COPE PROGRAM
PROGRESS REPORT FOR FY 91

COPE Advisory Council Meeting
BLM Salem District Office
Salem, Oregon
9:30 a.m., June 11, 1991

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COPE Program
Progress Report*

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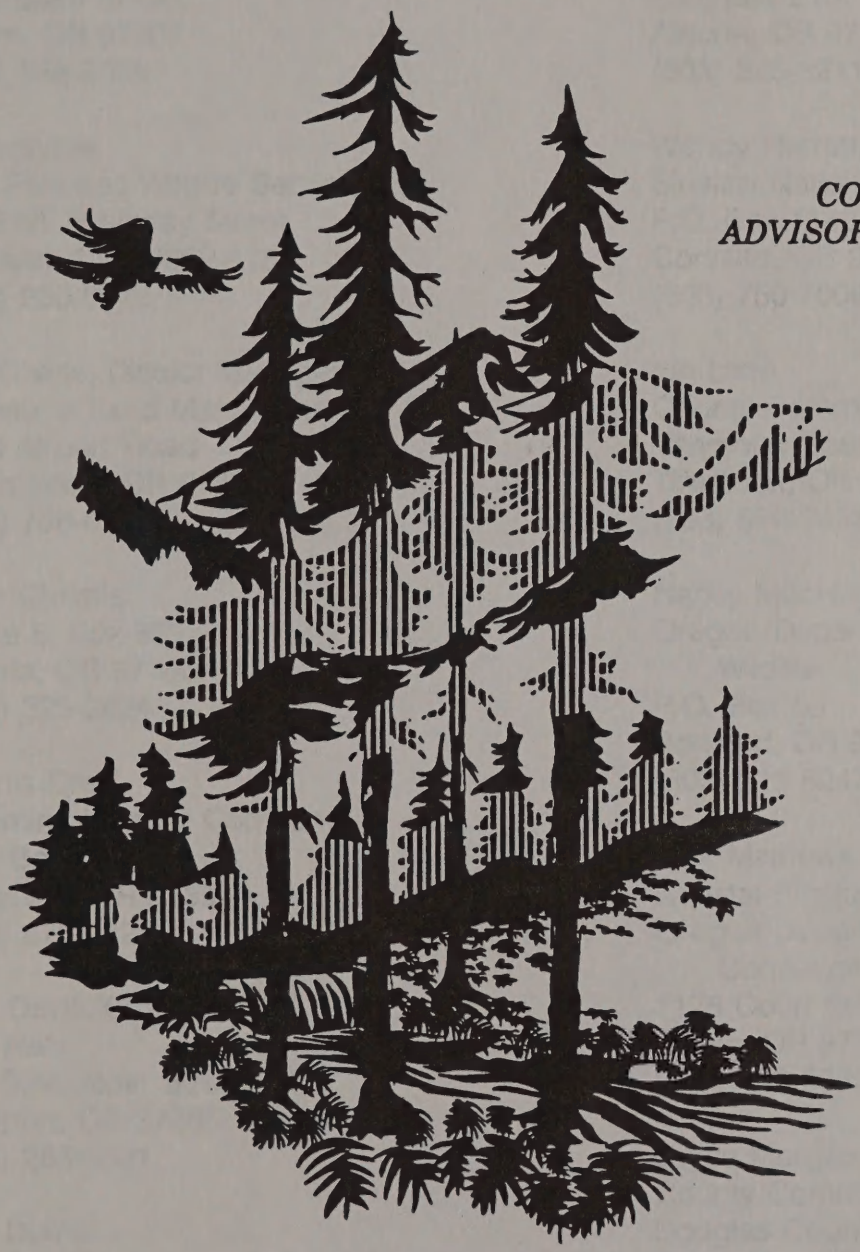
* Compiled by Steve Hobbs (Program Manager) and Sheila Till (Management Assistant), Forestry Sciences Laboratory, 3200 S.W. Jefferson Way, Corvallis, OR 97331. (503) 750-7393.

AGENDA

COPE Advisory Council Meeting
USDI Bureau of Land Management Salem District Office
Salem, Oregon
9:30 a.m., June 11, 1991

Time	*Topic*	*Discussion Leader*
9:30 a.m.	Welcome and Introductory Remarks	Barte Starker George Brown Charles Philpot
10:00	Fundamental COPE Brief Status Report New Studies, FY 92 Fundamental Budget, FY 92	Steve Hobbs
10:20	Adaptive COPE Brief Status Report New Studies and Technology Transfer, FY 92	Gabe Tucker
10:45	Coffee Break	
10:55	Adaptive COPE Budget	Steve Hobbs
11:15	Program Final Products and Public Awareness	Steve Hobbs
11:35	Discussion	Barte Starker
12:00 p.m.	Adjourn	



COPE PROGRAM
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May 1991

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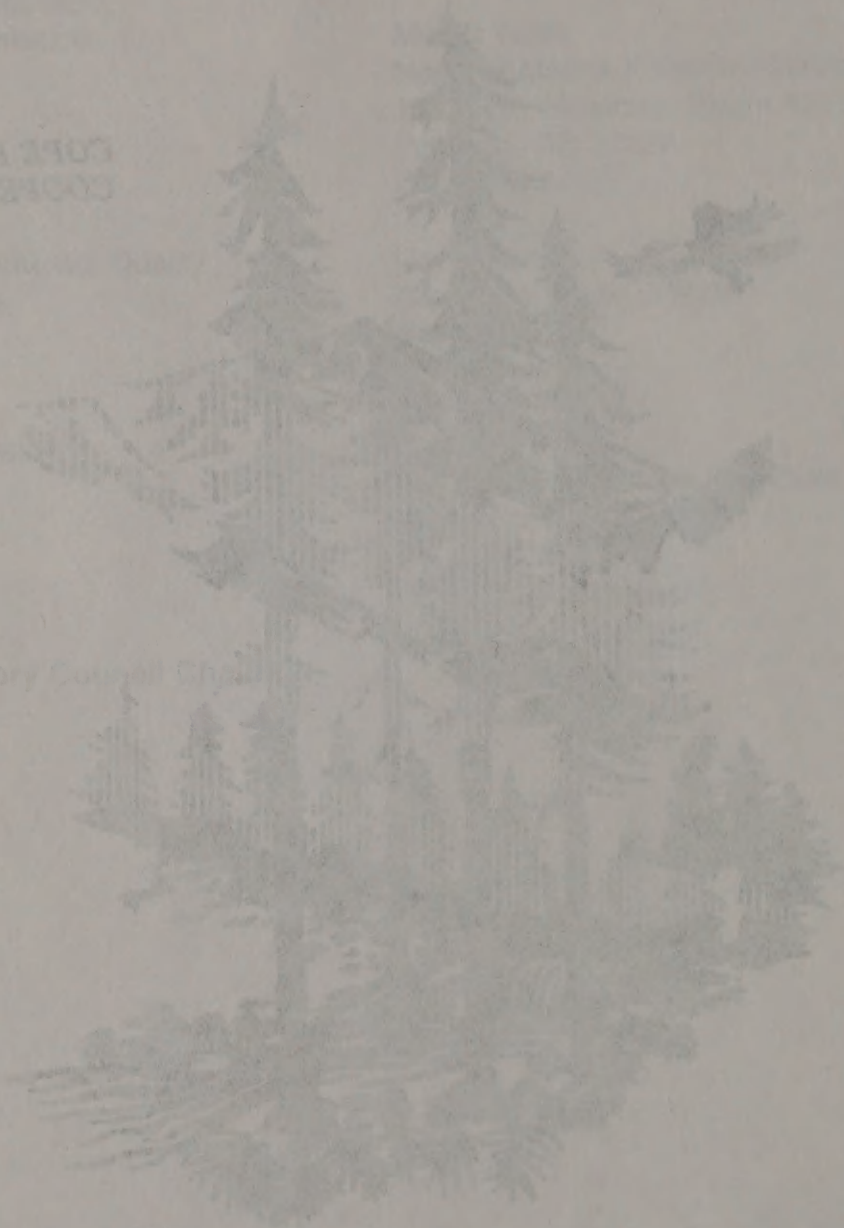
COPE PROGRAM
COOPERATORS



COPE COOPERATORS

Federal Agencies

Bureau of Indian Affairs
Bureau of Land Management
Pacific Northwest Research Station
Siskiyou National Forest
Siuslaw National Forest
U.S. Fish and Wildlife Service

State Agencies

Department of Fish and Wildlife
Department of Forestry
Oregon State University

Oregon Counties

Benton
Clatsop
Coos
Curry
Douglas
Josephine
Lane
Lincoln
Polk
Tillamook
Washington
Yamhill

Forest Industries

Bohemia, Incorporated
Boise Cascade Corporation
Champion International Corporation
Diamond B Lumber Company
Georgia-Pacific Corporation
Giustina Land & Timber Company
Hydraulic & Machine Services, Incorporated
International Paper Company
Lone Rock Timber Company

Forest Industries (continued)

Longview Fibre Company
Papé Brothers, Incorporated
Rosboro Lumber Company
Roseburg Resources Company
RSG Forest Products, Incorporated
Smurfit Newsprint Corporation
Starker Forests, Inc.
Stimson Lumber Company
Weyerhaeuser Company
Wheeler Manufacturing Company
Willamette Industries, Incorporated
Willamina Lumber Company

Oregon Small Woodland Association

COPE PROGRAM
MINUTES OF THE ADVISORY COUNCIL MEETING
NOVEMBER 20, 1990

Minutes of the COPE Advisory Council Meeting
USDI Bureau of Land Management
Coast Range Resource Area Office, Eugene
November 20, 1990

Council members present: John Byrne, Mel Chase, Jerry Chetock (vice Mike Beyerle), John Christie, Dennis Creel, Don Davis, Ron Heninger (vice John Wilkinson), Nancy MacHugh, Joyce Morgan, Dale Rettmann (vice Wendy Herrett), Darrell Schroeder, Barte Starker, Al Tocchini

Others present: Jerry Asher, George Brown, Andy Hansen, Steve Hobbs, Ron Kaufman, Joe Means, Logan Norris, Charles Philpot, Ron Rhew, Jim Schroeder, Arne Skaugset, Tom Spies, Bart Thielges, Sheila Till

Barte Starker opened the meeting by welcoming the group to the fall meeting. He then asked for a round of self introductions. Following this the minutes of the May 30, 1990 Advisory Council meeting were unanimously approved. Barte told the Council that many of the forest resource issues making the headlines are problems COPE is addressing, so the program is headed in the right direction. He then asked Charlie Philpot and George Brown to provide a few opening comments.

Charlie Philpot told the Council that the visit by the USDA Cooperative Forestry Research Advisory Committee (CFRAC) to Oregon went quite well. He said they had good exposure to COPE and that the presentations, science, and partnerships made a positive impression. Charlie then briefly outlined the Station's reorganization which includes a larger commitment to research, development and applications. He also told the Council that all reductions in funding for the Station's portion of the COPE Program were restored by Congress and new funds were actually added to the fisheries research.

George Brown also mentioned the CFRAC visit and the fact that Assistant Secretary Hess was present for the entire three days including the field trip. He said the Committee was surprised by the complexity of forest management in the Pacific Northwest.

Following George's comments, Steve Hobbs gave a brief overview of Fundamental COPE and the budget. He then introduced Tom Spies.

Tom provided the Council with a status report on the riparian vegetation study. He described the work that Jim Kiser is doing with the analytical stereo plotter and the intensive vegetation mapping of Deer Creek. There are now study plots in 20 subbasins of the central Oregon Coast Range including several on the east side of the range.

Joe Means discussed the integration study and explained how the scientists involved are examining the associations and relationships between geomorphology, vegetation, wildlife, and fish. He told the Council that the study utilizes geographic information systems (GIS) and that scientists are doing research that few other organizations have attempted.

Nancy MacHugh commented that the big picture approach is appropriate.

Following Joe Means' presentation, Andy Hansen gave a brief overview of the Adaptive Team's activities during FY 90. He highlighted the large woody debris study which has data from 70 streams including data provided by the Bureau of Land Management.

Progress on the debris piece size study was outlined by Arne Skaugset. This study examines the effect of debris piece size on fish habitat and how fish respond, in terms of habitat preference, to changes. Each piece of large woody debris has been surveyed and researchers are able to track the movement of each piece. The study involves the cooperation of Weyerhaeuser Company, Bureau of Land Management, Siuslaw National Forest, and the Forest Service Pacific Northwest Research Station.

Andy Hansen explained how he is adapting a wildlife habitat/forest succession model to the Oregon Coast Range. The model will simulate stand level vegetation dynamics resulting from various silvicultural treatments and identify suitability as wildlife habitat.

Following the Adaptive COPE presentations, Joyce Morgan summarized the four recommendations of the Program Review Committee. These were approved by the Council. Steve Hobbs was directed to develop plans to address these recommendations and present them to the Council in spring 1991.

Barte Starker opened the meeting for general discussion.

Dennis Creel said that the research being conducted by COPE comes at a critical time. Joyce Morgan added that it is important that we get this information into the hands of the decision makers. Darrell Schroeder asked why state agencies other than the Department of Forestry and the Department of Fish and Wildlife aren't contributing to COPE. George Brown said that the College of Forestry has worked with Gail Achterman but many state agencies lack budget flexibility. He added that this spring we'll know more about the effects of ballot measure 5.

The meeting adjourned at 12:25 p.m.

STEPHEN D. HOBBS
Program Manager

SHEILA TILL
Management Assistant

COPE PROGRAM
FUNDAMENTAL STUDIES

LIST OF PROGRESS REPORTS FOR FY 1991
FUNDAMENTAL COPE STUDIES

May 1991

Fundamental COPE
Progress Report

1. *Title*:

Evaluating the Socio-Economic Ramifications of Alternative Forest Resource Management Options in Coastal Oregon

2. *Principal Investigator(s) and Organization(s)*:

Dr. J. Douglas Brodie, Professor, Department of Forest Resources, College of Forestry, OSU, Corvallis
Dr. B. J. Greber, Assistant Professor, Department of Forest Resources, College of Forestry, OSU, Corvallis
Dr. Richard Haynes, Project Leader, Pacific Northwest Research Station, Portland

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

Develop economic models capable of assessing the economic impacts of various management regimes in riparian zones, and apply them to conditions prevailing on the Oregon coast.

4. *Study Objective(s)*:

a. To enable the translation of alternative levels of resource outputs into community impacts by permitting the assessment of the implied changes in employment, income, occupational makeup, demographic characteristics, and county revenues and expenditures.

b. To integrate the results of this study with the results of other COPE research, in order to fully assess the implications of management options proposed for coastal Oregon.

5. *Potential Benefit or Utility of the Study*:

The economy of coastal Oregon is greatly dependent on the fisheries, recreation, and forest industries. In that all of these industries, as well as the general quality of life in coastal Oregon are influenced by decisions related to the management of the forest, it is important that we be able to translate forest management options into impacts upon coastal communities. The improved assessment of nonfinancial benefits and costs will aid in the analysis of managerial options as well as political

options (e.g., tax policy, social infra-structures needs, and forest practices regulation).

A comprehensive economic assessment will be made of the Oregon coast, including the development of an integrated model of the regional economy, with case specific analyses of management options proposed within the course of other COPE research. Such a model and the related assessments are crucial if we wish to go beyond the standard assessment of financial merit of management options. By blending the econometric, input-output, and simulation techniques with which the investigators have extensive knowledge, a model can be developed that can translate proposed alternatives into employment, income, occupational and demographic makeup, and county revenues.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

Calibration and testing of IPASS models have been completed.

b. Tasks Yet to Be Completed in FY 91:

Simulation and sensitivity analysis for the regional models will be completed. Examples and use instructions will be provided in a publication.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

None.

b. Planned for Remainder of FY 91:

Prepare an article for the **COPE Report**.

Make projections of coastal Oregon regional developments using IPASS.

Complete publication of the models and results of model use.

8. *Estimated Cost*:

	OSU	*PNW*	*TOTAL*
FY 91	0	12,000	12,000

9. *Duration of the Study*:

Initiation date:	FY 87
Scheduled completion date:	FY 91

May 1991

Fundamental COPE
Progress Report

1. *Title*:

Ecology and Inventory of Riparian Zone Vegetation

2. *Principal Investigator(s) and Organization(s)*:

Dr. Thomas A. Spies, Research Forester, Pacific Northwest Research Station, Corvallis
Dr. John C. Tappeiner, Professor, Department of Forest Resources, College of Forestry, OSU, Corvallis
Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis
Dr. David P. Paine, Professor, Department of Forest Resources, College of Forestry, OSU, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Identify and explain the effects of various riparian and stream conditions on fish populations and communities.

b. Characterize wildlife communities in riparian and adjacent upland habitats and assess how changes in habitat affect wildlife species.

c. Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas and increase conifer development there.

d. Identify and integrate associations among ecosystem components (for example, vegetation, geomorphology, fish) in riparian areas and explain their ecological relationships.

4. *Study Objective(s)*:

a. Conduct an inventory of major vegetation types for representative subbasins within three Oregon Coast Range basins using photogrammetric and remote sensing techniques.

b. Characterize existing riparian vegetation structure and spatial distribution within representative basins according to stream size, valley width and gradient, geomorphology and other factors.

c. Characterize vegetation and large woody debris dynamics in streamside forests.

d. Determine response of streamside vegetation to flooding, mass movement, and other natural disturbances.

5. *Potential Benefit or Utility of the Study*:

Currently, the vegetative species composition, structure, stocking, and density are unknown for coastal Oregon riparian zones. A riparian vegetation inventory is fundamental and essential to any study of riparian zones in coastal Oregon. Quick results are necessary in order to select research sites for both extensive and intensive basin and stand level studies. The survey will also be necessary for any economic modeling effects.

Management of riparian zones is severely hindered by a lack of information about the ecological characteristics and dynamics of riparian zone vegetation. Vegetation is closely linked to stream processes, fish habitat, wildlife habitat, and regeneration of commercially valuable timber species. However, relatively few studies of the structure and ecology of riparian zone vegetation have been undertaken in the Oregon Coast Range. In order to develop comprehensive management plans that allow for multiple resource benefits from active riparian zone management, information on the ecology of riparian vegetation must be developed and provided to managers and other COPE scientists.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

Completed sampling in central coast area.

Began on-the-ground vegetation survey in Elk River basin.

Established and monitored vegetation dynamics plots in central coast area.

Installed second 2 ha reference stand in central Coast Range.

Continued intensive mapping of additional areas as requested by other COPE research teams.

Initial data base developed for Drift Creek incorporating fisheries and some wildlife data into the stream data.

Began to develop stream mapping for the Nestucca basin with Kevin McGarigal.

Added several sub-basins from the Lobster Valley drainage to the intensive mapping work.

Began work on a project to develop a vertical canopy index for forest stands using aerial photography and several surface modeling techniques.

b. Tasks Yet to Be Completed in FY 91:

None.

c. Planned for FY 92:

Continue sampling in Elk River and other south coast basins.

Initiate riparian forest stand productivity study.

Continue monitoring and installation of permanent plots in central coast range to study regeneration/disturbance.

Continue intensive mapping for Drift Creek and Lobster Valley as requested.

Continue intensive mapping on the Nestucca River basin.

Finish work on canopy index model.

d. Tasks to Be Completed By Fiscal Year Starting in FY 93:

FY 1993
Initiate sampling in north coast basin.

Continue forest stand productivity study.

Monitor regeneration/disturbance plots.

Monitor reference stand mortality.

FY 1994
Remeasure plots for regeneration/disturbance study.

Monitor reference stand mortality.

FY 1995
Use mortality data in conjunction with coarse woody debris model to evaluate wood input rates from reference stands.

Monitor regeneration/disturbance plots.

FY 1996
Continue mortality survey.

Complete analysis of coarse woody debris inputs based on mortality.

Monitor regeneration/disturbance plots.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

Spies, T.A.; R. Pabst and J. Tappeiner. 1991. Vegetation patterns in riparian forests. **COPE Report**. 3(4):7-10.

Riparian vegetation research. A status report to COPE Advisory Council.

Numerous seminars and presentations on data transfer to GIS and the use and applications of aerial photography and GIS interactively in forest resources.

b. Planned for Remainder of FY 91:

Prepare article for the **COPE Report** on Relationships among geomorphology, disturbance and riparian vegetation.

Prepare article for quarterly "Focus on Forestry" (OSU).

Planned publication on the canopy index model.

c. Planned for FY 92:

Prepare an article for the **COPE Report**.

Participate in field tours, seminars, and workshops.

8. *Estimated Cost*:

	OSU	*PNW*	*TOTAL*
FY 91	122,000	60,000	182,000
FY 92	125,000	63,000	188,000
FY 93	130,000	66,000	196,000
FY 94	133,000	58,000	191,000
FY 95	79,000	48,000	127,000
FY 96	81,000	38,000	119,000

9. *Duration of the Study*:

Initiation date:	FY 87
Scheduled completion date:	FY 96

Fundamental COPE
Progress Report

1. *Title:*

Fish Habitat and Riparian Zone Interactions

2. *Principal Investigator(s) and Organization(s):*

Dr. Stanley V. Gregory, Associate Professor, Department of Fisheries and Wildlife, College of Agricultural Sciences, OSU, Corvallis
Dr. Robert L. Beschta, Professor, Department of Forest Engineering, College of Forestry, OSU, Corvallis
Dr. Fred H. Everest, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Dr. Gary Lamberti, Assistant Professor, Department of Fisheries and Wildlife, College of Agricultural Sciences, OSU, Corvallis
Dr. Gordon H. Reeves, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis
Dr. Frederick J. Swanson, Research Geologist, Pacific Northwest Research Station, Corvallis
Dr. James D. Hall, Professor, Department of Fisheries and Wildlife, College of Agricultural Sciences, OSU, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6):*

Riparian Zone Management

a. Identify and explain the effects of various riparian and stream conditions on fish populations and communities.

b. Identify and explain how various management practices in streams and riparian areas affect fish populations and communities and water quality.

c. Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas and increase conifer development there.

d. Identify and integrate associations among ecosystem components (for example, vegetation, geomorphology, fish) in riparian areas and explain their ecological relationships.

4. *Study Objective(s):*

To describe relationships between riparian zones and critical fish habitat and to provide a foundation for basin-wide fisheries management.

a. To describe relationships between the distribution and abundance of salmonids and the geomorphic characteristics of basin landforms as a foundation for managing fisheries resources within entire drainage basins.

b. To describe the influence of riparian zone composition and structure on the distribution and abundance of salmonids.

c. To identify management strategies for maintaining riparian characteristics critical for salmonid populations in coastal basins.

d. To evaluate practices for mitigating loss of riparian resources or habitat for fisheries of coastal drainages. (This objective will be developed in future years as a basin context is developed for interpretation.)

5. *Potential Benefit or Utility of the Study:*

A variety of social, political, and environmental factors are forcing rapid change in management of fish habitat through the management of riparian zones, large woody debris, and instream structures. These management activities are seldom considered in a basin-wide context, a perspective that is essential for successful management of the fishery resource, particularly where mixed ownership patterns prevail.

Results of this study will provide vital data for planning, designing, and implementing management plans for riparian zones and fish habitat. Criteria will be developed for identifying critical areas of fish habitat.

6. *Research Activities:*

a. Accomplishments to Date in FY 91:

Coordinated planning of stream rehabilitation project in Lobster Creek basin (Camp Creek) with Siuslaw National Forest.

Mapped habitat in Camp Creek.

Completed survey of fish habitat and abundance in Elk River basin.

Completed fish population and distribution in Elk River basin.

b. Tasks Yet to Be Completed in FY 91:

Conduct survey of fish habitat and abundance in Lobster Creek basin.

Trap salmonid smolts leaving the Lobster Creek basin.

Trap salmonid smolts leaving the Elk River basin.

Examine relationships between channel structure and food supply for trout and salmon.

Monitor habitat and salmonid abundance in Flynn Creek, Deer Creek, and Needle Branch for long-term evaluation of Alsea Watershed Study.

c. Planned for FY 92:

Coordinate with Fish Habitat Project scientists to investigate interactions between habitat, temperature, and food in Lobster Creek basin.

Conduct survey of fish habitat and abundance in Elk River.

Monitor habitat and salmonid abundance in Flynn Creek, Deer Creek, and Needle Branch for long-term evaluation of Alsea Watershed Study.

Investigate food-habitat relationships in stream rehabilitation project in Lobster Creek basin.

d. Tasks to Be Completed By Fiscal Year Starting in FY 93:

FY 1993
Investigate mechanisms responsible for patterns of salmonid distribution and abundance.

Integrate basin-level information.

FY 1994
Same as 1993.

FY 1995
Develop basin-scale fish habitat model.

Synthesize information for coastal Oregon basins.

Investigate mechanisms related to fish habitat patterns emerging from synthesis.

FY 1996
Synthesize information for coastal Oregon basins.

7. *Publication and Technology Transfer Activities:*

a. Completed to Date in FY 91:

Presented information on Fish Habitat Project to BLM personnel from Washington, D.C. and Regional Office, May 1991.

Schwartz, John. 1991. Influence of geomorphology and land use on distribution and abundance of salmonids in a coastal Oregon basin. M.S. Thesis. 207 p.

Reeves, G.H.; F.H. Everest, and J.R. Sedell. 1991. Diversity of juvenile anadromous salmonid communities in basins with varying degrees of timber harvest in coastal Oregon. To be submitted to Canadian Journal of Fisheries and Aquatic Science.

b. Planned for Remainder of FY 91:

Submit two manuscripts on fish distribution and abundance in Drift Creek basin for publication.

Submit manuscript on woody debris abundance in Drift Creek basin.

Prepare an article for the **COPE Report**.

Participate in field tours, seminars, and workshops.

c. Planned for FY 92:

Prepare manuscript on fish distributions and abundance in Lobster Creek basin.

Prepare an article for the **COPE Report**.

Participate in field tours, seminars, and workshops.

8. *Estimated Cost:*

	OSU	*PNW*	*TOTAL*
FY 91	130,000	106,000	236,000
FY 92	133,000	111,000	244,000
FY 93	138,000	117,000	255,000
FY 94	141,000	123,000	264,000
FY 95	93,000	91,000	184,000
FY 96	63,000	63,000	126,000

9. *Duration of the Study:*

Initiation date: FY 87
Scheduled completion date: FY 96

May 1991

Fundamental COPE
Progress Report

1. *Title*:

Forest Management on Landslide-Prone Sites: Stability Evaluation, Effectiveness of Leave Areas, and Effects of Landslides on Riparian and Fisheries Resources

2. *Principal Investigator(s) and Organization(s)*:

Dr. Henry A. Froehlich, Professor, Department of Forest Engineering, College of Forestry, OSU, Corvallis
Dr. Frederick J. Swanson, Research Geologist, Pacific Northwest Research Station, Corvallis
Mr. Kevin Lautz, Research Assistant, Department of Forest Engineering, College of Forestry, OSU, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Identify and explain how various management practices in streams and riparian areas affect fish populations and communities and water quality.

b. Develop, refine, and test systems for predicting and reducing landslides, surface erosion, and sediment delivery to stream channels.

c. Identify and integrate associations among ecosystem components (for example, vegetation, geomorphology, fish) in riparian areas and explain their ecological relationships.

