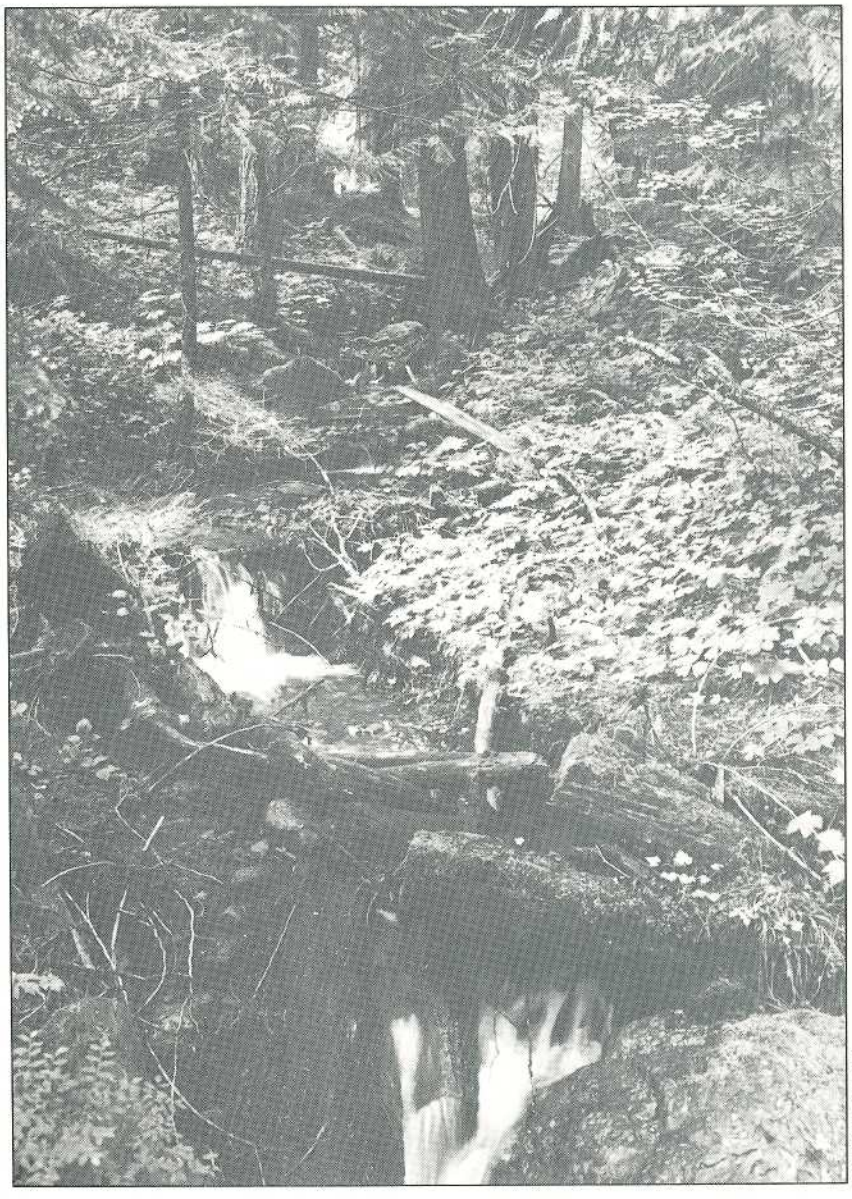
TOWARD A NEW FORESTRY

By DR. JERRY FRANKLIN

Brainchild of a group of scientists and rangers and driven by increasing resource conflict and decline, these concepts are a revolution in the making.



U.S. Forest Service

Logs create fish habitat in a stream.

Forestry is at a crossroads. For decades we thought we knew all that we really needed to know about forests. But in fact our level of knowledge is remarkably superficial.

The more time I've spent studying forests, the more I've come to appreciate their richness. The traditional approach to the management of forestland has reflected a simplistic attitude that has homogenized these complex systems. The result has made them ef-

ficient at producing the products and amenities that interest us. But in the search for that efficiency, we've sacrificed other values.

I come from a woods family. I grew up in Camas, Washington, a papermill town a short distance from Portland, Oregon. My father worked in the mill, and I spent my youth hunting, fishing, and camping in the Gifford Pinchot National Forest and Mount Rainier National Park.

