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Necessary Work: Discovering Old Forests, New Outlooks, and Community on the H.J. Andrews Experimental Forest, 1948–2000

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Photo Caption

On cover (front and back)—two panarama views of Lookout Creek drainage and surroundings on the Willamette National Forest, as seen from Carpenter Lookout in 1963 (top b&w) and the same view, six decades later (bottom color). Originals in Forest Science Database.

Abstract

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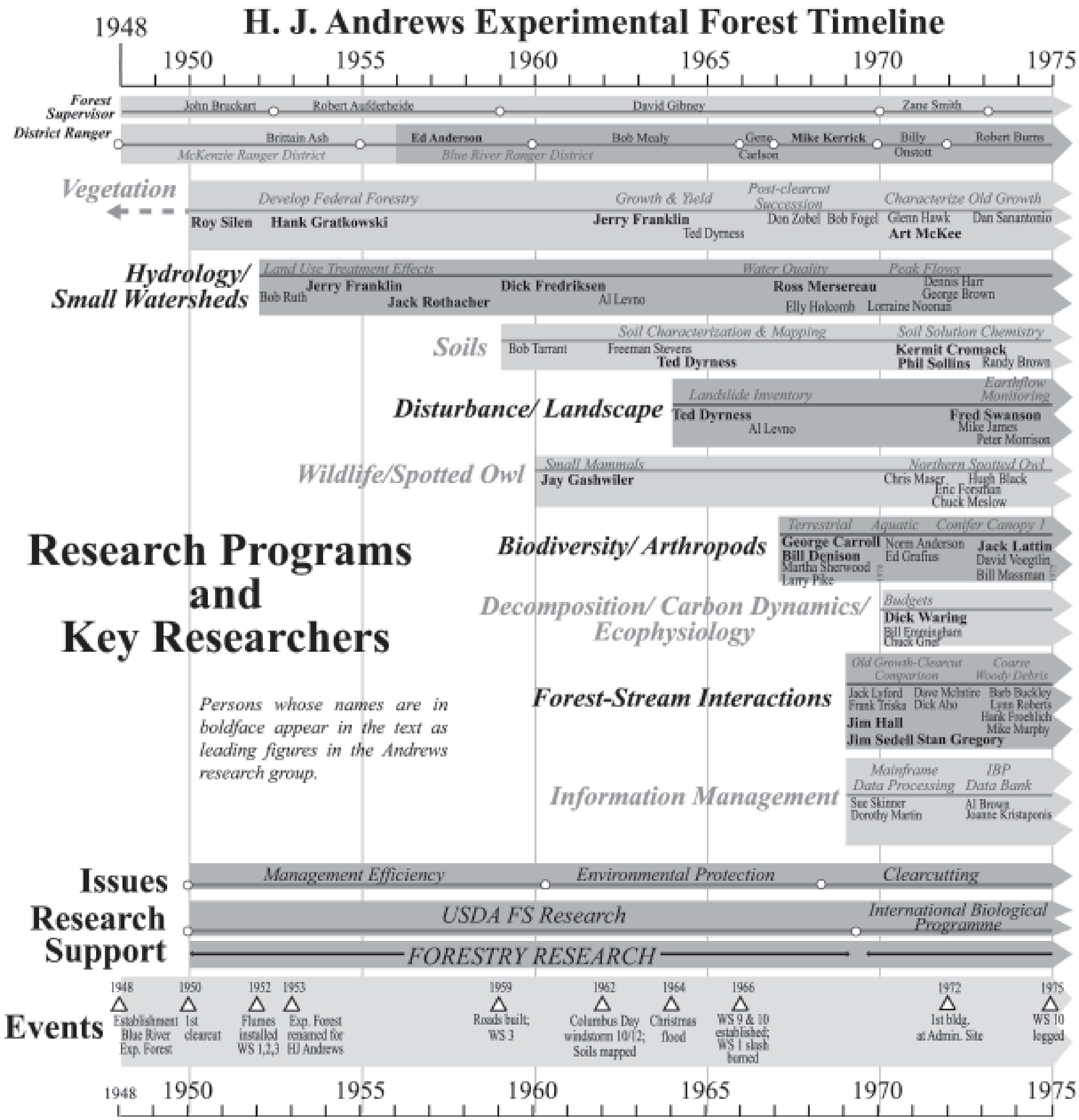
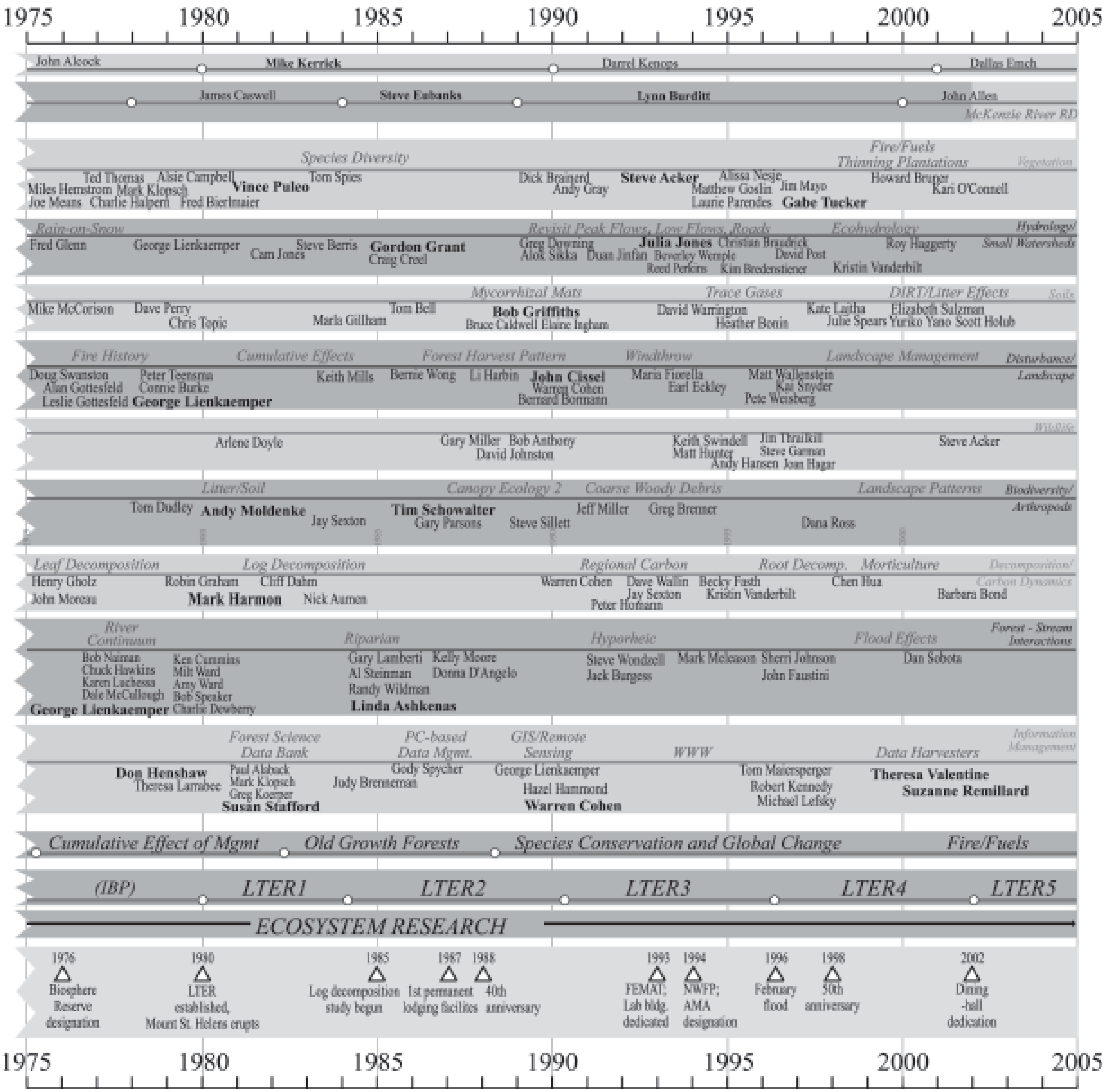
The H.J. Andrews Experimental Forest (Andrews Forest) is both an idea and a particular place. It is an experimental landscape, a natural resource, and an ecosystem that has long inspired many people. On the landscape of the Andrews Forest, some of those people built the foundation for a collaborative community that fosters closer communication among the scientists and managers who struggle to understand how that ecosystem functions and to identify optimal management strategies for this and other national forest lands in the Pacific Northwest. People who worked there generated new ideas about forest ecology and related ecosystems. Working together in this place, they generated ideas, developed research proposals, and considered the implications of their work. They functioned as individuals in a science-based community that emerged and evolved over time. Individuals acted in a confluence of personalities, personal choices, and power relations. In the context of this unique landscape and serendipitous opportunities, those people created an exceptionally potent learning environment for science and management. Science, in this context, was largely a story of personalities, not simply a matter of test tubes, experimental watersheds, or top-down management sponsored by a large federal agency or university. Ideas flowed in a constructed environment that eventually linked people, place, and community with an emerging vision of ecosystem management. Drawing largely on oral history, this book explores the inner workings and structure of that science-based community. Science themes, management issues, specific research programs, the landscape itself, and the people who work there are all indispensable components of a complex web of community, the Andrews group. The first four chapters explore the origins of the Forest Service decision to establish an experimental forest in the west-central Oregon Cascades in 1948 and the people and priorities that transformed that field site into a prominent facility for interdisciplinary research in the coniferous biome of the International

Biological Programme in the 1970s. Later chapters explore emerging links between long-term research and interdisciplinary science at the Andrews Forest. Those links shaped the group's response to concerns about logging in old-growth forests during the 1980s and 1990s. Concluding chapters explore how scientists in the group tried to adapt to new roles as public policy consultants in the 1990s without losing sight of the community values that they considered crucial to their earlier accomplishments.

Keywords: Andrews Forest, LTER, IBP, watersheds, adaptive management.


H. J. Andrews Experimental Forest Timeline
1948
1950
1955
1960
1965
1970
1975
Forest Supervisor
John Bruckart
Robert Aufderheide
David Gibney
Zane Smith
District Ranger
Brittain Ash
McKenzie Ranger District
Ed Anderson
Blue River Ranger District
Bob Mealy
Gene Carlson
Mike Kerrick
Billy Onstott
Robert Burns
Vegetation
Develop Federal Forestry
Growth & Yield
Post-clearcut Succession
Characterize Old Growth
Roy Silen
Hank Gratkowski
Jerry Franklin
Ted Dyrness
Don Zobel
Bob Fogel
Glenn Hawk
Art McKee
Dan Sanantonio
Hydrology/ Small Watersheds
Land Use Treatment Effects
Water Quality
Peak Flows
Bob Ruth
Jerry Franklin
Jack Rothacher
Dick Fredriksen
Al Levno
Ross Mersereau
Elly Holcomb
Lorraine Noonan
Dennis Harr
George Brown
Soils
Soil Characterization & Mapping
Soil Solution Chemistry
Bob Tarrant
Freeman Stevens
Ted Dyrness
Kermit Cromack
Phil Sollins
Randy Brown
Disturbance/ Landscape
Landslide Inventory
Earthflow Monitoring
Ted Dyrness
Al Levno
Fred Swanson
Mike James
Peter Morrison
Wildlife/Spotted Owl
Small Mammals
Northern Spotted Owl
Jay Gashwiler
Chris Maser
Hugh Black
Eric Forsman
Chuck Meslow
Research Programs and Key Researchers
Biodiversity/ Arthropods
Terrestrial
Aquatic
Conifer Canopy
George Carroll
Bill Denison
Martha Sherwood
Larry Pike
Norm Anderson
Ed Grafius
Jack Lattin
David Voegtlin
Bill Massman
Decomposition/ Carbon Dynamics/ Ecophysiology
Budgets
Dick Waring
Bill Emmingham
Chuck Grier
Forest-Stream Interactions
Old Growth-Clearcut Comparison
Coarse Woody Debris
Jack Lyford
Frank Triska
Dave McIntire
Dick Aho
Barb Buckley
Lynn Roberts
Hank Froehlich
Mike Murphy
Jim Hall
Jim Sedell
Stan Gregory
Persons whose names are in boldface appear in the text as leading figures in the Andrews research group.
Information Management
Mainframe Data Processing
IBP Data Bank
Sue Skinner
Dorothy Martin
Al Brown
Joanne Kristaponis
Issues
Management Efficiency
Environmental Protection
Clearcutting
Research Support
USDA FS Research
International Biological Programme
FORESTRY RESEARCH
Events
1948 Establishment Blue River Exp. Forest
1950 1st clearcut
1952 Flumes installed WS 1,2,3
1953 Exp. Forest renamed for HJ Andrews
1959 Roads built; WS 3
1962 Columbus Day windstorm 10/12; Soils mapped
1964 Christmas flood
1966 WS 9 & 10 established; WS 1 slash burned
1972 1st bldg. at Admin. Site
1975 WS 10 logged

H. J. Andrews Experimental Forest Timeline



Chapter One: Building an Experimental Place for Science and Community, 1948-1955

On a late September day in 1997, nine people climbed out of stuffy vans into the clear summer air high in the Cascades. Their path wound through high-elevation stands of noble fir (*Abies procera* Rehd.), across mountain meadows, and over rocky outcroppings. They continued upward, past the treeline, to a windswept, summit building known as Carpenter Lookout, the highest point of the H.J. Andrews Experimental Forest (Andrews Forest). Most people in the group had known each other for more than three decades and spent much of their professional lives within sight of that mountaintop. One of them, Roy Silen, was returning to the peak for the first time in more than 40 years. The Lookout itself was a rickety old structure with splintered railings dating back to the 1930s, but it commanded a panoramic view of forested and logged slopes in the Willamette National Forest, including the 16,000 acres of the experimental forest to the south and west. The group included people who had variously managed, studied, and criticized logging and reforestation practices on that landscape. They were there to remember

Art McKee, 1997

Figure 1—The people who gathered at Carpenter Lookout for this oral history group interview in 1997 represented a cumulative time of engagement (in person years) of more than 150 years of scientific, administrative, and technical leadership at the H.J. Andrews Experimental Forest. From left to right (standing), they include Art McKee, Roy Silen, Martha Brookes, Robert Tarrant, Fred Swanson, Ted Dyrness, Max Geier (the interviewing historian), and (seated) Al Levno and Jerry Franklin.

The oral history exercise demonstrated how a science-based community functioned at the Andrews Forest.

the past and to go on record with their memories. Their combined experience at the Andrews Forest spanned from before that research facility was first established through that day in 1997.

The oral history exercise that began that day at Carpenter Lookout was an ongoing, casual conversation that demonstrated how a science-based community functioned at the Andrews Forest. The exercise continued in the afternoon on a gravel bar along Lookout Creek, followed by a dinner at the headquarters site and a concluding, evening session in the Andrews conference room. The way these scientists and forest managers connected as human beings, on this and other occasions, was at least as important as the ideas they expressed about their work at the Andrews Forest. As a group of leaders and thinkers, they listened to each other, volunteered ideas, asked questions, and challenged ideas that didn't seem to fit known facts. The view from Carpenter Lookout inspired but did not limit the range of their conversation. They disagreed on many points, but those disagreements led to more discussion, reconsideration, and revised ideas, rather than recrimination.

The day ended in a tragedy that underscored their humanity and their spirit of community. When the group reassembled in the Andrews conference room after dinner to begin their third oral history session of the day, they learned—with Roy Silen—that his wife of 43 years had died in an automobile accident. For the rest of the night, everyone in the group struggled to provide comfort, sympathy, and respectful support to a friend suffering an inconsolable loss. It was an unforgettable day that stripped away the façade of scientific detachment and forced people to think about how their lives intersected with their work and with each other in this remarkable place.

Discovering Life in a Place of Work

People connect with human beings for varied and often mysterious reasons, and in that sense, this book is the product of a collaborative effort to explain how a particular place inspired a community of people who built a common ground for communication between scientists and managers struggling with public lands issues in the late 20th century. The 50-year history of the Andrews Forest shows the importance of individuals acting in a confluence of personalities, personal choices, and power relations. The unique mix of people and serendipitous opportunities at the Andrews Forest created an exceptionally potent learning environment for science and management. Science, in this context, was largely a story of personalities. It was not simply a matter of test tubes, experimental watersheds, or

Art McKee

Figure 2—Mike Kerrick, pictured here with the interview group along the lower reaches of Lookout Creek, was a forest manager whose involvement at the H.J. Andrews Experimental Forest spanned five decades. Discussing the management-science interface and how that had evolved over the previous half-century are (clockwise from left), Jerry Franklin (reclining), Max Geier, Martha Brookes, Robert Tarrant, Roy Silen, Mike Kerrick, Ted Dyrness, and Al Levno (back to camera).

A nurturing environment that linked people, place, and community with an emerging vision of ecosystem management.

top-down management sponsored by a large federal agency or university. Ideas flowed in a nurturing environment that eventually linked people, place, and community with an emerging vision of ecosystem management.

This book is primarily but not exclusively an oral history of the Andrews Forest and the community associated with it. The group meeting on Carpenter Lookout in September 1997 was one of several oral history interviews during 1997 and 1998 in which people met to discuss their memories of a past they helped create. These and other people also discussed their memories of the past in individual interviews, and before the end of 1998, more than 40 people contributed their memories in an oral history project to commemorate the 50-year anniversary of the H.J. Andrews Experimental Forest. The book also extends beyond that date to consider more recent developments. Hundreds more people have contributed to the collective knowledge from their experience as managers and scientists on this landscape. This book also relies heavily on their written accounts, as preserved in an assortment of archival records and other primary and secondary published works that provide interpretive context for oral accounts of the Andrews Forest. This documentation is especially important for the chapters dealing with the early years (1930s-1970s) because relatively few people survive to substantiate, refute, or illuminate other oral accounts from that period. In later years, the surviving voices of people associated with this place are more numerous, and they provide a wider variety of perspectives and perceptions of causality, consequence, and significance. People who participated in both group and individual interviews often emphasized different issues, events, or people, depending on whether they were speaking alone or in a group. The chapters of the book dealing with later years (1970s-1990s) draw on a wider array of oral history interviews and, therefore, are less dependent on archival records.

This book explores the inner workings and structure of a science-based community widely recognized—and sometimes criticized—for its visible role in many controversial issues about management policies for public lands in the Northwestern United States. The oral history project was prompted by the 50th anniversary of the Andrews Forest, the rapid pace of change at that facility in the late 1990s, and the realization that many of the original players in the Andrews story were still available for interviews. This project was an opportunity for people in the Andrews group to consider their accomplishments and evaluate their methods in critical hindsight. It was also an opportunity to regroup and think about the future.

Sidebars in each chapter outline the group's perspectives on major science themes.

Sidebars in each chapter outline the group's perspectives on major science themes that weave together many different strands of work at the Andrews Forest. Each sidebar begins with a brief outline of a perceived management or science theme, various science-based insights into that theme, and the evolutionary stages of an emerging synthesis of scientific theories related to that theme. Science themes, management issues, specific research programs, the landscape itself, and the people who work there are all indispensable components of a complex web of community, described in this book as the Andrews group. The book, however, is not designed to demonstrate the broader significance of the science or management initiatives linked with the Andrews group. It primarily follows the threads of people and place through the web of activities at the forest. It is intended to convey the perceptions, priorities, and accomplishments of people in the Andrews group, rather than perceptions of the group by people who were not part of that community. Meeting minutes, internal correspondence, oral history interviews, newsletters, and published writings generated by people in this group provide context and insight into the assumptions and priorities of scientists and managers associated with the Andrews Forest. These sources also convey, to various degrees, the personalities of the people who made this community work.

The linkage of the Andrews Forest with the USDA Forest Service complicates the history of this research facility and community because, in recent years, many historians have pointed to that agency as an example of misguided bureaucracy, challenging other, more positivist studies. Since the days of Gifford Pinchot, the Forest Service emphasized its commitment to "scientific" forestry, and it offered secure employment to scientists from many different disciplines. Paul Hirt has argued that the Forest Service, wittingly or unwittingly, embraced a *Conspiracy of Optimism* (1994) in which even well-meaning management practices wreaked ecological catastrophe on the national forests after World War II. Forest managers optimistically assumed "scientific management" would improve conditions on the national forests and produce more timber for a longer period. However, too often, Hirt argued, the optimistic dream of sustained-yield, scientific forestry turned into a nightmare reality of cut-and-run logging. Nancy Langston's *Forest Dreams, Forest Nightmares* (1995) argued along similar lines with a narrower perspective on the Blue Mountains of eastern Oregon. These and other authors, in noting the long record of management practices that Forest Service managers devised over the years with advice and support from prominent scientists, emphasize the unintended but no less disastrous ecological consequences of those practices. Numerous authors have detailed the historical geography of American forests (e.g., Michael Williams, 1989), the evolution of forestry priorities in the United States (e.g., William G. Robbins, 1985) and the implications of American policy and culture for forest ecology in the United States (e.g., Char Miller, 1997). Many others have examined the ecological implications of federal and corporate policy in forests of the Pacific Northwest (e.g., William Dietrich, 1992), and even for specific forest stands in that region (e.g., Jane Claire Dirks-Edmunds, 1999).

This book focuses on one experimental forest and the people who worked there.

This book focuses on one experimental forest and the people who worked there as a way of understanding how and why people generate new ideas about forest ecology and related ecosystems. It examines how people who worked together on a particular experimental forest generated ideas, developed research proposals, and considered the implications of their work. It explores how individuals functioned in this particular science-based community and how that community developed and evolved over time. It examines how and why people followed unique paths of research and to what end. Some, but not all, of their work challenged common assumptions about forest ecology and standard practices of scientific forestry. A related book provides a journalistic account of science discoveries at the Andrews Forest (John Luoma, 1998).

The idea of a common, if unstated, set of core values runs deep in the Andrews group, and this book explores how that idea originated and evolved into

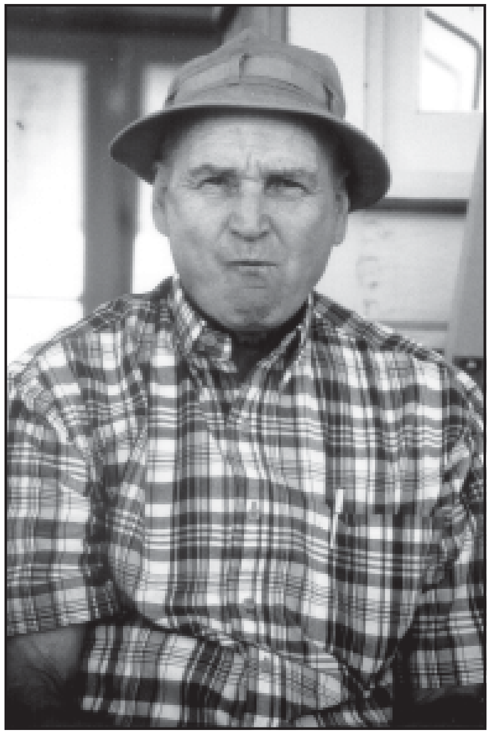


Figure 3—Roy Silen, pictured here during the group interview at Carpenter Lookout, was the first research forester in charge at the H.J. Andrews Experimental Forest (Andrews Forest) from the time it was first established in 1948 until he married Ethel Arthur in 1954 and accepted reassignment in Corvallis, Oregon. This 1997 visit was Silen's first return to the Andrews Forest since his marriage. Among other accomplishments during his earlier career managing the landscape he viewed from this site, Silen laid out the road structure that later encouraged the retention and study of old-growth forest stands at the Andrews Forest. While meeting with the interview group in the library conference room at the headquarters building later the same evening, Roy Silen learned that Ethel, his wife of nearly 50 years, had died in an automobile accident in Corvallis.

The book is arranged in chapters that first explore the various building blocks of community and then examine the functioning of that community.

its present form. As a historian who studies resource-based communities in the North American West, I am particularly concerned with how people reconciled their ideas about science and natural resources with the landscape and people they encountered at the Andrews Forest and how that dialogue among people, place, and natural science evolved over time. The book is arranged in chapters that first explore the various building blocks of community at the Andrews Forest, and then examine the functioning of that community. It begins with the origins and background of the Forest Service decision to establish an experimental forest in the west-central Oregon Cascades in 1948. The first four chapters explore the people and priorities that transformed that little-used field site into a prominent facility for interdisciplinary research in the coniferous biome of the International Biological Programme in the 1970s. Between 1948 and 1970, the few scientists who worked at the Andrews Forest were preoccupied with laying out roads, planning "experimental" clearcuts and watershed studies, and otherwise making the facility more accessible for field research. They struggled against numerous efforts to curtail research on the site and open it to more commercial logging.

The original voices of the group, as preserved in the oral history recordings, convey the contagious enthusiasm of people who learned how to share their own ideas and to listen when other people presented alternative views. The group plans to make their original voices accessible via the Internet. They are committed to the principle of making their work accessible to other people as they continue their efforts to encourage multiple dialogues and the free flow of ideas. These are adaptable people who prize individual autonomy but have learned how to work closely and collaboratively with other people. This book is their story. It is a portrait of their community, and it explores links connecting individual experience with group initiatives and collaborative insights. The book is not primarily about science or about the ecological transformation of a particular landscape, although those concepts do play a role in the narrative. It is mostly a story about people connecting with a place and with each other to build a community. That community was inspired but not contained by its connection with the Andrews Forest in the Cascade Range. The community functioned well beyond the mountain sanctuary of the Andrews, and it survived the departure of many close friends and associates. In the end, the people, science, and place adapted to new circumstances and challenges in ways that no one in the group could fully understand.

The Andrews Forest was a managed forest that people painstakingly constructed.

Early Perceptions of Place and Opportunity at Lookout Creek

The landscape that visitors to the Andrews Forest saw in the late 1990s was a managed forest that other people had painstakingly constructed over the preceding 50 years, but it was a patchwork landscape where unanticipated processes blended human actions and intents with unrecognized realities and unpredictable events, yielding unintended outcomes. The experimental forest was first an idea, later a place. Before linking the idea with the Lookout Creek drainage, people passed it back and forth, tweaking it into shape according to their personal and professional priorities. The idea evolved as people drew connections between the places where they lived and worked in the Pacific Northwest and the landscapes they valued. On the timbered slopes of the Cascade Range, people who worked for the Forest Service and the Army Corps of Engineers implemented the public policies that governed land use priorities in that region, and that effort influenced the personal and professional values people brought to that landscape. Public policy imposed limits and created opportunities, but people accomplished things because they acted in concert with other people. When his work on a Forest Service survey

Figure 4—Aerial oblique of the H.J. Andrews Experimental Forest, as photographed by Al Levno in July 1991. By the time of this photo, nearly 40 years of management decisions had transformed the Lookout Creek drainage (center) into a research landscape that, by comparison with surrounding national forest lands, included a relatively high proportion of contiguous, old-growth stands readily accessible for scientific studies.

of resources in the Cascade Range took Forest Service forester Phil Briegleb to Carpenter Saddle in the early 1930s, he got the idea that the Lookout Creek drainage was a good site for an experimental forest. Action on that idea, however, originated with a suggestion from the Army Corps of Engineers and a negotiated agreement within the Forest Service between the Willamette National Forest and the Pacific Northwest Forest and Range Experiment Station (later shortened to Pacific Northwest Research Station and, hereafter, PNW Station). That agreement defined the territory and mission of the experimental forest, translating the idea into policy. Converting the idea of a research forest into reality on the Lookout Creek drainage required human effort and individual initiative.

The Andrews Forest includes all of the area drained by Lookout Creek, a tributary of the Blue River north of its confluence with the McKenzie Fork of the Willamette River. This Andrews Forest is a triangular drainage on the west slope of the Cascade Range near the town of Blue River, Oregon, in the Willamette National Forest, within a 1-hour drive from Eugene and a 2-hour drive from Corvallis. On the western point of that triangle, Lookout Creek flows into Blue River. On the eastern leg of the triangle is Carpenter Saddle, located between Carpenter Mountain on the north and Frissell Point on the south. The northern and southern legs of the triangle rise toward Carpenter Saddle in diverging ridgelines, embracing the drainage of Lookout Creek and its tributaries. The PNW Station and the Willamette National Forest jointly administered this federally managed land, beginning in 1948, and in cooperation with Oregon State University since the early 1970s. It is a 16,000-acre landscape filled with small details that people can touch, smell, see, hear, and taste.

The mountainous terrain is an essential starting point for understanding both the Andrews Forest and the group centered on that landscape. Most of the attributes people examine at the place build on the geological features of the drainage. Rocks of volcanic origin, some formed from eruptions as recent as 4 million years ago, provide the foundation for the watershed that ranges from lower than 1,300 feet along the valley floor to more than 5,000 feet along the ridges rising toward the eastern boundary of the drainage. Since the volcanic episodes that shaped the rough outline of this drainage, glacial, alluvial, and mass-movement processes formed the modern topography of the Andrews Forest. At one point in its glaciated past, for example, ice dams may have blocked Blue River and flooded the lower 0.62 mile of the Lookout Creek valley, resulting in sedimentary deposits in that portion of the experimental forest. The modern landscape includes a flood plain and terraces with numerous, small, alluvial fans accumulated from tributary watersheds. Deep and shallow mass movements are common in the Andrews Forest, particularly in the steep headwall or midbasin regions of the many small watersheds that drain into Lookout Creek. In this respect, it is a landscape that resembles many others in the western Cascades.[1] Fires, floods, and the vagaries of climate shaped the landscape in more recent years, influencing human perceptions of potential uses for this drainage. A series of major fires of unknown origin swept through the area

[1] Frederick J. Swanson and Michael E. James, *"Geology and Geomorphology of the H.J. Andrews Experimental Forest, Western Cascades, Oregon"* (Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, Res. Pap. PNW-188, 1975).

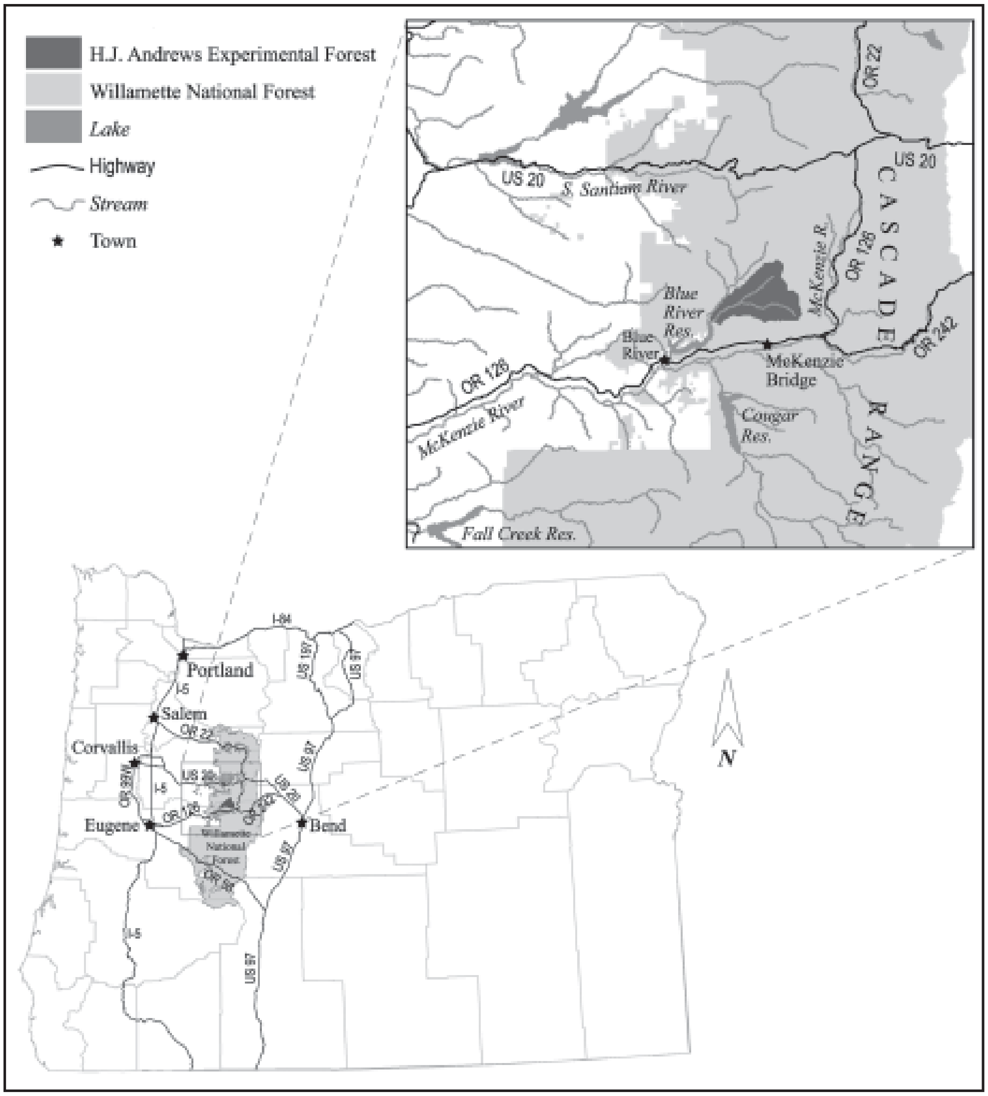


Figure 5—This map of the H.J. Andrews Experimental Forest shows the location of the facility in relation to the city of Corvallis, major transportation corridors, and prominent natural features of the Oregon landscape.

about 500 years ago, leaving behind a charred landscape on which various species gained a foothold and spread across the drainage over the last half of the millennium.[2]

[2] "Blue River Experimental Forest: Representing the Old-Growth Douglas-Fir Type of the Central to Southern Cascades, Willamette National Forest, Oregon, [1948]," H.J. Andrews Memorandum of Understanding Folder, H.J. Andrews Files, File Box F, Storage Vault, Corvallis FSL, PNW Station, Forest Service, United States Department of Agriculture.

They perceived the place as best suited for experimenting with how to transform old-growth timber into a managed forest.

Looking at that landscape from the early 1930s through the mid 1940s, Briegleb, his boss Horace J. [Hoss] Andrews, and other scientists and administrators with the Forest Service perceived a place they described as best suited for experimenting with how to most efficiently transform old-growth timber into a managed forest, by using clearcut logging and other methods of removing aged timber, and then studying how those changes affected water runoff and the process of growing new trees on cleared slopes. To that end, they established the Blue River Experimental Forest (the name of which was later changed to the H.J. Andrews Experimental Forest) on the Lookout Creek drainage in 1948, the year a major flood struck the western Cascades.[3]

Published guides to the experimental forest describe a place of "relatively steep" slopes with "frequent outcroppings" of bedrock. They report mean temperatures ranging from 35 °F in January to 65 °F in July. Precipitation is concentrated from November through March and ranges from 89 inches per year in the lower reaches of the drainage, mostly in the form of rain, to more than 140 inches per year at higher elevations, including a snowpack that lasts into late spring. Streamflows usually peak from November through February, particularly when warm rainstorms melt the snowpack. Unusually high streamflows in 1948, 1964, and 1996, for example, flooded the Lookout Creek drainage, caused landslides, washed away big trees, and carried much debris downstream. Those floods inundated creek channels, riparian-zone vegetation, and flood plains. The resulting landscape is complex and diverse, but the big trees initially attracted the most attention.

Before the Forest Service opened the area to timber harvest in 1950, Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) trees older than 400 years cloaked 65 percent of the drainage in old-growth conditions. Much of the remaining 35 percent included younger stands regenerating from fires since 1800. One guide to the Andrews Forest, published by the Forest Service in 1959, identified Douglas-fir as the "predominant forest type," found "in a complete range of size classes—from seedlings to large, overmature timber." Other tree species prominently identified on the experimental forest by that time included silver fir (*Abies amabilis* Dougl. ex Forbes), noble fir, and white pine (*Pinus albicaulus* Engelm.). A later guide published in the 1990s identified the most common tree species at lower elevations: in order of mention, they were Douglas-fir, western hemlock (*Tsuga heterophylla*

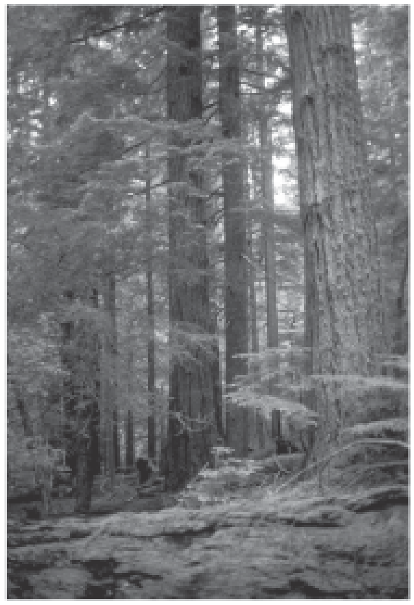
[3] Ibid.

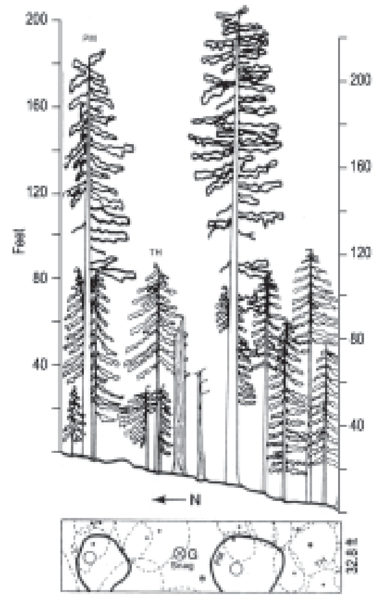
Sidebar 1.1: Old-Growth Forest

The Issue: What is old-growth forest? In the 1930s-1960s, old growth was mapped as "large saw timber" and referred to somewhat disparagingly as "decadent" and "over-mature." But little was known of its ecological properties; clearly the structure of old growth was different from younger forests, but were its composition and function the same as forests at other stages of development? Are some species and processes characteristic of old-growth forests? These questions were raised in scientific circles long before old-growth preservation, conservation, or cultivation became headline issues.

Left: Old-growth forest stands in the H.J. Andrews Experimental Forest. Note abundant wood on the forest floor, large trees, and multiple layers of understory. Photo by Tom Spies, USDA Forest Service.

Right: Vertical and horizontal profile through a 450-year-old Douglas-fir/western hemlock stand. PM, *Pseudotsuga menziesii*; TH, *Tsuga heterophylla*; G, canopy gap. From Spies et al. 1990.





The Roots: One important root of the Andrews Forest work on old growth comes from Jerry Franklin's love of big trees, dating from his early years growing up in Camas, Washington. Old growth was neither an ecological nor a social consideration elsewhere in the academic world because so little old growth is found near traditional strongholds of ecological academe. In the early 1970s, people sensed that old growth was being rapidly liquidated, so its lessons should be gleaned before the record was erased. But what gave the Andrews Forest group the opportunity to study old growth was funding for basic research in the International Biological Programme through the National Science Foundation. Forest Service research and university funding emphasized more practical matters.

The Approach: Study methods changed through time as the sophistication of science, management, and policy questions evolved. The initial question was, "What *is* old-growth forest?" The answer was approached through descriptive studies; vegetation plots were established in old forests of various structure and composition, and studies of associated organisms and processes began (Denison 1973, Franklin et al. 1981). Next, scientists asked, "How does old-growth develop?" They established vegetation plots representative of a succession of stages leading to the development of old-growth conditions, and they developed computer models to simulate change in forests as they aged. Another question arose from political debate about what was at stake in heated arguments about the fate of old-growth forests: "How much old growth is there and where is it?" These questions were approached through remote-sensing techniques that had to be developed and tested (Cohen and Spies 1992). In the 1990s, the central question became, "Can we speed development of old-growth characteristics in plantations or young, natural stands through silvicultural practices?" This question has led to a series of field and modeling experiments to examine the early history of today's old growth and alternative silvicultural approaches in previously clearcut stands.

Results: The work on old growth dramatically transformed approaches to forest management in the region, but also around the world, including New England, Scandinavia, and England, where all but the tiniest vestiges of old growth were lost long ago. The implications for science have been to sharpen understanding of similarities and differences of structure, composition, and function of stands of varying stages of development under both natural and managed conditions. The complexity of old-growth forest has given great richness to this inquiry--certainly more so than if studies had been restricted to younger forests.

(Raf.) Sarg), and western redcedar (*Thuja plicata* Donn ex D. Don), with noble fir, Pacific silver fir, Douglas-fir, and western hemlock as the tree species prominent at higher elevations.[4]

Much early work at the Andrews Forest focused on large trees, but scientists gradually developed a composite portrait of the Andrews Forest that included other details compiled from many different studies. By the late 1990s, scientists had accumulated lists that identified and described about 500 vascular plant species, more than 3,000 invertebrate species, and an extensive list of vertebrates, notably including the northern spotted owl (*Strix occidentalis caurina*), pileated woodpecker (*Dryocopus pileatus*), osprey (*Pandion haliaetus*), black bear (*Ursus americanus*), bobcat (*Lynx rufus*), mountain lion (*Felis concolor*), coyote (*Canis latrans*), black-tailed deer (*Odocoileus hemionus*), and Roosevelt elk (*Cervus elephus* roosevelti). Studies of riparian zones listed cutthroat and rainbow trout, Pacific giant salamanders, and other vertebrates, invertebrates, and streamside vegetation, including many deciduous, coniferous, and herbaceous species.[5] Even this detailed cataloguing of species, however, was incomplete. It was the limited result of research that focused mostly on species closely related to specific studies. Even after a half century of intensive study, much about the Andrews Forest remains a mystery. Detailed records supported research in that place, but people who went there seeking answers to questions about forest ecosystems usually discovered more work was necessary to unlock the forest's secrets.

Origins of the Experimental Forest Designation

An interagency movement to expand the number of outdoor laboratories, or "experimental plantations" in the Pacific Northwest took root during the depression years of the 1930s. The focus of forest research shifted during this period from earlier studies of stands regenerating from wild "burns" to forests managed for a 100-year rotation of timber production. The regional influence and practical, field orientation of the forestry school faculty at Oregon Agricultural College (OAC) encouraged this trend, leading to the development of a school forest. Close professional ties and administrative links with the OAC School of Forestry encouraged

The focus of forest research shifted to forests managed for a 100-year rotation of timber production.

[4] Carl M. Berntsen and Jack Rothacher, *"A Guide to the H.J. Andrews Experimental Forest"* (Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, 1959); Pacific Northwest Research Station, *"H.J. Andrews Experimental Forest* [Brochure]" (Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, June 1998).

[5] Ibid.

similar trends at the Pacific Northwest Research Station (PNW Station) in the same period. George Wilcox Peavy, a Michigan native who worked for the Forest Service in California, first joined the OAC faculty to head the forestry department in 1910 and served as dean of the new school of forestry, beginning in 1913. Peavy gained direct influence at PNW Station after 1929, when he took over as chair of the Forest Research Council. Station Director Thornton Munger had founded the council 3 years earlier to guide priorities at PNW Station. Weyerhauser executive C.S. Chapman chaired the council for the first 3 years, with the support of an executive committee consisting of Peavy and Munger. The larger committee included leading foresters from state and federal agencies, private industry, and regional forestry schools. On the advice of this committee, PNW Station had established experimental plantations near Bend, Oregon, and at the school forests of Oregon State College (OSC), Washington State College, and the University of Washington.[6] Peavy, as chair of the committee after 1929, gained further influence after 1932 when he accepted appointment as president of the renamed Oregon State College.[7]

The PNW Station, operating under guidance from Peavy's Forest Research Council during the early 1930s, also established several experimental forests and a natural area program[8] during this period. These trends strongly affected how people perceived the Lookout Creek drainage. The place clearly had aesthetic appeal for

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[6] June A. Wertz, "A Record Concerning the Wind River Experiment Station, July 1, 1913 to June 30, 1924 and the Pacific Northwest Forest and Range Experiment Station, July 1, 1924, to December 30, 1938, with Supplements 1939 through 1943." Unpublished typescript, History Files, Portland Office, PNW Station, 10 April 1940, pp. 19-20, 30.

[7] Marvin L. Rowley. "School's Forest Lands Serve as Classrooms." In: *75 Years of Continuing Progress in Forestry Education*, Albert Arnst, ed. (Corvallis, OR: School of Forestry, Oregon State University, 1981), 58-59, 61-62. *Oregon Journal* 24 Jan 1926.

[8] In October 1932, the Chief Forester approved establishment of the Wind River Experimental Forest, about 10,000 acres in extent, with extensive stands of Douglas-fir and western hemlock. Two years later, Cascade Head Experimental Forest was established on 6,500 acres of spruce-hemlock stands in the Siuslaw National Forest on the Oregon coast. The natural area program was closely related to the experimental forest program, which had greatly expanded because of emergency-funding support. The Metolius Natural Area was established in June 1931, followed by five additional natural areas established by 1936 and six more under consideration that year. Selection and official designation of experimental forests and, especially, natural areas, was subject to a prolonged review process, including final review and approval by the Regional Forester and the Chief Forester. Former PNW Station Director Cowlin observed virtually no scientists made use of the natural areas designated during this period. Robert Cowlin (n.d.) Federal Forest Research in the Pacific Northwest: the Pacific Northwest Forest and Range Experiment Station. Unpublished typescript, in the Portland Office History Files, 101-102, 119-120, 139-140.

campers, day hikers, and horse riders by 1930, but it inspired more pragmatic visions for Briegleb, a PNW Station employee who first encountered the drainage that year when Andrews, who headed the forest survey for PNW Station, sent his subordinate, Briegleb, into the western Cascades of Oregon. From the crest of Carpenter Saddle, Briegleb gazed down the Lookout Creek drainage, observing an extensive expanse of old-growth Douglas-fir. Briegleb privately considered the place ideally suited for an experimental forest in old-growth Douglas-fir, but his official report on the drainage instead emphasized its value as a source for timber. The survey data provided, for the first time, a quantified profile of timber resources in the drainage: 3,005 acres of large, old-growth Douglas-fir; 4,375 acres of small, old-growth Douglas-fir; 2,425 acres of second-growth Douglas-fir; 2,030 acres of small second-growth Douglas-fir; 2,685 acres of large mountain hemlock; 65 acres of small mountain hemlock; 265 acres of meadows; 80 acres of burns; and 60 acres of rocky, noncommercial forest land, with an estimated total volume of 802,150 thousand board feet of timber.[9]

Alternate visions of the Lookout Creek drainage vied for attention against the survey's depiction of the place as a cluster of economic potential. A photographic panorama taken from Carpenter Mountain in 1933 (see cover photo, top), as part of a national effort to document the views from every fire lookout in the United States, for example, depicts a landscape fading away into the surrounding forested slopes and rocky outcroppings of the Willamette National Forest. This panorama view reveals virtually no visible evidence of human activity, boundaries, or borders. The photograph itself, however, is evidence of the human hand on that landscape. During the early 1930s, the Forest Service constructed two fire lookout stations on what eventually became the Andrews Forest: one on Carpenter Mountain and one on Lookout Mountain. Carpenter Lookout was a permanent structure, but the one on Lookout Mountain was a temporary facility with a tent, rangefinder, and other portable equipment.[10] These structures were intended to facilitate early location and suppression of forest fires. Firefighting priorities created the need for access roads and trails, and depression-era programs supplied the labor force needed to build that infrastructure.

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[9] Cowlin, 70-76. Interview with Roy Silen by Max Geier on 9 September 1996 as transcribed by Jeff Fourier, 24; "Blue River Experimental Forest: Representing the Old-growth Douglas-Fir Type."

[10] Andrews group interview by Max G. Geier, en-route to and at the H.J. Andrews Experimental Forest with Bob Tarrant, Roy Silen, Jerry Franklin, Ted Dyrness, Al Levno, Art McKee, Fred Swanson, and Martha Brookes, 22 September 1997, 12, 30.

In Lookout Creek, CCC crews worked to make the Willamette National Forest more accessible for other people.