4. *Study Objective(s)*:

a. Compare and evaluate existing approaches to judging the stability of headwalls. If existing approaches prove to be inadequate, develop an improved method of evaluating headwall stability appropriate for field use.

b. Evaluate the role tree roots play in mitigating landslide activity within steep headwalls.

c. Determine where streamside buffer blowdown is likely to occur and if stream sediment levels significantly increase when wide-spread blowdown does occur.

d. Characterize the timing and rate of movement of large-scale landslides. Evaluate the effects of forest cutting on movement.

e. Examine variations in precipitation intensity and amounts throughout the Coast Range. Relate rainfall characteristics to landslide activity.

5. *Potential Benefit or Utility of the Study*:

Evaluation of slope stability in marginally stable areas forms the basis for management decisions on Federal, State, and private land. This research will result in the development of a better system for the evaluation of slide potential after clearcutting.

Also, this study will provide information for managing riparian areas to minimize buffer blowdown and associated stream sedimentation.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

Winter precipitation records for all 16 recording gages has been entered in data file.

Remeasurement of blowdown on 40 buffer strips has been completed and analysis of data about two thirds completed.

The analysis of soil engineering properties and vegetative characteristics for headwall slope stability analysis has been completed.

b. Tasks Yet to Be Completed in FY 91:

Summarize analysis of effects of clearcutting on Condon landslides as part of M.S. Thesis of Bernie Wong, Geosciences, Oregon State University.

Make final analysis at all headwalls in forested, clearcut and headwall leave areas.

Analyze radar imagery for potential in locating local storms of high (landslide producing) intensity.

Complete analysis of BLM and USFS slope stability prediction methods.

Following a major storm, revisit part or all of the headwalls on BLM and U.S. Forest Service land for which we have detailed field measurements. Determine if recent sliding can be correlated to topography, soil characteristics, vegetation type, and precipitation intensity.

c. Planned for FY 92:

Continue to collect precipitation data.

7. *Publication and Technology Transfer Activities:*

a. Completed to Date in FY 91:

Bransom, Mark. 1990. Soil engineering properties and vegetative characteristics for headwall slope stability analysis in the Oregon coast range. M.S. Thesis. Oregon State University, College of Forestry, Dept. of Forest Engineering. 80 p.

b. Planned for Remainder of FY 91:

Prepare an article for the **COPE Report** on storm precipitation patterns in central Oregon Coast Range.

Prepare slide-tape presentation concerning recognition of high-risk headwalls and management influences on slide frequency.

Prepare a manuscript evaluating existing approaches to judging stability of headwalls.

Participate in field tours, seminars, and workshops as appropriate.

c. Planned for FY 92:

Complete publication preparation.

Participate in field tours, seminars, and workshops as appropriate.

8. *Estimated Cost:*

	OSU	*PNW*	*TOTAL*
FY 91	62,000	15,000	77,000
FY 92	0	0	0

9. *Duration of the Study:*

Initiation date: FY 87
Scheduled completion date: FY 92

May 1991

Fundamental COPE
Progress Report

1. *Title*:

Wildlife Habitat and Wildlife Diversity in Riparian Zones: A Gradient Approach

2. *Principal Investigator(s) and Organization(s)*:

Dr. William C. McComb, Associate Professor, Department of Forest Science/Department of Fisheries and Wildlife, OSU, Corvallis
Dr. Robert G. Anthony, Assistant Leader, Oregon Cooperative Wildlife Research Unit/Department of Fisheries and Wildlife, OSU, Corvallis
Dr. E. Charles Meslow, Leader, Oregon Cooperative Wildlife Research Unit/Department of Fisheries and Wildlife, OSU, Corvallis
Dr. Joseph J. Beatty, Instructor, Department of Zoology, OSU, Corvallis

3. *Management Issues and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Identify wildlife species in and adjacent to riparian habitats.

b. Characterize wildlife communities in riparian and adjacent upland habitats and assess associations between habitat and wildlife species.

c. Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas.

d. Identify and integrate associations among ecosystem components (for example, vegetation, geomorphology, fish) in riparian areas and explain their ecological relationships.

4. *Study Objective(s)*:

a. Determine the relative abundance of vertebrate species and quantify patterns of vertebrate community structure and diversity along transriparian and intrariparian gradients in Coast Range watersheds.

b. Quantify food and cover along transriparian and intrariparian gradients in a representative set of Coast Range watersheds.

c. Assess habitat associations and the zone of riparian influence for selected species that may be sensitive to riparian zone disturbance.

d. Extensively sample habitat and vertebrate communities at sites throughout the Coast Range that represent a continuum of habitat conditions.

e. Develop and test hypotheses regarding the response of species and communities to changes in vegetation structure and composition within and adjacent to riparian zones.

f. Evaluate opportunities to manipulate vegetation to optimize simultaneous production of wildlife habitat and timber.

5. *Potential Benefit or Utility of the Study*:

There is currently almost no information which permits objective evaluation of tradeoffs for wildlife management in riparian zones. Controversies over the current Forest Practices Rules makes the need for this information a high priority. The goal of this research is to provide this needed information. Riparian zones receive water, nutrients and energy from upstream sources along the stream gradient, so they are potentially very productive ecosystems. They could add significantly to the food base of a watershed, thereby affecting vertebrate community structure. Variability in food and cover ought to be maximized through time along three spatial gradients: parallel to the stream (increasing floodplain size), perpendicular to the stream (moisture gradient), and vertically from the forest floor to the canopy. Characteristics of the stream and adjacent forest will influence these gradients. Research will be directed to provide information to develop prescriptions at a basin level in coordination with fisheries and forest ecologists working on other COPE projects.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

Completed analysis of small mammal and amphibian community relationships in managed and unmanaged stands.

Began sampling bird communities along intrariparian gradients in the south Coast Range.

b. Tasks Yet to Be Completed in FY 91:

Complete analysis of beaver habitat relationships in the central Coast Range.

Continue data collection on bird community relationships to riparian gradients and forest fragmentation in the central Coast Range.

c. Planned for FY 92:

Complete report on small mammal and amphibian abundance in managed and unmanaged stands.

Complete report on beaver habitat relationships in Coast Range streams.

Continue sampling bird communities along an intra-riparian gradient as a pilot study.

Continue sampling bird communities along riparian gradients in managed sub-basins.

d. Tasks to Be Completed By Fiscal Year Starting in FY 93:

FY 1993
Begin intra-riparian sampling study.

Continue sampling in managed sub-basins.

FY 1994
Complete field sampling in managed sub-basins and begin data analysis.
Continue sampling intra-riparian gradients.

Begin sampling birds, small mammals, and amphibians in buffer strips of varying widths.

FY 1995
Complete report on bird communities in managed sub-basins.

Continue intra-riparian study.

Continue study on buffer strip widths.

FY 1996
Analyze data and prepare reports describing the results of intra-riparian bird communities and influence of buffer strip width on bird, small mammal and amphibian communities.

7. *Publication and Technology Transfer Activities:*

a. Completed to Date in FY 91:

McComb, W.C., R.G. Anthony, and K. McGarigal. 1991. Differential vulnerability of small mammals and amphibians to two trap types and two trap baits in Pacific Northwest forests. Northwest Science. (In Press).

McComb, W.C., K. McGarigal, and R.G. Anthony. Small mammal and amphibian abundance in streamside and upslope habitats of mature Douglas-fir stands, western Oregon. Submitted to Northwest Science.

McGarigal, K. and W.C. McComb. Streamside vs. upslope bird communities in the central Oregon Coast Range. Submitted to Journal of Wildlife Management.

b. Planned for Remainder of FY 91:

Participate in field tours, seminars, and workshops as appropriate.

Prepare an article for the **COPE Report**.

c. Planned for FY 92:

Prepare manuscripts on:
1. Riparian and upslope relationships of small mammals and amphibians in managed and unmanaged stands of the central Oregon Coast Range.

2. Small mammal and amphibian association with beaver-modified habitat in the central Oregon Coast Range.

8. *Estimated Cost*:

	OSU
FY 91	130,000
FY 92	133,000
FY 93	116,000
FY 94	118,000
FY 95	74,000
FY 96	76,000

9. *Duration of the Study*:

Initiation date: FY 88
Scheduled completion date: FY 96

May 1991

Fundamental COPE
Progress Report

1. *Title*:

Hybrid Poplar and Red Alder in Coastal Riparian Zones for Non-point Source Pollution Control, Fish and Wildlife Habitat, and Wood Fiber

2. *Principal Investigator(s) and Organization(s)*:

Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis
Dr. William H. Emmingham, Silviculturist, Department of Forest Science, OSU, Corvallis
Dr. David E. Hibbs, Silviculturist, Department of Forest Science, OSU, Corvallis
Dr. Stanley V. Gregory, Fisheries Biologist, Department of Fisheries and Wildlife, OSU, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Identify and explain how various management practices in streams and riparian areas affect fish populations and communities and water quality.

b. Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas and increase conifer development there.

4. *Study Objective(s)*:

a. Monitor and measure the development of hybrid poplar and red alder established in riparian zones of streams adjacent to farm or pasture land in the Oregon Coast Range.

b. Monitor concentrations of nitrates at three depths in the soil profile across the transect of each poplar and alder buffer strip.

c. Monitor changes in bank stability and fish habitat complexity as hybrid poplar and alder stands develop.

5. *Potential Benefit or Utility of the Study*:

The best potential fish habitat in coastal Oregon is often on farmland and land near estuaries. However, in these areas bank stability, the physical configuration of fish habitat, and water quality are often in poor condition. Water quality problems related to non-point source pollution include high temperatures, high bacteria levels, and high nitrate concentrations. In Europe and the eastern United States it is well known that forest buffers can retain as much as 89 percent of the nitrogen and 80 percent of the phosphorous runoff associated with adjacent land use practices. Even narrow riparian forest strips are effective filters particularly when adjacent to cropland. Small side channels and the merger of rivers are potentially excellent salmonid habitat. However, due to past human disturbance, many of these areas are currently unproductive rearing habitat for young salmonids.

Hybrid poplar plantations are used successfully in France for fish and wildlife habitat, ground water nutrient filters, and fiber. On test plots in the Pacific Northwest, hybrid poplar can grow to over 60 feet high and attain a diameter of more than 7 inches within eight years. The French model should be tested along the Oregon Coast where, if successful, it would represent an excellent example of forest management and environmental protection resulting in better fish and wildlife habitat, cleaner rivers and bays, and an alternative high yield fiber supply. Red alder has similar potential and should also be tested. Demonstration plantations need to be started along the coast on farmland, followed by intensive sampling of ground water moving through the plantations. The demonstration sites will provide an early assessment of the length of time required to stabilize stream banks and effectively filter nutrients from ground water entering streams.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

Nestucca River site experienced winter kill and disease problems. The site was replanted in 1991 with both an alder plantation and poplar plantation.

We were unable to find a cooperator on suitable sites in Coos County. COPE, Soil Conservation Service and OSU Extension all tried to locate a willing cooperator..

We gave a dairy farmer 600 poplar whips and they were planted around a dairy pond and other point source pollution areas on the farm.

Camp Tillamook site heavily damaged by elk and deer. We replanted with poplar in spring 1991 and fenced with electric fencing.

OSU dairy farm had 80% damage to the cottonwoods. We have fenced and replanted 2% of the area.

OSU dairy farm alder plantation experienced 85% mortality in 1990. We replanted with red alder and white alder.

b. Tasks Yet to Be Completed in FY 91:

Analyze growth and lysimeter data at all sites.

Plant a poplar and alder plantation near Woodburn, Oregon.

Washington County officials have been contacted concerning plantation along the Tualitin River and tributaries.

c. Planned for FY 92:

Dig a dry well to monitor sub-surface water levels.

Plant plantations in Washington County and Tualitin River basin.

d. Tasks to be Completed by Fiscal Year Starting in FY 93:

FY 1993
Collect and analyze growth data.

FY 1994
Collect and analyze growth data.

FY 1995
Collect and analyze growth data.

FY 1996
Collect and analyze growth data.

Prepare a manuscript that summarizes study results.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

Conducted tours of sites with Paul Heilman, Washington State University. Consulted with him as to soils and growth.

Presented information and conducted tour for hardwood extension workshops.

Oregonian article, spring 1991.

b. Planned for Remainder of FY 91:

Participate in field tours, seminars, and workshops as appropriate.

Write a **COPE Report** article.

c. Planned for FY 92:

Participate in field tours, seminars, and workshops as appropriate.

Write a **COPE Report** article.

8. *Estimated Cost:*

	PNW	*OSU*	*TOTAL*
FY 91	49,000	22,000	71,000
FY 92	46,000	26,000	72,000
FY 93	44,000	23,000	67,000
FY 94	46,000	24,000	70,000
FY 95	37,000	27,000	64,000
FY 96	39,000	23,000	62,000

9. *Duration of the Study:*

Initiation date:	FY 89
Scheduled Completion Date:	FY 96

May 1991

Fundamental COPE
Progress Report

1. *Title*:

Ground Water Movement in Steep Forested Hill-Slopes with Particular Focus on Marginally Stable "Head-Walls"

2. *Principal Investigator(s) and Organization(s)*:

Dr. Marvin R. Pyles, Associate Professor, Department of Forest Engineering, Oregon State University, Corvallis
Dr. Henry A. Froehlich, Professor, Department of Forest Engineering State University, Corvallis
Mr. Arne E. Skaugset, Instructor, Department of Forest Engineering and Adaptive COPE Program, Oregon State University, Hatfield Marine Science Center, Newport

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

Develop, refine, and test systems for predicting and reducing landslides, surface erosion and sediment delivery to stream channels.

4. *Study Objective(s)*:

a. Review published analytical modeling methods for applicability to steep forest slope groundwater regimes.

b. Attempt measurements of the distribution of groundwater flow in a steep forested slope between saturated flow, unsaturated flow, and macro-pore or pipe flow.

c. Estimate hydraulic constants for groundwater flow in steep forest slopes.

d. Investigate site to site differences that relate to groundwater flow within a homogeneous sample of forest slopes.

5. *Potential Benefit or Utility of the Study*:

Debris avalanches from steep slopes are and will continue to be the focus of discussions about best management practices in the Oregon Coast Range. Attempts to manage forest land in such a way as to avoid the most unstable

terrain are moving in the direction of quantitative assessment of slope stability as a part of the management planning process. Central in the quantitative assessment of slope stability is the pore water pressure used in the particular slope stability equation selected. This value of pore water pressure is currently obtained either by simple assumption, or from empirical ground water functions of doubtful broad geographic validity. Best assessments of slope instability will be made only if a broadly applicable groundwater model can be developed. The proposed study is an essential first component in the development of improved ground water models.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

Hired two GRA's to staff the project.

Completed the slope stability background component of the project problem analysis/study plan.

Completed the tracer methods component of the project problem analysis/ study plan, which required detailed review of 75 articles from the literature.

Completed personal interviews with other groundwater researchers regarding unpublished work in the field.

b. Tasks Yet to be Completed in FY 91:

Complete the observational approach study plan.

Select field monitoring site(s).

Select and purchase instrumentation.

Install instrumentation at selected field sites.

Complete the ground water modeling review.

c. Planned for FY 92:

Conduct field and/or laboratory experiments that are compatible with the findings of the project problem analysis and study plan.

d. Tasks to be Completed by Fiscal Year Starting in FY 93:

FY 1993
Analyze data from FY 92 experiments.

Conduct field and/or laboratory experiments that are compatible with the findings of the project problem analysis and study plan.

FY 1994
Analyze data and prepare project reports.

7. *Publication and Technology Transfer Activities*:

a. Completed to date in FY 91:

None.

b. Tasks Yet to be Completed FY 91:

Participate in seminars, workshops and field trips as appropriate.

c. Planned for FY 92:

Participate in seminars, workshops and field trips as appropriate.

8. *Estimated Cost*:

	OSU
FY 91	45,000
FY 92	40,000
FY 93	49,000
FY 94	22,000

9. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 94

May 1991

Fundamental COPE
Progress Report

1. *Title*:

Integration of COPE Drainage Basin Studies

2. *Principal Investigator(s) and Organization(s)*:

Dr. Joseph E. Means, Research Forester, Pacific Northwest Research Station, Corvallis
Dr. Robert L. Beschta, Professor, Department of Forest Engineering, Oregon State University, Corvallis
Dr. Gordon E. Grant, Research Hydrologist, Pacific Northwest Research Station, Corvallis
Dr. Stanley V. Gregory, Fisheries Biologist, Department of Fish and Wildlife, Oregon State University, Corvallis
Dr. Andrew J. Hansen, Assistant Professor, Department of Forest Science and Adaptive COPE Team, Oregon State University, Hatfield Marine Science Center, Newport
Dr. William C. McComb, Associate Professor, Department of Forest Science, Oregon State University, Corvallis
Dr. Thomas E. McMahon, Fish Habitat Scientist, Department of Forest Engineering and Adaptive COPE Program, Oregon State University, Hatfield Marine Science Center, Newport
Dr. Gordon H. Reeves, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Dr. Thomas A. Spies, Research Forester, Pacific Northwest Research Station, Corvallis
Dr. Frederick J. Swanson, Research Geologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

Identify and integrate associations among ecosystem components (for example, vegetation, geomorphology, fish) in riparian areas and explain their ecological relationships.

4. *Study Objective(s)*:

a. Coordinate and facilitate interaction among the fisheries, riparian vegetation, wildlife, and geomorphology/landslide studies of COPE with regard to

conceptual approach, sampling, and data management in order to increase integration of research at the drainage basin scale.

b. Characterize drainage basin structure, such as drainage network and valley floor geomorphology, in order to facilitate sampling and interpreting distributions of wildlife, fish, and vegetation in the basins.

c. Examine selected patterns of association among fish, vegetation, wildlife and geomorphology, and interpret controls on productivity of fish, wood, and wildlife.

5. *Potential Benefit or Utility of the Study*:

The goal of COPE research is to find ways to enhance productivity of the multiple resources derived from streams, riparian zones, and forests of the Oregon Coast Range. This requires understanding relationships among geomorphology, stream characteristics, aquatic organisms, wildlife, and riparian and upland vegetation. Many of these components are considered in individual COPE studies, but no vehicle exists for integrating these studies and developing knowledge of the relationships involved . Such integration is not achievable without a team-oriented study specifically assigned to the task.

This study will increase coordination of conceptual approaches, field sampling, data analysis, and data management. For example, we will examine factors regulating the distribution of fish and wildlife within selected drainage basins. More specifically, past studies of fish populations have shown various levels of association of areas with wide valley floors which have open canopies and complex habitat resulting from landslide deposits and geologic structures. Areas of open canopy may affect production of aquatic invertebrates which are food for fish by increasing primary productivity and changing water temperature. Furthermore, the long-term effects of landslides on fish habitat and populations can be evaluated in the drainage basin and long-term contexts provided by the integration study. Examination of these and other processes is needed to determine limits on fish productivity. This will help to directly address the question of how to enhance fish productivity in a basin.

The study will also guide acquisition of a geographic information system (GIS) for COPE. This a powerful tool for analysis of spatial patterns of key resources and constraints on productivity.

6. *Research Activities*:

a. Accomplishments to date in FY 91:

Held scientist retreat to help determine direction for the Integration Project. Entered the following themes for Drift Creek into the GIS: Topography (slope,

elevation, aspect, 3-D models), Drainage networks, Transportation, Stand classifications, Plant associations, Geology map.

b. Tasks Yet to be Completed in FY 91:

i) Complete characterization of Drift Creek basin structure.

Continue analysis of patterns and associations in Drift Creek basin.

ii) Organize workshops for Integration scientists on:
1) Geomorphology Research in the Coast Range
2) Vegetation Modeling in the Coast Range
3) Wildlife Landscape Modeling in the Coast Range

iii) Organize meeting of Integration scientists to further define research direction.

iv) Begin characterization of Elk River basin structure.

c. Planned for FY 92:

Initiate analysis of Elk River basin patterns and associations.

Continue characterization of Elk River basin structure.

Continue analysis of Drift Creek basin patterns and associations.

Survey recorded history and important parts of natural history of Drift Creek basin, such as landslides and floods when possible.

Develop conceptual model of interactions among geomorphic, vegetation, fish and wildlife structures and processes.

d. Tasks to be Completed by Fiscal Year Starting in FY 93:

FY 1993
Complete characterization of Elk River basin structure.

Continue analysis of Elk River basin patterns and associations.

Begin developing a model of a selected portion of a Coast Range basin-level ecosystem.

FY 1994
Continue analysis of Elk River basin patterns and associations.

Continue development of a model of a selected portion of a Coast Range basin-level ecosystem.

FY 1995
Complete development of a model of a selected portion of a Coast Range basin-level ecosystem.

Participate in developing COPE synthesis products as appropriate.

FY 1996
Participate in developing COPE synthesis products as appropriate.

Prepare manuscripts that summarize study results.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

None.

b. Planned for Remainder of FY 91:

Prepare an article for the **COPE Report**.

Participate in seminars, workshops, and field trips as appropriate.

Present paper on synthesis and integration in Drift Creek at International Association of Landscape Ecology meetings in July.

c. Planned for FY 92:

Prepare an article for the **COPE Report**.

Participate in seminars, workshops, and field trips as appropriate.

8. *Estimated Cost:*

	PNW
FY 91	175,000
FY 92	184,000
FY 93	194,000
FY 94	203,000
FY 95	213,000
FY 96	210,000

9. *Duration of the Study:*

Initiation Date:	FY 90
Scheduled Completion Date:	FY 96

May 1991

Fundamental COPE
Progress Report

1. *Title*:

The Dynamics and Silviculture of Riparian Vegetation

2. *Principal Investigator(s) and Organization(s)*:

Dr. David E. Hibbs, Associate Professor, Department of Forest Science, Oregon State University, Corvallis
Mr. Samual Chan, Plant Physiologist, Pacific Northwest Research Station, Corvallis
Dr. William H. Emmingham, Associate Professor, Department of Forest Science, Oregon State University, Corvallis
Dr. John C. Tappeiner, Professor, Department of Forest Resources, Oregon State University, Corvallis

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas and increase conifer development there.

4. *Study Objective(s)*:

a. Determine the effects of harvest entry type and intensity, landform, vegetation type, upslope activity, and time since entry on tree regeneration, understory development, and overstory dynamics (succession, mortality, windthrow, diversity) by sampling the spectrum of existing buffer strip conditions.

b. Develop systems of tree regeneration in riparian areas and descriptions of (1) how these systems affect fish and wildlife habitat characteristics and growing conditions, and (2) how these regeneration systems can be integrated into adjacent upslope management.

c. Develop the information base and methodology required to manage the riparian overstory to maintain or achieve a desired plant composition and structure through manipulation of mixes of tree and shrub species in groups of different sizes and at different densities.

Two guidelines apply to all study objectives. First, the spectrum of riparian area activities studied will range from no disturbance, through partial overstory removals, to complete harvest and will include intensive regeneration and

stand management practices. Second, all characterizations of vegetation and the effects of manipulations on vegetation will be measured and described in terms useful to fisheries, wildlife and timber resource managers. Opportunities will be sought to coordinate this study with other COPE research.

5. *Potential Benefit or Utility of the Study:*

Riparian area plant communities are extremely diverse, and their structure and composition is a major determinant of fish and wildlife habitat. Likewise, the tree component can represent a sustainable source of forest products. Consequently, the management and successional dynamics of riparian area vegetation can have a major effect on the productivity of fish, timber, and wildlife resources. Unfortunately, little is known about how to manage riparian area vegetation to achieve specific habitat characteristics. Historically, management practices in riparian areas have shifted from maximum to minimum disturbance and the creation of buffer strips, primarily to protect the fisheries resource. However, in many Coast Range riparian areas, future habitat characteristics desirable for fish, timber, and wildlife may be delayed or foregone because current practices may not facilitate adequate tree regeneration and may not perpetuate desired community structure and composition.

This study will explore both the short- and long-term effects of riparian area management practices on the timber resource and on vegetation-related fish and wildlife habitat characteristics. It will provide much needed information on the growing conditions created by different silvicultural strategies and thus allow resource managers to choose appropriate methods to achieve specific vegetation characteristics in riparian areas. This will increase the resource manager's ability to eventually reach the desired mix of fish, timber, and wildlife required to meet management objectives.

6. *Research Activities:*

a. Accomplishments to Date in FY 91:

First-year chronosequence data entered. Analysis underway.

First regeneration site installed: overstory and initial understory treatments applied, seedlings planted and baseline measurements taken.

Second regeneration site located.

b. Tasks Yet to be Completed in FY 91:

Complete analysis and report on first-year chronosequence sampling.

Continue chronosequence sampling in mixed conifer-hardwood forest types (objective a).

Mark treatments and complete logistical planning for second regeneration site (objective b).

Begin environmental and growth monitoring of first regeneration site (objective b).

Cooperate with the USDA Forest Service in developing and installing interpretive signs for the regeneration site (objective b).

c. Planned for FY 92:

Continue chronosequence work: sampling, analysis, reporting.

Install second regeneration site.

Continue seedling growth and physiological measurements, microsite monitoring, vegetation development, analysis, reporting.

Develop research approach to objective 3.

Work with Adaptive COPE Team to develop a network of researchers and managers involved in riparian silviculture.

d. Tasks to be Completed by Fiscal Year Starting in FY 93:

FY 1993
Objective 1: specific activities dependent on outcome of first 2 years. Pursue buffer strip characteristics, and dynamics.

Objective 2: continue plant and microenvironmental measurements. Partial harvest and thinning of seedlings on first regeneration site for growth analysis.

Objective 3: continue developing data set on diversity characteristics and management implications.

Technology transfer activities.

FY 1994
As above.

FY 1995
As above.

FY 1996
Complete data analysis and prepare manuscripts summarizing study results.

7. *Publication and Technology Transfer Activities*:

a. Completed to date in FY 91:

Presentation to the CRAFTS Technical Committee: Fundamental COPE research: Dynamics and management of riparian zone vegetation, March 27, 1991.

b. Tasks Yet to be Completed in FY 91:

Prepare an article for the **COPE Report**.

Participate in seminars, workshops and field trips as appropriate.

c. Planned for FY 92:

Prepare an article for the **COPE Report**.