When I was nine years old, I decided to be a forester. The first decade of my career in silvicultural research, spent in the Willamette National Forest in the central Oregon Cascades, was oriented along traditional lines. In the 1960s the Forest Service was interested only in the harvest and regeneration of old-growth forests, not basic research on old-growth ecosystems.

At that time, those of us in the forestry profession tended to write off old-growth forests as being uninteresting except for their aesthetic and spiritual values. In 1970, I had the opportunity to become involved in a series of studies sponsored by the National Science Foundation on the effect of cutting on nutrient cycling and productivity, forest-stream interactions, and other ecosystem-level phenomena in old-growth forests. This research has continued ever since and provides the basis for a fresh look at forestry practices.

Over the past two decades, professional foresters have found themselves perplexed at the public's conflicting expectations. Fueled by society's increasing demand for wood products, industry is pressing to cut the remaining primeval forests on public lands. Tugging in the opposite direction are those who wish to preserve old trees, endangered species, and aesthetic values.

To add to the stew, our forestlands are increasingly hard pressed by the creep of urbanization and environmental stresses from acid rain, ozone, and, perhaps most threatening, global climatic change. Conflict, resource decline, and uncertainty are the themes in forestry today.

Attempts to resolve these conflicts have focused on how society should divide up the pie. If we take a pie-cutting approach, the result is commodity-producing lands managed intensively for high yields of wood fiber, plus preserved lands that are completely withdrawn from timber cutting. Ecological values and wood production are assumed to be incompatible. Unfortunately, the forestry profession has done a poor job of providing convincing evidence to the contrary, generally equating good forestry with the regeneration of trees.

U.S. Forest Service

Standing dead snags were left behind during cutting to provide wildlife habitat.

Is there an alternative to the stark choice between tree farms and total preservation?

My associates and I in the Andrews Ecosystem Research Group believe that an alternative does exist, and we call it the "New Forestry." We view the new approach as a kinder and gentler forestry that better accommodates ecological values, while allowing for the extraction of commodities.

Some of our colleagues note (correctly) that many of the concepts embodied in New Forestry are not new, but the Andrews group uses the term simply to reflect a fresh philosophy that distinguishes our recommendations from traditional forestry. The focus in New Forestry is on the maintenance of complex ecosystems and not just the regeneration of trees.

Our ecological studies at the Andrews Experimental Forest began in the early 1960s with a concern on the part of our hydrologists and geomorphologists about the effect of timber cutting on floods. This led to studies on water, energy, and nutrient cycles. As we proceeded, it became clear that nutrient budgets up to that time had failed to take adequate account of large organic debris, such as boles lying on the ground and standing dead trees (snags).

The Andrews group conducted a number of studies that quantified the amount of this material and its potential role. These studies led to major changes in debris management in our National Forests.

Traditionally, such materials were viewed as a fire hazard and impediment to travel. A great deal of money

was spent cleaning up coarse woody debris by pulling it from streams or piling it up on clearcuts so it could be burned. Today forest managers recognize that many creatures use this woody debris.

The Andrews group cannot take credit for the identification of snag-dependent species, but we can take the lion's share of credit for recognizing the ecological importance of woody debris as structural elements preventing erosion and as potential contributors to long-term site productivity.

Another group of studies at Andrews focused on the way forests and streams interact. The structure and energy base of a forest stream is controlled by the litter fall from the surrounding forest. Fallen logs create debris dams and plunge pools—critical habitat for fish and other kinds of organisms. In the resulting "sticky stream," fallen litter is retained and has time to decompose and provide nutrients for aquatic organisms, rather than being flushed out quickly. We concluded that it is often as important to leave stream buffers as sources of woody debris as it is to leave buffers for controlling stream temperatures, as was formerly thought.

Is there an alternative to the stark choice between tree farms and total preservation?

Another area where our studies have contributed deals with old-growth forests as important reservoirs

THE MAKING OF A REVOLUTIONARY

Forestry is feeling the rumblings of revolution, and Dr. Jerry Franklin is the chief instigator. For one thing, during his 30 years as a research scientist for the U.S. Forest Service and various Pacific Northwest universities, Franklin has come up with ideas that shock both foresters and environmentalists—two groups that often find themselves at loggerheads.

