SUMMARY OF PRECIPITATION DATA FOR THE SECOND HALF OF THE 1989 WATER YEAR

Ample rain fell throughout the central Oregon Coast Range during the second half of the 1989 water year, creating ideal conditions for seedling survival and lowering the fire hazard. Major summer storms occurred June 28-30, July 16-17, August 1-2, and August 21-22. August rainfall was unusually high with 1.5 to 4.0 inches recorded at the nine gauged sites (Table 1).

Table 1. Monthly precipitation for the second half of the 1989 water year.

Gauge	Elev. (ft)	Dist. from ocean (mi)	Dist. north[1] (mi)	Precipitation (inches) Apr	May	June	Jul	Aug	Sep[2]	Total
1	1040	13	38	4.7	4.8	2.2	1.3	3.2	0	16.2
2	780	12	30	3.7	5.3	2.0	1.6	4.0	0	16.6
3	1040	11	23	3.4	5.8	2.0	1.5	2.5	0	15.2
4	1640	14	18	4.2	M[3]	M	M	M	M	M
5	1220	18	14	3.2	3.6	1.5	1.5	2.3	0	12.1
6	760	11	11	3.3	3.5	2.0	2.0	3.2	0	14.0
7	1400	16	3	2.6	4.5	1.8	1.1	2.4	0	12.4
8	1400	25	26	2.4	3.3	1.4	0.8	1.5	0	9.4
9	1000	27	17	2.6	3.1	1.2	1.4	1.8	0.1	10.2

[1] Miles north of the Umpqua River at the Wells Creek Guard Station
[2] As of September 23
[3] Malfunction

Totals for the six-month period beginning in April and ending in September ranged from 9 to 17 inches. Sites to the north had the highest rainfall. Sites to the south and east had the lowest. This pattern was similar to what we found for winter rainfall. As before, elevation had no strong influence on rainfall amounts. Total rainfall for the 1989 water year ranged from 120 inches at gauge #1 to 65 inches at gauge #8.

The network has recently been expanded by three gauges. The Forest Science Lab installed a gauge in the upper reaches of Condon Creek (#98, elevation = 720 ft.). We installed a gauge in the Deadwood Creek drainage (#11, elevation = 1120 ft.) to help understand more about the high-rainfall region north of the Siuslaw River. We also installed one west of gauge #4 (#12, elevation = 800 ft.).

If you would like detailed information about rainfall data collected during the 1989 water year, contact Kevin Lautz, Forest Engineering Department, Oregon State University, Corvallis, OR 97330; (503) 737-2380.

Chip Andrus,
OSU Forest Engineering Department

OF INTEREST

CARL STOLTENBERG AND GEORGE BROWN EXCHANGE BATON

The co-directorship of the COPE program changed hands on January 1, 1990, when George Brown became Dean of the College of Forestry at Oregon State University. Carl Stoltenberg retired from the position after 23 years at the helm. Carl's presence in COPE will be missed. His guiding hand helped to make the program a reality and after its inception, Carl continued actively participating with COPE cooperators and scientists. George Brown also has a long history with the program. His hydrologic studies in the Alsea watershed in the 1960's laid the groundwork for much of the research being done by COPE scientists today. Moreover, George played a lead role in the development and initiation of the program over the last decade. "I strongly support the concept of COPE and look forward to continuing to work with co-director, C[illegible]s Philpot, PNW Station Director, and the members of the advisory council," George said recently.

Andy Hansen,
Adaptive COPE

ALTERNATIVE TIMBER HARVEST PATTERNS FOR LANDSCAPE DIVERSITY

The distribution of vegetation patches in a landscape profoundly influences many resources. Wildlife habitat, wildlife movement, watershed hydrology, erosion, timber harvest patterns, and other features depend, to a large extent, on how vegetation is distributed across the landscape. Landscapes managed for a variety of resources, including long-term ecosystem function, wildlife habitat, and timber, should be carefully designed to fulfill all those roles rather than allowed to evolve as by-products of traditional approaches to road systems and timber sale layout. Landscape design to meet these ends includes planning for stand level structural features and the distribution of vegetative patches across the landscape.

