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Scientists and managers on the H.J. Andrews Experimental Forest, located on the Willamette National Forest in Oregon, began their studies of water and watersheds, logging and fish, decades before they were on the national political agenda. They quietly investigated old growth and its most notorious inhabitant, the northern spotted owl, for years before the furor arose. Collaboration between scientists and managers was the norm, before it was called adaptive management. Landscape-scale forest planning was investigated when individual stands were still the management unit of choice on the national forests. How has it transpired that a single piece of real estate, and not a particularly large one at 16,000 acres, consistently stays ahead of the issues, only to emerge repeatedly at the heart of forest policy change? Fifty years after the establishment of the experimental area, this article examines "The Andrews" impact.

OPENINGS IN THE FOREST:

THE ANDREWS STORY

"The Andrews," as it is universally called by anyone involved with it, came into being as the Blue River Experimental Forest in 1948. This was a post-war world in which, despite some misgivings on the part of both foresters and the public, intensive forestry had taken root. By the time the forest was renamed for Horace Justin "Hoss" Andrews in 1953, intensive plantation forestry was the accepted practice on both industrial and public lands. While there was considerable talk about the role of forests in wildlife habitat, watershed protection, and even regional climate, the discussion had relatively little effect on forest practices.

The Andrews is broadly representative of the rugged, mountainous, Douglas-fir forested landscape of the Pacific Northwest. It features excellent examples of west-slope conifer forests and steep, fast-flowing streams. Before timber cutting began in earnest in 1950, about two thirds of the Experimental Forest was covered by towering old-growth Douglas-fir forests, with many trees over 400 years old. The remaining third held stands that had regenerated after wildfires in the mid-1800s, and into the early 1900s.

Wildfire was the primary disturbance agent in the natural forest, with windthrow, landslides, root rot infections and stream channel erosion secondary. A wide range of terrestrial and aquatic habitats supports a diverse flora and fauna.

"Hoss" Andrews, who helped select the site for the experimental forest, had a distinctive vision of forestry during his tenure as Regional Forester for Oregon and Washington from 1943 to 1951. Well ahead of his time, Andrews was concerned in the 1940s with the effects of logging on water quality and spawning habitat. While he foresaw intensive development of federal forest resources—in part to support the post-war housing boom—he wanted protection of watershed and fisheries resources to be part of that development. He had no wish to see the fate of Coast Range fisheries, already declining due to

BY SALLY DUNCAN

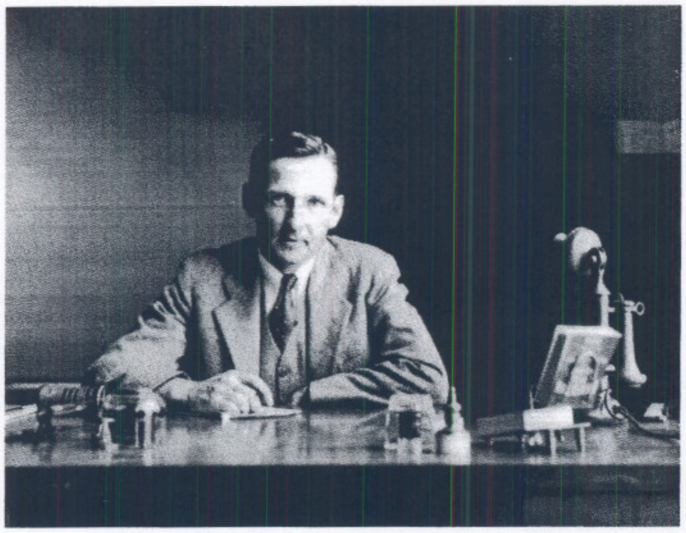


PHOTO COURTESY H.J. ANDREWS ARCHIVE

Horace Justin ("Hoss") Andrews was a driving force in the selection and establishment of the Experimental Forest to address regional problems. He was widely recognized as a leading authority on Northwest forestry issues, and the forest was named to honor him in 1953, after his death in a car accident in 1951.

logging practices, shared by fisheries in the Cascades.

