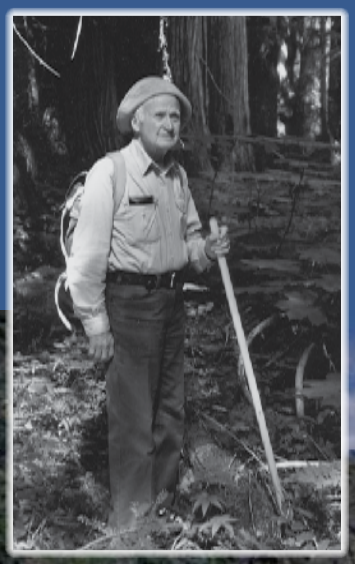
Building A Research Legacy

The Intermountain Station 1911-1997

By Richard J. Klade



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Abstract

Includes highlights of the history of organizations that preceded formation of the Intermountain Forest and Range Experiment Station in 1954. Provides detailed accounts of Intermountain Station research and administrative accomplishments, some of the people who led activities, and changes in the organization from 1954 through 1997 when the Intermountain and Rocky Mountain Stations merged to become the Rocky Mountain Research Station. Many significant Station publications are indicated by title in the text, and the references list includes other publications that provide additional historic background on research programs and results.

The Author

Dick Klade graduated from the University of Wisconsin—Madison in 1957 with a bachelor of science degree in journalism. His early jobs were editor of a weekly newspaper and sports editor for a daily paper. Before joining the Forest Service in 1968 as a writer-editor at the Forest Products Laboratory in Madison, Klade worked for Allis-Chalmers, The West Bend Company, and RCA (at a Job Corps Center) in editorial and news media contact positions. He became Public Information Officer for the Boise National Forest in 1972, and later served as Information Officer for the Eastern and Intermountain Regions of the Forest Service. He worked at the Intermountain Station twice, from 1974 through 1977 and from 1983 until he retired in 1994 as Staff Director for Research Information.

On the Cover

Three giants among the scientists who worked at the Intermountain Station and its predecessor organizations are superimposed on a Salmon River scene. The river was the boundary between Forest Service Regions 1 and 4. The two Regions encompassed the territory where most Station research was conducted throughout the bulk of its history. Chuck Wellner, Arthur Sampson, and Harry Gisborne (left to right) stood out from the many who contributed new knowlege to help solve natural resource management problems. Gisborne, Sampson, and Wellner contributed much more than improved techniques. They provided fundamental ideas and leadership that inspired many others to bring about continuing improvements in the conservation of America's natural resources.

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Acknowledgments

Writing this history was not a lonely occupation. Many people gave generously of their time and expertise. Their helpful attitudes and professionalism would have pleased those who dedicated a large part of their lives to building a legacy of useful natural resource research at Priest River, Great Basin, the Northern Rocky Mountain Station and the Intermountain Station.

Larry Lassen, Intermountain Station Director, 1983-92, laid the foundation for this history over several years of work as a volunteer after he retired. Lassen conducted interviews with scientists and administrators, reviewed available histories of Forest Service Research, and made detailed inspections of annual reports covering many years of activities at the Intermountain Station and its predecessor organizations. The result of his work was a 70-page narrative outline that served as a starting point for development of this history. Lassen also responded to many questions as work on the document progressed and wrote or rewrote several segments where his insights as a former top administrator in the Washington Office and at two stations were especially relevant. His excellent contributions are appreciated.

Two people provided especially important assistance and support throughout the project. *Dave Tippets*, Rocky Mountain Research Station (RMRS) Public Affairs Specialist, devoted many hours to answering questions, searching for hard-to-find information, and providing guidance based on his considerable knowledge of natural resource management and the history of the Intermountain (INT) and Rocky Mountain Stations and Regions 1 and 4. His help was invaluable in advancing this history from concept to publication. *Louise Kingsbury*, who retired near the end of the project as RMRS Group Leader of Publication Services, volunteered judgments on significant Intermountain Station research and publications that without exception were confirmed by current and former Station scientists. She also provided valuable editorial advice and made members of her staff available to handle production matters.