The PNW Station and other Forest Service units directly benefited from several New Deal programs. In addition to a large number of new employees hired through the Unemployment Relief Act of March 1933 to support research programs at the Station, the Civilian Conservation Corps (CCC) delivered other workers housed in camps on the national forests.[11] The CCC projects gave thousands of people a chance to live and work in the forests of western Oregon. The CCC located work camps in areas where their charges could experience the virtues of hard work that many Americans associated with rural life. In essence, however, CCC camps were places where people lived in large groups and worked for wages, and CCC crews supplied the labor the Forest Service needed to build trails and other facilities. In the McKenzie Ranger District, which included Lookout Creek, CCC crews worked to make the Willamette National Forest more accessible for other people. More than 200 crewmen worked out of Camp Belknap, currently the site of the McKenzie River District Ranger Station. Roy Engles, District Ranger at the time, reported that in addition to their other duties in camp, workers completed 14,108 hours of forest work between June and October 1933. They built 29 miles of telephone lines, 17 miles of roads, 35 miles of horse trails, six lookout houses, four firemen's cabins, two horse shelters, a garage, and five bridges. Near Lookout Creek, CCC workers from Camp Belknap built trails from McKenzie Bridge to Carpenter Mountain, and up the Blue River Ridge to Carpenter Mountain. These trails were the first improved-access routes into the immediate area of Lookout Creek, and as late as 1948, they were the only regularly maintained trails reaching that drainage. The CCC operations at Camp Belknap ended in 1938, but camp facilities continued to house seasonal Forest Service workers connected with the McKenzie District and the nearby experimental forest through the next three decades. The first person assigned to the new experimental forest, Roy Silen, for example, lived in the CCC cookhouse in his first years at Blue River, and other Forest Service people using the facility through the 1950s included Don Wustenberg, Jay Gashweiler, Brit Ash (then district ranger at McKenzie Bridge), and Mike Kerrick, then a college student on a fire-control unit based out of McKenzie Bridge.[12]

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[11] Cowlin, 113-114.

[12] Leaburg Library, *Historic Leaburg and Vicinity* (Leaburg, OR: Leaburg Library, 1987), 70-71. Interview with Roy Silen, 9 September 1996, 13-14. December 1992 discussion with Roy Silen, 1-2. Interview with Jerry Franklin by Max Geier at 3:00 p.m. on 13 September 1996 in a Forest Service cabin near the Wind River Canopy Crane facility as transcribed by Jeff Fourier, 6-7.

The CCC labor improved access to the Lookout Creek drainage just as frequent flooding along the Willamette River began to attract public attention. Concerns about flooding prompted a renewed focus on watershed studies at PNW Station about the time the Forest Research Council began to press for an expanded network of experimental forests. Lookout Creek subsequently emerged as a likely site with good potential for supporting the priorities of PNW Station and other agencies engaged in flood-related research. During 1936 and 1937, Horace J. Andrews headed initial efforts at PNW Station to coordinate a flood-control survey with the U.S. Army Corps of Engineers in a joint program funded under the Flood Control Act of 1936. The next year, Acting Station Director Andrews assigned E.G. Dunford to head the flood-control survey program at PNW Station.[13] The Portland District of the Army Corps of Engineers subsequently issued a report (House Document 544, 75th Congress, 3rd Session) predicting a major flood in the Willamette Valley once every 5 years, on average. That report stressed the need for storage reservoirs to avert damage to property and loss of life in the valleys. World War II and related concerns, however, diverted public attention from flood-control concerns from the late 1930s through 1948. The major flood that devastated Vanport, Oregon, in spring 1948, refocused public attention, and the PNW Station secured additional funding to support flood-control research.[14]

The renewed emphasis on flood studies at PNW Station complemented an earlier initiative near Blue River. The winter before the 1948 flood, the Army Corps of Engineers designated 5,000 acres of the Blue River valley immediately north of Lookout Creek drainage as a snow laboratory for gathering data on potential flood levels. Army Corps of Engineers selected that location because it was an area with a "good range of elevations and … virgin timber." The Corps also encouraged PNW Station and the Regional Forester to develop an experimental forest nearby to promote logging so they could "… start getting some of the answers on the effect of logging on run-off."[15] These actions encouraged a closer look at the drainage Briegleb recalled as an ideal site for an experimental forest in an old-growth forest.

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[13] The Flood Control Act of 1936 asserted that flood control on navigable waters or their tributaries was a proper activity of the federal government in cooperation with states. It provided for "investigations and improvements of rivers and other waterways, including watersheds thereof, for flood control purposes …in the interest of the general welfare." Heritage Research Associates, 142-145. Cowlin, 151-152, 155.

[14] Heritage Research Associates, 142-144. Christina McPhail, "The Supplements to the Station History, 1944 through 1953, compiled from the Station annual reports and news items from the Station News Notes and the R-6 Administrative Digest," unpublished typescript, History Files, Portland Office, PNW Station, 20 October 1954. Supplement for 1948, 1.

[15] "Blue River Experimental Forest: Representing …," 7-8; Cowlin, 270-271.

The Blue River valley suddenly became a major center for flood-related research in 1948, mostly because PNW Station, the Pacific Northwest Region (Region 6), the Army Corps, and the OSC School of Forestry had begun to take some tentative steps toward closer cooperation a decade earlier. Those efforts initially focused on the effects of logging on timber and watershed production. At least in this arena of applied research, these state and federal agencies had a common interest in finding practical answers to common questions.

On other matters, relations were often more contentious, particularly between PNW Station and Region 6. Thornton Munger, for example, favored clearcutting over selective cutting in old-growth Douglas-fir. In a paper he presented before the Puget Sound Section of the Society of American Foresters meeting in Seattle on 6 January 1939, Munger criticized Region 6 managers for their tendency to use selective-cutting methods where he thought clearcutting was more appropriate. The Regional Forester reportedly attempted, unsuccessfully, to block publication of Munger's paper.[16]

Relations between the PNW Station and Region 6 improved after Lyle F. Watts, recruited "Hass" Andrews in 1938.

Hoss Andrews wove his career carefully around the rivalries that tended to discourage interagency and, as in the case of Munger's conflict with the Regional Forester, intra-agency cooperation. As of 1948, Andrews' professional background included multiple assignments in the research and management branches of the Forest Service and in academia. He not only worked as Munger's close associate at PNW Station, including a brief stint as acting Station Director, but he also served in various administrative capacities with Region 6, and held an appointment as a research scientist at the University of Michigan. His broad professional networks were especially useful during the flood control survey, an interagency initiative that he helped lead. Relations between the PNW Station and Region 6 also reportedly began to improve after a new regional forester, Lyle F. Watts, recruited Andrews from Michigan late in 1938 to serve as his assistant regional forester in Portland. Five years later, Andrews succeeded Watts as regional forester, a position he held for the rest of his life. When the 1948 flood stimulated a renewed interest in watershed studies, this regional forester could draw on a full career of interagency experiences and professional networks.[17]

[16] Munger's conference paper was entitled "The Silviculture of Tree Selection Cutting in the Douglas-Fir Region," Cowlin, 193-199.

[17] Cowlin, 175-177; "Andrews Joins Regional Forester Staff," Press Release, U.S. Forest Service, 2 Aug 1939, from H.J. Andrews History File, Corvallis Forestry Sciences Laboratory (FSL), PNW Station; "Andrews Named Regional Forester," Press Release, U.S. Forest Service, 26 Feb 1943, from H.J. Andrews History File, Corvallis FSL, PNW Station.

The PNW Station, the Willamette National Forest, and Region 6 created the Blue River Experimental Forest in July 1948.

From the end of World War II until 1948, Forest Service administrators at PNW Station and Region 6 negotiated a compromise arrangement for managing the Lookout Creek drainage. Those negotiations produced a memorandum of understanding between the PNW Station, the Willamette National Forest, and Region 6 that created the Blue River Experimental Forest in July 1948. Regional Forester H.J. Andrews approved the intra-agency agreement on July 7; on July 28, Acting Forest Service Chief McArdle announced the establishment of the experimental forest. McArdle's brief statement was appended to an establishment report that outlined the mission and goals of the new facility. That report, to which McArdle referred in his announcement, observed of the old-growth Douglas-fir forests in the southern and central Cascade Range, "The need for study of problems in this virgin area, relatively untouched by research, is great. Therefore, the conversion of these overmature forests to managed young-growth stands in the most orderly manner with the least delay and most complete utilization of existing material has become one of the primary objectives of the Station." One criterion for selecting a site for the new experimental forest, the report noted, required that it be "large enough so that it will give the answers needed for managing entire watersheds or cutting units." The experimental forest primarily would be used "to test logging methods and techniques on commercial-sized operations." The report, however, also confirmed the interagency origins of the agreement, noting, "An additional objective is to provide a suitable area for the study of forest influences on streamflow, run-off, snow melt, and other hydrology, in cooperation with the U.S. Army Engineers."[18]

Plans for cooperatively administering the Blue River Experimental Forest required representatives of the Willamette National Forest and the PNW Station to meet on the forest at least once each year to review accomplishments and plan future programs. The report specified that the new experimental forest would be devoted primarily to "large-scale experimental cuttings." That managerial mandate was the joint responsibility of PNW Station, the Regional Office, and the Willamette National Forest. The agreement stipulated, however, that any management plans "should specify the removal of approximately 20 million board feet of logs per year for the first 15 years … to fit in with the cutting budget for the Blue River drainage as established by the Willamette National Forest." Signatories to this agreement, in

[18] "Blue River Experimental Forest Establishment Report," 1 June 1948, appended to Memo 29 July 1948 from E.I. Kotok, Assistant Chief in Charge of Research to PNW Station; H.J. Andrews Memorandum of Understanding Folder, H.J. Andrews Files, File Box F, Storage Vault, Corvallis FSL, PNW Station, Forest Service, United States Department of Agriculture. This document includes a copy of McArdle's establishment order, dated 28 July 1948.

chronological order, were J. Alfred Hall, PNW Station Director (21 June 1948); J.R. Bruckart, Willamette National Forest supervisor (6 July 1948); and H.J. Andrews, Regional Forester (7 July 1948). Under the terms of this agreement, PNW Station would determine what to cut and in what order, provided the total cut met these minimum targets. Responsibility for laying out the sales initially fell to Roy Silen, a Research Branch scientist with little seniority in the agency and limited experience laying out sales.[19]

Initial efforts to make the experimental forest a reality at Lookout Creek forced one man into intimate dialogue with the landscape. Silen spent long hours alone in the woods between 1948 and 1953 laying out logging roads and timber-sale units on the Blue River Experimental Forest. By the time Silen arrived at the experimental forest in 1948, production-oriented, scientific forestry was in full swing in western Oregon. In the postwar era, the Forest Service opened public lands to private timber contractors who cut timber in accordance with Forest Service guidelines to implement large-scale clearcuts in old-growth timber, as Munger had previously advocated. Silen followed those guidelines on the Andrews Forest, in keeping with the mandate in the original memorandum of understanding to "test logging methods and techniques on commercial-sized operations." The intent of this policy was to replace slow-growing, older trees with younger and more "productive" stands of scientifically managed timber. Silen had to balance his manager's mandate to produce timber against his scientist's ethic to conduct research and his private ethic as a citizen. As he grappled with these sometimes conflicting priorities during his 5-year career as forester-in-charge at the Blue River Experimental Forest, Silen laid the foundation for a future of cooperative relations among researchers at PNW Station, scientists at OSC, and foresters with Region 6 and the Willamette National Forest.[20]

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[19] "Blue River Experimental Forest Establishment Report," 7; "Agreement between the Regional Forester, Forest Supervisor, and Experiment Station Director …in the administration of the Blue River Experimental Forest," H.J. Andrews Memorandum of Understanding Folder, H.J. Andrews Files, File Box F, Storage Vault, Corvallis FSL, PNW Station, Forest Service, United States Department of Agriculture, 5.

[20] "Blue River Experimental Forest Establishment Report," 1 June 1948. In their early 1990s history of the Willamette National Forest, Lawrence and Mary Rakestraw quoted then-Supervisor of the Willamette National Forest, Mike Kerrick's recollection of the postwar years as "… the years of confidence, when we had our laws and manuals [and were] rapidly converting the forests; we knew what we had to do; we were experts in doing it. The public, for whatever reason, had not got involved. It was fun; we didn't have the controversies you have now—at least that is my recollection." Lawrence and Mary Rakestraw, "*History of the Willamette National Forest*" (Eugene, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Willamette National Forest, 1991[?]), 93.

Figure 6—From the beginning, research foresters with the Pacific Northwest Research Station took a hands-on approach to fieldwork. This 1954 photograph shows Roy Silen working with two assistants (Chew and Gretz) seining a hole below the concrete bridge in Lookout Creek.

Silen filtered Forest Service plans to cut and grow trees on the experimental forest through his own, personal ethic of reverence for the landscape, respectful stewardship over the old-growth Douglas-fir, scientific professionalism, and a sense of duty to the agency and its mission. Silen recalls very few personal reservations as he translated the Forest Service mission to revitalize the postwar timber economy of the Pacific Northwest onto the landscape of the new experimental forest. His low-level position with the Forest Service and the terms of the establishing agreement limited Silen's options for managing the experimental forest, but he did experiment with road location and design, as well as the size, shape, and placing of cutting units. He struggled with severe shortages of manpower, equipment, and supplies, but he also discovered the value of community support. Interpersonal and professional networks helped Silen work around the institutional limitations he faced, and he thereby left a legacy that redefined priorities for subsequent generations of scientists and managers at the experimental forest. Chief among those legacies was an innovative "ladder" road system that made the place more accessible with less disruption to the landscape than the "standard" design for Forest Service roads. He also discovered the value of communicating his ideas directly to forest managers who visited sites on the experimental forest. By the time he left the experimental forest in 1954, Silen had substantially converted the place into an accessible site for applied research. It was a humanized landscape where people could test scientific theories about forests.

Silen could not, ultimately, control the future of the place he had transformed. The Forest Service detached Silen from the experimental forest, renamed it, redrew its boundaries, initiated paired watershed studies, and redefined the mission of the facility between 1953 and 1954. Even as paired watershed studies got underway on the Lookout Creek drainage, Silen moved on to other places and different responsibilities at PNW Station. With his departure, the future of the experimental forest temporarily became an institutional concern rather than a personal priority. Perhaps as much as any other single person, Silen shaped future patterns of land use on the experimental forest, and he established the precedent of rigorous, pragmatic field research that shaped the community culture of future scientists and land managers at this forest. That legacy, like the man and the place, was at once straightforward and complex, but it is perhaps best explained by Silen's simple observation: "I was in love for the place."[21]

Personal and Institutional Traditions Intersect at the Blue River Experimental Forest

Silen brought to the forest local traditions of timber-dependent communities that he absorbed growing up in western Oregon.

Community culture at the experimental forest built on the foundation of personal experience and institutionalized traditions spanning more than half a century, from 1948 to beyond 2000. In one person, Silen brought to the forest local traditions of timber-dependent communities that he absorbed growing up in western Oregon, an emphasis on applied research derived from his training in the OSC School of Forestry, close ties with New England academies of higher education, and the progressive ethic of applied research and scientific management that he absorbed on his first professional assignment at PNW Station. His personal background was deeply rooted in the interwar years of economic development in Coos Bay, Oregon—the logging and shipping community where he was born and raised through high school.[22] He graduated from North Bend High School in 1937, and then worked for 2 years with a logging company as a bookkeeper. The timber

[21] Interview with Roy Silen 9 September 1996, 25-26.

[22] Interview with Roy Silen 9 September 1996, 1. For a profile of the timber-dependent community of Coos Bay, Oregon, in these years, see William G. Robbins, *Hard Times in Paradise: Coos Bay, Oregon* (Seattle: University of Washington Press, 1988).

industry, he recalls, was an obvious career choice for a young man of his background: "[There] couldn't be any other job." After an abortive effort to pursue secondary studies elsewhere, he went "back to woods" in Oregon, where he attended OSC, majoring in forestry.[23]

Silen's forestry career took an abrupt detour into federal service during and after World War II, and he secured a position with PNW Station by 1946. The work environment at PNW Station encouraged relatively close, daily interaction among senior managers and staff, and this raw recruit worked directly with the former Station Director, Thornton Munger. Silen credits the camaraderie of coffee-room gatherings for promoting an atmosphere of informal exchange among junior and senior colleagues at the Station in those postwar years. He carried that style into his interactions at the experimental forest when he was assigned there as "Research Forester-in-Charge" after working barely 2 years at the Station.[24] As a person who grew up during the depression and served with the infantry in Europe, Silen brought a pragmatic ethic of "making do" and "toughing it out" to his career as a scientist with PNW Station, and he built that ethic into the community culture at the experimental forest from 1948 to 1954. In his Army reserve days near North Bend, early in the war, for example, Silen recalls how an ill-conceived Forest Service effort to economize on the cost and weight of field equipment placed him with a colleague on a mountain peak in experimental sleeping bags. The bags were made of paper, and they generated more noise than warmth. Late at night, as the temperature dropped at high elevation, Silen and his friend improvised: They taped the bags together so they could keep each other warm and survive the night.[25]

The war diverted funding and labor to military programs, even as it created new markets for construction-grade timber from the forests of the Pacific Northwest. The Station struggled through a major labor shortage as workers were called away for military service and depression-era programs ended. More than 85 percent of the remaining resources at the Station went to support projects directly related to the war effort.[26] Amidst wartime rhetoric warning of a need for improved forest protection,[27] Station personnel diverted their energies to a "Douglas-fir job

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[23] Interview with Roy Silen 9 September 1996, 1.

[24] Andrews group interview 22 September 1997, 53-54. Interview with Roy Silen 9 September 1996, 2-3.

[25] Andrews group interview 22 September 1997, 3-4.

[26] Cowlin, 219-228.

[27] For examples, see the *Oregonian*, 17 May 1942, 02 May 1943, 03 May 1943.

classification study." That work identified more than 188 distinct job classifications in the logging and timber industries of the Pacific Northwest considered vital to securing timber resources for the war effort. Station scientists also cooperated with colleagues at the Oregon State College School of Forestry and the Oregon State Board of Forestry to publish *Forest Resources of Oregon*, including an assessment of forest protection and management issues. Despite these concerns, however, funding shortfalls during the war forced administrators at PNW Station to temporarily close experimental forests at Blue Mountain, Port Orford, and Pringle Falls.[28]

By the last year of the war, plans for postwar building ran up against limited supplies of lumber, and public attention focused on the valuable timber resources on the national forests. As the war ground to a close, the Forest Service faced a host of forest management problems. The Sustained Yield Forest Management Act of 29 March 1944 revised the federal mandate for the agency, and administrators at PNW Station responded by reassessing research needs and potential uses for experimental forests.[29] As the ongoing war continued to drain human resources and distort budgets, the Forest Service retrenched, and between 1944 and 1946, a new Station Director, J. Alfred Hall, reorganized the PNW Station. Hall refocused Station resources on research centers committed to the principle of field-testing experimental theories with commercial-scale logging. This model prioritized applied research and required Station administrators to establish or identify large experimental forests that represented a specific forest type. They expected research programs at each facility to address management concerns related to commercial-scale logging in forests of that type. The PNW Station research priorities in 1947, for example, called for studies on how best to manage second-growth Douglas-fir in western Washington, old-growth Douglas-fir and spruce-hemlock in western Oregon, and ponderosa pine in central Oregon. These plans required Station

[28] Cowlin, 237-240. McPhail, "The Supplements to the Station History, 1944 through 1953," 9.

[29] The stated purpose of the Sustained Yield Act was to promote "the stability of forest industries, of employment, of communities, and of taxable forest wealth through continuous supplies of timber." In the Pacific Northwest, which had emerged as a vital source of timber during the war, this mandate to manage for continuous supplies implied the need to study how PNW forests responded after harvest. Cowlin also notes that scientists at PNW Station also benefited from a general climate of renewed respect for professional expertise in the postwar era, as wartime experiences displaced depression-era suspicions about the industrial economy. Cowlin, 243; McPhail, "The Supplements to the Station History, 1944 through 1953," 1.

administrators to locate new experimental forests with large acreages of the appropriate species within a larger expanse of national forest lands that were accessible to logging. The PNW Station lacked sufficient experimental forests to support this model when the reorganization went into effect in 1947, and Station administrators adopted a two-pronged, fall-back strategy. On the one hand, they negotiated cooperative agreements to establish long-term studies on private, state, and other federal forests. On the other hand, they escalated plans to establish new experimental forests administered directly by the Station. During this period of readjustment, the Station reopened three experimental forests closed earlier in the war, and Hall also negotiated the intra-agency agreement to establish the experimental forest at Lookout Creek.[30]

Cooperative arrangements among PNW Station, Region 6, and Oregon State College, in the context of the postwar priorities of 1948, built from the premise Munger first laid down in 1924: forest research should address issues of immediate economic importance, and the national forests should be managed for efficient timber production. Bob Tarrant, a soil scientist who joined the Station the same year as Silen, was the Station Director who had to confront the environmental legacy of this policy some 30 years later. He recalls that through World War II, "the bulk of the research" had to do with "What's in the nation's woodpile? How much is there?" In later years, Tarrant argues, the ecological implications of that outlook took the Station leadership, including himself, somewhat by surprise.[31]

Bob Tarrant, recalls that through World War II, "the bulk of the research" had to do with "What's in the nation's woodpile? How much is there?"

In this period of shifting federal mandates, administrative changes at PNW Station, and interagency initiatives, Silen drew on the resources of his research colleagues as he worked to transform the experimental forest from an agreement on paper to a reality on the ground. Despite his relative inexperience, Silen brought impressive credentials to the new experimental forest. He had recently returned to PNW Station from an educational leave to attend Yale, where he earned a master of forestry degree from the premiere forestry school in the country. Perhaps more importantly, however, PNW Station offered expert advice. Under the new administrative structure, Silen's immediate superior was Robert Aufderheide, who transferred from the Siuslaw National Forest in November 1946 to head the newly

[30] Cowlin, 255-259.

[31] Andrews group interview 22 September 1997, 24-25.

established Western Oregon Research Center at Corvallis. Aufderheide was one of several people who joined the Station that year and later became prominent leaders in the Forest Service. This leadership cohort supplied crucial support at a critical stage in the development of the experimental forest and the research community linked with that place. Briegleb, for example, rejoined the Station in 1946, after a 3-year stint in Chile and at the Northeastern Forest Experiment Station, to head the PNW Station Division of Forest Management.[32]

Aufderheide's philosophy of immediately applicable research, Silen suggests, directly guided his own early efforts at the Blue River Experimental Forest. As cutting escalated on the Willamette National Forest after 1946, Silen recalls, the forest supervisor and his staff shifted management priorities from fire to timber management. The problem, Silen notes, was that the Forest Service "was very ill prepared for this level of cutting." Up until this time, agency managers generally laid out only the rough boundaries of staggered-set units in a timber sale, and the contractor who successfully bid for the sale handled the details of road design, landings, and extraction of timber, with very little oversight from Forest Service officials. Aufderheide, however, was convinced that the Forest Service should not let the loggers lay out the cutting pattern, because, as Silen recalls, "they had no idea what silviculture really meant." Aufderheide argued that the location and design of roads and landings were vital to silvicultural planning.[33]

The production quotas stipulated in the establishing agreement for the experimental forest, together with the Station's emphasis on studies of commercial-scale logging, meant that Silen was primarily a forest manager at Blue River. He adopted as his operational guide the philosophy that Aufderheide brought over from the Management Branch: long-term planning and careful implementing of a comprehensive logging plan would shape the entire future of a forest. In keeping with that management philosophy, Silen developed a system of roads and logging units that eventually distinguished the Lookout Creek drainage from other experimental forests managed by the Forest Service in this period (see sidebar 1.2). Silen also worked with Robert H. Ruth, his counterpart at Cascade Head Experimental Forest, and Aufderheide to incorporate their ideas into a PNW Station publication, *Getting More Forestry Into the Logging Plan*. That publication, he recalls, "was the best seller in the Station for several years."[34] Silen stresses, however, that Aufderheide

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[32] McPhail, "The Supplements to the Station History, 1944 through 1953," 1-3.

[33] Interview with Roy Silen 9 September 1996, 3-4.

[34] Interview with Roy Silen 9 September 1996, 4.

was the driving force behind his efforts to implement those ideas on the Blue River Experimental Forest, and that his position at the forest had more to do with his practical training at Oregon State College, and 1 year of experience working under the tutelage of Leo Isaac, than with his own ideas or theories about silviculture.[35] He also notes that the ideas he used at Blue River Experimental Forest in the late 1940s and early 1950s were not unique and resembled those guiding Bob Ruth at Cascade Head Experimental Forest during the same period. Ruth, however, had to contend with the legacy of more than a decade of management activities and an existing road structure at the Cascade Head facility. Silen enjoyed the relative luxury of laying out the original road system at the Blue River site. He recalls that his initial planning for management activities included a personal commitment to long-term involvement in monitoring those activities over 30 to 50 years: "I felt that I would have a rather permanent spot here. I was prepared to do it."[36]

Silen began, in 1948, his own gradual, personal journey from a jobs-and-recreation Forest Service employee who actively pursued social ties with the local community in Blue River, to a professional steward of aesthetic, physical, and scientific resources at the Blue River Experimental Forest. That personal transition happened in an era when institutional support for long-term, commercial-scale, place-centered, field-oriented research at PNW Station was both recent and eroding. Initial plans for the Blue River Experimental Forest virtually ignored those aspects of local community that Silen recognized as helpful, and plans for the facility casually ignored any potential effects on local residents. Public sentiment about the new experimental forest was not explored, or invited. The Forest Service acted on the assumption the local community would naturally support an experimental forest, or at least would not oppose it.

The agency's characterization of the physical and biological resources of the forested slopes was similarly impressionistic and dismissive. The initial establishment report for the new experimental forest, for example, explicitly addressed both recreational and wildlife matters, and rejected them as insignificant concerns. It claimed, for example, "There is no recreational development on the proposed area nor is any contemplated. The only recreational use this area has ever had is a small amount of trout fishing in Lookout Creek and in the fall an occasional deer hunter." The report further noted the presence of "the usual animal and bird life found in the

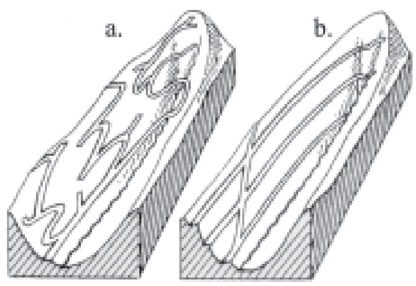
[35] December 1992 discussion with Roy Silen, 18-19.

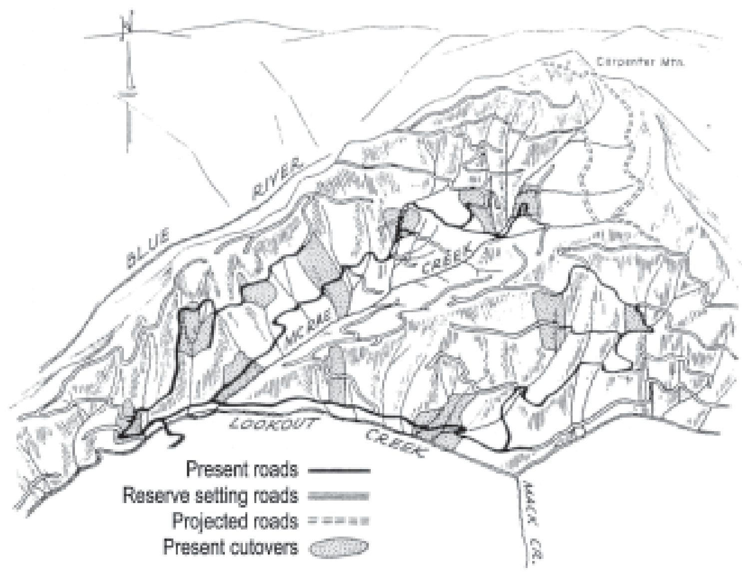
[36] Andrews group interview 22 September 1997, 33. Interview with Roy Silen 9 September 1996, 18-19.

Sidebar 1.2: Roads in the Watershed

The Issue: As roads were first developed in Forest Service lands of the Pacific Northwest in the late 1940s, they were viewed as a practical, engineering matter. The early issues were about how to develop the road system efficiently while minimizing water runoff, sediment from landslides, and erosion of bare soil associated with road building. Managers' experience and systematic study showed that improving road location, design, and maintenance could reduce the adverse effects of roads on watersheds.

The Roots: Water supply was the primary concern in the Organic Act that established the Forest Service. That the bare soil created by road building should raise concerns in watersheds previously entered only on foot and horseback comes as no surprise. Roy Silen recognized the importance of these issues, making them a major theme of his work at the Andrews Forest in the early 1950s. As the road system grew and was tested by major storms, the issue of the roads' effects on the watershed was repeatedly rekindled. The decline of timber harvests on federal lands over the 1990s has triggered a synthesis of knowledge about roads and a reassessment of Forest Service road policy and management.





Above, Two road patterns: a. Random development; b. Single climbing road with others on levels roughly parallel to valley bottom road.
Right, Systematic road pattern used on the north side of Lookout Creek. Road levels are distinct, and climbing roads are minimized. Road density is lower and yarding improved relative to a random road pattern. Figures from Silen 1955.

The Approach: Early work on roads included designing road-network layouts to find efficient, environmentally cautious patterns (Silen 1955). The first real test of the road network by a big storm came in the December 1964 and January 1965 floods, which triggered dozens of landslides. Ted Dyrness (1967) used an inventory of slides in forest and road areas to assess the extent of road effects on soil erosion and landslides. In the late 1990s, road studies took a landscape ecology perspective to address more rigorously how road location affects the watershed, including water supply and quality, erosion, and movement of exotic plants into the landscape (Jones et al. 2000, Wemple et al. 2001, Wemple and Jones 2003). Simple observation and sketches of alternative road layouts have given way to emphasis on highly quantitative studies of processes, experimentation, hydrologic modeling, and use of geographic information systems.

Results: Information needs for management and policy formulation have provided major impetus for new research. Roads were first approached as an engineering issue, but by the mid-20th century, watershed and ecological aspects of roads became prominent. As emphasis shifted from developing roads to reducing road mileage and to watershed restoration, the balance tipped from engineering to ecosystem perspectives in managing road systems. More recent studies have influenced plans for modifying road systems with a strong emphasis on restoring watersheds and reducing costs of maintaining roads. A "science" of roads began to emerge in the late 1990s, evidenced by a set of international symposia on road ecology and road hydrology and a major book, *Road Ecology* (Forman et al. 2003). Important advances in science come from studies of hydrological and ecological processes associated with road networks and their interactions with forest landscapes and stream networks.

Cascade Mountain region although neither is abundant." Finally, at a time when the Forest Service did not even have detailed descriptions or maps of Lookout Creek drainage, the establishment report nevertheless concluded, "The deer population is very light due primarily to the lack of suitable forage in dense timber stands. … Getting logging operations underway will greatly improve forage conditions."[37]

The Forest Service saddled the new experimental forest with a contradictory mandate.

The Forest Service saddled the new experimental forest with a contradictory mandate. The agency's stated goal of modeling commercial-scale logging efforts was in direct conflict with its fledgling natural area program. Forest Service policy in 1948 called for designating a portion of each experimental forest as a natural area, but the establishment report for the Blue River facility noted a lack of "sufficient detailed examination" to make such a determination. It further observed that the Willamette National Forest "has under consideration other proposed Natural Areas in this locality. The establishment of the Blue River Experimental Forest will probably make it unnecessary to have any additional natural areas in this general vicinity." The accompanying management plan for the new research forest, however, specifically required an annual production of 15 to 20 million board feet of logs from the Lookout Creek drainage over the first decade of the experimental forest (1948-1958).[38]

Silen notes that the contradiction in purposes at the Blue River facility was more apparent than real. Everyone knew which mandate took priority for onsite implementation. Where plans to log the experimental forest at an accelerated rate conflicted with the claim that this research facility negated any further need to designate natural areas on the Willamette National Forest, Silen's mandate was clear. He recalls that Bruckart, the Willamette forest supervisor, was "going after the record for cutting more timber than any other National Forest," and he refused to relinquish control over the Lookout Creek drainage until the Station agreed to log the maximum allowed under the management plan. Silen argues that, as a relatively inexperienced forester with less than 2 years with the Station, he could do little other than follow orders.[39]

Roy Silen's modest assessment of his accomplishments at the experimental forest understates the theory and methods of progressive forestry in the postwar era. Research foresters of that period diligently generated data that supplied professional forest managers with the details they needed to represent extensive timber

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[37] "Blue River Experimental Forest," 1a, 6.

[38] "Blue River Experimental Forest," 8.

[39] December 1992 discussion with Roy Silen, 1.

harvests as "scientific" forestry. The stated goal was to convert "degenerate" forests of old-growth Douglas-fir into "productive," managed stands of second-growth timber. Few professional foresters questioned this characterization of old-growth forests in the late 1940s and early 1950s, and both Silen and Tarrant agree with Ted Dyrness' later observation that scientists at PNW Station accepted this premise without qualm or question, well into the 1960s.

In an era when the job-conscious concerns of the depression years still burned fresh in the memories of these scientists, the forest was a place for productive work that would transform and improve both man and nature. At Lookout Creek, between 1948 and 1955, Roy Silen led a skeletal staff on a mission that combined the managerial impulse to change the face of the land and the scientific compulsion to study the consequences of those changes. The unrelenting work ethic and energetic enthusiasm that Silen brought to his mission, however, also introduced him to the forest on a more intimate level. By the end of his assignment there in 1954, he found himself more attached to the forest he had first encountered than to the forest he helped re-create. By 1954, he recalls, he was selling timber all the way up Lookout Creek, "almost to the head of McRae Creek and up to the head of Mack Creek." Describing his decision not to go back after he left the place, he observes, "It's kind of a personal thing. You get to where you love a piece of country and you don't want to see it hurt, you know. I love that piece of country." In his mind, Silen remembered the place he first encountered as a "forest primeval": "I don't know how many people have actually been in primeval conditions, but here's an example of what you could find on the Andrews: The crew that surveyed the access road had worked as far as McRae Creek, so that area had been fished some. Beyond McRae Creek, I remember one time going down to a fairly deep hole coming in from the south side and looking over this bank 4 or 5 feet into this hole, which had a lot of logs in it fairly deep, I took a little twig and tossed it out there. It looked just like a fish hatchery as fish streaked toward the spot from all directions—you don't see that anymore. I don't know where in the world you would see that anymore."[40]

[40] December 1992 discussion with Roy Silen, 2-3, 4 -5; interview with Roy Silen 9 September 1996, 16; Andrews group interview 22 September 1997, 19, 24.

Work and Community at the Blue River Experimental Forest, 1948–1953

The Blue River Experimental Forest was as much vision as reality during the first 2 years Silen worked alone at his job at the site. During those years, Silen lived as a bachelor in a trailer at Belknap Camp, and he walked to work in the Lookout Creek drainage. At the time, no improved roads or trails led into the valley of the experimental forest. The closest access road in 1948 stopped just short of the south side of Lookout Ridge, where a timber sale brought a road almost to the top of the ridge near the sites later designated watersheds 1, 2, and 3.[41] Silen recalls that the 4-mile hike to Frissell Point from McKenzie Bridge was a grueling climb on a steep, hot, dry, south-facing slope that exhausted even his dog, Rusty, who he acquired to keep him company in the field.[42] Silen ate breakfast and supper with the family of a plumber who lived in McKenzie Bridge, and his local renown as "the plumber's friend" was a more likely basis for recognition in the community than his work on the forest.[43] McKenzie Bridge was a close-knit community with an extended, seasonal pattern of rotating invitations to dine with local families through most of Silen's tenure at the Blue River Experimental Forest. He recalls, "I got plenty from the community. … we were all waiting for school starting and the roads, particularly when the roads closed over the pass. And then the social season started. Everybody visited everybody else. …"[44]

The snow-bound isolation of McKenzie Bridge in winter cemented Silen's ties with local residents.

The snow-bound isolation of McKenzie Bridge in winter cemented Silen's ties with local residents, but people in that community were largely oblivious to his purpose on Lookout Creek and the town was remote from the forest. Even official visitors from the upper echelons of the Forest Service seemed mostly interested in the local color at McKenzie Bridge in the early 1950s, which included evening poker games in Silen's trailer and fishing on the McKenzie Fork. Silen recalls, "Oh yeah, … I had numerous Washington Office visitors wanting to see this wonderful work that was going on on the Andrews Experimental Forest as long as it involved opportunities to fish and play poker."[45]

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[41] December 1992 discussion with Roy Silen, 1-3; interview with Roy Silen 9 September 1996, 16-17.

[42] Andrews group interview 22 September 1997, 30.

[43] Andrews group interview 22 September 1997, 3.

[44] Interview with Roy Silen 9 September 1996, 15.

[45] Interview with Roy Silen 9 September 1996, 14-15.

Silen himself largely avoided the experimental forest during his off-hours, preferring recreational pursuits, especially fishing, closer to McKenzie Bridge, and effectively maintaining a distinct separation between work and leisure.[46] He reserved the Blue River Experimental Forest as a site for productive work in the woods, and it was the locale for his strenuous efforts to lay out timber sales between 1949 and 1954. Silen's solitary work, however, was a central part of his life, and forays into the forest were often prolonged expeditions that offered their own rustic rewards. On a typical Monday morning, he would "go out with the pack. Pack all the way out to the falls, and walk across the canyons on windfalls." Then he would set up a 9- by 12-foot "silkolene" fly, roll out his sleeping bag, take the food down to the creek, and place it underwater in big pots with rocks piled on so bears would not get into it. He concludes, "You could say I spent some of the best days of my life out there."[47]

Working conditions at the experimental forest were dangerous and lonely, even after Hank Gratkowski joined Silen in 1951 to assist him in laying out the timber sales. Silen and Gratkowski often spent the entire day apart, each alone in the forest and far from assistance. Silen recalls one harrowing experience when Gratkowski got lost near Carpenter Saddle while working with an analog barometer and air photos, in an effort to develop the first detailed contour map of the Lookout Creek drainage. The process involved pinpointing a location on the air photo, going out there to record 15 minutes of barometric readings to correlate with concurrent barometer records at a base camp, and then repeating the process at other points around the valley. Silen directed Gratkowski to a point on Blue River Trail where he could follow a ridge out to a good picture point, but Silen mistakenly sent him out on the wrong ridge where the photo reference point didn't match the actual terrain. Gratkowski figured out the problem after about an hour and a half of confusion, but the delay put him behind schedule for the rest of the photo points that day, and he missed a planned rendezvous with Silen in the late afternoon. Silen became increasingly concerned as the daylight hours slipped away. He recalls, "We were supposed to meet at this little lake in this basin down here. … I came all the way up to Carpenter Mountain and back down, and reached the lake about 5 o'clock . … I expected Hank to be there before me, because he had a shorter leg [of scheduled hiking]. No Hank. And it got more and more nerve-wracking to think that he might

[46] Andrews group interview 22 September 1997, 16.

[47] December 1992 discussion with Roy Silen, 1-3; interview with Roy Silen 9 September, 16-17; Andrews group interview 22 September 1997, 16.

be injured out there." As darkness descended, Silen decided he would have to wait until morning and then go out and search for Gratkowski. He headed up out of the basin onto the trail on Blue River Ridge, and was just beginning to head down the trail in the direction of Blue River, when he gave "one last yell." Gratkowski responded from way down at the bottom of the Lookout Creek valley, and Silen waited for him to climb up to the trail on the ridge. As Silen recalls, "It must have been after 7 o'clock when we started down the Blue River Trail, and it got quickly dark. … we just had to make our way in the dark. You could feel the trail. … 7 or 8 miles! … all switchbacks and everything. We made it!"[48]

Science and Community at the Blue River Experimental Forest, 1951–1955

Gratkowski's dogged determination to find the correct photo location and then complete the full cycle of readings despite the impending gloom of twilight epitomized the spirit of these early years of effort at the Blue River Experimental Forest. His 8-mile stumble through the dark with Silen as they struggled out of the wilderness into the primitive comforts of a base camp is also an apt metaphor for the nature of forest research in that time and place. They were engaged in a process of redeeming a usable resource from a landscape Silen describes as a "forest primeval." Mapping, delineating, and cross-referencing the landscape was the first step in the journey from a perceived wilderness to a managed forest, and these early research foresters mostly operated in a vacuum of professional interest from colleagues in forest management. Their primary directive was simply to "get the cut out." As motivation, they relied mostly on their own blind faith in the long-term value of the work and on their professional commitment and passion for research. In the short term, Silen paints a picture of unrelenting, hard work that was largely unappreciated: "We were aiming our research to be used by the Forest Service, and … they weren't a very ready customer."[49]

They were engaged in a process of redeeming a usable resource from a landscape Silen describes as a "forest primeval."

Silen's close ties with former Forest Supervisor Aufderheide, however, eventually ensured that the experimental forest was drawn closer to the center of management concerns in Region 6. That was especially true after Aufderheide resumed his career in forest management, first as forest supervisor of the Umpqua National Forest in 1950, and later as Forest Supervisor of the Willamette National Forest

[48] Andrews group interview 22 September 1997, 17-18.

[49] Andrews group interview 22 September 1997, 43.

from 1954 until his death in 1959. Both Silen and Aufderheide, a graduate of the Oregon State College School of Forestry who spent his entire Forest Service career in the Pacific Northwest, were avid fly-fisherman who frequented the McKenzie. Their personal connection established a tradition of close relations between PNW Station scientists who worked at the experimental forest and this forest supervisor.[50]

One of the practical research issues that began to interest forest managers in the immediate postwar era involved problems with reforesting after clearcut logging. As timber harvests in the region advanced southward from the Columbia River and into higher elevations in the Cascade Range, forest managers noticed a dramatic increase in the percentage of logged land that did not naturally regenerate. The failure to regenerate stands of marketable softwoods by natural means meant that broadleaf species rapidly displaced conifers. People and their actions reshaped forest succession. Silen observes that early forest researchers assumed that a logged stand would re-grow in natural succession, starting with annuals, then perennials, then broadleaf brush, then conifers. On about 30 percent of the acreage of Douglas-fir forest logged after World War II, however, broadleaf brush was a lasting stage.[51] This concern, together with watershed issues highlighted in the aftermath of the 1948 floods—and Silen's college training in forest management and forest engineering—guided early efforts to develop a comprehensive logging plan for the Blue River Experimental Forest.

Given the scale of expected timber yields from the Lookout Creek drainage, one of Silen's more important decisions was not *what* to cut, but in what *order* to schedule logging of existing stands of old-growth Douglas-fir. Timber cutting plans set one goal for the entire Blue River watershed for the period 1949 to 1964, but the Army Corps of Engineers' snow laboratory, which encompassed drainages in the Blue River watershed adjacent to the experimental forest was exempt from any cutting between 1947 and 1957, as specified in the Army's cooperative agreement with the Willamette National Forest. The Blue River Experimental Forest was expected to make up the difference. The cooperative agreement governing the establishment of the experimental forest spelled out how it would happen and how it would be enforced: The PNW Station Director agreed to subordinate research interests to production goals and to acknowledge that "… to fulfill obligations

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[50] December 1992 discussion with Roy Silen, 2-3. Rakestraw, 95; interview with Roy Silen 9 September 1996, 3-4.

[51] Silen, R.; Doig, I. The care and handling of the forest gene pool. *Pacific Search*. 10(8): 7-9. Cowlin, 275-279.

incurred in accepting access road money for opening up the Blue River watershed it is necessary that the full cut for the next 15 years come from the Lookout Creek drainage according to the plans contemplated prior to the designation of this area as an experimental forest." The Director further agreed to develop " … experimental cutting plans for the Blue River Experimental Forest so that this planned rate of cutting can be maintained in an orderly fashion." In the event PNW Station failed to meet those goals, the agreement authorized the supervisor of the Willamette National Forest to make "regular timber sales," completely bypassing the PNW Station's protocols, if necessary.[52]

Through 1959, the research forester-in-charge at the experimental forest was responsible for planning and initiating management activities but lacked the power to control or enforce guidelines governing how to implement those plans. The supervisor for the Willamette National Forest wielded final control over all management activities on the Lookout Creek drainage, including negotiations on sales or permits, but he could designate "some properly qualified member of the Station staff" to fulfill this function, subject to his approval. In a small concession to PNW Station, the agreement required the forest supervisor to furnish the Station Director with a copy of all agreements and plans. The agreement also included restrictions on control over receipts from timber sales, which were to be "collected by and credited to the Willamette National Forest." In addition to timber sales, this restriction extended to all receipts from the sale of grazing permits, firewood, or other special uses. Research personnel were responsible for initiating and supervising all experimental work, but requests to make timber sales or issue permits for grazing or other special uses were to be routed through the Station Director to the Forest Supervisor.[53] Silen adapted to this combination of responsibility without authority by developing and nurturing a network of support among forest managers, loggers, and the local community, to supplement his links with PNW Station.

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[52] "Agreement between the Regional Forester, Forest Supervisor, and Experiment Station Director …in the administration of the Blue River Experimental Forest," H.J. Andrews Memorandum of Understanding Folder, H.J. Andrews Files, File Box F, Storage Vault, FSL, Corvallis, 3.

[53] "Agreement between the Regional Forester, Forest Supervisor, and Experiment Station Director [1948]."

Jack Rothacher in March 1964

Figure 7—The Army Corps of Engineers constructed this 8- by 8-foot cabin on the upper Blue River in the early 1950s, hauling building materials in by pack train from Santiam Highway. Located just outside the H.J. Andrews Experimental Forest (Andrews Forest), the cabin was a satellite refuge for workers who supported a nearby gaging station as part of the Corp's snow study. After the Corps abandoned the facility in 1957, researchers with the Andrews Forest thereafter maintained records from the site until the flood of 1965 destroyed the gaging station. Dick Fredriksen is the Pacific Northwest Research Station researcher in the photo.

Experimental Priorities for Roads, Watersheds, and Regeneration

Personal and professional networks enabled Silen, in a span of less than 5 years, to design and implement a system of roads and landings on the Lookout Creek drainage. The system he implemented included experimental culvert designs, routes, and locations intended to minimize erosion and sedimentation in streams adjacent to cutting units. One important advantage of this strategy was that it often minimized the miles of road per square mile because all timber harvests could be done from parallel, level roads.[54] He based this "ladder-road" system on what he had observed from other logging road sites, where runoff problems were most serious on climbing roads, and where the level, connector roads had fewer problems. At Blue River Experimental Forest, where he had the luxury of designing all the roads, he could locate them anywhere he wanted, and he designed a plan that simply avoided the steeper parts. He also initiated experimental cutting units of

[54] Interview with Roy Silen 9 September 1996, 10.

larger and smaller acreages and in unusual shapes to study the effect those variations had on natural regeneration.[55] Some of his other studies measured seedling mortality in areas subject to slash burning after logging. He developed close working relations with a logging contractor who successfully bid on virtually every experimental sale,[56] and his road system won grudging respect from initially hostile forest managers and loggers, as well as later scientists at the experimental forest. Logging contractor Mike Savelich was one of six contractors who toured the proposed site before Sale 1, but Silen recalls Savelich outmaneuvered other bidders and effectively secured a working monopoly on experimental sales at Blue River Experimental Forest: "He contracted with Associated Plywood, and as I understand it, he had quite a thing going on." Silen explains that when Savelich bid against other contractors on various timber sales, "He was a good poker player, and he'd never get stuck with the sale, he would always bid the price up a little higher than … some [bidders] really wanted to pay, and then he got out of the bidding." To avoid the higher costs that Savelich was forcing them into, Silen recalls the other contractors made a deal with Savelich that he would get all the sales out on the experimental forest, provided he stopped bidding against them on sales elsewhere on the ranger district.[57]

The research that Silen accomplished while pursuing his management goals was the product of a prolonged effort to reconcile elegant theory with ugly fact. Silen observes, for example, that Aufderheide's idea to complete the logging plan for the entire drainage before opening the first sale was unrealistic, given the governing agreement and its imperative for immediate returns from timber. Silen's effort to lay out an initial sale in 1948, moreover, failed to attract a single bid. He argues that this failure was fortunate because he was able to adjust the logging plan to minimize the effect on watersheds near the confluence with Blue River. The proposed sale would have interfered with the paired watershed study later implemented on the three small watersheds there. The initial failure delayed Silen's first

He was able to adjust the logging plan to minimize the effect on watersheds near the confluence with Blue River.

[55] Andrews group interview 22 September 1997, 32-33. December 1992 discussion with Roy Silen, 3-4.

[56] Andrews group interview 22 September 1997, 1. Blue River Sale 1 was shown on 13 Dec 1949 to representatives from 6 companies: Cliff Pool of South Fork, Wayne Hale of Hale Brothers Logging Company, Brown Ziolkowski of Springfield Plywood, Roy Cronk of Springfield Plywood, S.A. Cuttyback of Cuttyback Logging Company, E.J. Nyholm of Associated Plywood, and Mike Savelich of Savelich Logging Company. Britt Ash, Rex Wakefield [Forester, Willamette Forest, Eugene], and Roy R. Silen represented the Forest Service at the showing. Memo 14 December 1949 from Roy R. Silen to Britt Ash, Ranger, McKenzie Bridge. Sale 1 Folder, H.J. Andrews Files, File Box C, Storage Vault, FSL, Corvallis.