Instead, he sought data through inventories and investigation, recognizing before many others that these tools would allow foresters to manage the resource better. The inventory he had implemented in 1934 to catalogue the resource is still being used: the results of his study are helping researchers today to document workings of the carbon cycle. With his belief in collaboration, he planted the first seed for a more productive relationship between managers and research scientists.

THE BUMPY ROAD TO PARTNERSHIP

The first emphasis of the forest was to examine the possible effects of harvesting and logging on run-off. The goal was to provide scientific studies designed to provide information for improved management. "Improved management" had a fairly simple meaning in the full-steam-ahead days following World War II: maximum efficiency. Having been established in a national forest with a healthy annual allowable cut, the Andrews itself began with a management plan calling for the removal of 15 to 20 million board feet of logs per year for the next 10 to 15 years "... so as to fit in with the cutting budget for the Blue River drainage as established by the Willamette National Forest." Nonetheless, there was room in the research forest both for people who guided the development of production forestry on private and public lands, and for people who questioned some of its basic premises.

The research forest has operated for 30 years under a three-way partnership between the Pacific Northwest Research Station, the research arm of the U.S. Forest Service; the Willamette National Forest, within whose Blue River District it lies; and Oregon State University. In the earliest days of the


PHOTO COURTESY H.J. ANDREWS ARCHIVE

Studying the effects of logging, landslides and water quality on fish has occupied researchers on the Andrews since the 1950s. Sampling fish for population and habitat studies helped identify the crucial role of woody debris in streams, and long-term monitoring of fish, including by seining, continues. 1955.

Andrews, the business of the Willamette National Forest was largely applied forestry and the efficient building of roads, and the research forest reflected this. Roy Silen, one of the earliest researchers on the forest, was selected to work there because of his logging engineering training. He recalls "I was pretty low on the totem pole in those days. I just followed instructions... We were aiming our research to be used by the Forest Service, and they weren't a very ready customer, I guess." The forest supervisor at the time was busy "watching that cut."

However, in a notable exception to an early agreement between the experimental forest and the national forest, the three small, gauged watersheds near the mouth of Lookout Creek were excluded in 1951 from the cutting commitment. The memo of understanding specified that they would be left undisturbed for six to 10 years "... to complete their calibration period. Timing and volume of timber removed after calibration is complete will be based entirely on research needs." This effort saw the beginning of research into hydrology, soils, and land use effects in small watersheds. Broader thinking about environmental protection was already carving out some ground in the Andrews, more than a decade before any significant national environmental legislation.

The response of Willamette National Forest managers to this research orientation on their forest continued to be cautious, however, and the relationship between researchers and managers was decidedly not as close as it is today.

LAYING STEPPING STONES

Yet the achievements of researchers during the quiet first 20 years of the experimental forest's history were crucial, with some successes in translating research findings to management. There was Silen's commitment working as closely as possible with managers to improve road layouts, complete forest and stream inventories, and determine that deteriorated forest stands should be selected first for cutting. As the first Andrews researcher, Silen began alone what whole teams of researchers tackle today.

Jack Rothacker began a team effort in 1955 to conduct a series of experimental treatments on sets of small watersheds between the Columbia River and Southern Oregon; the object was to examine effects of forest management on stream flow and water quality. Today, several of these watersheds and their decades-long records are subjects of new studies of ecological hydrology. These studies follow the effects of vegetation succession on water quality and quantity using modeling and statistical tools that didn't exist in the 1950s when the early work began.

And Ted Dyrness's research on effects of fire and forest practices on forest soils and vegetation succession, set up in 1961, paved the way for new studies of the impacts of climate change on forest ecosystems. Without their groundwork, the path would not have been laid for what came next.

The 1964 regional flood, heralded as a 100-year marker, was literally and figuratively a watershed event. It highlighted questions about land use effects on landslides, flood effects on roads, and the role of natural disturbance. It initiated a quiet dialogue about wood in streams, logging slash in particular. Soil characterization and mapping began in earnest around the same time.