Participate in seminars, workshops and field trips as appropriate.

8. *Estimated Cost*:

	OSU	*PNW*	*TOTAL*
FY 91	60,000	52,000	112,000
FY 92	61,000	55,000	116,000
FY 93	64,000	58,000	122,000
FY 94	65,000	61,000	126,000
FY 95	66,000	64,000	130,000
FY 96	57,000	67,000	124,000

9. *Duration of the Study*:

Initiation Date: FY 90
Scheduled Completion Date: FY 96

May 1991

Fundamental COPE
Progress Report

1. *Title*:

Disturbance History, Channel State, Fish Habitat, and Fish Production in Sandstone Basins of the Central Oregon Coast

2. *Principal Investigator(s) and Organization(s)*:

Dr. Fred H. Everest, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Mr. Lee E. Benda, Graduate Student/Staff, Department of Geological Sciences and Fishery Research Institute, University of Washington, Seattle
Dr. Gordon H. Reeves, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Identify and explain the effects of various riparian and stream conditions on fish populations and communities.

b. Identify and explain how various management practices in streams and riparian areas affect fish populations and communities and water quality.

4. *Study Objective(s)*:

Establish the spatial and temporal relationship between natural and human disturbances in central coast sandstone basins and successional state of riparian vegetation, stream channel state, fish habitat characteristics, and fish populations and community structure.

5. *Potential Benefit or Utility of the Study*:

Habitat characteristics of stream channels are influenced by riparian vegetation. The structure and composition of fish communities is in turn a function, at least in part, of habitat conditions. Little is known about changes in habitat and fish community characteristics following natural disturbance events. Even less is known about how these things change as the stream system and associated riparian zone recover over time. Knowledge of the recovery of stream systems from natural

disturbance events will provide a temporal and spatial context for the management of riparian areas. This temporal and spatial context, particularly the temporal aspects, is lacking in current management schemes. This knowledge will provide a better understanding of the long-term role of riparian vegetation in stream systems and will be incorporated into riparian management schemes.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

Data analyzed.

Initial development of landscape-level fire-landslide-stream patch model.

b. Tasks Yet to be Completed in FY 91:

Complete data analysis.

c. Planned for FY 92:

Complete analysis. Study ends in FY 92.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

Presentations made at:
1) American Geophysical Union Meeting, San Francisco, CA, December 1990.
2) North American Benthological Society Meeting, Sante Fe, NM, May 1991.

Benda, L. In press. The influence of debris flows on channels and valley floors in the Oregon Coast Range, U.S.A. Earth Surface Processes and Landforms. (This revised paper claimed in "Behavior of Debris Torrents and Effects on Anadromous Fish Habitat in the Oregon Coast Range" contains ideas generated from this project).

Reeves, G.H.; F.H. Everest, and J.R. Sedell. 1991. Diversity of juvenile anadromous salmonid communities in basins with varying degrees of timber harvest in coastal Oregon. To be submitted to Canadian Journal of Fisheries and Aquatic Science.

b. Planned For Remainder of FY 91:

Prepare a manuscript for publication.

Participate in seminars, workshops and field trips as appropriate.

c. Planned for FY 92:

Prepare manuscript for submission to peer reviewed journal.

8. *Estimated Cost*:

	PNW
FY 91	21,000
FY 92	22,000

9. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 92

May 1991

Fundamental COPE
Progress Report

1. *Title*:

Juvenile Salmonid Macrodistribution and Habitat Availability in a Small Coastal Oregon Stream: A Basin-Wide Seasonal Perspective

2. *Principal Investigator(s) and Organization(s)*:

Dr. Fred H. Everest, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Dr. Jack D. Sleeper, Graduate Research Assistant, Department of Fish and Wildlife, Oregon State University, Corvallis
Dr. Stanley V. Gregory, Associate Professor, Department of Fish and Wildlife, Oregon State University, Corvallis
Dr. Gordon H. Reeves, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

Identify and explain the effects of various riparian and stream conditions on fish populations and communities.

4. *Study Objective(s)*:

a. Determine if basin-wide distribution and abundance of juvenile anadromous salmonids in habitat units (pools, riffles, glides, side channels) vary seasonally and longitudinally, and quantify the associated seasonal relationships between juvenile salmonids and habitat characteristics.

b. Relate longitudinal and seasonal juvenile anadromous salmonid habitat use, and possible changes in habitat use, to the identification of characteristics of critical fish habitat and to the development and design of habitat rehabilitation programs.

5. *Potential Benefit or Utility of the Study*:

An increased understanding of seasonal macrodistribution of juvenile salmonids and its relationship to the distribution of salmonid habitats is needed. By relating

these distributions to geomorphic and hydrologic characteristics within basins, fisheries managers and researchers can better identify characteristics of critical habitat, and improve their ability to produce cost-effective enhancement projects.

Data from several basins in Oregon indicate that specific stream sections and habitat units (pool, riffle, etc.) contain a disproportionate number of the total fish in the basin during summer, and these patterns appear relatively consistent between years. An understanding of the habitat characteristics that influence these areas of high salmonid concentration, and knowledge of the relationship between these areas and geomorphic and hydrologic conditions within basins, would be useful for fisheries managers and researchers.

Several studies have documented changes in distribution and abundance of juvenile salmonids in streams, including fry dispersal from emergence sites and juvenile fish migrations from summer to winter habitat. Also, the relative abundance of salmonids in specific habitat units has been shown to vary both longitudinally and seasonally. However, few of these studies have taken a seasonal, basin-wide perspective which could document the longitudinal distribution of juvenile salmonids and could associate the potential changes in that distribution with seasonal migrations.

A complete basin perspective is needed to assess seasonal and longitudinal salmonid habitat use. The practice of researchers selecting specific study sites to assess basin-wide characteristics introduces a bias into the sampling scheme and provides no information about the distribution and abundance of those characteristics. By surveying entire basins and estimating the dimensions of all habitat units, habitat parameters can be quantified and their distribution can be mapped. This method, when combined with seasonal sampling, can provide basin-wide information on seasonal habitat availability and distribution and its relationships with salmonid community composition, distribution, survival, and production. Managers can use such information to protect critical habitats within a basin, to identify factors limiting fish production in a basin, and to design cost effective habitat rehabilitation and enhancement programs.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

Data analysis completed.

b. Tasks Yet to be Completed in FY 91:

None.

c. Planned for FY 92:

None. Study terminates at the end of FY 91.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

Results presented as part of talks given at various workshops and meetings.

b. Planned for Remainder of FY 91:

Complete M.S. thesis and submit study results to primary fisheries journals.

Participate in seminars, workshops and field trips as appropriate.

c. Planned for FY 92:

None. Study terminates at the end of FY 91.

8. *Estimated Cost*:

	PNW
FY 91	26,000

9. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 91

May 1991

Fundamental COPE
Progress Report

1. *Title:*

Behavior of Debris Torrents and Effects on Anadromous Fish Habitat in the Oregon Coast Range

2. *Principal Investigator(s) and Organization(s):*

Dr. Fred H. Everest, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Mr. Lee E. Benda, Graduate Student/Staff, Department of Geological Sciences and Fishery Research Institute, University of Washington, Seattle
Dr. Gordon H. Reeves, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6):*

Riparian Zone Management

a. Identify and explain the effects of various riparian and stream conditions on fish populations and communities.

b. Identify and explain how various management practices in streams and riparian areas affect fish populations and communities and water quality.

c. Develop, refine, and test systems for predicting and reducing landslides, surface erosion, and sediment delivery to stream channels.

4. *Study Objective(s):*

a. Determine the cause, frequency, behavior, and spatial and temporal distribution of debris torrents in sandstone and basalt geologies of the Oregon Coast Range.

b. Determine the spatial and temporal effects of debris flows on the physical structure of habitat for anadromous salmonids in streams draining sandstone and basalt geologies of the Oregon Coast Range.

5. *Potential Benefit or Utility of the Study:*

Though mass wasting by debris torrents is a natural process, forest management is altering the frequency and magnitude of these events across regional landscapes in the Pacific Northwest. The problem of assessing the effects of mass wasting on channel morphology and fish habitats on scales of watersheds and over time periods of decades has never been adequately investigated, yet it is an area of great importance to resource managers.

Information on how different frequencies and magnitudes of debris torrents affect channel morphology and fish habitat will enhance the manager's ability to solve such forest management problems as identifying geomorphically-driven biological thresholds in streams, defining the degree of heterogeneity of channel morphology needed to maintain biological diversity, and designing a methodology for analysis of cumulative effects.

6. *Research Activities:*

a. Accomplishments to Date in FY 91:

None.

b. Tasks Yet to be Completed in FY 91:

Continue data collection.

We will continue to assess the spatial and temporal effects of debris torrents on fish habitat characteristics in the Knowles Creek basin (8th year) by field surveys (September 1991).

c. Planned for FY 92:

Continue annual field habitat surveys of Knowles Creek basin.

Analyze 10-year record of habitat changes in response to debris torrents in 1980, 1981, and 1984, in particular the persistence of channel pools and the extent of gravel accumulation created by debris torrent deposits.

d. Tasks to be Completed by Fiscal Year Starting in FY 93:

FY 1993
Submit manuscript for publication.

Continue physical habitat field work.

FY 1994
Examine the link between distribution of juvenile anadromous salmonids in stream sub-basins and physical habitat changes caused by debris torrents.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

Presentation of results at meetings and workshops:

Cummulative Effects - New Perspectives in Watershed Management, Seattle, November 1990.

National Stream Habitat Workshop, Ft. Collins, CO, USDA, Forest Service, November 1990 and April 1991.

Oregon Chapter American Fisheries Society, Fish Habitat Restoration Workshop, Glenedan Beach, February 1991.

Revised and In Press: Benda, L. The influence of debris flows on channels and valley floors in the Oregon Coast Range, U.S.A. Earth Surface Processes and Landforms.

b. Planned for Remainder of FY 91:

Participate in seminars, workshops and field trips as appropriate.

Prepare an article for the **COPE Report**.

c. Planned for FY 92:

Preparation of manuscript for peer reviewed journal.

8. *Estimated Cost*:

	PNW
FY 91	21,000
FY 92	22,000
FY 93	23,000
FY 94	24,000

9. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 94

May 1991

Fundamental COPE
Progress Report

1. *Title*:

Influence of Geology on Response of Channel Morphology and Juvenile Salmonid Populations to Logging in Streams of the Oregon Coast Range

2. *Principal Investigator(s) and Organization(s)*:

Dr. Fred H. Everest, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Dr. Brendan J. Hicks, Graduate Research Assistant, Department of Fish and Wildlife, Oregon State University, Corvallis
Dr. James D. Hall, Professor, Department of Fish and & Wildlife, Oregon State University, Corvallis
Dr. Gordon H. Reeves, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Identify and explain the effects of various riparian and stream conditions on fish populations and communities.

b. Identify and explain how various management practices in streams and riparian areas affect fish populations and communities and water quality.

4. *Study Objective(s)*:

a. Determine the response of channel morphology to timber harvest and road construction by comparison of streams with similar underlying rock types in largely unharvested and harvested watersheds in the Oregon Coast Range.

b. Describe key basin-scale geomorphic characteristics of watersheds in different rock types to determine the effect of rock type on basin topography.

c. Determine channel unit and subunit characteristics such as gradient, width, depth, substrate size, habitat complexity, and the proportion of different channel units at similar sites in streams running through different rock types.

d. Determine the extent to which the abundance of salmonids is associated with different channel morphology in harvested and unharvested watersheds in different rock types.

5. *Potential Benefit or Utility of the Study:*

The ability to predict the response of watersheds and their salmonid populations to logging has become one of the most perplexing problems in fishery management in the Pacific Northwest. The problem arises from the observation that though trends in habitat degradation resulting from clearcut logging have been documented, there has been no unambiguous demonstration of impacts on salmonid populations. There are a number of possible reasons for this.

First, survival of the marine phase of anadromous species is dependent on variable ocean conditions and harvest rates in the ocean. Fluctuating returns of adults mean that rearing habitat for juveniles may not be occupied to capacity. Second, the freshwater environment is also subject to episodic natural disturbance, which may be climatic, such as forest fire; geographic, such as mass wasting and debris torrents; or hydrological, such as floods. Third, upon this background of changing ocean survival and natural fluctuations, are imposed the effects of timber harvest.

The effects of logging on freshwater stream environments are dependent on the extent of clearcutting and forest roads, yarding practices, and the extent and nature of buffer strips. However, the response of the stream environment may be exacerbated by the geomorphic, climatic, and lithologic characteristics of the watershed. The combination of variable forest practices and prevailing watershed characteristics probably account to a large extent for the variable nature of the salmonid response to logging.

The contradictory nature of the effects of logging is evident. Clearcut logging to stream margins allows more incident radiation to reach a stream, which can increase primary productivity, stream temperature fluctuations, and salmonid growth rates. However, the rate of entry of large woody debris will also decline, often resulting in greatly simplified habitat. While logging can increase low flows, it can also increase the size of peak flows which may reduce the winter survival of salmonids. The cumulative effects on salmonids of the changes brought about by logging are not well shown by short-term studies. Long-term, basin-scale, population-level studies are most appropriate to investigate cumulative effects, and very few of these have been done. Notable studies are those of the Alsea watershed and the Carnation Creek watershed. It is probable that even these studies did not span a long enough time period to truly look at cumulative effects, and both studies involved small watersheds. Identification of the sources of variability is a crucial part of studies of the response of salmonids to logging.

The underlying rock type is one aspect of variability of streams that has a strong influence on channel morphology, and this has been well documented. Changes in channel morphology in response to logging have been documented, but such

changes have not been widely linked to the underlying rock type. Geomorphology has been utilized more often than rock type to explain salmonid abundance, and has been somewhat successful. Different watershed geomorphic parameters have been used, however, and no universally applicable model appears to exist. This study proposes to link basin-scale rock type and timber harvest history to stream channel morphology, habitat complexity, and salmonid abundance.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

None.

b. Tasks Yet to be Completed in FY 91:

Complete final data analysis.

c. Planned for FY 92:

None. Study terminates at the end of FY 91.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

Hicks, B.J. 1990. The influence of geology and timber harvest on channel morphology and salmonid populations in Oregon Coast Range streams. Ph.D. Thesis. Oregon State University, Corvallis, OR. 199 p.

Hicks, B.J. and J.D. Hall. Verification of diver estimates of juvenile salmonid populations in small streams. Draft manuscript.

b. Planned for Remainder of FY 91:

Hicks, B.J., R.L. Beschta, and J.D. Hall. In press. The influence of rock type and forestry on channel morphology in Oregon Coast Range streams. Draft manuscript from Ph.D. Thesis.

Hicks, B.J., J.D. Hall, and F.H. Everest. In press. The influence of channel morphology and forestry on salmonid distribution in Oregon Coast Range streams. Draft manuscript from Ph.D. Thesis.

Hicks, B.J. Stratification of stream habitats in basalt and sandstone and implications for estimating salmonid distribution. Draft manuscript from Ph.D. Thesis.

Participate in seminars, workshops and field trips as appropriate.

Prepare an article for the **COPE Report**.

c. Planned for FY 92:

None. Study terminates at the end of FY 91.

8. *Estimated Cost:*

	PNW
FY 91	16,000

9. *Duration of the Study:*

Initiation Date:	FY 90
Scheduled Completion Date:	FY 91

May 1991

Fundamental COPE
Progress Report

1. *Title*:

Estimation of Smolt Production from Lobster Creek Study Basin

2. *Principal Investigator(s) and Organization(s)*:

Dr. Fred H. Everest, Research Fish Biologist, Pacific Northwest Research Station Corvallis
Dr. Stanley V. Gregory, Associate Professor, Department of Fish and Wildlife, Oregon State University, Corvallis
Dr. Gordon H. Reeves, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Identify and explain the effects of various riparian and stream conditions on fish populations and communities.

b. Identify and explain how various management practices in streams and riparian areas affect fish populations and communities and water quality.

4. *Study Objective(s)*:

a. Quantify salmonid smolt (juvenile migrants physiologically adapted for ocean existence) production from the Lobster Creek basin, including numbers, size, community structure, and timing of migration.

b. Relate production and behavior of smolts to land use activities in riparian and upland areas of the basin.

5. *Potential Benefit or Utility of the Study*:

Land management activities such as timber harvest and road construction can affect the physical configuration of stream habitats for anadromous salmonids. Changes in habitat can affect survival of young salmonids at various life history stages and result in ecological changes that favor one species over another.

Changes in fish community structure are likely to follow if changes in habitat persist. While any life stage in the egg, embryo, alevin, fry, parr, smolt sequence can be affected by freshwater habitat changes, those changes that reduce smolt production are the most crucial to viability of a species. It is possible, however, for a species to suffer losses in egg, alevin, fry, and parr survival without affecting smolt production. This is especially true for species (e.g., anadromous trouts) with extended fresh water rearing periods.

To accurately assess the affects of land management practices on salmonid production in a stream subbasin, it is essential to quantify spatial and temporal changes in habitat and relate those changes to the number of smolts produced annually. The relationship between habitat and smolt production is not well documented for streams in the Oregon Coast Range. COPE basin studies offer the opportunity to couple land management, fish habitat, and salmonid smolt production in a way that will help to isolate the habitat factors that are most sensitive to change and are most likely to limit a given salmonid species.

6. *Research Activities:*

a. Accomplishments to Date in FY 91:

Sampled smolt migration between March 15 and June 15.

b. Tasks Yet to be Completed in FY 91:

Continue trapping smolts in Lobster Creek basin and conduct basin surveys of habitat and fish populations in Lobster Creek.

c. Planned for FY 92:

Analysis of FY 91 data.

d. Tasks to be Completed by Fiscal Year Starting in FY 93:

FY 1993
Continued operation of trap and data analysis.

FY 1994
Continued operation of trap and final data analysis.

7. *Publication and Technology Transfer Activities:*

a. Completed to Date in FY 91:

None.

b. Planned for Remaining of FY 91:

Participate in seminars, workshops and field trips as appropriate.

c. Planned for FY 92:

Preparation of report summarizing data from 1990 and 1991 from multi-institutional research team.

8. *Estimated Cost*:

	PNW
FY 91	16,000
FY 92	17,000
FY 93	18,000
FY 94	19,000

9. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 94

May 1991

Fundamental COPE
Work Plan Progress Report

1. *Title:*

Recreation and Related Social Values of Coastal Oregon Forests

2. *Principal Investigators and Organizations:*

This study will be conducted by the Consortium for Social Values of Natural Resources.

Dr. George Stankey, Professor, College of Forestry, Oregon State University, Corvallis
Dr. Perry J. Brown, Professor, College of Forestry, Oregon State University, Corvallis
Dr. Robert Lee, Professor, College of Forest Resources, University of Washington, Seattle
Dr. Roger N. Clark, Project Leader, Pacific Northwest Research Station, Seattle
Dr. Thomas M. Quigley, Range Scientist, Pacific Northwest Research Station, La Grande

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6):*

This study will encompass the economic-related research tasks of both the riparian and reforestation management issues.

4. *Study Objective:*

Determine priority information needs to enable resource managers to effectively address critical issues and problems related to the social and economic aspects of natural resource management in the Oregon Coast Range. This will entail a comprehensive assessment of research needed to understand the role of recreation and other social values in regional and community growth, stability, and quality of life.

5. *Potential Benefit or Utility of the Study:*

Growing concerns with changes in this region, particularly related to potential reductions in timber harvests, have focused attention on the transition of the region from one highly dependent upon timber to one where a more diversified

economic base may be found. Such a transition will lead to a variety of social and economic effects upon the region. However, neither the potential opportunities nor problems associated with this transition are well understood. The problem analysis would identify priority issues among public interests and resource managers and outline a program of research, demonstration, and technology transfer to address these problems.

6. *Research Activities:*

a. Accomplishments to Date in FY 91:

Several meetings were held with managers and a prioritized list of recreation-related research needs identified. In order of decreasing priority, these were:

Identify ways to manage recreation opportunities consistent with resource sustainability, including an assessment of social and monetary costs, and identify how to integrate recreation and other resource uses. Estimated total cost is $84,000.

Identify the kinds of recreation programs which would most benefit community economic stability and growth. Estimated total cost is $41,000.

Identify public values relative to what recreation opportunities should be supplied. Estimated total cost is $50,000 to over $200,000 depending upon the type and extent of the survey used.

b. Tasks Yet to be Completed in FY 91:

None.

7. *Technology Transfer Activities Planned for FY 91:*

Not applicable.

8. *Estimated Cost:*

Congressionally appropriated funds could not be transferred between PNW budget line items. As a consequence, funds could not be allocated to the study. However, scientists, through their own inititative, were able to identify recreation-related research needs!

9. *Duration of the Study:*

Initiation Date:	FY 91
Scheduled Completion Date:	FY 91

May 1991

Fundamental COPE
Work Plan Progress Report

1. *Title*:

Ecology and Habitat Relationships of Selected Riparian-Associated Wildlife

2. *Principal Investigators and Organizations*:

Dr. Robert G. Anthony, Assistant Leader, Oregon Cooperative Wildlife Research Unit, Department of Fisheries and Wildlife, Oregon State University, Corvallis
Dr. E. Charles Meslow, Leader, Oregon Cooperative Wildlife Research Unit, Department of Fisheries and Wildlife, Oregon State University, Corvallis
Dr. William C. McComb, Associate Professor, Departments of Forest Science and Fisheries and Wildlife, Oregon State University, Corvallis

Advisory Personnel:

Dr. Joseph J. Beatty, Director, Biology Program, Biology Department, Oregon State University, Corvallis
Dr. Stanley V. Gregory, Associate Professor, Department of Fisheries and Wildlife, Oregon State University, Corvallis
Dr. Andrew Hansen, Assistant Professor, Department of Forest Science and Adaptive COPE Program, Oregon State University, Hatfield Marine Science Center, Newport
Dr. David Hibbs, Associate Professor, Department of Forest Science, Oregon State University, Corvallis
Dr. Thomas A. Spies, Research Forester, Pacific Northwest Research Station, Corvallis
Dr. John C. Tappeiner, Professor, Department of Forest Resources Management, Oregon State University, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

Characterize wildlife communities in riparian and adjacent upland habitats and assess how changes in habitat affect wildlife species.

Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas and increase conifer development there.

4. *Study Objectives*:

a. Describe movements and habitat relationships of selected riparian-associated wildlife.

b. Describe diets and reproductive fitness of selected riparian-associated wildlife.

c. Identify the important resources (food, water, habitat) that explain association to riparian areas.

5. *Potential Benefit or Utility of the Study*:

Riparian zone management is increasingly scrutinized by State and Federal agencies and the public, and associated wildlife are one of the important resources in these management considerations. Research is currently underway to identify species of vertebrates that are closely associated with riparian areas, but no information is available on the extent of these associations nor the riparian resources which constitute any dependencies. Recent controversies over the new Forest Practices Rules and the lack of ecological information on riparian-associated wildlife makes the need for this information a high priority. This study will provide a data base upon which wildlife/forest management in riparian zones can be improved. Specifically, the study will identify the area and key resources (food, water, microhabitats, etc.) important to selected species (e.g., river otter, beaver, mink, marsh shrew, great-blue heron, bald eagles, kingfishers, etc.) that could be sensitive to riparian management. We will work closely with other COPE scientists to develop information for enhanced integrated resource management in riparian areas.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

We advertised nationally for a Ph.D. student and received applications from 16 candidates. Applicants were screened down to the top three and then interviewed by telephone. Mr. John Loeggring, who is finishing his M.S. degree at Virginia Polytechnic Institute (VPI), was selected and will join us on 1 June 1991.

b. Tasks Yet to be Completed in FY 91:

Tasks to be completed in FY91 include field reconnaisance, selection of study sites and methods, and completion of a detailed study plan. The Ph.D. student will interact with forest ecologists, fisheries biologists, and other COPE investigators and cooperators in selecting study sites and developing a study plan.

c. Planned for FY 92:

Activities in FY92 will include project planning, and fieldwork (spring and summer). Intensive fieldwork will be conducted from April through September of 1992. Ph.D. student plus one field assistant will conduct the field studies.

d. Tasks to be Completed by Fiscal Year Starting in FY 93:
(Scheduled completion date FY 96)

FY 1993
Continuation of intensive field work.

FY 1994
Continuation of intensive field work.

Data analysis.

Completion of Ph.D.

Initiation of additional projects/studies.

FY 1995
Intensive field work on additional studies.

FY 1996
Data analysis and report write-up.

Prepare manuscripts for publication.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

None.

b. Planned for Remainder of FY 91:

None.

c. Planned for FY 92:

Participate in field tours, seminars, and workshops as appropriate.

8. *Estimated Cost:*

	OSU
FY 91	27,000
FY 92	28,000
FY 93	45,000
FY 94	48,000
FY 95	50,000
FY 96	52,000

9. *Duration of the Study:*

Initiation Date:	FY 91
Scheduled Completion Date:	FY 96

May 1991

Fundamental COPE
Progress Report

1. *Title*:

Ecology and Management of Shrubs and Hardwoods in Coastal Forests

2. *Principal Investigator(s) and Organization(s)*:

Dr. John C. Tappeiner, Professor, Department of Forest Resources, College of Forestry, OSU, Corvallis
Dr. John C. Zasada, Research Forester, Pacific Northwest Research Station, Corvallis
Dr. Steven R. Radosevich, Professor, Department of Forest Science, College of Forestry, OSU, Corvallis

This work will be coordinated with riparian zone studies and with research conducted by Dave Sandberg, PNW.

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Reforestation in the Oregon Coast Range

a. Develop and test strategies for reforestation that will be effective wherever coastal forests grow, even with constraints on prescribed fire and herbicides.

b. Examine the economics of the above-mentioned strategies and assess the economic impacts of constraints on fire and herbicides.

4. *Study Objective(s)*:

Develop guidelines and techniques for managing the major shrub and hardwood species in the forests of coastal Oregon by:

a. relating their potential rates of vegetative reproduction to the size and vigor of their aerial and/or underground parts;

b. determining the effect of common silvicultural treatments (logging, burning, cutting) on vigor and density of vegetation reproduction;

c. determining their rates of reproduction and growth from seed and sprouts in a range of environments common in clearcuts and in young and old stands.

