Corvallis, OR.

- 20 years experience in ecophysiology and silviculture research in California, the Lake States and the Pacific Northwest regions. Specific expertise in plant physiological and growth responses to environment, inter- and intra-specific plant competition, and silvicultural manipulation.

IS PART OF THE WORK BEING SUBCONTRACTED? NO

REFERENCES:

Tappeiner, J.C., D. Huffman, D. Marshall, T.A. Spies, and J.D. Bailey. 1997. Density, ages, and growth rates in old-growth and young-growth forests in coastal Oregon. Canadian. J. Forest Research 27: 638-648.

Thompson, C.R., and L. Larsen. 2003. Density management studies status report. Oregon/Washington Bureau of Land Management.

USDA and USDI. 1994. Record of Decision for amendments to Forest Service and Bureau of land Management planning documents within the range of the northern spotted owl. Standards and Guidelines for management of habitat for late-successional and old-growth related species within the range of the northern spotted owl. Interagency Publication.

BUDGET:

Justification: The Density Management Studies Component on Microhabitats and Microclimate of Riparian and Upland Forest is a research program of importance to a broad clientele and represents a valued partnership between PNW station scientists and BLM resource managers. From its inception in 2001, this study has been jointly funded with the BLM contributing $150,000 dollars and the PNW contributing, by conservative estimate, an additional $400,000 funding from the Northwest Forest Plan (NWFP), Sustainable Management Systems (SMS), and the Resource Management and Productivity Program. As a result of discontinuation of SMS funding in FY04, we are requesting an additional $62,820 from the BLM to complete the current research program, including the analysis, synthesis, and reporting of data and results generated during the 2001-2003 period. Specifically, these additional funds will be used primarily as salary for the project Principal Investigator (0.5 FTE in FY04), and to provide for supplies and travel necessary to information transfer via presentations and reporting. The PNW will provide in-kind funding of $46,760 in the form of salary and benefits contributions of a Supervisory Research Scientist (analysis and reporting, 0.15 FTE), a database manager (data management, 0.3 FTE), and an office automation assistant (manuscript and presentation preparation, 0.15 FTE).

COSTS TO BLM

	FY 2004
Direct Costs	
Salary	
Principal Investigator (GS-12 analyst, co-author)	
Salary (0.5 FTE)	$ 31,800
Benefits	$ 10,770
Administrative costs	$ 7,000
Total	$ 49,570
Supplies	
Misc. (copy costs, poster prep, etc.)	$ 1,000
Travel	
Travel to professional meetings, workshops, and demonstration tours	$ 2,000
Subtotal	$ 52,570
Indirect Costs	
Overhead @ 19.5%	$ 10,250
TOTAL COST TO BLM	**$ 62,820**

PNW IN-KIND CONTRIBUTION

Salary	
Co-Principal Investigator (GS-13 analyst, co-author)	
Salary (0.15 FTE)	$ 10,350
Benefits	$ 2,900
Administrative costs	$ 2,100
Database Manager (GS-9 data management)	
Salary (0.3 FTE)	$ 14,610
Benefits	$ 4,380
Administrative Costs	$ 4,200
Editorial Assistant (GS-6, editing, poster preparation, document formatting)	
Salary (0.15 FTE)	$ 4,700
Benefits	$ 1,420
Administrative Costs	$ 2,100
TOTAL PNW IN-KIND CONTRIBUTION	**$ 46,760**

Relevant Presentations and Publications

(Products of Samuel S. Chan unless otherwise noted)

Presentations:

Thompson, C., D.H. Olson, S.S. Chan, K. Maas-Hebner, and J. Tappeiner. 2002. The density management and riparian buffer studies of western Oregon.