PHOTO COURTESY H.J. ANDREWS ARCHIVE

Roy Silen, the first scientist to work at the Andrews, understood the technical needs of logging operations. As an early example of research influencing management activities, he was instrumental in planning timber sales so that the most deteriorated stands of old growth were in the first sales, even though they were more difficult, and therefore more expensive, to cruise.

Events in 1969 finally placed the experimental forest on the ecosystem research approach it has today. The Andrews was selected as an International Biological Program (IBP) site, which brought a major influx of National Science Foundation research funding, five to ten times the former budget. The IBP designation transformed the small collection of Forest Service studies into a more diverse and multidisciplinary suite of research interests. It brought more attention and funding to infrastructure, particularly data management. It also brought more interest and cooperation with university researchers. Here began a new life for long-term ecological research.

The quiet, gradual expansion of research into the workings of the whole forest were inevitably changing the way the forest was viewed. No matter that business as usual continued around them, scientists and the managers associated with the

Andrews were starting to glimpse the massive ecological infrastructure supporting the applied forestry of fiber production. And that new underworld of knowledge unearthed a fascinating notion: that forests past the peak of growth are characterized by uniquely rich habitat. Old growth was about to be unveiled.

> Sedell told the audience plainly: streams need merchantable timber too.

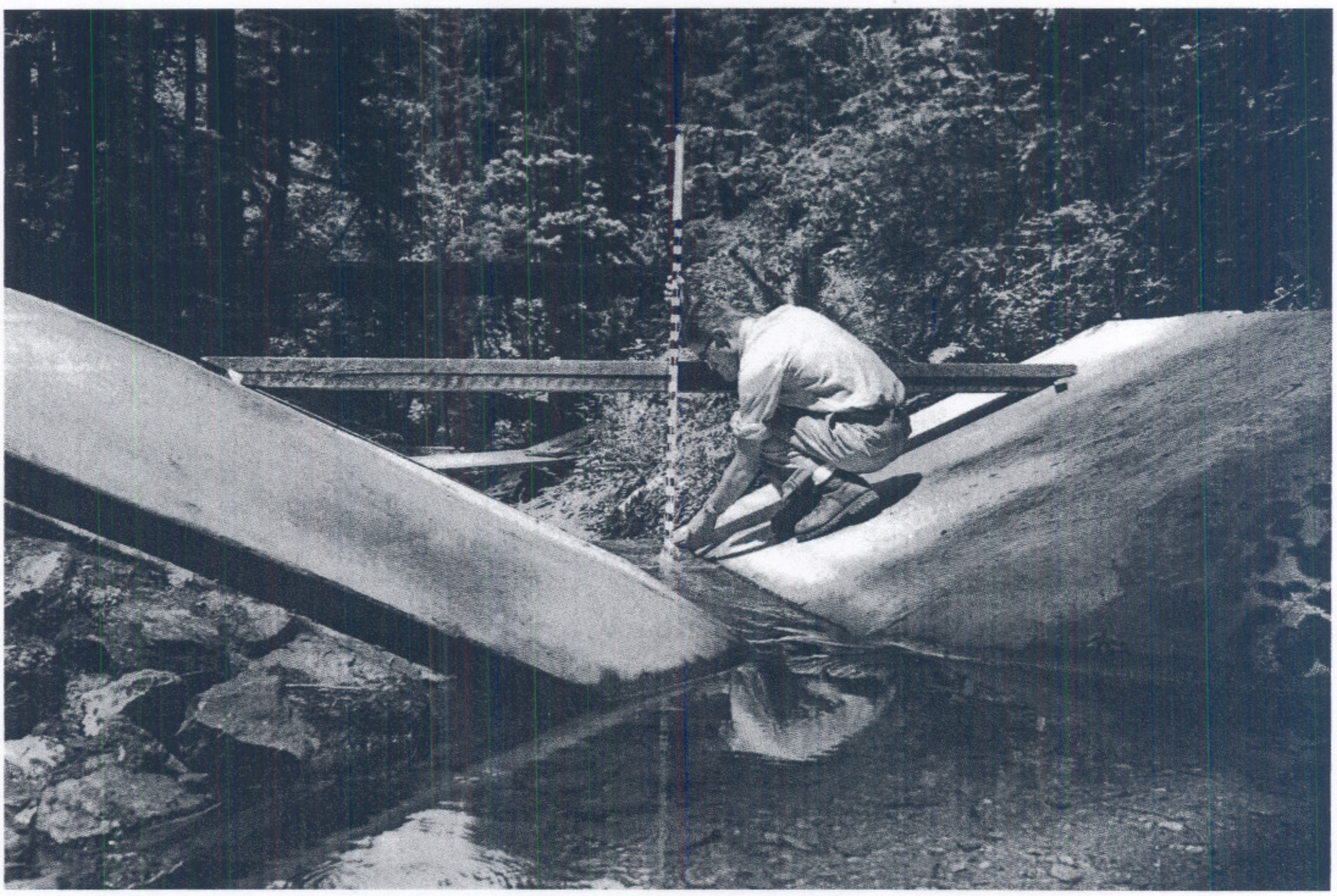
In an era when the common wisdom was that managed forests were the forests of the future, Jerry Franklin championed research in the forest's old-growth stands, and sought to untangle their story. There was ample old growth within the Andrews to consider, so starting in 1971, he and his colleagues started asking some fundamental questions. What exactly is old growth? How does such a forest work? How does it affect streams? How much is out there and where is it?