Many INT and RMRS active and retired scientists, technicians, professional support, and administrative personnel went far beyond what might be considered normal participation in a history project. They took the initiative to provide rare photos, accounts of their experiences, publications, and leads to the whereabouts of other individuals and source documents. These very special people were *Bobbie Bartlett*, RMRS Forester, Missoula Fire Lab; *Carolyn Bohn*, RMRS Hydrologist, Boise; *Warren Clary*, retired INT Project Leader, Boise; *David Cole*, RMRS Research Geographer, Aldo Leopold Institute, Missoula; *Bob Denner*, RMRS Forester and Priest River Superintendent, Moscow; *Dave Fellin*, retired INT Team Leader, Missoula; *Dennis Ferguson,* RMRS Project Leader, Moscow; *Mal Furniss*, retired INT Project Leader, Moscow; *Willa Gingery*, RMRS Administrative Support Clerk, Missoula; *Mike Hardy*, retired INT Research Forester, Missoula Fire Lab; *Harold Haupt*, retired INT Project Leader, Moscow; *Bob Lucas*, retired INT Project Leader, Missoula; *Durant McArthur*, RMRS Project Leader, Provo; *Ward McCaughey*, RMRS Research Forester, Missoula; *Walt Mueggler*, retired INT Project Leader, Logan; *Kerry Overton*, RMRS Technology Transfer Specialist, Boise; *David Parsons*, RMRS Program Manager, Aldo Leopold Institute, Missoula; *Jan Qualls*, retired INT Section Head, Ogden; *Jack Schmidt*, RMRS Forester and Coram Superintendent, Missoula; *Nancy Shaw*, RMRS Botanist, Boise; *Al Stage*, retired INT Project Leader, Moscow; Elaine Sutherland, RMRS Project Leader, Missoula; *Jonalea Tonn*, RMRS Forester, Moscow; and *Shirley Waters*, RMRS Computer Programmer, Ogden.

Rare photo images and identifying information were provided by *Amanda Burbank*, Region 1 Archives Manager; *Beth King*, Region 4 Technical Information Specialist; *Richa Wilson*, Region 4 Architectural Historian; *Renee Green-Smith*, Forest Service Washington Office Visual Information Specialist; and *Teresa Hamann*, Archives Technician, K. Ross Toole Archives, Maureen and Mike Mansfield Library, University of Montana-Missoula. Prints of photos identified in this history as from the Gisborne Collection may be obtained from the Mansfield Library. Jim Stone, Region 4 Public Affairs Specialist, suggested the Salmon River scene used on the cover.

Individuals who consented to telephone or personal interviews are listed in a section that follows the main text of this history. The list will not be repeated here, but all are appreciated. Others also responded positively to specific requests for information. They were: *Dale Bartos*,

RMRS Project Leader, Logan; *Barbara Bentz*, RMRS Project Leader, Logan; *Liz Close*, Region 4 Director, Recreation; *Keith Evans*, retired RMRS Assistant Station Director; *Rick Fletcher*, RMRS Public Affairs Specialist; *Kathy Graham*, Senior Advancement Consultant, Sun Gard SCT Higher Education, Moscow; *Roy Harniss*, retired INT Range Scientist, Logan; *Beverly Holmes*, retired Region 5 Deputy Regional Forester, Administration; *John Kinney*, Range Technician and Desert Range Superintendent, Boise; *Ron Lindmark*, retired Director, North Central Forest Experiment Station; *Jack Lyon*, retired INT Project Leader, Missoula; *Delpha Noble*, retired INT Public Information Specialist, Ogden; *Renee O'Brien*, RMRS Lead Ecologist, Ogden; *Richard R. Price*, M.D., Salt Lake City; *Jerry Sesco*, retired Forest Service Deputy Chief—Research; *Dennis Simmerman*, retired RMRS Forester, Fire Lab, Missoula; *Ron Stoleson*, retired Region 4 Director, Vegetation Management; *JoAn Steele*, RMRS Budget Officer; *Dwane Van Hooser*, retired RMRS Program Manager, Ogden; *Jack Waide*, RMRS Assistant Station Director; *Alan Watson*, RMRS Research Social Scientist, Aldo Leopold Institute, Missoula; *Bruce Welch*, retired RMRS Plant Physiologist, Provo; and *Bill Wykoff*, retired RMRS Research Forester, Moscow.