Franklin has his own vision. It is one that he insists defies classification as either pro-industry or pro-conservation. Which may explain why this graying scientist, whose bushy mustache and kindly manners seem more avuncular than radical, accepts such a subversive label.

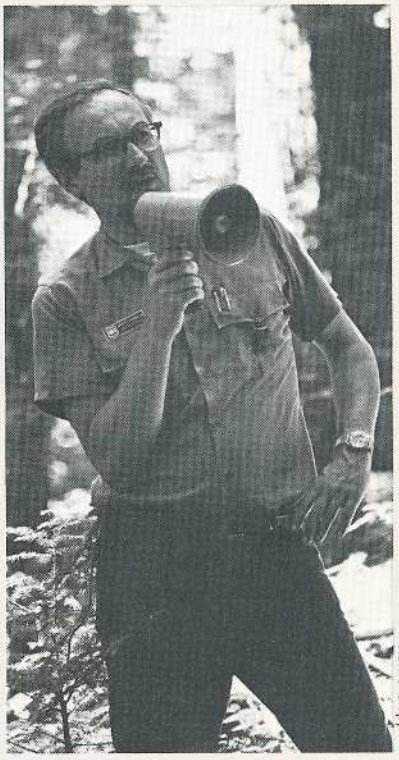
What Jerry Franklin—Bloedel Professor of Ecosystem Analysis at the University of Washington, Chief Plant Ecologist for the U.S. Forest Service's Pacific Northwest Research Station, and, most recently, a Bullard Fellow at Harvard—is promoting is a set of views that is coming to be known as the "New Forestry."

The New Forestry is far from extremist in tone. If anything, Franklin sounds conciliatory. Foresters and environmentalists, he says, "must learn to share the sandbox rather than divide it."

To the Forest Service, he admonishes: Timber cutting is not the only item on the multiple-use agenda mandated by Congress for our National Forests. That side of Jerry Franklin gladdens the hearts of environmentalists.

But lately he's been advocating large clearcuts (albeit with some pretty important modifications), and that side of Franklin makes the greens see red.

Despite the gnashing teeth around him, this West Coast scientist—holder of advanced degrees in forestry and botany—has garnered a reputation as "the nation's foremost expert on ancient forests," as The New York Times *proclaimed him. He has been the leading light over the years of a cadre of scientists known as the H.J. Andrews Ecosystem Research Group, whose members are doing work that is on the cutting edge of forest research today.*



Rollie Geppert

Jerry Franklin is the leading light of the New Forestry movement.

The linchpin of Franklin's views is that the main job of the New Forester is to maintain the forest ecosystem, not just produce wood. You might say that traditional foresters couldn't see the forest for the trees. For the New Foresters, the catchword would be, "The forest comes before the trees."

*One story told about Dr. Jerry Franklin sums up the spirit of the new philosophy. The story goes that Franklin was hiking with Brock Evans, vice president of the National Audubon Society, in an old-growth forest in the mid-1960s. "Franklin would stop every few steps and point to a mushroom, a fallen log, or a lichen," relates Evans. "I would say, 'Look at the size of those trees,' but Franklin would respond, 'Forget the trees. Look at the mushrooms!' "—*NORAH DEAKIN DAVIS

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Leaving standing green trees after a cut helps reestablish ecological diversity.

of biological diversity. Our scientists climbed into the tree canopies to find out what happens there and what lives there. Out of this research came a recognition of the incredible diversity of invertebrate life in old-growth forests, especially insects that are predators or parasites on other insects. In contrast, invertebrate communities in young forests are heavily weighted toward insects such as aphids that eat plants.

From this starting point we theorized that old-growth forests may be a major source of predators and parasitic invertebrates for adjacent young forests. As a corollary, we realized the value of retaining trees of diverse ages in managed forests.

In natural forests, the multilayered canopies that extend from crown to ground provide not only habitat for a rich array of animal and microbial species but also an amazing interface between the ecosystem and the atmosphere. A single old-growth Douglas-fir can have the equivalent of an acre (43,560 square feet) of foliage surface exposed. Hence, an old-growth stand can be viewed as a huge comb that condenses moisture and precipitates dust and other particles from the atmosphere.