5. *Potential Benefit or Utility of the Study*:

Currently, foresters manage nonconiferous vegetation in the Coast Range to enhance conifer growth and to provide wildlife habitat. However, they do so with little information on the reproduction and growth habits of shrubs and hardwoods. At what stage of succession do shrubs and hardwoods become established? What environments favor their establishment, and what are their growth rates following reproduction from seed, from vegetative reproduction, and following burning and other silvicultural treatments? How can establishment and growth be predicted? At what age and in what environments do they produce seed? How does interspecific competition affect succession and species composition? With answers to these questions, foresters will be better able to make site-specific prescriptions to produce wildlife habitat and to enhance conifer growth. Zasada and Tappeiner have begun seedling growth and survival studies on salal, bigleaf maple, vine maple, thimbleberry, and elderberry. Tappeiner has completed studies on vegetative and seedling reproduction of tanoak and madrone. Radosevich has begun studies on the seedling establishment and vegetative growth of thimbleberry and salmonberry. Maxwell and Radosevich have also begun development of population growth models for these species which includes the influence of intra- and inter-specific competition on demographic parameters and lateral spread from rhizomes. These models will provide a means of assessing the influence of management practices on salmonberry and thimbleberry. Thus collectively, with this research, we will be able to make a substantial step toward answering the questions posed for these major species.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

Measured salmonberry cutting response in the understory of alder stands and verified that two annual cuttings on 6 ft x 6 ft plots will control salmonberry density to a level that allows conifer establishment.

Continued documenting the response of vine maple to clearcutting, commercial thinning, and no treatment and found that disturbance will greatly increase its layering and spread if the major stems are not cut or burned.

Remeasured post-harvest shrub survival on root rot study site at Vernonia.

b. Tasks Yet to be Completed in FY 91:

Install large 1-2 acre salmonberry cutting plots under alder to verify results reported in 6a.

Recount salmonberry annual sprouting.

Complete sampling of vine maple in disturbed and undisturbed sites.

Measure salal seedling establishment and clonal development in thinned and unthinned stands.

Install final treatment on bigleaf maple preharvest control treatments. Cut overstory conifers and the remaining maple.

Preharvest assessment of shrubs on root rot study site at Grande Ronde.

c. Planned for FY 92:

Monitor vine maple sprouting.

Continue monitoring salal seedling establishment and clonal development.

Measure salmonberry response to control in alder understory.

Document bigleaf maple response to pretreatment control and overstory removal.

Analyze vine maple clone data.

Install vine maple bud bank study.

Pre-harvest evaluation of shrub survival and sprouting on root rot study plots.

d. Tasks to be Completed by Fiscal Year Starting in FY 93:

FY 1993

Monitor response of salmonberry to understory treatment.

Monitor response of bigleaf maple to preharvest control.

Monitor vine maple bud bank study.

Study salal clone development in clearcuts.

Follow data on salal seedling and clone development in thinned stands.

Begin preliminary data analysis on these studies.

Continue re-evaluation of post-harvest plots.

FY 1994
Data analysis.

Continue re-evalution of post-harvest plots.

Manuscript preparation.

FY 1995
Data analysis and manuscript preparation.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

Tappeiner, J., J. Zasada, P. Ryan, M. Newton. 1991. Salmonberry clonal population structure in Oregon forests: the basis for a persistant cover. Ecology. 72:609-618.

Salmonberry cutting: **COPE Report**, In press.

Made presentations at several workshops and seminars:
- Veg. Management Workshop
- Ontario Silviculture Institute
- OSU/UW Silviculture Institute
- CRAFTS (2 presentations)
- University of Alberta
- Gifford Pinchot New Perspectives Workshop
- Shrub Riparian Zone Symposium

b. Tasks Yet to be Completed in FY 91:

Submit a paper on shrub/hardwood seedling establishment to a journal.

Participate in field tours, seminars, and workshops as appropriate.

c. Planned for FY 92:

Complete a draft manuscript on riparian shrubs.

Prepare an article on vine maple for the **COPE Report**.

Prepare a draft paper on seedling establishment.

8. *Estimated Cost*:

	OSU	PNW	TOTAL
FY 91	62,000	75,000	137,000
FY 92	38,000	55,000	93,000
FY 93	40,000	58,000	98,000
FY 94	41,000	24,000	65,000
FY 95	43,000	25,000	68,000

9. *Duration of the Study*:

Initiation date:	FY 87
Scheduled completion date:	FY 95

May 1991

Fundamental COPE
Progress Report

1. *Title:*

Characterization of the Thermal Environment for Developing Guidelines to Manage Shrubs and Hardwoods in Coastal Forests

2. *Principal Investigator(s) and Organization(s):*

Dr. Roger D. Ottmar, Acting Project Leader, Pacific Northwest Research Station, Seattle

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6):*

Reforestation in the Oregon Coast Range

Develop and test strategies for reforestation that will be effective wherever coastal forests grow, even with constraints on prescribed fire and herbicides.

4. *Study Objective(s):*

a. Characterize the humus layer and soil thermal environment (depth of heat penetration, intensity, and duration) from broadcast burns in coastal forests.

b. Develop a thermodynamic heat transfer model based on the relationship between woody fuel load, humus load, live vegetation load, lighting method, fuel moisture, soil moisture, and soil heat transfer properties.

5. *Potential Benefit or Utility of the Study:*

One of the benefits from prescribed fire is the short-term control of certain plant species which will improve the establishment and survival of tree seedlings. Through the heating of the humus and soil layers by fire, the roots, rhizomes, and buried seeds of unwanted weed species are affected. However, most vegetation succession studies have described the vegetation response without documentation of the fire and the humus and soil thermal environment which created the response.

This study will provide the thermal environment characterization and modeling that is a critical element in development of guidelines for managing the major shrub and hardwood species in the forests of coastal Oregon, the chief objective of the companion study.

The heat intensity, duration, and penetration into the humus and soil layer generated by broadcast burning logging debris is the critical variable determining the overall effectiveness of fire for controlling undesirable vegetation. Modeling the heat transfer process using variables which managers can easily acquire will allow preharvest and prescribed fire planning to best control vegetation and mitigate the effect of fire on air, soil, and water resources.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

Completed data reduction and analysis of 1990 field data collected from 2 prescribed burns. A total of 8 prescribed burns have been characterized since the initiation of this study. Results indicate high moisture contents of the duff and mineral soil minimize the heat penetration. In most cases, heat penetration of 60 degrees centrigrade averaged between 1 and 2 inches with a duration of less than 2 hours.

Met with Missoula Fire Lab scientist Roger Hungerford and discussed progress of heat pulse model. He is using our heat pulse and fuel consumption data for calibrating and testing various heat pulse models. Two models designed to predict high intensity heat penetration into the soil have been tested with laboratory experiments. The model initially designed by Bristow and Cambell performs well (Hungerford 1990).

b. Tasks Yet to be Completed in FY 91:

Locate, inventory, burn and monitor 2-4 units specific to the needs of filling data gaps. We need data for the long duration fire situations. Continue to cooperate with Missoula Fire Lab in fine tuning heat pulse model.

c. Planned for FY 92:

Locate, inventory, burn, and monitor 2-4 units specific to the needs of filling data gaps. Work closely with Missoula fire lab to simplify selected heat pulse model for operational use by managers. Model will use variables available to managers.

d. Tasks to be Completed by Fiscal Year Starting in FY 93:

FY 1993
Complete final analysis of heat pulse and fuel consumption data. Finalize heat pulse model and prepare joint publication with Missoula Fire Lab.

Transfer knowledge to land managers through formal training sessions and workshops.

7. *Publication and Technology Transfer Activities:*

a. Completed to Date in FY 91:

Provided instruction at two Regional level training sessions, Technical Fire Management, two forest level fuel planning sessions, and two fire research planning sessions.

b. Planned for Remainder of FY 91:

Prepare an article for the **COPE Report**.

Participate in field tours, seminars, and workshops as appropriate.

c. Planned for FY 92:

Prepare an article for the **COPE Report**.

Provide instruction at a Regional level training session, Technical Fire Management, and two Forest-level fuel planning sessions.

8. *Estimated Cost:*

	PNW
FY 91	50,000
FY 92	53,000
FY 93	39,000

9. *Duration of the Study:*

Initiation date: FY 87
Scheduled completion date: FY 93

May 1991

Fundamental COPE
Progress Report

1. *Title:*

Second Decade Effects of Site Preparation on Tree and Vegetation Development With and Without Precommercial Thinning

2. *Principal Investigator(s) and Organization(s):*

Dr. William I. Stein, Research Forester, Pacific Northwest Research Station, Corvallis
Dr. Peyton W. Owston, Project Leader, Pacific Northwest Research Station, Corvallis
Dr. John C. Zasada, Research Forester, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6):*

Reforestation in the Oregon Coast Range

a. Develop and test strategies for reforestation that will be effective wherever coastal forests grow, even with constraints on prescribed fire and herbicides.

b. Examine the economics of the above-mentioned strategies and assess the economic impacts of constraints on fire and herbicides.

c. Identify the effects of prescribed fire on long-term site productivity and develop methods to reduce adverse impacts.

4. *Study Objective(s):*

Determine the extended effects of reforestation practices on the growth of trees and associated vegetation with or without precommercial thinning by:

a. Comparing tree survival and growth during the second decade following different site preparation treatments.

b. Determining changes in vegetative cover, height, and animal use as conifers close crowns with or without precommercial thinning.

c. Quantifying the effects of precommercial thinning on stand growth, vegetative development, and animal use.

5. *Potential Benefit or Utility of the Study*:

Substantial information is available on the short-term effects of different reforestation practices on survival and growth of conifers and the development of associated vegetation in coastal forests but very little on the duration of these effects as crowns close and intraspecific competition becomes a prominent factor. Precommercial thinning is also practiced extensively, but its effects on early growth in plantations and the development of associated vegetation has not been quantified. The scheduled duration of two studies in which site preparation treatments were compared side-by-side for a decade on the Siuslaw National Forest is just ending. Large differences are evident due to treatments and to tree protection by tubing.

It is important to learn whether these differences continue as stands close and what effect precommercial thinning has on both stand development and vegetation associated with each treatment. The two studies, totaling 10 replications, are large enough to accommodate a thinning treatment within the framework of the original design. They represent one of the few opportunities to follow the effects of reforestation practices on a longer-term basis where both trees and associated vegetation are monitored to learn the interrelated effects of treatment on both timber and wildlife.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

Completed tenth year vegetation survey of the four sites of the coastal site preparation study. Tree and vegetation data accumulated for the 1st through 10th years is now being used as part of the data base for the CRAFTS young stand modeling project and the USFS Regional Vegetation Management Model.

Made baseline size measurements on thinned and unthinned trees at Randall. This is the first study site where bear damage was found on study trees; it was inflicted before the 13th year.

The baseline vegetation survey has been completed at Randall.

b. Tasks Yet to Be Completed in FY 91:

Designate plots and make baseline size measurements on thinned and unthinned trees at Poposchultz.

Select and thin trees at two sites--Randall and Poposchultz.

Complete tenth year tree remeasurements in the coastal site preparation study.

c. Planned for FY 92:

Remeasure vegetation transects at Pitchfork - 16th year.

Remeasure tree diameters and heights at Pitchfork - 16th year.

Summary of baseline tree height and diameter data by treatments for all Coastal Reforestation Study sites.

d. Tasks to be Completed by Fiscal Year Starting in FY 93:

FY 1993
Remeasure vegetation transects at Beaver and Upperton - 16th year.

Remeasure vegetation transects in all 4 units of the Coastal site preparation study - 13th year.

Remeasure tree diameters and heights at Beaver and Upperton - 16th year.

Remeasure tree diameters and heights in all 4 units of the Coastal site preparation study - 13th year.

FY 1994
Remeasure vegetation transects at Randall and Poposhultz - 16th year.

Remeasure tree diameters and heights at Randall and Poposhultz - 16th year.

FY 1995
Remeasure vegetation transects at Pitchfork - 19th year.

Remeasure tree diameters and heights at Pitchfork - 19th year.

Work on data analysis.

FY 1996
Remeasure vegetation transects at Beaver and Upperton - 19th year.

Remeasure vegetation transects in all 4 units of the Coastal Site Preparation Study - 16th year.

Remeasure tree diameters and heights at Beaver and Upperton - 19th year.

Remeasure tree diameters and heights in all 4 units of the Coastal Site Preparation Study - 16th year.

Complete data analysis.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

None.

b. Planned for Remainder of FY 91:

Participate in field tours, seminars, and workshops as appropriate.

Prepare a progress report for the **COPE Report**.

c. Planned for FY 92:

Prepare a progress report for the **COPE Report**.

8. *Estimated Cost*:

	PNW
FY 91	38,000
FY 92	44,000
FY 93	39,000
FY 94	41,000
FY 95	43,000
FY 96	45,000

9. *Duration of the Study*:

Initiation date:	FY 89
Scheduled Completion date:	FY 96

May 1991

Fundamental COPE
Progress Report

1. *Title*:

Species Manipulation as a Strategy to Reduce the Impact of Laminated Root Rot in Regenerated Coastal Stands

2. *Principal Investigator(s) and Organization(s)*:

Dr. Walter G. Thies, Research Plant Pathologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Reforestation in the Oregon Coast Range

Develop and test ways of reducing root rot damage in new plantations.

4. *Study Objective(s)*:

a. Identify the relative susceptibility of coastal Oregon conifers to laminated root rot.

b. Determine if the number of nonsymptomatic-diseased trees in a stand is correlated to the number of symptomatic trees.

c. Measure the minimum inoculum size that can cause seedling mortality.

d. Determine if the size and condition of stumps left on the site can be successfully used to predict seedling mortality due to laminated root rot in the regenerated stand.

5. *Potential Benefit or Utility of the Study*:

Laminated root rot is responsible for significant losses in the Oregon Coast Range. Using data from recently completed surveys by state and federal agencies we conservatively estimate that there are 300,000 acres of openings in the forests of the Oregon Coast Range caused by laminated root rot, with a nearly equal area populated by infected live trees. This is land out of production but it is also land on which up to $500 per acre is being spent for site preparation and planting which will not result in a harvestable stand. Losses are more severe in northern counties than in southern counties. Using the above survey data, we estimated that Columbia County is experiencing a 50 percent production short-fall on 32 percent of the commercial forest land.

Douglas-fir is very susceptible to laminated root rot yet it occupies large areas of commercial forests in the Oregon Coast Range. Use of valuable but more resistant conifers could increase economic yield on infested forest lands, with relatively little additional investment. However, at this time, a verified ranking of commercial conifer species by their susceptibility to laminated root rot is not available. Data on susceptibility to infection and yield of various species on infested sites is an essential prerequisite to recommending reforestation with alternate conifers on traditional Douglas-fir sites.

To develop an ability to predict laminated root rot losses in a replacement stand we need to determine the size of roots that can serve as effective inoculum and the frequency of nonsymptomatic infected trees in an uncut stand.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

Planted seedlings on Study Area One.

Established mapping grid and permanent block corners on Study Area Two.

Identified and mapped inoculum on approximately 70% of Study Area Two.

b. Tasks Yet to be Completed in FY 91:

Check survival of seedlings on Study Area One at the end of the growing season.

Complete efforts to identify and map the inoculum on Study Area Two.

Produce an inoculum map for Study Area Two.

Harvest Study Area Two.

Locate plot centers for "undisturbed inoculum" on Study Area Two.

Install reburied inoculum plots; collect and rebury 500 pieces of inoculum.

Locate Study Area Three and begin identification and mapping of inoculum on the site.

c. Planned for FY 92:

On Study Area One, conduct plot maintenance to include replanting where needed.

On Study Area Two, plant seedlings on the site and check survival in the fall.

On Study Area Three, complete all inoculum mapping, cut the stand, locate all "undisturbed inoculum" plots, install reburied inoculum plots, and collect and rebury 500 pieces of inoculum.

Locate Study Area Four, and inititate pre-cut inoculum mapping.

d. Tasks to be Completed by Fiscal Year Starting in FY 93:

FY 1993
Continue plot maintenance on Study Areas One and Two.

Replant as needed in Study Area Two.

Plant Study Area Three and check survival in the fall.

On Study Area Four, complete all inoculum mapping, cut the stand, locate all "undisturbed inoculum" plots, install reburied inoculum plots, and collect and rebury 500 pieces of inoculum.

FY 1994
Collect and Analyze seedling mortality from inoculum rebury plots on Study Area One.

Continue plot maintenance on Study Area Two and Three.

Replant Study Area Three as needed.

Plant seedlings on Study Area Four, and check mortality in the fall.

FY 1995
Study Area One: collect mortality data from both inoculum rebury plots and from undisturbed plots. Tag and map seedlings on undisturbed plots.

Study Area Two: collect and analyze data from inoculum rebury plots.

Study Area Three: plot maintenance.

Study Area Four: plot maintenance, replant as needed.

FY 1996
Study Area One: collect mortality data from all plots.

Study Area Two: collect mortality data on all plots. Tag and map seedlings on undisturbed plots.

Study Area Three: collect and analyze data from inoculum rebury plots.

Study Area Four: plot maintenance,.

Prepare a manuscript reporting the correlation between symptomatic diseased trees and nonsymptomatic diseased trees.

Prepare a report describing inoculum size and condition required to initiate infection.

Prepare a report on the relationship of residual infected stump size to mortality of nearby seedlings due to laminated root rot.

Final reports: summary paper of species susceptability information based on inoculum-rebury plots in Study Area One, Two, and Three.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

Conducted several small workshops on study areas one and two to inform local cooperators of study activity.

b. Planned for Remainder of FY 91:

Participate in field tours, seminars, and workshops as appropriate.

c. Planned for FY 92:

Prepare an article for the **COPE Report**.

Participate in field tours, seminars, and workshops as appropriate.

8. *Estimated Cost*:

	PNW
FY 91	87,000
FY 92	150,000
FY 93	124,000
FY 94	61,000
FY 95	68,000
FY 96	66,000

9. *Duration of the Study*:

Initiation date:	FY 89
Scheduled Completion date:	FY 96

May 1991

Fundamental COPE
Progress Report

1. *Title*:

Asymbiotic Nitrogen Fixation in Large Woody Residues of Oregon Coastal Forests

2. *Principal Investigator(s) and Organization(s)*:

Dr. C.Y. Li, Research Microbiologist, Pacific Northwest Research Station, Corvallis
Dr. Randy Molina, Project Leader, Pacific Northwest Research Station, Corvallis
Ralph Crawford, Plant Pathologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Reforestation in the Oregon Coast Range

Identify the effects of prescribed fire on long-term site productivity and develop methods to reduce adverse impacts.

4. *Study Objective(s)*:

a. To provide baseline information on the amount of nitrogen fixation by free living bacteria in large woody debris on the forest floor before and after tree harvest.

b. To determine the influence of mycorrhizae on nitrogen fixation rates in large woody debris in coastal Oregon forests.

c. To provide information to reforestation specialists on the impact of large woody debris removal on long-term nitrogen economy of Oregon coastal forests.

5. *Potential Benefit or Utility of the Study*:

Woody residues are conspicuous features of the forest floor in coastal Oregon forests. They provide habitat for plants, animals, and a diversity of microorganisms. Nitrogen fixation by free living (asymbiotic) bacteria in large woody debris is known to input small but significant amounts of nitrogen into Rocky Mountain Douglas-fir forests. Large woody debris also serve as active refugia for roots and mycorrhizae. Recent research by our group has shown a close association between certain mycorrhizae of forest trees and free living nitrogen-fixing bacteria. Information is

badly needed on the degree of nitrogen fixation occurring in large woody debris in coastal Oregon forests and the influence of resource management practices (e.g. removal or burning of large woody debris) on long-term accretion of nitrogen via these mechanisms.

6. *Research Activities:*

a. Accomplishments to Date in FY 91:

Determined nitrogenase activities, as measured by acetylene reduction, and populations of nitrogen-fixing organisms in woody debris and soils on clearcut and forest sites. Woody debris and soils at oxygen concentrations below atmosphere exhibit higher nitrogen fixation than those at aerobic conditions. Intense microbial activity and higher rates of respiration in wood debris and soil lead to the formation of microamorphic conditions in which nitrogenase activity is most efficient. Populations of N_2-fixing organisms on woods, mostly microaerophilic, range from 2×10^4 to 4.8×10^6 per gram of woody debris, and 1×10^3 to 32×10^4 per gram soil.

b. Tasks Yet to be Completed in FY 91:

Assay nitrogen fixation of wood and soil samples using $^{15}N_2$ analysis.

c. Planned for FY 92:

7. *Publication and Technology Transfer Activities:*

a. Completed to Date in FY 91:

None.

b. Planned for Remainder of FY 91:

Participate in field tours, seminars, and workshops as appropriate.

Prepare a draft manuscript for journal submission and an article for the **COPE Report**.

c. Planned for FY 92:

Complete and submit manuscript.

8. *Estimated Cost*:

	PNW
FY 91	55,000
FY 92	16,000

9. *Duration of the Study*:

Initiation date:	FY 89
Scheduled Completion date:	FY 92

May 1991

Fundamental COPE
Progress Report

1. *Title:*

Characterization of Trichoderma spp.: Prelude to Biological Control

2. *Principal Investigator(s) and Organization(s):*

Dr. Earl E. Nelson, Research Plant Pathologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6):*

Reforestation in the Oregon Coast Range

Develop and test ways of reducing root rot damage in new plantations.

4. *Study Objective(s):*

a. Collect and identify *Trichoderma* spp. associated with root pathogens.

b. Characterize isolates using isozyme analyses and related technology.

c. Test promising isolates for biological control potential.

5. *Potential Benefit or Utility of the Study:*

Laminated root rot (*Phellinus weirii*) and other root diseases of western conifers greatly reduce yields on many thousands of acres in western Oregon. Annual loss to *P. weirii* alone in western United States has been estimated at 4.4 million cubic meters of timber. Root diseases not only reduce tree growth and cause mortality, but keep valuable forest lands out of production by their continued presence as facultative saprophytes in roots and butts of killed or harvested trees. Consequently, regeneration of these areas to Douglas-fir or other susceptible conifers is doomed to failure, unless these pathogens are removed from the site or effectively eliminated by chemical or biological controls.

Inoculations with isolates of *Trichoderma* spp. into stumps infested with *P. weirii* have resulted in colonization by those inoculants, and have presumably reduced the viability of the pathogen in those parts of the stumps colonized. Tests of antagonism of *Trichoderma* spp. against *Armillaria luteobubalina* (Nelson et al. 1989) appear to work equally well with *Trichoderma* spp. against *P. weirii*, but these tests, using colonized stem wood sections, are time consuming. Isozyme

analysis of isolates of *Trichoderma* spp. appears to be a useful means of characterizing specific isolates as an aid in taxonomic classification, and perhaps as a means of "finger printing" specific isolates. In addition, this and other techniques can be used to probe for specific attributes pointing toward effective biological control or competitive colonization of pathogen-infested substrates.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

Continued isolation of *Trichoderma* spp. and identifications. Approximately 180 new isolates were identified and stored in liquid nitrogen. Sixty isolates were screened for antagonism to *P. weirii*. Isozyme analyses tend to separate species along lines of morphological differences.

b. Tasks to be Completed in FY 91:

Continue collections of *Trichoderma* isolates and identify them to species.

Continue antagonism testing using technique reported in 7th International Conference on Root and Butt Rots. (Proceedings published 1989).

c. Planned for FY 92:

Continue collections of *Trichoderma* isolates and identify them to species.

Continue antagonism testing using technique reported in 7th International Conference on Root and Butt Rots. (Proceedings published 1989).

Publish on new *Trichoderma* spp. in late FY 92 or early 93. Two or possibly 3 new species have been isolated from wood and soil.

d. Tasks to be Completed by Fiscal Year Starting in FY 93:

FY 1993
Continue collections of *Trichoderma* isolates and identify them to species.

Continue antagonism testing using technique reported in 7th International Conference on Root and Butt Rots. (Proceedings published 1989).

FY 1994
Prepare comprehensive paper on *Trichoderma* spp. and their potential for biological control of *P. weirii*.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

Met with Charles Donworth and other scientists at the Pacific Forestry Centre, Victoria, BC to discuss biological control options and to assist in the initiation of a biological control program in BC.

b. Planned for Remainder of FY 91:

Prepare an article for the COPE Report.

Participate in seminars, workshops and field trips as appropriate.

c. Planned for FY 92:

Prepare an article for the COPE Report.

Participate in seminars, workshops and field trips as appropriate.

8. *Estimated Cost*:

	PNW
FY 91	16,000
FY 92	17,000
FY 93	18,000
FY 94	19,000

9. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 94

May 1991

Fundamental COPE
Progress Report

1. *Title:*

Rate of Spread of Phellinus weirii in Living vs Dead Root Systems

2. *Principal Investigator(s) and Organization(s):*

Dr. Earl E. Nelson, Research Plant Pathologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6):*

Reforestation in the Oregon Coast Range

Develop and test ways of reducing root rot damage in new plantations.

4. *Study Objective(s):*

To determine if development of *P. weirii* is restricted in root systems of harvested trees.

5. *Potential Benefit or Utility of the Study:*

Phellinus weirii (Murr.) Gilb. (laminated root rot) is the most damaging root disease in the northwestern United States and British Columbia. Annual losses are estimated at 4.4 million cubic meters. Once established in a stand, the disease spreads along root systems, passing from tree to tree when an infected root contacts a healthy root. Spread along living root systems increases the radius of infection centers about 34 cm/year. Spread of the fungus after death of the host may be limited by competition from other microorganisms, at least after the first year, but growth in living vs. dead trees has not been objectively compared.

Recent attempts to model important root diseases in the west (including *P. weirii*) have pointed to information gaps in numerous areas. Spread of the fungus along living roots to expand infection centers during the life of a stand has been established, but spread after harvest (or stand destruction by other means) and, consequently, area of potential inoculum in the succeeding stand are not known. If spread along dead roots continues (at rates different from or similar to those measured in living trees), then areas of potential inoculum some years after stand harvest can be estimated accordingly.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

None. First harvest of inoculated stumps and roots will be made in August 1991.

b. Tasks Yet to be Completed in FY 91:

Excavate one-third of all trees, section, and analyze roots for extent of colonization of *P. weirii*.

c. Planned for FY 92:

The second sampling of stumps and roots for *P. weirii* will be made in August 1992.

d. Tasks to be Completed by Fiscal Year Starting in FY 93:

FY 1993
The third and final sampling of stumps and roots for *P. weirii* will be made in August 1993.

FY 1994
Complete data analysis and publication preparation.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

None.

b. Planned for Remainder of FY 91:

Prepare an article for the **COPE Report**.

Participate in seminars, workshops and field trips as appropriate.

c. Planned for FY 92:

As in 1991, no publication is likely since only preliminary results will be available.

Participate in seminars, workshops and field trips as appropriate.