[57] Andrews group interview 22 September 1997, 24-25.

successful sale until his second year at the experimental forest (1949). This later success, which Station records designate "Sale #1", required the logger to build the road system into the area up to 3,000-feet elevation. Silen adhered to the spirit, if not the letter of Aufderheide's vision. He notes, "We actually laid out about 80 million board feet of … area to get 20 million board feet [for harvest], because we … would have a complete layout of the sale for the entire area before we sold the units that would go out first. … we cut one unit out of four, … so that you were completely surrounded by timber each time."[58]

Any hopes Silen harbored that foresters would translate his applied research into management policy on the Willamette National Forest depended on opening channels of communication with lower level administrators like McKenzie District Ranger Brit Ash. Some administrators higher in the Willamette National Forest and at Region 6 were openly hostile to ideas Silen introduced at Blue River Experimental Forest. He observes, "It was a relationship that started off badly with [Forest Supervisor Bruckart] watching that cut [the failed first sale]. He was not friendly to the effort there and they watched every move I made." Personal and political issues aside, the elegant ideal of laying out 100 percent of the drainage before initiating sales collided with the ugly fact of limited fiscal and human resources at the McKenzie Ranger District. Forest managers viewed the plan with some skepticism because safety considerations prevented them from requiring their people to work alone in the field without support, as Silen often did. In practice, Silen and Gratkowski laid out timber sales on the experimental forest with far fewer human or fiscal resources than district crews typically deployed for sales of similar scale, but they struggled with difficult working conditions that imposed limits on the accuracy of their work. Sale layouts were always well beyond the last road into one of the watersheds on the experimental forest, and Silen or Gratkowski had to walk in at least a mile or more before they began to lay out the sale. They prepared packs supplied with everything they needed for a week in the field and then carried those packs 2 or 3 miles into the forest before establishing a base camp for that week. They organized their equipment to do everything in one-man crews. Using a stapling gun and aluminum tags, they ran a survey line by stapling a tag to a tree, and then tilting it so the reflection could be seen from a distance. That system permitted them to run a "p-line" (preliminary line) without the usual surveyor's assistant. At the end of each leg of the p-line, they stapled

[58] Interview with Roy Silen 9 September, 7.

up a tag and began the process for the next leg. Rather than using a chain, they surveyed the 10-chain lines with a 10-foot pole for a rough estimation that, Silen concedes, was "a little off in places."[59] This system was sufficient for Silen's needs, but the national forests held district rangers to a stricter standard, and implementing Silen's 100-percent proposal while adhering to those standards would have required about three times as many people to lay out each sale.[60]

Silen often struggled to reconcile his scientific impulse to be precise with his mandate to efficiently and expeditiously manage timber sales on the experimental forest. His work with Gratkowski demonstrated ingenious strategies and methods for minimizing both time and expense, but his road standards taxed the patience of forest managers hard-pressed to simply "get the cut out." He could count on himself and Gratkowski to maintain strict quality controls, even while using rough methods and tools. District rangers who managed a large staff with a more diverse commitment to quality control could not expect that all of their employees would successfully implement Silen's methods without close supervision. Silen concedes, "It wasn't that there was anything wrong, it was just they were objecting to a slowdown. I was starting strip clearcuts and small clearcuts to try to find more reliable methods for natural regeneration, but it was interpreted as the way future cutting was proposed."[61] Silen did manage to implement the ladder system of roads despite some initial friction with Ash, who regularly reported Silen's activities to the Regional Forester. Silen commonly complicated his sale layouts with requirements that carefully kept any activity out of the "leave" units between clearcuts. Any salvage sales within those leave units required logging with mobile yarders from very low-grade roads to minimize sedimentation problems. Silen recalls Ash "was just, almost an enemy when I came here [laughing]." He claims that Ash, however, was a grudging convert to Silen's road design. Some years after he was reassigned to Alaska, Ash returned to the experimental forest for a visit, and Silen recalls the former district ranger told him, "You know, before I left, I began to see some sense of what your program was going to be, but before that,' he says, 'I was just against it. The things you were doing, we were already doing, and you were trying to say you were doing them better, and we couldn't see it.'" The problem, Silen explains, was more in the timing than in the personalities involved:

[59] December 1992 discussion with Roy Silen, 9-10.

[60] December 1992 discussion with Roy Silen, 6-7.

[61] Communication from Fred Swanson 28 January 1998; December 1992 discussion with Roy Silen, 7.

"You can't get something going in a year or so, it takes 3 or 4 [years], and by that time, … I think we had a superior road system in, and … we had as much planning going into the leave units as we had going into the cut units, and we could tell them, this was something that the National Forest didn't do at all."[62]

Silen struggled to reconcile his research goals with the limited resources available for sale layouts on the experimental forest and with the federal guidelines governing road design on national forests. A professional relationship of grudging, mutual respect with the logging contractor on those sales (Savelich) helped his cause. Silen argues that existing standards for roads on Region 6 in the early 1950s lacked clear direction or coherence, and he concluded, "if I'm going to improve sale layout and do it with minimum impact, these standards are in the way."[63] As a research forester, Silen was able to reach beyond the limits of the usual standards, but only by shouldering responsibility for constant oversight and close interaction with Savelich, who was also initially resistant to the unusual design. Savelich, Silen recalls, often left notes scrawled in a blaze on the side of a tree, saying things like, "Roy, this is a fine place for a road, but I want no part of her.'" After a few years of working on the experimental forest, however, he reportedly gained a grudging respect for the design. Silen recalls a roadside conversation with Savelich's roadbuilder who reportedly confided, "You know, there was a guy that wanted to propose a change in this curve that you put through here and in the next site, … and [he said] 'If we do it this way, we can save a lot of money,' and Mike says, 'Damn it. Everytime I change Roy's plans it costs me money.'"[64]

Those few cases in which Silen successfully translated his research results at the experimental forest into management practice in the Willamette National Forest were direct products of his habit of working closely with forest managers and logging contractors onsite at the experimental forest. Silen, for example, recounts as a "success" one such encounter with Alan Winer, who did the timber cruising for the Willamette National Forest. Silen intentionally planned timber sales on the experimental forest so that the "most deteriorated stands" of old growth were in the first sales. He adopted this strategy after noting that some old-growth stands were virtually brush patches after many trees had fallen from butt rots, while other

[62] Interview with Roy Silen 9 September 1996, 6-7. "Working plan for Blue River harvest outings (Sale #1) [1950]," H.J. Andrews Files, File Box C, Storage Vault, FSL, Corvallis. Andrews group interview 22 September 1997, 24-25.

[63] Interview with Roy Silen 9 September 1996, 20-21.

[64] Interview with Roy Silen 9 September 1996, 8-9.

stands of similar age were "better preserved." As Silen recalls, Winer complained after one particularly stressful bout with Silen's sale layout, "You know, that was the damndest country to cruise. It was … just so darn brushy. What's going on?" As Silen explained his reasoning to Winer, he recalls thinking, "Well, I'll hear from the higher-ups about this." The standing rule at the time was to cut the concentrations of old growth to "pay for the roads." Silen reasoned that 500-year-old stands typically had only a few Douglas-fir stems per acre, and only the best-preserved stands would still have enough standing fir to provide sustained yield late in the rotation.[65] The result of this strategy from the perspective of Winer, however, was that it raised the cost of cruising the proposed sale areas. Silen expected a negative reaction from Winer's superiors, but as he recalls, the next thing he heard on the issue from the Willamette National Forest supervisor's office was a statement that said, "we're changing our policy … henceforward, we will put the most deteriorated old growth into the cutting units." Silen concludes, "I SOLD him on it!"[66] The key to this exchange was Silen's ability to think on his feet under field conditions and effectively communicate to Winer onsite at the experimental forest.

The incompatibility of long-term research goals and short-term harvest targets left Silen and the experimental forest vulnerable to criticism. Silen, for example, tried to adjust the design standards for logging roads so that roads located farther from the main roads could be constructed at lower standards to better fit the topography. This meant more remote roads could be narrower, with sharper curves, and a shorter line-of-sight around corners. Silen made these changes on an ad-hoc basis with onsite revisions to the road standards that governed sales elsewhere in the district. District staff, however, were more concerned with "getting the cut out" than with testing Silen's theories about the long-term benefits of a more flexible system of road standards. Silen observes, "the engineers didn't like it. I was always complaining that … these road standards were forcing us to do dumb things, … and then they came back and said, 'If you don't lay them out to our standards then we won't maintain them.'"[67]

District staff, however, were more concerned with "getting the cut out" than with testing Silen's theories about the long-term benefits of a more flexible system of road standards.

[65] Communication from Roy Silen, 9 November 1999.

[66] Interview with Roy Silen 9 September 1996, 18-19.

[67] J. Herbert Stone succeeded H.J. Andrews as Regional Forester [R-6] in 1951 and served in that capacity through 1967. Rakestraw identifies John Ray Bruckart, who served through 1953 as forest supervisor for the Willamette National Forest, as "the last of the old time supervisors whose skills came from the 'University of Hard Knocks' rather than formal education in forestry …" Aufderheide replaced Bruckart in 1953, and was succeeded by David R. Gibney, a graduate of the University of Minnesota, who served as forest supervisor from 1959 through 1970. Rakestraw, 93-94. Interview with Roy Silen 9 September 1996, 20.

Silen's effort to design roads that would minimize sedimentation in the Lookout Creek drainage was closely related to watershed studies at the Blue River Experimental Forest. By the time logging began on Sale #1, in 1950, the experimental forest was already dedicated to the study of watershed problems, with stream gauges established on both Blue River and Lookout Creek. The Army Corps of Engineers had also established Snow Laboratory facilities at various sites on and around the experimental forest. After his initial sale failed to draw a bid, Silen redesigned Sale #1 to accommodate paired watershed studies on three small drainages on the lower portion of the experimental forest. His sale layout located roads, landings, and cutting lines on those drainages to "demonstrate good practice from a water management standpoint." He began with the hypothesis that the sale layout was the "greatest step in cutting down stream sedimentation. …" His design included detailed instructions on building methods to minimize cuts, disruption, and soil movement, notably including a requirement that culvert installation be at least partially completed before road building continued beyond any stream crossing. This requirement provided at least a temporary road surface to support traffic involved in logging the right-of-way, and it avoided the common alternative of driving construction equipment and trucks directly through the streambed. Silen's reports also stressed the need to educate forest managers and loggers about culvert design, landing placement, and alternatives to yarding logs down creek banks with tractors.[68]

Silen's efforts to minimize sedimentation in streams during logging operations at the experimental forest were more successful than his efforts to communicate those ideas to forest managers. He was proud of his strict guidelines for installing culverts, but federal guidelines governing agency contracts prevented Forest Service managers from adopting his standards. Sale-layout officers at Region 6 did support Silen in his efforts to draft sale contracts for the experimental forest specifying strict procedures for operating near streams. Silen also worked directly with District personnel and contractors to ensure strict enforcement of his requirement that contractors build a "barely passable," temporary road at the top of each cut, before clearing the right-of-way for each road. This temporary road allowed crews to work down from the top of the cut, clearing the road right-of-way while moving logs away from the stream to a cleared area higher on the slope. He recalls that getting contractors to build roads in that fashion was hard, but he wrote it into

[68] "Working plan for Blue River harvest outings (Sale #1) [1950]," 15; communication from Roy Silen 9 November 1999.

each timber-sale agreement, and he relied on support from Region 6 and district staff to ensure the legal framework was accurate and enforced. He was pleased with the results on the experimental forest, and he expected other forest managers in Region 6 would adopt his ideas, but he concedes that for the most part, they did not.[69]

Silen considered the road system an integral component of his research, but it was also an infrastructure development that supported subsequent logging. The result was a strikingly different landscape that broadened the range of potential research activities on the forest. Silen was among the first to take advantage of the emerging opportunities for research. He used wax pellets to measure temperatures lethal to seedlings, in an effort to show how shade and heat influenced seedling survival on staggered-setting clearcuts. He found that lethal temperatures were common on south slopes and the valley bottom throughout the growing season, but not on adjacent north slopes until early July. Silen experimented with timber-sale layouts in different sizes and shapes of cutting units designed to support studies of how shade and heat influenced seedling survival. He laid out a series of clearcuts aligned in north-south strips, ranging in width from 200 to 400 feet, to "see how they regenerated." He recalls, "They ALL regenerated [new seedlings were established, survived, and thrived]. That was never a problem." He experimented with other, larger clearcuts where he could leave lines of trees about 180 feet apart so that the tops of the trees would shade the ground that was cleared, limiting their exposure to about 4 hours of full sunlight. Those clearcuts also regenerated. Larger clearcuts, however, he found to be "much slower in regenerating." In one study of a clearcut 3 years after logging, Silen observed seedlings were most numerous in the stand shadow along the south border of the units, and seedlings were more numerous on unburned than burned seedbeds.[70]

Landscape Legacies of Early Research and Perceptions of New Opportunities

Silen's experimental clearcuts and road-building activities altered the landscape in ways that attracted more people to the experimental forest. The road system made the place more accessible than much of the surrounding national forest, and the clearcuts offered opportunities to study the effects of logging in old-growth

[69] Interview with Roy Silen 9 September 1996, 20-22.

[70] Interview with Roy Silen 9 September 1996, 23; McPhail, "The Supplements to the Station History, 1944 through 1953," 15; interview with Roy Silen 9 September 1996, 22-23.

Douglas-fir. These changes made the place seem more relevant to human concerns beyond the Lookout Creek drainage. Silen observes, "… once we got into this large-scale cutting, we began to get cooperators and other guys coming in." Two scientists from the Oregon Cooperative Wildlife Research Unit were among the first people to conduct fieldwork at the experimental forest on a regular basis. Don Wustenberg and Jay Gashweiler worked on plots at the experimental forest during summer and fall for most of the time Silen was in charge there. As a result of their work, Silen observes, "we had a good line on what was going on from the wildlife and fish standpoint."[71] Wildlife studies and recreation activities on the experimental forest also led to innovative methods for describing the landscape at remote locations on the national forests. Silen recalls, for example, how a casual conversation with Dick Wilson (a planner with the Willamette National Forest) during "our barely successful deer hunt" prompted their efforts to draw topographic information (contours and section lines) on a mosaic of air photos depicting the experimental forest. Silen and Wilson hoped this method would reduce the cost of accurately and efficiently planning timber sales, believing it would support research needs. Silen argued in a subsequent memo to Victor Flach in the cartographic section of the Willamette National Forest that this use of remote sensing could be used for spotting clumps of old growth with airphotos, adding, "I am quite enthusiastic to try the idea. …"[72]

Early efforts to gather baseline information from ground observations also refined the focus and mission of research at the Blue River Experimental Forest. Precipitation records for the Lookout Creek drainage began in 1951, after Silen installed three gauges, and he collected data and maintained the instruments until he left the forest.[73] The Army Corps of Engineers also escalated its activity on neighboring drainages of the Blue River watershed during the early 1950s, building a snow cabin just off the experimental forest. The cabin was built of aluminum sheets packed in with mules and staffed during the winter with Army recruits from a base cabin 7 miles farther up Blue River. Just staying alive in that cabin was the primary challenge facing the Army recruits who staffed it during the 1950s. In the next decade, Station crews working under the direction of Al Levno refitted the cabin with bunks and a small wood stove that made it more habitable for crews

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[71] Interview with Roy Silen 9 September 1996, 5.

[72] Memo 15 Oct 1951 from Roy R. Silen to Victor Flach, Cartographic Section. Silviculture Mgmt. Folder, H.J. Andrews Files, File Box F, Storage Vault, FSL, Corvallis.

[73] December 1992 discussion with Roy Silen, 14.

gathering research data in winter.[74] As data from Silen's gauges and from the Snow Laboratory began to accumulate at PNW Station, the roaded and logged areas of the experimental forest attracted other scientists. The place gradually gained recognition as a leading site for watershed studies, and this emphasis displaced forest management as the primary focus of research.

Watershed studies displaced forest management as the primary focus of research.

The new facilities for watershed studies at the Blue River Experimental Forest fulfilled the requirements of the establishing agreement and interagency cooperation with the Army Corps of Engineers, just as Silen's forest management studies fulfilled the intra-agency agreement with Region 6. As PNW Station geared up to address the watershed concerns that had contributed to establishing the experimental forest, E.G. [Jerry] Dunford returned to the Portland office in 1952 from the Rocky Mountain Station "to appraise critical watershed problems in Oregon and Washington." He developed a problem analysis and implemented a program of research, beginning with field studies already underway at the experimental forest. The Station, which acquired responsibility for flood control research in Oregon during this period, also recruited Donald R. Gedney and his colleague, a Dr. Hale, both of whom transferred from the Northeastern Station to join Dunford in Portland in 1952. Gedney and Hale supervised installation of modified trapezoidal flume stream gauges in the three small watersheds at the experimental forest that year. Hale subsequently transferred to the Northeastern Station. Two years later, George Meagher, an assistant director at PNW Station, directed Roy Silen to leave the experimental forest in 1954 to join the forest genetics team in Corvallis, overruling Silen's vehement objections. The PNW Station, in other words, simultaneously moved to reemphasize watershed studies and terminate Silen's forest management studies at the experimental forest. Silen recalls, "Yeah, they wiped it out. The program stopped." When Silen asked Meagher to explain the reasoning behind this administrative move, the assistant director informed him that, henceforth, the Blue River Ranger District would handle timber sales, and watershed management would continue as a separate program administered by PNW Station. The Station subsequently contracted with the United States Geological Survey to periodically service stream gauges at the experimental forest, with financial support from Region 6. The Station's support for Silen's legacy of forest management studies, however, was not completely terminated. Dunford hired Jack Rothacher, formerly a district ranger in the Pacific Northwest, to provide onsite support at the Andrews Forest.[75]

[74] Andrews group interview 22 September 1997, 40-41.

[75] Andrews group interview 22 September 1997, 16-17, 39; Cowlin, 314-315.

With Rothacher, the community of scientists connected with the experimental forest had a solid connection with timber management concerns, even as they branched out in new directions. That characteristic of adaptive innovation was a critical factor that attracted a small nucleus of young scientists to the Lookout Creek drainage, where they formed a close attachment to Rothacher in the late 1950s and formed the nucleus of an emergent group of cooperators and researchers centered on the experimental forest, whose association with each other and that place gradually evolved into a long-term and sustained engagement over the next few decades.

Community Legacies and Administrative Restructuring

The experimental forest attracted the attention of a more diverse group of scientists and administrators by the mid 1950s, when the Station redefined the purpose of the facility. That administrative move was both a product of evolving priorities at the Station and a catalyst for change at the experimental forest. The Station substituted a more remote, institutional framework for Silen's personal connections with the Lookout Creek drainage and with local people in the McKenzie valley. The transition began with a formal dedication ceremony at the site on 26 July 1953, when PNW Station administrators renamed the experimental forest for H.J. Andrews, their former colleague who had died 2 years before the ceremony. His wife and daughter joined the 100 people attending the dedication. Before his assignment as Regional Forester, Andrews had alternately worked with the PNW Station and with Region 6. Among other accomplishments, he directed the early survey efforts that brought Briegleb to Carpenter Saddle in the 1930s, and he served in various administrative capacities with PNW Station and as a forest manager in the national forests of the Pacific Northwest. By the time of his death, Andrews personified an emerging tradition of close collaboration between scientists and managers in that region. When the agency renamed the Blue River Experimental Forest in his honor, the facility gained a name that linked the place with a dynamic personality well known to scientists at PNW Station and to forest managers who worked in the surrounding national forest. Before his death, Andrews had very little direct involvement with the facility at Lookout Creek, but after 1953, his name symbolized the intersection of people and ideas in that place.[76] The previous name, Blue River Experimental Forest, had linked the place with a local geographic feature, and with the

[76] "Blue River Experimental Forest: Representing the Old-Growth Douglas-Fir Type."

nearby town named for that river. The new name linked the place with a person who, aside from putting his name to the interagency agreement establishing the experimental forest, was most remarkable for his role in a series of administrative decisions in a federal agency. The next step was to reassign away from the experimental forest the person who knew it best. Roy Silen reluctantly accepted reassignment in 1954, but he left behind a more humanized landscape than the one he first encountered 5 years earlier.

The Station decision to redefine the purpose of the experimental forest and reassign Silen to Corvallis had more to do with a remote bureaucracy than with the local place or person, but it did shift the focus of the scientific community closer to the Lookout Creek drainage. In the 1950s, people at the experimental forest did not yet have any real control over the place or its community. The people who defined priorities for the Andrews Forest had virtually no direct experience at the place itself.

The reorganization originated with an internal review at PNW Station that was prompted by a report from the Region 6 Investigative Committee. This committee, which convened in 1952 for the first time in 6 years, identified "shortcomings" in specific fields of work at the Station: forest influences, forest soils, forest genetics, and the slash-disposal phase of forest management and fire research. Resources were scarce for funding new research or hiring the additional scientists that would be needed to address those concerns, but the Director of PNW Station initiated an internal review of Station programs and work at field centers and noted a need for more technical aides "to relieve professionals of low-grade tasks." The resulting report identified as a leading concern the inadequate physical facilities at research-center headquarters. The Station subsequently joined Region 6 in selecting and organizing a Regional Forest Service Advisory Council, composed of leaders from the Pacific Northwest who represented "major geographic, governmental, and economic segments of the region," and charged the council with addressing broad policy issues.[77]

The Station reorganization was part of a broader restructuring in the Forest Service that elevated the status of research in the agency. The transition was at least partly due to a change of leadership at the top. Richard E. McArdle replaced Lyle F. Watts in June 1952 as Chief of the Forest Service. Until his appointment as Assistant Chief 8 years earlier, McArdle's entire Forest Service career was in the

[77] Cowlin, 307-308.

Research Branch. In his first year as Chief, McArdle directed a thorough revamping of the organizational and personnel structure at the major research Stations, including PNW. An internal review and reorientation of research programs at the Station, together with advisory group discussions, resulted in an administrative decision to focus investigative efforts on "urgent problems." The renaming and dedication of the Andrews Forest was part of this broader reorganization.[78]

The changes at the Lookout Creek facility were just one part of a general reassessment and restructuring of experimental forests and their function in the revised mission of PNW Station. The immediate effects differed considerably from site to site. The Station deactivated John Day Experimental Forest in 1954, for example, only 5 years after it was originally established, and moved its headquarters buildings to Unity, Oregon. Cascade Head Experimental Forest, by contrast, gained a boost from external funding in the same period. The Station negotiated a cooperative agreement with Publishers' Paper Company that supported road building well in advance of actual logging at Cascade Head.[79] In comparison with these examples, the changes at the Andrews Forest were relatively modest, although they were certainly wrenching from Silen's personal perspective. A "follow-up memorandum of understanding" reduced the required annual cut at the Andrews Forest to its estimated "sustained-yield capacity," or "roughly 7 MM bd ft" (an amount consistent with Forest Service regulations governing other national forest lands). Despite this change, timber production was still the top priority for the Lookout Creek drainage, and the language of the agreement stipulated that any reduction in the annual harvest must be "consistent with overall cutting plans for the McKenzie Working Circle." The memo further recognized that "actual volume sold and cut may vary considerably from year to year." Signatories to the agreement included, in chronological order, R.W. Cowlin, Director of PNW Station (5 May 1953); J. Herbert Stone, Regional Forester (7 May 1953); and J.R. Burchart, Willamette National Forest Supervisor (11 May 1953).[80]

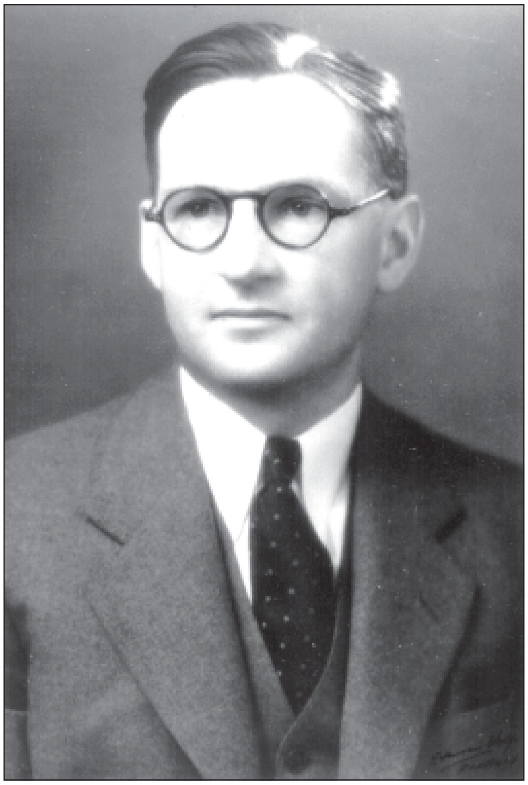
A "follow-up memorandum" reduced the required annual cut to its estimated "sustained-yield capacity."

This "follow-up" memorandum of understanding clarified the transfer of authority for management activities at the experimental forest from PNW Station

[78] Cowlin, 318-321.

[79] McPhail, "The Supplements to the Station History, 1944 through 1953," 8, 13-15.

[80] "Follow-up Memorandum of Understanding [1953]…for the administration of the H.J. Andrews Experimental Forest (formerly the Blue River Experimental Forest)," H.J. Andrews Memorandum of Understanding Folder, H.J. Andrews Files, File Box F, Storage Vault, FSL, Corvallis, 1.



Vince Puleo collection

Figure 8—Horace J. "Hoss" Andrews, for whom the H.J. Andrews Experimental Forest (formerly the Blue River Experimental Forest) was named in 1953, directed the forest survey during the 1930s that brought the Lookout Creek drainage to the attention of forest researchers at the Pacific Northwest Research Station in Portland, Oregon.

to the Willamette National Forest. Even if the Station had not reassigned Silen, he would have lost the authority over sales that he previously wielded. The memo noted concerns about preparing and administering timber sales on the Andrews Forest, and it conceded that the original estimate of timber volume that could be removed from the experimental forest was "too high." Silen's planned Sale 5 was "fairly well along" at the time of this memo, which called for PNW Station to complete the layout of that sale, and then hand it over to the Willamette for cruising, appraisal, advertising, and "all further administration." Sale 6 was the first one handled entirely by the Willamette National Forest. The 1953 memo emphasized that full responsibility for administration of all future sales on the Andrews Forest would rest with the Willamette. In a notable exception to this transfer of authority, the three small, gauged watersheds near the mouth of Lookout Creek were excluded from the cutting commitment, and the memo of understanding specified that they would be left undisturbed for 6 to 10 years to "complete their calibration period." After that period, the memo explained, the timing and volume of timber harvests would be based "entirely on research needs."[81]

Conclusion: The Andrews Forest as a Humanized Landscape

The dedication ceremony of 26 July 1953, in the context of the revised memorandum, was more than a simple renaming. In the preceding 5 years of planning and management, Silen and his associates superimposed a management template of built and planned roads and logging units. Those plans effectively subdivided the forested slopes into discrete administrative parcels. The new agreement effectively divided the same drainage into two large units with different management goals: one 800-acre unit with three gauged watersheds would be managed for "research needs," and one larger unit including everything else would be managed for "sustained yield." This management overlay was virtually invisible to casual observers. The changes Silen had implemented were more obvious, including the system of central access roads extending halfway up the drainage along McRae Creek and Lookout Creek.[82]

The Forest Service endowed the Andrews Forest, in 1953, with an official, but brief, history of human efforts to reconfigure that landscape since 1948. The Station printed that history on a dedication program and distributed it to a wider audience in the form of press releases. That narrative, as represented in promotional pamphlets and flyers, shaped the preconceptions people later brought to the place. The original purpose of the experimental forest, according to this official story, was "to serve as a pilot plant where the most promising timber growing and watershed management practices could be tested on a commercial scale." The narrative described the place as "representative of the old-growth forests in the Oregon Cascades." Since 1948, the Station had transformed the area from a "near wilderness reached by a single fire road, and a few ridgetop trails" to a managed site with a forestry-logging plan and a permanent road system. As of 1953, the narrative observed, "Sixteen miles of road have now been completed and the mature timber harvested on 18 clear-cuttings."[83]

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[81] "Follow-up Memorandum of Understanding [1953], 2.

[82] Pacific Northwest Forest and Range Experiment Station, "Dedication of H.J. Andrews Experimental Forest [Program Flyer and itinerary, 1953]," Andrews History File, Records Vault, Corvallis FSL, PNW Station, U.S. Department of Agriculture.

[83] "Dedication of H.J. Andrews Experimental Forest [1953]."

Silen consciously distanced himself from activities at the experimental forest after 1954, preferring to remember it the way it had been.[84] Shortly before he moved to Corvallis, he married Ethel Arthur in a ceremony at First Presbyterian Church in Portland, and he left behind his bachelor days and the experimental forest in almost the same breath.[85] He notes that his understanding of the place was "a very personal thing," and he claims he knew "something on almost every acre out there."[86] The place he remembered, however, was rapidly changing, largely owing to his efforts. Others who later worked at the forest could talk to Silen about what he remembered, but the landscape they saw was more humanized than the one he recalled as a "forest primeval." Fragments of Silen's life and work at the experimental forest lingered on in the scientific papers and reports that he and his associates produced, and he left a legacy of physical changes to the landscape and a tradition of principled, applied research that later supported rediscovery and reacquaintance with the place. Silen continued his career with the Forest Service in Corvallis for nearly 50 years, sharing his memories of the forest that **was** with scientists exploring the potential of forests that **would be**.

His understanding of the place was "a very personal thing."

[84] Interview with Roy Silen 9 September 1996, 13.

[85] McPhail, "The Supplements to the Station History, 1944 through 1953," [1953].

[86] Interview with Roy Silen 9 September 1996, 16.

Chapter Two: Envisioning Long-Term Research and Innovative Science, 1955–1964

The institutional authority that ended Silen's role at the H.J. Andrews Experiment Forest (Andrews Forest) in the mid 1950s also accelerated the pace of change on the Lookout Creek drainage through the next decade. By 1953, Silen and his assistant, Hank Gratkowski, located and marked more than 72 miles of road and about 580 log-gathering points (landings) on the landscape. Only a small fraction of the facilities Silen planned were built before he left the next year, but by 1956, more than 30 miles of all-weather, gravel-surfaced road were completed. In 1959, the Forest Service claimed, in a brochure designed to attract more scientists to the experimental forest, that the original road design was intended "to provide access to a generous variety of study areas," even though Silen recalls that his primary design consideration was simply to "get the cut out" with "least damage to the resource." In that brochure, Pacific Northwest Research Station (PNW Station) foresters Jack Rothacher and Carl Berntsen noted that development work at the Andrews Forest had produced a road density on the Lookout Creek drainage of 4.97 miles of road per square mile by 1959, or about 115 linear miles of roadway on those 23 square miles of the Willamette National Forest that were designated as the experimental forest. The density of roads for the entire 1.7 million acres of the Willamette National Forest, by contrast, increased from only 0.36 miles of road per square mile in 1954 to 1.42 miles of road per square mile by 1970. For most of the 20th century after 1950, this drainage was one of the most road-accessible on the Willamette National Forest. Designs for roads and timber sales initially followed Silen's plan for the drainage, but he notes that the district ranger's office made many changes after he left. Regardless of intent, the reality of roads and clearcuts began to attract more people to the place because they provided access and opportunity to those interested in studying the effects of clearcuts in an old-growth setting, as well as many other topics.[1]

The accelerated pace of road building and clearcutting on the Andrews Forest during the 1950s and 1960s highlighted the difference between management priorities and research goals for the drainage. As a result, conflicts often broke into the open, and the division of authority for reconciling those differences caused

[1] Berntsen and Rothacher, "*A Guide to the H.J. Andrews Experimental Forest,*" 3-4. Rakestraw, iv-vii, 101.

conflict between district staff and Station scientists at the facility. The Station's role at the Andrews Forest was sharply diminished after 1953 under the terms of the revised memorandum of understanding approved that year. The agreement assigned the district ranger clear authority and responsibility for administering Forest Service policy on the experimental forest. Station interests had no direct representative at Blue River for the first 3 years after 1954, when the district ranger directly managed the experimental forest as part of the McKenzie Bridge Ranger District. Beginning in 1956, the newly created Blue River Ranger District assumed direct responsibility for managing the Andrews Forest. Station authority over the place, thereafter, devolved upon a PNW scientist-administrator at the Corvallis center, and beginning in 1957, a research forester-in-residence at Blue River also monitored field projects at the experimental forest for the Station. The person who filled this latter position, initially Jack Rothacher, was also a local liaison linking research people with the district office in Blue River. Rothacher lived on the compound of the Blue River Ranger District and dealt directly with District Ranger Ed Anderson, who moved from his position as district ranger at McKenzie Bridge to become the first district ranger at Blue River. Rothacher could not represent research interest on equal terms with Anderson because he was only a site manager, not the responsible authority representing the PNW Station interest in the Andrews Forest.

Relations with Anderson were somewhat strained, but Rothacher and his wife, Jean, lived on the compound next door to Assistant District Ranger Mike Kerrick. Despite their different roles at the experimental forest, Kerrick, Rothacher, and their families became close friends, and that friendship helped Rothacher cope with an often disinterested or dismissive district ranger.[2] By the end of the 1960s, Rothacher and Kerrick were part of an established Andrews group tradition of multiple leadership roles that built on informal paths of communication strengthened through face-to-face contact and daily life in the vicinity of the Andrews Forest. That tradition also involved formal structures of authority with distinct roles for Station and district staff. Those who built personal and professional networks around this place, were willing to work around unresolved tensions and irresolvable differences. In doing so, they constantly tried to balance conflicting ideals and multiple perceptions of opportunity on the Lookout Creek drainage.

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[2] Interview with Ed Anderson and Mike Kerrick by Max Geier on 28 August 1996 at Anderson's home in Springfield, OR, 1; interview with Jean Rothacher by Max G. Geier at her Corvallis, OR, residence on 29 August 1997, 1; interview with Mike Kerrick by Max Geier at Kerrick's home near Springfield, OR, on 28 August 1996, 13-14.

Figure 9—Jack Rothacher (right) who succeeded Roy Silen as Pacific Northwest Research Station research forester-in-charge at the H.J. Andrews Experimental Forest, lived with his wife Jean Rothacher (2nd from left) at the Blue River Ranger District compound where their closest daily interactions were with district employees and their families. In this 1958 photo by Jack Rothacher, family friend Marty Fox and her children pose with the Rothachers.

Watersheds research was one of the more obvious opportunities that scientists perceived at the Andrews Forest in the 1950s and 1960s. Urban concerns about how best to manage the Bull Run watershed that supplied Portland's water encouraged PNW Station leaders to make watersheds research the leading priority at the Andrews Forest. Scientists could readily study apparent linkages between old-growth conditions and watershed quality on this road-accessible drainage, and after the reorganization of 1953, the three lower watersheds draining into Lookout Creek were more fully under the control of PNW Station than the rest of the experimental forest. Station scientists who established study plots in this area could be relatively confident that management activities would not disrupt their plots. Installation of research flumes on the three small watersheds during this period further encouraged such studies. By the early 1960s, forest scientists, like the society in which they lived, relied on urban services and amenities. Urban outlooks also influenced Oregon State College and other research institutions that expanded funding and facilities for laboratory-based research. By comparison, relatively fewer funds and other resources were available to support facilities and programs for field research, including the experimental forests and natural areas.

Ted Dyrness and Jerry Franklin; cultivated their professional and personal contacts to build the nucleus of an "Andrews group."

As the cost of building and staffing laboratories escalated, some administrators at PNW Station proposed closing the Andrews Forest and other field facilities in the region. Two scientists already accustomed to working with Rothacher at Blue River, however, promoted the Andrews Forest to their colleagues as an "outdoor laboratory." These scientists were Ted Dyrness and Jerry Franklin; together, they cultivated their professional and personal contacts to build the nucleus of an "Andrews group" at Oregon State University in Corvallis. As part of that effort, they portrayed the Andrews Forest as a valuable and scarce resource that should be used to support studies that would continue for a long time. The coincidental timing in 1964 of a major flood in the Willamette River basin and the global startup of the International Biological Programme (IBP) provided unexpected opportunities that Dyrness and Franklin quickly exploited in an effort to establish the Andrews Forest as a long-term resource.

Leadership Traditions of Vision and Detail

The joint efforts of Franklin and Dyrness followed a pattern established a decade earlier by Silen and Gratkowski. Gratkowski's penchant for rigorously focused, detailed planning and by-the-book implementation balanced Silen's tendency to adapt his plans to problems or concerns that arose along the way. Silen struggled to translate his broadly defined logging plan into daily assignments and goals for Gratkowski, who worked independently of Silen for prolonged periods in the field.[3] Russ Mitchell, who worked one summer as a field assistant with both men, argues that they had different but complementary personalities. Both men were schooled in forestry at Yale University, but aside from that common link, they had little else in common. Silen, a bachelor, was born in Oregon and trained at Oregon State College before he went to New England as a graduate student, while Gratkowski was a newly relocated family man from Pennsylvania when he first began working at the Andrews Forest in 1951.[4] Mitchell grew up near Pacific University in Forest Grove, Oregon, and later graduated from Syracuse University in New York. He argues that the academic culture of forestry schools in Oregon during the 1940s and 1950s was less interdisciplinary than comparable programs at eastern schools

[3] Cowlin, 300-301; McPhail, "The Supplements to the Station History, 1944 through 1953."

[4] Interview with Russ Mitchell by Max G. Geier on 20 September 1996 at Mitchell's office in the Bend FSL, 15-16, 21-23.

like Yale or Syracuse. Silen learned applied forestry at Oregon State College and combined it with his native understanding of timber communities in the same region. His native comfort with folks in McKenzie Bridge helped him work with local timber contractors and forest managers.

As a recent migrant to the Pacific Northwest, Gratkowski was less interested in going along with local wisdom in Blue River. According to Mitchell, he was also a "very organized" and "very intense guy" who had a reputation for getting "very upset" when things didn't go the way he planned. By contrast, Mitchell observes, Silen tended to plan broadly and make up his mind about the details as he went along. That approach, Mitchell recalls, "just used to drive Hank [Gratkowski] crazy," though it was a good fit with the shoestring budget the Station had allocated for large-scale work at the Andrews Forest. Silen's folksy approach tempered Gratkowski's "Old World style" and eased otherwise tense relations with district staff and loggers. Gratkowski's perfectionism, meanwhile, was a systematic counterweight to Silen's pragmatism.[5] This balanced blend of broad planning, pragmatic adaptation, and rigorous attention to the details of good science is an early example of the Andrews group's formula for successful and productive innovation.

An ability to balance reverence for the landscape with curiosity and good fun is an important, second component of the Andrews group's formula for success. People differed in the way they balanced fun and reverence, however. In the early years at the experimental forest, for example, Silen demonstrated more emotional attachment to the Andrews Forest than did Gratkowski or Mitchell. Mitchell recalls how he and Gratkowski once amused themselves during a midday break by pushing boulders off a ridge and watching them roll downhill. At the bottom of the slope, the rocks crashed into a stand of Douglas-fir saplings, seriously damaging the young trees. When Silen chanced upon the scene a few weeks later, Mitchell recalls, "He was really mad that somebody would go scarring up those trees with these damn rocks." In a second example, Mitchell and Gratkowski rolled cable spools from logging sites down one of Silen's experimental clearcuts on a long, downhill slope. Mitchell recalls that the heavy, Volkswagen-size spools bounced as high as 100 feet in the air when they hit the trees at the bottom: "It just popped out of there, popped clear out of the damn trees!" Even though Mitchell claims it was "fun" to send those spools bouncing down the slope, he and Gratkowski were

[5] Russ Mitchell, 4-5, 11-16

careful not to tell Silen about either incident. Mitchell observes, however, that they hadn't given a second thought to the damage they were causing.[6]

Silen and Gratkowski eventually went their separate ways at PNW Station in 1954,[7] but the pattern of complementary pairs leading research, as well as the subordination of research to management goals, continued at the Andrews Forest. After 1954, Carl Berntsen and Bob Ruth assumed responsibility for managing the experimental forest. Berntsen previously was Gratkowski's counterpart, and Bob Ruth was Silen's counterpart at Cascade Head Experimental Forest. When Aufderheide moved on to become forest supervisor at the Willamette National Forest, Ruth replaced him as Silen's superior at the Western Research Center.[8] Unlike Silen and Gratkowski, both Berntsen and Ruth worked in Corvallis and were only remotely involved with day-to-day events at the Andrews Forest. Under the terms of the revised agreement, moreover, their input was subordinate to the district ranger's. Even without that constraint, Berntsen and Ruth did not demonstrate a high degree of personal attachment to the landscape or traditions of research before or after they assumed control over the Andrews Forest. Silen observes that Ruth implemented a system of roads and clearcuts at the Cascade Head facility that were "nothing like" the system he himself established at the Andrews. He further notes that Berntsen and Ruth mostly pulled the plug on the forest management research that he and Gratkowski initiated. Ruth and Berntsen, for example, recruited Boy Scout volunteers who replanted virtually all of the clearcuts Silen designed to study natural regeneration. Exceptions included some east-west strips where naturally regenerating seedlings were "so thick the scouts couldn't fight their way through to plant new seedlings." It was a period, Silen concludes, "… when the [Blue River Ranger] District took over the activity on the forest."[9]

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[6] Interview with Russ Mitchell, 13-14.

[7] Gratkowski, who initiated preliminary studies of brush control at the Andrews in the early 1950s, secured a reappointment to the PNW Station lab at Roseburg, where he continued his studies of brush control and herbicides on the South Umpqua Experimental Forest, established in 1951; interview with Russ Mitchell, 16; Andrews group interview 22 September 1997, 16-17; Cowlin, 300-301.

[8] McPhail, "The Supplements to the Station History, 1944 through 1953"; Cowlin, 257-258; interview with Roy Silen, 4. Andrews group interview 22 September 1997, 9.

[9] Andrews group interview 22 September 1997, 16-17.

Management Priorities and Distant Relations With Research

Forest managers with the Willamette National Forest operated under a different mandate than scientists with PNW Station. One important difference in the mid 1950s was the new Forest Supervisor, Robert Aufderheide, who made community outreach a leading priority on the Willamette. District Ranger Anderson recalls that Aufderheide initially told him his "primary job" at Blue River was to "restore confidence in the Forest Service by people in the McKenzie River area." Local residents lacked confidence in the agency and accused district staff of favoritism in handling timber sales. Anderson responded with public-outreach programs that placed officers from the Blue River Ranger District in every class from elementary through secondary schools in the local school district. He hired high school students for weekend tree planting and adjusted work schedules on the district to accommodate local school schedules. Anderson considers the effort a success, observing that by the time he left the district, "We were pretty well known and liked."[10]

Local people were virtually unaware of the work at the experimental forest.

The Willamette National Forest public relations effort boosted local support for forest managers in Blue River, while scientists with PNW Station in Blue River focused more narrowly on their research with less concern for how it related to local concerns. As a result, local people were virtually unaware of the work at the experimental forest, and research began to focus on more basic questions. Research at the Andrews Forest had never been closely relevant to the immediate concerns of local people in the towns of Blue River and McKenzie Bridge, but community ties were an important part of Silen's early success with applied studies. Silen did devote considerable personal time to cultivating social connections with local residents, but he and his research colleagues intended their work for other professionals and forest managers, not for local folks. He tried to answer two broad questions: "How does nature work? and "How can we use that information?[11] These two questions summarize the distinction between basic and applied research in the Andrews group. Scientists in this research community often argue that their work addresses both of these components, as compared with other research centers that often emphasize either basic or applied research at the expense of the other.

[10] As quoted in Rakestraw, 95.

[11] Interview with Roy Silen, 31.

Figure 10—An outing to Carpenter Mountain Lookout was often a family event for Forest Service employees who lived with their families at the Blue River Ranger District compound in Blue River. Here, District Ranger Ed Anderson poses for a self-portrait with Jim Marshall (lookout) and Anderson's son, Mike, and daughter, Ginna in August 1956.

The distinction between basic and applied research, however, made little difference to forest managers like Anderson, who recalls that for him, the work at the Andrews Forest was a distraction, at best, from more pressing management concerns. He draws a much sharper line than scientists usually use to distinguish between research that produces findings managers can use, and research of merely academic interest. More often, Anderson argues, research created problems for himself and other forest managers. As an example, he recalls how University of Oregon Professor Carl Onthank publicly pressured him to leave all the snags in place on sites slated for clearcut logging during the 1950s. That public pressure, Anderson claims, interfered with his authority to manage the forest in a professional manner. In the end, Anderson had little use for research at the Andrews Forest, basic or otherwise. He claims he had virtually no direct contact with scientists working at the facility, observing, "I was only there once a year anyway."[12]

Anderson's arms-length approach to activities on the experimental forest underscores the cultural distance between Research foresters and National Forest

[12] Interview with Ed Anderson and Mike Kerrick, 5-7.

Sidebar 2.1: Disturbance in Forest and Stream Ecosystems

The Issue: Many attributes of the Cascade Mountain environment set the stage for processes that can severely disturb forest and stream ecosystems. Steep slopes, heavy rainfall, and rapid snowmelt contribute to major floods. These factors combine with weak rocks and soils to make landslides common. Long, hot, dry summers gradually convert the huge quantities of forest biomass to tinder-dry fuel for wildfires. Hence, the forest and stream landscapes are complex and dynamic mosaics reflecting, in part, the history of disturbances. Understanding disturbance history is essential to interpreting many aspects of ecosystem structure, composition, and function. Land use can be interpreted as an alteration of the natural disturbance regime, increasing or decreasing the frequency and severity of different processes of disturbance.

Andrews Forest Watershed 3 stream flowing over debris flow deposits and road into Lookout Creek (lower left) during the February 1996 flood. Debris flows originating from roads and forest areas periodically disturb small streams. Figures in background are Fred Swanson, Gordon Grant, and others. Photo by Al Levno, USDA Forest Service.

The Roots: The significance of natural and land use disturbance regimes in the Andrews Forest landscape and the work there has emerged in a series of steps spanning the history of the forest. The earliest questions about disturbance in Andrews Forest ecosystems were about the effects of logging and forest roads. The importance of floods and associated landslides as disturbance agents became clear in the aftermath of major floods in December 1964 and January 1965 (Dyrness 1967). Other natural events strongly punctuated current thinking, most notably the 1980 eruptions of Mount St. Helens (Dale et al. 2005, Franklin et al. 1985) and the 1996 flood in the Oregon Cascade Range (Johnson et al. 2000, Nakamura et al. 2000, Swanson et al. 1998). Wildfire history came into focus first in the mid 1970s as a reference point for evaluating effects of land use disturbance, and then in the 1990s as a basis for developing landscape management plans (Cissel et al. 1999).

The Approach: Studies of disturbance take two paths: studying the disturbance processes themselves and studying the ecosystem response to disturbances. Floods, for example, have been examined in terms of the aftermath of major events in the Andrews Forest and neighboring areas, as well as retrospective analysis of streamflow records. Similarly, landslides have been inventoried immediately after clusters of events, supplemented by retrospective techniques to compile a record for the forest since its establishment. Revegetation of landslide scars was studied by sampling sites with a range of elapsed times since the landslides occurred. On the other hand, no significant forest fires have happened in the forest over the history of research there, so interpretation of fire history relies on reconstructing past events recorded in tree-rings and in lake sediment containing pollen and charcoal from the Andrews and neighboring areas.

Results: Study of disturbance history is revealing the integral roles of these processes in ecosystems and the extent to which land use can modify natural disturbance processes. This revelation has led the science effort to better understand disturbance processes, their histories, and ecological implications. Land management and policy have moved from a position of attempting to exclude natural processes, such as fire, to incorporating aspects of the historical disturbance regime in management plans (Cissel et al. 1999).