Landscape design toward these goals requires planning at watershed or larger scales and over several decades. In order to better understand the planning process and resource implications, the Blue River Ranger District, Willamette National Forest, designed alternative landscape patterns that could be implemented over the next 30 years in the 11796 acre Cook and Quentin drainages. The objectives were to contrast management for maximum dispersion of harvest impacts across the watershed (the staggered setting approach) and retention of large unharvested blocks and connecting corridors for as long as possible into the future (the minimum fragmentation approach).

The following constraints guided the development of the alternatives:

- Maintain large patches, connectors among stands, and connectors to adjacent drainages in an unharvested condition for as long as possible in the minimum fragmentation design.

- Disperse harvest units through the watersheds according to standard District practices in the staggered setting design.

- Select an area with typical levels of resource complexity, stand conditions, and existing harvest patterns.

- Project harvest patterns for both typical dispersed patch cutting (staggered setting) and minimum fragmentation designs for 30 years into the future. Total time span examined extends from 1955 (first harvest in the area) to 2018. Evaluate effects on unharvested stands and other resources.

- Design harvest patterns that can be implemented within current regional guidelines regarding harvest unit size and total size of created openings.

- Apply the same decadal harvest levels to both landscape designs.

- Distribute the same amount of decadal harvest within 1000 foot elevation bands in both designs to minimize differences in watershed effects. A significant portion of the study area is at elevations where winter rain-on-snow events could produce rapid runoff and consequent watershed and soils impacts.

Significant differences emerged in the patterns and patch size of remaining unharvested stands and young stands (Figure 1). Total harvest from 1955 to 2018 with each alternative was approximately 4700 acres. Minor differences in unit boundaries and map accuracy actually provided slightly more harvest, by 350 acres, over the next 30 years in the minimum fragmentation approach. This is not a general result of the minimum fragmentation approach. Remaining unharvested stands, including a spotted owl habitat area and unstable soils, totaled about 7000 acres for both approaches.