More than 20 poster displays and/or brochure distributions have been made, including:

October 2001: Congressional staff (Smith, Hooley), Corvallis, OR
Deputy Chief FS, Wilsonville, OR
PNW - Olympia, WA
Headwaters Research Cooperative Workshop, Corvallis, OR

Nov. 2001: Biodiversity Conference, Taiwan
Congressional staff (Wyden, DeFazio), Eugene, OR.
Region 6 Riparian Management Conference, Hood River, OR

Dec. 2001: Western Forestry & Conser. Sci. Symp., Eugene, OR
Region 6, Watershed Restoration Workshop, Skamania, WA
Wood Compatibility Initiative Workshop, Skamania Lodge, WA

Feb. 2002: OR Chapter, The Wildlife Society, Gleneden Beach, OR
OR Chapter, American Fisheries Society, Sunriver, OR
Small Stream Channels and their Riparian Zones Symp., Vancouver, BC
ALI Program retreat, Welches, OR

March 2002: Silviculture Options conference, Corvallis, OR
Ministry of Air, Land, and Water, Riparian Ecology and Management, Riparian restoration best management practices Workshop, Richmond, BC

April 2002: Society for Northwestern Vertebrate Biology, Hood River.
Mount Hood National Forest, OR

May 2002: Western Division of the American Fisheries Society, Spokane, WA

June 2002: Aquatic Level one and two teams, Keel Mountain, OR
Managing Landscapes for Diversity, Workshop, Sisters, OR

Tappeiner, J., C. Thompson, D. Olson, and S. Chan. 2001. Density Management Studies. Presentations to:

May 2001: National Silviculture Workshop, USDA Forest Service, Hood River, OR.

August 2001: Thinning in LSRs Workshop, USDA Forest Service, Portland, OR.

Chan, S. S., D. Larsen, D. Olson, and Wm. Emmingham. 2003. Density management effects on stand development and microclimate in headwater forests of western Oregon. North American Forest Ecology Workshop, Oregon State University, Corvallis, OR, June 16-20, 2003.

Canopy structure, light availability, understory development, and microclimate. May 6, 2003. Young Stand Development Workshop field tour. Eugene, Oregon. (Approx. 40 participants).

Olson, D., S.S. Chan, L. Ellenburg, and C. Rugger. 2003. Riparian buffers within a forest thinning context: effects on stream amphibians and riparian microclimates in headwater drainages. Society for Northwestern Vertebrate Biology, Arcata, CA, March 19-22, 2003.

Rundio, D., D. Olson, L. Ellenburg, and S.S. Chan. 2003. Effects of forest thinning on terrestrial salamanders and potential benefits of riparian reserves. Society for Northwestern Vertebrate Biology, Arcata, CA, March 19-22, 2003.

Studies on the influence of commercial thinning and regeneration on the microclimate and microsite of headwater streams in western Oregon. Jan. 16, 2003. Invited oral paper and abstract for the Oregon Headwaters Research Cooperative's Headwater Stream Ecology Forum. Corvallis, Oregon. (Approx. 150 participants).

Microclimate and stand dynamics associated with density management in headwater forests. January 6 and 8, 2003. Executive summary presented to the REIC (Regional Ecosystem Executives Interagency Committee) (1/6/03). (Approx. 20 participants). Detailed presentation of early findings to line officers, senior level planners, biologists, physical scientists, ecologists and silviculturists. (Approx. 80 particpants). Portland, Oregon.

Early effects of thinning on stand structure and canopy development. January, 2002. Invited seminar to the Oregon Dept. of Forestry's State Forester and his senior staff. Information was used to evaluate State's management plan on "Structural Based Management for the State Board of Forestry.

Thinning young stands for diversity: regeneration, stand structure and microsite. In: Silvicultural Options for Sustainable Management of Pacific Northwest Forests: integrating research results into management practice. March 5, 2002. Symposium for natural resource managers and planners, foresters, silviculturists, wildlife biologists, woodland owners. Poster and presentation. Website has presentations and abstracts: **{** HYPERLINK "http://outreach.cof.orst.edu/silvopt/presentations.htm" **}**. Corvallis, OR. (Approx. 100 participants).