System managers during the 1950s. The Andrews Forest figured prominently in the newly created and relatively small Blue River Ranger District, recently carved out of the much larger Mackenzie District, and the establishing agreement called for a disproportionate amount of the district's allowable cut from the Blue River drainage to be taken from the experimental forest, but Anderson was pointedly dismissive toward that administrative unit. Anderson claims that Station scientists at the Andrews Forest offered little of interest to forest managers concerned with meeting the administrative mandates of the 1950s. One reason for the lack of interest, he suggests, was the perception that Research was reinventing the wheel: "We [the NFS] used to do studies for 30 to 50 years. And we could go in there and tell you, if this was in a wild fire, it would burn up." Kerrick, who became district ranger at Blue River in 1967, agrees with his predecessor on this issue. Noting that some scientists had proposed to study the effects of fire on succession, he observes, "ALL of this forest came in that way. I mean, yeah, it's vast laboratories that already exist out there. That, in fact, HAS been studied." Anderson concludes, moreover, that the necessary research was already done: "They're in books, they could go to the library and find all the answers they want."[13]

Anderson's tenure at the ranger district was about as long as Silen's with the Blue River Experimental Forest, and his effects on community traditions and the physical landscape were arguably as important. By the time Anderson left the district in January 1960 to take a position on the Malheur National Forest, the scale and pace of cutting activities at the Andrews Forest had expanded dramatically over Silen's last year in charge. Scientists from PNW Station and other agencies who established studies at the experimental forest had to adapt to the dismissive attitude of district staff and to the rapid pace of change at the research facility. Anderson, as the founding administrator of the Blue River Ranger District, set the tone for interactions between district staff and scientists working at the site. Anderson's description of Jay Gashwiler epitomizes that attitude. He describes Gashwiler, who worked with Oregon Fish and Wildlife on pioneering studies at the Andrews Forest during the 1950s and 1960, as nothing more than a grown man who talked to mice: "He was a mice guy. I looked one day and … he'd been talking to the mice, and he was on a first-name basis with all the mice. I mean, he'd catch the same mouse 3 or 4 or 5 times, in the same traps. [chuckles] Then he traveled on."[14]

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[13] Interview with Ed Anderson and Mike Kerrick, 9-10.

[14] Interview with Ed Anderson and Mike Kerrick, 1.

Gashwiler's work at the Andrews, it should be noted, resulted in some 15 publications between 1959 and 1977, including studies of small mammals, the harlequin duck (*Histrionicus histrionicus*), Cooper's chipmunks (*Eutamias townsendi cooperi*), the Townsend chipmunk (*Eutamias townsendi*), the deer mouse (*Peromyscus maniculatus*), the California red-backed vole (*Clethrionomys occidentalis*), pine siskins, seed survival and abundance, plant and mammal changes on clearcuts, and seedling mortality. Dyrness notes that Gashwiler's approach to studying natural regeneration in relation to small mammals and birds was to ask the question, "What are the most important factors of limiting sufficient seed for natural regeneration?" In an effort to answer that question, Gashwiler established plots with fenced-in areas designed to exclude small mammals, but not birds. In contrast to Anderson's ridicule of Gashwiler and his work, Dyrness emphasizes Gashwiler's attention to the standards of rigorous scientific methods and hypothesis testing.[15]

Kerrick, Anderson's assistant district ranger, gradually began to support closer involvement with research scientists at the Andrews Forest. He recalls, for example, that studies of erosion after logging on the Andrews Forest helped the Forest Service answer some of its critics during the French Pete controversy of the late 1950s and early 1960s. Mostly, he observes, the information from the Andrews Forest tended to support Forest Service practices and discredit the arguments protestors presented in that case. From his viewpoint, "They [the protestors] had this different view of how the national forest should be managed, and … they didn't rely on good information in that regard. I mean, they were just very interested in not having any more harvest. Period."[16]

Kerrick's gradual conversion was important because, across five decades, he looped in and out of four different positions that linked him with the Andrews Forest.

Kerrick's gradual conversion was important because, over the course of a career with the Forest Service that stretched across five decades, he looped in and out of four different positions that linked him with the Andrews Forest. In his early days along the McKenzie in 1952, he assisted Silen as a seasonal student worker from the University of Minnesota. Two years after completing his forest management degree, he returned as the first assistant Anderson hired to help him set up the new ranger district, staying on until 1959. He returned in 1967 as the new

[15] Arthur McKee, Gary M. Stonedahl, Jerry F. Franklin, and Frederick J. Swanson, comps., *Research Publications of the H.J. Andrews Experimental Forest, Cascade Range, Oregon, 1948 to 1986* (Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Gen. Tech. Rep. PNW-201, 1987), 16-17; interview with Ted Dyrness by Max Geier on 11 September 1996 at Dryness' office at the Corvallis FSL as transcribed by Jeff Fourier, 2-3.

[16] Interview with Ed Anderson and Mike Kerrick, 8-9.

Figure 11—As evident in this 1950s photo, the Blue River Ranger District compound was an institutional setting with limited amenities for the Forest Service families who lived there. The Rothachers regularly drove into Eugene, nearly 2 hours away by mountain highway, for entertainment and socializing.

district ranger at Blue River, and he became more broadly responsible for the Andrews Forest, among his many other responsibilities as forest supervisor for the Willamette National Forest from the early 1980s through the early 1990s. Kerrick's personal and professional experience as Anderson's protégé and as Rothacher's personal friend and neighbor placed him squarely between two conflicting perspectives on the Andrews Forest. His personal ties with Rothacher and his love for the region helped Kerrick reconcile those perspectives. He notes, "I fell in love with Oregon when I first came out. I was blown over by the size of the trees and the opportunities to practice forestry here." He also credits the professional ethics he learned in the forestry program at the University of Minnesota for his evolving appreciation for the value of research efforts at the Andrews Forest. The University of Minnesota program, he notes, was "… focused a lot on … preparing you for learning more. You know, the learning process didn't stop the day you got your degree."[17]

[17] Interview with Mike Kerrick, 13-14, 21-22.

Kerrick is an example of a recurring pattern of people whose lives intersected at the Andrews Forest, then branched away only to circle back to the place later in their careers. In Kerrick's case, he was drawn to the Willamette National Forest because of his interest in Oregon, not because of any interest in building bridges between research and management at the experimental forest: "… the Andrews didn't have that reputation in those days." If anything, he observes, the place was more known for the animosity between district staff and Station scientists. He argues, however, that animosity was not rooted in personal conflict between researchers and managers but simply resulted from larger, uncontrollable forces: "Hell, they weren't stupid. … they [just] didn't have all the information that they needed … and that's the way the world is."[18]

Pacific Northwest Research Station and Management Priorities on the Andrews Forest

On the surface, the outlook for amicable cooperation between researchers and forest managers at Blue River seemed promising when Jack Rothacher started working at the Andrews in 1957. Rothacher moved from a promising career in forest management to accept the position with PNW Station in the Research Branch of the Forest Service. That move was not unlike H.J. Andrews' similar move in earlier years. Unlike Andrews, however, he never returned to the National Forest System. His move was more of a conversion experience, and like many converts, he became fiercely loyal to his new faith. Rothacher came to the experimental forest directly from his previous position as district ranger at Steamboat, Oregon, on the North Umpqua. An avid outdoorsman, he was also a recent convert to married life. He met his wife, Jean, 2 years earlier during a hiking expedition in the mountains near Shelton, Washington. They lived in that town until Jack secured a Forest Service position as district ranger at Steamboat. Jean recalls, "I don't think he liked being a ranger very much. He didn't like … being responsible for people who were not responsible." Rothacher's friend, Jerry Dunford, who headed the watersheds program at PNW Station in Portland, convinced him to accept the position at the Andrews Forest, and Jean recalls Jack took it "because he liked the idea of … [research forestry] better than being in the regular Forest Service and being a ranger." He and Jean moved to their residence on the district compound sight-unseen, largely on Dunford's advice.[19]

[18] Interview with Mike Kerrick, 25-26.

[19] Interview with Ed Anderson and Mike Kerrick, 1; interview with Jean Rothacher, 1-2.

Rothacher arrived during the first full year of operations for the Blue River District and for the new District Ranger, and his prospects looked bright. He was relatively oblivious to the earlier tension between Silen and forest managers at the district, and the newness of the physical setting and administrative framework encouraged an optimistic outlook. These circumstances suggested strong potential for a fresh start for the experimental forest and for the Rothachers. Jean Rothacher recalls that the forest and general locale made a good first impression when she arrived in 1957: "I thought it was a lot neater than the North Umpqua road which went into Roseburg. A little farther away, a little less civilized. But … our main town for shopping was Eugene. The roads were better kept and … you were getting into the recreational areas. … The houses were brand new."[20]

The Rothachers were culturally distant from the local community, its traditions, and their predecessors at the Andrews Forest, and they arrived at a time when the Blue River District Ranger had gained new authority over the place. The PNW Station's interests, priorities, and authority at the Andrews Forest were severely curtailed. In earlier years, programs of study at the experimental forest included a wildlife unit, forest management research, and the hydrology group. Of the three, the only one that survived after Silen's departure was the hydrology group, and that was the focus of Rothacher's assignment.[21] The new administrative boundaries separating research personnel from day-to-day management decisions at the Andrews Forest were clearly evident. When Dick Koenig, of the Blue River District, asked Bob Ruth, of PNW Station, to obtain cruise data for the Andrews from Roy Silen, for example, Bob Ruth responded to that request with a curt note: "Roy does not have any cruise data for the Andrews. All data is in the ranger station files. … "[22] Rothacher began his daily responsibilities in this climate of a present disengaged from the recent past, and his work centered on the watershed program that was unquestionably within the purview of his authority from PNW Station.

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[20] Interview with Jean Rothacher and Ted Dyrness, 1-2; "Follow-up Memorandum of Understanding [1953]," 1-2.

[21] Andrews group interview 22 September 1997, 46.

[22] Memo 8 Aug 1955 from Robert H. Ruth, Willamette Research Center, to Dick Koenig, Silviculture Mgmt. Folder, File Box F, H.J. Andrews Files, Storage Vault, FSL, Corvallis, OR.

Watersheds Research and Urban Priorities for the Andrews Forest

Watershed management research at PNW Station was elevated to full divisional status in 1955 amidst a flurry of public demands for greater attention to the role of forests in managing municipal watersheds. The first chief of the new division, Jerry Dunford, worked to coordinate the Station's various watershed studies, and the Station supported those efforts with a small, but dedicated budget line, thus elevating the visibility of those studies within the agency and in the public eye. In November 1955, the Station entered into an agreement with the City of Portland Water Bureau to establish a jointly funded study on the Bull Run drainage of the municipal watershed. This agreement called for a 20-year study of watershed management conditions and problems "with the objective of determining an informed and sound basis for management of this 102-square-mile drainage." Specific goals included a charge to explore the possibility of increasing water supply by cutting the old-growth stand, and to determine methods of maintaining water quality.[23] City commissioners entered into the Bull Run watershed study at the urging of Marshall Dana, who was the former editor of the *Oregon Journal* and an official of U.S. National Bank. Dana, who visited the experimental forest with Regional Forester Herbert Stone in the 1950s, had long been a strong supporter of forest resource "conservation and utilization" efforts. By encouraging the 1955 agreement, Dana facilitated PNW Station's efforts to enhance its visibility and reputation among conservationists in Portland and in Oregon, while also advancing the Station's emphasis on applied research.[24] Even before this agreement was approved, however, the Andrews Forest was well positioned as a site for exploring the relation between old-growth timber and watershed management.

Watershed management studies focused on "three comparable side drainages."

Watershed management studies at the Andrews began with the original working plan, which focused on "three comparable side drainages on the south side of Lookout Creek … located between the experimental forest boundary and the end of the access road." If Silen's initial, failed sale had gone forward, the working plan observes, two of these watersheds "would have been spoiled for study purposes as they have to be calibrated for about seven years before cutting starts." The original sales plan included a road into the first drainage "about where it started up steeply

[23] The Bull Run reserve was established in 1892, excluding all human use, including livestock grazing from the watershed; Cowlin, 349-350.

[24] Andrews group interview 22 September 1997, 42; Cowlin, 350-351.

and curved back." From there, the road would have wound around the point into the second watershed and, finally, risen up to the landings on the third watershed. By the time Silen redesigned the logging plan for the area, the access road was completed farther into the drainage, and he designed a "very easy road" into the same area that came in at midlevel and eliminated most of the design problems in his original plan.[25] In 1952, Dunford, who had recently returned to PNW Station from a 7-year stint directing watershed studies at the Southeastern Station, directed Hale and Gedney to supervise installation of modified trapezoidal flume stream gauges on the three small watersheds at Blue River Experimental Forest.[26]

Dunford's experience at the Southeastern Station linked the Andrews Forest into state-of-the art watersheds research. Dunford worked with ecologists who pioneered watershed research at the Coweeta Hydrologic Laboratory, including Charles R. Hursh, who founded the Coweeta facility and still directed it during Dunford's time there. Dunford's move from Coweeta to direct watershed studies at the Andrews Forest in the early 1950s initiated a long chain of interaction among scientists at these two sites for forest hydrology research. By 1959, scientists and technicians working for Dunford at the Andrews Forest produced continuous records providing data about streamflow "under natural conditions." Analysis of those data revealed peak flows of "as much as 140 cubic feet per second per square mile" in December and January. Streamflow data for September was dramatically less, approaching barely 0.1 cubic foot per second per square mile.[27]

The study plan for the watersheds program that Hale and Gedney installed at the Andrews Forest called for calibrating and then clearcut-logging Watershed 1 with a skyline system that required no roads across the drainage; leaving Watershed 2 undisturbed for comparative, "control" purposes; and logging Watershed 3 "in the conventional manner [small clearcuts], with normal road construction." They laid out small plots on each drainage to study key sources of erosion, with the goal of minimizing soil movement from those sources. Debris basins installed

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[25] December 1992 discussion with Roy Silen, 22; "Working Plan for Blue River harvest outings (Sale 1) [1950]" File Box C, H.J. Andrews Files, Storage Vault, FSL, Corvallis, OR, 2.

[26] W.T. Swank, J.L. Meyer, and D.A. Crossley, Jr., "Long-Term Ecological Research: Coweeta History and Perspectives," (typescript from Wayne Swank, 22 August 1997), 1-7.

[27] Andrews group interview, 16-17, 39. Cowlin, 253-254, 314-315.

Figure 12—From left to right: Jerry Dunford, Pacific Northwest Research Station (PNW) watershed assistant director; Jack Rothacher, PNW watershed project leader; Ted Dyrness, PNW soil scientist; and Dick Fredriksen, PNW soil scientist having lunch by the old swimming hole on Lookout Creek just above WS 3 confluence in August 1963.

at lower ends of the three small watersheds were designed for "measuring stream bedloads." Debris accumulation in these basins, for the 3-year period of 1956-59, averaged 1.5 cubic feet of sediment per acre of drainage.[28]

Preliminary results from early watersheds research at the Andrews Forest seemed to support the premise that logging old-growth timber on the Bull Run reserve would increase water production, but Station scientists also stressed the need to study the broader implications of this management activity. The Station's 1959 brochure and bibliography also marketed the experimental forest as a site available for those kinds of studies. In this guide to the Andrews, Rothacher and Berntsen reported, "… old-growth Douglas-fir forests prevent a sizeable proportion of rainfall from reaching the ground. Apparently, the forest intercepts about a quarter of the gross rainfall during summer and early fall, and about 15 percent during the wetter part of the year." The report noted that cooperative studies of the effects of timber harvesting on fish and wildlife were underway in 1959 by the U.S. Fish and Wildlife Service and the Oregon Cooperative Wildlife Research Unit.

[28] Berntsen and Rothacher, *A Guide to the H.J. Andrews Experimental Forest*, 15-16.

From Gashwiler's studies of small-animal populations before, during, and after logging, and in relation to seed fall, this guide concluded, "… apparently, chipmunks and red-backed mice do not like logged or burned units, and quickly move into green timber. … deer mice continue to live in logged units and show signs of population increase." Studies of fish and large game animals by the Oregon Cooperative Wildlife Research Unit showed "a noticeable increase in black-tailed deer populations since logging began." Studies of native fish indicated limited home ranges for their life-cycles, and indicated sedimentation "temporarily reduced the trout population in small streams. …"[29]

Urban Growth as a Stimulus for Research and Cooperative Effort at the Andrews Forest

The PNW Station secured increased funding in 1956 to study problems resulting from rapid urban growth and booming timber harvests in the Pacific Northwest. The Station fielded demands for information from an increasingly urban population seeking more access to forest resources, including water, timber, recreation, and aesthetic experiences. The new supply of funding and increased demands for research prompted a Station-wide review that revealed a serious shortage of trained professionals. State agencies and the timber industry, meanwhile, also initiated new programs of research and competed with PNW Station for qualified staff. Forestry schools in the region responded with programs that focused more on preparing their graduates for careers in research. The PNW Station responded by cooperating with universities to support more projects designed to gather "basic forest information," and the Station began to support graduate training for research-oriented foresters. This trend toward highly trained specialists with more emphasis on "basic science" also answered public demand for multiple-use management of the national forests during the late 1950s and early 1960s.[30] It was an opportunity for innovative thinking in the area of forestry research, and two young scientists who met at the Andrews Forest during this period seized the moment, combining their resources to study forest ecology.

Rothacher's family, home, and station as research forester-in-residence drew Ted Dyrness and Jerry Franklin together at the Andrews Forest at a critical juncture in the history of PNW Station. These two Station scientists brought very

[29] Berntsen and Rothacher, *A Guide to the H.J. Andrews Experimental Forest*, 17.

[30] Cowlin, 354-355.

different backgrounds and experiences to the experimental forest, but they were both graduates of Oregon State College who eventually pursued common interests in forest ecology. Dyrness, who first visited the Andrews in 1955 as a graduate student on a field trip with leading soil scientists, initially joined PNW Station in 1959 and worked on the Alsea River Basin soil vegetation survey for the next year and a half. He frequently visited the Rothachers for fishing expeditions on Lookout Creek in those years. He spent much of the summer of 1961 touring national forests in western Oregon and Washington with Rothacher, collecting information they needed to write a problem analysis of soil stability issues in that region. By the end of that summer, Dyrness notes, "I was thoroughly up on what was going on in the Andrews." That same year, Rothacher moved to Corvallis, where he directed the watershed program from the Willamette Research Center.[31] Through the Rothachers, Dyrness met Franklin, who was also a frequent guest at their house.

"A college assistant lived in a trailer above our house. That was Jerry Franklin."

Franklin and Rothacher first met at the Andrews Forest several years before he teamed up with Dyrness. Jean Rothacher recalls that early in 1957, "the first summer we were there, [Jack] had a college assistant who lived in a trailer above our house. That was Jerry Franklin." Franklin was the person Jack interacted with most frequently at the experimental forest.[32] He began working there as an undergraduate and was employed by the Forest Service through the Oregon State College cooperative extension office in early 1957. Ruth, who headed the Research unit at Corvallis, hired Franklin shortly after Rothacher signed on, and Berntsen escorted Franklin to the Andrews, where he helped Rothacher monitor stream gauges. Dyrness recalls, "He [Franklin] had really good rapport with Jack and Jean Rothacher, and so it was natural that he would do his master's [thesis] on his work on the Andrews."[33]

Later in the 1960s, Dyrness and Franklin emerged as leaders of a science team at the Andrews Forest, although Dyrness notes that initially, "We definitely were not in leadership positions." Their partnership, like the earlier pairing of Silen and Gratkowski, combined diverse backgrounds in the Eastern and Western United States, and they mixed their personal attachment to the region with visionary

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[31] Interview with Ted Dyrness by Max Geier on 11 September 1996 at Dryness' office at the Corvallis FSL as transcribed by Jeff Fourier, 1-2.

[32] Interview with Jean Rothacher, 2-3.

[33] Andrews group interview 22 September 1997, 48; interview with Jerry Franklin by Max Geier on 13 September 1996 in a Forest Service cabin near the Wind River Canopy Crane facility as transcribed by Jeff Fourier, 2-3.

Figure 13—Ted Dyrness inspecting revegetation plot at the H.J. Andrews Experimental Forest on road fill at Watershed 1, 22 April 1966.

enthusiasm and cautious, pragmatic research. Dyrness, who was born and raised in Wheaton, Illinois, grew up amidst the academic trappings of Wheaton College, where his father was an administrator. He credits his mother with instilling an artistic ethic and for cultivating an early interest in plants and animals. He also traces his early interest in ecology to his experience as a high-school student building a family cabin in the Wisconsin woods with his father and grandfather, and to his father's interest in outdoor activities, "… things like fishing and going out on the lake and sitting. Not any fancy fishing, … you know, a meat fisherman [laughs]."[34] He headed West in 1951 as a young college student seeking summer employment and adventure in the forests of the "evergreen" Northwest. That experience inspired a life-long appreciation for the scenic wonders of the forested slopes of

the Cascade Range. Dyrness notes, however, that he decided to pursue a career in ecology because of his college experience at Wheaton, where the liberal arts program required at least one laboratory course: "I sat down and said, "What's the most Mickey-Mouse laboratory science that I can take, and get it out of the way as a freshman, you know, thinking very logically. [laughter] And I thought: 'Ah, BOTANY!'"[35]

[34] Interview with Ted Dyrness, 7-8.

[35] Interview with Ted Dyrness, 7-8.

That botany course set Dyrness on a career path that wound through the Pacific Northwest and eventually brought him to the Andrews Forest. Dyrness got more than he bargained for when his botany instructor taught the introductory course with an ecological emphasis. Dyrness was hooked, and he subsequently changed his major from ancient history to botany, setting him on the path to a future career in Forest Service Research. He worked as an itinerant employee in the timber industry of the forests of the Pacific Northwest during the summer after his freshman year of college, including a stint pulling the green chain and running the trim saw at a mill near Packwood, Washington. He also fought forest fires near Randall, Washington. Meanwhile, he lived in a makeshift home in a converted chicken coop and explored the countryside in his free time. He lived for the summer with the college buddy who lured him West with grand images of country life on a family ranch that didn't quite live up to its billing. The surrounding countryside, however, was all that he expected, and more. During one overnight visit to a fire lookout near Goat Rock Wilderness in the western Cascades that summer, Dyrness decided to pursue a career in the Pacific Northwest.[36]

Gazing out from the fire lookout, Dyrness saw an inspiring wilderness landscape, and when he went back to Wheaton College, he told his academic advisor he wanted to go to graduate school in the Pacific Northwest. He was bored with the farm country of Illinois where he grew up, and he had always been fascinated with mountainous terrain, beginning with family excursions to the Great Smoky Mountains National Park. His experience in the Cascade Range, however, eclipsed even his memories of the Smokies. His major advisor at Wheaton was close friends with Chet Youngberg, a graduate of Wheaton who secured an appointment at Oregon State College and was looking for promising new graduate students. Dyrness followed up on that contact and began graduate work in Corvallis in the late 1950s, about the time Jerry Franklin completed his undergraduate work at Oregon State College and began his graduate studies.[37]

Where Dyrness was a transplanted Midwesterner with academic roots, Franklin was a native Northwesterner with a working-class background. He grew up in Camas, Washington, where his father worked as a foreman at the local mill. Like Silen, Franklin's appreciation for the local woods was based on regular, everyday experience from early childhood through his adult life. When he was a young

[36] Interview with Ted Dyrness, 5-8.

[37] Interview with Ted Dyrness, 6-9; communication from Ted Dyrness March 1998.

boy near the end of World War II, the Franklins purchased a car, and the family began taking frequent camping trips to the woods near Wind River, at Mineral Springs, Washington. Franklin cites those family outings as inspiration for his life-long interest in trees and forests: “This is where it all began for me as far as an interest in trees and forests is concerned. …”[38]

Franklin, like Silen, began his college career assuming he would eventually wind up in a job in the timber industry, and he spent most of his academic life bouncing back and forth between the state colleges of Oregon and Washington. He started out at Clark College as a freshman and then transferred to Washington State University in his sophomore year, planning to go into forestry. He notes, however, “I got distracted, as people often do. But then in my junior year, I went to Oregon State University and settled down.” He completed his B.S. (1959) and M.A. (1961) degrees in forest management at Oregon State College and eventually earned a Ph.D. (1966) in botany at Washington State University. Bill Ferrell, Franklin’s advisor at Oregon State College, “made the connection” between the Forest Service and Oregon State College Cooperative Extension (then called the Student Trainee program) in the 1956-57 academic year. Ferrell told Franklin, who was enrolled in his course that fall, that PNW Station was looking for a student “interested in a career in Research.” Franklin notes the shift from forest management to forest Research was a real “risk” because the government “didn’t pay very well” and he was “totally dependent” on his own resources at the time. He had been working at the Crown Zellerbach paper mill in Camas, where he made more than three times as much money as PNW Station offered in 1957, but he decided, “I’ll take the risk and hope I get a scholarship the next year. Which I did.”[39]

Franklin initially planned to become a park or forest ranger, but once he began working with the research program at PNW Station, he discovered it was a “less-structured situation” than other jobs in the Forest Service. He found people there doing “exciting” and “interesting” work with minimal supervision, and by 1961, he followed their lead and shifted his goals to pursue a career in forest research. “I like freedom,” he observes, “I like options.” He mostly serviced and maintained gauging stations in his early days at the Andrews Forest, and he helped Rothacher install a forest regeneration study. He notes, however, his first big job of the summer” was to run boundary surveys on Watersheds 1, 2, and 3 with another

[38] Interview with Jerry Franklin, 1.

[39] Interview with Jerry Franklin, 1-2.

Figure 14—Jerry Franklin, shown here measuring streamflow with a velocity head rod at the weir, experimental Watershed 1 gaging station in July 1957, was one of Rothacher's earliest associates at the H.J. Andrews Experimental Forest.

technician who supervised his work. When Rothacher encouraged him to start his own research project, Franklin developed a guide for identifying tree seedlings.[40]

Franklin, like Dyrness, was excited to be working in the old-growth timber of the Andrews Forest. He recalls it was a novel experience, despite his familiarity with the woods around Camas, Washington: " … wow it was neat! I hadn't seen so much old growth in the Oregon Cascades up until then." Franklin was interested in more than aesthetics, however. Working at the Andrews Forest was an adventure: "I think that's the first time I've ever been … anywhere on snow shoes. So it was [an] exhilarating experience. … it was my first real experience working regularly in the big woods, a lot of time on my own, and I did a lot of backpacking on weekends."[41]

The "wow factor" that Franklin and others emphasize when describing their first encounter with the Andrews Forest also helped them recruit other scientists for research programs during the 1960s. It was, however, a constantly changing ally. Each generation of scientists encountered a forest transformed by their predecessors but impressive as an apparent example of relatively intact old growth

[40] Interview with Jerry Franklin, 3-4.

[41] Interview with Jerry Franklin, 3.

“It was an incredibly pristine landscape. … Blue River drainage was essentially pristine.”

(for an experimental forest). Arriving on the scene 3 years after Silen left the Andrews Forest, Franklin was impressed with the place as a relatively untouched landscape: “the only clearcuts that were visible at that time, really, were at the head of Deer Creek. … there were none of the cuttings out in the High Cascades at all, there wasn’t anything out there, so it was an incredibly pristine landscape. … Blue River drainage was essentially pristine.”[42] The place Silen had worked so hard to make more accessible still seemed remote and untouched by comparison with the forests near Camas, Washington, and other places this native of the Pacific Northwest had seen.

People and research were relatively sparse at the Andrews Forest when Franklin and Dyrness first began working there together. Scientists walked a curious line between monitoring the effects of human activities on the watersheds and defining the degree to which the landscape remained “pristine” or apparently free of human disturbance. Anderson recalls that Franklin, whose career soon moved beyond the Andrews Forest, was initially somewhat impatient and detached from the legacy of previous work on the experimental forest: “Jerry didn’t know that we were there [laughter]. He was very ambitious, he was ready to learn.” Anderson recalls that from his perspective as district ranger, research at the Andrews all related to timber sales, and Anderson, Kerrick, and Franklin all recall working to lay out trails on the control watershed [Watershed 2]. The process, Kerrick observes, created “a lot of disturbance” despite the absence of roads.[43] In an account reminiscent of Mitchell’s experience with Gratkowski, Franklin cites his work on the Watershed 2 trails as an example of Rothacher’s reputation for meticulous attention to detail. He notes that Rothacher made him lay out the trails three times before allowing he was satisfied with the results. Like Silen, Franklin also developed a sense of stewardship for the pristine character of the place, but with more of an emphasis on maintaining that character. He recalls coming down out of Watershed 2 at the end of the day and diving for cans at the bottom of Lookout Creek where it pooled near a gauging station: “People would leave cans in that pool, and so, I took ‘em out, one at a time.”[44]

Franklin was reassigned to Cascade Head Experimental Forest in the Coast Range of Oregon in the summer of 1958, and he was not happy about the transfer. Most of his work at the Andrews Forest had been in watershed research, but as he

[42] Andrews group interview 22 September 1997, 19.

[43] Interview with Ed Anderson and Mike Kerrick, 1-2.

[44] Andrews group interview 22 September 1997, 29.

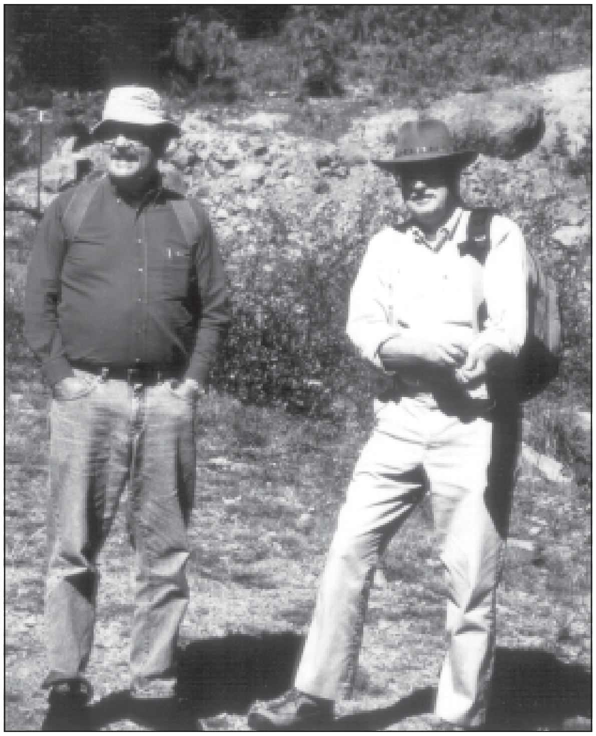

Figure 15—Ted Dyrness (left) and Jerry Franklin worked together at the H.J. Andrews Experimental Forest during the early 1960s, while Franklin was staying with the Rothachers at Blue River. In this photo, they reminisce at Carpenter Saddle in 1997 about their professional association of more than three decades.

recalls, "Cascade Head Experimental Forest was all timber management research. Cutting, … regeneration, spruce hemlock type, a different forest type." He didn't mind working on timber management research, but he missed the Cascade Range and he missed working with Rothacher: "I've always liked the Cascades environment better than the coastal one. The guy I worked for at Cascade Head … wasn't near as much fun as working for Jack [Rothacher]."[45] The year after his summer at Cascade Head, Franklin joined PNW Station as a permanent employee and took over Berntsen's responsibilities at the Corvallis center, which included administrative authority over the Andrews Forest. Franklin recalls that from then through the mid 1960s, the object of management was to "road the Andrews. And we DID it."[46]

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[45] Interview with Jerry Franklin, 4.

[46] Andrews group interview 22 September 1997, 27.

Franklin's impression of district priorities mirrored Anderson's view that Research had little relevance to forest managers, and research scientists who worked at the Andrews Forest after 1954 seldom interacted with district staff or other people in Blue River through the 1960s. When Franklin married in 1958, for example, he and his family lived in Corvallis and he visited the experimental forest for brief stays of only 2 to 3 days, living in a trailer camp near Blue River. "Once you got into the trailers," he recalls, "unless your work brought you together, you didn't [interact]. I didn't drink, and so I didn't go down to the bars, pool room, or anything like that, hang out."[47] Their priorities, he recalls were "pretty heavy duty … go-for-broke management. … they weren't much interested in research." District managers, Franklin notes, often acted on the Andrews Forest without consulting anyone at PNW Station: They would put up a timber sale and build a road [up] there … and drop it down on the Andrews side, … and we wouldn't even know about it."[48]

Scientists with PNW Station also worked on more compartmentalized and specialized projects during the late 1950s and early 1960s, and less commonly interacted with other scientists at the Andrews Forest than in previous years. In his first year at PNW Station, Dyrness discovered an institutional culture of strictly defined limits. He had studied soil-vegetation relations near Klamath Falls for his Ph.D. thesis, but his boss reprimanded him for presenting that work at a conference that focused on federal plans to terminate the Klamath Tribe and Reservation. Dyrness recalls, "I took the … Greyhound Bus to Klamath Falls, and stayed overnight and attended the meeting. And when I got back, I was in trouble [with PNW Station administrators]. You know: I was a west-sider. I shouldn't have gone to that meeting, etc. … " Station leadership expected Dyrness to work on the west side of the Cascade Range, meaning he should no longer engage in east-side studies. The Station subsequently assigned him to work with Rothacher at the Willamette Research Center in Corvallis.[49]

The Transition From Research Centers to Research Laboratories

The PNW Station's diminished role at Lookout Creek was painfully obvious by the time Dyrness began working there, and by mid decade, the facility teetered on the brink of formal termination. The few scientists who did any field work at the

[47] Interview with Jean Rothacher, 3-4; interview with Jerry Franklin, 6-7.

[48] Interview with Jerry Franklin, 6.

[49] Interview with Ted Dyrness, 9-10.

facility during the early 1960s did not seem to justify the costs of keeping it open, but Dyrness, Franklin, and Rothacher scrambled to preserve it as an irreplaceable resource. Congressional funding specifically earmarked to build new facilities for forest research in 1960 actually made their effort more difficult, because it shifted the agency's focus from field studies to scientific laboratories. The allocation reversed a 15-year trend. After World War II, the Forest Service had reorganized research into "problem areas," mostly emphasizing studies "in the woods" or "on the forest ranges." Field studies in the agency were organized into 11 geographical forest regions, each with a forest and range experiment station supplemented by several experimental forests. This framework supported research in some 80 "problem areas" or "research provinces." Each province had at least one research center, and each center had at least one experimental forest. At PNW Station, this structure produced the Willamette Research Center in Corvallis and other similar centers elsewhere in the Pacific Northwest. In 1960, however, PNW Station opened its first research laboratory in Olympia, Washington, and deemphasized experimental forests.[50] Oregon State College also shook off Dean Peavy's legacy of field-oriented training and planned a new laboratory for forestry research in the early 1960s. These parallel developments at PNW Station and at Oregon State College encouraged closer cooperation between scientists with PNW Station and faculty at the state college. The growing emphasis on laboratories at both Oregon State College and PNW Station came at the expense of institutional support for experimental forests, but the new climate of academic cooperation in Corvallis rescued the research facility from a proposal to terminate it.

Station scientists at the Willamette Research Center and faculty with the Oregon State College School of Forestry cooperated more closely after the state of Oregon concentrated its forestry research programs on the Corvallis campus during the 1950s. Walter F. McCulloch, who served as Dean of the School of Forestry at Oregon State College from 1952 to 1966, managed the transition from a program that emphasized field training and applied skills to one that emphasized more basic research, and he committed institutional support to laboratory-based research in Corvallis.[51] Four years into McCulloch's term as Dean, the state authorized funds for a Forest Research Laboratory (FRL) on the Corvallis campus and

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[50] Cowlin, 406-407.

[51] Arnst, A., ed. 1981. 75 years of continuing progress in forestry education. Corvallis, OR: School of Forestry, Oregon State University. 9.

placed it under the administration of a state committee that McCulloch headed, and it operated independently of the state college. The new FRL was completed in 1957, and the Forest Lands Research Division of the Oregon State Forestry Department moved from Salem into the new building. State silviculture and forest products researchers already in Corvallis also moved into the new building. This consolidation, together with the federal Research Center, made Corvallis a regional center of laboratory-based forest research.[52]

Laboratory-oriented scientists who initially expressed little, if any, interest in field work at the Andrews Forest, converged on Corvallis during this period, and the number of scientists studying forest-related issues in Corvallis reached critical mass by the late 1950s. The transformation of Oregon State College into Oregon State University (OSU) in 1961 helped make the Corvallis campus seem more inviting to research scientists just beginning their professional careers. That same year, the Oregon State Legislature transferred authority over the Forest Lands Research Division from the State Forestry Department to OSU, merged it with the Experiment Station, and in 1965, redesignated the combined program the FRL (as distinguished from the building by the same name constructed 8 years earlier).[53] Robert Tarrant, whose career in the region's forest re-search community included stints as PNW Station Director and as Forest Science Department Head at OSU, argues this concentration of forestry programs and scientists in Corvallis created an unsurpassed climate for forest-related research in the last third of the 20th century. Research at the university's Forest Experiment Station included programs in forest management, forest products, soils, botany, plant pathology, and entomology. The School of Forestry was also well funded with sales of timber from state-owned forest lands.[54] This convergence of people and programs created the potential, at least, for well-funded interdisciplinary research.

Robert Tarrant argues this concentration of forestry programs and scientists in Corvallis created an unsurpassed climate for forest-related research.

One young scientist who found the academic climate in Corvallis appealing in 1963 was Dick Waring, who completed his doctoral work at Berkeley and joined the OSU faculty that year. Waring saw OSU as an institution with enhanced national prestige and good opportunities for growth. He was initially attracted to the programs at Corvallis, but he soon emerged as a leader in the effort to develop field

[52] Arnst, 6, 12-13; George W. Bengston, "Forest Research Programs Stimulate Progress in Forestry." In: Arnst, A., ed. 1981. 75 years of continuing progress in forestry education. Corvallis, OR: School of Forestry, Oregon State University. 47.

[53] Bengston, 47.

[54] Interview with Robert Tarrant by Max Geier on 24 July 1997 at Tarrant's house in Corvallis, as transcribed by Keesje Hoekstra, 14-15; Andrews group interview 22 September 1997, 23; Bengston, 46-47.

Figure 16—Laboratory research gained new impetus during the 1960s at the Pacific Northwest Research Station (PNW), and Franklin and Dyrness promoted the H.J. Andrews Experimental Forest as a field laboratory in an effort to protect the facility from a proposed closure. Here, Dyrness makes soil measurements in a laboratory on the Oregon State University campus in 1962, a few years before PNW constructed the Forestry Sciences Laboratory in Corvallis.

research programs at the Andrews Forest. He was a midwesterner, originally from Chicago, but with B.S. and M.S. degrees in forestry at the University of Minnesota and a Ph.D. from the University of California, Berkeley, where his preparation included botany, physiology, and soils. Waring, like Dyrness and Franklin, cites an early involvement in the outdoors with his father as inspiration for pursuing a career in forestry, but his career path into research was less circuitous than theirs. One of his father's business associates in Chicago was a lawyer who purchased land and then dedicated it to research. Waring, consequently, grew up surrounded by scientists practicing their craft, and he viewed that as a natural career path. As a high school student, they were his role models, and he began his own research projects even before he enrolled as a freshman in the forestry program at the University of Minnesota. His path through graduate programs at the University of Minnesota and the University of California was similarly direct. Even as an undergraduate, Waring secured summer assignments as a research assistant at the University of California, where he worked on the Redwood Ecology Project, and in Spokane, Washington, where he worked with the Inland Empire Research Station of the Forest Service on a pole blight project. As a freshly minted Ph.D. in high demand, he could choose among several job offers, and Waring notes the centralization of state forestry programs at Corvallis was a major factor in his decision to accept a position at OSU: "This was the one that was initially full-time research, but with a potential to fuse the … Forest Research Lab with the College of Forestry—at that time the School of Forestry, so that you could have some teaching, at least, at the graduate level.[55]

When Waring arrived, Franklin and Dyrness were already promoting the Andrews to Corvallis-area colleagues as a site for field research, hoping that if more scientists installed studies at the experimental forest, Station administrators would not close the facility. Shortly after Franklin and Dyrness began working there during the early 1960s, George Meagher had floated the idea that PNW Station should reduce its involvement with experimental forests. Meagher's proposal called for returning the South Umpqua Experimental Forest and the H.J. Andrews Experimental Forest to the National Forest System, except for existing experimental watersheds programs in those places. Although Meagher's proposal simply recognized the Station's already diminished role at the Andrews Forest, his suggested restructuring would have closed down one of the largest facilities available to support field research in old-growth stands of Douglas-fir. Given the political climate at the time, there was little doubt that the Station, once it surrendered formal control over a drainage with substantial quantities of marketable, old-growth timber, would never again control a similar parcel of federal land.[56] If the proposal went through, scientists would have to adapt their studies to areas where market forces and other management concerns took priority over scientific plots without any requirement, whatsoever, for "consultation" with the scientists themselves, or even with PNW Station. Under such conditions, long-term studies would be vulnerable to the impact of unanticipated management actions, thus rendering field-tests of scientific hypotheses relatively useless. The governing memorandum of understanding for the Andrews Forest had mostly gutted the PNW Station Director's authority over management activities on the Lookout Creek drainage, but

[55] Interview with Dick Waring by Max G. Geier on 26 September 1997 at Waring's office in Peavy Hall at Oregon State University, as transcribed by Linda Hahn and Keesje Hoekstra, 1-2.

[56] Documentation for this proposal is elusive, but Tarrant, who later became PNW Station Director, recalls conversations between Meagher and Cowlin concerning this proposal during the early 1960s, and Franklin recalls Meagher circulated a letter confirming the proposal during that period. Andrews group interview 22 September 1997, 20-21.

it still required "consultation," even if it was perfunctory—or ignored. Termination of the designation as an experimental forest would have eliminated even that thin thread of security for the integrity of scientific research.[57]

Al Levno, who began working as PNW Station's watersheds technician at the Andrews Forest in 1963, notes that Meagher's proposal to close the facility just compounded existing problems with district staff who refused to support scientists on the Lookout Creek drainage. Levno recalls that Gashwiler, for example, "had a lot of trouble getting support from the district. And there was many a time he would come in and complain about not getting any support."[58] Levno lived in the house the Rothachers previously occupied at the Blue River compound and worked out of the district offices, monitoring rain and stream gauges and forest plots at the Andrews in his role as technician-in-residence. He recalls that, given the strained relations with district staff, research use of the experimental forest was very low: "The emphasis was that people needed to be here [Corvallis], that the center of interest was at OSU, so their people were leaving the woods and going to the big labs."[59]

Opening the Floodgates and Facilitating Research at the Andrews Forest

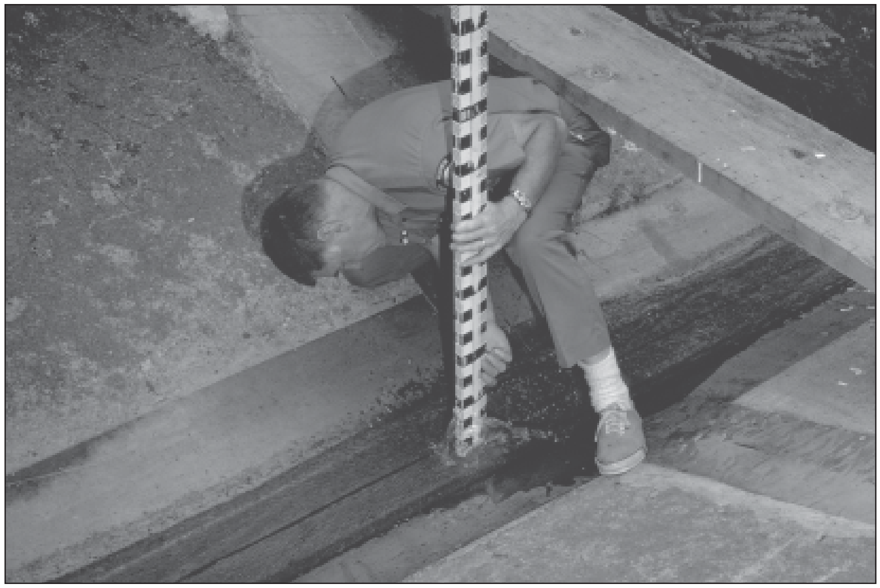
Dyrness and Franklin bucked the trend toward laboratory research with a "boot-legged" vegetation classification study at the Andrews Forest. They also accomplished other, funded research more directly related to their assigned responsibilities while working on the unauthorized and unfunded vegetation classification project. Dyrness, for example, recalls he was studying effects of different logging methods on soil conditions: "I just investigated high-lead, tractor, sky-line, and balloon logging. So that salved my conscience a little. Then, I began to get interested in road-side soil stability and treatments to forestall erosion on newly constructed roadsides."[60] Informal collaboration with a soil survey crew working at the Andrews Forest in the summer of 1962 also boosted the vegetation classification effort. Dyrness and Franklin lived that summer next door to the trailer housing the survey crew. Dyrness talked to them each evening about their work as fellow soil

[57] Interview with Dick Waring, 4.

[58] Interview with Al Levno by Max G. Geier on 12 September 1996 at the Corvallis FSL as transcribed by Jeff Prater, 4-5.

[59] Interview with Al Levno, 4-5.

[60] Interview with Ted Dyrness, 12-13.



Dick Fredriksen in August 1969

Figure 17—Among his other responsibilities, Jack Rothacher maintained long-term watershed records at the experimental forest. This photo shows Rothacher making stream discharge measurements at one of the three small watersheds (WS 1, 2, 3), by using a velocity head rod. This method was used to calibrate these 120-degree, trapezoidal flumes.

scientists, and by the end of the summer, he and Franklin had a broader understanding of soils on the Andrews Forest. It was a significant year in the development of the experimental forest for several reasons. Field work on the soil survey ended that year, and logging began that fall on Watersheds 1 and 3, shortly after Dyrness and a summer field assistant installed permanent vegetation plots on those drainages. Then, on October 12, a major windstorm swept through the valleys of western Oregon, including Lookout Creek, causing enough damage to be remembered thereafter as the Columbus Day Storm.[61] Beginning in 1963, Dyrness and Franklin began to supplement the knowledge they had gleaned from the survey crews with their own reconnaissance studies of vegetation in association with those soils. Finally, in 1964, Rothacher insisted they draw up a formal plan for the vegetation study so that it would be officially listed at PNW Station and qualify for research funding and assistants.[62]

Dyrness' primary interest was always ecology, and he notes his specialization in forest soils was more a means than an end. Dyrness credits Rothacher for

[61] Communication from Ted Dyrness, March 1998.

[62] Interview with Ted Dyrness, 11-12.

supporting his efforts at the Andrews Forest, despite resistance from both the district and the Station during the early 1960s. Rothacher, who directed their work from the Research Center in Corvallis, required they adhere to Station policy, but he also allowed them room to unleash their curiosity in the field, provided they kept things in perspective. Dyrness recalls, "I should have been working on *soil erosion*. And Jerry should have been working on just, … higher elevation, upper-slope silviculture." Rothacher, however, allowed Dyrness to install permanent vegetation plots on Watershed 1 and Watershed 3, and he allowed Franklin and Dyrness to work on a plant community classification for the Andrews Forest for about 3 years, starting in 1963. Dyrness emphasizes that it was more an example of active encouragement than loose management: "It was a credit to Jack to recognize that what we were doing was worthwhile. … it was kind of a pioneer effort in vegetation classification. How to do it. What kind of units to come up with. … figuring out … successional relationships among the groupings." Rothacher, in other words, encouraged scientists to look around when they were doing field work, observe what was happening, and then decide what they could do. Once they decided something didn't fit into an existing study plan, Rothacher supported their efforts to draft a new plan. In short, Dyrness explains, Rothacher was "really grass-roots oriented."[63]

"It was a credit to Jack to recognize that what we were doing was worthwhile. … it was a pioneer effort in vegetation classification."

Franklin also credits Rothacher with encouraging his joint efforts with Dyrness, and he emphasizes that their "normal assignments" at PNW Station did not really permit collaborative work. The Station practice of assigning each scientist an approved area of work, he argues, limited opportunities for cooperative efforts, and scientists were seldom free to follow their independent interests. Franklin recalls, however, that the close quarters he shared with Dyrness at Blue River broke down some of those institutional barriers. Living in a trailer with Dyrness, he discovered they had "a lot of similar kinds of viewpoints and general inclinations," and they began to look for "opportunities to do things together" at the Andrews Forest. The resulting vegetation classification study combined Dyrness' expertise in soils with Franklin's experience sampling vegetation.[64]

Their joint effort was remarkably successful and illustrated the pragmatic value of collaborative effort for managers and scientists. They produced *Natural Vegetation of Oregon and Washington*, first printed in 1973 and later reprinted in the

[63] Interview with Ted Dyrness, 9-10.

[64] Andrews group interview 22 September 1997, 20; interview with Jerry Franklin, 11.