Critical reviews resulted in many corrections and improvements. The complete manuscript was reviewed by *Roger Bay*, retired INT Station Director, *Jim Brown*, retired INT Project Leader, Missoula, Fire Lab; Evans, Furniss, Kingsbury, and Lassen.

Comments on one or more segments were provided by *Gene Amman*, retired INT Project Leader, Ogden*; Carol Ayer*, RMRS Library Group Leader; Bartlette; Bartos; Bohn; *Dave Born*, retired INT Research Forester, Ogden; *Ray Brown*, retired INT Project Leader, Logan; *Jeanne Chambers*, RMRS Team Leader, Reno; Clary; *Jim Clayton*, retired INT Soil Scientist, Boise; Denner; *Bill Elliot*, RMRS Project Leader, Moscow; Fellin; *Bob Ferguson*, retired INT Range Scientist; Dennis Ferguson; Graham; Haupt; Holmes; Kinney; Lindmark; *Jesse Logan*, RMRS Project Leader, Logan; Lyon; McArthur; McCaughey; *Jack McIntyre*, retired INT Project Leader, Boise; *Walt Megahan*, retired INT Project Leader, Boise; Noble; O'Brien, Overton; Parsons; *Bruce Rieman*, RMRS Project Leader, Boise; Sesco; Shaw; Stage; Tippets, *Russ Thurow*, RMRS Fisheries Biologist, Boise; Van Hooser; Waters; and *Michael Wilson*, RMRS Assistant Station Director, Ogden.

Bob Hamre, retired RMRS Group Leader of Research Information who was a long-time colleague, provided insightful editing that helped shorten the manuscript by pointing out where a number of passages strayed too far into matters curious or humorous, but peripheral to Station history. The exorcism of some anecdotes, many photos, and other fun things that followed is lamented, but Hamre's suggestions undoubtedly helped make this history a better read.

Contents

The Trail We Will Follow

There was no organization known as the Intermountain Station until 1928, but its origins were in earlier times.

The first predecessor was the Priest River Experiment Station in the Panhandle area of northern Idaho. Research began there in 1911. The second location was on the slopes of the Wasatch Plateau in central Utah, where the Utah Experiment Station was established in 1912 (Rocky Mountain Research Station 1999).

Great Basin was lovely in winter, but not a good place to live after the weather turned cold. Snow had to be shoveled off the roofs periodically to keep them from collapsing.

Forestry research started in the Northern Rocky Mountains in 1911 when a small tent was pitched at Priest River.

In 1916 the Priest River Station headquarters moved to Missoula, Montana, although the original location remained as an experimental forest. The Station was known by a variety of names until 1925 when it became the Northern Rocky Mountain Forest Experiment Station.

In Utah, after a few years of operation, the organization's name was changed to the Great Basin Experiment Station. Heavy snows forced the small staff to spend winter months elsewhere. They moved to Ogden each fall, probably to be near the District 4 headquarters. In 1928 Congress passed legislation recognizing research as an entity within the Forest Service. The act formally authorized a Station for Utah and adjacent States. The Intermountain Forest and Range Experiment Station thus was conceived, with the Great Basin organization as its foundation.

In 1953 the U.S. Department of Agriculture announced a series of major Forest Service consolidations. Among them was the merger of the Northern Rocky Mountain Station and the Intermountain Station, effective January 1, 1954. Ogden was designated as the headquarters site and the new organization assumed the Intermountain Station name.

The early experiment Stations bore little resemblance to today's Stations in terms of staffing, funding, and scope of the research program. For example, in the early 1920s the Great Basin staff consisted of a director and two temporary field assistants. Research was confined to a few range and watershed experiments and work on establishment and growth of three tree species. At about the same time, limits on funding reduced the staff of the Priest River Station to one person, who served as the director and the only investigator. When the first full-time forester was assigned to begin fire research in 1922, total Priest River Station funding was increased to $18,920 for all of 1923.

In contrast, in April 1997 shortly before it merged with the Rocky Mountain Station, the Intermountain Station directory listed 241 full-time employees. In addition the Station had a large number of seasonal and part-time workers, plus people working in special programs, such as the Senior Community Service Employment Program. Several dozen administrative employees of the Intermountain Region also did Station business through a shared services arrangement. A substantial number of volunteers contributed many hours of useful work in many program areas.