Other examples abound of the complex interrelationships in natural forest ecosystems. The work of Chris Maser and James M. Trappe, both participants in the Andrews research,

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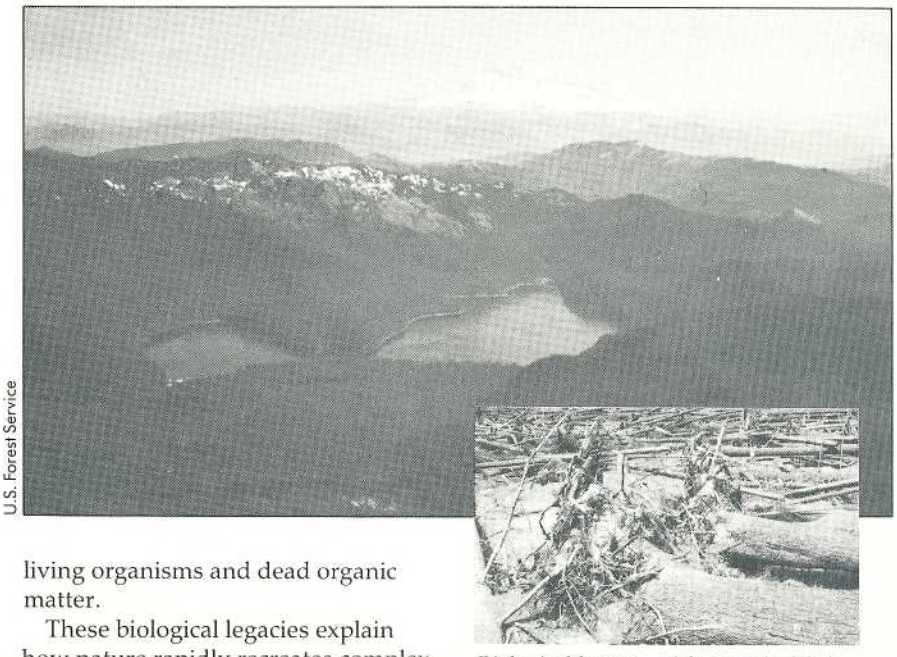
showed the relation between subterranean fungi that form mycorrhizae—symbiotic associations with tree roots—and mycophagous (fungal-eating) rodents such as California red-backed moles, which disperse the fungi spores through the process of defecation.

I had always believed these underground fungi to be long-lived, but what we found was that once the host species is killed through the cutting process, many fungi disappear if they do not quickly encounter another host. After documenting the occurrence of such linkages, we realized the need to provide opportunities for these small mammals to move about on cutover areas. One way is to leave down wood that provides protected runways.

The value of also retaining large green trees on cutover areas is becoming increasingly clear. For one thing, many invertebrates in old-growth forests are weak flyers or flightless, so that they too do not disperse well after a timber harvest. By leaving some green trees—their habitat—we provide the invertebrate "seed" for reinoculating the new stand.

After the eruption of Mount St. Helens, we developed the theory that "biological legacies"—dead and green wood—are mechanisms by which much of the ecological diversity of natural forests survives catastrophic disturbances. After the eruption, we expected to see a sterile landscape, but in fact we found incredible legacies of living organisms and dead organic matter.



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Biological legacy—rich organic debris —remained after St. Helens blew.

These biological legacies explain how nature rapidly recreates complex ecosystems after catastrophes rather than simply young stands of trees. Studies of succession following wildfire, windstorm, and flood show that such disturbances often leave green trees and do not consume much of the wood, which remains behind in the form of snags and down logs. Most plant and many animal species survived the catastrophic eruption of Mount St. Helens to repopulate a landscape rich in organic debris.

In addition to adding the concept of biological legacies to our understanding of ecosystem complexity, the St. Helens eruption started us on the way to appreciating the need for landscape-level perspectives when considering logging practices.

The normal logging practice on federal lands in the Northwest is dispersed-patch clearcutting in which parcels of 25 to 40 acres are interspersed with forested areas. Dispersed clearcutting fragments the forest into small blocks, maximizing the amount of "edge" or boundary between cutover areas and natural forests. While this may benefit some wildlife, it can have adverse effects on other species and increase the potential for catastrophe.