What started to unfold with Andrews old-growth research was the fantastic multi-dimensional picture of temperate forest ecosystems. Every part related to every other part, every bug and leaf had a job, and not a winter wren fell without being heard. Ecosystem research at the Andrews would never be the same again, and the type of scientist drawn to it there would have to fit the increasingly obvious requirements of multi-dimensional, interdisciplinary thinking and open sharing of data. All the time.

Examples of early old-growth discoveries include the importance of snags and rotting logs as habitat for numerous species of bugs, for nutrient cycling, for connectivity between plants and soil via intricate webs of fungal threads, and controls on the timing and geographic patterns of natural disturbances such as wildfire and flood. In streams, the fallen wood helped create a "stepped" profile, lessening the stream's capacity to scour its own bed during high flows. Old-growth forests were proving to be highly dynamic systems, even with the seemingly timeless presence of trees over 500 years old. And woody debris was due for a status change.

TACKLING WOODY DEBRIS

Research on the forest had moved into the diverse interactions between forest and streams, where the strong ties between the workings of aquatic systems and those of the surrounding



H.J. ANDREWS ARCHIVE: PHOTO BY JACK ROTHECKER

Jerry Franklin drew on vegetation, hydrology and other studies to help describe the structure and function of old-growth ecosystems. Ultimately, his work on old growth, begun in the 1950's, connected with habitat studies such as those concerning the northern spotted owl, and dramatically changed the face of public land management in the early 90s.

PHOTO COURTESY H.J. ANDREWS ARCHIVE

The Andrews forest was harvested in the typical style of public lands in the 1950s—40-acre clearcuts dispersed across the landscape. The Northwest Forest Plan and ongoing studies of disturbance-based management will continue to change both the appearance and the functioning of the landscape.

forest were becoming more clear. "Stream ecologists couldn't ignore the forest. That's what they walk through to get to their areas of study," Fred Swanson notes. "The reverse wasn't always true of *forest* ecologists. But once we started walking the streams on old growth research projects, we couldn't *not* notice the large woody debris. It was a crotch-splitter!" Swanson has been a researcher at the forest since 1972, and Andrews ecosystem team leader since 1986.

Researchers became interested in large, or coarse, woody debris in the early 1970s, but a policy and management issue accelerated the work. Arguments arose over revising the Oregon State Forest Practices rules, and better science was needed to underpin that policy. Previously, woody debris had been removed from streams as it was regarded mainly as a nuisance.

In 1977 a conference on logging debris in streams produced the turning point. Fisheries people wanted the logging debris and slash to stop blocking the streams. Logging people didn't want to use high-value equipment to remove low-value wood. But what about the fish?, asked Jim Sedell. Research showed that *large* wood plays a significant role in stream ecology—for bank stability, for long-term channel structure, for providing good pool habitat for fish and their food sources, and for enhancing fish survival during floods. At the standing-room-only conference, Sedell told the audience plainly: streams need merchantable timber too.