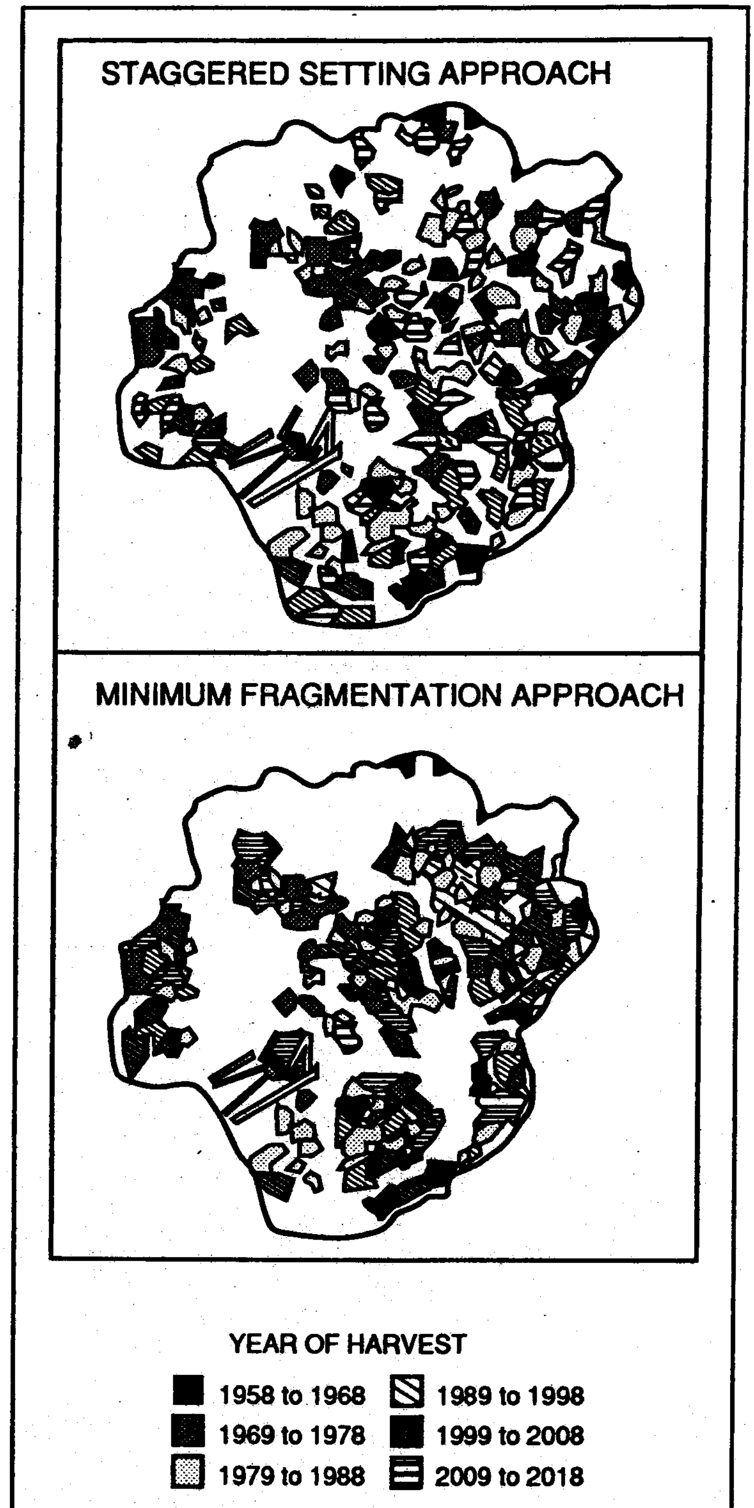

Figure 1. Alternative harvest designs for the next 30 years in the Cook-Quentin study area, Blue River District, Willamette National Forest.

Effects on Interior Forest Habitat

A significantly greater amount of interior forest habitat could be provided with a minimum fragmentation design over the next 30 years. Assuming an edge effect of two tree lengths, the amount of remaining effective interior forest habitat after 30 years of harvest would be 5240 acres under the minimum fragmentation design and 4553 acres under the staggered setting design. Approximately 10 percent more of the unharvested area was effective interior habitat with the minimum fragmentation design. The total amount of cut to un-cut edge was 95 miles under the minimum fragmentation design and 135 miles under the staggered setting design, an increase of 42 percent.

Effects on Big Game and Forage and Hiding Cover

For this analysis, forage was presumed accessible to big game if it was within 600 feet of hiding cover.

Stands less than 20 years old were assumed to provide forage and no hiding cover. Stands over 20 years old provided hiding cover. Effects of the two harvest patterns on big game forage were not substantially different. No forage was more than 600 feet from cover in the staggered setting design. A total of 49 acres of forage was more than 600 feet from cover, and therefore presumed inaccessible to big game, in the minimum fragmentation design. Total amount of accessible forage was 2633 acres in the minimum fragmentation design and 2263 acres in the staggered setting design. Most of the difference is due to slightly more acres harvested in the minimum fragmentation design. Although loss of available forage with a minimum fragmentation design was not substantial in this example, at least through the next 30 years of harvest, losses could be more severe in the two or three decades at the end of the rotation.

Long Rotations and Minimum Fragmentation

Minimum fragmentation designs could easily be used with long rotations to produce large blocks of older stands. Small watersheds harvested over the course of a few decades and allowed to recover for 200 or more years would develop into contiguous patches of interior forest habitat. Development of old-growth forest conditions could be enhanced by leaving abundant structure (green trees, snags, and down wood) at the beginning of the rotation and, perhaps, by judicious silvicultural stand tending. This procedure could be used to produce large patches of old-growth conditions in landscapes that are extensively harvested and fragmented at present. It is not too late to plan for old-growth replacement in areas where significant stands do not currently exist.