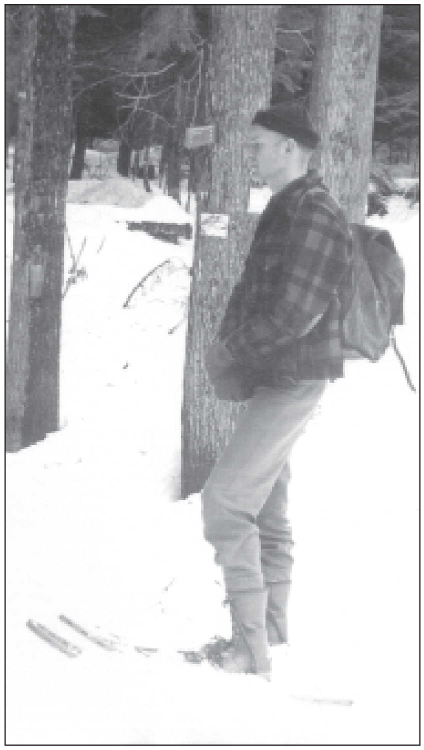


Figure 18—Dick Fredriksen at Carpenter Saddle, January 1962.

1980s by Oregon State University Press, in response to strong and continuing demand for a reference work that had become an indispensable "bible" for field work in the area that it covered. This successful example of collaborative field work also enticed Dick Waring to join Dyrness and Franklin at the Andrews Forest. The young Berkeley graduate had prior experience in, and enthusiasm for collaborative research. While at Berkeley, he worked with three professors and three other graduate students on a joint project in the redwood region, and he was familiar with the benefits and some of the problems that arise in joint research. Waring became acquainted with Dyrness and Franklin through their interactions with the forest research community on the OSU campus in Corvallis. He was already working at a field site above Cougar Reservoir on the Augusta Creek drainage, a tributary to the McKenzie River. He was interested in the general area around the Andrews Forest, but he also wanted to place his own work in a broader context, and collaboration with Dyrness and Franklin was a relatively fast way to do it.[65]

[65] Interview with Dick Waring, 4-6, 12-13; communication from Martha Brookes 28 August 2000; Andrews group interview 22 September 1997, 20.

Figure 19—Jack Rothacher contributed to the reputation of the H.J. Andrews Experimental Forest (Andrews Forest) as a place where scientists involved people with the landscape as a way of explaining the interface of scientific theory and resource management. Here, Rothacher describes the research program to members of the League of Women Voters who toured the Andrews Forest in June 1960. The photo was taken from Lookout Point, Unit 1-I.

Collaboration at OSU did not automatically translate into cooperative efforts at the Andrews Forest, but the chance to work closely with other people did encourage laboratory-oriented scientists to do more field work. During the mid 1960s, the experimental forest began to attract scientists who wanted or needed to work with other people. As Dyrness observes of the Andrews, "… what we had was at least somebody that could help us down there. Because, starting with Jack [Rothacher], we always had somebody stationed down there. … after Jack it was Dick Fredriksen. After Dick Fredriksen, it was Al Levno. After Al Levno was Ross Mersereau. … you know, in these kinds of studies, you need somebody to help you." Among their other responsibilities, Rothacher, Fredriksen, Levno, and Mersereau monitored and maintained equipment that measured streamflow, and they sampled storm flows. These people, who lived on site near the Andrews Forest, also gained an appreciation for the place, and they encouraged other people to consider doing field work there.[66]

[66] Interview with Ted Dyrness, 12-13.

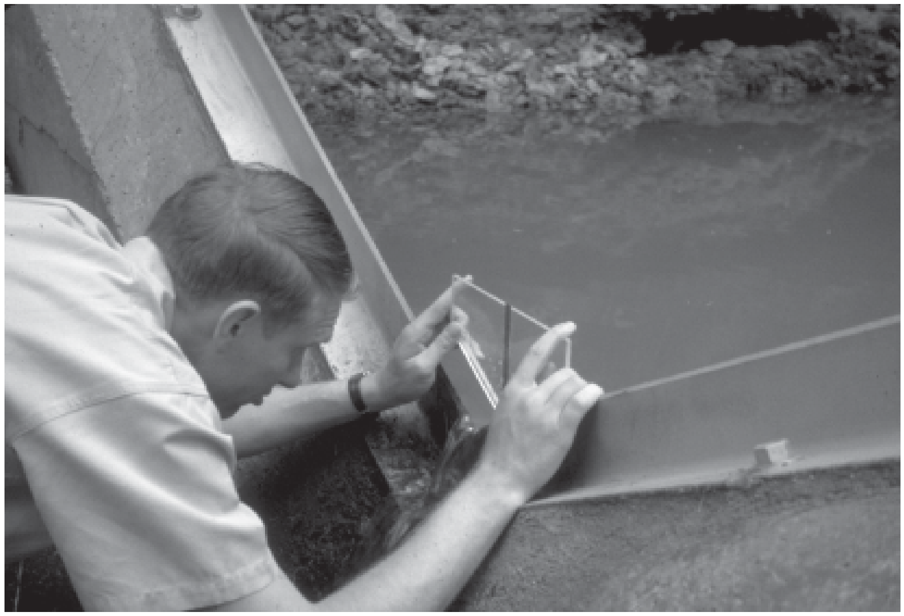

Jack Rothacher in July 1964

Figure 20—As scientists affiliated with Oregon State University (OSU) began to consider the H.J. Andrews Experimental Forest (Andrews Forest) as a venue for field studies, they laid the foundation for the long-term association of Forest Service and academic researchers at the Andrews Forest. George Brown, who later served as Dean of the College of Forestry at OSU through the 1990s, is shown here as a graduate student in 1964, when he worked as a field assistant at the Andrews Forest.

The human touch included a sense of respectful stewardship for the Andrews Forest as a research resource. Rothacher struggled to defend that outlook against forest managers at the district who were moving ahead with extensive logging activities on the experimental forest. He represented PNW Station in meetings to review logging plans and to secure basic resources, such as housing and laboratories, needed to support scientists working at the facility. Rothacher, Dyrness recalls, faced relentless pressure from forest managers, who claimed they needed to accelerate logging on the Andrews Forest to meet timber-production goals for the Willamette National Forest. Rothacher argued on behalf of Research scientists like Dyrness and Franklin that unless it supported a purely research purpose, no logging should be permitted on the Andrews Forest. Dyrness recalls the constant battles for research facilities at the district ranger station were a source of great stress for Rothacher, and by 1964, the outlook was bleak: "[Jack would] come back [from meetings with district and Region 6 managers], you know, just really worn out, saying: 'Jimminy. I don't know if we can hold 'em off.'"[67]

[67] Interview with Ted Dyrness, 14-15.

Faced with a proposal from PNW Station to close the Andrews Forest, demands from the district for expanded logging there, and a general drift toward laboratory-based research at OSU and in the Forest Service, Dyrness and Franklin scrambled to identify a white knight. They found one in an international initiative that began in the mid 1960s and became operational in the United States by 1968. They found a second, unexpected ally in the flood of 1964, which left a legacy of changes on the landscape that revitalized enthusiasm for field research at the Andrews Forest. When Franklin learned about the International Biological Programme (IBP) through the National Science Foundation (NSF), he told Dyrness they needed to get involved, despite the fact neither one of them knew much about systems ecology. Dyrness recalls Franklin telling him, "We gotta get on-board! … sure, we don't know much about this systems ecology stuff, but we can learn."[68] Their biggest hurdle to attracting the IBP to the Andrews Forest was that very few people were working there at the time. It was a Catch-22 situation: involvement in the IBP would attract people to the Andrews Forest, but chances of including the place in the IBP network of sites were remote, unless they could recruit more people to work there. Dyrness observes, "… what really helped … was the '64 flood." He and Franklin advertised the place to their colleagues in Corvallis, urging them to "come down and see what happened on the Andrews in the '64 flood." They put people to work, documenting all the flood-related slides and measuring other effects on the landscape.[69]

When Franklin learned about the International Biological Programme, Dyrness recalls Franklin telling him, "We gotta get on-board!"

By mid decade, a small, but vital nucleus of scientists had identified the Andrews Forest as a valuable site for field studies, and they were experimenting with marketing strategies to "sell" the Andrews to their colleagues in the burgeoning community of forestry research in Corvallis. The flood of 1964 provided a hook for attracting more scientists to the Lookout Creek drainage, and by the late 1960s, the small, initial core of the Andrews group managed to put together a successful bid to designate the experimental forest as one of three research sites in the Coniferous Biome Project of the IBP. That accomplishment was due, in no small measure, to the emerging prominence of Corvallis as a world-class center for forest-related research, and it played into the political climate of the late 1960s and early 1970s. The rapid growth of research capabilities at the FRL on the OSU campus in that period coincided with increased recognition of tremendous problems with forest regeneration in Oregon and the need for fundamental knowledge

[68] Interview with Ted Dyrness, 11-12.

[69] Andrews group interview 22 September 1997, 21.

to address those problems. As a result of those concerns, OSU recruited more faculty with expertise in forest biology during the 1960s and early 1970s, and that expertise was a resource that helped the Andrews group secure their bid for designating the Lookout Creek drainage as an IBP site.[70]

After a decade of difficult relations with forest managers at Blue River, people like Franklin, Dyrness, and Rothacher responded by building a community of scientists interested in long-term research at the Andrews Forest. They saw the place as an irreplaceable, scarce, and threatened resource that should be protected and promoted to other scientists. They did basic survey work to document the soils and vegetation at the Andrews Forest, and they tried to shield the place, and the scientists who worked there, from distant and arbitrary management decisions. Their grass-roots effort laid the foundation for later collaborative research. Forest managers like Kerrick, meanwhile, began turning to researchers for answers to a broader range of management questions. Prospects improved for closer cooperation between scientists and managers at the experimental forest during the 1960s, even as the Andrews group scrambled to include Lookout Creek in the IBP and secure outside funding for research at the site. As of 1964, however, the IBP was a remote vision, and the few scientists working at the Andrews Forest had little influence, funding, or authority over the site.

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[70] Bengston, 47.

Chapter Three: Basic Science Priorities and the International Biological Programme, 1964–1975

The Christmas flood of 1964 and full-scale logging on the surrounding Willamette National Forest changed the Lookout Creek drainage from a familiar to an exotic landscape. Curiosity about the flood and its effects brought more scientists to the H.J. Andrews Experimental Forest (Andrews Forest) in the late 1960s than had visited the place during the previous decade. Those who arrived after 1964 worked at road-accessible sites on a logged drainage. The Lookout Creek drainage was heavily logged by 1964, especially by comparison with the rest of the Blue River Ranger District. By the time logging began in earnest on other drainages near the experimental forest later that decade, the oldest clearcuts on the Andrews Forest were already filling in with fast-growing, young trees. In those areas where later managers followed Silen’s original plan and road design, extensive stands of old-growth Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) surrounded relatively smaller clearcuts. Some people, consequently, described the Andrews Forest as a “pristine” landscape, despite the intensive management activities of the previous decade. Despite those perceptions, it was a place much more intensively managed and studied than the surrounding national forest precisely because it had been more accessible, for a longer time, than most other drainages in the district. This combination of a relatively pristine and unusually accessible drainage open to “experimental” activity attracted new scientists to the Andrews Forest in the 1960s. They saw it as an interesting and knowable place where scientific methods could extract detailed information more efficiently than from the surrounding national forest.

Roads and clearcuts attracted scientists who needed to work at accessible field sites, but the aesthetic appeal of the unlogged portions of the Andrews Forest made it a place where people *wanted* to work. Many people who saw the experimental forest for the first time during this period formed intense, personal connections with the place. The boundary between professional and personal concerns also began to blur during the 1960s. More people were increasingly aware of environmental problems and some of them campaigned to protect or preserve “pristine” sites. The resulting political pressure eventually led to more funding for the environmental sciences and some of that found its way to the Andrews Forest.
When the Wilderness Act fueled public conflict over management decisions on the Willamette National Forest, for example, forest managers seeking to address criticism of their actions turned to the Pacific Northwest Research Station (PNW

Dick Fredriksen on 21 December 1964

Figure 21—The 100-year storm of 1964 transformed the familiar landscape of the H.J. Andrews Experimental Forest into a bewildering terrain of torrential flooding. This photo shows Blue River at Tidbits Creek during the 1964 flood.

Station) for scientific information that addressed their concerns. Scientists at the Andrews Forest often had other priorities, but the Christmas flood of 1964 profoundly affected them. They saw powerful forces of nature reshaping landscape features that previously seemed immutable. As they gained a new appreciation for the changing character of the place, the group mobilized a landslide inventory to document the scope and characteristics of mass soil movements on the drainage.

The 1964 flood prompted a small surge of scientific activity at the experimental forest that helped the Andrews group gain credibility in advance of the International Biological Programme (IBP). The timing of the flood was fortuitous. The First General Assembly of the IBP convened in July, just 5 months before the flood, but another 4 years passed before the IBP was implemented in the United States. Those intervening years were a window of opportunity for marketing the Andrews Forest to the international community. In that period, the newly emergent Andrews group created a niche for itself. The IBP was an opportunity to build the group into a collaborative community of scientists that could transcend institutional barriers to interdisciplinary cooperation among American academics. E.B. Worthington, who chronicled the history of the IBP from the perspective of his personal experience as an administrative leader in that 10-year program, observes, "The toughest biological community into which to launch the scheme was that of the United States." He cites, as major stumbling blocks, the ingrained hierarchies of academic life in America, particularly in the areas of field biology, microbiology, and molecular biology. Those hierarchies, he argues, interfered with the IBP ideal of integrated, international programs of scientific inquiry. An American culture of polarized extremes, he concludes, contributed to a political standoff between people who promoted a free-use ideology of unregulated access to public lands and people who advocated a preservationist approach to protecting public lands by creating national parks and wilderness areas. Conflict between those two groups, he suggests, poisoned the well for public support of ecological research and effectively delayed implementation of the IBP in the United States until the end of the 1960s.[1]

The ultimate goal of the IBP was to overcome nationalistic boundaries while gathering comprehensive data to describe biomes-broad-scale ecosystem types, such as desert, tundra, and conifer forests, that would represent the global range of ecosystems. With this information, the project would build predictive models of natural ecosystems functioning in a global context. The IBP vision was that by studying particularly stable systems (including old-growth, coniferous forests), scientists could construct models to predict how a particular management action would affect an ecosystem. The ultimate goal was to help people understand how to avoid or otherwise manage problems resulting from human disruption of natural systems, in effect, promoting more efficient human control over nature.[2]

The Andrews Forest was an understaffed, dark horse candidate for the IBP, but in retrospect, it seems like an obvious place to include in an interdisciplinary and international effort to catalogue and model ecological communities. By 1964, it had been the focus of intensive monitoring and observation for more than 16 years, and scientists linked with the place were energized and enthusiastic about the IBP.

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[1] E.B. Worthington, *The Evolution of the International Biological Programme*. Cambridge: Cambridge University Press, 1975, 8-11.

[2] Peter Bowler, *The Norton History of Environmental Sciences* (New York: W.W. Norton and Company, 1992), 516, 539.

"We were naïve back then, I'll tell you. … We were going to grow an entire ecosystem."

Dyrness describes the IBP years as an era of innocent optimism at the Andrews Forest: "We were naïve back then, I'll tell you. … We were going to grow [computer models depicting] an entire ecosystem." Once they got started, however, the group discovered they really didn't know very much about the systems they were trying to model. They lacked answers to basic questions about internal processes, including "How limiting is soil moisture to our communities in the Andrews?" or "How are nutrients cycled through this system?" or "How long do [needles] … stay on the trees?" Looking back, Dyrness concludes, "that's what modeling accomplishes. You don't get all these sophisticated models up and running with a lot of predictive capacity. What you do, you find out your stupidity." In the effort to develop predictive models, the group found they didn't even know what they needed to learn in order to understand how the system operated. They did discover, however, the benefits of collaborative effort and interdisciplinary exchange.[3]

Although the IBP effort didn't reach the Pacific Northwest before the late 1960s, some scientists who later became associated with the IBP at the Andrews Forest sparked a spirit of community during that decade. They forged a group identity and an enduring legacy of enthusiasm for collaborative research at that site. The IBP also established the Andrews Forest as a globally prominent site for studying forest ecosystems. The Andrews group, and the enthusiasm for collaborative research at the Experimental Forest, survived the end of the IBP, as scientists adapted ongoing programs of research to meet the constraints of constantly shifting sources of funding.[4]

The Andrews group made an early decision to rely on postdoctoral assistants instead of graduate students and tenured professors, and that decision smoothed the transition from the IBP to alternative sources of funding in the early 1970s. Faculty cooperators from Oregon State University (OSU) initially played central roles in the effort. Leaders in the Andrews group, however, notably Dick Waring (OSU) and Jerry Franklin (Forest Service), soon shifted the focus toward more reliance on postdoctoral assistants. That decision diverged from customary practices elsewhere in the Coniferous Biome Project of the IBP, which included links with the University of Washington and study sites at Findlay Lake and the Cedar River Experimental Forest in Washington. Postdoctoral assistants on grant-funded

[3] Interview with Ted Dyrness by Max Geier on 11 September 1996 at 9:30 a.m. at Dryness' office at the Corvallis FSL as transcribed by Jeff Fourier, 16-17; communication from Fred Swanson 27 April 1998.

[4] Worthington, 164.

appointments could focus on their assignments, without the distraction of teaching, taking classes, or dealing with academic committees, and their future employment with the group depended on securing renewed funding from grants. Few of them could rely on a regular salary if the grants didn't come through. With a large number of people working under similar pressures, the group developed a common culture of urgency to focus on the task at hand and produce results. This effort drew them together across disciplinary lines to secure ongoing support for the broader effort at the Andrews Forest. It was a formula for interdisciplinary collaboration, but it might just as easily have turned into a formula for disarray and rampant competitiveness.

A carefully structured core of salaried professionals held together the interdisciplinary group of scientists working on temporary appointments during the IBP. These salaried professionals designed an infrastructure that supported over 100 people who lived and worked at the Andrews Forest for prolonged periods during the field season. They built a tent city on a landscape they selected for its "pristine" and "natural" attributes representing the coniferous biome for the IBP. Others lived in rented trailers in nearby communities and commuted to work at the Andrews Forest. Researchers who lived in this scientific boomtown, paradoxically, constructed a community committed to the concept of long-term research and human occupation. In the mid 1970s, as that community weathered the transition from the IBP to other sources of funding, a few of the scientists working on "temporary" appointments at the experimental forest assumed more prominent leadership roles. In this period of transition from one generation of leadership to another, the group drew strength from those who were most vulnerable to the winds of change: scientists on temporary appointments. Together, they completed the transformation of the Andrews Forest from a Forest Service facility on the verge of elimination to a functional, outdoor laboratory where scientists enthusiastically congregated to support each other in their work.

National Policy and Growing Public Concern About Environmental Issues

The emergence of the Andrews Forest as a major site for interdisciplinary research was rooted in the contradictions of the political landscape and its influence on public lands policy in the early 1960s. Americans were increasingly ambivalent about science and technology in an era when the space race symbolized the hopes of progress and the fear of nuclear destruction. Public concern about fallout from nuclear testing and dangerous chemicals polluting the natural environment challenged official optimism about scientific progress. By the 1960s, the United States was deeply mired in an international arms race and struggling with social unrest on the domestic front. In his 1960 election campaign, Kennedy claimed the Soviet Union had gained the advantage over the United States on several key fronts, but he argued that Americans could win the Cold War by unleashing untapped reservoirs of scientific talent and putting those skills to work on the “new frontiers” of science and industry.

Scientists who founded the IBP were deeply concerned about the ways in which science and technology accelerated ecological problems around the world, but rather than rejecting science, they optimistically hoped to harness its methods and technology in a global effort to catalogue and model “stable” natural systems (see footnotes 1 and 2). In the United States, scientists were caught up in a flurry of legislation, public debates, and administrative efforts to clarify how multiple-use mandates would translate into management policy for the national forests. The glaring lack of basic information about ecological processes and their effects on forest resources, however, undermined those efforts. Scientists needed more staff, resources, and funding to supply basic information to legislators and administrators, and the IBP was one way of structuring the flow of money to support that effort.

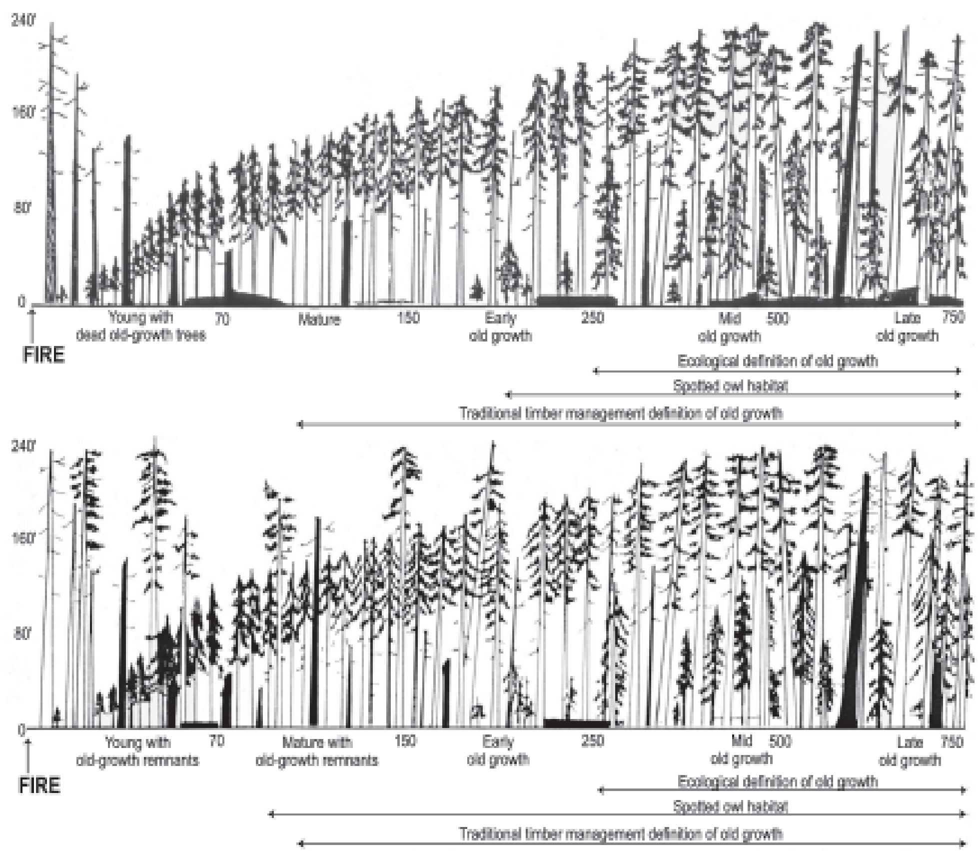
The Andrews group included scientists who relied on funding from federal agencies, from universities, and from outside grants. Each of these sources of funds included distinct benefits and drawbacks. Scientists with the Forest Service, for example, had permanent, civil service appointments with relatively secure prospects for long-term employment. That agency, however, disbursed funds only to support research projects that met specific information needs of land managers. This system required line-item approval for each proposed study. This meant that people like Rothacher could approve or disapprove funding for projects that people like Dyrness and Franklin required to support their field work. Their vegetation classification study at the Andrews Forest initially lacked such approval, although Rothacher unofficially allowed them to devote time and resources to that study. Eventually, however, even Rothacher required them to submit a formal research proposal for that work. Tenured university faculty also enjoyed relatively secure prospects for long-term employment, but much like their colleagues in federal agencies, they also relied on a hierarchical funding structure. Campus administrators set budgeting priorities for staff and funded assistantships, and faculty had little influence over that process. Scientists with long-term appointments with the Forest Service or with a university also wrote grants to supplement agency funding. Scientists who secured grant funding gained more control over hiring and purchasing decisions, but they also assumed the administrative burden of managing those resources, and they could not guarantee long-term employment to the people they hired with such funding. Scientists who were secure in their own careers constantly struggled to procure the grants they needed to fund the people who staffed their research programs. The people recruited with this "soft-money" support from grants contributed skills otherwise not available, and they often supplied the innovative ideas and enthusiastic energy so necessary for securing additional grants. One key to the success of the Andrews group in this period was their ability to seamlessly integrate these different components (both "hard" and "soft" money) of the funding structure for work at the experimental forest.

The IBP dramatically expanded the funding available through grants, but the range of research that qualified for direct, budget-line funding from the Forest Service also broadened considerably in the 1960s. In the waning years of the Eisenhower administration, Congress responded to public enthusiasm for outdoor recreation and automobile camping by allocating $2.5 million to fund an Outdoor Recreation Resource Review Commission. The commission subsequently identified wilderness as a recreational resource. This definition strengthened the argument that wilderness was a legitimate management goal. The Multiple Use-Sustained Yield Act of 1960 reinforced that argument, although it was the product of very different forces. Forest Service Chief McArdle and industry leaders involved in timber, mining, and grazing activities on national forests supported the act, and subsequently interpreted its multiple-use provisions primarily as a guarantee of future access.[5] Nevertheless, the act directed the Forest Service to give equal consideration to outdoor recreation, range, timber, water, wildlife, and fish. In a compromise designed to thwart potential opposition from preservationists, the act also included the caveat that "establishment and maintenance of areas of wilderness are consistent" with multiple use.

[5] Paul W. Hirt, *A Conspiracy of Optimism: Management of the National Forests Since World War Two* (Lincoln: University of Nebraska Press, 1994), 171-242, explores the evolution of this concept from the early 1950s through its application in the 1960s.

Sidebar 3.1: Vegetation Succession

The Issue: The sequential change in composition and structure of plant and animal communities through time in response to disturbance, establishment and growth, competition among plants, and mortality is called succession. Processes that alter the path of succession have long been of interest to scientists, forest managers, and other thoughtful observers, such as Henry David Thoreau, who first used the term "succession" in the mid 19th century.



Above: Hypothetical path of natural forest development following stand-replacing wildfire.

Below: Hypothetical path of natural forest development following moderate-severity wildfire.

Source: Franklin and Spies 1991a, 1991b.

The Roots: Succession in Douglas-fir forests of the Oregon Cascades proceeds over the protracted, even millennial, time scale of the presence of Douglas-fir in stands. Successional trajectories can be complicated by a great variety of disturbance processes, such as fire, wind, insect outbreaks, and disease. Practical issues also raise questions about processes of succession, such as defining old-growth forest for purposes of inventory and designing silvicultural approaches to enhance development of old-growth attributes in young, previously managed and natural stands.

The Approach: Studies of succession began with describing stands of various ages since the previous major disturbance. This "chronosequence" approach is supplemented by long-term, direct observation of stand development in vegetation plots, including some in postwildfire plots established as early as the 1910s and others in areas clearcut as early as the 1960s. Computer models have simulated successional sequences under different scenarios of natural disturbance and management influence. Silviculture experiments have been implemented in 20- to 50-year-old Douglas-fir plantations to explore effects on successional pathways, including the pace of development of old-growth conditions (Garman et al. 2003).

Results: The process of vegetation succession has taken on new importance as scientists, managers, and policymakers consider the consequences of climate change and issues of ecosystem restoration in areas affected by plantations, fire suppression, and other forms of management intervention. Some years ago, silvicultural practices were concerned with successional sequences extending only to 80 to 100 years, which was the rotation-length typical of federal forestry in the 1950s to the 1980s; however, the regional emphasis on old-growth forest conditions is extending that time horizon by additional centuries.

The wilderness provision expanded the range of disciplines and specialized studies that could be legitimately included in Forest Service Research budgets, just as the IBP expanded grant-funded ecological studies. Congress proposed wilderness legislation about the time debate began on the Multiple-Use Act and 4 years before it became law. When finally enacted in 1964, the Wilderness Act designated some 9 million acres as wilderness and required the Forest Service to recommend within 10 years whether an additional 5 million acres of national forest land should be added to that total. It also included a provision that the total acreage of national forest designated as wilderness under the terms of the act had to be substantially less acreage than the Forest Service previously managed as "wilderness, wild, and primitive."[6] In real terms, the Wilderness Act of 1964 actually required the Forest Service to reduce the amount of land designated and managed as wilderness on the national forests.

Growing support from the management side of the Forest Service further encouraged funding for ecological studies by Forest Service scientists. Forest managers with the Willamette National Forest, including Mike Kerrick at Blue River, faced immediate and vocal criticism when they initiated development in unroaded areas adjacent to wilderness areas defined in the 1964 act. Among other concerns, the Wilderness Act upped the ante in the long-simmering French Pete controversy on the Willamette National Forest. The French Pete issue originated well before the Wilderness Act of 1964. It began with public criticism of a Forest Service decision to reclassify the Three Sisters Primitive Area as the Three Sisters Wilderness Area and relocate the boundary of the unit. The boundary shift redefined a portion of the French Pete drainage as a designated primitive area adjacent to the wilderness area.

The Wilderness Act upped the ante in the long-simmering French Pete controversy on the Willamette National Forest. The controversy was an "educating moment" for Kerrick.

The controversy was an "educating moment" for Kerrick because, despite his argument that the decision to relocate the boundary was well founded, he agrees it was "never supported" by people he describes as "radical environmentalists." Thereafter, he began to look for new ways to substantiate his decisions with concrete and "scientific" evidence that would convince even skeptics. In responding to subsequent preservationist challenges, Kerrick's appreciation for scientific research transcended Ed Anderson's attitude. Rather than deriding or dismissing scientific studies at the Andrews Forest, as Anderson was prone to do, Kerrick

[6] Hirt, *Conspiracy of Optimism*, 229-231; Harold K. Steen, *The U.S. Forest Service: A History* (Seattle: University of Washington Press, 1976), 311-313; Samuel Trask Dana and Sally K. Fairfax, "*Forest and Range Policy: Its Development in the United States,*" *Second Edition* (New York: McGraw-Hill Book Company, 1980), 196-199, 200-206, 217-221.

recalls he increasingly viewed those studies as useful tools. He argues that "good" science was his best defense against those who questioned the policies he implemented as district ranger at Blue River, beginning in January 1967. Under public pressure, this manager of public lands discovered the value of data from studies at the Andrews Forest, even though the scientists who generated that data did not necessarily agree how he used it or even his priorities of land management.[7]

Kerrick's new appreciation for the Andrews Forest was a breakthrough in thinking with the potential for opening a dialogue between scientists and forest managers, but sudden managerial interest could not erase the effects of nearly a decade of tense relations between forest managers and scientists. Given the emphasis on laboratory research at PNW Station, moreover, scientists in that unit had little interest in closing the gap between researchers and managers at Blue River. Scientists like Ted Dyrness, who began working at the Andrews Forest in the this period, recall that in the early 1960s, interactions with forest managers at the Blue River Ranger District were often less than cordial, and for that reason, he simply tried to keep his distance while working there.

The Forest Service faced a rising tide of external criticism, close scrutiny, and general mistrust from all quarters during the late 1960s. As part of the compromise that facilitated passage of the Wilderness Act of 1964, Congress established the Public Land Law Review Commission (PLLRC) and charged it with examining policies pertaining to all public lands except Indian reservations.[8] After a 5-year investigation, the commission released a report that landed with a thud amidst Earth Day preparations, passage of the National Environmental Policy Act (NEPA), and President Richard Nixon's pronouncement in January 1970 that this would be the "environmental decade." It emphasized the need for Congress to reassert its constitutional authority to manage public lands, and it accused federal agencies of withdrawing and reserving public lands without adequate consultation with Congress. The commission specifically argued that Congress should review all national forest lands to determine which should be reserved to the federal government and which should be transferred to state or private control. It proposed a "best-use" policy that was heavily slanted in favor of timber production and favored an

[7] Interview with Mike Kerrick at his home near Springfield, OR, by Max Geier on 28 August 1996,15-16; interview with Ed Anderson and Mike Kerrick by Max Geier on 28 August 1996 at Anderson's home in Springfield, OR, 7-8; Rakestraw, *History of the Willamette National Forest*, 111-115.

[8] Dana and Fairfax, *Forest and Range Policy*, 231-233.

accelerated program for building access roads. The report concluded that "conservative cutting practices" had resulted in "over-mature" forests, and it claimed that the national forests were not particularly valuable for uses other than timber production.[9]

The commission's recommendations ran counter to public enthusiasm for environmental legislation and concern about past management practices by the late 1960s and early 1970s. Federal action included the Wild and Scenic Rivers Act (1968), the NEPA (1970), and the creation of the Environmental Protection Agency (1970). Public protests against Forest Service strategies to promote reforestation on the Bitterroot National Forest, including the practice of bulldozing terraces into recently clearcut slopes, prompted a Congressional inquiry in 1969, with a particular focus on patterns of soil erosion and nutrient loss associated with clearcutting. The Forest Service leadership, meanwhile, was preoccupied with PLLRC proposals to move the agency into the U.S. Department of the Interior and create a new Department of Environment and Natural Resources. The Sierra Club capitalized on the public mood with a counter-offensive against PLLRC proposals for "best-use" management on national forest lands. Its legal challenges vigorously defended a broad reading of multiple-use legislation in an effort to secure wilderness designations on the national forests and to place wilderness on a footing more equal to other mandated forest uses, such as logging or game management. These challenges further pressured the Forest Service to fund a broader range of ecological studies. Dick Fredriksen's earlier nutrient cycling and small watershed studies positioned the Andrews group to respond quickly to that challenge, building on those earlier studies at the Andrews Forest and at Hubbard Brook.[10]

The NEPA requirements that studies of potential environmental impacts must precede any major action by federal agencies[11] expanded the range of issues the Forest Service, by statute, was required to investigate. The PNW Station responded

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[9] Public Land Law Review Commission, *One Third of the Nation's Land* (Washington, DC: GPO, 1970); Roy M. Robbins, *Our Landed Heritage: The Public Domain, 1776-1970* (Lincoln: University of Nebraska Press, 1976), 466-469; Dana and Fairfax, *Forest and Range Policy*, 232-234; Philip Berry and Michael McCloskey, "The Public Land Law Review Commission Report: An Analysis," *Sierra Club Bulletin* 55: (October 1970), 18-30.

[10] Dana and Fairfax, *Forest and Range Policy*, 221-222, 241-242, 311-315; Steen, *U.S. Forest Service*, 328-329; Hirt, *Conspiracy of Optimism*, 245-247; communication from Fred Swanson 15 September 2003.

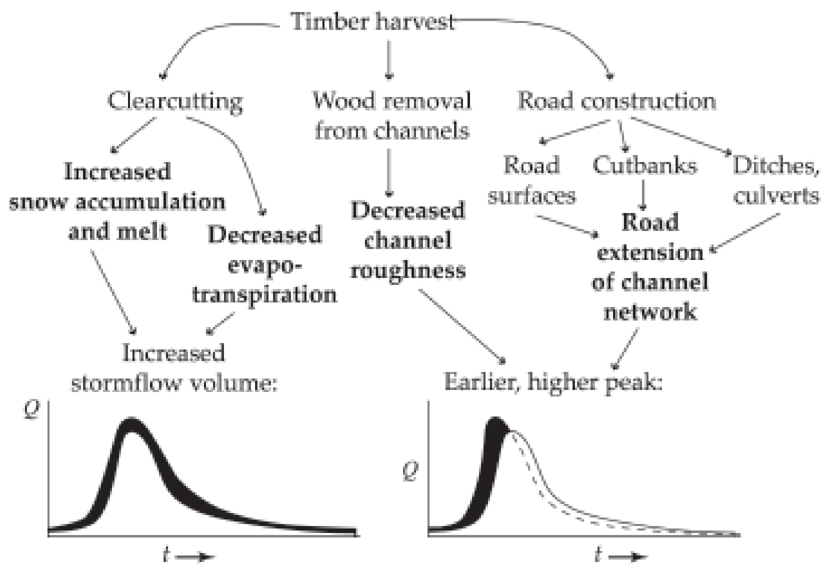
[11] Environmental Impact Statement requirements.

Sidebar 3.2: Small Watershed Hydrology

The Issue: Water enters a watershed by precipitation, may be temporarily stored in various sites in the watershed, is transferred through vegetation and soil back to the atmosphere, or may ultimately exit the watershed as streamflow or deep groundwater percolation. Change in vegetation conditions or waterflow paths, as may happen where roads are present, can alter this hydrologic system. Effects of vegetation and water routing can also vary in response to the climatic system affecting the watershed, such as the role of snow.

The Roots: The questions of how the hydrologic cycle operates in forest landscapes and how forest management affects water have roots that are centuries and even millennia deep. Use of small, experimental watersheds to address these questions began long before the Andrews Forest was established, though this approach was first used in the Pacific Northwest at the Andrews in the mid 1950s. Because of a succession of issues that can be addressed through analysis of long-term records from watershed studies, the experimental watersheds have been a critical meeting ground for scientists and managers in many disciplines (hydrology, biogeochemistry, plant succession), encouraging integrated work in that context. Both science and management questions concern effects of climate variability, vegetation, vegetation removal, and roads on total water yield, peak flows, and low flows. Despite decades of study, the issue of management effects on watersheds can still trigger heated debate (Beschta et al. 2000, Jones and Grant 1996, Thomas and Megahan 1998).

Hypothetical effects of timber harvest (bold) on streamflow hydrographs (bottom figures of streamflow (Q) vs. time (t)). From Jones and Grant 1996.



Watershed 1, Andrews Forest. Experimental Watershed 1 was clearcut in 1962-1966 and burned in 1967. Control Watershed 2 is located just to the left (east), contains 500-year-old conifer forest, as did Watershed 1 before treatment. Photo: Fred Swanson, USDA Forest Service, August 1991.

The Approach: Studies in small, experimental watersheds have long been used to elucidate the hydrologic cycle by examining water entering a watershed as precipitation, leaving as streamflow or evapotranspiration back to the atmosphere, and cycled and stored within the watershed. Effects of forest disturbance, forest regrowth, and roads on streamflow are measured with experimental treatments, such as removing vegetation and comparing streamflow from treated watersheds with untreated, control watersheds through time (Jones and Grant 1996). By studying sets of watersheds across ranges of elevation and latitude, effects of variation in snow hydrology and other factors that vary along these gradients can be assessed (Jones 2000).

Results: Although small watershed hydrology is a decades-old aspect of ecosystem science and management, watershed science is constantly finding new applications. New management issues emerge with changing forest practices, and new research opportunities arise as the length of hydrologic records increases, as vegetation succession proceeds into new states, as new analytical tools (like water aging and tracing techniques, and statistical methods for analyzing long-term records) become available, and as new science questions develop, such as how climate change is expected to affect hydrologic systems.

by increasing the level of support for ongoing studies and developing new programs. Station scientists scrambled to learn and use skills and methods from disciplines not previously considered relevant to the Forest Service mandate. The Station, for example, initiated a new, multiproject research program known as For-est Residues Reduction Systems, and it strengthened programs in recreation research and studies of biological methods for controlling forest insects. At the Andrews Forest, the trend toward interdisciplinary research was evident in the Forest Ecology project that Franklin headed, on the watersheds project that Rothacher headed with Logan Norris, and in the IBP.[12] When they first started the drive to attract scientists to the Andrews Forest, however, Dyrness and Franklin had no way of knowing these forces would converge to support their efforts. In 1964, the landscape itself was their best ally.

The Flood of 1964 and Perceptions of Research Potential at the Andrews

Major flooding in the Willamette River basin in 1964, like the wilderness legislation of that year, made the Andrews Forest seem more relevant to the priorities of the Forest Service and of forest scientists. The flood was a force of nature that people could not ignore, and it was a reminder that people could not completely control nature, especially on an experimental forest. If the Andrews Forest was an outdoor laboratory, natural "disturbance" was an uncontrolled and unpredictable variable that could drastically affect the outcome of any experiment in that setting, no matter how carefully it was designed. Natural disturbances were many and varied. Two years before the 1964 flood, for example, the Columbus Day Storm downed an estimated 140 million board feet of timber on the Willamette National Forest, including the Andrews Forest. The downed timber caused logjams on rivers throughout the national forest, threatening property downstream, and causing localized flooding in riparian areas. Forest Service managers identified the downed timber as potential habitat for bark beetles, and they scheduled salvage sales in an effort to avert an expected beetle outbreak in commercial-grade timber nearby. Managers of the national forest were still struggling with the after-effects of the windstorm when the Christmas-week flood of 1964 began. That flood destroyed

[12] Cowlin, 512-528; Dana and Fairfax, *Forest and Range Policy,* 221-222, 241-242, 311-315; Steen, *U.S. Forest Service*, 328-329; communication from Fred Swanson 27April 1998.

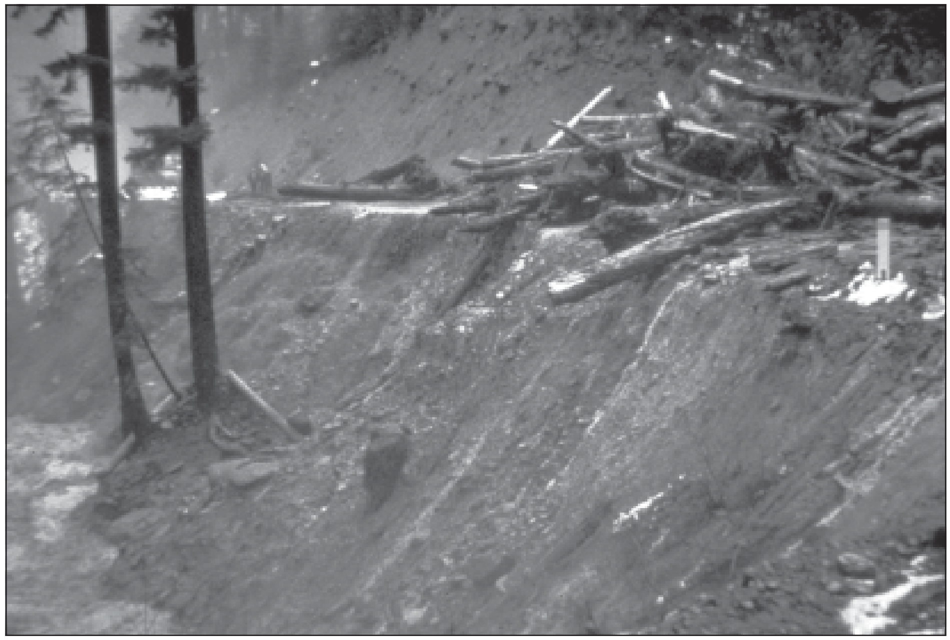


Figure 22—The second of three debris torrents in Watershed 3 during the Christmas flood of 1964 wiped out the gaging station, filled the lower channel, deposited a mound of logs and debris on the Lookout Creek Road, and deposited an undetermined amount of material into Lookout Creek.

The Christmas flood changed the physical appearance of the experimental forest.

six campgrounds, damaged seven others, washed out numerous roads, and wreaked havoc on bridges and culverts throughout the Willamette National Forest.[13]

The Christmas flood had personal as well as economic and ecological consequences. It changed the physical appearance of the experimental forest, it endangered field crews at the Andrews Forest, and it left physical evidence of its passage and indelible, personal recollections of its power. People familiar with the Andrews Forest suddenly found themselves on unfamiliar ground. Al Levno, then working for PNW Station as a technician assisting Dick Fredriksen at the Andrews Forest, had a view of the flood that was too close for comfort. He was working on a round-the-clock sampling routine on Watershed 3 when the storms hit in late December. The routine involved taking samples from streams at 3-hour intervals, 24 hours a day, using flashlights to climb down steep slopes after dark, crawling out onto narrow boards stretched over a stream, and then dipping a milk bottle into the water to get a fresh sample. Levno was driving out to the watershed with Fredriksen to begin that routine during a windy rainstorm at 1:00 a.m. on the

[13] Rakestraw, 101.

morning of December 21, 1964, when he noticed an enormous pile of debris and logs had piled up on the road where it crossed the stream, and he recalls, "we were really concerned and thought we ought to get the hell out of that place."[14]

Levno, who lived in Blue River and worked full-time at the Andrews Forest on a year-round basis, recalls the flood suddenly transformed the experimental forest from familiar woods to nightmarish chaos. He knew the logging roads and the landscape by heart, and together with Fredriksen, he plotted an escape route in the pitch-black darkness of the early morning storm. They drove back from Watershed 3 toward home, but halfway between Watershed 1 and Watershed 2, a debris slide blocked the road. It was 10 or 12 feet deep with mud and rocks, and it was too wet and slippery to cross, even on foot. Instead, they drove back to the first slide they had seen blocking the stream crossing on Watershed 3. They intended to climb across the logs tangled in that slide, and then walk up the road to an old log bridge that crossed Lookout Creek near that location. From there, they would be able to climb through logging unit B134, up a 1,000-foot ridge to the B130 logging road, and then walk to the main Forest Service Road 15. From there, it was a 4-mile walk to the McKenzie highway and a 3-mile walk to Blue River. This well-considered plan was based on their intimate knowledge of the Andrews Forest, but it didn't work. Levno describes the trek as a "very noisy and confusing ordeal." His eyeglasses were fogged up and covered with water as he walked in the dark through pouring rain in a driving windstorm. He heard big boulders "bouncing along the bedrock bottom" of Lookout Creek. The creek itself was "roaring," old-growth trees crashed to the ground as they stumbled by, and Levno heard "the roar of several landslides … all around us." Several landslides slumped away in the logging unit as they climbed through, creating enormous sinkholes of mud and debris. Levno stumbled upon one of these in the dark and would have fallen in if Fredriksen hadn't grabbed him by the collar and pulled him back.[15]

The nightmarish scramble through a shattered landscape continued after Levno and Fredriksen escaped the experimental forest. They finally reached the McKenzie Highway around 4:00 in the morning, 3 hours after they first realized their dangerous predicament, but floodwaters completely blocked their way. Fredriksen, Levno recalls, was a "big strapping guy—6-foot-6 or something like that," and he tried to wade through the floodwaters. Levno, about half a foot shorter, followed behind,

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[14] Interview with Al Levno by Max G. Geier on 12 September 1996 at 1:00 p.m., at the Corvallis FSL, as transcribed By Jeff Prater, 5-6.

[15] Interview with Al Levno, 6-7; communication from Al Levno 3 November 1999.

with Fredriksen's dog trailing him. As they waded in deeper, Levno suddenly noticed the dog floating by in the rushing current, headed for the open river. Fredriksen grabbed the dog by the tail, and they headed back to higher ground. They eventually reached a nearby farmhouse, where they waited for the floodwaters to subside.[16]

The 1964 flood disrupted elegant theories about forest management as well as physical infrastructure and research facilities at the experimental forest. On the eve of the IBP, scientists discovered they didn't know as much as they thought they knew about ecological processes in the Oregon Cascades. The big storm tested the group's watershed management practices, and researchers and district staff at Blue River gained pragmatic insights about the experimental roads, clearcuts, and other projects previously installed at the Andrews. Anderson and Kerrick were surprised at the consequences of the flood in areas where roads, flumes, and sediment ponds were constructed on Watershed 3 during the early 1950s and then "calibrated" for nearly a decade until the watershed was roaded in 1959 and logged in 1962. About 25 percent of the watershed was hi-lead logged in three staggered clearcuts averaging about 20 acres each. The experimental logging plan included an upper and a middle logging road, along with the main road at the bottom. The 1964 flood, Kerrick observes, showed that midslope "wasn't a very good place to put roads." During the flood, the middle road failed, and Kerrick argues it "created more problems than Watershed 1." In comparison with the partial cutting on Watershed 3, Watershed 1 had been completely clearcut with a skyline logging system designed to minimize the dragging that scarred landscapes logged with high-lead methods. Logging on Watershed 1 was recent and ongoing by the time the flood hit, but it was relatively unaffected by comparison with Watershed 3, where the stream flume installed in 1953 was buried beneath 14 feet of debris in the 1964 event. After the flood, technicians exhumed the flume, and it continued to generate streamflow data for the next 35 years.[17]

Scientists at the Andrews generally agreed with the managerial lessons Kerrick drew from the 1964 slides on Watershed 3, but the flood also created new research opportunities. The fact that most of the erosion was connected with roads, rather than logging, Dyrness observes, "was a real eye-opener." After the 1964 event, the

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[16] Interview with Al Levno, 6-7; communication from Al Levno 3 November 1999.

[17] Interview with Ed Anderson and Mike Kerrick, 2-3. Andrews group interview 22 September 1997, 39; communication from Ted Dyrness 15 April 1998; communication from Fred Swanson 27 April 1998.