Both Franklin and Sedell subsequently took their findings on the road, far from the local, secluded forest setting. They each believed strongly enough in the stories they had to tell that they took vital time away from research and publishing to tell them. An increasingly informed public, and then their representatives in Congress, wanted to know what it all meant. First old growth, then woody debris, became part of common parlance, and research and policy on both continue to evolve today.

THE OLD GROWTH BIRD

Meanwhile, the intact old growth had long eluded the attention of wildlife ecologists, whose work focused mostly on game species, such as deer and elk. But one wildlife ecologist formed a particular interest in a bird favoring old growth as its home: Eric Forsman, a graduate student at the time, began in 1973 to study the northern spotted owl.

With logging in high gear on public lands during the 1980s, there had been attempts by activists to slow its onward rush, first by using old-growth research findings, according to Swanson. "But old growth itself had no legal clout. The National Forest Management and the Endangered Species Acts gave species—the owl in this case—their role center stage. Few species could have played the same role politically, because of the massive size of the owl's habitat requirements."

It could be seen as merely fortuitous that the owl was present on the Andrews. But the research climate there unquestionably provided fertile ground for understanding the owl and the implications of its rapidly diminishing old-growth habitat across a broader landscape. What happened next, of course, is history: the Forest Ecosystem Management Assessment Team (FEMAT) and the Northwest Forest Plan.

FEMAT called upon data collected by Forsman's research team in 1993 to plan habitat management for declining numbers of owls, agreeing with the 1990 Interagency Scientific Committee that a viable population of spotted owls could probably be maintained if managers did a good job with habitat just on Federal lands.

While Forsman and others were not completely comfortable writing off the importance of private lands, they felt the conclusions to be sufficiently sound, particularly in geographic strongholds of the species range. The Northwest Forest Plan was forged on this basis, despite uncertainties about the owl's future that remain today.

Many scientists and managers from the Andrews played key roles in FEMAT, providing data and field experience to the decision-making process on both ecological and social aspects of Northwest forests, from the owl and old growth to woody debris and riparian management. The resulting Plan is based on a combination of riparian and habitat reserves, with timber-producing "matrix" lands. The underlying belief is that ecological and economic objectives can both be met with careful planning and management.

RESEARCH, APPLY, ADAPT

What is known today formally as adaptive management took form in the Andrews context as a simple, informal matter of learning by doing in management-research partnerships. Through much of its 50 years, the Andrews partnership has focussed not just on how science might inform management, but also on how management might inform science. Repeatedly, and often under fire, this partnership has reduced the time lag between research findings and management application on the local landscape.

"It's hard work to keep this partnership functioning. Sometimes scientists and managers assume they're using words the same way, and then when something goes off the track, we discover the misunderstandings," says Lynn Burditt, Blue River district ranger since 1989. "What I always ask is how can we do our best to answer the kinds of questions likely to come up 15 and 20 years from now, the things people haven't even thought of yet?"

There is an element of professional risk-taking implicit in this kind of partnership, according to Steve Eubanks, who was district ranger for the Blue River District from 1984 until 1989. Many of the scientists, he says, gave time to technology transfer on the ground, where the impact is immediate, and to spreading the word in person in the policy realm, rather than solely to academic publishing. They still do.

"They were also willing to give us managers suggestions about how forests can be managed before they had gone through the safety filter of peer review," he says. "They trusted each other, they trusted us, so we trusted them. It's synergistic, the way this group works, and very unusual." Of course, management was taking a risk in its own way, in so rapidly adopting and adapting new ideas. Timber industry folks used to take Willamette National Forest managers to task regularly for the new approaches they were willing to try, according to Eubanks. "But visitors would see researchers and managers standing shoulder to shoulder on the ground, describing not just the science, but exactly how it was working in practice. Credibility was not an issue," he says. Thus when adaptive management became official Forest Service watchwords in the early 1990's, it was a matter of institutionalizing their ongoing efforts, according to Swanson. The Cascade Center for Ecosystem Management was set up in 1991 by the three-way partnership to give itself a public identity.