8. *Estimated Cost:*

	PNW
FY 91	8,000
FY 92	9,000
FY 93	13,000
FY 94	3,000

9. *Duration of the Study:*

Initiation Date:	FY 90
Scheduled Completion Date:	FY 94

May 1991

Fundamental COPE
Progress Report

1. *Title:*

Chemical Control of Phellinus (Poria) weirii Part III-- Application of Chloropicrin or Methyl Isothiocyanate (MS) to Live Infected Trees

2. *Principal Investigator(s) and Organization(s):*

Dr. Walter G. Thies, Research Plant Pathologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6):*

Reforestation in the Oregon Coast Range

Develop and test ways of reducing root rot damage in new plantations.

4. *Study Objective(s):*

a. Determine if either healthy or diseased (*P. weirii* infested) Douglas-fir can survive injection of chloropicrin or MS at dosages approaching those previously shown to eradicate *P. weirii* from stumps.

b. Determine if when trees receiving sublethal dosages of fumigant are harvested how completely *P. weirii* been eliminated from the stump and roots.

c. For those trees that die as a result of injecting the fumigants, determine if the fumigant eradicated *P. weirii* from the stump and root system.

d. At sublethal dosages, determine what the impact is on diameter growth of non-infected and infected trees injected with chloropicrin or MS.

e. Examine the impact on non-target organism populations around trees treated with chloropicrin or MS.

5. *Potential Benefit or Utility of the Study:*

Laminated root rot, caused by *Phellinus weirii*, affects all species of commercially important conifers in the Oregon Coast Range. When infected trees die, the pathogen continues to live saprophytically in dead roots for 50 years or more. Infection in a young stand begins when roots of young trees contact residual infested stumps and roots from the preceding stand. The fungus spreads between

living trees through root contact and may take 25 years to kill a second growth Douglas-fir. Regenerating Douglas-fir or other highly susceptible species on a site infested with *P. weirii* nearly always results in continuation of the disease and subsequent losses in the new stand.

Laminated root rot is responsible for significant losses in the Oregon Coast Range. Using data from recently completed surveys by state and federal agencies we conservatively estimate that there are 300,000 acres of openings in the forests of the Oregon Coast Range caused by laminated root rot, with a nearly equal area populated by infected live trees. This is land out of production but it is also land on which up to $500 per acre is being spent for site preparation and planting which will not result in a harvestable stand. Losses are more severe in northern counties than in southern counties. Using the above survey data, we estimated that Columbia county is experiencing a 50 percent production short-fall on 32 percent of the commercial forest land.

Phellinus weirii causes the most serious root disease problem facing land managers in the Pacific Northwest. Evidence suggests that chloropicrin or methyl isothiocyanate (MS) can be used to eradicate *P. weirii* from stumps and roots. Additional evidence suggests that live Douglas-fir at least tolerate injection of fumigants into their root collars. This study will test the hypothesis that chloropicrin or MS can be injected into Douglas-fir at some dosage that will not adversely affect growth of the host while eradicating *P. weirii* or ameliorating its impact on the host.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

Planning of the field work has been completed.

b. Tasks Yet to be Completed in FY 91:

Harvest the study.

Fell 80% of subject trees and measure them for volume.

Excavate stumps and roots and evaluate them for the presence of active *Phellinus weirii*.

Initiate sampling for non-target organisms.

c. Planned for FY 92:

Complete collection and process soil samples for non-target organism test.

Complete the harvesting of treated trees (October).

Complete lab work and analyze data.

d. Tasks to be Completed by Fiscal Year Starting in FY 93:

FY 1993
Complete analysis of non-target organism data and prepare manuscripts.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

None.

b. Planned for Remainder of FY 91:

Prepare an article for the **COPE Report**.

Participate in seminars, workshops and field trips as appropriate.

c. Planned for FY 92:

Prepare a manuscript for publication.

Prepare an article for the **COPE Report**.

Participate in seminars, workshops, and field trips as appropriate.

8. *Estimated Cost*:

	PNW
FY 91	44,000
FY 92	85,000
FY 93	20,000

9. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 93

May 1991

Fundamental COPE
Progress Report

1. *Title*:

The Influence of Tree Vigor on Infestation of Douglas-fir by *Phellinus weirii*

2. *Principal Investigator(s) and Organization(s)*:

Dr. Everett M. Hansen, Associate Professor, Department of Botany & Plant Pathology, Oregon State University, Corvallis
Dr. Ellen Michaels Goheen, Plant Pathologist, Forest Pest Management, USDA Forest Service, Region 6, Portland
Dr. Walter G. Thies, Research Plant Pathologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Reforestation in the Oregon Coast Range

Develop and test ways of reducing root rot damage in new plantations.

4. *Study Objective(s)*:

a. Determine if tree vigor as influenced by inter-tree competition, affects susceptibility to laminated root rot.

b. Determine if seedling vigor as affected by light and nutrient availability, affects susceptibility to laminated root rot.

5. *Potential Benefit or Utility of the Study*:

Laminated root rot, caused by *Phellinus weirii*, affects all species of commercially important conifers in the Oregon Coast Range. When infected trees die, the pathogen continues to live saprophytically in dead roots for 50 years or more. Infection in a young stand begins when roots of young trees contact residual infested stumps and roots from the preceding stand. The fungus spreads between living trees through root contact and may take 25 years to kill a second growth Douglas-fir. Regenerating Douglas-fir or other highly susceptible species on a site infested with *P. weirii* nearly always results in continuation of the disease and subsequent losses in the new stand.

Laminated root rot is responsible for significant losses in the Oregon Coast Range. Using data from recently completed surveys by state and federal agencies, it has

been conservatively estimated that there are 300,000 acres of openings in the forests of the Oregon Coast Range caused by laminated root rot, with a nearly equal area populated by infected live trees. This is land out of production but it is also land on which up to $500 per acre is being spent for site preparation and planting which will not result in a harvestable stand. Losses are more severe in northern counties than in southern counties. Using the above survey data, it has been estimated that Columbia County is experiencing a 50% production short-fall on 32% of the commercial forest land.

It has been hypothesized that trees become susceptible to root rot only when growing under stress. Stressed trees must allocate scarce resources to minimal growth requirements, and have nothing left over for the "luxury" of producing defense compounds. If true, then silvicultural treatments to increase tree vigor should render trees resistant to *Phellinus weirii*.

We will test the hypothesis directly by inoculating trees of high and low Waring vigor index with the laminated root rot fungus and later measuring infection, and extent of colonization. The study will be established on plots in both the Oregon Coast Range and in the Cascade Range; however, this report deals only with the effort being made in the Oregon Coast Range.

6. *Research Activities*:

   a. Accomplishments to Date in FY 91:

      None.

   b. Tasks Yet to be Completed in FY 91:

      Evaluate results of greenhouse test.

      Excavate Mary's Peak field test and evaluate data.

   c. Planned for FY 92:

      Complete evaluation of data.

7. *Publication and Technology Transfer Activities*:

   a. Completed to Date in FY 91:

      None.

   b. Planned for Remainder of FY 91:

      Prepare an article for the **COPE Report**.

Participate in seminars, workshops and field trips as appropriate.

c. Planned for FY 92:

Conduct tours and participate in workshops as appropriate.

Prepare a manuscript for publication.

8. *Estimated Cost*:

	PNW
FY 91	11,000
FY 92	11,000

9. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 92

May 1991

Fundamental COPE
Progress Report

1. *Title:*

Long-Term Site Productivity in the Oregon Coast Range: Effects of Harvesting, Site Preparation and Vegetation Management

2. *Principal Investigator(s) and Organization(s):*

Dr. John C. Zasada, Research Silviculturist, Pacific Northwest Research Station, Corvallis
Dr. Michael Castellano, Research Forester, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6):*

Reforestation in the Oregon Coast Range

a. Develop and test strategies for reforestation that will be effective wherever coastal forests grow, even with constraints on prescribed fire and herbicides.

b. Examine the economics of the above-mentioned strategies and assess the economic impacts of constraints on fire and herbicides.

c. Identify the effects of prescribed fire on long-term site productivity and develop methods to reduce adverse impacts.

4. *Study Objective(s):*

Determine the effect of different harvesting, site preparation, and vegetation management practices on growth, development and productivity of forest ecosystems in the Oregon Coast Range by assessing the following biotic and abiotic variables:

a. Conifer growth and development.

b. Growth, development and spatial distribution of broadleaved trees and shrubs, and herbaceous species.

c. Site nutrient pools.

d. Soil carbon resources.

e. Site variables such as, temperature, water and solar radiation, and soil physical properties.

f. Distribution and composition of soil microorganisms.

5. *Potential Benefit or Utility of the Study:*

Harvesting, site preparation and other vegetation management practices (chemical or manual treatment) in Coast Range forests create a continuum of conditions with regard to seedling microsite, composition and distribution of non-conifer vegetation, and soil and site conditions. The relative levels of resource removal and site disturbance can strongly influence the early stages of secondary succession. Most obvious are the different aggregations of plant species that invade or reestablish on these sites. Less obvious, but of equal importance, is the effect of disturbance on biotic and abiotic soil processes. At present, little is known about the relationship between these early patterns of secondary succession following harvesting and their relationship to long-term site productivity on sites in the Oregon Coast Range. Some important questions in this regard are:

a. How do different levels of biomass removal affect the nutrient and carbon pools and can these be used to predict future productivity?

b. How does intensity of burning affect nutrient availability and species composition in early stages of secondary succession and how does this relate to long-term site productivity?

c. How do different levels of vegetation management affect the course of secondary succession and site resource availability?

To begin to answer these questions, integrated experiments which examine secondary forest succession at various levels of resolution must be undertaken. These experiments will start prior to harvest in order to document stand biomass, nutrient pool size and distribution, spatial distribution of trees and associated vegetation, distribution and composition of soil microorganisms, animal populations and other factors. Changes in these variables can then be tracked through harvesting, post-harvesting site treatment and stand development to determine how they affect stand and vegetation composition and dynamics. This information will also be used to determine if early changes can be used to predict future tree and stand performance.

6. *Research Activities:*

a. Accomplishments to Date in FY 91:

Because of uncertainty due to the northern spotted owl issue, it has been difficult to locate study sites. We do, however, have 4 areas tentatively located - 3 on the Alsea District and 1 on the Mapleton District of the Siuslaw National Forest.

The PNW/COPE long-term site productivity study plan was sent out for review and is currently being revised based on reviewers comments. This will be the document which guides the program.

b. Tasks Yet to be Completed in FY 91:

Conduct preharvest site conditions and sampling.

c. Planned for FY 92:

This will depend on the owl issue and research priorities in COPE.

d. Tasks to be Completed by Fiscal Year Starting in FY 93:

The future of this study is uncertain because of the status of lands in regard to the owl issue. We will continue to work with districts and as site availability is known, do the necessary preharvest work.

7. *Publication and Technology Transfer Activities:*

a. Completed to Date in FY 91:

None.

b. Planned for Remainder of FY 91:

Participate in seminars, workshops and field trips as appropriate.

c. Planned for FY 92:

Participate in seminars, workshops and field trips as appropriate.

8. *Estimated Cost:*

	PNW
FY 91	159,000
FY 92	167,000
FY 93	175,000
FY 94	184,000
FY 95	193,000
FY 96	203,000

9. *Duration of the Study:*

Initiation Date:	FY 90
Scheduled Completion Date:	FY 96

Fundamental COPE
Progress Report

1. *Title:*

Identification of Potential Brush and Hardwood Problem Sites

2. *Principal Investigator(s) and Organization(s):*

Dr. Don Minore, Plant Ecologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6):*

Reforestation in the Oregon Coast Range

Develop and test strategies for reforestation that will be effective wherever coastal forests grow, even with constraints on prescribed fire and herbicides.

4. *Study Objective(s):*

a. Describe and measure areas on which unusually intensive vegetation management is required to control shrubs and hardwoods that compete with conifer regeneration after timber harvest, stratifying the areas by site preparation treatment.

b. Describe and measure areas on which little vegetation management is required to control the shrubs and hardwoods that compete with conifer regeneration after timber harvest, stratifying the areas by site preparation treatment.

c. Correlate important preharvest site characteristics with the range of postharvest shrub and hardwood competition identified under objectives a and b.

d. Formulate a preharvest identification key to potential postharvest shrub and hardwood problems.

5. *Potential Benefit or Utility of the Study:*

Shrub and hardwood competition is a major problem in regenerating conifers in the Oregon Coast Range. Salmonberry, thimbleberry, vine maple, alder, bigleaf maple, and a host of other competing species often occupy harvested areas and preempt the light, moisture, and nutrients needed by young conifer seedlings. Shrub and hardwood competition tends to be erratic and unpredictable, however,

and areas differ with respect to the amount and vigor of postharvest shrub and hardwood growth that they support. Some areas require intensive, expensive treatments if planted conifers are to survive and grow; on others little vegetation control is needed. Unfortunately, it is often difficult to predict the postharvest response of shrubs and hardwoods before harvest occurs on a given area, and problem areas cannot be reliably identified in advance.

An ounce of prevention is worth a pound of cure in forestry as well as medicine, and applying preventive measures or allocating available resources in advance to known brush and hardwood problem areas before they are harvested is more economical and efficient than waiting until after harvest to see if a problem develops on any given area. A guide to the identification of potential brush and hardwood problem sites is needed. This study should provide that guide.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

Data collected during the 1990 field season were subjected to preliminary analyses that included the determination of canopy cover from fisheye photographs, the correlation of fisheye photography with spherical densimeter readings, and initial investigations of preharvest shrub density vs. preharvest environment. Several harvested stands were revisited to locate and mark the permanent plots established before harvest.

b. Tasks Yet to be Completed in FY 91:

Continue to locate and measure a variety of sites, both clearcut and soon-to-be-harvested.

c. Planned for FY 92:

Establishment of more preharvest plots on soon-to-be-harvested sites.

Relocation and measurement of plots on harvested sites.

This work will not be possible if logging is precluded by northern spotted owl regulations.

d. Tasks to be Completed by Fiscal Year Starting in FY 93:

FY 1993
Remeasurement and analyses of harvested stands.

FY 1994
Remeasure and analyses of harvested stands.

Summary analyses.

Prepare a manuscript summarizing study results.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

None.

b. Planned for Remainder of FY 91:

Participate in seminars, workshops, and field trips as appropriate.

c. Planned for FY 92:

A preliminary publication summarizing progress to date will be prepared.

8. *Estimated Cost*:

	PNW
FY 91	52,000
FY 92	55,000
FY 93	58,000
FY 94	61,000

9. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 94

COPE PROGRAM
ADAPTIVE STUDIES
AND TECHNOLOGY TRANSFER ACTIVITIES

LIST OF PROGRESS REPORTS FOR FY 1991
ADAPTIVE COPE STUDIES AND TECHNOLOGY TRANSFER ACTIVITIES

1. *Title*:

Modeling Root Reinforcement in Shallow Forest Soils

2. *Principal Investigator(s) and Organization(s)*:

Mr. Arne E. Skaugset, Hydrologist, Adaptive COPE Team, OSU, Hatfield Marine Science Center, Newport
Dr. Marvin R. Pyles, Associate Professor, Department of Forest Engineering, OSU, Corvallis
Mr. James Schroeder, Hydrology Research Assistant, Adaptive COPE Team, OSU, Hatfield Marine Science Center, Newport

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

Develop, refine, and test systems for predicting and reducing landslides, surface erosion, and sediment delivery to stream channels.

4. *Study Objective(s)*:

a. Develop an analytical model of the root reinforcement mechanism.

b. Determine the relationship between soil strain and rupture for a continuum of simulated root biomasses using a physical model.

c. Verify model results in the field.

5. *Potential Benefit or Utility of the Study*:

Landslides are the dominant erosional process in the Oregon Coast Range. If excessive sediments become entrained in and/or settle out on streambed gravels, hatching and emergence of salmonid fry may be impaired. More transport resistant sediment can cause stream aggradation which may change the form of and impair the function of the aquatic habitat.

One of the possible causes of accelerated erosion following harvesting is associated with the effect of clearcut silviculture on slope stability. It is hypothesized that the increase in slides is caused, in part, by the decay of harvested tree roots. This hypothesis is based on the concept that the strength of shallow forest soils on steep slopes is due, in part, to reinforcement by roots. When trees are harvested

and their roots decay, a reduction in soil strength results. Regeneration of the stand will establish new roots, but a window will exist between harvest and complete regeneration when root reinforcement will be at a minimum. If the reduction in root reinforcement is large enough, and if a storm of the sufficient magnitude to cause slides occurs during this window, accelerated erosion caused by increased landsliding may occur.

There are numerous questions remaining concerning the role of roots in stabilizing steep slopes. Research is needed to quantify the extent of root reinforcement in natural and managed forest areas. Slope stability models exist which require data input concerning root strength and at present, there is not an adequate basis for assigning accurate values for this variable. The goal of this research project is to develop a model that will allow the determination of the magnitude of potential root reinforcement. This will allow for the comparison of the magnitude of root reinforcement with other soil strength parameters so a determination can be made of the importance of root reinforcement at a site.

To better manage the steep forested slopes of the Coast Range, land managers will need to have an increasing knowledge of the actual failure mechanism in shallow forest soils. This research will help develop a detailed understanding of the failure mechanism and in particular the mechanism of root reinforcement.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

Refinement of the mathematical model has continued and work on the tilting table is still centered around making it fully operational. Currently, problems are being worked out of the sand delivery system. Also, the engineering properties of the sand are being deterimined.

b. Tasks Yet to Be Completed in FY 91:

Complete refinement of the mathematical model and the hardware/software support system for the tilting table.

c. Planned for FY 92:

Develop and refine the analytical model.

Carry out model verification using the tilting table.

d. Tasks to Be Completed By Fiscal Year Starting in FY 93:

FY 1993
Prepare a manuscript that summarizes study results.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

None.

b. Planned for Remainder of FY 91:

Participate in field tours, seminars, and workshops as appropriate.

c. Planned for FY 92:

Prepare a manuscript for publication on the analytical model.

8. *Duration of the Study*:

Initiation date:	FY 89
Scheduled Completion date:	FY 93

May 1991

Adaptive COPE
Progress Report

1. *Title*:

The Role and Management of Large Woody Debris for Fish Habitat in Coast Range Streams

2. *Principal Investigator(s) and Organization(s)*:

Mr. Arne Skaugset, Hydrologist, Adaptive COPE Team, Oregon State Univ., Hatfield Marine Science Center, Newport
Mr. Ron Rhew, Research Assistant, Department of Forest Engineering and Adaptive COPE Program, OSU, Hatfield Marine Science Center, Newport
Dr. Robert L. Beschta, Professor, Forest Engineering Department, OSU, Corvallis
Dr. Gordon Reeves, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

Identify and explain the effects of various riparian and stream conditions on fish populations and communities.

4. *Study Objective(s)*:

a. Synthesize current information relative to the abundance, distribution, and composition of large woody debris and fish populations in Oregon Coast Range streams of varying size and management history.

b. Quantify the relationship between large woody debris and riparian vegetation composition and structure.

5. *Potential Benefit or Utility of the Study*:

Although the importance of large woody debris (LWD) as fish habitat is now well-established, a number of key questions remain as how best to protect and maintain LWD in watersheds managed for timber production or how to manage riparian zones where past practices led to substantial reductions in LWD. These questions are: What is the relationship between amount and quality (species, size, shape, and stability) of debris and fish production? What are the characteristics

of debris (distribution, abundance, composition) and associated fish populations in streams flowing through different aged forest stands? What streamside management prescriptions will provide the appropriate types of debris to the stream and in the proper quantities? Answers to these questions are necessary for evaluating the effectiveness of the current Forest Practices Act, for proper placement and design of instream structures to mimic the function of LWD in debris impoverished streams, and for effective management of riparian zones to ensure production of large woody debris over the long-term.

The first step in answering these questions will be to review available published and unpublished information, with particular reference to the Oregon Coast Range. Such an effort will provide managers with a useful synthesis of current information distribution, size, and composition of LWD in forest streams of various management histories and sizes. This synthesis will focus on ways to adapt this information into management strategies for protecting and enhancing fish habitat. The synthesis would also aid in refining hypotheses to be tested in further field research.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

Data collected, entered, and processed using mean values.

Data recompiled, and processed for median, mode, and geometric means.

Draft of introduction materials and methods and summary results using mean values completed.

b. Tasks Yet to Be Completed in FY 91:

Finish assembling data matrix using alternative distributional statistics (median, geometric mean).

Proof/edit materials and methods.

Reanalyze data using alternative distributional statistics.

Proof/edit/revise results.

Complete first draft.

c. Planned for FY 92:

None.

7. *Publication and Technology Transfer Activities:*

a. Completed to Date in FY 91:

None.

b. Planned for Remainder of FY 91:

Prepare an article for the **COPE Report**.

Participate in field tours, seminars, and workshops as appropriate.

c. Planned for FY 92:

Complete a draft publication and submit to a journal.

8. *Duration of the Study:*

Initiation date:	FY 89
Scheduled Completion date:	FY 92

Adaptive COPE
Progress Report

1. *Title*:

Establishment and Growth of Conifers Under Existing Riparian Vegetation

2. *Principal Investigator(s) and Organization(s)*:

Dr. Gabe Tucker, Assistant Professor, Adaptive COPE Team and Department of Forest Science, Oregon State University, Corvallis
Mr. Steve McConnell, Silviculture Research Assistant, Adaptive COPE Team, OSU, Hatfield Marine Science Center, Newport
Mr. Mike Cloughesy, Douglas County Forestry Extension Agent, Roseburg
Mr. Ralph Duddles, Coos and Curry Counties Forestry Extension Agent, Coquille
Dr. Mike Newton, Professor, Department of Forest Science, OSU, Corvallis

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas and increase conifer development there.

4. *Study Objective(s)*:

a. Quantify survival of conifer seedlings planted under riparian vegetation subjected to overstory and understory manipulation.

b. Quantify growth (height and diameter) of conifer seedlings planted under riparian vegetation subjected to overstory and understory manipulation.

c. Quantify browse damage on protected and unprotected seedlings planted under riparian vegetation subjected to overstory and understory manipulation.

d. Quantify disposition of vexar tubes placed on seedlings planted under riparian vegetation subjected to overstory and understory manipulation.

e. Determine which treatment combinations used, by species, result in the best establishment of coniferous regeneration under riparian vegetation.

5. *Potential Benefit or Utility of the Study:*

In this study growth response and survival of four species of conifers planted under riparian vegetation subjected to overstory and understory manipulation are quantified. This information will provide insight into the effort that must be expended, and the silvicultural strategies that must be used, to obtain coniferous regeneration by planting into riparian forests.

The current Forest Practices Act contains regulations designed to enhance fish habitat, including the retention of conifers in riparian management areas which may eventually serve as woody debris in streams. Because of past natural and man-caused disturbances many riparian areas are dominated by a red alder overstory and a brush understory (principally salmonberry). There are few conifers in many of these stands and limited potential for natural conifer regeneration. Active management to reestablish conifers in these areas may restore the structures and functions desired from riparian vegetation and enhance fisheries and wildlife resources as well as provide timber for harvest.

Strategies for conifer establishment in riparian areas are untested. Emmingham et al. showed that planted hemlock seedlings can survive and grow under upland alder stands and that growth was enhanced by thinning some of the overstory alder. The thinning was done by chemically girdling trees, leaving some shade from standing dead timber. This study will compare killing all or a portion of the overstory trees by both chemically and manually girdling trees, as well as controlling understory vegetation by chemical and manual means. Results will offer insight into the nature of the manipulations of riparian vegetation necessary to create conditions suitable for successful growth of different species of conifer regeneration.

6. *Research Activities:*

a. Accomplishments to Date in FY 91:

Collected first-growing season data for the six study sites, including: height, diameter, diameter-at-6-inches, overstory cover, understory cover, browse damage, and disposition of vexar tube. Analyzed first year results. Found that both overstory and understory treatment enhanced height growth and survival of planted conifers as compared to controls. No differences in response between chemically treated and mechanically treated plots were apparent after one growing season. Western redcedar were browsed more frequently than were Douglas-fir, western hemlock, or grand fir. The leaders of western hemlock and western redcedar trees frequently grew out the sides of tubes by the end of the first growing season.

b. Tasks Yet to Be Completed in FY 91:

Measure winter browse damage and disposition of vexar tubes (May '91).

Quantify mid-summer cover over planted seedlings (July '91).

c. Planned for FY 92:

Measure end of growing season growth and survival, damage, and tube dispostion (October '91).

Analyze 2nd year results (Winter '91-'92).

Measure winter browse damage and disposition of vexar tubes (May '92).

Quantify mid-summer cover over planted seedlings (July '92).

d. Tasks to Be Completed By Fiscal Year Starting in FY 93:

FY 1993
Measure end of growing season growth and survival, damage, and tube dispostion (October '92).

Analyze 3rd year results (Winter '92-'93).

Measure winter browse damage and disposition of vexar tubes (May '93).

Quantify mid-summer cover over planted seedlings (July '93).

FY 1994
Measure end of growing season growth and survival, damage, and tube dispostion (October '93).

Analyze 4th year results (Winter '93-'94).

Measure winter browse damage and disposition of vexar tubes (May '94).

Quantify mid-summer cover over planted seedlings (July '94).

FY 1995
Measure end of growing season growth and survival, damage, and tube dispostion (October '94).

Analyze 5th year results (Winter '94-'95).

Measure winter browse damage and disposition of vexar tubes (May '95).

Quantify mid-summer cover over planted seedlings (July '95).

FY 1996
Measure end of growing season growth and survival, damage, and tube dispostion (October '95).

Analyze 6th year results (Winter '95-'96).

Measure winter browse damage and disposition of vexar tubes (May '96).

Quantify mid-summer cover over planted seedlings (July '96).

Complete final data collection, analyze, and provide a draft publication.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

Publication:
McConnell, S. and G. Tucker. 1991. Underplanting conifers in riparian forests: first year results. **COPE Report**. 4(2):2-3.

Presentation:
McConnell, S. January, 1991. Active Management of Riparian Areas: Goals and Strategies. BLM/ODF&W Coordination Meeting, North Bend, OR.

Poster:
McConnell, S., P. Giordano, D. Hibbs, R. Pabst, S. Chan, and T. Spies. December, 1990. Riparian vegetation research in the Oregon Coast Range. Presented at: New Perspectives for Watershed Management: Balancing Long-Term Sustainability with Cumulative Environmental Change. Center for Streamside Studies, University of Washington, Seattle, Washington, Nov. 27-29, 1990.

Note: This poster was also presented at the Oregon Chapter Wildlife Society Meeting, February 26-27, Newport, OR, and at Fernhopper Day, OSU.

b. Planned for Remainder of FY 91:

Present poster at Society of American Foresters National Convention, San Francisco, August 5-8, 1991.

Participate in field tours, seminars, and workshops as appropriate.

c. Planned for FY 92:

Prepare **COPE Report** article on second year results (April '92).

Participate in field tours, seminars, and workshops as appropriate.