Riparian silviculture: environmental characteristics and plant responses. In:USDA Forest Service Technical Input: British Columbia Riparian Restoration Workshop. March 6-7, 2002. British Columbia and USDA Forest Service practitioners and scientists reviewed existing practices, knowledge and riparian modelling to assist in developing state-of-the-art "best management practices" for accelerating recovery of riparian functions to achieve future desired conditions. Re-examined underlying assumptions, towards generating best management practices based on current knowledge. Vancouver, British Columbia. (Approx. 80 participants).

Density Management Studies Field Tours. Two tours given in FY02:
April 11, 2002: Delph Creek, Mount Hood, OR, 40 participants, Region 6 and BLM.
June 19, 2002: "Riparian Thinning", Keel Mountain, Oregon Cascade Range, about 40 participants from BLM, FS, FWS, and NMFS fish biologists, and aquatic Level One teams that review and implement silvicultural activities in Riparian Reserves.

Tree School. Silvicultural strategies for riparian management. June 21, 2002. Annual Tech Transfer Event sponsored by OSU (lead organizer), USFS, BLM, ODF and NRCS. Small woodland owners, watershed council representatives and professionals from the ODF, NRCS and BLM participated in a classroom and fieldtrip to learn about managing forests near streams and sensitive aquatic environments. Topics included plant ecology, soils, wildlife habitats and silvicultural and restoration habitats appropriate for riparian areas in western Oregon. Roseburg, Oregon. (Approx. 24 participants in sub-group).

Microsite and understory vegetation response to thinning, canopy dynamics and light relationships following commercial thinning. In: Silviculture For Diverse Forests. June 25, 2002. Symposium for: 1) recertification of USFS silviculturists 2) symposium for regional natural resource managers and planners, foresters, silviculturists, wildlife biologists, woodland owners. Presentation. (Approx. 70 participants).

Commercial thinning of young stands in western Oregon for structural diversity. July 18, 2002. Field tour of study site and description of research on commerical thinning and underplanting young Douglas-fir stands for structural diversity. Tour was conducted at the request of Jim Furnish, former Deputy Chief of the USDA FS NFS for the Wilderness Society, press media and interested congressional staff. Mapleton, Oregon. (Approx. 12 participants).

Riparian Vegetation Management: Some implications on soils and vegetation dynamics. In: Annual Field Meeting of the NW Soil Science Society. July 18, 2002. Major outcome of the review were suggestions to improve our understanding on the range, abundance and variation of functions provided be vegetation and coarse wood in riparian areas. Mapleton, Oregon. (Approx. 40 participants).

Publications:

Olson, Deanna H., Samuel S. Chan, and Charles R. Thompson. 2002. Riparian buffers and thinning designs in western Oregon headwaters accomplish multiple resource objectives. In: Johnson, A.C.; Haynes, R.W.; Monserud, R.A.; eds. Congruent Management of Multiple Resources: Proceedings from the Wood Compatibility Workshop; December 5-7, 2001, Skamania Lodge, Stevenson, WA. Gen. Tech. Rep. PNW-GTR-563. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 81-91.

Published Abstracts:

Olson, Deanna, Samuel S. Chan, Loretta Ellenburg, and Cynthia Rugger. 2003 in press. Riparian buffers within a forest thinning context: effects on stream amphibians and riparian microclimates in headwater drainages. *Northwestern Naturalist*.

Thompson, Charley, Deanna H. Olson, Samuel Chan, Kathleen Maas-Hebner, and John Tappeiner. 2002. The density management and riparian buffer studies of western Oregon. *Northwestern Naturalist* 83: 86.

Curricula Development:
Conservation Education (CE) field project from the Washington Office. The Watershed Stewardship Education Program. Various Dates. Work with the Sea Grant Program, Oregon State University, and the Governor's Watershed Enhancement Board in developing a program and technical information for training "certified watershed stewards" and trainers that help administer and implement watershed restoration programs. Trainers include USFS and BLM specialists along with specialists from OSU and the State natural resources agencies. The goal is a to develop information, test tech transfer options and develop a CD for one of the WSEP module on Riparian Functions and Management.