THE BIRTHPLACE OF THE NEW FORESTRY

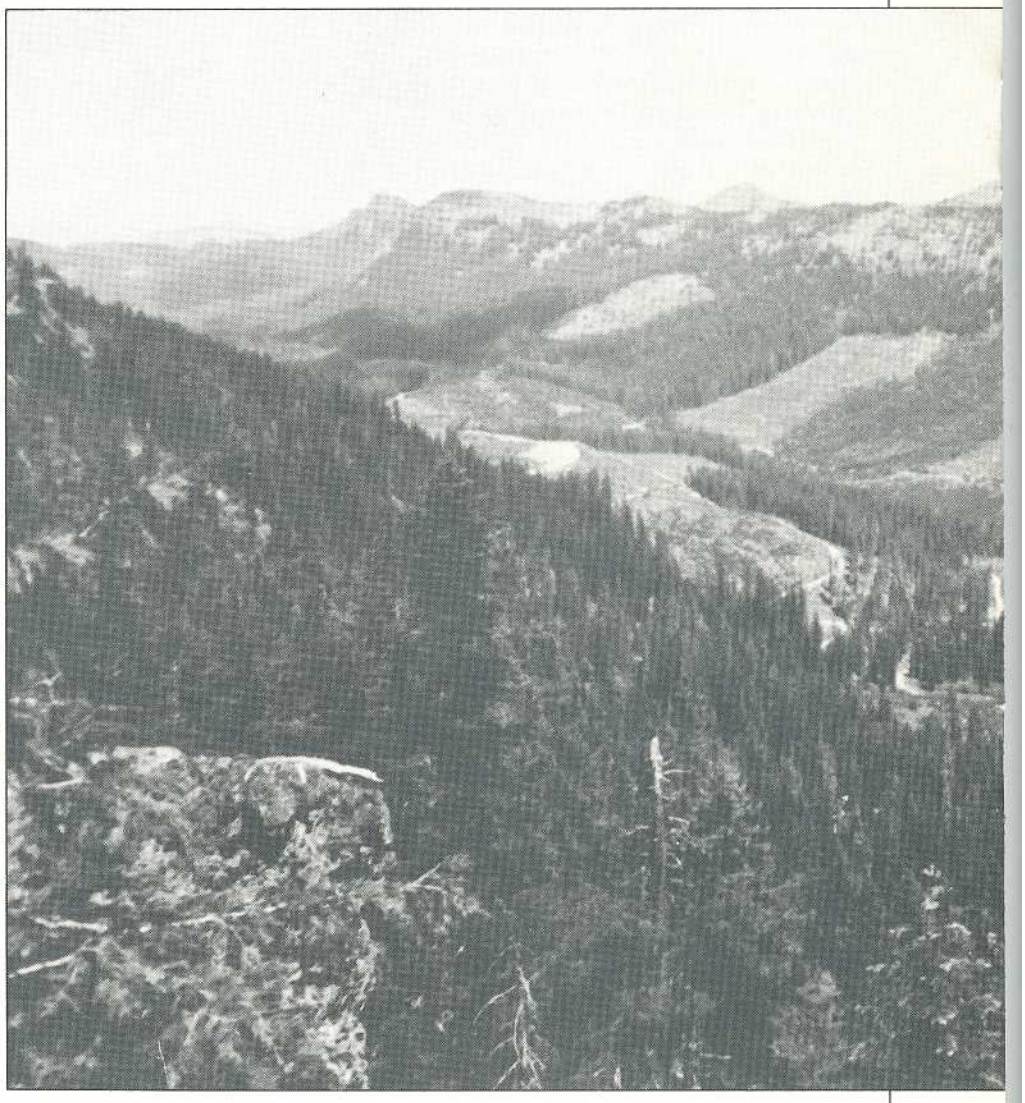
The facility that has provided the glue for the New Forestry research group is the H.J. Andrews Experimental Forest near Blue River, Oregon—15,000 acres containing superior examples of natural forest ecosystems set aside in 1948.

For its first two decades, it was devoted to studies of practical problems that arise in converting old-growth forests to young forests. In 1970 it became the locus for the IBP study of conifer forests. A research site that has both pristine and manipulated areas, as the Andrews does, is an appropriate place to address new problems and to take new approaches to old problems.

The Andrews facility has a minimal physical plant consisting of several trailers, and few of the scientists are actually based there. Offices and laboratories are in the town of Corvallis, about a two-hour drive from Andrews.