Laboratories, which were crude or nonexistent in the early days, were homes to a variety of research units. Labs were located at Reno, Nevada; Boise and Moscow, Idaho; Ogden, Provo, and Logan, Utah; and Missoula (two) and Bozeman, Montana. Six of them were on or near university campuses. The Station maintained five experimental forests and two experimental ranges. Twenty research units conducted studies that spanned a wide range of natural resource protection and

management topics. The Station budget was $15.5 million.

Fortunately, excellent histories of the Priest River and Great Basin Stations have been published. Chuck Wellner, a retired Assistant Station Director, wrote of events at Priest River up to its 65th anniversary year (Wellner 1976). Wellner worked at Priest River in the 1930s and was closely associated with activities there for many years. In 2004 the Rocky Mountain Station published a history by Kathleen Graham, who took a somewhat different approach to the Priest River story. Graham's work added coverage of the years from 1976 to 2003 (Graham 2004). Wendell Keck, retired Intermountain Station editor, wrote a Great Basin history as a volunteer (Keck 1972). Keck acknowledged technical assistance by Bill Laycock, Perry Plummer, Jim Blaisdell, and Joe Pechanec, all of whom were personally involved in research at Great Basin. Incidentally, Pechanec is pronounced Pah-hah-nek. Blaisdell described him years later as "the nice guy with the funny name" (Blaisdell 1989).

Control and proper use of wildland fire have always posed challenges in the Northern Rocky Mountains and Great Basin. Fire research was a large part of the early work at Priest River and later became one of the most important parts of the total Station program. Charles E. (Mike) Hardy wrote two comprehensive histories of the "Gisborne Era" of fire research, which spanned the years from 1922 to 1950 (Hardy 1977, 1983). Hardy had a 22-year career at the Fire Lab contributing to development of the National Fire Danger Rating System.

Material from the five histories is included here. However, to avoid needless duplication the strategy was to extract highlights from the earlier works, adding such new information as could be found. Although descriptions of a few events are carried through to 2005 to complete the account, this history emphasizes the era that began in 1928 and ended in 1997 when the Intermountain Station name was discontinued. Only the name passed into history. The organization did not die. It lives today as a vibrant part of the Rocky Mountain Research Station, which was established with the 1997 merger.

What's In a Name?

Looking back on 86 years of research history in the Great Basin and Northern Rocky Mountains, one encounters a somewhat bewildering array of different names for sites, organizations, programs, and the jobs of the participants. Many labels for the same thing changed several times. Were all these changes necessary? Or, were some mainly caused by the inclination of bureaucrats to tinker with things?

Whether all the name changes were needed or not, some were a reflection of research strategies that were formed and re-formed to meet ever-evolving needs of natural resource managers. They also reflect addition of new scientific disciplines and administrative skills as the world grew increasingly complex, populations expanded, and there were demands for new research approaches to support ecosystem management.

Some of the names were cumbersome in the extreme. The Intermountain Forest and Range Experiment Station, official name during much of the organization's history, was descriptive but a mouthful. To anyone who had to write or type it frequently, it was a real pain. Within the Forest Service this problem was minimized in a minor way by using the acronym IF&RES. But few in the outside world had any idea of what that represented.

Later, Station acronyms were discontinued and "INT" became the official brief identifier. Many people within Forest Service Research used INT, and when they were communicating with other research personnel within the service the meaning was understood. But if you said, "I'm working at INT," to many National Forest managers, you were likely to get a "Huh?" in response. The Northern Rocky Mountain Forest and Range Experiment Station name was truly mind-boggling—two words longer than the Intermountain Station's official title.

Several Intermountain Station people, including the author of this history, were unhappy with the lengthy or inappropriate unit names. Without devoting much time to it, they made some changes. For example, Publications and Information Services in 1975 became simply Research Information. Counterpart units at several other Stations subsequently adopted this name.