Important Issues Remain To Be Addressed:

- What would the watershed and soils effects be as the remaining unharvested stands in the minimum fragmentation design are all harvested over a short period at the end of the rotation? These effects could well be unacceptable in many landscapes, especially in areas where much of the remaining general forest is in steep terrain with erosive soils.
- What is the response of wildlife to the two patterns? Do big game species really find the middle of larger areas of young stands not usable for forage? What are the impacts on interior forest species and smaller, less mobile organisms?
- What are the visual impacts of minimum fragmentation designs?
- How does within-stand management of structures (green leave trees, snags, down logs) interact with harvest unit dispersion to modify soil, watershed, wildlife, and visual effects?

Application

Minimum fragmentation designs spanning a range from small aggregations of units to one hundred or more acre aggregates have been planned or exist in several places across the National Forest system. Some of these were not purposefully designed to minimize fragmentation of remaining natural stands--salvage harvest of insect-damaged stands, for example--but may have similar end results. Minimum fragmentation designs must be accompanied by retention of within-stand structures (green trees, snags, and down logs) to lessen the effects of large openings on wildlife habitat and unstable soils, especially as the size of aggregates of units exceeds 100 acres. There are nearly always effects on watershed conditions, wildlife habitat, or visual resources to be balanced against the retention of large unfragmented natural forest blocks.

Present applications of minimum fragmentation designs on the Willamette National Forest include the following.

- All of the new timber sales on the Blue River District include at least one minimum fragmentation alternative.
- Several ranger districts on the Willamette National Forest are considering minimum fragmentation designs for timber sales. Where minimum fragmentation fits overall resource concerns, it is incorporated in harvest designs.
- Recently sold timber sales have incorporated minimum fragmentation design elements. The design can be implemented under current Regional and Forest direction.
- Landscape design will be addressed in the Forest Plan through descriptions of the desired future condition and standards and guidelines. Particular designs, either staggered setting or minimum fragmentation, will not be mandated.
- Several cooperative projects between research and management to refine knowledge and examine effects of different landscape designs are underway or under consideration.

Large landscapes, on the order of ranger districts, could easily benefit from a combination of approaches that focused on the habitat and ecosystem goals for the whole landscape. In some areas, with fragile soils for example, small, dispersed patch harvest might be appropriate. In other areas, long rotation patches under a minimum fragmentation approach would provide a continuous supply of interior forest habitat. The rest of the landscape would be managed to provide a consistent level of within-stand structure (snags, logs, large green trees) in either minimum fragmentation, staggered setting, or intermediate approaches, depending on design objectives. Within-stand structural diversity is particularly important in the minimum fragmentation design where large areas might otherwise lack habitat for many species of wildlife. Harvest methods become less obviously clearcuts and more closely resemble shelterwoods or uneven-aged management as more structure is left following harvest. The minimum fragmentation approach is but one of the tools available to meet landscape design objectives.

Summary

Landscapes can be designed to provide different patch sizes and distributions within constant levels of timber harvest. The effects on edges and interior habitat can be dramatic, especially during the first rotation. Since the same amount of area is harvested over the same amount of time, changing harvest scheduling does not address the issue of how much old growth will be left at the end of a rotation. Minimum fragmentation designs can be implemented given current National Forest Regional standards.

Management for within-stand structures becomes increasingly important as the size of aggregate open areas increases. Patches of snags and green trees, riparian corridors, and down woody debris provide travel routes and habitat for many animals in young stands.

Important questions about watershed, wildlife habitat, soils, and visual effects have yet to be resolved.

For the first rotation on public lands, a general application of minimum fragmentation, within the limitations of other major resource concerns, would provide society with the option to manage for existing older stands for longer periods of time. In the long run, however, minimum fragmentation designs on rotations of 150 years or less do not provide any answers to the old-growth issue. Minimum fragmentation designs are not the solution to land allocation issues. They are one tool in an expanded set of tools we must consider when designing landscapes.

Recommended Readings

Franklin, J.F. and R.T.T. Forman. 1987. Creating landscape patterns by cutting: ecological consequences and principles. Landscape Ecology 1(1):5-18.

Harris, L.D. 1984. The Fragmented Forest. University of Chicago Press, Chicago. 211 pages.