Andrews group initiated a full-scale inventory of landslides on the experimental forest, and they concluded that mass soil movements of the type Levno encountered during the storm, rather than surface effects from rainfall, were the primary mechanisms of erosion in that drainage. Fredriksen had reached similar conclusions 5 years earlier, and his brief paper on a slide he studied was published shortly before the 1964 event. The postflood landslide inventory confirmed his findings, and in the aftermath of the landslide inventory, PNW Station adjusted its recommendations for road location and design to reduce the threat of mass movement associated with logging roads.[18]

The PNW Station provided "flood money" that funded the purchase of automated, digital recorders.

The Andrews group reevaluated its data-gathering priorities after the 1964 flood and secured new funds to monitor stream levels, but technical problems forced them to decide between new technology or the long-term integrity of the data they were collecting. The PNW Station provided "flood money" that funded the purchase of automated, digital recorders that registered stream levels on a punch-tape. The group purchased scores of these recorders and connected them with stream gages, but they soon discovered the new technology generated data that was incompatible with research needs. Among other problems, field technicians could not read the punch tapes onsite, and the taped records were not directly comparable to hydrographic charts that earlier field workers had compiled with simpler mechanical devices. When they realized the problem, the watersheds team removed all of the new recorders and replaced them with the older, "A35" machines that had worked since the early 1950s. The group preferred to admit they had made a mistake in purchasing the new technology, rather than compromise the long-term integrity of the monitoring effort.[19] Recognizing the need to maintain and protect their A35s while preparing them for long-term, continuous use, the group sent their technicians to train with the manufacturer of that device,

[18] Interview with Ted Dyrness, 12-14; R.L. Fredriksen, *A Case History of Mud and Rock Slide on an Experimental Watershed*, (Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, Res. Note PNW-29). R.L. Fredriksen, *Christmas Storm Damage on the H.J. Andrews Experimental Forest*, (Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, Res. Note PNW-29, 1965). Small watersheds group interview by Max G. Geier with interview subjects George Lienkaemper, Fred Swanson, Don Henshaw, Ted Dyrness, Gordon Grant, Al Levno, and Ros Mersereau on 16 October 1997 at Oregon State University in Peavy Hall, 3-4. C.T. Dyrness, *Mass Soil Movements in the H.J. Andrews Experimental Forest* (Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, Res. Note PNW-42, 1967); small watersheds group interview, 3-4; communication from Ted Dyrness 27 April 1998; communication from Fred Swanson 15 April 1998.

[19] Andrews group interview 22 September 1997, 38-39; small watersheds group interview, 13.

Figure 23—Al Levno at the Soil Moisture Study site on Watershed (WS) 3, plot 1, transect 1, Unit L 141. This photo was taken in 1964 shortly after logging and slash burning were completed on WS 3. Two soil moisture transects were established in WS 3 before logging. Transect 2 was logged. Transect 1 remained undisturbed in the timbered area.

and they purchased and stockpiled a reserve of those older machines. Over the next 35 years, technicians salvaged parts from damaged A35s and used them to repair and replace other machines.[20] The data stream, as a result, remained comparable across decades of record management.

Beyond generating new insights and enthusiasm for field research, the 1964 flood undermined management claims that Research was simply retilling old fields

[20] Small watersheds group interview, 25-26.

in search of answers to questions that had already been answered. It forced scientists to consider how the Lookout Creek watershed itself was changing and how apparent changes resulted from a chain of contingent events. That realization opened the door for a new range of science questions.[21] Among its other effects, the flood prompted the group to shift the emphasis of research on the small watersheds from annual water production, streamflow, sediment, and nutrients, to an event-oriented model, in which the chronology of disruptions in the past could have an effect on the later characteristics of the ecosystem, and the sequence of events could dramatically affect the outcome. The new model took into account, for example, whether a big flood, or a heavy, wet snow occurred in the 1st, 10th, or 13th year after the most recent logging activities on a watershed.[22]

The PNW Station and Adjustments at the Andrews Forest After the Flood

Proposals to close the Andrews dissolved after the flood reenergized watershed management research on the experimental forest. The flood, ongoing efforts to include the site as a component of the IBP, and Meagher's retirement in March 1968, virtually extinguished the argument at PNW Station that the Andrews had fulfilled its function and outlived its usefulness. Tarrant suggests that the initial proposal for shutting down the experimental forest originated with administrative concerns about staffing shortages, the pervasive "throw things out" mentality of postwar American culture, and Meagher's personal bias that studies of old-growth were unnecessary because, in Tarrant's words, "second growth is … all there's gonna be left."[23] At one point, Franklin recalls, "Meagher told us to pull all the tags on the permanent plots. … He said, '… we don't need those growth and yield plots anymore, and I want you to go pull the tags on them, so that no one can ever go back and remeasure them.' [laughter] Of course, we didn't do it."[24]

Efforts to block closure of the experimental forest dovetailed with an opportunity to tap into funding from the National Science Foundation (NSF) for the U.S. component of the IBP. The Andrews was "on the bubble" to be eliminated by PNW Station between 1964, when the IBP was formally launched, and 1967, when the

[21] Small watersheds group interview, 8.

[22] Small watersheds group interview, 4-5.

[23] [PNW] *Forestry Research News* (March 1968). Andrews group interview 22 September 1997, 23.

[24] Andrews group interview 22 September 1997, 22.

Figure 24—Watershed (WS) 7 was the first watershed to receive a gaging station in the "Hi-15," three experimental watershed set, which includes WS 6 (32.1 acres), WS 7 (38.1 acres), and WS 8 (52.9 acres). These watersheds are located on a south aspect at around 3,280 feet elevation. They contain 130-year-old Douglas-fir. An H-flume was installed at WS 7 in 1963, with a FW-1 recorder with a 7-day chart that continuously recorded water levels. Technicians built shelters over these H-flume installations shortly after they were installed to protect them from snow "bombing" off overhanging trees during winter. Here, Al Levno checks the installation during the first winter after construction in 1964.

first round of requests for proposals for the IBP in the United States went out from the NSF. Franklin and Dyrness both credit Rothacher with leading the ultimately successful fight to "save the Andrews." During the same period, PNW Station also targeted the South Umpqua Experimental Forest for closure and eventually reduced its size to four experimental watersheds, collectively known as the Coyote Creek watersheds. The successful strategy for saving the Andrews Forest from a similar fate revolved around a plan to attract other scientists to the place while securing NSF funding to support an interdisciplinary program of research there under the IBP umbrella.[25]

The tentative proposal to close the experimental forest was aborted without any direct statement or decision from PNW Station, and it may have died simply because no one stepped forward to push it through. Franklin considers the proposal a trial balloon that would have gone through if no one had opposed it, but

[25] Andrews group interview 22 September 1997, 21; communication from Fred Swanson 27 April 1998.

Silen argues that in the particular case of the Andrews, it failed largely because it lacked an advocate with decisionmaking authority: “I don’t think anybody was in a position to do anything who was close to it.” The apparent lack of administrative enthusiasm to return the Andrews to the national forest was far from a ringing cry of endorsement or funding to support more research at the experimental forest, but it was a significant improvement over previous attitudes of indifference, or efforts to discredit the need for further research. By the mid 1960s, managers clearly wanted Research on their side, if not in their corner, but mutual mistrust of motives and purpose barred any rapprochement with the new generation of Corvallis-based scientists whose interests centered on the Andrews Forest, through the 1970s.[26] In the interim, the group secured a greater degree of self-confidence in their methods and abilities to secure funding independent of the Forest Service, and they subsequently avoided falling back into a management-support role.

Any rapprochement, such as it was,[27] focused more on relations between individual scientists with PNW Station and OSU than between the Research Branch and the NFS. Dyrness, for example, argues that the IBP was the turning point for initiating constructive engagement with forest managers at the district and forest level, primarily because it increased the visibility of scientific research for students in forestry programs that trained future managers for the Forest Service. Tarrant also argues that, although events like the 1964 flood may have stimulated a change in thinking about the experimental forest as a Research resource, individuals and academic networks played a larger role.[28]

The IBP was the turning point for initiating constructive engagement with forest managers at the district and forest level.

One of the more obvious differences between scientists and forest managers at Blue River was simply a matter of corporate culture. Station scientists at the Andrews operated with fewer constraints on their day-to-day activities, whereas forest managers at the Blue River Ranger District had to follow rules and regulations that were more narrowly defined and more closely monitored. Dyrness, for example, recalls a feeling of relative freedom at the experimental forest, observing, “Sometimes, Jerry and I were surprised at what we could do with no repercussions.”[29] As the number of scientists working on study sites at the Andrews Forest increased with the advent of the IBP in the late 1960s, however, Rothacher recognized the need to coordinate activities to avoid situations where one study might

[26] Andrews group interview 22 September 1997, 26.

[27] Interview with Ted Dyrness, 16-17.

[28] Andrews group interview 22 September 1997, 22.

[29] Andrews group interview 22 September 1997, 43.

damage another. In an effort to maximize opportunities for complementary studies while minimizing the potential for studies that conflicted with other research efforts, he set up a map at the ranger station, with "verboten" areas marked on it in green pencil, delineating established study areas. With the advent of the IBP, the group planned to focus on Watershed 10, and they implemented a bewildering system of colored flags to delineate different study sites and avoid conflicts on that watershed. This concern, among others, eventually led to the decision to hire Art McKee as site coordinator, and McKee recalls he struggled to get a grip on the "chaotic" situation when he first arrived on the scene.[30]

The International Biological Programme and Interdisciplinary Initiatives

The eventual proposal to include the Andrews Forest in the Coniferous Biome of the IBP named Franklin and Waring as co-principle investigators for a major grant from the NSF. This pairing brought together OSU (Waring) and Forest Service (Franklin) interests for a cooperative effort at the Andrews Forest. Dyrness notes that Franklin led the charge in rounding up campus-wide support at OSU for the IBP initiative. Franklin arranged a meeting of all interested faculty on the Corvallis campus to explore the possibility of supporting the Andrews Forest as "the" intensive study site for the Coniferous Biome Project of the IBP. The most important obstacle to that plan was a similar proposal from the University of Washington that sought to pre-empt the leadership of the Coniferous Biome and exclude the site backed by OSU.[31]

Any initial hopes for establishing the Andrews Forest as the exclusive study site for the Coniferous Biome of the IBP dimmed in 1968 when Franklin, Waring, and others from OSU met at Pack Forest, near Seattle, with Dale Cole, Stan Gessel, and other scientists from the University of Washington. In that meeting, Waring recalls, he and everyone else who represented sites beyond the Seattle area began to realize that the University of Washington had the upper hand and "there wouldn't be much off-site." Waring concedes "there were some good people at the University of Washington," but he didn't think a proposal centered on University of Washington facilities was broad enough to develop the kinds of models needed for

[30] Andrews group interview 22 September 1997, 21-22; small watersheds group interview, 17.

[31] Small watersheds group interview, p. 17.

the IBP. He and other attendees, consequently, quickly organized a counter-proposal that would produce a more balanced model of the coniferous biome.[32]

The counter-proposal that Waring and Franklin engineered at the 1968 meeting included the Andrews Forest as one of three major sites for the Coniferous Biome. That outcome, however, required a risky move on the part of the Corvallis group. As Franklin explains, the Andrews group was "willing to hold it hostage if we didn't get a significant piece of the action." Relations between the University of Washington and OSU factions were so contentious, he recalls, that NSF administrators warned him, "either Seattle and Corvallis get it together or there will be no Coniferous Forest Biome."[33] Franklin's group subsequently issued what amounted to an ultimatum, threatening to scuttle the entire biome proposal if the Andrews Forest was not included. Ultimately, it was included, along with Findlay Lake and Cedar River Watershed, which were located more conveniently for scientists based in Seattle.[34]

The human legacy of respectful stewardship, ongoing research, and scientific potential at the Andrews tipped the balance toward the Lookout Creek drainage during negotiations over the location of sites for the Coniferous Biome. Waring notes that Gashwiler's wildlife studies, among others, gave the Andrews Forest an important edge over some other proposed sites. Norm Anderson, who represented the OSU Biology Department at the Pack Forest meeting, however, also argues that he and his OSU colleague, Jim Hall, together with Rothacher, "dreamed up" the aquatic component of the Coniferous Biome Project and proposed to locate it at Mack Creek on the Andrews Forest. These features strengthened Franklin's efforts to slow down the "UW juggernaut" during the 1968 meeting.[35] McDonald Forest, which was administered by the OSU College of Forestry and located nearby on the outskirts of Corvallis, was a possible alternative as an intensive study site for the Coniferous Biome Project. The Andrews Forest, however, had ongoing wildlife studies, including exclosures to keep out birds, deer, and rodents, and it also had gauged watersheds. Cost considerations, moreover, drove management decisions at the McDonald Forest, where the College of Forestry frequently scheduled timber

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[32] Interview with Dick Waring by Max G. Geier on 26 September 1997 at Waring's office in Peavy Hall at Oregon State University, as transcribed by Linda Hahn, 3-4.

[33] Small watersheds group interview, 16-17.

[34] Interview with Jerry Franklin, 13.

[35] Interview with Dick Waring, 7.

Rollie Geppert

Figure 25—Short course participants at Gypsy Camp in late 1970s. Located about a mile from the headquarter site near the "Y" in the main road on the H.J. Andrews Experimental Forest, Gypsy Camp was the Andrews group's solution to the problem of running out of space for people to stay during the International Biological Programme.

sales to generate revenue for the school. "It was much more difficult," Waring concludes, "to control an experiment on McDonald Forest than on the Andrews, even though the Andrews was much farther away and on federal land."[36]

The forced merger between the contending research groups at the University of Washington and OSU essentially divided the Coniferous Biome into two groups with separate administrative centers in Seattle and Corvallis governing three intensive research sites in Oregon and Washington. Fred Swanson, who joined the Andrews group in the early years of the IBP on a postdoctoral appointment at the University of Oregon and later rose to a leadership position at the Corvallis Forestry Sciences Laboratory, notes that despite the forced merger, the two groups took

[36] Communication from Fred Swanson 27 April 1998. Riparian group interview of Linda Ashkenas, Art McKee, Stan Gregory, Norm Anderson, George Lienkaemper with Max Geier on 21 November 1997 at the FSL, in Corvallis, OR, as transcribed by Elizabeth Foster, 1; interview with Dick Waring, 2-3.

divergent paths. The Seattle group, he observes, "were hunkered on a lake [Findlay Lake], and hunkered on stands on glacial outwash [Cedar Creek] where there wasn't an aquatic component." Both of those locations, he argues, were "pretty limited" in their potential for ecosystems research as compared with the more diverse landscape of the Andrews Forest. That physical advantage, Swanson concludes, may help to explain why a more interdisciplinary ecosystem team developed at the Andrews Forest, although he suspects that the reason for that different outcome may be more sociological than geographical.[37]

The Coniferous Biome Project dramatically changed the sociological profile of the Andrews in ways that distinguished the Andrews group from other IBP sites, and those changes help explain the gradual emergence of an interdisciplinary, pragmatic emphasis at the Andrews Forest. Waring, Franklin, and Dyrness scrambled to recruit people who could fill the particular niches required for the Biome Project because, as Dyrness observes, "We needed people with new expertise and interests that we didn't have in our little group."[38] They had few options, because Waring and other OSU faculty associated with the Coniferous Biome were mostly junior faculty. Graduate students tended to gravitate toward more senior faculty, but postdoctoral associates followed the grant money, not the personality. The University of Washington component of the Coniferous Biome relied more heavily on tenured faculty and their graduate students. Over the first 5 years of the Biome Project, Waring weeded out some full professors and graduate students from the OSU contingent and replaced them with an interdisciplinary group of postdoctoral recruits that included Chuck Grier, Kermit Cromack, Phil Sollins, Fred Swanson, Jim Sedell, and Frank Triska. Stan Gregory, who began working with the group as a student in this period, later continued on a postdoctoral appointment. These people, Waring suggests, were more willing and able to work across disciplinary boundaries than the people they replaced.[39]

The sociological profile of the Andrews distinguished the Andrews group from other IBP sites.

Waring admits that interdisciplinary cooperation was an accidental consequence, not the driving motivation of this demographic restructuring—he was simply operating in a crisis mode: "You know, if we don't do this, then we can't go to the national meeting, we can't renew the grant. … I mean, we had to show what … [we were] doing. … 'cause these were BIG grants." The first grants

[37] Communication from Fred Swanson 27 April 1998; small watersheds group interview, 16-17.

[38] Small watersheds group interview, 16.

[39] Interview with Dick Waring, 3, 6.

totaled upwards of half a million dollars at a time when a full-time, tenure-track assistant professor at OSU was earning about $12,000 a year, and the NSF sent reviewers to Corvallis to talk to all the research assistants and verify how they fit into the larger project. It was a closely monitored process, and Waring considered postdoctoral associates a safer risk than graduate students, because they were more interchangeable and would begin with a stronger initial base of knowledge, with more self-confidence and experience in developing hypotheses and story lines, while enjoying more freedom and time to interact with other members of the project. Most importantly, they could be recruited for skills specific to the needs of the research project.[40] The down side, of course, was that overreliance on postdocs would limit opportunities for graduate students to participate in funded, professional-caliber research, and this tendency might gradually distance the project from the central mission and purpose of the university and thereby limit access to permanent, tenure-track appointments or state funding for its participants.

Budget-driven concerns and the need to show NSF reviewers concrete results also drove much of the early thinking about how to structure IBP research at the Andrews Forest. Lead scientists at the experimental forest had little experience administering budgets of that size and limited training or experience in conducting integrated ecosystems research. The early IBP work at the Andrews Forest, consequently, focused mostly on descriptive analysis. This orientation served the modeling emphasis of the program, but it also was a derivative of long-term field studies at Lookout Creek and of more established programs elsewhere in the United States. Small watershed studies already underway at the Hubbard Brook Experimental Forest (near Woodstock, New Hampshire), Coweeta Hydrologic Laboratory (near Otto, North Carolina), and the Andrews Forest, Swanson notes, were "somewhat parallel and continue that way today," and they included "some inter-site comparative studies" during the IBP. Franklin particularly credits scientists at Hubbard Brook with showing the way, observing, "… a lot of it started there with a refinement and an expansion of the small watershed idea." During the IBP, he notes, "everybody got into it, but they came at it, initially, through [hydrologic and nutrient] budgets. Because no one had any intelligent questions to ask about ecosystems, so, 'Okay, let's describe them.'" From that base, he concludes, "we very quickly found very interesting kinds of things about which we could make hypotheses and about which we could experiment."[41]

[40] Interview with Dick Waring, 3, 6, 7; communication from Fred Swanson 27 April 1999.

[41] Communication from Fred Swanson 27 April 1998; Andrews group interview 22 September 1997, 33.

The concept of long-term research and its goals and methods evolved from these early interactions among the research group at the Andrews. Franklin notes that the climate for long-term research had improved by the late 1960s: “The only vision of long-term, ecological research [in 1962],” he observes, “was probably the vision of the small watershed studies and permanent plots.”[42] Gordon Grant, a Forest Service hydrologist involved with the watersheds program at the Andrews in later decades, agrees with Franklin’s assessment, crediting Hubbard Brook scientists, notably Likens and Bormann, with “putting these forest issues out there, and having them blessed as major science issues in their own right.” Dyrness adds that Fredriksen’s interest in the chemical composition of streamwater originated when Likens visited the Andrews Forest in 1966: “I remember taking him [Likens] around out at the Andrews, and he was saying what they were doing, and of course, they were concentrating on nitrates … in the water.” He remembers Dick [Fredriksen] becoming interested, and saying, “Hey! We can do the same thing here. We should be doing it.” Fredriksen proceeded to set up a 4-year study on Watersheds 9 and 10 as part of his Ph.D. thesis.[43]

After securing IBP support with a proposal modeled after other sites, the Andrews group moved in a more independent direction, challenging provocative theories with place-centered testing at Lookout Creek. Dyrness, who notes the community of watershed hydrologists in the United States was “fairly tight-knit,” recalls thinking the Hubbard Brook area was “very much different than the Andrews in terms of soil conditions and so on.” The work at Hubbard Brook was not just logging and then allowing natural revegetation, as Silen had done at the Andrews Forest. Scientists at the New Hampshire facility found vast amounts of nitrates in a logged watershed where researchers applied herbicides for several years to suppress vegetation in an effort to better understand its role in regulating nutrient release in that system. Their scientific findings seemed to support environmentalist arguments that clearcutting was an inappropriate and ecologically harmful management practice. Scientists at the Andrews Forest, however, argued that these findings from New England were not necessarily applicable to conditions in the Cascade Range. They did not defend clearcut logging, but they did argue that scientists had not studied the ecological effects of clearcut logging in the Oregon Cascades sufficiently to provide an informed and scientifically credible assessment

[42] Andrews group interview 22 September 1997, 33.

[43] Small watersheds group interview, 3-4, 18.

of its ecological effects in that region.[44] The Andrews group stressed the need for studies designed specifically for the unique attributes of these Douglas-fir forests, noting that western conifer forests may respond differently than eastern deciduous forests. They were also concerned that several years of intensive herbicide treatment may not accurately mimic clearcutting. In part, theirs was a pragmatic move. As activist groups, including the Sierra Club, began to file lawsuits challenging Forest Service contracts for clearcut logging on national forest lands, both sides in the legal dispute demanded more detailed and more credible scientific studies of specific Western forests.

Scientific Community and Coordination of IBP Science

The people who converged on the Andrews Forest during the IBP had to reconcile the pragmatic, timber-management traditions of the forestry program at OSU with the emerging priorities of ecosystem research during the IBP. Scientists involved with the Coniferous Biome Project worked to develop the niche they had established for the Andrews in relation to other sites in the IBP, and in relation to OSU, the Forest Service, and their colleagues at the University of Washington. Applied science traditions in the OSU College of Forestry unavoidably shaped their sense of purpose, as the Andrews Forest gradually attracted a "critical mass" of personnel, recognition, and interest. The result was a science-oriented, research community where personal networks and loyalties were at least as important as institutional affiliations. The core of that community was a small group of scientists who recruited support through close colleagues and mentors. Those personalized patterns of recruitment tended to perpetuate and reinforce established traditions and priorities, rather than rootless experimentation. People whose graduate work included studies with leading scientists like Don Zobel and Chet Youngberg, Dyrness observes, tended to recruit others with similar experiences. The recruitment process, he notes, often originated with a scientist who had identified an interesting research question on the Andrews. That scientist, Dyrness recalls, would then telephone one or more contacts, asking, "'Do you have graduate students who would be interested in working on it?' … That's the way it went, but very, very personalized."[45]

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[44] Insertions in Dyrness quotes from communication from Dyrness 15 April 1998; interview with Al Levno, 7-8; small watersheds group interview, 5-6.

[45] Interview with Jerry Franklin, 12; Andrews group interview 22 September 1997, 26.

The Andrews group used the big-budget funding of the IBP to support their strategy of recruiting new associates, and that strategy reinforced later perceptions that field research at the Andrews Forest was a relatively unstructured social experience. They recruited people with a common scientific bent and philosophical orientation of scholarly curiosity about scientific processes and informal, unstructured, and spontaneous, interdisciplinary exchange, but who specialized in rather different fields. Dyrness observes, "… that was the fun of it. You got to have people working on different things. Small mammal people talking to … the silviculturists and … measuring fire intervals and talking to the vegetation classifiers, and … all that kind of stuff." Members of the Andrews group later drew on their positive experiences with the high-energy, interdisciplinary, group-oriented research of the IBP years as they tried to consciously replicate the IBP model of "unplanned" col-laborative interaction. Franklin, for example, rallied a subset of the group to participate in a series of focused, professional field experiences that members of the group refer to as "pulses." Dyrness explains the "pulse idea" originated in 1973 with the concept "that we could go other places [away from the Andrews] and have this same kind of interaction going on. … and we worked together all day, and then [sat] around the campfire at night, saying what you'd observed and what questions you had."[46]

"The International Biological Program in the United States will not bridge the communication gap between disciplines and institutions."

Waring also emphasized the socializing benefits of the IBP in an internal paper he wrote at the time. Clarifying his perception of the primary benefits to be expected from participation in the Coniferous Biome, Waring predicted, "… the most valuable product of the International Biological Program in the United States will not be the systems models that will aid in making decisions concerning land and water management but the training of the people that will bridge the communication gap between disciplines and institutions." Referring to that report two decades later, Waring cautions, "… it wasn't necessarily a consensus from … [the] University of Washington. … [but],"that's what we put out at that time so people could see how the thing was organized." He notes that it was important to convey the structure of the group and its program to NSF reviewers in the political climate of the early 1970s, when "… most people didn't think it [the IBP] was going to be a good investment." Among other concerns, Waring concludes, critics argued the models were "too complex," and he agrees, "all of that's true, okay? [chuckle] It's only when you look at the legacy of the next generation and how they were able to do

[46] Interview with Ted Dyrness, 24-25.

Figure 26—Art McKee joined the H.J. Andrews Experimental Forest group during the International Biological Programme to manage site administration issues. Here, he views the results of a test of explosives to fell trees in June 1984 on Log Decomposition Site 4.

better and integrate and … begin to see *applications* where other people didn't … that you could really evaluate it." The IBP, in his view, was "sort of like bringing up kids. … you're not sure when they're in high school whether you want them to grow up [chuckles]. But you better wait a while because you have a big investment."[47]

Decisions about where and how to allocate funds were more restrained. The amount of money involved, and the professional interest that the IBP and Coniferous Biome Project attracted, forced project leaders to refine and focus their mission, and even to exclude funding for people considered outside the scope of the project's purpose. After the Andrews group was successful in "elbowing their way in [to the IBP]," Franklin notes, "… We had to work through what we were going to do to allow for a piece of the action." He asserts, "I had always been looking for ways to get money to study old growth," and, he argues, "There wasn't any question that a lot of the scientists that were involved in the initial workshop in 1968 were interested in old growth, were interested in natural forests. And clearly, … that was what we were interested in by the time we got our first money in 1969."[48]

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[47] Interview with Dick Waring, 6-8.

[48] Interview with Jerry Franklin, 13-14.

Other scientists with the Andrews group argue that Franklin tends to overemphasize the role of conscious planning in positioning the Andrews for the old-growth debates of later years. Art McKee, who was the first person Franklin and Waring hired with funding from the IBP grants, suggests for example, that accessibility and not foresight positioned the Andrews Forest as a place relevant to research questions dealing with the old-growth debate in later years. Fredriksen, he observes, "invested a lot of energy and time into describing watersheds, which were being set up for manipulation so we could do energy flow [and] nutrient [analysis] on those watersheds. The stage was set and he had chosen them because of their ease of access, not because of what kind of vegetation they have." McKee further stresses that during the early IBP years of the 1970s the group committed much of its budgetary resources to studies in plantations or young stands, rather than in old growth, despite the fact that less than one-third of the Andrews was young stands. Neither the prominence of old growth on the Andrews, he contends, nor the predisposition of scientists necessarily led in the direction of old-growth studies. Rather, people like Fredriksen established study sites near well-traveled roads that provided wintertime access to gauging stations. Watersheds 9 and 10, he points out, had the advantage of being adjacent to a major logging road that was not even on the Andrews Forest: "Nothing is plowed in the wintertime and this usually had logging traffic and I suppose it [winter snow] was pounded flat or kept flat."[49]

Even if early scientists were mostly concerned with problems of access and convenience, when the group rapidly expanded the number and variety of research activities during the IBP, they had to think more systematically about where and how to structure study sites. Waring, who was the initial site director for the IBP, found his time commitments at OSU conflicted with the need for careful management at the Andrews Forest.[50] Together with Franklin, Waring decided to hire a site-coordinator-in-residence at the Andrews. The person they selected to fill the position was Art McKee—a graduate student from Vermont and Maine, by way of Georgia. McKee worked with Yale ecologist George Woodwell on a nutrient cycling study at Brookhaven National Laboratory before he entered the graduate program at the University of Georgia, and he seemed a good fit with their evolving plans for implementing the IBP at the Andrews Forest. McKee recalls he was in a

[49] Interview with Art McKee by Max Geier on 12 September 1996 in McKee's office at the Corvallis FSL as transcribed by Jeff Fourier, 1-2.

[50] Interview with Dick Waring, 9-10.

Jack Rothacher

Figure 27—Continuity of personnel is one of the key attributes at the H.J. Andrews Experimental Forest (Andrews Forest). Dick Fredriksen, who played a key role in recruiting Art McKee into the group during the International Biological Programme (IBP), bridged the earlier era of watershed studies and the later IBP era. This photo of Fredriksen at plot 9 Unit L 141 on the Andrews Forest was taken on 26 October 1963, shortly after logging and slash burning were completed on Watershed (WS) 3. Two soil moisture transects were established in WS 3 before logging. One transect was logged, the other remained in the undisturbed timbered area.

"pretty tight financial bind" at the time, and he accepted the position more for the paycheck and the promise that he would be free to pursue his own research interests than for any other reason.[51]

McKee is a good example of how the personal networks of recruitment operated in the early 1970s. Waring and Franklin wanted someone with an established

[51] Interview with Art McKee, 4, 7, 12.

record in the IBP who could hit the ground running and help them get the Coniferous Biome operational at the Andrews. Although McKee had not completed his doctoral program at Georgia, leading scientists connected with eastern components of the IBP recommended him highly. His sponsors in the IBP establishment, in fact, contacted Waring and Franklin before they even began their search, asking, "We have a person … who'd like to come west and [he is] interested, are you?" Waring recalls, "I said, 'well yeah!'"[52] McKee's introduction to the informality and spontaneity of the Andrews group occurred in a bar near the University of Georgia. Franklin and Waring had asked Fredriksen to "sound out" McKee during a visit to Georgia and the Coweeta laboratory. McKee, who was seated at a table in the bar, recalls that Fredriksen, whom he had never met, "… staggered up there to the table and bellowed, 'Are you Art McKee?'" McKee recalls thinking, "Who is this guy?" He later discovered Fredriksen's drunken act was a put-on, and that some mutual acquaintances associated with the group had put him up to it. It was his first indication that he was a candidate for the position.[53]

From McKee's perspective, he arrived at the Andrews Forest almost by accident, but personal networks tied him to the Andrews group even before he realized they were in operation. Once there, he served as a "scientist in the field" who was expected to coordinate and support research activities at the experimental forest. He describes his responsibilities as "… sort of a super-technician's position, where people already had these ideas, and … I was … trying to organize myself and other technicians to collect the numbers." At the time, he recalls, he had "no intellectual investment in the program." He initially saw his job as a series of relatively "menial" tasks limited to building "support mechanisms," although it "very quickly became more professional."[54]

McKee embodied a complex mix of continuing traditions dating back to Silen's time.

The Andrews Forest gained a stable presence and long-term advocate over the next three decades with the appointment of McKee, who embodied a complex mix of continuing traditions dating back to Silen's time there. McKee eventually gained faculty appointment at OSU, and after 1978 he moved into the Site Director's role at the Andrews Forest. His deep, personal roots in New England and professional experience in the northeastern and southeastern centers of ecosystems research added depth to the growing assortment of scientific pedigrees in the Andrews group. His background at the University of Georgia included work in the Arctic

[52] Interview with Dick Waring, 10.

[53] Interview with Art McKee, 3-5.

[54] Interview with Art McKee, 8-9.

with plant physiologist Philip Johnson, who was his major professor, and he also had worked with Dick Wiegert, studying thermal ecosystems at Yellowstone. His pragmatic attention to detail and enthusiastic enchantment with the aesthetic appeal of the forested public lands of the Pacific Northwest resonate with the best attributes Silen and Gratkowski brought to the Andrews Forest. His emphasis on applied research also dovetailed with ingrained traditions at OSU and at the experimental forest. Like Franklin, his family tree included ties to the timber industry, and he observes his mother's family, "nearly lost a fortune in lumber." He also brought a Yankee commitment to craft and workmanship to the Andrews group.[55]

Over the next three decades, McKee emerged as one of several prominent leaders who first joined the Andrews during the IBP. His personal characteristics strongly influenced the way new recruits perceived the group and the experimental forest. Several generations of scientists relied on his expertise as they acclimated themselves to that community over the next 30 years. Another long-time associate of the Andrews Forest, Andy Moldenke, who worked with McKee in the IBP at other sites before they both wound up at Lookout Creek, argues that McKee is one of the most critical factors behind the long-term success of the Andrews group. He argues that scientific community tends to arrive at "fundamental realizations … a lot easier than most other interdisciplinary groups," and he attributes that characteristic primarily to McKee's role as a dominant personality: "He is the one element who is really responsible for the way different people talk to one another in … different disciplines. … he is the glue that holds it together."[56]

The reputation of the Andrews Forest and the group associated with it were scarcely sufficient to recruit and hold world-class scientists in the early 1970s. The place was less than compelling for someone stepping onto the scene fresh from the more plush appointments of established programs like Hubbard Brook, Woods Hole, Coweeta, or Yale University. Idealized images of the pristine Northwest also conflicted with McKee's initial impressions of what he describes as a "Neanderthal environmental ethic" in the Pacific Northwest at that time. In the context of the wave of environmentalism that was sweeping the country in the early 1970s, McKee recalls thinking that Franklin and others in the Andrews

[55] Interview with Art McKee, 7.

[56] Interview with Andrew Moldenke by Max Geier on 14 Nov 1997 in Cordley Hall at Oregon State University, as transcribed by Elizabeth Foster, 13.

group were "sympathetic, but not sensitive. They were listening to it and it resonated, but they weren't actively engaged." In comparison with other IBP sites where he worked before 1970, McKee suggests, the Andrews group tended to be reacting to environmental initiatives, not leading the way.[57]

Scientists working at the Andrews Forest after McKee began working there in 1970 benefited from his efforts to improve its substandard support facilities. When McKee first arrived at the Blue River from the University of Georgia and saw the ill-equipped office assigned to him in the ranger station, he started brainstorming solutions to the problem of inadequate research facilities: "I was thinking mobile home, prefab homes." It was, he recalls, an overwhelming problem: "Big program, big ideas, and zero facilities to work in." McKee improvised an administrative center for the scientific boomtown near the confluence of Lookout Creek and Blue River: "We bought one trailer one year, one trailer the next. Put up the warehouse to house things at the site, got a couple of camper trailers on extended rental for people to work out of out in the field." McKee also purchased a variety of camping gear "… so that people could work out of tents and so on. [We] designated a campground area on the forest."[58]

The campground was a low-technology strategy for meeting human needs and building a sense of community at the forest during the field season. McKee built kitchens and outhouses in and around the many windthrows in the old-growth setting of a headquarters site located near the entrance to the Andrews. This improvised solution simply bypassed management guidelines and did nothing to soothe the already tense relations with the district: "… the Forest Service," he notes, "… woke up one day and suddenly there was this defacto campground on the Experimental Forest." The improvised facilities wedged between fallen old-growth trees successfully converted the mundane, daily routines of camp life into memorable experiences that helped forge a spirit of shared adventure at the Andrews Forest. The camp facilities, for example, included kitchens that used the root wads of windthrows as a framework for shelves, and McKee recalls that people even seemed to enjoy using the outhouses: We'd nailed a couple of planks between some windthrow trees and … put up a toilet seat. … It was very informal. People loved the open air, actually. Most of them loved it a lot.[59]

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[57] Interview with Art McKee, 1.

[58] Interview with Art McKee, 8-9.

[59] Interview with Art McKee, 9.

A Crowded Landscape of Science and Community

The aura of adventure at the improvised camp on the Andrews Forest promoted a romantic, community ethic of "making do" and self-sacrifice in the name of science. The group's struggle to fit their ambitious plans for research into the short field seasons, budgetary constraints, and temporary nature of the IBP heightened the atmosphere of frenzied enthusiasm. At the peak of the IBP, upwards of 100 people swarmed over the experimental forest during the summer months, living in a scientific boomtown that strained the capacity of the improvisational sewage disposal system, kitchen facilities, and transportation network. The Coniferous Biome was, by design, a project of finite duration that channeled funding from the NSF and other cooperating agencies and universities to scientists working in the field. The congregation of scientists at the Andrews Forest and the byproducts of their encampment, however, were also a concentrated human presence with environmental consequences on the landscape selected for the IBP as a "pristine" example of the Coniferous Biome. The contradiction of a "pristine" landscape attracting hordes of people echoed contemporary concerns about the environmental impact of the expansive urban culture of the United States. The group's activities and priorities in this scientific boomtown, moreover, often deviated from local standards in the nearby community of Blue River, Oregon.

The contradiction of a "pristine" landscape attracting hordes of people echoed concerns about the expansive urban culture of the United States.

The immediate effects of this sudden influx of people were obvious to people with long-term, prior involvement at the Andrews Forest and in Blue River. Levno, who worked at the experimental forest for nearly a decade before the Coniferous Biome Project began, observes that it was a "real radical change." He was accustomed to working in a landscape where there were seldom more than one or two people at any given time, but with the IBP, he recalls, "all of a sudden 50 to 100 people showed up and were living in trailers and camps. …" The sudden influx of people caused problems with the staff at the Blue River Ranger District, but Levno perceived it as a "good thing." Among other concerns, he recalls a generational and cultural gap between district staff, who adhered to the paramilitary standards of the Forest Service, and the academic community of young college faculty, postdoctoral associates, and graduate students, who were steeped in the culture of antiwar protests and campus activism. As Levno observes, "This influx of kids, it was during the hippy days, I guess you could say, and if you went swimming anywhere in the Andrews you didn't wear clothes. I remember at one of

Figure 28—During the International Biological Programme, a more diverse array of personalities crowded onto the H.J. Andrews Experimental Forest to support research activities there. In this photo, Ray Beug (and Steve Running, at right, with hand on Rusty) stand in Watershed 6 on 30 June 1975, one day after crews completed logging and slash burning on the site. The 32-acre watershed was entirely clearcut, and 90 percent of the resulting logs were yarded up hill with a high-lead cable system. The other 10 percent of the logs were yarded with a tractor.

our meetings Jerry said 'well we need to clean up our act a bit, better not skinny dip right out in public places.' It was a radical change."[60]

The science community at the Andrews had few ties with local customs or culture in Blue River. Levno observes that little in the town catered to the interests of researchers, and scientists at the experimental forest mostly avoided Blue River, "almost to a point of avoiding the townspeople." Other scientists tend to agree with Levno's assessment. The one feature of the town that did attract scientists did little to dispel district concerns about relaxed standards at the scientific encampment. Dyrness observes that many researchers occasionally visited a local hangout in Blue River known as the Cougar Room—a tavern "with Go-Go Dancers and everything"—until it burned down in the early 1990s. Levno emphasizes, however, that for the most part, reciprocal disinterest prevailed: The townspeople were not very aware of activities on the forest, and researchers mostly avoided the town and paid little attention to affairs in that community.[61] The camptown culture of the

[60] Interview with Al Levno, 8-9.

[61] Interview with Ted Dyrness, 25-26; interview with Al Levno, 9-10.

Andrews group was centered on the landscape of the Lookout Creek drainage, but people in that community were more closely tied to the urban center and academic culture of Corvallis, than to nearby forest-oriented towns like Blue River or McKenzie Bridge. The encampment was not an isolated community, but it was also not integrated with nearby townfolk, and this was a distinct change from the era of Roy Silen's leadership at the experimental forest.

Scientists, technicians, and other support staff at the Andrews Forest during the IBP era also differed from their predecessors in their scientific priorities. Their areas of specialization were more varied than those of earlier scientists at the Andrews, and they also included more people from different ethnic backgrounds and genders. Ross Mersereau, who replaced Levno as technician-in-residence at the Andrews Forest during the late 1960s,[62] argues that in the scramble to provide sufficient staffing to support the proliferating number of field studies, hiring standards began to decline. Some technicians, he claims, were hired despite their weak understanding of scientific method: "Al [Levno] got permission to hire a couple of new technicians. And that was a real experience because … up until then, almost everybody that we had … was, uh, pretty well educated, you know. Yeah, I had a degree, Al, by this time had a degree. … Under different circumstances both of us would have been scientists rather than just technicians. … and then we get two guys that, I don't even know that they finished high school."[63]

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[62] Mersereau continued the earlier tradition of close ties linking the Andrews group and community traditions in Oregon, despite the otherwise widening gap between the town of Blue River and the science group at the Andrews. At the time of his first assignment to the Andrews, he was a disabled military veteran who became involved with the group as a graduate student at OSU. He had served in the U.S. Marine Corps during World War II, serving in the South Pacific theater with the Marines from 1943 until the end of the war. He was released from service under the GI Bill in 1946 after suffering a gunshot wound on Iwo Jima. That injury forced him to quit his prewar career as a laborer and return to school under a vocational rehabilitation program at Oregon State College from 1946 to 1951. After a brief, unsatisfying stint as a general science teacher in Springfield during the 1950s, Mersereau returned to Oregon State College as a graduate student in the fisheries program. Gashwiler recruited him out of the fisheries program and recommended him to Fredriksen for the technician-in-residence position at the Andrews, where he began in 1966. By 1969, Mersereau observes, he and his family, including nine children, were well-integrated into the community of Blue River, and they secured most of their day-to-day needs from local establishments, except for occasional runs into Eugene to buy groceries in bulk. They moved to Corvallis in 1978, however, when his oldest son was still in high school. Interview with Ros Mersereau by Max G. Geier (with Ted Dyrness) on 3 September 1997 at Mersereau's house in Corvallis, as transcribed by Brooke Warren, 2-5, 10-11.

[63] Interview with Ros Mersereau, 19.

Figure 29—Fred Swanson, shown here at the first Ecosystem Management Workshop at Watershed 2 on the H.J. Andrews Experimental Forest (Andrews Forest) in summer 1979, later emerged as one of several scientists in a new leadership group that began to emerge from among those recruited to the Andrews Forest during the 1970s.

The number of scientists increased faster than the number of technicians at the Andrews Forest because postdoctoral associates did much of the technical work. Between 1968 and 1978, Waring and Franklin recall hiring some 16 postdoctoral associates, including Kermit Cromack, Bill Emmingham, Robert Fogel, Charles Grier, Joan Hett, Dick Holbo, Ron Nussbaum, Ken Reed, Jeff Richie, Jim Sedell, Phil Sollins, Mary Ann Strand, Fred Swanson, Gordon Swarzman, Frank Triska, and Bob Wissmar. The career path for postdocs recruited to the Andrews during this period, Waring recalls, typically involved prior experience as graduate students working with other IBP groups. The people in this cohort were typically hired on 3-year appointments.[64]

With IBP funding, the Andrews group built a nucleus of scientists and ongoing programs of research that snowballed into a self-activated recruitment mechanism. Dyrness explains that once people began to realize that there was at least a chance for funding at the Andrews Forest, people were "attracted in." One of those people was a young geologist named Fred Swanson, then completing his graduate work at

[64] Interview with Ros Mersereau, 18-19; interview with Dick Waring, 1; communication from Franklin and Waring 10 February 1998.

the University of Oregon. Dyrness recalls he and Franklin first met Swanson when they presented an evening seminar at the University of Oregon to an audience of "mostly geologists," and he observes, "Fred, from the very start said, 'Oh, gee, this is neat! You get to work with guys in biology and silviculture, geography, whatever!'"[65]

Interdisciplinary Traditions and New Generations of Leadership and Community

Three scientists—Swanson, Sedell, and Gregory—added intergenerational depth to the group's leadership.

Three prominent leaders of the Andrews group who exemplify the trend toward a diversity of scientific specializations first became involved at the Andrews Forest during the early 1970s as graduate students or as postdoctoral assistants. These three scientists—Swanson, Sedell, and Gregory—all emerged as leaders before the end of the decade, and then guided the group through much of the remainder of the century. Sedell and Gregory both arrived in 1971, and Swanson began working for the Coniferous Biome in 1972. They added intergenerational depth to the demographic profile of the group's leadership, and their combined efforts were largely responsible for transforming the temporary community of interdisciplinary cooperation into a long-term tradition for the Andrews group that survived the eventual departures of Franklin, Dyrness, and Waring. By the end of that decade, the leadership of the group was more diverse and less centralized in any one person, although Franklin remained the central figure holding the group together, and they were experimenting with various forms of consensus-oriented decisionmaking.

The unique combination of academic backgrounds and personal networks that Swanson, Sedell, and Gregory brought to the community help explain why those traits became prominent features of the Andrews group during their involvement and eventual leadership.

Swanson, like Gratkowski, came to Oregon by way of Pennsylvania, pursuing graduate studies at the University of Oregon after completing undergraduate work at Pennsylvania State University and two summers of field experience at the Bermuda Biological Station, where he reportedly hung out with "… a group of very interesting, top-notch grad students who were taking a course on organism-sediment relations in a modern environment of carbonate (limestone) depositions." Swanson cites this interdisciplinary experience with "geochemists, sea-water

[65] Interview with Ted Dyrness, 18-19.

chemists, biologists, and geologists" as a formative influence on his own priorities for scientific research. He recalls they all worked together with some "really impressive people," including Stephen J. Gould. He went on to work with the U.S. Geological Survey on the Oregon coast, making professional contacts that eventually led him to pursue graduate studies at the University of Oregon. There, he "helped lead a project to the Galapagos that involved plant-geology interactions and geologic history. …" When he completed his graduate studies, in 1972, he began working on the IBP, studying the geology of the Andrews with Alan Kays, a University of Oregon geology professor who previously worked with Dyrness.[66]

Sedell, like Silen, was born and raised in Oregon. He attended Willamette University as an undergraduate philosophy major, but like Swanson, he also arrived at the Andrews by way of Pennsylvania, where he did his graduate work in Biology at the University of Pittsburgh while developing professional research networks with scientists at Hubbard Brook, at Michigan State University, and at the Oak Ridge National Laboratory in Tennessee. His interest in fishing the lakes and streams of Oregon drew him into aquatic studies, and he attracted the attention of OSU fisheries professor Jim Hall and entomologist Norm Anderson through their mutual acquaintance with Ken Cummins, at Michigan State.[67]

Gregory came to the group with similarly strong links in his home state of Tennessee. He started his graduate career at OSU in 1971 after completing an undergraduate program in fisheries biology at the University of Tennessee, where he worked with Dave Etnier. He previously spent a summer in a multidisciplinary, NSF-sponsored program in geology, water chemistry, hydrology, and biology at the School for Marine Biology in Mississippi, before his senior year in high school. Etnier's zoological interests and involvement in the IBP program at Oak Ridge and his contacts with the IBP program at Seattle drew Gregory into closer involvement with the Pacific Northwest. In 1971, he began working with his major professor, Jack Donaldson, at OSU, where he soon fell into close professional association with Sedell.[68]

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[66] Interview with Fred Swanson by Max Geier on 6 September 1996 at his home in Corvallis, as transcribed by Sara Rogers, 2-3.

[67] Interview with Jim Sedell by Max Geier on 14 February 1998 in Sedell's office in the FSL in Corvallis, OR, as transcribed by Keesje Hoekstra, 1-3.

[68] Interview with Stan Gregory by Max Geier on 7 October 1997 at Nash Hall, Oregon State University, as transcribed by Keesje Hoekstra, 1-3.

Figure 30—Jim Sedell and Stan Gregory, shown here at Mack Creek in 1973, infused new energy into aquatics research at the H.J. Andrews Experimental Forest.

The long-term involvement of Swanson, Sedell, and Gregory with the Andrews group, along with the ongoing roles of McKee, Levno, and Mersereau, laid the foundation for the first gradual transition of science leadership at the experimental forest since it was first established in 1948. Their mentoring into the group, their experience working under the leadership of Waring and Franklin, and their integration of graduate student, postdoc, faculty, and agency scientist roles, contrasted with the experiences of their predecessors. Previous science leadership was more centralized and administered far fewer researchers and programs. Silen and Rothacher, for example, both were assigned to the Andrews Forest without any prior involvement there, and Silen was summarily reassigned, with virtually no opportunity to transfer his knowledge to his successor. The PNW Station hierarchy, in fact, actively discouraged his continued involvement with decisions governing the Andrews. The new cohort of future science leaders arriving at the Andrews in the early 1970s, therefore, represents an unusual development. For the first time, the scientists most directly involved in managing and directing research at the Andrews were directly recruiting and mentoring their immediate and long-term successors.