*"Operating and maintenance funds are limited and generally bootlegged from other sources," says Jerry Franklin. "We are proud of the fact that we have chosen to nurture the science, rather than to build a large edifice."—*FREDERICK J. SWANSON

Is anyone actually developing and testing the New Forestry practices?



For one thing, environmental conditions in the remaining small forest patches are drastically changed, since temperature, humidity, and wind are modified for a distance equivalent to two to three tree heights from the boundaries. A 25-acre forest patch surrounded by clearcuts will thus be totally lacking in the conditions representative of the interior of an unmodified forest.

Traditional forestry practices such as clearcut, shelterwood, and selection cutting have focused on the regeneration of trees and not the perpetuation of a complex forest ecosystem. Traditional practices often destroy many of the linkages that occur in natural forests.

In contrast, the young natural forests that appear after a wildfire or windstorm are complex and rich in

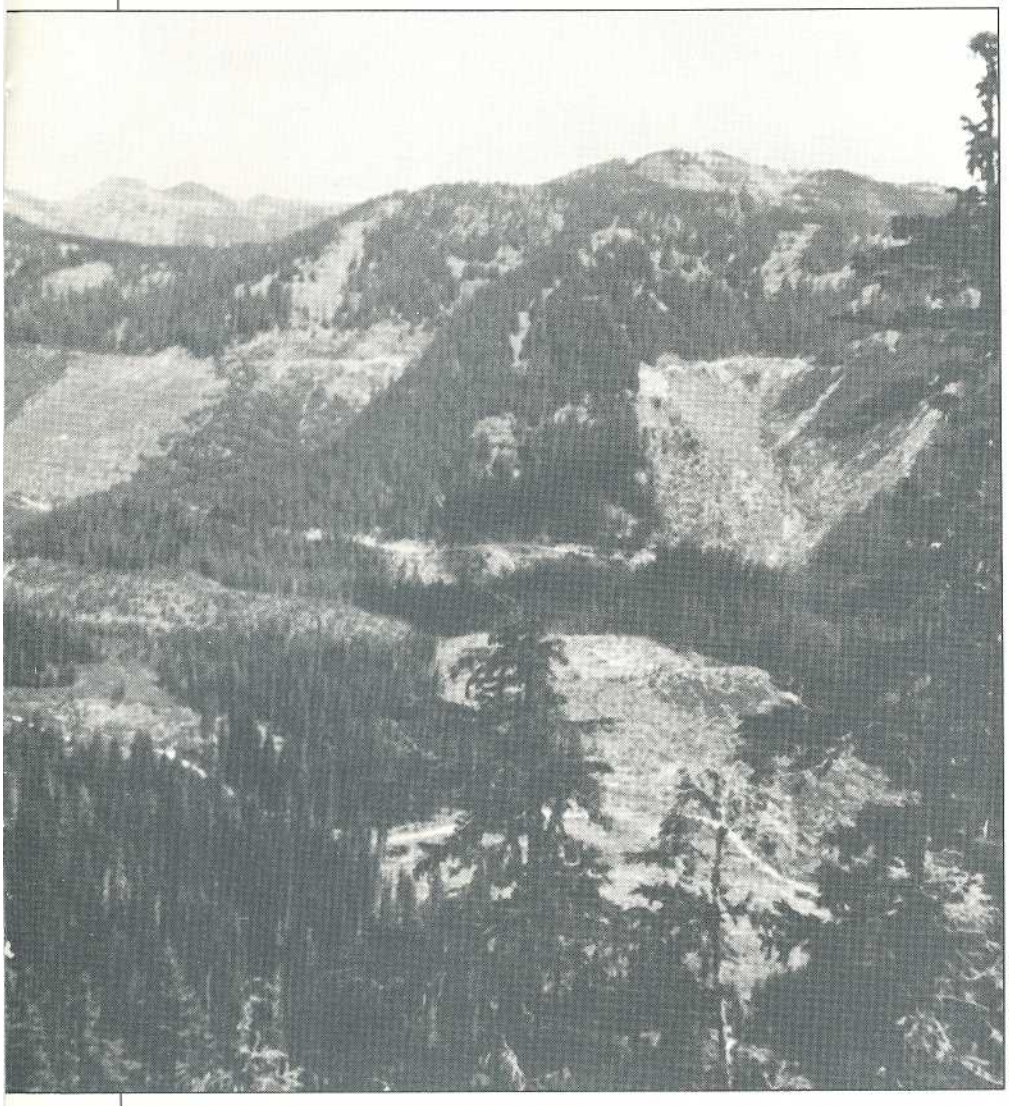
A Word from the Front-line Troops

As former District Ranger on the Blue River Ranger District, I oversaw decisions on how best to manage the district's resources, including where, when, and how to harvest the timber. Out there where forest policy becomes reality—that's where the rubber meets the road.