8. *Duration of the Study:*

Initiation date:	FY 89
Scheduled Completion date:	FY 96

May 1991

Adaptive COPE
Progress Report

1. *Title:*

Active Management of Riparian Zones for Multiple Resources: An Integrated Approach

2. *Principal Investigator(s) and Organization(s):*

Dr. Gabriel Tucker, Assistant Professor, Department of Forest Science and Adaptive COPE Program, Oregon State University, Hatfield Marine Science Center, Newport
Dr. Andrew J. Hansen, Wildlife Habitat Scientist, Department of Forest Science and Adaptive COPE Program, Oregon State University, Hatfield Marine Science Center, Newport
Mr. Arne E. Skaugset, Forest Engineer/Hydrologist, Department of Forest Engineering and Adaptive COPE Program, Oregon State University, Hatfield Marine Science Center, Newport

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6):*

Riparian Zone Management

a. Identify and explain how various management practices in streams and riparian areas affect fish populations and communities and water quality.

b. Characterize wildlife communities in riparian and adjacent upland habitats and assess how changes in habitat affect wildlife species.

c. Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas and increase conifer development there.

4. *Study Objective(s):*

a. Identify studies to test various management strategies for protecting and enhancing fish and wildlife habitat and for promoting tree establishment and growth in riparian areas.

b. Coordinate and facilitate interaction among active riparian management studies with regard to conceptual approach, study design, and data analyses.

c. Integrate results from individual studies developed under objective a in order to evaluate alternative approaches for actively managing riparian areas for the benefit of multiple resources.

d. Identify opportunities to demonstrate state-of-the-art practices for maintaining and improving fish and wildlife habitats and for increasing tree development and growth in riparian areas.

5. *Potential Benefit or Utility of the Study*:

A major objective of COPE is to find ways to maintain or enhance the productivity of fish, wildlife, and timber in riparian areas. To this end, current studies are characterizing existing riparian stands, describing the interactions between riparian habitat and fish and wildlife, and identifying desired vegetative and structural features in riparian areas for the benefit of multiple resources concentrated in and along streams. This study will complement these efforts by developing and testing various strategies for managing and manipulating riparian areas to obtain desired vegetative and structural features.

Specifically, this study will identify a series of studies to evaluate the feasibility and success of various methods for protecting and enhancing fish and wildlife habitat and for promoting tree establishment and growth in riparian areas. Studies will focus on evaluating both the effectiveness of current riparian management area practices as well as methods for manipulating or "actively managing" existing stands. Since effective, integrated management of riparian areas requires information on fish, timber, wildlife, soils, and how the various components respond to a particular forest management practice, studies will involve scientists from various disciplines. Results from individual studies will also be integrated to develop and evaluate various approaches to active management of riparian areas. For example, prescriptions for "growing" appropriate sizes of trees for future recruitment of woody debris into streams or for timber will be developed by combining the results from studies on conifer establishment, growth, and release with results from research on size of debris needed to form stable pools for fish habitat.

There are three current or proposed studies dealing with active riparian management that will be coordinated under this study. These are: (I) Establishment and growth of conifers in alder-dominated riparian stands; (II) Release of understory conifers by thinning; and (III) Influence of debris piece size on function in small streams. Potential future studies include: (1) evaluation of methods for manipulating second growth riparian stands to increase the productivity of fish populations, and (2) evaluation of the effectiveness of leaving snags in riparian areas and adjacent clearcuts to protect wildlife after harvest. In conjunction with cooperating agencies, current state-of-the-art practices (e.g., variable width buffer strips, deliberate introduction of trees into streams during harvest as woody debris) for managing riparian areas for multiple resource benefits will also be developed for their research and demonstration value.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

None. This study will be incorporated into the more comprehensive study "Integrated Response of Multiple Forest Resources to Alternative Silvicultural Prescriptions in Headwater Basins of the Oregon Coast Range" if approved.

b. Tasks Yet to Be Completed in FY 91:

None.

c. Planned for FY 92:

None.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

None.

b. Planned for Remainder of FY 91:

None.

c. Planned for FY 92:

None.

8. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 98

May 1991

Adaptive COPE
Progress Report

1. *Title*:

Active Management of Riparian Zones for Multiple Resources: II. Release of Suppressed and Intermediate Conifers in Alder-Dominated Riparian Zones of the Oregon Coast Range

2. *Principal Investigator(s) and Organization(s)*:

Dr. Gabriel Tucker, Assistant Professor, Department of Forest Science and Adaptive COPE Program, Oregon State University, Hatfield Marine Science Center, Newport
Mr. Steve McConnell, Research Assistant-Silviculture, Department of Forest Science and Adaptive COPE Program, Oregon State University, Hatfield Marine Science Center, Newport
Mr. Doug Bateman, Research Assistant, Department of Forest Science and Adaptvie COPE Program, Newport

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas and increase conifer development there.

4. *Study Objective(s)*:

a. Determine whether suppressed and intermediate conifers released by manipulating overtopping vegetation respond with enhanced diameter and height growth.

b. Determine the characteristics of understory conifers that are best correlated with their response to release.

c. Determine the manipulations of overtopping vegetation that are best correlated with understory conifers response to release.

d. Provide land managers with easily measurable features (both seedling and stand characteristics) from which the success of release operations may be predicted.

5. *Potential Benefit or Utility of the Study*:

Establishment and growth of coniferous trees in riparian zones has been identified as a high priority for riparian zone management in the Oregon Coast Range. From a fish and wildlife perspective, a principal riparian management objective is to ensure recruitment of conifers as large woody debris (LWD) and snags. From a forestry perspective, trees within riparian zones can provide a source of harvestable timber, a portion of which may be utilized under current Forest Practice Regulations.

Presently, many riparian areas in the Coast Range are dominated by red alder rather than conifers because of past natural and human disturbances. Red alder does not attain the desirable size, strength, and decay resistance features of conifers and therefore is less desirable for fish and wildlife habitat. Coniferous trees also grow larger and are usually of higher value than red alder and thus are more desirable for timber.

Substantial numbers of suppressed and intermediate conifers exist in the understory of many alder-dominated riparian zones. Many of these are tolerant species which may eventually gain dominance over the site. Some are intolerant species and will eventually die if not released. Tolerant species left to attain dominance on their own will likely do so very slowly. The stocking of successful tolerant trees that become dominant on their own may also be very sporadic. Growth rates of tolerant species are likely to increase if released, shortening the time to their attainment of a size sufficient to have value as LWD, a usable snag, or a harvestable tree.

Release of understory conifers has been documented in other studies on upland sites. In many cases released conifers responded positively to release with increased height and diameter growth. Response in these studies began immediately after release or following only a short lag time. In some cases existing understory trees responded extremely slowly to release, however. Removing these existing trees and planting seedlings may have reduced the time required for establishment of a coniferous stand. In other cases removal of too much of the overstory resulted in stress and eventual mortality of understory conifers. Little is known about overstory removal responses in riparian stands. This study, in combination with information obtained from the Adaptive COPE study, "Establishment and Growth of Conifers under Existing Riparian Vegetation," will provide managers with a variety of strategies for managing riparian vegetation to obtain the multiple benefits afforded by the presence of conifers.

6. *Research Activities:*

a. Accomplishments to Date in FY 91:

Measured first year treatment response of study trees on sites established in FY 90, including: 1) height, 2) height increment, 3) diameter, 4) crown ratio, 5) overstory cover, 6) understory cover, 7) surrounding basal area.

Implemented treatments (girdling and felling of overstory alder) on three additional study sites and collected baseline data.

Monitored vegetation response on sites treated in FY 90.

b. Tasks Yet to Be Completed in FY 91:

Measure first and second year response of understory vegetation to treatment (June '91).

Quantify canopy cover over study trees.

c. Planned for FY 92:

Collect end of growing season data.

Measure response of understory vegetation to treatment (June '92).

Quantify canopy cover over study trees.

Analyze data.

d. Tasks to Be Completed By Fiscal Year Starting in FY 93:

FY 1993
Collect end of growing season data.

Measure response of understory vegetation to treatment (June '93).

Quantify canopy cover over study trees.

Analyze data.

FY 1994
Collect end of growing season data.

Measure response of understory vegetation to treatment (June '94).

Quantify canopy cover over study trees.

Analyze data.

FY 1995
Collect end of growing season data.

Measure response of understory vegetation to treatment (June '95).

Quantify canopy cover over study trees.

Analyze data.

FY 1996
Complete final data collection and analysis, and prepare a draft manuscript for publication.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

Publication:
McConnell, S. and G. Tucker. 1991. Underplanting conifers in riparian forests: first year results. **COPE Report**. 4(2):2-3.

Poster:
McConnell, S., P. Giordano, D. Hibbs, R. Pabst, S. Chan, and T. Spies. December, 1990. Riparian vegetation research in the Oregon Coast Range. Presented at: New Perspectives for Watershed Management: Balancing Long-Term Sustainability with Cumulative Environmental Change. Center for Streamside Studies, University of Washington, Seattle, Washington, Nov. 27-29, 1990.

Note: This poster was also presented at the Oregon Chapter Wildlife Society Meeting, February 26-27, Newport, OR, and at Fernhopper Day, OSU.

b. Planned for Remainder of FY 91:

Present poster at Society of American Foresters National Convention, San Francisco, August 5-8, 1991.

Participate in field tours, seminars, and workshops as appropriate.

c. Planned for FY 92:

Prepare **COPE Report** article on second year results (April '92).

Participate in field tours, seminars, and workshops as appropriate.

8. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 96

May 1991

Adaptive COPE
Progress Report

1. *Title:*

Active Management of Riparian Zones for Multiple Resources. III. Influence of Woody Debris Piece Size on Function in Small Streams

2. *Principal Investigator(s) and Organization(s):*

Mr. Arne Skaugset, Hydrologist, Department of Forest Engineering and Adaptive COPE, Oregon State University, Hatfield Marine Science Center, Newport
Dr. Robert Bilby, Aquatic Ecologist, Weyerhaeuser Company, Western Forestry Research Center, Centralia, Washington
Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis
Mr. Ron Rhew, Research Assistant, Department of Forest Engineering and Adaptive COPE, Oregon State University, Hatfield Marine Science Center, Newport
Mr. James Schroeder, Hydrology Research Assistant, Adaptive COPE, Oregon State University, Hatfield Marine Science Center, Newport.

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6):*

Riparian Zone Management

Identify and explain how various management practices in streams and riparian areas affect fish populations and communities and water quality.

4. *Study Objective(s):*

Determine the relationship of debris piece size and orientation to debris stability, pool configuration, sediment storage, and fish habitat quantity and quality in small streams.

5. *Potential Benefit or Utility of the Study:*

State and federal riparian zone management regulations require the retention of specified amounts of standing timber along important fish-bearing streams following harvest of adjacent areas. The primary goal of these regulations has been to ensure a continued source of woody debris for streams. While the importance of wood in streams is generally recognized, our knowledge of the way in which characteristics of the debris, such as size, species, or orientation, influence the

function of this material in streams of varying sizes is incomplete. The relationship between size of debris and its stability during high flow events also has not been clearly established. A more complete understanding of these interactions would allow the matching of debris characteristics to the needs of a particular stream, thereby maintaining fish habitat in these systems while minimizing landowner costs.

The purpose of this study is to experimentally evaluate the relationship between debris piece size and function in small stream systems of the Oregon Coast Range. Laboratory studies by R. Beschta at Oregon State University have shown a positive relationship between piece size and the size of a pool produced by that piece. Field surveys in southwestern Washington by B. Bilby and J. Ward have generally validated this relationship in larger streams, but the relationship does not appear as clear for small streams.

Experimental placement of pieces of wood of varying sizes in stream channels will be used in this study to examine the relationship between piece size and function. Three treatments (wood diameters of 8, 16, and 24 inches) will be established in each of two study streams. Study sites will be located on small, anadromous fish-bearing streams (channel widths 10-15 feet, Oregon Class I). Piece length in all three treatments will be a minimum of two times the width of the channel. Eight pieces of wood per treatment will be placed in the channel, four oriented perpendicular to the direction of flow and four oriented at a 45° angle to the channel. These two orientations were the most commonly observed during the surveys of streams in southwestern Washington. Unmanipulated reaches located upstream and downstream from treatment reaches will serve as controls.

Changes in channel morphology, sediment accumulation, debris stability, and fish populations at the study sites will be monitored through time. Morphology of the channel at debris placement sites will be carefully mapped prior to installing the wood and then remapped annually. The length of the study will depend upon the occurrence of high flows, which are primarily responsible for shaping the channel and determining the stability of debris pieces. Mapping of fish habitat will also be done along the entire experimental stream reach using the method developed by Bisson and others. Fish population surveys will be conducted during the winter and summer, beginning prior to debris placement in summer 1989 and continuing through the study. The purpose of these surveys is to compare the influence of the three treatments on seasonal use of the areas by salmonid fishes.

6. *Research Activities:*

a. Accomplishments to Date in FY 91:

Reduced and analyzed first-year results.

Collected Winter '91 habitat data.

The first year results showed that the woody debris caused an increase in slow water habitat, pools and glides, at the expense of fast water habitat, riffles. No results have been worked up on individual pieces yet.

b. Tasks Yet to Be Completed in FY 91:

Continue monitoring changes in stream channel morphology and fish populations during summer and winter.

Plan field program for Summer of '91.

Collect field, both fisheries habitat and physical hydrology, data.

c. Planned for FY 92:

Collect, reduce and analyze field data.

d. Tasks to Be Completed By Fiscal Year Starting in FY 93:

FY 1993
Continue to monitor channel changes and fish populations in summer. Reduce and analyze data to include individual piece size effects on fish populations.

FY 1994
Continue to monitor channel changes and fish populations. Use channel change data along with stream flow data to validate flume studies of local scour associated with woody debris. Generate an empirical model predicting local scour due to woody debris.

FY 1995
Continue to monitor channel changes and fish populations. Reduce and analyze data to investigate the effect of piece size on local scour, fish habitat, and fish populations.

FY 1996
Continue to monitor channel changes and fish populations. Modify local scour model and fish habitat population models as needed.

FY 1997
Continue to monitor channel changes and fish populations. Modify local scour model and fish habitat population models as needed.

FY 1998
Synthesize, reduce and analyze data. Generate a final scour model. Also, finalize model on the effect of piece size and orientation of habitat and populations.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

Seminar in FE507, Forest Engineering Seminar, on the first year results of the project.

COPE Report article on first year results.

b. Planned for Remainder of FY 91:

Participate in seminars, workshops, and field trips as appropriate.

c. Planned for FY 92:

Prepare a manuscript on first-year results.

8. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 98

Adaptive COPE
Progress Report

1. *Title*:

Stability Assessment of End-Haul Disposal Areas

2. *Principal Investigator(s) and Organization(s)*:

Mr. Arne E. Skaugset, Hydrologist/Geotechnical Specialist, Department of Forest Engineering and Adaptive COPE Program, Oregon State University, Hatfield Marine Science Center, Newport
Dr. Marvin R. Pyles, Associate Professor, Department of Forest Engineering Oregon State University, Corvallis
Mr. James Schroeder, Research Assistant, Department of Forest Engineering and Adaptive COPE Program, Oregon State University, Hatfield Marine Science Center, Newport
Mr. Dave Michael, Geotechnical Specialist, Oregon Department of Forestry, Forest Grove
Mr. Keith Mills, Geotechnical Specialist, Oregon Department of Forestry, Salem
Mr. John Seward, Geotechnical Specialist, Oregon Department of Forestry, Roseburg

3. *Management Issue and Research Task (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

Develop, refine, and test systems for predicting and reducing landslides, surface erosion, and sediment delivery to stream channels.

4. *Study Objective(s)*:

a. Develop a procedure to determine the location and then rank the stability of potential end-haul disposal areas on a basin scale.

b. Develop a procedure to assess the relative and/or absolute stability of end-haul disposal areas on a site specific scale.

c. Validate the above set of procedures by implementing them in field case studies on basin and site specific scales.

5. *Potential Benefit or Utility of the Study:*

Research results indicate that timber harvesting activities can increase the frequency of landslides on steep, landslide prone slopes of the Pacific Northwest. Some investigators have shown that roads are an important factor associated with the increased incidence of landslides on forest lands. Over the years, management practices have been developed which minimize road related failures. These practices include reducing the amount of land in roads, avoiding road locations in high risk sites, and improving site specific construction and maintenance practices.

One practice used to minimize road related landslides is waste disposal by end-hauling. End-hauling is the practice of moving spoil material, generated from road construction, from unstable sites to more stable locations. This practice is used whenever roads are constructed on slopes greater than 50 to 70 percent. Often, logging engineers will consider many alternatives, including different logging systems and road locations, before electing to end-haul a section of road.

At times however, logging roads must be built through high risk terrain and end-hauling is required. A significant problem in these cases is locating sites for disposal of the spoil material. Relatively flat, stable sites which are most suitable for end-haul disposal are not abundant in steep, landslide prone terrain. This problem has never been investigated rigorously, so there are no formal criteria for choosing end-haul disposal areas. The purpose of this project is to develop a set of procedures for siting end-haul disposal areas on a basin scale and for evaluating the relative and/or absolute stability of these selected areas on a site specific scale.

6. *Research Activities:*

a. Accomplishments to Date in FY 91:

None.

b. Tasks Yet to Be Completed in FY 91:

None. This study has been extended for an additional year because the principal investigtor has temporarily assumed additional research responsibilities for the debris piece size study.

c. Planned for FY 92:

Initiate data collection on inventoried end haul disposal areas.

7. *Publication and Technology Transfer Activities:*

a. Completed to Date in FY 91:

None.

b. Planned for Remainder of FY 91:

Participate in seminars, workshops, and field trips as appropriate.

c. Planned for FY 92:

Prepare an article for the *COPE Report*.

8. *Duration of the Study:*

Initiation Date:	FY 90
Scheduled Completion Date:	FY 93

May 1991

Adaptive COPE
Progress Report

1. *Title*:

A Synthesis of Reforestation Practices with Constraints on Fire and Herbicides

2. *Principal Investigator(s) and Organization(s)*:

Dr. Gabe Tucker, Silviculture Scientist, Assistant Professor, Department of Forest Science, OSU and Adaptive COPE Team, Hatfield Marine Science Center, Newport
Mr. Steve McConnell, Silviculture Research Assistant, Adaptive COPE Team, OSU, Hatfield Marine Science Center, Newport
Dr. Stephen D. Hobbs, Associate Professor, Department of Forest Science, OSU, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Reforestation in the Oregon Coast Range

a. Develop and test strategies for reforestation that will be effective wherever coastal forests grow, even with constraints on prescribed fire and herbicides.

b. Examine the economics of the above-mentioned strategies and assess the economic impacts of constraints on fire and herbicides.

4. *Study Objective(s)*:

a. Synthesize current information on vegetation management and reforestation strategies and treatments, where use of fire and herbicides are constrained, that are applicable to the Oregon Coast Range.

b. From this synthesis, develop a study prospectus to test a specific hypothesis on the use of alternative vegetation management or reforestation techniques.

5. *Potential Benefit or Utility of the Study*:

Land managers reap a variety of benefits from prescribed burning and herbicides in their reforestation efforts. Herbicides control unwanted vegetation that compete with planted seedlings for moisture and light, or provide habitat for animal pests that damage seedlings. Prescribed burning also provides temporary and effective control of competing vegetation that can help seedlings get established. In addition,

prescribed burning also controls habitat of animal pests that may kill or damage planted seedlings, allows for planter access to harvested sites, and reduces the potential for a damaging wildfire on a site in the future.

Use of these tools has been constrained recently by legal and social considerations. The extent to which they are constrained varies between organizations and by location. Constraints on prescribed burning has affected land management organizations more or less ubiquitously. "Burn days" are harder to come by, limited by pressure to limit smoke encroachment into areas of human population or other restricted areas. Competition from other managers wishing to burn on the limited days with meteorologic conditions under which burning may take place results in few managers able to burn as much as they like. herbicide use was curtailed in federal organizations in 1983 by court order and will likely be used only with substantial restrictions even after processes are complete that reestablish it as a tool on federal lands. Other organizations occasionally limit herbicide use for reasons including social ones at their own discretion.

As a result of limitations on prescribed burning and herbicides many managers have experimented with alternative vegetation management treatments. Many innovations have been made, modified, and improved. Information on the various approaches has not been documented, however, nor has their effectiveness and cost efficiency been compared and shared among user groups. A synthesis document of management alternatives used where prescribed burning or herbicides are constrained will disseminate findings of managers and researchers throughout the Coast Range and allow for cursory comparison of cost/efficiency of some of the techniques used.

6. *Research Activities*:

a. Accomplishments to Date in FY 91:

Prepared questionnaire to be mailed to silviculturalists to obtain information on management alternatives where burning and herbicides are constrained.

Reviewed scientific literature. Obtained and read pertinent information.

b. Tasks Yet to Be Completed in FY 91:

Mail questionnaire, follow-up, and evaluate information obtained.

c. Planned for FY 92:

Scheduled for completion in FY 92.

7. *Publication and Technology Transfer Activities* [1]:

a. Completed to Date in FY 91:

None.

b. Planned for Remainder of FY 91:

Prepare a draft synthesis report on alternative reforestation options in the Oregon Coast Range.

Prepare an article for the **COPE Report**.

Participate in field tours, seminars, and workshops as appropriate.

c. Planned for FY 92:

Prepare final document and submit for publication.

8. *Duration of the Study*:

Initiation date:	FY 89
Scheduled Completion date:	FY 92

May 1991

Adaptive COPE
Progress Report

1. *Title:*

Patterns of Wildlife Abundance and Diversity in Managed Upland Forest Landscapes

2. *Principal Investigator(s) and Organization(s):*

Dr. Andrew J. Hansen, Assistant Professor, Adaptive COPE Team, OSU
Hatfield Marine Science Center, Newport

3. *Management Issues and Research Tasks (COPE Long-Range Plan, Pages 3-6):*

Reforestation in the Oregon Coast Range

a. Identify relationships between wildlife populations, habitat, and damage to young conifer plantations.

b. Develop conceptual models of habitat manipulation in order to learn how to minimize animal damage to young conifer plantations.

Riparian Zone Management

a. Identify wildlife species in and adjacent to riparian habitats.

b. Characterize wildlife communities in riparian and adjacent upland habitats and assess how changes in habitat affect wildlife species.

4. *Study Objective(s):*

a. Determine patterns of wildlife abundance and associations with vegetation in three prevalent forest stand types: managed, open-canopy plantations (2-8 yrs old); managed closed-canopy plantations (25-30 yrs old); and mature natural stands.

b. Quantify wildlife community characteristics and habitats along a gradient from stand edges to stand interiors.

c. Determine the distribution of stand types, stand sizes, edge types, and edge lengths across the study area using aerial photograph interpretation.

5. *Potential Benefit or Utility of the Study:*

Currently little is known about wildlife habitat associations in the managed forests of the Oregon Coast Range. Yet such information is essential for the integrated management of wildlife and timber on multiple-use forest lands. Particularly pressing is the need for information on: wildlife community characteristics in intensively managed plantations; comparisons with wildlife patterns in surrounding natural forests; and wildlife responses to stand edges. This information will be useful for management decisions that best accomplish wildlife and wood production objectives on forest lands. Data from this study will also complement that developed for riparian wildlife communities.

6. *Research Activities:*

a. Accomplishments to Date in FY 91:

All field sampling of birds, small mammals, and amphibians was completed. All habitat sampling was completed.

b. Tasks Yet to Be Completed in FY 91:

Complete data analyses.

c. Planned for FY 92:

Finalize data interpretation and prepare scientific articles.

7. *Publication and Technology Transfer Activities:*

a. Completed to Date in FY 91:

COPE Report article.

Hansen, A.J. and D. Urban. Avian response to landscape pattern: The role of species life histories. Landscape Ecology (submitted).

Hansen, A.J. Managing Biodiversity. Invited presentation to the annual meeting of the Wildlife Society, Washington Chapter, Silverdale, OR. April 18, 1991.

Hansen, A.J. COPE Research on Biodiversity. Invited presentation to BLM workshop on biodiversity. Lincoln City, OR. May, 18, 1991.

b. Planned for Remainder of FY 91:

Prepare an article for the **COPE Report**.

Participate in field tours, seminars, and workshops as appropriate.

c. Planned for FY 92:

Complete several scientific papers.

Prepare **COPE Report** article.

8. *Duration of the Study*:

Initiation date:	FY 89
Scheduled Completion date:	FY 92

May 1991

Adaptive COPE
Progress Report

1. *Title*:

Adaptation of a Forest Succession and Wildlife Habitat Model to Managed Coast Range Forests

2. *Principal Investigator(s) and Organization(s)*:

Dr. Andrew J. Hansen, Assistant Professor, Department of Forest Science and Adaptive COPE Program, Oregon State University, Hatfield Marine Science Center, Newport
Mr. Steve Garman, Research Assistant, Department of Forest Science and Adaptive COPE Program, Oregon State University, Hatfield Marine Science Center, Newport

Cooperators:

Dr. Dean Urban, Research Associate, Department of Environmental Sciences, University of Virginia, Charlottesville, Virginia
Dr. Barry Noon, Project Leader, Pacific Southwest Research Station, Arcata
Dr. William McComb, Associate Professor, Department of Forest Science, Oregon State University, Corvallis
Dr. Martin Raphael, Research Ecologist, Pacific Northwest Research Station, Olympia

3. *Management Issues and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Reforestation in the Oregon Coast Range

a. Identify relationships between wildlife populations, habitat, and damage to young conifer plantations.

b. Develop conceptual models of habitat manipulation in order to learn how to minimize animal damage to young conifer plantations.

Riparian Zone Management

Characterize wildlife communities in riparian and adjacent upland habitats and assess how changes in habitat affect wildlife species.

4. *Study Objective(s):*

a. Adapt FORET/ZELIG, a widely used stand simulation model, to Oregon Coast Range conditions.

b. Develop a wildlife habitat subroutine that classifies model output in terms of suitability as wildlife habitat.

c. Validate the model by comparing simulation results to actual field data for tree and shrub performance and wildlife habitat characteristics in managed plantations and natural stands in the Drift Creek Basin.

d. Use the model to predict: wildlife habitat characteristics of plantations under various silvicultural treatments and long-term Douglas-fir growth rates under various levels of animal damage.

5. *Potential Benefit or Utility of the Study:*

Forest development and wildlife communities are strongly interrelated; wildlife pests reduce wood production while silvicultural treatments influence wildlife habitats. These interrelationships are difficult to study because of the long period of time required for stand development. Few studies in the Pacific Northwest, for example, have examined the response of tree seedlings to animal herbivory for more than a few years. Similarly, the dynamics of wildlife habitats in managed forests over the full rotation cycle are poorly known. Simulation models can help. They are widely used to examine long-term forest responses to management practices and natural disturbances.