"But visitors would see researchers and managers standing shoulder to shoulder on the ground, describing not just the science, but exactly how it was working in practice. Credibility was not an issue."

The long-tested working relationship was used as a model for Adaptive Management Areas (AMAs), ecological units embodied in the Northwest Forest Plan in 1993 to provide sites for management flexibility and the testing of alternate management approaches. The setting aside of these areas reflects the fact that not all the framers of the Northwest Forest Plan saw its tenets as the absolute answer. The Andrews partnership had sent its ripples across the landscape once again.

REDEFINING FOREST POLICY

How pieces of Andrews science start on the tortuous path to policy varies: questions from managers; questions arising during the preparation of scientific proposals for research funding; serendipitous informal conversations among visitors to the forest; requests for briefings from Congressional staffers; and requests from researchers or managers for an audience in Washington, DC, or Salem, Oregon. Most often it takes the form of putting tests of new or modified practices into place on the ground, then discussing both the science and the management with hundreds of interested observers.

In any given year, Andrews' researchers and managers host as many as 80 field trips, presentations, and workshops. During the 1990s, over 2,500 people annually took part in these two-way exchanges. Congressional interest remains high, and numerous foreign scientists and managers visit, noting the beneficial example of the partnership they witness in action.

Private and state foresters inform their programs by staying in close touch with work at the Andrews.

The learning is cumulative, like ecosystem effects. A stream of 80 plus publications per year, monthly meeting notes, an active Web site (*http://www.fsl.orst.edu/lterhome.html*) keep interested readers up to date with research progress. By the early 1990s, Senators in committee meetings were asking Andrews' researchers detailed questions about the fungi in rotting logs on the old-growth forest floor.

Findings from the Andrews have substantially changed the way the Willamette National Forest does business over the years. The riparian management guides for the Forest were written in 1990 by two Andrews researchers; they continue to have lasting impact on such hot current issues as riparian buffer zone design. In addition, the Forest's Management Plan by that time contained more than 50 Standards & Guidelines that directly reflected Andrews research: guides on woody debris in streams and on the forest floor, riparian zone function, and slash burning for managing the forest's nitrogen capital.

However, the road still offers plenty of bumps. "We usually come under close scrutiny from both the environmental and industry communities," Burditt says. "What we have learned is that not all research is viewed as being a good thing. Sometimes people are afraid of how the findings might be used, and we have to remember that they absolutely have a right to disagree with us." One of the benefits, however, is that the Andrews receives fairly constant feedback on its ecosystem research.

OUTGROWTHS FROM OLD GROWTH

Whole ecosystem research. The old-growth focus, begun nearly 30 years ago, has generated a wealth of associated ecosystem studies that thrive today. Invertebrates, for example, have quietly been gaining new respect as the teeming masses on which the forest depends for many interactions. Some of the work began as basic inventory 20 years ago: who's out there? and what are they doing? Researchers have documented over 4,000 species and many of their basic attributes; an effort involving hundreds of collaborating scientists around the world. The questions evolved to become research into the role of bugs in the workings of the forest canopy, how logs are used by micro and other organisms, how the forest soil feeds and is fed by insects. Thousands of species have been inventoried in the course of this research, including previously undiscovered ones.

One of the more compelling Andrews experiments is the Log Decomposition Study, initiated in 1985. It is designed to last 200 years, and to uncover the role of logs as ecological entities—a complex interplay between long-term decaying wood, insects, rodents, and fungal life. Early results have revealed a stunningly large community of insects colonizing logs, a significant role of logs in the water balance of forests, and surprisingly rapid carbon and nutrient cycling out of the logs to the forest floor.

Intensified work in old-growth forested streams has led incrementally to changing ideas on how to view water and watersheds. How do floods affect natural ecosystems? What is the ecological role of floods that recur on average every 20 years? Every 100 years? How do large and small events—the chaos of major floods and the minor effects of small landslides—relate within a watershed? What does this mean for water resource management: for water quality, recreation, reservoirs? How does land management affect these relationships?