As a professional forester, my approach to land management is a blend of agency policy, legislative mandate, public expectations, and, most of all, a personal philosophy influenced by many years of partnership and interaction with resource specialists and researchers like Jerry Franklin, Fred Swanson, Chris Maser, and many others. My philosophy is that I should provide a healthy, productive forest for present and future generations by managing forest landscapes as ecosystems and by maintaining as many future options as possible.

That's a mouthful, but what it means in actual practice is following the principles of the New Forestry.

Environmentalists and the timber industry are locked in a battle that seemingly has no common ground. Having been actively involved in developing and applying the New Forestry, I believe that landscape ecosystem-based forestry provides a vision of a middle ground in the industry-environmentalist polarity and an assurance of a healthy and productive forest.—STEVE EUBANKS, *National Recreation Strategy Leader, U.S. Forest Service, Washington, DC*



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Small dispersed clearcuts drastically change environmental conditions in the forest patches that remain.

structures and organisms. They differ in the extreme from high-intensity managed forests where the systems have been dramatically simplified.

Alternative silvicultural practices proposed by the New Forestry utilize the concepts of ecosystem complexity, biological legacies, and viable landscapes to retain ecological values.

At the landscape level, the New Foresters design timber sales that minimize fragmentation of residual forest areas. Clearcuts are placed adjacent to existing cutover areas. Computer simulations have shown that such practices can retain larger forest patches and corridors for several decades longer than would occur under the old practice of dispersing clearcuts.

Is anyone actually developing and testing the New Forestry practices? Yes, the U.S. Forest Service and the Washington Department of Natural Resources have both initiated pilot tests of retaining green trees. In several trials, the density of "leave" trees is eight to 15 trees per acre, similar to levels left on shelterwood cuttings. But unlike shelterwood cuttings, the intention in New Forestry is to leave the large trees through the entire next rotation. At the next harvest cycle, decisions can be made about whether they should be cut, utilized as a source of large woody debris, or left for another cutting cycle.

Rules for the selection of leave trees vary with site conditions. Retention of dominant green trees may not be suitable in areas of high windthrow potential or heavy mistletoe infection, but it has great potential for maintaining ecological values on many commodity lands.

Nor should the practice of leaving green trees be confused with traditional selective cutting. In that case, trees are selected for removal. Under the new practice, trees are selected for retention. Although selective cutting does allow for high levels of biological legacies, the necessity for dense road systems and frequent logging entries has high environmental and economic costs.

With the new practices, the forests after cutting resemble natural forests with a mixture of tree sizes, including some large, old green trees. Evidence exists that predominantly young stands that "inherit" significant numbers of old-growth trees and snags may fulfill the habitat requirements of species such as the northern spotted owl.

On the Olympic Peninsula, the owls are known to use multi-aged stands that were created by windstorm and wildfire some 70 to 90 years ago. By adopting New Forestry practices, we may recreate spotted owl habitat in a matter of 90 years, rather than having to wait 200 to 250 years as with current practices.

Many of the practices of traditional silviculture were developed for narrowly focused objectives. New objectives such as the provision of snags for wildlife were incorporated, but this effort has been a piecemeal response since the philosophical basis for the systematic incorporation of such findings has been lacking.

The time has come for a shift in agenda. Forestry needs to expand its focus beyond wood production to the perpetuation of diverse forest ecosystems. Industry users need to recognize that society views forestlands as

THE PEOPLE BEHIND THE NEW FORESTRY

The Andrews Ecosystem Research Group is unique. The group is a voluntary association of scientists including a large outer circle of collaborators and an inner core of 15 to 20 researchers who have provided continuity over the 20 years of the group's existence. They are an interdisciplinary team representing the earth and life sciences from both field and theoretical orientations.