During the early 1970s, Waring had emerged as the go-to leader of the Corvallis component of the Coniferous Biome. Franklin's role at the Andrews was more sporadic because he took a 10-month sabbatical in Japan in 1970, just as the

Coniferous Biome was getting underway, and then accepted a 2-year appointment at NSF in Washington, DC, where he hoped to shore up support for long-term, continuous funding at established IBP sites, while also expanding the concept of ecosystem research into new venues. Franklin, who began his stint at NSF in summer 1973, emphasizes he was determined to "convert IBP funding to [budget] line funding, continuous funding to ecosystem research, so instead of disappearing into just regular ecology or biology funding, the line item that had been there for IBP was rolled over into the ecosystem science program." He set, as one priority, the goal of continuing to fund "sites like the Andrews." Franklin also worked to ensure "that some new, related kinds of activities that hadn't been able to make it in under the IBP banner" would get funded. In that vein, he worked with Dyrness and Keith Van Cleve, of the University of Alaska, Fairbanks, to establish the Taiga Research Project that later developed into the Bonanza Creek Long Term Ecological Research. Shortly after Franklin began working for NSF, PNW Station Director Bob Buckman tapped Dyrness to lead a multifunctional unit in Fairbanks, Alaska, and Dyrness carried the vision of interdisciplinary, collaborative research into his new, 16-year career in the far north, where he quickly linked up with Van Cleve.[69]

Waring led the post-doctoral associates and cooperating scientists into one of the most prolific periods of scientific inquiry in the history of the H.J. Andrews Experimental Forest.

Waring, while still a relatively junior faculty member at OSU, stepped into the local leadership breach and led the growing cohort of postdoctoral associates and cooperating scientists into one of the most prolific periods of scientific inquiry in the history of the H.J. Andrews Experimental Forest. Franklin, meanwhile, broadened his personal and professional networks in Washington, D.C., eventually returning to the Andrews in the latter part of the decade to resume a somewhat diminished leadership role in a more diverse program already greatly transformed by the prospect of long-term, continuous funding for ecosystems research. He was still a prominent, even dominant leader in the group, but a broader system of decisionmaking and a more complex set of constraints and incentives guided the research effort through the end of the IBP. The number of people with professional connections and personal commitments to the Andrews Forest had greatly expanded, and the sheer numbers of people working at the place had left their imprint.[70]

[69] Interview with Ted Dyrness by Max Geier at Dyrness home in Albany, OR, 17 July 1995; correspondence from Ted Dyrness to Ken Wright, 19 June 1995.

[70] Interview with Jerry Franklin, 16.

The Reconstructed and Humanized Landscape of the Andrews Forest

By the mid 1970s, the Andrews Forest and programs of research linked with that place were already larger and more permanent than any one person could manage. To promote the place and protect it from closure, Franklin and Dyrness moved it from relative obscurity into national prominence. Their campaign to include the experimental forest as an intensive study site for the Coniferous Biome Project of the IBP humanized the landscape in ways that went beyond Silen's system of roads and clearcuts: large numbers of people lived and worked at the Andrews Forest during the 1970s, and it became a place where scientists went to interact with other people. It went from being a place that Dyrness and Franklin had perceived as underpopulated, to a place that district staff at Blue River and others described as overrun with out-of-control people or even the wrong kind of people. It was a place that had become so popular with scientists that Waring finally had to admit he couldn't manage the place without assistance. Finally, it was a place so crowded with people and their habits, that McKee began to perceive it as dismally lacking in human amenities. This humanized landscape, ironically, was the end-product of the decision to include the Andrews Forest as a "pristine" example of the Coniferous Forest Biome designated for "intensive study." Much of the Andrews Forest remained relatively remote, and much of its potential as a research resource remained untapped. The most remarkable change resulting from the IBP at the Andrews Forest was the emerging spirit of collaborative effort and the tradition of pragmatic adaptation that became hallmarks of the Andrews group over the last quarter of the century.

Chapter Four: Fostering Cooperation Between Research and Management, 1970–1980

The Andrews group capitalized on the H.J. Andrews Experimental Forest (Andrews Forest's) growing popularity as a site for field research throughout the 1970s. Scientists found inspiration and new respect for each other on a landscape they described as pristine, although it was more intensively developed than the surrounding national forest. The sudden popularity of the place forced leaders of the group to become managers of people and other resources, but it also killed the proposal to close the Andrews Forest. During this decade, the most immediate threat to its long-term viability was the possibility that different studies at the site might begin to interfere with one another. The group formalized an administrative structure for coordinating research efforts, but they also tried to preserve the informality and spirit of the group's "make-do" tradition.

In the last half of the decade, the Andrews Forest and the group entered a new era of prominence as a pilot program in a permanent, global network of field sites dedicated to ecosystem research. It was a daunting experiment in collaborative management of people, place, and process in a decade of increased public concern about the environment. These people expanded their activities beyond the Lookout Creek drainage and began annual, community-building exercises modeled after their previous experiences at the Andrews. As they became more accustomed to their national prominence, they also gained self-confidence. They began to draw forest managers into the group's inner circle, and they began to supplement the basic science orientation of the International Biological Programme (IBP) with more applied research, culminating in a pathbreaking collaboration with the Willamette National Forest to develop new guidelines for managing forests and streams.

New Priorities for the Andrews Research Community

The Andrews group forged a community ideal of interdisciplinary, cooperative, long-term research amidst swirling political debates and social tensions. In the decade that began with the first Earth Day celebration in April 1970, those who managed public resources had to pay more attention to the ecological context of their actions. At the Andrews Forest, more than two decades of continuous monitoring of streams and permanent plots supplied the data needed to support long-term studies of ecological processes. The self-defined limits of the Andrews group expanded during the 1970s to include more academic scientists not connected with the Forest Service, more nonscientists, and more sites away from the experimental forest. Their focus, however, was closely centered on the Lookout Creek drainage. The rising public concern about environmental issues, and the political expression of that concern, also made the group's research more relevant to the priorities of forest managers. As the IBP drew to a close, Forest Service scientists and Oregon State University (OSU) cooperators associated with the Andrews Forest pioneered a strategy of independent funding from the National Science Foundation (NSF). That strategy left them well positioned, by the mid 1980s, to explore with relative autonomy the long-term implications of policy alternatives to clearcut logging in the old-growth forests of the Pacific Northwest.

The long-established ethic of stewardship-for-future-use continued as a core value of the Andrews group, but preservationist priorities for managing the forest also became more apparent during the "environmental decade." The new generation of scientists who joined the group early in the 1970s gradually moved from assistant to leadership positions by the 1980s, while exploring hypotheses that challenged and advanced previous thinking about ecological processes. At the same time, a stricter test of scientific relevance virtually halted nonsalvage timber sales in the Lookout Creek drainage, even as timber harvests and road building accelerated on neighboring drainages of the adjoining Willamette National Forest. By the early 1980s, roads and clearcuts were less common on the Andrews than on the surrounding landscape. Relative to nearby, logged drainages, the experimental forest had begun to live up to its previous image as a pristine place. In this comparative context, scientists reimagined potential uses for the Andrews. They perceived and managed the Andrews Forest as an accessible reserve of intensively studied, regenerating, older clearcuts and stands of old growth in a larger, patchwork landscape of more recent timber harvests, road projects, recreational developments, and other uses of the Willamette National Forest. They expanded their focus above and below the forest floor, and they explored ways to integrate ideas from their work at the Andrews with management practices on the adjacent national forest.

International Biological Programme Shortfalls and the Problem of Long-Term Ecosystem Studies

The sheer quantity of effort and funding focused on the Andrews Forest during the Coniferous Biome Project attracted national attention and skilled scientists to the site, but the IBP failed to fully meet its goals before the planned end of the program. By the time that international effort was scheduled to end, in 1974, the

U.S. component of the IBP had absorbed about $50 million, most of it channeled through grants from the NSF. These monies mostly funded studies of five biomes: grasslands, tundra, desert, western coniferous forest, and eastern deciduous forest. As the program neared its scheduled end, the National Academy of Sciences commissioned a report of the entire American component. That report, when finally released to the public in January 1975, drew harsh criticism. An unnamed reviewer in the 21 February 1975 edition of *Science* (Vol. 187), for example, observed that unspecified "critics" of the program questioned "whether IBP did anything that wouldn't have been done anyway, and for less money." The same critics suggested the program provided research funds to "second-rate researchers who wouldn't have qualified for grants under the regular NSF grant programs." The *Science* review also reported claims that "the biome studies have accumulated masses of data while failing to establish chains of cause and effect that could lead to deeper understanding of how ecosystems work."[1]

From the outset, Franklin, Waring, and others wanted predictive models that would structure the research effort and determine data needs. The group's top priority for the first full year of the Coniferous Biome (1970-1971), was "to review available information for the development of preliminary models with an emphasis on the terrestrial-aquatic interface system." Their second objective was "to initiate studies of poorly understood processes and elucidate functional relationships." Second-year objectives (for 1972) reversed the order, with a stronger focus on (1) completing "selective ecosystem descriptions at the intensive sites," (2) developing "additional information for modeling of transfer mechanisms and pathways of nutrients, particulate matter, energy, and water … ," (3) modeling "assembled information … ," and (4) developing "the coordination program."[2]

Predictive models were elusive, and Waring admits much of the criticism of the IBP was well founded.

Predictive models were elusive, and Waring admits much of the criticism of the IBP was well founded. Part of the problem was that the technology of computing could not handle the volume of data that the large assemblage of scientists had generated. The group struggled to pull together "just enough so we could see how

[1] National Academy of Sciences, *U.S. Participation in the International Biological Program: Report 6 of the U.S. National Committee for the International Biological Program* (Washington, DC: National Academy of Sciences, 1974). *Science* 187 (21 February 1975).

[2] Jerry F. Franklin, "Why a Coniferous Forest Biome?" In: *Proceedings—Research on Coniferous Forest Ecosystems—a Symposium* (Bellingham, WA—March 23-24, 1972); "Coniferous Forest Biome Ecosystem Analysis International Biological Program Proposal for 1973 and 1974, Vol II" (bound typescript in Coniferous Biome files, Publication Room, FSL, Corvallis, OR, July 1972), 4.1.

the pieces fit together and get something out [published].” They rushed many reports into print as “gray literature” that didn’t measure up to the standards of peer-reviewed journals like *Science*. These caveats notwithstanding, the Coniferous Biome Project generated more than 45 contributions to the “open literature” by early 1975, including Waring’s own work with K.L. Reed and W.H. Emmingham to develop an environmental grid for classifying coniferous forest ecosystems.[3]

Unplanned spinoffs from IBP turned out to be more important than its shortcomings and arguably more significant than anything the group published as part of that effort at the time. Even its failures had long-term payoffs not fully recognized until much later. Work at the Andrews Forest, for example, provided initial data for characteristics not previously considered, including the amounts and functions of dead wood on land and in streams. These data were the foundation for later, experimental work in that area. The IBP work also linked the group with young scientists working at other sites, including Hubbard Brook and Coweeta. Reciprocal, intersite meetings with those scientists strengthened the group’s reputation for accomplishing significant results with minimal facilities.[4]

The Andrews group made a virtue of minimal physical improvements at the experimental forest in their dealings with NSF reviewers during the early 1970s. After visiting the Andrews, NSF officials could hardly accuse the group of wasteful spending. McKee and Waring, for example, blithely cited as a “major overhead” expense the cost of acquiring and installing a single mobile home unit that they acquired from Forest Service surplus stocks and designated as a combined meeting space, sleeping quarters, kitchen, and dining hall. This single unit supported more than 100 scientists who otherwise relied on the temporary camp facilities.[5] McKee, Levno, Mersereau, and others supported a world-class science effort with a garage-sale mentality of making do.

The skeletal program at the Andrews Forest, relative to some other IBP sites, was obvious even to the most casual observer. Overnight guests crammed into a surplus trailer could not help but notice the enthusiastically efficient opportunism of the group. Scientists and staff volunteered their time, and cooperative arrangements with various OSU departments and the Forest Service covered the material

[3] Interview with Dick Waring, 8-9; J.F. Franklin, L.J. Dempster, and R.H. Waring (eds.), *Proceedings—Research on Coniferous Forest Ecosystems—a Symposium* (Portland, OR: USDA Forest Service, 1972), 79-92.

[4] Communication from Fred Swanson 12 November 1998.

[5] “Coniferous Forest Biome Ecosystem Analysis … Proposal for 1973 and 1974, Vol II,” 4.20-4.21.

cost of vehicles, equipment, and laboratory facilities. They hosted visitors from around the world, including representatives from Japan and Austria, U.S. delegates from the Grasslands and Deciduous Forest Biomes, and other visiting scientists who conducted seminars and workshops at the experimental forest.[6] Together, they founded a community ethic of unpaid volunteering, and their human capital subsidized the group's scientific programs.

Individual scientists and staff paid a high price for their volunteerism. They sacrificed personal time with their families to support programs at the Andrews Forest, and the time they donated seldom translated into lines on a résumé. It was time they might otherwise have invested in opportunities for professional involvement at more traditional venues in their own disciplines. The opportunity cost of their involvement at the Andrews Forest often exceeded their professional return, in terms of career advancement, but people found alternative outlets for their creative energies within the cooperative culture of the group.[7]

The group promoted the failures of the early models as opportunities to rethink the goals, purpose, and approach of research at the Andrews Forest. They eventually rejected the idea that predictive models applicable elsewhere could be developed from the localized, intensive research sites of the IBP. The group's initial models, Waring observes, "basically described what we measured." They did not accurately predict how timber harvests or changes in climate would affect the ecosystem. That realization encouraged Waring to work with other scientists at the Andrews Forest and at other sites to devise broader, more generalized models built around physical processes, rather than site-specific observations. They began with models of hydrologic processes because, Waring observes, those are "the most physical-based and least biological-based of all the processes that go on in watersheds and in ecosystems." The goal was to demonstrate generalities among the biomes of the IBP and build quantitative models based on the actual processes, rather than statistical correlations. Before that effort, Waring observes, most models of watersheds were tuned to data on how much water flowed in and how much flowed out, rather than on processes in the watersheds themselves. The Andrews group worked with Wayne Swank of Coweeta, who also had links with the University

[6] "Coniferous Forest Biome Ecosystem Analysis … Proposal for 1973 and 1974, Vol II," 4.20-4.21.

[7] Interview with Andrews IBP group including Jerry Franklin, Dick Waring, Fred Swanson, Jim Hall, Martha Brookes, Don Henshaw, Art McKee, Al Levno, Bill Denison, and Ted Dyrness by Max G. Geier on 10 February 1998 at the Siuslaw National Forest Headquarters, as transcribed by Keesje Hoekstra, 2.

The group used the failure of the initial models as a powerful rationale for aggressively expanding intersite networking.

of Washington, to develop a general model that could be tested in Arizona, Oregon, and North Carolina, and they worked with Dale Cole and others at the University of Washington to develop nutrient-cycling models.[8]

The group's shift from descriptive to process-oriented models is an example of their tendency to convert apparent setbacks into opportunities for innovation. People in the group used the failure of the initial models as a powerful rationale for aggressively expanding intersite networking. They pinned their hopes on a guiding principle of the IBP: to encourage greater integration across national, disciplinary, and institutional lines. They responded to local constraints by broadening the range of their interactions with people at other sites and expanding their field of inquiry. In that sense, Waring suggests, the IBP was phenomenally successful: "We did reach out … [to] other biomes, particularly the Tundra and Eastern Deciduous [biomes]." They worked with other people who were also studying decomposition, water, and carbon cycling, and they constantly sought opportunities to share and learn new methods.[9]

A sense of desperate urgency drove the opportunism and adaptive style of research at the Andrews Forest during the 1970s. People who became involved with the Andrews Forest during the IBP knew that the Coniferous Biome, by design, was a finite project. That knowledge gave them a common purpose and unusual focus that encouraged effective teamwork, but it also set them up for a wrenching readjustment at the end of the project. Bill Denison, a cooperating scientist from OSU who worked on the Biological Processes team of the Coniferous Biome, notes that the IBP disrupted previous working relations and habits of thought among his colleagues on campus, and it left a legacy of heightened expectations that were difficult to meet. He describes the IBP as a lost opportunity to discard the traditional pattern of departmental rivalries and forge an interdisciplinary tradition at OSU: "People were reluctantly transformed. Once they were transformed [pause], we sort of [did not have] the resources … available to follow up on it." He and his colleagues, Denison recalls, "got fired up and were excited about it." They were excited partly because the money was available to support their research, but Denison remembers they were also attracted by the lure of "interaction across departmental lines and disciplinary lines." He observes, however, that their initial excitement "proved to be very naïve" because the program ended, and

[8] Interview with Dick Waring, 2-3.

[9] Interview with Dick Waring, 4.

"to have that evaporate, was [pause] a blow [long pause]."[10] The dislocation and sense of abandonment that Denison recalls was real, but while some elements of the IBP abruptly ended, others continued and even expanded after that program formally ended at the Andrews Forest.

Modeling Research and Community During the IBP

Computer modeling was one area of remarkable success that helped reenergize the Andrews group. Dyrness, who observes that their early leaders were neophytes in the field of integrated ecosystem research, recalls that Joan Hett initially introduced him and Franklin to the concept of computer modeling at an orientation to ecosystems theory they all attended at the University of Wisconsin in the mid 1960s. Hett, who later joined the Modeling and Integration Team of the Coniferous Biome as a scientist at the University of Washington, demonstrated the potential of computer modeling at the Wisconsin session, which Dyrness recalls as a "gee-whiz thing." That awakening to the potential of ecosystem science, Franklin ads, "led directly into our old-growth characterization and all our [subsequent] involvement with policy analysis."[11]

With the IBP field site at the Andrews Forest members of the group were full participants at the cutting edge of ecosystem research. They joined an interdisciplinary effort to model whole ecosystems, bringing in specialists from many different academic backgrounds. As a result, Waring explains, "We began to look at decomposition as a process." They examined the details of how organic material actually decomposed, including the biological organisms and chemical exchanges involved in that process. In so doing, they furthered the goals of the IBP in which the Andrews Forest was just one site of many potential reference points for building a comprehensive model of how ecosystems function. That overarching model remained elusive, but the Andrews group benefited in other, unplanned ways.[12]

The IBP initiative at the Andrews Forest was more successful as an exercise in human development than as a breakthrough in scientific thinking: it modeled new job possibilities for scientists interested in studying forest ecosystems in the post-IBP era. As new opportunities for interdisciplinary professionals in forest science became more apparent, Waring, at least, had a clear conscience when he recruited people from other disciplines to fill short-term niches in the Coniferous Biome: "At

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[10] Interview with IBP group, 29.

[11] Interview with IBP group, 2-3, 17.

[12] Interview with Dick Waring, 3-4.

that time we could see jobs on the horizon either at the Forest Service or at the University, so we didn't feel guilty about exploiting the talents of people from other fields when you could see that there was an opportunity to move them into classically forestry enterprises where you had to have a degree in forestry, otherwise you wouldn't be accepted. … we broke that convention … big time. We did it!"[13]
The postdoctoral and graduate student assistants that Franklin and Waring recruited to jump-start the computer-modeling program gained valuable experience and built networks with other scientists and funding agencies that helped them launch professional careers elsewhere.

Those who hoped to establish a long-term program of ecosystems research at the Andrews Forest needed to convince a substantial number of cooperating scientists not to leave at the end of the Biome Project. Those who stayed later argued that the transition toward a more sustainable, collaborative group at the Andrews Forest began with an informal process of "self-selection" during this phase of the project. That belief emerged as a core value among survivors of the Andrews group in the post-IBP era.[14]

The recruitment and winnowing of participants was more self-conscious than the natural evolution that the group's preferred term for the informal process seems to imply. Franklin observes that he and Waring "made decisions about people and activities which brought some in and pushed others out." A prolonged disagreement between Franklin and statistician Scott Overton during the early days of the IBP, for example, led directly to Overton's departure. Overton was an OSU scientist who cooperated with Hett and others on the Modeling and Integration team of the Coniferous Biome. His innovative work during that period didn't mesh with Franklin's vision, and McKee recalls Overton eventually left the group amidst evident displays of "bad blood" between the two men. The terms of Overton's departure, he adds, had some long-term consequences for scientific exchange at the Andrews, including McKee's sense that he "couldn't use the term that Scott used" to describe the hierarchical statistical models on which Overton later worked.[15]
Franklin describes his break with Overton as a struggle for control within the group and as an example of deep-rooted disagreements over the direction of

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[13] Interview with Dick Waring, 2-3; interview with IBP group, 29.

[14] Interview with Ted Dyrness, 19-20.

[15] Communication from Jerry Franklin 6 December 1999; interview with Art McKee, 13-14; communication from Art McKee November 1998.

the modeling effort. He notes, "We gave him some major opportunities and responsibilities in IBP," but relations between Franklin and Overton reached a "breaking point" over a dispute involving the sampling design for biomass on Watershed 10. Overton, Franklin observes, favored an innovative sampling model emphasizing statistical estimates, while Franklin himself preferred a "more traditional" sampling design emphasizing allometric relations. He admits Overton "really wanted to pioneer some new statistical ground" and that approach was "probably right" for a biomass estimate of Watershed 10, if that had been the sole purpose of the sampling design. Franklin argues, however, that he was concerned about the broader application of the sampling *results* while Overton was more concerned about the broader application of the sampling *design*. In Franklin's view, "This biomass sampling was going to be very expensive, we weren't going to do very much of it, and it had to be designed so as to be useful in many other places and in the future—even if it was less than perfect from a biometrician's view!"[16] Franklin wanted the work to generate results that accurately described the actual functioning of the ecosystem in ways that met the needs of forest managers. Presented with Franklin's ultimatum, Overton subsequently left the group. The episode demonstrated a hard-earned lesson for the group that Swanson summarizes with the phrase, "personality matters."[17]

Dennis Harr, a hydrologist who worked closely with Overton, recalls the statistician was "a very sharp and brutally frank systems person," and, he suggests, "Scott's brutal frankness … put him at odds with those in control of IBP." With Overton's departure, McKee argues, the Andrews group lost an opportunity to lead the way in one important arena of ecosystems research. Overton's later work in hierarchical modeling involved compartmentalized processes that operated at different timeframes, each providing input to the model at a higher level. At that higher level, the model could interrogate other models for input on specific conditions. In this way, models nested within other models could communicate with each other in an interactive system. That concept, McKee notes, was the basis for

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[16] Communication from Jerry Franklin 6 December 1999.

[17] Jerry F. Franklin, "Why a Coniferous Forest Biome?" In: *Proceedings—Research on Coniferous Forest Ecosystems—a Symposium*, 3-5; communication from Art McKee 7 December 1999; communication from Jerry Franklin 6 December 1999; communication from Fred Swanson 16 December 1998.

"a lot of high profile, hierarchical modeling work that came out in the mid eighties," and 20 years later, he concludes, the group revisited the approach and found it "conceptually very useful."[18]

Overton guided Henshaw's early involvement with modeling ecosystems and information management at the Andrews.

Overton's role in the Andrews group, like his hierarchical models, illustrates how complex systems function at various levels simultaneously. Despite the rift, Overton nonetheless played a critical role in recruiting Don Henshaw into the group, and he guided Henshaw's early involvement with modeling ecosystems and information management at the Andrews. Henshaw, who continued as a long-term associate of the group through the next three decades, recalls that when he first mentioned an interest in "doing something related to ecology" as a new student at OSU in 1974 he was "immediately" directed to Scott Overton, who became his major professor. He began working as a liaison between Overton and Boyd Wickman, Dick Mason, and other Forest Service people who were working on an insect population model, and he learned about the IBP through Overton's cooperative effort to develop hydrology models with Harr.[19]

Dennis Harr's experience of recruitment, priorities, and interactions at the Andrews Forest during the IBP and through the 1980s demonstrates some of the more pragmatic reasons why people joined or left the group in these years. Harr, a native of northwestern Washington, studied forest management at Washington State University from 1959 to 1963. He recalls the curriculum proceeded from the assumption that, "The simple objective of forestry was to convert the decadent, overmature, rotten old-growth to vigorous, fast growing new growth for the benefit of all." He secured a National Defense Fellowship to support his Ph.D. work in watershed management at Colorado State, and after serving a tour of duty in Vietnam with the Navy, he worked for 2 years at the Hanford Nuclear Reservation near Richland, Washington. Desperate to "escape the situation I was in at Hanford," Harr recalls, he applied for a soft-money position funded with a grant that George Brown (then a forest engineering professor and later the Dean of the College of Forestry at OSU) wrote under the broader umbrella of IBP funding at OSU in 1971. Harr recalls of that appointment, "It didn't fulfill some life-long dream."[20]

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[18] Communication from Dennis Harr 27 August 1998, 1; interview with Art McKee, 13-14.

[19] Interview with IBP group, 11.

[20] Communication from Dennis Harr 27 August 1998, 1.

Harr's work initially focused on subsurface hydrology of a forested slope on Watershed 10, but his recollections revolve around his experiences with people on that landscape. He worked most closely with Darrell Ranken, a graduate research assistant, and the time they spent together lugging equipment up and down the steep terrain on Watershed 10 left an indelible impression on Harr. He especially emphasizes the excitement of meeting people who later emerged as prominent scientists in a variety of different fields, all collaborating at the Andrews during the mid to late 1970s: he learned about spotted owls from Eric Forsman, old-growth forests from Jerry Franklin, canopy communities from Bill Denison, soil science from Ted Dyrness, nutrient cycling from Dick Fredriksen and Phil Sollins, and aquatic ecosystems from Jim Sedell.[21] It was a veritable smorgasbord of ideas and approaches to ecological systems.

Mobility from soft-money, postdoctoral appointment to a permanent, funded position and a leadership role in the group was possible, if not common, during the IBP. Harr, for example, quickly secured a permanent position with the Forest Service in 1973, when Rothacher's retirement left a vacancy at PNW Station. He "inherited all the watershed studies" from Rothacher about the time Swanson began his first geomorphologic study on soft-money funding at the Andrews Forest. Harr began to explore the relation between aquatic and terrestrial systems, and over the next 10 years, his studies focused on snowmelt in relation to watershed dynamics in western Oregon.[22] In 1983, he became project leader of the Forest Service scientists assigned to the watershed group at the Pacific Northwest Research Station (PNW), which by that time included Swanson, Fredriksen, Doug Swanston, and Duane Moore. That year, the watershed group decided to abandon studies at Fox Creek (in the Bull Run watershed near Portland, Oregon) and Coyote Creek so they could concentrate their energies at the Andrews Forest.[23]

Harr left the Andrews on good terms in 1988, when he transferred to a new position in PNW Station that required him to relocate to the University of Washington. There, he continued his snowmelt research through his retirement in 1994. He recalls with fondness his 15-year experience with the Andrews group: "I think a characteristic common to the Andrews Group is an outstanding, collective sense of humor. … Members of the Group have taken themselves very seriously

[21] Communication from Dennis Harr 27 August 1998, 3.

[22] Harr, R.D. Some Characteristics and Consequences of Snowmelt During Rainfall in Western Oregon. *Journal of Hydrology*. 53: 277-304.

[23] Communication from Dennis Harr 27 August 1998, 5-6.

over the years—and the success of the Andrews shows that—but they've also done it with a great sense of humor." He relates, for example, how Art McKee once stopped a "runaway" snowmobile by "risking life and limb" to direct it harmlessly into a clearcut area downslope from the road, observing, "This sounds more responsible than what really happened."[24]

Excellence in science was an expected, but not sufficient qualification for long-term involvement in that group. People had to be able to work together, and they had to be able to produce. A community spirit of collegial good humor emerged during the IBP and fostered a productive environment of collaborative exchange and mutual goodwill. That characteristic was, potentially, a powerful force that could support innovative science, and the Andrews group cultivated that community ethic throughout the 1970s. The group recruited, in a spirit of consensus, people to replace those who left, though McKee observes that, on occasion, Franklin "cleverly gave people the feeling we were coming to a consensus and … we would go to a decision that he had already made." In the process, he notes, "Sometimes a majority would be ignored, and, … that caused some heartburn and there were several people who left the group for that reason over the years."[25] The Andrews group of the 1970s and early 1980s was by no means utopian, but people in the group had begun to value a shared spirit of community.

Reference Stands and the Community Ideal of Long-Term Research

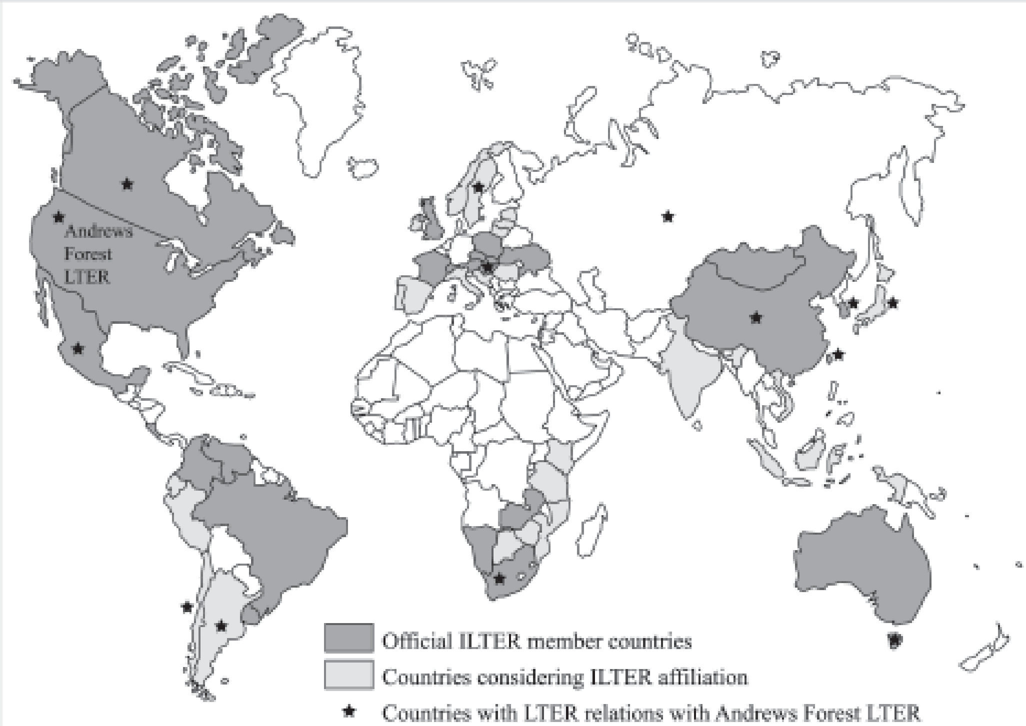
As people in the Andrews group developed close personal and professional ties with others in that science community, they were more willing to get involved in long-term research at the Andrews Forest, even without long-term funding. The group developed a network of permanent study plots on and around the Andrews Forest during the Coniferous Biome Project, when they designated specific "reference stands" slated for long-term measurement and monitoring efforts. The vegetation studies Franklin and Dyrness completed the previous decade provided the baseline data needed to identify and lay out 19 reference stands by 1972 (12 on the Andrews, 4 on adjacent drainages, 2 on Wildcat Mountain Research Natural Area, and another reference stand located 1 mile west of Blue River). Each site represented a different ecological community, including the spectrum of stand productivity, moisture variability, and other attributes associated with that community.

[24] Communication from Dennis Harr 27 August 1998, 5-6.

[25] Interview with Art McKee, 14.

Sidebar 4.1: International Exchanges and Cooperative Research

The Issue: Ecosystem science is a global enterprise because science is addressing global questions, basic scientific knowledge is potentially relevant to all ecosystems, and individual sites are part of the global biosphere. Individual scientists and institutions such as the National Science Foundation are committed to sharing information on both the process and the products of science. Similarly, groups working in research-management partnerships share commitments to information sharing. Much can be learned from cooperative and comparative studies across borders.



Countries presently or prospectively participating in the International Long Term Ecological Research (ILTER) network, and those linked with the Andrews Forest LTER program. Map adapted from LTER Network Office.

The Roots: Formal international linkages of Andrews Forest people and programs stem from participation in the International Biological Programme in the 1970s and designation in 1976 as a biosphere reserve under the United Nations Man and the Biosphere Programme. Participation in LTER beginning in 1980 and in its expanding network in International LTER (ILTER) interactions presents new and growing opportunities for international scientific exchange. Many of the international collaborations with the Andrews Forest group arise from the initiative of individual scientists, but Andrews scientists also participate in country-to-country exchanges of delegations of scientists and administrators.

The Approach: International exchanges take place in diverse, commonly ad hoc forms, such as consultations, exchange of visiting scholars and graduate students, and program reviews. Specific science projects involving the Andrews group are conducted in an international context, such as comparative studies of litter decomposition with Costa Rica and Mexico, carbon sequestration in forests with Russia, soil processes with Hungary, and hyporheic zone processes with Japan.

Results: Ecosystem science and management of forest and watershed resources are enterprises shared around the globe; exchange of views within and across borders is always beneficial. International exchange facilitates comparisons and collaborations across starkly different ecosystems and social systems. International networks include study sites representing environmental conditions that do not exist in the United States. The global aspects of the work grow along with global concern for climate change and sustainable development.

Data collected from the reference stands, which initially measured 164 by 164 feet each [later expanded to 328 by 328 feet], included species composition, density, biomass, leaf-area index, structure, and, through time, forest succession. The intent, Dyrness notes, was to initiate long-term measurements on the reference stands.[26]

The reference stands were a tangible accomplishment, but the group still needed to secure institutional support for long-term research at the Andrews Forest. Abrupt changes in administrative authority and management priorities thwarted most previous efforts to promote long-term research in the Lookout Creek drainage.[27] Those efforts were mostly obscure, internal battles waged by Forest Service employees directly involved with the Andrews Forest. Franklin's 2-year appointment as program officer with the NSF in Washington, DC, (in 1973), however, moved the venue for that struggle outside the Forest Service and linked it with a broader, global effort. Franklin mostly wanted to find a way to fund long-term research at the Andrews Forest, but toward that end, he energetically supported broader efforts to establish the Long Term Ecological Research (LTER) program at NSF. Franklin stresses that his colleagues at NSF designed the program to support "everybody" interested in long-term ecosystems research, but his own efforts to initiate that program "came out of a desire to have it here in the Northwest."[28]

Between 1973 and 1977, Franklin linked the Andrews Forest more closely with the long-term ecological research movement.

Between 1973 and 1977, Franklin linked the Andrews Forest more closely with the long-term ecological research movement at the United Nations and at the NSF. He chaired the U.S. component of United Nations Educational, Scientific, and Cultural Organization's (UNESCO's) Man and the Biosphere Committee on Project 8 (Conservation of Natural Areas and of the genetic material they contain), and he led the effort to identify natural areas that would represent the major biomes or biotic divisions in the United States in 1973 and 1974. Over the next 3 years, the U.S. Project 8 committee identified 27 sites, including the Andrews Forest, as biosphere reserves in the United States.

Its designation as a biosphere reserve linked the Andrews Forest with regional as well as international interests. The UNESCO committee that Franklin chaired selected, for each biotic province, a site representing an outstanding natural or conservation-oriented reserve (or "control" site). The committee then paired each

[26] Interview with Ted Dyrness, 16-17. Franklin recalls he was involved in establishing reference stand 2 in 1957, noting it was "a highly technical job;" Andrews group interview 22 September 1997, 41; Rakestraw, 138-139.

[27] Andrews group interview 22 September 1997, 32; interview with IBP group, 21.

[28] Interview with Jerry Franklin, 15-16.

Bill Emmingham

Figure 31—The Andrews group designated “reference stands” on the H.J. Andrews Experimental Forest during the 1970s as a network of permanent plots slated for long-term measurement and monitoring efforts. Here, Joe Means takes notes at RS 20 [HJA Reference Stand 20], Plot 2, on 23 August 1977.

of these natural reserves with the leading center for field research (or “experimental” site) in that province. Their intent was to encourage collaborative programs. They paired the Andrews Forest (experimental) site with the Three Sisters Wilderness (control) site, together representing the Sierra-Cascade (north) Biotic Province. Franklin, in his summary description of the Andrews Forest as a field research site worthy of this status, highlighted the extensive, long-term, “Forest Service studies of management practices on water yield and quality and ecosystem analyses” at the Andrews. He also cited, as part of this rationale, the Andrews previous designation as an intensive study site in the IBP.[29]

[29] Other biosphere reserves in the United States at that time included the Aleutian Islands National Wildlife Refuge, Big Bend National Park, Cascade Head Experimental Forest [currently managed by the same group that administers the Andrews Forest], *Central Plains Experiment Station, Channel Islands National Monument, Coram Experimental Forest, *Coweeta Experimental Forest, Desert Experimental Range, Everglades National Park, Fraser Experimental Forest, Glacier National Park, Great Smokey Mountains National Park, *Hubbard Brook Experimental Forest, *Jornada Experimental Range, Mount McKinley National Park, Noatak National Arctic Range, Olympic National Park, Organ Pipe Cactus National Monument, Pawnee National Grassland, Rocky Mountain National Park, San Dimas Experimental Forest, San Joaquin Experimental Range, Sequoia-Kings Canyon National Parks, Stanislaus Experimental Forest, Three Sisters Wilderness, and Yellowstone National Park. Sites marked with an asterisk (*) later were included in the LTER network. Jerry F. Franklin, “The Biosphere Reserve Program in the United States,” *Science* Volume 195 (21 January 1977), 262-267; Jerry F. Franklin, “The conceptual basis for selection of U.S. Biosphere Reserves and features of established areas” (typescript, LTER archives, Corvallis FSL, PNW Station, 1979). See http://www.lternet.edu/ for a updated profile of the network.

The Biosphere Reserve network linked the Andrews Forest and group with the Global Environmental Monitoring System of the United Nations Environment Programme (UNEP) Earthwatch network and committed them to a long-term research emphasis.[30] Franklin's Project 8 committee, he later observed, considered "long-term baseline studies of environmental and biologic features" necessary for effectively managing the biosphere reserve. The committee wanted to encourage research that would "assist in determining management policies for the reserve," and they also favored "experimental or manipulative studies" that explored the "ecological effects of human activities." In an article published in 1977, Franklin stressed the need to locate a source of funding sufficient to support baseline surveys, studies, and monitoring efforts in the biosphere reserves, and he urged "ecologically oriented scientists" to design studies that would make "more effective" use of those sites. The key, he suggested, was interagency planning and cooperation to ensure that the system of linked sites would be "managed and used as unitary biosphere reserves and not as isolated tracts."[31]

The move toward long-term ecological research also took place in the context of a shifting political and social environment in the United States during the 1960s and 1970s. The 1962 release of Rachel Carson's *Silent Spring* in the *New Yorker*[32] and the appearance of Paul Ehrlich's *The Population Bomb* in 1968 helped mobilize public opinion to support ecological initiatives and legislation. The Santa Barbara oil spill of 28 January 1969 further demonstrated that the price of a technology-dependent world might exceed the supposed benefits of engineering "fixes" to human problems. The spill, and its aftermath, also exposed the relatively toothless federal Clean Waters Act, approved less than 3 years earlier. Also in 1969, reports that the Cuyahoga River in Cleveland had caught fire and burned added an air of ridiculous insult to dismaying injury. Heavy concentrations of flammable industrial chemicals in the river spontaneously combusted, and an astonished public demanded government action.

Congress responded with a flood of legislation that changed the legal footing for environmental regulation, beginning with the National Environmental Policy Act in 1969. President Richard Nixon established the Environmental Protection Agency the following year, announcing in his February 1970 State of the Union message

[30] Interview with Jerry Franklin, 15.

[31] Franklin, "The Biosphere Reserve Program in the United States," 262-267.

[32] *Silent Spring* was later republished in book form, and has appeared in several editions, most recently the 25th anniversary edition (Boston: Houghton Mifflin Corporation, 1987). Opie, *Nature's Nation*, 414; Shabecoff, 100-148.

Al Levno, December 1980

Figure 32—An early pattern of long-term, continuous data collected in a consistent fashion was an established tradition by the time Roswell (Ross) Mersereau made these measurements of streamflow in Watershed 6 at a gaging station equipped with a 2-foot H-flume and the venerable Stevens A-35 recorder on which the group relied for consistent data comparable across multiple decades.

that the 1970s "absolutely must be the years when America pays its debt to the past by reclaiming the purity of its air, its waters and our living environment. It is literally now or never."[33] In the next 6 years Congress added The Federal Water Pollution Control Act (1972), the Endangered Species Act (1973), the Safe Drinking Water Act (1974), the Toxic Substances Control Act (1976), the Federal Land Management Act (1977), and the National Forest Management Act (NFMA) (1978).[34] These measures dramatically expanded the federal mandate to monitor and regulate the environmental impact of natural resource industries.

Ecological monitoring efforts also accelerated on a global scale from the late 1960s through the mid 1970s. The United Nations Educational, Scientific, and Cultural Organization sponsored the 1968 biosphere conference in Paris. Participants painted a grim picture of pollution, deforestation, and overgrazing, and they warned that natural resources would soon become critically scarce. They urged

[33] As quoted in Philip Shabecoff, *A Fierce Green Fire: The American Environmental Movement* (NY: Hill and Wang), 112. Opie, John, *Nature's Nation: an Environmental History of the United States* (Ft. Worth, TX: Harcourt Brace, 1998), 404-433, and Hal K. Rothman, *The Greening of a Nation? Environmentalism in the United States Since 1945* (NY: Harcourt Brace & Co., 1998), 101-128.

[34] Some other major pieces of federal legislation enacted during this decade include Shabecoff, 131-132.

the United Nations to sponsor environmental inventories, monitoring, and training worldwide, but that agency initially did not immediately support such efforts. Other, ongoing programs such as the IBP, however, continued ecological monitoring efforts (independent of the United Nation) through the early 1970s. Among other accomplishments, those efforts documented DDT contamination in Arctic fish and Antarctic penguins, and they dramatized the global character of ecosystem issues.[35]

Delegates at the 1972 United Nations conference on the human environment held in Stockholm formalized the global monitoring movement by authorizing the United Nations Environment Programme (UNEP). This new agency provided an institutional focus for the global ideal, if not reality, of integrated research. It rapidly gained influence after the IBP ended in 1974, despite an initially weak record of support in the United States. The UNEP, for example, established an Earthwatch network that included environmental data surveys and an international registration and referral system. One UNEP goal was to promote interdisciplinary and intersite cooperation through a global, information-sharing network. During the 2-year transitional period between the beginnings of the UNEP and the end of the IBP in 1974, Franklin joined other scientists at the National Science Foundation in building a U.S. component for that global effort. Their combined efforts built a network of LTER by the early 1980s.[36] Noel Brown, the North American director of UNEP, reflected in 1982 at the second United Nations conference on the environment in Nairobi, that, "In ten years, environmentalism has become a global value."[37]

Franklin joined other scientists at the National Science Foundation in building a network of LTER by the early 1980s.

Transitioning From IBP to the UNESCO Model of Collaborative, Intersite Monitoring

The Andrews group's experience with intersite collaboration, interdisciplinary cooperation, and long-term monitoring during the IBP helped them understand what it would take to sustain a focused program of long-term, collaborative research. Among other things, Denison notes, they learned that it required personal sacrifice and collegial interaction: "You had to have colleagues willing to come to the table with something to really make a commitment."[38] Diane Tracy, for example, walked

[35] Opie, *Nature's Nation*, 468, 480; Shabecoff, *A Fierce Green Fire*, 190-191, 198.

[36] *Nature's Nation*, 481; Shabecoff, *A Fierce Green Fire*, 191.

[37] Shabecoff, *A Fierce Green Fire*, 190-191.

[38] Interview with IBP group, 36.

into Denison's office one day during the early 1970s while she was still an undergraduate at OSU, and volunteered a way to help researchers study the question of whether lichens in the canopy were fixing significant amounts of nitrogen. Scientists were stymied by their need to obtain intact samples of lichens at that height. Tracy suggested that with modified rock-climbing techniques and equipment, she could ascend into the old-growth canopy and collect samples of lichens for researchers at the Andrews Forest. Denison agreed to try her suggestion, and Tracy followed through by assembling a volunteer crew of tree-climbers, mostly undergraduates. Their collaboration led to path-breaking research in the old-growth canopy at the Andrews Forest.[39]

The group's informality and community spirit modeled on a small scale the ideas that Franklin proposed in his 1977 article. Sedell, for example, recalls how Denison and his OSU colleague, George Carroll held "brown bag seminars" that led to impromptu, interdisciplinary discussions where participants enjoyed taking "any wild, hairbrained idea and tossing it around." One of the more remarkable seminars explored the relation between neurological networks, highway networks, tree-branch networks, and stream networks. Sedell, who notes, "I never did anything with that group other than [attending these informal seminars]," observes that he had had similar experiences at graduate seminars at the University of Pittsburgh, but his interactions with the Andrews group had an important difference: "This was the first time where you knew what you came up with, you could put down on paper and get funded to check [it] out or actually do something with what you had."[40]

Although the UNESCO model, in theory, required more structured, collaborative strategies and more conscious linkage of theory with managerial methods, the Andrews group moved in that direction for reasons more personal and local. Kerrick, whose involvement with the group spanned more than three decades, first as district ranger at Blue River, and later as forest supervisor of the Willamette National Forest, nudged the group in the direction of stronger interaction with forest managers when he recruited Steve Eubanks as district ranger at Blue River.[41]

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[39] Interview with IBP group, 15, 36.

[40] Interview with Jim Sedell by Max Geier on 14 February 1998 at Sedell's office in the FSL, Corvallis, OR, as transcribed by Keesje Hoekstra, 7-8.

[41] Interview with Al Levno, 8-9.

He also contributed a personal appreciation for the Andrews group from his wide-ranging experience as a forest manager in the far West. After his tenure as district ranger at Blue River ended in 1970, Kerrick had served as “the Timber staff” on the Six-Rivers National Forest in northern California and then as deputy forest supervisor for the Mount Hood National Forest. By the time he returned to the Willamette National Forest as forest supervisor in 1980, he recalls, the legacy of IBP and the heightened awareness of ecological issues during the previous decade had already improved the potential for closer relations between managers and scientists at Lookout Creek. He returned from the Southwestern United States with a new appreciation for those possibilities at the Andrews Forest.[42]

Apart from the designation as a biosphere reserve, the research infrastructure at the experimental forest included other efforts to link the Andrews with a regional network of designated research natural areas on national forest lands. This network of satellite sites broadened the venues for scientists sampling vegetation types and environmental conditions in the Pacific Northwest. Early in the IBP, Dyrness and Franklin had jointly prepared a descriptive summary of the natural vegetation in Oregon and Washington,[43] and they collaborated on the Research Natural Area Committee at PNW Station. That committee identified and designated potential research natural areas on Pacific Northwest Region forests and elsewhere in the Pacific Northwest, beginning in 1970. Research natural areas ranged from hundreds to thousands of acres of native ecosystems with minimal evidence of human manipulation since the time of recorded European contact with North America. These sites are restricted to nondestructive research. They were intended to provide future opportunities for research spanning the range of biological conditions in the United States.

Franklin and Dyrness, in collaboration with other scientists on that committee, produced a guide to research natural areas in the Pacific Northwest in 1972. Their intent was to inform scientists and educators about the sites and their potential for

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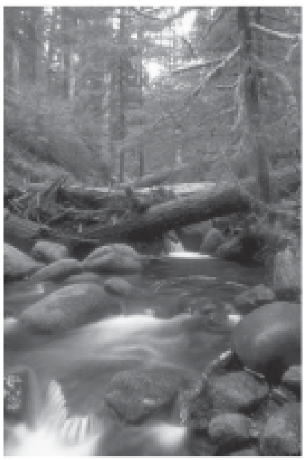
[42] Interview with Mike Kerrick, 22-23.

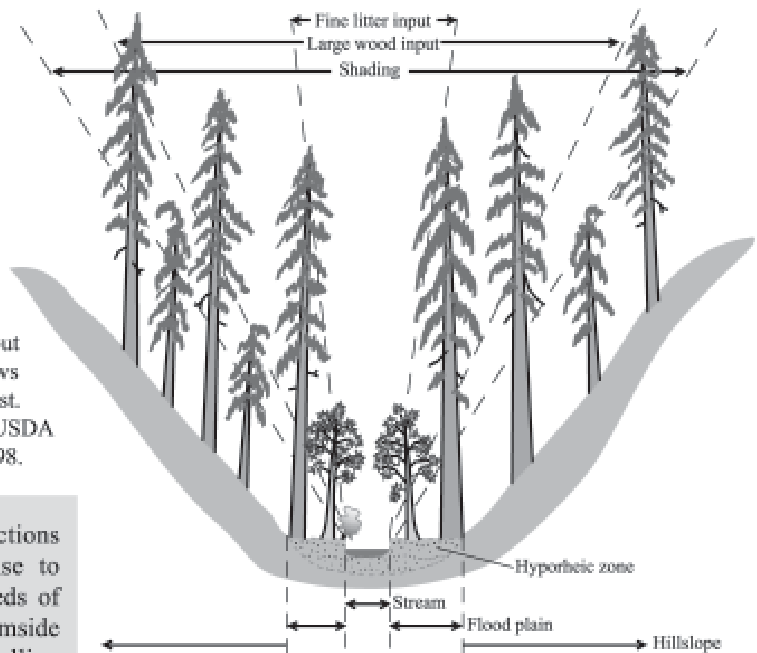
[43] Jerry F. Franklin and C.T. Dyrness, *Natural Vegetation of Oregon and Washington* (Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, Gen. Tech. Rep. PNW-8, 1973). Interview with Ted Dyrness 17 July 1995; communication from Ted Dyrness to Ken Wright 19 June 1995.