Several types of simulation have been developed for different applications. Shrubs and understory are important components of wildlife habitat and a model that deals with mixed-species, mixed-age stands is required for our purposes. The model also needs to output vegetation data in the form of habitat measurements in wildlife studies. Finally, the model should be able to simulate tree and shrub growth under various management and disturbance regimes.

The FORET family of models has these capabilities. They simulate the establishment, growth, and death of individual trees probabilistically based on species life histories, competition from neighboring plants, and local disturbance regimes. These models have been used to simulate forest and habitat response to: various thinning regimes, insect and mammal herbivory, and air pollution. Over 20 versions have been developed around the world, including one for the Pacific Northwest (ZELIG).

We will adapt ZELIG, a version of FORET, for use in plantations and natural stands in the Oregon Coast Range. Additionally, we will expand consideration of shrubs, snags and downed logs in the model and add a subroutine for classifying wildlife habitats. The model will be used to predict tree response to browsing and the long-term dynamics of wildlife habitat in managed forests. The model, once in

place, will be useful for broader application to problems of riparian zone silviculture, snag and woody debris dynamics, and landscape-level forest management. The model will be developed in coordination with other Fundamental and Adaptive COPE studies.

6. *Research Activities:*

a. Accomplishments to Date in FY 91:

A subroutine to classify animal habitat suitability was completed.

A major reworking or the parameters used to model tree growth was completed.

A large collection of data sets on forest structure have been compiled and will be used to test the model.

Demonstration runs of model applications were completed.

b. Tasks Yet to Be Completed in FY 91:

Modify the model to include consideration of shrubs.

Develop subroutines to simulate snags and fallen trees.

c. Planned for FY 92:

Test model performance.

Apply the model to questions of impacts of alternative silvicultural prescriptions.

d. Tasks to Be Completed By Fiscal Year Starting in FY 93:

FY 1993
Publication of final products.

7. *Publication and Technology Transfer Activities:*

a. Completed to Date in FY 91:

Article in **COPE Report**.

Hansen, A.J., S. Garman and D.L. Urban. 1990. Modeling stand dynamics and wildlife habitats. Poster presented at the NSF LTER ALL Scientists Meeting, Estes Park, CO.

Garman, S., A. Hansen and D. Urban. 1991. Modeling stand dynamics and wildlife habitats. Poster presented at Olympic National Forest New Perspectives Meeting, Olympia, WA.

b. Planned for Remainder of FY 91:

Participate in seminars, workshops, and field trips as appropriate.

c. Planned for FY 92:

Scientific publications will be prepared.

Prepare an article for the **COPE Report**.

8. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 93

May 1991

Adaptive COPE
Progress Report

1. *Title:*

Effects of Forage Seeding on Establishment and Growth of Douglas-fir Seedlings

2. *Principal Investigator(s) and Organization(s):*

Dr. Tim Harrington, Research Associate, Department of Forest Science, College of Forestry, Oregon State University, Corvallis
Dr. Gabe Tucker, Assistant Professor, Department of Forest Science and Adaptive COPE Program, Oregon State University, Hatfield Marine Science Center, Newport
Mr. Steve McConnell, Research Assistant, Department of Forest Science and Adaptive COPE, Oregon State University, Hatfield Marine Science Center, Newport

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6):*

Reforestation in the Oregon Coast Range

a. Develop and test strategies for reforestation that will be effective wherever coastal forests grow, even with constraints on prescribed fire and herbicides.

b. Examine the economics of the above-mentioned strategies and assess the economic impacts of constraints on fire and herbicides.

4. *Study Objective(s):*

a. Quantify the effect of a range of grass-legume forage seeding mixes on the survival and growth of Douglas-fir seedlings.

b. Determine the relative competitive ability of natural vs. forage-seeded herbaceous communities.

c. Determine the extent to which forage seeding reduces the invasion and growth of the natural woody and herbaceous competitors of Douglas-fir.

d. Determine the growth response of Douglas-fir to herbaceous weed control treatments applied at different plantation ages.

5. *Potential Benefit or Utility of the Study:*

Forage seeding of recently burned clearcuts with a grass-legume mix is being encouraged as a method of multiple resource management. Forage seeding provides a nutrient-rich food source for big game wildlife (e.g., elk and deer), purportedly reduces establishment of native brush and herbs which compete with planted conifer seedlings, and protects against soil erosion.

The nutritive effects to wildlife and prevention of soil erosion have been documented in other studies. There is little information on the effect of introduced grass-legume mixtures on survival and growth of planted conifer seedlings or the extent of brush control attained from forage seeding, however. Recent studies indicate that herbaceous vegetation may reduce growth of Douglas-fir seedlings even on the moist sites characteristic of the Oregon Coast Range. Quantitative information on the extent of vegetation control attained from forage seedling and the effect this method of brush control has on growth and survival of seedlings is lacking.

Tradeoffs in terms of potential multi-resource benefits cannot be conclusively determined until effects to seedlings, either by increasing competition from the forage mix, or reducing competition by preventing establishment of native vegetation, are determined. Therefore, this study will quantify growth and survival of planted Douglas-fir seedlings in response to various combinations of grass-legume mixtures, and monitor the invasion of natural woody and herbaceous competitors in seeded and unseeded plots and quantify the survival and growth of Douglas-fir seedlings in relation to the competition conditions that result.

Additionally, as some managers are including herbaceous weed control in their normal plantation establishment treatments, this study will explore conifer growth response to different regimes of timing of herbaceous weed control in the first five years after planting.

6. *Research Activities:*

a. Accomplishments to Date in FY 91:

Three subcommittee meetings with CRAFTS and one meeting with all of CRAFTS cooperators were held to iron out study objectives and design of plots. Agreement was reached on COPE/CRAFTS cooperation and overlap of interests.

b. Tasks Yet to Be Completed in FY 91:

Prepare a detailed study plan; expect to complete by June 30, 1991.

c. Planned for FY 92:

Install two plots.

Apply treatments (Spring).

Collect initial seedling measurements (Spring).

Collect 1st year measurements (Spring).

d. Tasks to Be Completed By Fiscal Year Starting in FY 93:

FY 1993
Install 2 plots.

Collect 1st year measurements.

Collect 2nd year measurements.

Treat plots with hervicides according to sampling regime established at outset.

FY 1994
Collect annual measurements.

Treat plots with herbicides according to sampling regime established at outset.

FY 1995
Collect annual measurements.

Treat plots with herbicides according to sampling regime established at outset.

FY 1996
Collect annual measurements.

Treat plots with herbicides according to sampling regime established at outset.

End data collection.

FY 1997
Analyze and publish final results.

7. *Publication and Technology Transfer Activities*:

a. Completed to Date in FY 91:

Herbaceous bibliography:
Louchs, D.M. and T.B. Harrington. 1991. Herbaceous vegetation of forests of the West U.S.: an annotated bibliography. Forest Research Lab, Oregon State University, Corvallis, OR. 103 p.

b. Planned for Remainder of FY 91:

Participate in seminars, workshops, and field trips as appropriate.

c. Planned for FY 92:

CRAFTS Workshop: Forest Vegetation Management Without Herbicides, February, 18-20, 1991.

8. *Duration of the Study*:

Initiation Date:	FY 90
Scheduled Completion Date:	FY 97

May 1991

Adaptive COPE
Progress Report

1. *Title*:

Technology Transfer Activities

2. *Principal Investigator(s) and Organization(s)*:

Adaptive COPE Team, College of Forestry, OSU, Newport.

3. *Technology Transfer Accomplishments to Date in FY 91*:

a. Workshops:

None.

b. Other Activities:

Two issues of the **COPE Report** were published.

COPE poster was displayed at U.S. Forest Service conference on New Perspectives for Watershed Management, Seattle, WA.

Presentation on Timber Harvesting and Landslides in the Oregon Coast Range, BLM/ODFW Biologists, Coos Bay, OR.

Presentation on Managing biological diversity given at annual meeting of Washington Farm Forestry Association, Olympia, WA

Participated in panel discussion as member on Managing Biodiversity conference, U.S. Forest Service, Region 6, Spokane, WA

Presentation on landscape ecology for forest management at Stand Management Short Course, OSU, Corvallis, OR

Presentation on Managing Biodiversity at meeting of U.S. Forest Service, Pest Management personnel, Salt Lake City, UT

Poster and oral presentations at the annual meeting of the Northwest Section of the Wildlife Society, Silverdale, WA

Poster presentation, Oregon Society of American Foresters Annual Meeting, Roseburg, OR

Presentation on COPE Research at Bureau of Land Management Conference on Biodiversity and Silviculture, Glendale, OR

Poster presentations at U.S. Forest Service Conference on New Perspectives Program, Olympia, WA

Northern and Southern coastal field tours to introduce new COPE employees to project cooperators and study sites.

Slide presentation on COPE activities to Bureau of Land Management officials from their National Headquarters

Presentation: McConnell, S. January, 1991. Active Management of Riparian Areas: goals and Strategies. BLM/ODFW Coordination Meeting, North Bend, OR (invited speaker)

Presentation: McConnell, S. and T. Scoggins. May, 1990. The Shelterwood System: A No Burning Option for the Northern Coast Range. COPE Workshop, Reforestation Options for the Oregon Coast Range, Newport (presented paper)

4. *Planned for Remainder of FY 91:*

a. *Workshops:*

Conduct a workshop on managing forest biodiversity in Pacific Northwest coastal forests.

Conduct a workshop on stream survey design and methodology.

Conduct a field workshop on Forestry, Landslides and Fisheries in the Southern Oregon Coast Range.

b. *Other Activities:*

Prepare a draft slide-tape program on riparian management on forest lands (in conjunction with Forestry Extension).

Prepare an information booklet summarizing COPE research studies and educational activities.

Prepare a draft chapter on wildlife management for the Animal Damage Control book.

Prepare a draft report on wildlife-habitat relationships in managed and unmanaged forest landscapes of the Pacific Northwest.

Publish two issues of the **COPE Report**.

Prepare an annual report.

Continue to increase public awareness of the COPE Program through the media and presentations to civic groups.

Continue to work closely with resource managers through office visits and field tours.

5. *Technology Transfer Plans for FY 92:*

a. *Workshops:*

Conduct two regional workshops on "Streamside Management and Soil Erosion Control Techniques for Small Woodland Owners."

Conduct a workshop on forest road drainage.

Conduct a regional symposium on the assessment of stream habitat inventory and monitoring programs.

b. *Other Activities:*

Prepare a poster on the Interdisciplinary Research and Demonstration Area Project (IRDAP).

Prepare a manuscript on impacts of alternative silviculture on wildlife habitat.

Prepare a manuscript on survey of land managers on forest road drainage.

Publish four issues of the **COPE Report**.

Prepare an annual report.

Increase public awareness of the COPE Program through the media and presentations to civic groups.

Work closely with resource managers through office visits and field tours.

COPE PROGRAM
FY 92 PROSPECTI

LIST OF PROPOSED FUNDAMENTAL COPE STUDIES PROSPECTI FOR FY 1992

LIST OF PROPOSED ADAPTIVE COPE STUDIES PROSPECTI FOR FY 1992

May 1991

Fundamental COPE
Study Prospectus

1. *Title*:

The Utilization of Unconstrained Stream Reaches by Salmonids in the Oregon Coast Range

(This study was intitiated in 1985. Because of the study's relevance to riparian zone management in the Oregon Coast Range and associated research tasks identified in item 3, this study will become COPE-sponsored research starting in FY 92).

2. *Principal Investigators and Organizations*:

Dr. Gordon H. Reeves, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Identify and explain the effects of various riparian and stream conditions on fish populations and communities.

b. Identify and explain how various management practices in streams and riparian areas affect fish populations and communities and water quality.

4. *Study Objective(s)*:

Synthesize data from the Oregon Coast Range which encompasses channel reach types. Specifically the proportion of broad valley flats and their relative utilization by salmonids.

5. *Justification*:

Unconstrained reaches on wide valley flats have been shown in previous COPE research to be extremely productive and important refuges for different species and age classes of salmonids. Many stream habitat surveys and fish population estimates have been undertaken by several agencies in the last few years or are currently underway. No attempt has been made to examine this data from the

point of view of fish species, age class and location in the basin of unconstrained reaches. A synthesis of this data would allow us to determine how much the Elk River case study can be extrapolated to other geologies and latitudes in the Oregon Coast Range. If the results hold up, the product of the research would be to aid managers in identifying high priority areas for fish habitat restoration.

6. *Anticipated Initiation and Completion Dates*:

October 1, 1991 to September 30, 1994.

7. *Proposed Tasks to be Completed by Fiscal Year*:

FY 1992
Southern Oregon Coast data analysis and synthesis.

FY 1993
Central Oregon Coast data analysis and synthesis.

FY 1994
North Oregon Coast data analysis and synthesis.

8. *Publication and Technology Transfer Activities*:

Prepare **COPE Report** articles and present results at workshops.

Participate in field tours and seminars as appropriate.

Prepare a manuscript that summarizes study results.

9. *Estimated Cost*:

	PNW
FY 92	9,000
FY 93	8,000
FY 94	8,000

May 1991

Fundamental COPE
Study Prospectus

1. *Title:*

Evaluation of Anadromous Salmonid Habitat Restoration Program on Schooner Creek, Hebo Ranger District, Siuslaw National Forest

(This study was intitiated in 1990. Because of the study's relevance to riparian zone management in the Oregon Coast Range and associated research tasks identified in item 3, this study will become COPE-sponsored research starting in FY 92).

2. *Principal Investigators and Organizations:*

Dr. James R. Sedell, Research Ecologist, Pacific Northwest Research Station, Corvallis
Dr. Gordon H. Reeves, Research Fish Biologist, Pacific Northwest Research Station, Corvallis
Mr. Robert Metzger, Siuslaw National Forest
Mr. Carl McLemore, Hebo Ranger District, Siuslaw National Forest
Mr. Mario Salozzi, Research Division, Oregon Department of Fisheries and Wildlife, Corvallis, Oregon
Mr. Ron Rhew, Adaptive COPE, Newport, Oregon
The Northwest Steelheaders, Lincoln City Chapter, Lincoln City, Oregon

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6):*

Riparian Zone Management

a. Identify and explain the effects of various riparian and stream conditions on fish populations and communities.

b. Identify and explain how various management practices in streams and riparian areas affect fish populations and communities and water quality.

4. *Study Objective(s):*

a. Document and quantify physical changes in summer and winter habitats for steelhead trout, coastal cutthroat trout, coho salmon, and chinook salmon resulting from habitat rehabilitation in the South Fork of Schooner Creek.

b. Quantify response of juvenile anadromous salmonids to changes in summer and winter habitat.

c. Quantify changes in smolt production resulting from habitat rehabilitation.

d. Quantify numbers and species of adult salmonids returning to the South Fork of Schooner Creek.

e. Evaluate the cost-effectiveness of the overall rehabilitation program.

5. *Justification:*

The Siuslaw National Forest and the Oregon Department of Fish and Wildlife are engaged in a systematic program to restore and enhance habitats of anadromous salmonids in streams in the Oregon Coast Range including the South Fork of Schooner Creek. The Oregon Department of Fish and Wildlife and PNW Research Station are actively engaged in a systematic effort to evaluate the results of salmonid habitat rehabilitation programs in coastal Oregon. The Northwest Steelheaders are interested in restoration of steelhead stocks to provide improved angling opportunities. The COPE program is actively involved in research and education programs to maintain and enhance the productivity on Oregon's Coast Range resources.

The methods and techniques for habitat restoration are still in the developmental stage, and the physical, biological, and economic benefits of habitat restoration and enhancement are not completely understood. The accessibility and uniqueness of the Schooner Creek evaluation project have considerable educational and demonstration value to resource managers and the public in regard to the design and relative effectiveness of various fisheries habitat restoration and enhancement activities.

6. *Anticipated Initiation and Completion Dates:*

October 1, 1991 to September 30, 1996.

7. *Proposed Tasks to be Completed by Fiscal Year:*

FY 1992

Quantify returning adult salmonids and quantify smolt production from the basin.

Determine changes in physical habitat in summer and winter and the response of juvenile salmonids to such changes.

Complete detailed study plan.

FY 1993 - 1996

Objectives a. - e. above.

Make preliminary estimates of the cost-effectiveness of the overall rehabilitation program.

FY 1996

Prepare a manuscript that summarizes study results.

8. *Publication and Technology Transfer Activities:*

Prepare **COPE Report** articles and present results at workshops.

Participate in field trips and seminars as appropriate.

Publish study results.

9. *Estimated Cost:*

	PNW
FY 92	18,000
FY 93	46,000
FY 94	48,000
FY 95	50,000
FY 96	53,000

May 1991

Fundamental COPE
Study Prospectus

1. *Title*:

Harvesting in Headwater Basins for Alternative Silvicultural Prescriptions

2. *Principal Investigators and Organizations*:

Dr. Loren D. Kellogg, Associate Professor, Department of Forest Engineering, Oregon State University, Corvallis

This study will be conducted in cooperation with and in support of the Adaptive COPE study: Integrated Responses of Multiple Forest Resources to Alternative Silvicultural Prescriptions in Headwater Basins of the Oregon Coast Range.

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas.

b. Develop, refine, and test systems for predicting and reducing landslides, surface erosion, and sediment delivery to stream channels.

c. Identify and integrate associations among ecosystem components in riparian areas and explain their ecological relationships.

d. Test and compare harvesting systems that enable managers to achieve various states of fish and wildlife habitat and levels of timber production in riparian areas.

4. *Study Objective(s)*:

a. Identify the logging planning and layout requirements for a replicated set of experimental timber harvest treatments in headwater basins which represent a gradient of levels and/or spatial distributions of structural retention (live trees, snags, fallen trees).

b. Identify and evaluate operational constraints of implementing harvest treatments relative to logging feasibility and human safety.

c. Quantify logging production and costs associated with harvest treatments.

5. *Justification:*

It is important that forest operations are adequately considered when evaluating response of multiple forest resources to alternative silvicultural prescriptions. There are many logging constraints associated with steep terrain and cable operations in the Oregon Coast Range. Non-traditional silvicultural prescriptions must be evaluated for feasibility and cost. Unfortunately, little economic information is available even on more recent riparian management practices, and no information is available regarding new proposed prescriptions. In addition, worker safety associated with strategies aimed at developing forest structure is an area of concern by the timber industry. Given the forest management challenges of today and tomorrow, there are certainly opportunities for practicing some new silvicultural prescriptions in the Oregon Coast Range. For a complete identification and evaluation of these prescriptions, information needs to be obtained and presented concerning operational logging issues as well as other multiple forest resource issues.

This study will contribute to the overall success of Adaptive COPE by interacting with other scientists and providing guidance in selecting sites and conducting harvesting treatments from the perspective of operational feasibility. It will also provide much needed information on logging planning, worker safety and economics associated with different silvicultural strategies. This operational information can then be used in conjunction with other soil, water and wildlife information for a complete evaluation of alternative silvicultural prescriptions in headwater basins. This comprehensive analysis and synthesize approach will provide information to the resource manager to help choose appropriate methods to meet multiple forest resource objectives. At the same time, the resource manager will know harvesting cost tradeoffs and operational requirements for implementation.

6. *Anticipated Initiation and Completion Dates:*

October 1, 1991 to September 30, 1995.

7. *Proposed Tasks to be Completed by Fiscal Year:*

FY 1992

Prepare a detailed study plan. Work with Adaptive COPE team and cooperators in selecting study sites, and making arrangements for the implementation of harvest treatments (logging planning and layout).

Work with COPE team on appropriate publications and technology transfer activities (harvesting component).

FY 1993

Installation of treatments. Harvesting data collection for study objectives a, b and c.

FY 1994

Installation of treatments. Harvesting data collection for study objectives a, b and c.

FY 1995

Data analysis and reporting of results.

8. *Publication and Technology Transfer Activities:*

Present results at COPE workshops and other appropriate meetings, contribute to appropriate newsletter articles and site tours organized by Adaptive COPE leaders; publish study results as they become available in refereed journal articles and other publications.

9. *Estimated Cost:*

	OSU
FY 92	64,000
FY 93	67,000
FY 94	70,000
FY 95	73,000

May 1991

Fundamental COPE
Study Prospectus

1. *Title*:

Strength Behavior of Forest Soils Under True Field Stresses

2. *Principal Investigators and Organizations*:

Dr. J. Richard Bell, Professor, Department of Civil Engineering, Oregon State University, Corvallis
Dr. Warren L. Schroeder, Associate Dean of Engineering, College of Engineering, Oregon State University, Corvallis
Dr. Marvin R. Pyles, Associate Professor, Department of Forest Engineering, Oregon State University, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

Develop, refine, and test systems for predicting and reducing landslides, surface erosion and sediment delivery to stream channels.

4. *Study Objective(s)*:

a. Review published information on residual soils and soil strength theories and testing procedures especially as related to soils under low ambient stress levels.

b. Design and construct strength testing apparatus and procedures for low stress testing and stress path control.

c. Test laboratory prepared specimens under stress conditions that simulate actual stresses in steep forested or recently logged slopes.

d. Test typical natural soils to obtain a preliminary evaluation of the range and variability of the controlling strength parameters.

e. Document the equipment, procedures, and results and present results at COPE workshops and appropriate conferences.

5. *Justification:*

In recent years there has been a major effort to apply the theories of soil mechanics to the problem of shallow landslides on the steep forested slopes of the Pacific Northwest. Even though these techniques have been successful in civil engineering applications their application to forested slopes has been disappointing. Since the methods of analysis often have been proven elsewhere, it is believed the difficulty is with the input data - especially soil strength data.

For most civil engineering works the ambient stresses in the soils are relatively higher than in the forested slopes. Also, engineering construction usually increases total stresses. In the forest soil slope, failures are usually the result of reductions of effective stress at essentially constant total stress. Standard test equipment and procedures are designed for the civil engineering applications and nearly all information in the literature is based on research with this equipment.

Tests at higher stresses may overwhelm and thereby obscure the factors that control behavior at low stresses. Some low stress tests have been performed by forest engineering researchers at OSU, but they were performed with increasing total stress loading and they leave many questions unanswered. It is the purpose of this study to conduct a detailed laboratory study of typical forest soils subjected to stress paths (loading conditions) true to those developed in the steep forested slopes of the Pacific Northwest.

6. *Anticipated Initiation and Completion Dates:*

October 1, 1991 to September 30, 1995.

7. *Proposed Tasks to be Completed by Fiscal Year:*

FY 1992

Perform literature review, complete detailed study plan, design test apparatus, and order equipment and supplies.

FY 1993

Complete equipment and test procedures development, select test soils, perform tests on laboratory prepared samples.

FY 1994

Collect and test natural soil samples.

FY 1995

Complete tests, prepare publications, and present results.

8. *Publication and Technology Transfer Activities:*

Present results at COPE workshops and document instrumentation, procedures and results. Present results in regional, national, and international conferences and appropriate journals.

9. *Estimated Cost:*

	OSU
FY 92	51,000
FY 93	33,000
FY 94	35,000
FY 95	37,000

May 1991

Fundamental COPE
Study Prospectus

1. *Title*:

Integrating and Managing Recreation with Other Resources

2. *Principal Investigators and Organizations*:

Dr. Perry J. Brown, Professor, Department of Forest Resources, Oregon State University, Corvallis
Dr. George H. Stankey, Senior Research Professor, Department of Forest Resources, Oregon State University, Corvallis
Dr. Roger Clark, Program Manager, Pacific Northwest Research Station, Seattle

The project will be undertaken within the structure of the Consortium on Social Values of Natural Resources, of which all three investigators are members of the Board of Directors.

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

This study encompases both the riparian and reforestation management issues.

4. *Study Objective(s)*:

a. Determine what is known about management of recreation relative to sustainability and to other resource uses.

b. Develop a conceptual framework for understanding how recreation can be integrated with other resource uses.

c. Develop guidelines for management of recreation which is integrated with other resource uses and which considers resource sustainability.

5. *Justification*:

Resource management often has been divided into functional areas which pit one resource use against another and which lead to competition among managers of different resource functions. We now are moving into an era where recognition of the complementary relationship among many resource uses is recognized and valued. Simply, in many cases joint production of resource outputs is possible and desirable. Some forms of recreation, timber, wildlife, and grazing management (and outputs) particularly fit this situation. Additionally, a recognition of the need

to ensure sustainability of resources is a major tenet of the current resource management paradigm. What this suggests is that we need to find ways to do joint production while ensuring resource sustainability. Specifically, we need to synthesize what we know about integrating recreation with other resource uses, particularly timber and wildlife, and develop guidelines for integrating recreation with these other resource uses.

This study will involve developing a conceptual framework for considering recreation in integrated resource management. It will involve synthesizing what we now know about joint production which includes recreation and it will involve developing guidelines for recreation management in an integrated and sustainable resource management system. Thus, it will provide much needed information about how to manage the recreation resources of Oregon's coastal forests such that resources can be sustained and multiple social values served.

6. *Anticipated Initiation and Completion Dates*:

October 1, 1991 to September 30, 1994.

7. *Proposed Tasks to be Completed by Fiscal Year*:

FY 1992

Complete detailed study plan, formulate framework for analysis (objective b), and complete majority of literature review (objective a). Identify a team of managers who will assist in development of guidelines (objective c).

FY 1993

Draft a publication which lays out the conceptual framework (objective b) and interprets the literature (objective a) relative to that framework. Begin to meet with managers to formulate recommended management guidelines (objective c).

FY 1994

Complete formulation of management guidelines (objective c) and develop a publication which reports the guidelines.

8. *Publication and Technology Transfer Activities*:

Present results at COPE workshops or other appropriate meetings; prepare newsletter articles; possibly establish a demonstration site; publish two documents as reports (noted above FY 1993, FY 1994).

9. *Estimated Cost*:

	OSU
FY 92	27,000
FY 93	28,000
FY 94	29,000

May 1991

Fundamental COPE
Study Prospectus

1. *Title*:

Socioeconomic Research Feasibility Study

2. *Principal Investigators and Organizations*:

Dr. Steven E. Daniels, Assistant Professor, Department of Forest Resources, Oregon State University, Corvallis

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

This study encompasses both the riparian and reforestation management issues.

4. *Study Objective(s)*:

a. Inventory the existing research and development/assistance efforts related to the study region and issue.

b. Determine the relevant geographic scale for considering socioeconomic issues in the Oregon Coast Range. (Can you understand the socioeconomics of coastal Oregon without understanding the region's relationship to the Willamette Valley populations?)

c. Develop an information base and technology to access and incorporate expertise and values of local communities related to socioeconomic issues.

d. Develop a set of potential research programs that address socioeconomic issues in the relevant region.

e. Design a forum where researchers and various stakeholders could discuss the potential research programs and rank them in terms of feasibility or desirability.