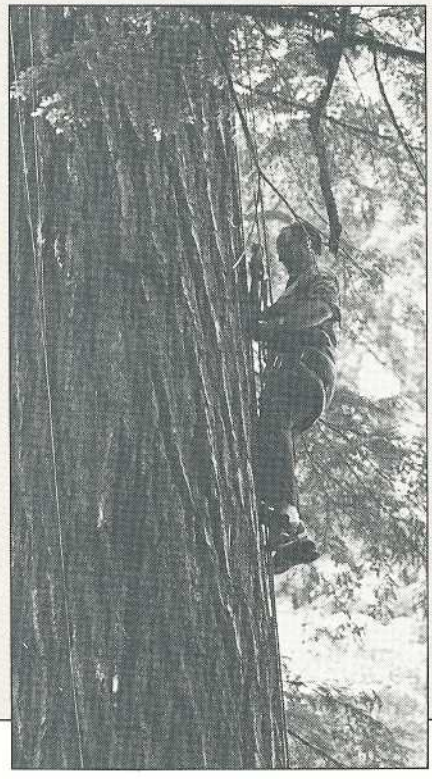
The Andrews group has no formal affiliation with a university or the Forest Service, but one-third of the members are scientists and forest managers associated with the U.S. Forest Service's Pacific Northwest Research Station and Willamette National Forest, and two-thirds are scientists connected with Oregon State University and the University of Washington. With the group's work developed jointly by researchers and forest managers, any troublesome lagging of technology transfer is eliminated.

Most of the funding is provided by the National Science Foundation and the U.S. Forest Service. The group's long history of cooperative research dates to 1970 when the NSF established a series of studies of major ecosystems, including grasslands, tundra, and eastern deciduous forests, as part of the International Biological Program (IBP).

As Jerry Franklin recalls, "After considerable pulling and tugging, politicking and proposal writing, the conifer forest biome study was funded to Oregon State University, where I was at the time, and University of Washington."

The Andrews research group has little organizational structure; decisions are made by consensus. This kind of participatory goal setting and project review is essential as we attempt to move from the adversarial approaches that have dominated public forestland policy in recent decades. It is also critical as we develop and apply nontraditional, sometimes controversial, practices.

*Dr. Franklin has nurtured this collaborative atmosphere. He has also served as the group's synthesizer, bringing diverse threads together into larger concepts. Though many of the parts of the new approach are not novel, he has put them together into a new philosophical underpinning for forest management—a kind of unified field theory for forestry.—*FREDERICK J. SWANSON, *Research Geomorphologist, U.S. Forest Service, Pacific Northwest Research Station*



Rollie Geppert

One of the scientists in the Andrews Ecosystem Research Group Studies invertebrate life in old-growth forests.

more than just another form of agricultural land with a slow-maturing crop. Forestry professionals need to acknowledge that what is good for wood-fiber production is not necessarily best for other forest values.

Conversely, environmentalists must stop relying on setting aside preserved lands as the only approach to the protection of ecological values. Clearly, the reserving of lands is critical to the protection of many values—such as, for example, aquatic habitats and unstable soils. But many of the reserves need to be a part of the commodity landscape, rather than existing apart from it.

We could never hope to adequately protect biological diversity solely through preservation, since so much diversity occurs on commodity landscapes, which represent vast acreage. The productivity of our land, the diversity of our plant and animal gene pool, and the overall integrity of our forest and stream ecosystems must be protected on those landscapes as well as in preserves. Protection of diversity must be incorporated into everything we do every day on *every* acre, whether preserve or commodity land.

The stewards of our public lands—indeed, of all our forestlands—need to adopt the ecosystem perspective. Doing so will finally provide a philosophical underpinning for the oft-maligned multiple-use concept. Judgments regarding timber production, recreation, and the enhancement of wildlife and wilderness will be made with our eyes clearly focused on what will best maintain resilient, diverse, and sustainable forest ecosystems. Only in this way can we maintain our options in the face of the great uncertainties created by air pollution and global climate change.

Let us adopt a forest ethic. Let us approach forest ecosystems with the respect that their complexity and beauty deserve. And, considering our current level of knowledge, let us approach the forest with appropriate humility. **AF**