Fueled by better knowledge of whole forest ecosystems,

PHOTO COURTESY H.J. ANDREWS ARCHIVE

The association between roads and landslides has been studied intensively at the Andrews since the 1950s. The questions have ranged through the 50 years from how to improve road design to how to assess environmental impacts.

H.J. ANDREWS ARCHIVE; PHOTO BY MARK HARMON

The 200-year Log Decomposition Study has required careful placement of 530 logs which will be studied for their role in forest floor ecology and carbon dynamics, including decomposition, habitat, invertebrate function, and mycorrhizal fungi interactions. The study was initiated by Mark Harmon in 1985.

the productivity of a forest has taken on a different meaning from the days of board-foot budgeting. The science-management partnership today considers how native forest attributes, from woody debris in streams to wildfire, might be encouraged or sustained through various management prescriptions.

While the pendulum has swung during the last 50 years, neither commodity production nor environmental protection was ever meant to be excluded from consideration at the Andrews. Integration of research is such that the apparently "environmental" findings all contribute directly to production-oriented studies as well. Research into very young stand management, for example, now incorporates both timber production and biodiversity study objectives. Differing approaches to thinning, gap creation, and interplanting have been installed in an attempt to create more diverse stands while maintaining output of timber, edible fungi, and other human commodities. The underlying assumption is that it can be done.

LIVING WITH THE LONG VIEW

Broad-scale and long-term perspectives, the dialect of the Andrews partnership, are now more widely recognized as crucial to understanding complex forest systems. Far from the glare of the media and policy spotlights, long-term baseline records take on critical importance in providing the lens through which to view naturally-occurring events. When viewed long-term and large-scale, what we call catastrophic events—flood, wildfire, landslides and windthrow—become natural disturbances, with a vital positive function in the ecosystem.

The Augusta Creek Study and the Blue River Landscape Project, begun in 1991 and 1994 respectively, reflect research that challenges the species-based reserve and matrix approach of the Northwest Forest Plan. While pursuing the same ecological and economic objectives as the Plan, these landscape-scale studies incorporate knowledge of natural disturbance regimes into management prescriptions. Projections of potential future outcomes from both approaches have been simulated for the Blue River project, with encouraging results for disturbance-based management planning, according to Swanson.

Each of the changes in management policies and practices that have been influenced by the Andrews partnership reflects the whole-ecosystem approach to management. "There is no doubt in my mind," says Eubanks "that without the example of the Andrews group, ecosystem management would not have been adopted by the Forest Service."

SEEDBEDS FOR DISCOVERY

What is perhaps most notable about the Andrews teams over the years is not so much what they have discovered in their research as *how* they go about it, how they have changed and redefined the social side of science.

"I would say there is an Andrews way of thinking. I have never seen a group as open with each other, as compatibly interdisciplinary, as this one," says Jerry Franklin, a key figure in turning the Andrews into the place of renown it has become. He is now a forest ecology professor at the University of Washington. "The people who get involved in the Andrews are self-selected as researchers with a holistic perspective on forests and forest landscapes. They're interested in collaboration, sharing ideas and creating new approaches." And, as Swanson adds, if they're not, they usually move on.

Today, in the person of John Cissel, there is specific staffing for the link between scientists and managers. Cissel is research liaison between the National Forest and the Andrews research community, manages the Cascade Center, and is coordinator of the Central Cascade Adaptive Management Area.

"When I came here nine years ago, Fred Swanson told me they were looking for a 'seamless fit' between management and research," he recalls. "That's been my mantra from day one, and it's a real challenge to do this administratively." The key, he says, is flexibility, an attribute that depends on administrative willpower. Relationships become crucial to resolving ambiguities, when objectives of a national and a research forest might come to conflict.

"I supply support from the National Forest for research activities on the ground, and also help bring the tools of science to applied management studies, demonstration projects and educational outreach," he says. "The researchers tend to see me as knowing all the rules and representing the management side, and the managers see me as coming from the very different worldview of the researchers. The important thing is that I can look at the world from a variety of viewpoints."