USDA Forest Service. 1989. Old Growth Douglas-fir Forests: Wildlife Communities and Habitat Relationships. Abstracts of Proceedings. Pacific Northwest Forest and Range Experiment Station, Portland, OR. 80 pages.

Miles Hemstrom,
Willamette and Siuslaw National Forests

OPPORTUNITIES

NORTHWEST SCIENTIFIC ASSOCIATION ANNUAL MEETING — OREGON STATE UNIVERSITY

March 21-23, 1990 **Corvallis, OR**

This year's meeting will feature a day-long symposium entitled "Environmental Disasters and the Nature of Recovery" which will focus on events such as the Alaska earthquake, Mt. St. Helens eruption, and the Alaska oil spill. For more information, contact Bill Emmingham, Department of Forest Science, Oregon State University, Corvallis, OR 97331.

VARIABLE PROBABILITY SAMPLING—VARIABLE PLOT AND THREE-P — OREGON STATE UNIVERSITY

April 3-7, 1990 **Corvallis, OR**

This course is offered for foresters interested in learning more about timber cruising. Two popular methods will be covered in detail: Variable-Plot Sampling and Three-P Sampling. The course is suitable for both beginners and those with experience who would like to brush up on the principles and computation techniques using hand calculators and microcomputers. For more information, contact the Conference Assistant, College of Forestry, OSU, 202 Peavy Hall, Corvallis, OR 97331-5707 or phone (503) 737-2329.

COPE WORKSHOP: REFORESTATION OPTIONS FOR THE OREGON COAST RANGE — COPE

May 22-23, 1990 **Newport, OR**

Restrictions on burning and herbicide use have resulted in the development and application of numerous reforestation tools. A silviculturist faced with the need to reforest a site in the Oregon Coast Range, however, has relatively little information on the effectiveness of these tools or how to implement them. This workshop will provide state-of-the-art information that will help land managers choose from the various tools available, based upon their management objectives.

The first day will include reports on pertinent research results and will feature silviculturists talking about how they reforest their lands. There will be a range of presentations from various agencies and industry with an emphasis on relative costs and effectiveness. The field tour on the second day will allow

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COPE Report

Coastal Oregon Productivity Enhancement Program

Promoting Integrated Management of Oregon's Coast Range Forests Through Research and Education

Volume 3, Number 1 Winter 1990

The COPE Program

The Coastal Oregon Productivity Enhancement (COPE) Program is a cooperative effort between Oregon State University's (OSU) College of Forestry, the USDA Forest Service Pacific Northwest Research Station (PNW), the USDI Bureau of Land Management (BLM), other federal and state agencies, forest industry, county governments, and the Oregon Small Woodland Association. The intent of the program is to provide resource managers and the public with information relative to the issues and opportunities associated with the management of fish, timber, water, wildlife, and other resources of the Oregon Coast Range. The COPE Program emphasizes an integrated approach—an integration of research and education and an integration of scientific disciplines—to find effective ways to manage these diverse resources collectively.

The COPE Program has two related components: Fundamental COPE and Adaptive COPE. Comprised of OSU and PNW scientists based primarily in Corvallis, Fundamental COPE addresses problems related to riparian zone management and reforestation in the Coast Range through basic research. Adaptive COPE is comprised of an interdisciplinary team responsible for applying and adapting existing research information to solve specific management problems. Stationed on the coast in Newport at the Hatfield Marine Science Center, the Adaptive COPE team is also responsible for providing continuing education opportunities to facilitate technology transfer.

Published quarterly, the COPE Report provides a means to rapidly disseminate research findings, announce upcoming educational opportunities, and highlight recent publications and topics of interest. Its goal is to foster good resource management by helping people involved in the management of Oregon Coast Range resources to stay well-informed. Comments and suggestions concerning the content of the COPE Report are welcomed and encouraged. To receive this free newsletter, contact COPE, Hatfield Marine Science Center, Oregon State University, Newport, OR 97365. Phone: (503) 867-4011.

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