Sidebar 4.2: Forest-Stream Interactions

The Issue: From a stream ecologist's perspective, the stream has a life of its own, but the towering stature of Pacific Northwest conifer forests and rapid downslope movement of water and other materials strongly link forests and streams. The Andrews Forest group has focused studies on how forests affect streams through mechanisms like shading, which regulates the light supplying energy to fuel growth of aquatic plants and to warm stream water; input of forest litter, which is consumed by stream organisms; and the supply of large wood, which shapes stream habitat. This perspective of forest-stream interactions (Gregory et al. 1991) led to the idea of delineating zones of influence of individual processes of interaction and to the question of how the degree to which forest influences decrease with increasing distance away from the stream edge.



Left: Upper Lookout Creek, H.J. Andrews Experimental Forest. Photo: Al Levno, USDA Forest Service, 1998.



Above: Cross section of a small valley and riparian zone showing areas of forest-stream interactions. Adapted from Meehan et al. 1977.

The Roots: Individual forest-stream interactions have in the past been examined in response to scientific curiosity or specific information needs of policymakers and managers. Managing streamside vegetation was mainly motivated by controlling water temperature in the 1960s; gradually, more interactions were considered, especially viewing the riparian forest as the source of large wood for streams. For the Andrews group, the influence of forests on streams was starkly displayed in studies during the 1970s at Mack Creek, where an old-growth forest reach was compared with a recently clearcut section of stream. The stream ecologists, led by Jim Sedell, examined elements of the stream ecosystem that integrated multiple influences--light, temperature, litter availability, and habitat structure. This approach led to an ecosystem-scale perspective that has gradually expanded in the scope of interactions and the scale of stream network considered (e.g., Gregory et al. 1991, Swanson et al. 1982).

The Approach: The Andrews group has examined forest-stream interactions in both field (e.g., McDade et al. 1990) and modeling (such as Van Sickle and Gregory 1990) studies to determine the zone of forest influence on stream ecosystems. Studies of more complex interactions, such as water and nitrogen exchange between surface and ground waters, involved combining simulation modeling with field studies that use observational and chemical tracer techniques (Wondzell and Swanson 1996a,b). Collective influences were examined by comparing ecosystem properties in adjacent open- and closed-canopy stream reaches (Murphy and Hall 1981). A novel study using time-lapse photography along streams showed unexpected dynamics of the system, such as massive logs within a logjam bobbing up and down during a flood.

Results: Knowledge about the lateral extent and ecological significance of forest-stream interactions have had both practical and scientific importance for decades. Widths of riparian reserves in the Northwest Forest Plan are based in part on interpretations of the extent of forest-stream interactions of various types (USDA and USDI 1994). Ecosystem science continues to refine understanding of these interactions and efforts to scale up interpretations to full stream networks.

supporting research,[44] partly in an effort to counter critics who claimed that no one ever used the sites for research. As Dyrness recalls, "What we were facing, you see, was land managers [who] would say, 'gosh, you guys run around, set up these things, withdraw them from mineral entry and logging, and nobody ever goes to [use] them, that we can see."[45]

The Research Natural Area (RNA) committee, Franklin notes, faced difficult obstacles and intense criticism from all sides at the time: "They [were] asking us again and again, '… How many of these damn things do you need?!' And so, it became obvious, we needed to develop a comprehensive list." The PNW Station eventually published *Research Natural Area Needs in the Pacific Northwest*, by Dyrness and Franklin, et al. in 1975. That publication went far beyond a simple catalogue of existing sites. It built a template of "cells," each representing a specific ecosystem type in Washington and Oregon, and it stressed the need to expand the existing network to fill in the "gaps" where a given cell lacked a corresponding RNA. The report suggested guidelines for selecting future RNA sites and noted the need to address concerns relating to rare and endangered organisms and aquatic areas.

Tarrant suggests the success of the RNA effort surprised Station administrators.

Tarrant suggests the success of the RNA effort surprised Station administrators like himself. Speaking to a group of scientists involved in that effort who assembled one summer at Carpenter Lookout, Tarrant observed, "It's amazing how successful you were. You know there's not another network like it anywhere else in the nation that holds a candle. Other regions are beginning to come on-line, but what you accomplished over that short period is just astonishing." Franklin explains they moved with such urgency because "we realized, this landscape's being cut over real fast, and we'd better get with the program." Others in the agency, he observes, "were willing to encourage young folks like us to, 'Well, get out there. Run into brick walls.' [laughter]."[46]

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[44] Jerry F. Franklin, Frederick C. Hall, C.T. Dyrness, and Chris Maser, *Federal Research Natural Areas in Oregon and Washington: a guidebook for scientists and educators* (Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, 1972). C.T. Dyrness, Jerry F. Franklin, Chris Maser, Stanton A. Cook, James D. Hall, and Glenda Faxon, *Research Natural Area Needs in the Pacific Northwest: A contribution to land-use planning* (Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, Report on Natural Area Needs Workshop November 29—December 1, 1973, Wemme, OR, Gen. Tech. Rep. PNW-38, 1975).

[45] Interview with Ted Dyrness 17 July 1995.

[46] Andrews group interview 22 September 1997, 23; interview with Jerry Franklin, 8-9; C.T. Dyrness and others, *Research Natural Area needs in the Pacific Northwest* (Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Station, Gen. Tech. Rep. PNW-38, 1975), 235.

Administrative changes at PNW Station also encouraged scientists to rethink their priorities for the Andrews Forest. A new Station Director, Robert Buckman, reorganized PNW Station during a general restructuring of the Forest Service in 1974. Buckman placed the Station's 24 projects under the control of two assistant directors (including Robert Tarrant) and three program managers. Franklin credits Buckman with sparking his early concern about clearcut logging during a field excursion to a proposed RNA at Wildcat Mountain in the early 1970s. "That trip with Buckman," he notes, "first got me thinking about the negatives. People had started these clearcuts, and it took about a decade for the whole thing to bloom in my mind, but … I'm sure, today, he'd disown any responsibility for anything I've been involved in, subsequently."[47]

Buckman's indirect influence on research priorities at the Andrews Forest far exceeded his direct influence on Franklin. He was a strong supporter of research in the Forest Service hierarchy, and he was particularly influential in supporting Tarrant and PNW Station at the national level during a period when Tarrant directed researchers like Franklin at the Andrews. Before taking over from Briegleb as Station Director, Buckman served 10 years at the Forest Service research lab in Grand Rapids, Minnesota, and another 5 years in the Washington Office. He held graduate and undergraduate degrees in forestry, silviculture, and public administration from the University of Minnesota, University of Michigan, and Harvard.[48] His tenure at PNW Station was brief, but significant. One year after the 1974 reorganization, he transferred back to Washington, DC, where he served as Deputy Chief for Research over the next 11 years. Tarrant, who followed Buckman as Station Director, was a graduate of OSU and a soil scientist with 29 years of experience in the Research Branch of the Forest Service at the time he was appointed to head PNW Station. Tarrant previously worked at the Andrews Forest, where he pioneered research in the nitrogen-fixing characteristics of alder. His experience working there with other scientists, and his ties with Buckman, enhanced the group's standing with the Washington Office.[49] Together with their stronger inter-agency and international networks, this indirect network of support within the

[47] Andrews group interview 22 September 1997, 20.

[48] Interview with Robert Buckman by Max Geier, 13 July 1995, at Peavy Hall, Oregon State University, Corvallis, OR.

[49] *Forestry Research News* (Internal memo) 15 Aug 1975; Pacific Northwest Forest and Range Experiment Station, *Research Progress 1974* (Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, 1975), 1-3; 17; interview with Robert Buckman 13 July 1995; interview with Robert Tarrant 11 July 1995.

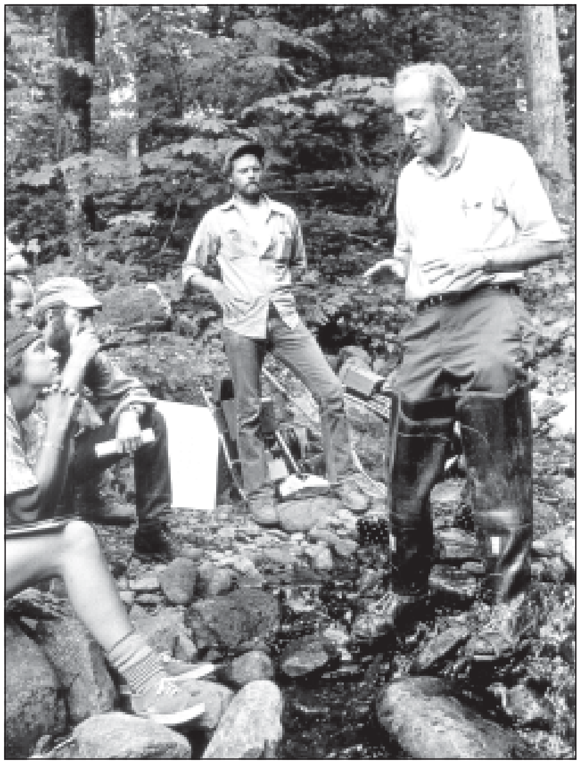
Rollie Geppert

Figure 33—The "Stream Team" brought aquatics science into the forefront of forest planning on the Willamette National Forest. Jim Hall, pictured here in 1979 speaking to a field group on a tour of Mack Creek worked with Norm Anderson, Stan Gregory, and Jim Sedell to build an aquatics program into the International Biological Programme, forming the basis for the emergence of a stream team that worked with Mike Kerrick's staff at the Willamette National Forest to develop new guidelines for managing coarse, woody debris.

Forest Service bolstered the group's confidence in their interactions with national forest managers and their science peers at a crucial point in the global development of long-term research networks.

The Stream Team and the Transition to Long-Term and Applied Research

The Andrews group easily adapted to the UNESCO model of research linked with management applications. One manifestation was the relevance of their studies of woody debris in streams as a pragmatic solution to an expensive problem on the Willamette National Forest. Prior to these studies, forest management guidelines required loggers to remove woody debris from streams on sale units, and that requirement increased the cost of cutting on those units. Research at the Andrews Forest, however, demonstrated that riparian ecosystems needed woody debris. Kerrick, as forest supervisor, quickly grasped the implications: "It was costing money to take all this stuff off the slopes. And the process of doing it wasn't making any money at all. And … we were spending big bucks. … [laughing] I mean, you could save a bundle, and make [ecologically] good decisions as a result of it. I mean, my God, what could be better?"[50]

The woody debris issue was the first time the Andrews group successfully translated a research finding into a major policy shift on the Willamette National Forest. Woody debris studies originated with the Andrews-centered stream group that worked with the lakes group at the University of Washington in the aquatic project of the Coniferous Biome. Oregon State University cooperators Norm Anderson and Jim Hall, along with Stan Gregory and Jim Sedell, formed the core of that group in the early 1970s. Anderson, a professor in the Entomology Department at OSU, together with Hall, of the Fisheries Department, and Rothacher, jointly convinced Franklin to include an aquatic project in the Coniferous Biome at the Andrews Forest, and they hired Sedell as a postdoc to help them get the project underway. Sedell was one of the new leaders who emerged when Franklin left the group in 1973, and his "stream team" gradually shifted the focus of water-related research from continuous hydrologic monitoring efforts to more broad-based, aquatic ecosystem and thematically broader research funded with grants from the NSF.[51]

The aquatics group developed a spirit of close-knit teamwork, personal commitment, and intersite cooperation to compensate for their initially marginal role and isolation from other groups of the Coniferous Biome. They ignored the institutional rivalries that sometimes divided the IBP leadership at OSU from their counterparts at the University of Washington. They rejected the notion that the aquatics program was peripheral to the central concerns of the Coniferous Biome, and their energetic efforts to prove that point made their unit a uniquely cohesive "collective" (in Sedell's words). That characteristic, and their breakthrough success with the woody debris studies, established the stream team as an effective model for the larger Andrews Group.[52]

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[50] Andrews group interview 22 September 1997, 36-37.

[51] Riparian group interview, 1, 6; interview with Jim Sedell, 3-4.

[52] Interview with Jim Sedell, 4; interview with IBP group, 3; communication from Fred Swanson 16 December 1998.

The interdisciplinary nature of the stream team and earlier studies of landslides and debris flows at the Andrews Forest led to their breakthrough insight on the woody debris issue. As the stream team struggled to understand how stream ecosystems worked, they focused on the storage and flux of carbon as a common denominator of ecosystems. Their studies of standing-crop carbon and the transport of carbon in stream ecosystems primarily focused on leaves and other organic debris, but Hank Froehlich, a professor of forest engineering at OSU, alerted them to an alternative. Froehlich was particularly interested in whether logging slash precipitated debris flows and landslides in small drainages, and he developed a method to measure the amount and siting of wood and slash in a stream after logging operations. Froehlich's forest management study coincided with the IBP aquatics effort at the Andrews Forest and inspired an innovative method for studying stream ecology.[53]

In an effort to determine what precipitated debris flows after logging, Froehlich theorized that in cases where logging operations left slash piled up in small streams, the water collected in ponds until, eventually, the stream broke out, producing a large debris flow. Realizing that he needed to distinguish between the slash left behind by loggers and the woody debris that was already in the stream prior to logging, Froehlich then applied the problem-solving methods of forest engineering to the question of woody debris in streams: he broke the question down into discrete components and then tackled each element as an independent problem.[54]

Froehlich applied the problemsolving methods of forest engineering to the question of woody debris in streams.

To determine how much logging slash from harvest activities in a particular drainage was deposited in the stream, Froehlich needed a method to determine the baseline amount of woody debris in the stream before logging. He independently devised a census technique to establish that baseline, but, Gregory observes, Froehlich was "still looking at it totally from a logging operation point of view." Froehlich's attempt to document the amount of wood already in streams alerted stream ecologists to the prevalence of woody debris and the need to study it. He also alerted scientists to the relation between the width of buffer-strips and their effectiveness in keeping logging slash out of streams. When Sedell learned of Froehlich's method, he invited the engineer out to the Andrews Forest to teach members of the stream team how to use the census method in areas that had not been logged. Froehlich demonstrated the technique in Mack Creek; shortly

[53] Interview with riparian group, 14.

[54] Riparian group interview, 14; communication from Fred Swanson 16 December 1998.

thereafter, the group started applying the technique in other streams. They sampled streams beyond the Andrews Forest in places as farflung as Washington, California, New Hampshire, Alaska, and Tennessee. Gregory recalls they discovered "a huge amount of wood in the streams. … any place there was an old forest we found a lot of wood." With their newfound ability to measure the amount of wood in streams, the stream team also began measuring the biological activity in that debris. The resulting research notably included OSU entomologist Norm Anderson's studies of insects associated with large wood.[55]

Scientists in the group found Froehlich's method useful for studying stream ecology in old-growth drainages, even though he intended it to solve a forest engineering problem on logged sites. That pattern of management concerns influencing research at the Andrews Forest was nothing new. During the IBP, however, it inspired a conceptual breakthrough that helped the group understand the ecology of old-growth forests. That research insight, Gregory observes, established the Andrews Forest as one of the first places where ecologists "recognized the importance of large wood." The group's conceptual breakthrough also inspired new policies for managing large woody debris in forest ecosystems.[56]

The stream team first adapted Froehlich's management-oriented techniques to their research needs at the Andrews, and then they tested their findings at other sites around the country. Sedell invited Froehlich to demonstrate his method of surveying the amount of wood in streams to members of the stream team at the Andrews, and then they applied his methods to their studies of carbon transport and storage in streams. In Gregory's words, they "found that there was a huge amount of wood in the streams." When they presented their findings at conferences and meetings, he notes, "people started saying 'Oh that's just an anomaly, that's just the Andrews, or that's just the Northwest. So we started going around to streams around the country." Wherever they went, the stream team found the same results: "Anyplace there was an old forest we found a lot of wood, and any place that there was not an old forest the wood amounts to about 10 percent of what's … in forested areas." As people in the Andrews group became more aware of

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[55] N.H. Anderson, J.R. Sedell, L.M. Roberts, F.J. Triska, "The role of aquatic invertebrates in processing of wood debris in coniferous forest streams," *The American Midland Naturalist* 100 (1978), 64-82; interview with Gregory, 5-6; communication from Fred Swanson 2 January 1999; interview with riparian group, 14-15.

[56] Interview with Stan Gregory, 5-6.

wood in streams, they also became more aware of woody debris on the forest floor, and their studies of woody debris linked terrestrial and aquatic research at the Andrews Forest.[57]

The woody debris studies led the group from studies of stream ecosystems into involvement with land management planning. Gregory observes that it "suddenly became an issue in how you manage the stream-side zone, not just [for] shade." Previous management concerns primarily emphasized the need to anchor the banks and provide shade for fish. As Gregory explains, "If you could provide bank stability and shade, [management activity] … wasn't an issue. But, suddenly this [concern for supply of woody debris] … pushed back riparian management quite a ways up the slope."[58] Franklin also argues that the woody debris finding was a turning point in establishing the reputation of the Andrews as a site for productive, applied science, and he suggests it gave scientists associated with the Andrews some leverage with the Forest Supervisor's office at the Willamette National Forest: "In a matter of two or three years … there were some [major] turnarounds."[59]

The woody debris studies stimulated long-term thinking that branched into other arenas of research, notably including the role of logs in forest ecosystems. Sedell recalls, "We used to not think about logs as anything [significant] until we did a carbon budget and found out that all this wood … was the total dominant." In the short term, he argues, leaves were the "energetic driver" in a forest ecosystem, but compared with logs, leaves were a "minor league part of the [total] organic story." The overall volume of wood was so dominant that even if the ecosystem processed only a very small fraction of that wood, it would still be a "huge contribution" to the overall energy budget for the system. Large woody debris, Sedell observes, went from being "something that we cursed when we tripped over it as we went to gather our leaf packs or do our sampling" to an asset that the Group recognized as "something really unique and … worthy of study in itself."[60]

District Ranger Steve Eubanks worked closely with the Andrews group on the woody debris issue, testing their ideas on the Blue River Ranger District, and that relationship spilled over into other projects. Franklin, who was rethinking the concept of forest fragmentation at the time, theorized that dispersed-patch clearcutting

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[57] Interview with Stan Gregory, 5-6.

[58] Riparian group interview, 15-16.

[59] Interview with Jerry Franklin, 23.

[60] Interview with Jim Sedell, 13.

would minimize problems associated with forest fragmentation. When Franklin explained his ideas, Eubanks quickly implemented them on the district, and the scientist was able to see the management implications of his ideas in practice. The enthusiasm with which Eubanks responded to research ideas helped scientists in the Andrews group realize the potential benefits of working with people who could translate theory into policy on a large scale. That feedback, Franklin notes, was "very useful," but sometimes their ideas moved from conceptual theory to practical application before they fully analyzed the full implications of what they were doing.[61]

Social Cohesion and Awareness of Community

The stream team's studies of forest-stream interactions provided a focal point for community involvement that went beyond mere working relations. People in the group remember, for example, how Dennis Harr kept them entertained with his 12-string guitar after long, weary days in the field on Watershed 10. Sedell notes there was a lot of "informal sharing" among group members, and he credits Stan Gregory's sense of humor, his "mouthiness," and his "real sense of corporate responsibility" for nurturing the "real openness" that keyed the stream team's success.[62]

The team also capitalized on the camp-town mentality of making do with minimal facilities at the Andrews. In keeping with that "roughing-it" mentality, team members, their families, and other volunteers staffed a storm watch that far exceeded the normal call of duty for scientific field work and tested the commitment of the participants. To measure organic debris movement during the fall storm season, the group ran Watershed 10 through a net to capture all of the particles that flowed out the watershed. During storms, the net filled rapidly with debris and had to be cleared or it would be swept away. Gregory recalls, "everyone on the stream project—and daughters—were assigned weekends that they were responsible.[63] In one case, a storm came through shortly after Thanksgiving. Sedell spent almost the entire month of December on the storm watch, even though he and his wife had just had a new baby. Gregory recalls telling him, 'Jim, you got to at least go buy some Christmas presents for your family." When Sedell refused to leave,

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[61] Andrews group interview 22 September 1997, 37; communication from Fred Swanson 16 December 1998.

[62] Interview with Jim Sedell, 5.

[63] Riparian group interview, 2.

Gregory recalls, "Vicki and I went up, we decided to spend Christmas up there tending the net and to be with Jim and help him out, and … on the night before Christmas Eve, suddenly it opened up and we saw the stars for the first time in weeks, and he was able to get down to Christmas Eve with his family."[64]

The storm watch had a short lifespan compared with many other activities at the Andrews, but it had long-term implications for those involved. Many who shared that experience were still close associates more than 20 years later. The sheer physical and mental strain of the storm watch, however, eventually eroded support for the duty, especially after logging began on Watershed 10 in 1975. The group ended the practice that year, but the storm watch survived as a shared memory of people who demonstrated personal commitment to their colleagues and their work at the Andrews Forest. The cooperative effort served its immediate purpose, and it yielded unanticipated benefits.[65]

The Andrews group with other, planned events intended to simulate the bonding experience of the storm watch, a field excursion later identified as a "pulse."

The Andrews group experimented with other, planned events intended to simulate the bonding experience of the storm watch. When Franklin returned to the Andrews from NSF, he realized that "… the group was becoming bigger—35, 40, 45 people involved—a lot of them didn't know each other." He organized a field excursion that the Andrews group later identified as a "pulse." The idea was to take the group away from their ordinary surroundings and get them out in a setting where they had to live with each other for a couple of weeks of intensive field-work. Dyrness recalls he accompanied Franklin, McKee, and Bob Woodmansee, of Colorado State University, on a minipulse to Steamboat Mountain Research Natural Area, where Franklin wanted to establish permanent plots in 1973. All four of them packed into one carryall, lived in tents in a campground, and ate meals in the mess hall at Trout Lake Ranger Station. McKee recalls a similar event in 1976 near Waldo Lake. The first event that Franklin describes as a pulse, however, was a 2-week-long excursion he organized in 1978 to the South Fork of the Hoh River in Olympic National Park. The primary purpose of this team-building exercise, he notes, was to "go out and suffer together" (it rained most of the 2 weeks and the camp, located on a Hoh River gravel bar, partially flooded).[66]

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[64] Riparian group interview, 3.

[65] Riparian group interview, 3.

[66] Interview with Jerry Franklin, 25; interview with Ted Dyrness, 24-25; communication from Art McKee November 1998; communication from Ted Dyrness December 1998; communication from Fred Swanson September 2003.

Figure 34—The stream team's collaborative spirit was a personal as well as professional commitment, as evident in this view of Aquatic Researchers at French Pete Creek in 1987: (from left) Al Steinman, Linda Ashkenas, Randy Wildman, Kelly Moore, and Stan Gregory.

Community Ideals and Forest Policy in the Late 1970s

The successful transfer of theory into practice in getting woody debris in streams included as a management goal helped overcome any misgivings that scientists may have carried over from previous, more antagonistic interactions with Forest Service managers. By the late 1970s, despite the spartan research facilities supporting their work, scientists associated with the Andrews had assumed a more independent, consulting role in their relations with district rangers and forest supervisors. Forest managers themselves confronted increasingly complex expectations and congressional mandates. The coincident involvement of the group with local, regional, national, and international networks of ecosystems research created a more authoritative, autonomous, and cooperative context for interactions between managers and researchers at Blue River. The emerging self-confidence and self-awareness of this scientific community paralleled changes in public-policy and management priorities for the experimental forest and for the surrounding districts of the Willamette National Forest. Intellectual curiosity, an eagerness to test elegant theory against the harsh reality of field conditions, and an interest in finding ways to mitigate ecological problems encouraged these scientists to work more closely with forest managers. Those managers, meanwhile, sought practical solutions to the disputes that resulted when public values changed more rapidly than forest policy. The NFMA of 1976 reinforced these general tendencies with a Congressional mandate that pushed scientists and forest managers into more cooperation.

President Gerald Ford signed the NFMA into law in October 1976 as a measure intended to resolve a long struggle in the courts and in Congress against an accelerated pattern of timber sales on national forest lands. A ruling by the Court of Appeals for the Fourth Circuit in the 1975 *Monongahela* case established a precedent that temporarily halted clearcutting in the national forests. Senator Hubert Humphrey's subsequent bill, the NFMA, specifically authorized clearcutting, but it directed the Forest Service to develop detailed land and resource management plans in consultation with a committee of scientists, to be appointed by the Secretary of Agriculture. The Committee of Scientists met 18 times between 1976 and 1979, culminating in revised NFMA regulations by 1982. The law imposed a ceiling on timber sales allowed each year, it required the Forest Service to initiate regional and local planning programs, and it required the Forest Service to complete new management plans by 1985. The agency subsequently established interdisciplinary teams to prepare management plans for each national forest.[67]

The NFMA mandate for long-term, science-based, region-wide, forest planning resulted in a flurry of activity among the various national forest staffs to comply with the new law. The NFMA's more restrictive definition of sustained yield ("nondeclining even-flow," meaning timber output and other forest values must be sustainable in perpetuity, without decline) effectively broadened the range of considerations included in planning.[68] The NFMA was implemented between 1976 and 1983, just as the Andrews group transitioned from the end of the IBP to the beginning of the LTER. By the mid 1980s, the group was more secure, with independent funding from NSF to supplement their ongoing support from the Forest Service. The process of securing that status, however, was anything but linear or final. It was the result of continuing and convoluted efforts to hold together a nucleus of scientists jointly engaged in cooperative, interdisciplinary, long-term research through a period of uncertain experimental grants of limited duration and dubious precedent. By the early 1980s, group leaders had managed to turn an impending crisis in funding into an opportunistic experiment in long-term research, and the Andrews emerged as a flagship program of a fledgling network of research sites supported with NSF funds as a LTER.

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[67] Charles F. Wilkinson and H. Michael Anderson, *"Land and Resource Planning in the National Forests"* (Washington, DC: Island Press, 1987, 15-45).

[68] Critics of the act observe, however, that the NFMA contained "…loopholes large enough to drive logging trucks through…" Hirt, *Conspiracy of optimism*, 262-264.

Building an Autonomous Subculture With Interagency Support

The Andrews group broadened its base of support during the 1970s to include three major legs of support: the Forest Service, OSU, and the NSF. As late as 1972, the Forest Service annually funded 14 of 19 major research projects at the Andrews for a total of $100,000. Those funds supported six agency scientists, their research assistants, and their staff. Aside from this direct funding for specific research projects both the PNW Station and the university provided basic infrastructure and support for the Andrews group in the form of permanent staff (including scientists, technicians, and faculty), office and lab facilities in Corvallis, and other tangible and intangible support, not least of which was the way in which the university provided an administrative structure for processing the grant and routing it through the budgeting system to cover expenses and salaries. The Andrews group also drew support from the broader research community that the university and the Forest Service lab attracted to that city, including formal and informal consultations, meeting venues and other networking opportunities. The concentration in Corvallis of those university and agency resources was a tangible asset that scientists could cite in their efforts to secure NSF funds through the competitive grants process. The 1974 proposal to NSF for funding in 1975-76, for example, included 69 "subproject" proposals with 139 cooperating scientists at the various sites of the Biome. Local scientists clearly benefited from working in the surroundings of an NSF oriented culture that encouraged and mentored broader participation and involvement in these funding opportunities.[69]

By the late 1970s, this third leg of funding (NSF programs) was at once the most important and the most tenuous. Through the competitive grants process, the NSF funded programs at the Andrews Forest at an annual amount of $569,000 by 1975. As principal investigator of record, Waring channeled these funds through OSU, but the program under which the NSF offered these funding opportunities was scheduled to end in 1977. Additional NSF grants in the annual amount of approximately $247,400 supported studies (variously scheduled to end in 1977 or 1978) of canopy subsystems, the incidence and significance of coniferous needle and twig endophytes, and the structure and function of aquatic ecosystems (the River Continuum project) at the Andrews Forest. During the same period, Forest Service funding included $10,000 from the Pacific Northwest Region for a study

[69] Coniferous Biome ecosystem analysis International Biological Programme proposal for 1973 and 1974 [prepared in 1972], 5.1-5.8; Coniferous Biome ecosystem analysis International Biological Program proposal for 1975 and 1976 [prepared in 1974], 6.1-6.7.

McKee worked with Franklin to produce a proposal for an NSF grant to support the Andrews Forest as a National Experimental Ecological Reserve.

of northern spotted owl ecology, and $115,000 from PNW Station to fund studies of forest watershed management, the ecology and successional patterns in natural stands and disturbed habitats of mixed-conifer forests, community-environment relations in mixed-conifer forests, intensive culture of Douglas-fir, and genetic variation in Northwest trees.[70]

Before 1975, the NSF funded research proposals only up to 3 years, but Franklin and other national science leaders wanted to extend that funding over a longer period. He and several associates at NSF cultivated support for the idea in that agency by promoting the concept of "centers of excellence" as a mechanism for funding place-specific programs to benefit sites that had flourished during the IBP. Scientists at the Andrews Forest had compiled continuous records of monitoring efforts spanning more than two decades before 1975, and those baseline data, along with other ongoing research at the Andrews Forest, Franklin argued, were compelling reasons for converting NSF funding for the IBP into an ongoing program of support for long-term research.[71]

McKee worked closely with Franklin to draft a proposal they both hoped would be the prototype for a broader network of National Field Research Facilities independently funded with long-term grants from the NSF.[72] McKee's effort produced an initial, 16-page, draft proposal for an NSF grant to support the Andrews Forest as a National Experimental Ecological Reserve. Franklin circulated the proposal to six of his colleagues at PNW Station, OSU, and at the Blue River Ranger District in December 1975. Franklin's cover letter solicited their input on the draft, inviting a three-way dialogue among scientists and managers directly involved with the Andrews Forest. He addressed carbon copies of the memo and the attached proposal to an additional 24 colleagues from all three groups, and he invited "other interested parties" to attend a meeting in the conference room of PNW Station's forestry sciences laboratory in Corvallis on December 22. As a leading agenda item for that meeting, he stressed the need to carefully define the administrative responsibilities and limits of authority implied in channeling the money through OSU.[73]

[70] "Current research [1975-6]" (unpublished typescript, NSF Proposal for Support File, 4060 Research Facilities Folder, Publications Room, FSL, Corvallis, OR).

[71] Interview with Jerry Franklin, 16-17; interview with IBP group, 31.

[72] Interview with Art McKee, 15.

[73] Memo (8 December 1975) from Jerry F. Franklin to William Ferrell, James Sedell, Thomas Moore, George Carroll, Robert Burns, Dick Fredriksen (4060 Research Facilities Folder, Publications Room, FSL, Corvallis, OR).

McKee structured the proposal in response to the formal request for proposals from the NSF (NSF 75-32) conforming to the National Science Foundation Biological Research Resources Program: Support of Field Research Facilities. The Andrews group formally designated this effort as the Field Research Facilities program in correspondence with the NSF, but commonly referred to it as "the experimental ecological reserve program" in internal documents, and they commonly refer to this 1975-76 proposal as "the facilities grant" or the "bridge grant." The proposal identified as outstanding attributes of the site its long-term control by a research organization, its representation of important and widespread forest ecosystems of the Pacific Northwest, its "pristine" and "virgin state," its extensive stands of mature and old-growth forests, its large size and suitability for large-scale experimenting and control, its diversity of represented ecosystems, its legacy data from past research and inventories of physical and biological features, and its physical improvements and field sampling installations.[74]

The facilities grant outlined a 3-year budget totaling $443,000, with a starting date of 1 June 1976, and it listed Waring (OSU) and Logan Norris (PNW Station) as co-principal investigators responsible for administering funds channeled from NSF through OSU. Forest Service "ownership" of the site was one complicating factor for a proposal that implied OSU ownership of facilities improvements funded with a federal grant channeled through that institution. The preliminary budget targeted improving the database and services for scientists at the Andrews, including additional trailers for working and living space. Franklin's cover letter also highlighted the need to fund at least two full-time positions: a site manager and a technician.[75]

The NSF guidelines for the facilities grant forced leaders of the Andrews group to develop a new agreement clarifying administrative responsibilities at the experimental forest. Previous memorandums of understanding had clarified the boundaries of responsibility for PNW Station and the Willamette National Forest. The Facilities Grant, however, complicated matters. It included soliciting funds from a third party (NSF), then channeling those resources through a fourth party (OSU), which would formally authorize distribution of those monies for expenditures to

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[74] National Science Foundation Biological Research Resources Program, *Support of Field Research Facilities* (Washington, DC: National Science Foundation, NSF 75-32); "Outstanding Attributes of the Site, [1975/6]" (H.J. Andrews Experimental Ecological Reserve Proposal, 4060 Research Facilities Folder, Publications Room, FSL, Corvallis, OR).

[75] "Possible budget for NSF proposal for support of H.J. Andrews as National Experimental Ecological Reserve [1975-6]" (H.J. Andrews Experimental Ecological Reserve Proposal, 4060 Research Facilities Folder, Publications Room, FSL, Corvallis, OR).

update the physical infrastructure of federal property under the jurisdiction of the Forest Service and jointly administered by the Research Branch (PNW Station) and the National Forest System (Willamette National Forest). This convoluted structure hinged on a self-appointed, interagency, advisory group of scientists and forest managers directly involved with the Andrews Forest, and it erected a tangle of potentially overlapping zones of legal responsibility. This arrangement with the NSF implied the two branches of the Forest Service and the university had made a long-term commitment to support the programs linked with the facilities funded under this grant. The group, however, never fully defined the boundaries of legal responsibility for all of the parties, thus avoiding the risk that turf wars among agencies and among scientists might block the proposal.

The site-centered Facilities Grant stretched the precedent of program-centered cooperative agreements between OSU and PNW Station during the Coniferous Biome. Those earlier arrangements covered specific research efforts with no guarantee of continued support after the program ended. The NSF funded the Facilities Grant, however, as an effort to support an open-ended commitment to long-term research.[76] To protect the autonomy of the Andrews group, Franklin and Waring negotiated a series of limited agreements between OSU and the Forest Service that clarified some limits of bureaucratic authority. Station Director Tarrant facilitated their efforts. Together, they negotiated a three-cornered set of agreements including OSU and regional representatives for both branches of the Forest Service (PNW Station and the Willamette National Forest). Those agreements, which spanned 1976 through 1980, reaffirmed previous agreements that withdrew the Andrews from allowable-cut calculations on the Willamette National Forest. In the process, the group secured university funding for McKee's position as site manager.[77]

The group negotiated separately with NSF to meet program requirements for specific agreements defining the responsibilities of all parties at the Andrews Forest. Scientists participating in that effort struggled to define the limits of bureaucratic authority and responsibility without surrendering control or forfeiting the opportunity to secure NSF funding. Two participating scientists (Kermit Cromack and Waring) met in March 1976 with William Sievers, who represented the NSF

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[76] Communication from Art McKee December 1998. Interview with IBP group, 10.

[77] Interview with Dick Waring, 6-7.

Biology Research Resources Program, to discuss the Facilities Grant and the respective commitments of OSU and the Forest Service. Waring referred Sievers to the PNW Station Director (Tarrant) or the Deputy Chief for Research (Buckman) for confirmation of Forest Service intentions to continue the scientific dedication of the site. He also stressed the size of that agency's annual investment at the Andrews Forest, citing the "draft supplement to the Master Memorandum of Understanding between OSU and the FS [PNW] Station" as evidence of their intentions. At the time, that draft supplement was completely devoid of signatures, but Waring confidently conveyed to Sievers his expectation that small detail would be resolved "by the time you arrive in July."[78]

The three-page draft document to which Waring referred was circulated barely 2 weeks earlier to Dick Fredriksen, Logan Norris, Art McKee, Bob Romancier, and Dick Waring with a marginal notation by "Lucy F." indicating it was merely "an idea draft" seeking input and suggestions on a draft document of ideas that Lucy F. considered "vague enuf to fly in both institutions [PNW Station and OSU]".[79] Even this document did not formally coordinate the three-way division of authority among OSU, PNW Station, and Willamette National Forest. Instead, separate agreements (memorandums of understanding) were approved between PNW Station and Willamette National Forest on 21 December 1976,[80] and between PNW Station and OSU on 7 June 1977.[81] Despite Waring's assurances that any loose ends would be tied up by July 1976, and despite repeated pleadings from Franklin to the Station and the university, moreover, loose threads pertaining to this agreement hung in the air until 22 February 1980. On that date, the OSU Business Affairs Office forwarded a finalized memorandum of understanding to Franklin

[78] "Letter 30 April 1976 from R.H. Waring, Deputy Director Coniferous Forest Biome, Oregon State University Department of Forest Management, to William Sievers, Biology Research Resources Program, National Science Foundation," H.J. Andrews Memorandum of Understanding Folder, H.J. Andrews Files, File Box F, Storage Vault, FSL, Corvallis, OR.

[79] "Idea Draft (16 Apr 1976) USFS PNW - OSU Supplement to Master Memo of Understanding," H.J. Andrews Memorandum of Understanding Folder, H.J. Andrews Files, File Box F, Storage Vault, FSL, Corvallis, OR.

[80] "Memorandum of understanding 21 December 1976 Between Willamette National Forest and PNW re H.J. Andrews Experimental Forest, Robert F. Tarrant to Forest Supervisor, Willamette National Forest, " Master Memorandum of Understanding Folder, H.J. Andrews Files, File Box D, Storage Vault, FSL, Corvallis, OR.

[81] "Letter 7 June 1977 from R.M. Kallender, Assistant Director, Forest Research Laboratory, to Charles J. Petersen, Assistant Director, Pacific Northwest Forest and Range Experiment Station," Master Memorandum of Understanding Folder, H.J. Andrews Files, File Box D, Storage Vault, FSL, Corvallis, OR.

The structure linking the NSF, PNW Station, OSU, and the Willamette National Forest with a scientist-administered program was difficult to explain.

detailing the interagency agreement to jointly administer the Andrews.[82] Until that 1980 memo, however, the Andrews group autonomously coordinated NSF funding, site administration, and research from 1976 through 1980 on little more than a handshake agreement not to inquire too closely into the matter.

The structure of support linking the NSF, PNW Station, OSU, and the Willamette National Forest with a scientist-administered program was difficult to explain to people outside the group. Franklin recalls that visitors to the Andrews Forest often asked, "How the hell does this work? You got all these university people down here on the Andrews and they're calling a lot of the shots. And, you know, you're a Forest Service employee and you're spending National Science Foundation [funds]? And how the hell does this stuff work?" His common response was, "You know, we just do it." Franklin theorizes the structure mostly worked because, initially, OSU, PNW Station, and the Willamette National Forest "probably didn't have us far enough up on their radar screen to cause them to really think that much about it." That began to change during the 1980s, as the capital invested in programs at the Andrews Forest began to attract more attention, but Franklin notes, "some stuff never has gotten down on paper." Unusual features of the agreement, he observes, include a university employee (McKee) who wields authority over a university facility on Forest Service property with no clear agreement on "who cleans up the mess when the party's over." Since that time, the NSF has tightened its funding guidelines, with the result, as Franklin concedes, that many of the proposals for which the Andrews group secured funding in previous years, likely would not have been funded if current rules had been in force at that time.[83]

The facilities grant funded the group's plans to designate an experimental ecological reserve (EER) on the Andrews Forest. The new EER included 23,588 acres of lands in and around the experimental forest and linked them with the

[82] "Memorandum of understanding 22 Feb 1980 to J.F. from OSU Business Affairs Office," H.J. Andrews Files, File Box D, Storage Vault, FSL, Corvallis, OR.

[83] Interview with Jerry Franklin, 19; interview with IBP group, 30-31.

97,600 acres of the Three Sisters Wilderness.[84] This structure of an experimental area paired with a wilderness control area resembled the biosphere reserve concept Franklin helped develop earlier in that same decade. McKee and Franklin expected the NSF would adopt the EER as a prototype for a more permanent and far-flung program funding long-term ecological reserves across the country within the next 5 or 6 years. They envisioned a structure of interagency funding tied to place-centered monitoring, and site-specific research, all geared toward long-term studies with short-term productivity. The NSF, however, actively discouraged the Andrews group from referring to their site as an EER, preferring instead the formal designation of the place as a National Field Research Facility.[85]

The Andrews group worked to coordinate their work at the experimental forest with other sites, in an effort to convert the facilities grant into a more secure, long-term structure of support from the NSF. Between 1977 and 1980, the group's small-but-expanding circle of alumni and associates sent delegates to a series of conferences and workshops. These conferences were precursors to the NSF's request for proposals for a LTER program.[86] Ken Cummins (OSU Department of Fisheries and Wildlife) and Franklin, for example, attended the Long-Term Ecological Measurements Conference at Woods Hole, Massachusetts, in March 1977. Conference participants generated an NSF report that addressed the feasibility of long-term ecological measurements and recommended measurement priorities for terrestrial, freshwater, and marine ecosystems. The next year, Waring, McKee, and Carl Berntsen (then with the Washington Office of the Forest Service) joined Cummins (who subsequently moved from the W.K. Kellogg Biological Station at Michigan State University to OSU) as participant and observers at a second conference at Woods Hole. Conferees at that February 1978 meeting considered what

[84] In addition to the 14,943 acres in the Andrews itself, this total includes the Wildcat Mountain Research Natural Area, Olallie Ridge Research Natural Area, Gold Lake Bog Research Natural Area, Middle Santiam Research Natural Area, and two areas described in the proposal as the "Mountain Hemlock Research Natural Area," and the "Second-Growth-Douglas-Fir Research Natural Area," as well as the "Chemsheds" (watersheds 9 and 10) near the experimental forest. "Land Allocation for H.J. Andrews Experimental Ecological Reserve Proposal [1975/6]," 4060 Research Facilities Folder, Publications Room, FSL, Corvallis, OR.

[85] Interview with Art McKee by Max Geier on 12 September 1996 in the Corvallis FSL. Interview transcribed by Jeff Fourier, 15. The Institute of Ecology, *Experimental Ecological Reserves: a Proposed National Network* (Washington, DC: National Science Foundation, June 1977), 41.

[86] Interview with Art McKee, 15.

would be needed to operate a program of long-term measurements in ecology. The next year, at a June workshop at the Institute of Ecology in Indianapolis, Indiana, Waring and 39 other participants exchanged insights from previous long-term studies in different agencies. That workshop developed the structure for a new, continuing LTER program. As a culmination to this series of meetings, the Institute of Ecology issued a final report to the NSF in November 1979, and circulated it to all participants.[87]

The LTER program went from initial conceptualization to operative reality in a remarkably short time. The NSF issued the request for proposals for the first LTER in late 1979, and applications for the first round of LTER funding were due back at the agency by March 1980. The Andrews group responded by proposing, among other ideas, a study of log decomposition slated to continue for 200 years.[88] Ongoing EER funding at the Andrews Forest from 1977 through 1983 overlapped with the LTER, beginning in 1980, and that overlap complicated the group's initial proposal. The NSF renewed the initial, 3-year facilities grant for another 36 months, beginning in March 1980, for a 3-year total of $683,798, ending in 1983. These funds, averaging a little over $200,000 per year, included support for significant expansion of facilities at the headquarters site, including the purchase and conversion of additional trailers that housed a laboratory, cafeteria, and sleeping quarters. By comparison with the funds that NSF provided for the facilities grant, the agency provided about $500,000 per year for LTER sites. The NSF, therefore, approved the first LTER grant to the Andrews group with lower funding so that the combined funds from the LTER and the facilities grant totaled about $500,000. After 1983, when the facilities grant ended, the NSF boosted annual LTER funding to the

[87] National Science Foundation Directorate for Biological, Behavioral, and Social Sciences, Division of Environmental Biology, *Long-term ecological measurements: report of a conference, Woods Hole, Massachusetts, March 16-18, 1977* (Washington, DC: National Science Foundation, 1977), 26; National Science Foundation Directorate for Biological, Behavioral, and Social Sciences, Division of Environmental Biology, Biological Resources Program, *A pilot program for long-term observation and study of ecosystems in the United States: report of a second conference on long-term ecological measurements, Woods Hole, Massachusetts, February 6-10, 1978* (Washington, DC: National Science Foundation, 1978), 45; The Institute of Ecology, *Long-Term Ecological Research: Concept Statement and Measurement Needs, Summary of a workshop, Indianapolis, Indiana, June 25-27, 1979* (Indianapolis, IN: The Institute of Ecology, August 1979), 27; The Institute of Ecology, *Guidance Documents for Long-Term Ecological Research: Preliminary Specifications of Core Research Measurements, Final Report to the National Science Foundation, Grant DEB 7920243* (Indianapolis, IN: The Institute of Ecology, November 1979), 54.

[88] Interview with IBP group, 40.


Martha Brookes, 1997

Figure 35—Jerry Franklin's efforts to build an autonomous subculture with interagency funding supporting collaborative research at the H.J. Andrews Experimental Forest (Andrews Forest) promoted collaborative engagement among scientists and forest managers. Here, Jerry Franklin, Steve Eubanks, and Stan Gregory confer at the Andrews Forest in 1997.

Andrews group to $500,000.[89] Technically, the group received no more than other sites under the LTER, but they had a running start on the LTER concept in the 3 years before other sites had access to that NSF program.

Conclusion

The Andrews group, by the late 20th century, was a self-conscious community that supported interdisciplinary cooperation and mutual support for long-term programs, and people in that community cooperated in joint efforts to secure funding and other support from two different federal agencies and a state university. The resulting community was a refuge for scientists struggling to reach long-term goals in a period of sustained instability. The group patterned its vision for the future on a collective legacy from the IBP years: a composite portrait of remembered experiences conveyed through oral traditions and science data, including the landscape

[89] "Support of the H.J. Andrews Experimental Forest as a National Field Research Facility, Proposal to the National Science Foundation," 4060 Research Facilities FY1979 File, Publications Room, FSL, Corvallis, OR; Andrews History Project Workshop of 7 August 1996 at the Corvallis FSL. Workshop participants included Max Geier, Art McKee, Fred Swanson, Cindy Miner, Ted Dyrness, and Kelley Allen, 11.

and publications rooted in research at the Andrews Forest. The community of the LTER era, however, was not the same as the community of the IBP era. Those who survived the transition from IBP to LTER funding, and those who joined the group during those years, passed through a cultural filter that winnowed out a significant number of their colleagues. Many people who worked on the Coniferous Biome at the Andrews were disillusioned with the unfulfilled promise of the IBP. They had rational concerns about whether alternative funding would materialize after the IBP ended, and they were frustrated by the constant strain of trying to make a living or raise a family while working in a professional environment of ongoing uncertainty about future sources of funding and support. The temptations of other opportunities for career advancement, consequently, seriously depleted the core group of cooperating scientists. During this transitional period, the NSF trimmed the proposed network of field sites from nearly 200 to fewer than 10 LTER sites—a 95-percent reduction of the sites in the original proposal—and there were no guarantees the Andrews Forest would make the final cut.

Programs and facilities at the Andrews Forest survived in a never-never land of overlapping, interagency responsibilities.

People who stayed with the Andrews group had to be willing to work under uncertain conditions at a facility with a long record of abrupt changes in staffing and funding. Programs and facilities at the Andrews Forest survived in a never-never land of overlapping, interagency responsibilities. The group's leaders wielded authority that rested on little more than bureaucratic indecision and vague assurances not to look too closely at what was going on. Under these conditions, passion for the place and the endeavor was a more important variable attracting people to the Andrews group than was common sense. These characteristics of the Andrews Forest and group did, however, virtually ensure that the people who remained in this community in the last two decades of the 20^{th} century included many scientists who were light on their feet, intellectually and academically nimble, adaptive, and willing to take on daunting new challenges. People who remained with the group through this period were whistling through a scientific graveyard strewn with half-finished projects and ongoing responsibilities. They were ideally suited for negotiating the opportunities and minefields of natural resource policy and ecosystems research in the last two decades of the 20^{th} century.

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