His approach is to maintain constant interaction—"there is no such thing as overcommunication in this business"—to keep the ground fertile and allow ideas for new approaches to bubble up to the surface. And bubble up they do: there has been no abatement of new ideas as the forest has moved on and off center stage in the policy world. The science-management community Cissel nurtures encourages careful consideration of an idea's validity. How should we frame a potential research project? Do the potential findings have management applications? New approaches to management might be implemented as experiments, as demonstration projects, as field tours, as workshops. Multiple outcomes from these settings routinely set new thoughts in motion.

THE PEOPLE IN THE FOREST

Ralph Waldo Emerson posited that people—individuals—make the difference. "There is properly no history," he wrote, "only biography." And in the case of the Andrews, a few selected biographies, starting with "Hoss" himself, would elicit much of the story of this peculiarly central forest. Of course the biographies would be replete with details of interdisciplinary teamwork, unselfish professionalism, and an ever-strengthening partnership between researchers and managers, but nonetheless, this forest has tended to attract individuals willing to swim against the current.

"It's not always clear whether it's the research issue or a lead personality that has brought some topic into the limelight and kept it there," says Swanson. "But there's no doubt that Jerry Franklin and Jim Sedell are two good examples of people who stepped into the breach and kept the energy level high enough not only to foster strong science, but also to lead these issues out of the research arena and into national prominence and policy."

The forest as dynamic landscape is apt backdrop for the social world in which today's scientific research must operate. "Changes in both the scientific and political arenas have us moving in and out of the limelight," says Swanson. "The crux is finding the balance between persistence and flexibility; between long-term, basic studies, and the issue of the moment. There are scientific and societal angles to each scientific domain, some long-term, some short-term, and there are new issues and tools emerging constantly to keep us on our toes."

The Andrews partnership does not always hit its targets. Some efforts to get projects off the ground, particularly large-scale projects, have been stymied by political developments such as intensifying debate over the future of roadless areas, or by natural events such as wildfire, Swanson recalls. Some have never made it past the idea stage, if researchers and managers cannot agree on appropriate direction, or legal battles intervene. Always, the decision about direction is guided by where and how best to use the limited human resources of the partnership.

NEW DIMENSIONS

"Science is faced with the challenge of providing knowledge that helps society achieve sustainability," writes Oregon State University ecologist and Andrews researcher Dave Perry in a recent monograph. "This requires grappling successfully with complexity, greatly magnified by adding the social and economic aspects, a strategy that radically departs from the industrial approach of simplifying systems to make them more predictable... Scientists agree that successful conservation will require viewing landscapes for what they are—functional totalities in which both reserves and managed lands play a role."

The forestry of the future seems likely to blend aspects of intensive management and ecosystem management, either on the same piece of ground, across landscapes, or more likely some combination of the two. Adaptive management will continue to forge the learning by both scientists and managers, and also by the public.

What the owl, old growth, woody debris, and forest-stream interactions did to shift policy is bound to happen again in today's whole-landscape planning arena. Fifty years after its designation as an experimental forest, that single piece of real estate still lies close to the heart of forest science and science-based learning, sometimes leading directly to policy change. With the minds prepared, the opportunities still follow.

> *"In research the horizon recedes as we advance and is no nearer at sixty than it was at twenty."*
>
> *Mark Pattison 1813–1884*

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On the Cover:
George S. Long, pictured here in 1903 on a skid road in southwest Washington, was Weyerhaeuser's first general manager and an early champion of sustainable forestry, fire protection and laws that encouraged reforestation. The skids of the skidroad were laid cross-wise and buried in the ground at seven-and-a-half-foot intervals so that a traveling 16-foot log would always rest on two of them. A scallop was cut out of the middle of each skid to cradle the passing logs. The steel cable was probably attached to a steam donkey engine that pulled logs along the road. Taken at Weyerhaeuser Timber Company Camp #1, King County, Washington. Photograph taken by Lafe Heath who worked as a cruiser for Weyerhaeuser. Courtesy of Weyerhaeuser Corporate Archives.

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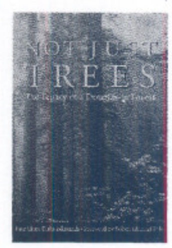

ANNUAL REPORT