5. *Justification*:

Socioeconomics is a broad concept that captures many of the ways people interact with natural resources. It is also a topic that COPE has not focused on to date. Any COPE research into socioeconomics must be carefully designed if it is to be both technically feasible and produce useful knowledge. Research planning for this endeavor is especially important, given the large number of other agencies and organizations that are either gathering data or actively assisting rural

communities. Without careful planning, it would be easy to duplicate other efforts, or conduct research on a policy issue that is being resolved in another venue.

This study will systematically examine the socioeconomic situation in the Oregon Coast Range to identify research projects that are both desirable and feasible. Special efforts and techniques will be used to combine the knowledge of both university researchers and local stakeholders who hold important expertise.

6. *Anticipated Initiation and Completion Dates:*

October 1, 1991 to September 30, 1992.

7. *Proposed Tasks to be Completed by Fiscal Year:*

FY 1992

All objectives described in section 4 (above).

8. *Publication and Technology Transfer Activities:*

Prepare a final report that outlines research options. Present results at COPE workshops or other appropriate meetings, prepare a newsletter article.

9. *Estimated Cost:*

	OSU
FY 92	25,000

May 1991

Fundamental COPE
Study Prospectus

1. *Title*:

Decision Support System for Reforestation in the Oregon Coast Range

2. *Principal Investigators and Organizations*:

Mr. Pat Cunningham, Statistician, Pacific Northwest Research Station, Corvallis.
Dr. Tim Harrington, Assistant Professor, Department of Forest Science, Oregon State University, Corvallis.
Dr. Steve Knowe, Assistant Professor, Department of Forest Science, Oregon State University, Corvallis.
Dr. Steve Radosevich, Professor, Department of Forest Science, Oregon State University, Corvallis.
Dr. John Zasada, Research Silviculturist, Pacific Northwest Research Station, Corvallis.

Other significant contributors who will participate as their time permits:

Don Minore, PNW Research Station, Corvallis.
Mike Newton, OSU College of Forestry, Corvallis.
John Tappeiner, OSU College of Forestry, Corvallis.
Pete Owston, PNW Research Station, Corvallis.
Bob Shula, OSU College of Forestry, Corvallis.
Gabe Tucker, OSU College of Forestry, Newport.
Bill Emmingham, OSU College of Forestry, Corvallis.
Steve Hobbs, OSU College of Forestry, Corvallis.
Dave Hibbs, OSU College of Forestry, Corvallis.

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Reforestation in the Oregon Coast Range.

Develop and test strategies for reforestation that will be effective whereever coastal forests grow, even with constraints on prescribed fire and herbicides.

4. *Study Objective(s)*:

a. Compile and evaluate information available on biotic and abiotic factors (including pre- and post-harvest variables) affecting survival and early growth

of conifer and hardwood regeneration. PNW scientists will take the lead in this objective.

b. Develop an expert system for defining and evaluating reforestation alternatives for the Oregon Coast Range. OSU scientists will take the lead in this objective.

5. *Justification:*

Reforestation is a critical step in forest management in the Oregon Coast Range. The reforestation stage is so critical that many alternatives have been tested and a large amount of knowledge obtained both through research and operational experience. However, much of this information is not readily available to land managers and researchers for the purpose of identifying and evaluating regeneration alternatives for a given site within the framework of ecological, environmental, and political constraints. The accessibility of this information is particularly important because of limitations to the use of historically valuable tools such as fire and herbicides.

We propose the development of two parallel tools for use by managers and researchers which will allow maximum accessibility to historical information on reforestation alternatives in the Coast Range and evaluation of those alternatives for a given site. The first tool is a computer-based bibliography of reforestation information from the Coast Range. The second tool is a computer based expert system designed to integrate information accessed from the above-mentioned bibliography with known site history and conditions to formulate and customized reforestation alternatives for the site. The new information on site conditions then becomes part of the information base which can be used in the future on the given site for further alternative formulation and evaluation at the later stages of the reforestation process, as well as on similar sites for alternative formulation and evaluation.

This system is an expansion of the concept behind the VEGPRO system developed by the CRAFTS program at Oregon State University for evaluating vegetation management alternatives. However, this system would incorporate a broader perspective of forest management, thus requiring a broader information base and more decision criteria, and be more closely tied to pre-and post-harvest site and stand conditions.

There are a number of research projects under way on which this project would draw heavily for published and unpublished information. These include a several CRAFTS projects which deal with various aspects of modeling and young stand development. In addition there are fundamental and adaptive COPE projects which will provide important information.

Expert systems are also able to incorporate operational information into the decision making and evaluation process. This information would be gathered from public

agencies and private companies and be an important part of the data base for the project.

6. *Anticipated Initiation and Completion Dates:*

October 1, 1991 to September 30, 1996.

7. *Proposed Tasks to be Completed by Fiscal Year:*

FY 1992

Write a detailed study plan.

Begin literature search and information gathering.

Evaluate best methods for developing expert system.

FY 1993

Continue literature search and development of computer based bibliography.

Begin development of expert system.

FY 1994

Literature search; develop bibliography; develop expert system.

FY 1995

Continue development of bibliography and expert system.

FY 1996

Test and refine expert system and decision base.

8. *Publication and Technology Transfer Activities:*

Present study results at conferences and workshops as appropriate. Make information available when it is ready. The bibliography will continue to be updated throughout the project. Expert system will be made available to managers in late 1995-early 1996 for their evaluation. The final product will be available by then end of 1996.

of conifer and hardwood regeneration. PNW scientists will take the lead in this objective.

b. Develop an expert system for defining and evaluating reforestation alternatives for the Oregon Coast Range. OSU scientists will take the lead in this objective.

5. *Justification:*

Reforestation is a critical step in forest management in the Oregon Coast Range. The reforestation stage is so critical that many alternatives have been tested and a large amount of knowledge obtained both through research and operational experience. However, much of this information is not readily available to land managers and researchers for the purpose of identifying and evaluating regeneration alternatives for a given site within the framework of ecological, environmental, and political constraints. The accessibility of this information is particularly important because of limitations to the use of historically valuable tools such as fire and herbicides.

We propose the development of two parallel tools for use by managers and researchers which will allow maximum accessibility to historical information on reforestation alternatives in the Coast Range and evaluation of those alternatives for a given site. The first tool is a computer-based bibliography of reforestation information from the Coast Range. The second tool is a computer based expert system designed to integrate information accessed from the above-mentioned bibliography with known site history and conditions to formulate and customized reforestation alternatives for the site. The new information on site conditions then becomes part of the information base which can be used in the future on the given site for further alternative formulation and evaluation at the later stages of the reforestation process, as well as on similar sites for alternative formulation and evaluation.

This system is an expansion of the concept behind the VEGPRO system developed by the CRAFTS program at Oregon State University for evaluating vegetation management alternatives. However, this system would incorporate a broader perspective of forest management, thus requiring a broader information base and more decision criteria, and be more closely tied to pre-and post-harvest site and stand conditions.

There are a number of research projects under way on which this project would draw heavily for published and unpublished information. These include a several CRAFTS projects which deal with various aspects of modeling and young stand development. In addition there are fundamental and adaptive COPE projects which will provide important information.

Expert systems are also able to incorporate operational information into the decision making and evaluation process. This information would be gathered from public

agencies and private companies and be an important part of the data base for the project.

6. *Anticipated Initiation and Completion Dates:*

October 1, 1991 to September 30, 1996.

7. *Proposed Tasks to be Completed by Fiscal Year:*

FY 1992

Write a detailed study plan.

Begin literature search and information gathering.

Evaluate best methods for developing expert system.

FY 1993

Continue literature search and development of computer based bibliography.

Begin development of expert system.

FY 1994

Literature search; develop bibliography; develop expert system.

FY 1995

Continue development of bibliography and expert system.

FY 1996

Test and refine expert system and decision base.

8. *Publication and Technology Transfer Activities:*

Present study results at conferences and workshops as appropriate. Make information available when it is ready. The bibliography will continue to be updated throughout the project. Expert system will be made available to managers in late 1995-early 1996 for their evaluation. The final product will be available by then end of 1996.

9. *Estimated Cost*:

	PNW	*OSU*
FY 92	50,000	30,000
FY 93	53,000	31,000
FY 94	56,000	32,000
FY 95	59,000	33,000
FY 96	62,000	34,000

May 1991

Adaptive COPE
Study Prospectus

1. *Title*:

Integrated Responses of Multiple Forest Resources to Alternative Silvicultural Prescriptions in Headwater Basins of the Oregon Coast Range

2. *Principal Investigators and Organizations*:

Dr. Andrew Hansen, Assistant Professor, Department of Forest Science and Adaptive COPE Team, Oregon State University, Hatfield Marine Science Center, Newport
Mr. Arne Skaugset, Instructor, Department of Forest Engineering and Adaptive COPE Team, Hatfield Marine Science Center, Newport
Dr. Gabriel Tucker, Assistant Professor, Department of Forest Science and Adaptive COPE Team, Oregon State University, Hatfield Marine Science Center, Newport
Mr. Douglas Bateman, Research Assistant, Department of Forest Engineering and Adaptive COPE Team, Hatfield Marine Science Center, Newport
Mr. Eric Horvath, Research Assistant, Department of Forest Science and Adaptive COPE Team, Oregon State University, Hatfield Marine Science Center, Newport
Pei-fen Lee, Research Assistant, Department of Forest Science and Adaptive COPE Team, Oregon State University, Hatfield Marine Science Center, Newport
Mr. Steve McConnell, Research Assistant, Department of Forest Science and Adaptive COPE Team, Oregon State University, Hatfield Marine Science Center, Newport
Mr. Ron Rhew, Research Assistant, Department of Forest Engineering and Adaptive COPE Team, Hatfield Marine Science Center, Newport
Mr. James Schroeder, Research Assistant, Department of Forest Engineering and Adaptive COPE Team, Hatfield Marine Science Center, Newport

3. *Management Issue and Research Tasks (COPE Long-Range Plan, Pages 3-6)*:

Riparian Zone Management

a. Develop silvicultural systems to maintain and improve fish and wildlife habitats in riparian areas and increase conifer development there.

b. Develop, refine, and test systems for predicting and reducing landslides, surface erosion, and sediment delivery to stream channels.

c. Identify and integrate associations among ecosystem components in riparian areas and explain their ecological relationships.

4. *Study Objective(s)*:

a. Quantify the responses of selected forest resources to alternative silvicultural prescriptions in structurally-poor, young or mature forest stands in headwater basins in the Oregon Coast Range.

b. Determine processes or mechanisms that underlie key responses.

c. Quantify and evaluate operational constraints of implementing the harvest treatments relative to feasibility and economics.

d. Provide sites that demonstrate the implementation of alternative silvicultural prescriptions for uplands and riparian zones in headwater basins.

e. Synthesize the results to identify the ecological and operational consequences for multiple resources of the alternative prescriptions.

Stand-Scale Silvicultural Prescriptions:

a. Objective - Maximize wood production.

Target Stand Structure - Even tree size and age

Prescription - clearcut, no structural retention, intensive site preparation, single species planting, pre-commercial thinning, short rotation

b. Objective - Optimize wood production and plant and animal diversity

Target Stand Structure - Two to four tree size and age classes; moderate levels of shrubs, snags, fallen trees; overstory retention dispersed

Prescription - clearcut, 15% retention of live trees, snags, fallen logs, shrubs; retention dispersed, moderate site preparation, multiple species planting, variable thinning, moderate rotation

c. Objective - optimize wood production and water quality

Target Stand Structure - 15% structural retention clumped in headwalls or along stream

Prescription - as in (b) except retention clumped along stream or in headwalls

d. Objective - Maximize water quality and late-seral plant and animal diversity

Target Stand Structure - Multiple tree ages and sizes, multiple canopy layers, high levels of spatial heterogeneity in canopy, high levels of snags, fallen trees, shrubs

Prescription - group selection, variable sizes; site preparation if feasible, planting of multiple species, variable thinning, creation of snags and fallen logs, long rotation

Response Variables:

Commercial trees - volume harvested, natural and planted seedling survival and growth rates, overstory survival (including blow-down rates) and growth rates.

Vegetation - structure, composition, diversity, shrub survival, growth, seed production
Water - seasonal yield (especially low flows), chemical composition, sediment loading, temperature

Soil - compaction, nutrient status, structure, slide potential

Microclimate - solar radiation, humidity, air and soil temperature, wind speed

Headwater stream ecology - primary production, invertebrate and vertebrate community structure and composition, organism dispersal

Wildlife - community structure and composition

5. *Justification*:

Public demand for increasing levels of diverse natural resources is fueling rapid change in forestry. Land managers are being challenged to maintain suitable levels of wood production while also providing for biological diversity, water quality, long-term site productivity, and human recreation and aesthetic values. This challenge is especially great in smaller, lower-order, headwater basins. These headwater watersheds are important in several ways. Though individually small in size, they collectively comprise a large portion of the forest land area and the streams within them represent the majority of total stream miles. Headwater streams probably exert substantial influence on water quality and fish habitat lower in watersheds. Furthermore, the forested hillslopes of headwater basins are productive for timber and provide habitat for a diverse community of plants and animals. Presently, however, these small headwater streams receive less protection under the Oregon Forest Practices Act than larger, fish-bearing streams. A variety of new silvicultural practices are presently under development in the Northwest.

There is a need to evaluate the ecological and operational consequences of alternative treatments in headwater basins.

Among the key issues are the responses of wood production and species diversity to forest management practices. Evidence is mounting that traditional forest practices in the Coastal Northwest can negatively impact native species diversity. By removing live trees, snags, and fallen trees in uplands, these practices simplify the microhabitat heterogeneity typical of natural forests and sometimes lower the abundance or diversity of floral and faunal communities. Clearcutting across headwater riparian zones and streams may further reduce native species diversity, especially for amphibians.

Water quality and stream ecology in headwater systems is also receiving growing attention. The buffer strips now required along larger streams are thought to be effective in reducing adverse impacts of timber harvest on water quality. Little studied, in contrast, are the potential effects on water quality and water yield of buffer strips along streams and forest patches in steep headwalls in headwater watersheds. Moreover, the ecological role of headwater streams is virtually unknown in the region. These streams may provide nutrients and food resources to downstream fish communities.

Innovative new silvicultural approaches are now being designed and, in some cases, implemented in an attempt to better optimize wood production, conserve biodiversity and water quality. Varying levels of live trees, snags, fallen trees, and shrubs are now commonly retained on federal forest lands in the region. These are either dispersed over harvest units or clumped along streams or on headwalls. Such designs are specified in many of the new National Forest Plans and these structurally-rich harvest units are likely to become even more common.

There is much concern, however, over how these new approaches may effect wood production, harvest costs, reforestation success, and human safety. Critics argue that the retention of some canopy trees will shade the regenerating plantation and reduce tree growth, a position supported by some simulation modelling efforts. Moreover, the presence of native shrubs is likely to increase competition with commercial seedlings. harvest costs are apt to be higher in these units than in traditional clearcuts and the presence of live trees, snags, and downed logs may make site preparation more difficult and more hazardous for field workers.

At the same time, it is not clear how effective these efforts may be in protecting water quality and conserving biodiversity. Hydrologists speculate that retention of overstory trees in uplands and buffers along streams will increase water yield during the dry season and also reduce sedimentation rates. Few data are available to test these hypotheses. Moreover, the possible benefits of structural retention for species diversity are little known. Several studies have shown that the retention of snags in harvest units does provide breeding habitat for several cavity-nesting birds. But much less is known about wildlife response to retention of green trees, shrubs, and downed logs. A pilot study in the west Cascades of Oregon found

that several species of forest-dwelling birds that avoided clearcuts were present in shelterwood sites. Their densities in shelterwoods were so low, however, to raise question as to the value of this habitat for these species. Retention of canopy trees in plantations also arouses concern that shading will be sufficient to reduce habitat quality for the large number of plant and animal species that specialize on open-canopy stands. Some of these species are declining in abundance over the region and merit interest from conservationists.

Forest managers are clearly in need of information that will allow them to predict the trade-offs in wood production, operational constraints, habitat diversity, and water quality of differing levels and configurations of structural retention.

The proposed study is designed to provide land managers with such information. The experimental design will be rigorous in having well-defined treatments, replication, and pre- and post treatment measurements. Several response variables will be monitored including commercial tree growth rates, water quality and quantity, and structure and diversity of plant, wildlife, aquatic insect and fish communities. Also, the operational constraints associated with the treatments will be documented. This approach will allow the operational and ecological trade-offs of these silvicultural treatments to be quantified. This study is being designed to not only yield useful information during the COPE Program but long after the program has been completed in 1998. These installations could potentially be utilized by other research programs to evaluate the long-term effects of the treatments imposed during COPE.

Another benefit of the study involves monitoring protocols. National Forest Plans call for increasing monitoring efforts but the rigorous scientific methodologies have in many cases not yet been developed. Some of the sampling protocols we develop may well be exportable for other applications.

Finally, this project will provide demonstration sites where resource managers, policy makers, and scientists can view alternative harvest units and discuss the associated resource and operational trade-offs.

6. *Anticipated Initiation and Completion Dates*:

October 1, 1991 to September 30, 1998.

7. *Proposed Tasks to be Completed by Fiscal Year:*

FY 1992

Prepare a detailed study plan.

Develop criteria for selecting study sites.

Select study sites in conjunction with cooperators.

Make arrangements with cooperators for the implementation of the treatments in FY 93.

Designate on the ground study site boundaries and sampling points.

FY 1993

Pre-treatment sampling.

Installation of treatments.

FY 1994

Pre-treatment sampling.

Installation of treatments.

Post treatment sampling.

FY 1995

Post treatment sampling.

FY 1996

Post treatment sampling.

FY 1997

Post treatment sampling.

FY 1998

Synthesis of results.

8. *Publication and Technology Transfer Activities:*

Conduct educational and planning meeting with cooperators.

Prepare a poster describing the project and prepare articles for the **COPE Report**.

Participate in workshops, field tours and seminars as appropriate.

Conduct tours of the study sites.

Prepare publications that report study results.

COPE PROGRAM
REALTIONSHIP OF CONTINUING AND PROPOSED STUDIES
TO MANAGEMENT ISSUES AND RESEARCH TASKS

RELATIONSHIP OF CONTINUING AND PROPOSED STUDIES TO MANAGEMENT ISSUES AND RESEARCH TASKS IDENTIFIED IN THE COPE LONG-RANGE PLAN[1]

Management Issue: **RIPARIAN ZONE MANAGEMENT**

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[1] A Long-Range Plan for completing the Coastal Oregon Productivity Enhancement (COPE) Program. April 1989. Forest Research Laboratory, Oregon State University, Corvallis. 15 p.

Page

Research Task 4: Characterize wildlife communities in riparian and adjacent upland habitats and assess how changes in habitat affect wildlife species.

Continuing Studies

Proposed Studies

None

Page

Research Task 9: Identify and integrate associations among ecosystem components (for example, vegetation, geomorphology, fish) in riparian areas and explain their ecological relationships.

Management Issue: **REFORESTATION IN THE OREGON COAST RANGE**

Page

Research Task 2: **Examine the economics of different reforestation strategies and assess the economic impacts of constraints on fire and herbicides.**

Continuing Studies

Proposed Studies

None

Management Issue: **THESE STUDIES ENCOMPASS BOTH RIPARIAN ZONE MANAGEMENT AND REFORESTATION IN THE OREGON COAST RANGE**

COPE PROGRAM
BUDGET SUMMARIES

May 1991

Fundamental COPE

Combined OSU and PNW Budget Summary
FY 91 and FY 92

Projected Expenditures

	FY 91 (anticipated)	FY 92 (requested)
OSU[1]	$ 838,000	$1,028,000
PNW[1]	1,205,800	1,150,000
Total	**$2,043,800**	**$2,178,000**

Revenues

	FY 91 (appropriation)	FY 92 (planned)
USDA, FS	$1,050,000	$1,050,000
USDI, BLM	993,800	1,128,000
Total	**$2,043,800**	**$2,178,000**

[1] Includes funds necessary for program administration and research support service.

May 1991

Adaptive COPE

Budget Summary
FY 91 and FY 92

Expenditures	FY 91 (anticipated)	FY 92 (requested)
Personnel (salaries, wages, and OPE)	$347,754	$367,000
Services and Supplies	48,750	50,000
Travel	40,000	39,000
Capital Costs (equipment, facilities)	14,679	50,000
Indirect Costs	21,825	23,000
Tuition Remission	0	0
Total	**$473,008**	**$529,000**

Revenues	FY 91 (anticipated)	FY 92 (requested)
BLM Districts	$134,000	$172,000
National Forests	100,000	100,000
Industry	150,000	150,000
Oregon Dept. of Forestry	50,000	50,000
Counties	38,500	38,500
Dept. Fish & Wildlife	5,000	5,000
Oregon Small Woodland Assoc.	200	200
U.S. Fish & Wildlife	5,000	5,000
Bureau of Indian Affairs	5,000	5,000
Carryover	37,460	52,152
Total	**$525,160**	**$577,852**

College of Forestry
Oregon State University
Peavy Hall 154
Corvallis, OR 97331-5704

June 4, 1991

MEMORANDUM

TO: COPE Advisory Council Members and Invited Participants

FROM: Steve Hobbs

SUBJECT: Spring Advisory Council

As you know, the spring meeting of the COPE Advisory Council will be held at the Bureau of Land Management Salem District Office on June 11 (map enclosed). The meeting will start at 9:30 a.m. and adjourn by noon.

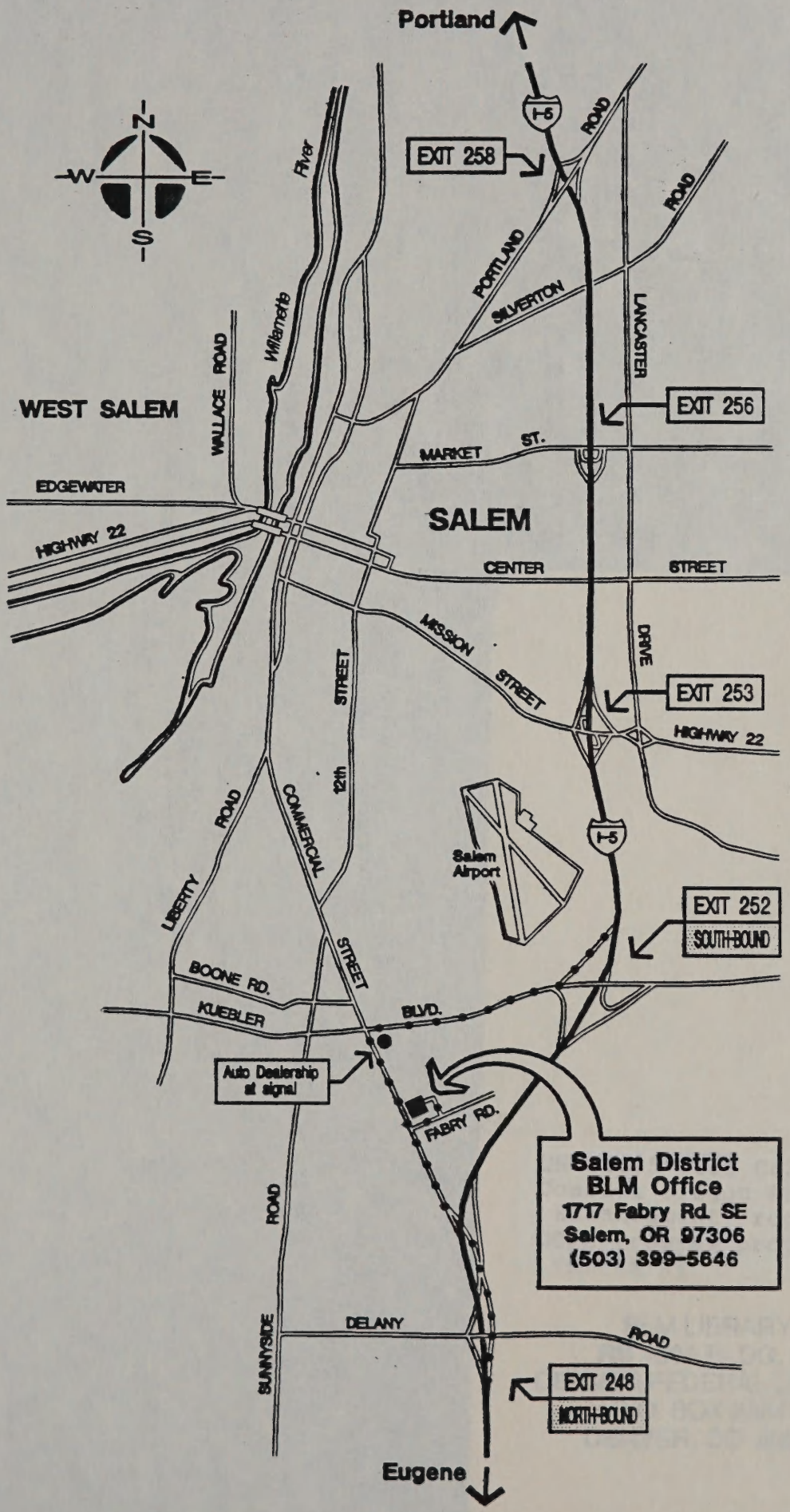
The COPE Progress Report for the current fiscal year is enclosed for your review. Included are the meeting agenda, minutes to the last Advisory Council meeting, updates on all Fundamental and Adaptive COPE activities during FY91 and plans for FY92. This year we have expanded the Progress Report to include annual research objectives for each study. Although you have already received the prospecti for new studies proposed to start in FY92, they are also included in the Progress Report.

As in past years, the spring meeting will focus on plans and budgets for the next fiscal year. I will also outline work that the COPE Science Committee has done to identify information products we should strive to develop by the end of the program. In addition, I'll make a proposal on how to increase public awareness of the COPE Program.

This promises to be an important meeting, and I hope that you will be able to participate. If you will be unable to attend, please let us know by calling either myself (750-7426) or Sheila Till (750-7393).

Enclosures

S.HOBBS:EDIT-CLIwai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EXIT 258
ROAD
PORTLAND
SILVERTON
LANCASTER
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Willamette River
WALLACE ROAD
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EXIT 256
MARKET ST.
EDGEWATER
SALEM
HIGHWAY 22
CENTER STREET
MISSION STREET
DRIVE
EXIT 253
HIGHWAY 22
12th STREET
COMMERCIAL
LIBERTY ROAD
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Auto Dealership at signal
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BLM Office
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