One theory shared by the label reformers was that an important consideration in selecting a good name ought to be what most people called the thing—common usage. Forest Survey was called just that for many years. Most people who had any contact with the unit used the term and knew what it described. In 1974 the Forest Service changed the name to Renewable Resources Evaluation (RRE). The change was applied to units at Stations as well as the national program. The new name never took hold. Most people continued to call the operation Forest Survey. One who disliked the RRE label was Dwane Van Hooser. When he came to the Intermountain Station in 1979 as project leader he promptly proposed changing the unit name back to Forest Survey. Assistant Station Director Jim Blaisdell approved, and "Forest Survey" returned to common usage at the Station (Van Hooser, interview 2004).

That name change probably should have had national office approval. Blaisdell took care of that by merely neglecting to ask for approval. Van Hooser recalled that a few people in the Washington Office were "not particularly pleased" with the unilateral change at the Intermountain Station, but no formal protest was made. Currently, the unit is known as Forest Inventory and Analysis. Van Hooser said he believes this label is a good one—descriptive of the unit mission and accepted by the people involved.

A more important name change did get Washington Office approval. In 1990 the Intermountain Forest and Range Experiment Station officially became the Intermountain Research Station. Most employees were pleased.

Those who have read this far may have noticed a highly regarded administrator, Charles A. Wellner, referred to as "Chuck." A laboratory has been called a "lab" and the Priest River Experimental Forest shortened to just "Priest River." Some might argue that such informality is inappropriate in describing the history of an organization that had a serious and important mission. But those are the terms people used during the times chronicled here.

Many oldtimers have fond memories of their experiences as members of the "Forest Service family." Some of the customs and traditions that caused employees to feel like "family" began to fade away in the late 1970s, but they were nearly universal during most of the history of the Intermountain Station. People went out of their way to help fellow employees, on and off the job. It was common to invite out-of-town Forest Service visitors home for dinner with one's "real" family. Many supervisors showed appreciation for subordinates by hosting parties for them, usually during the holiday season.

People who worked together participated in informal social events—picnics, house parties, or get-togethers in restaurants or taverns. Unit Christmas parties (see chapter 13) usually were fairly elaborate affairs. Retirement parties were considered equally important and they were well attended. For many, the Forest Service was the hub of their social life as well as the outfit they worked for. As in a real family, arguments over matters large and small could be heated, but the antagonists usually patched things up rather quickly.

It is not surprising, then, that "Forest Service family" members were on a first-name basis with each other. This familiarity ran from the bottom of the organization to the very top. Intermountain Station Directors, for example, were known to one and all as "Joe," or "Roger." Assistant Station Director Beverly C. Holmes was "Bev." Few ever called Dr. Albert R. Stage "Dr. Stage" or even "Albert." He was "Al." Similarly, Dr. Walter E. Cole was "Walt." Perhaps in consideration of others who held jobs at the same level but did not have Ph.D. degrees, those who had earned doctorates rarely used "Dr." in identifying themselves. In fact, "Dr." seldom was heard anywhere around the Station.

When this history identifies a unit informally—the Fire Lab, for example—or uses the informal first name of an employee it is not an effort to be folksy or flippant. It is part of an attempt to reflect the culture as it was.

The Intermountain Station territory, 1970-1997, included about three-quarters of the National Forest System's Region 1 (Montana and northern Idaho) and all of Region 4 (Utah, Nevada, western Wyoming, southern Idaho, and small areas of California and Colorado). Many Station units worked in larger areas and much work was national and international in scope.

What Was the Territory?

Forest Service research stations traditionally have been assigned territories just as the management units had National Forest and Regional boundaries. In the early days of research the "territory" had considerable meaning. Research locations were in remote areas, communication methods were primitive, and travel was difficult. Of necessity, most studies concentrated on local plant species and conditions and seldom produced results that were transferable to other areas (West 1990). For many of the early years, research was under regional administration, so, for example, the territory of the Northern Rocky Mountain Station corresponded to that of the Forest Service's Northern Region (Region 1, known as District 1 until 1932).

After the Intermountain and Northern Rocky Mountain Stations merged in 1954, the new Station territory included northwestern South Dakota, eastern Washington, a bit of eastern California, western Wyoming, and all of Idaho, Utah, Montana, and Nevada. By the early 1970s, most of the bits and pieces of States had been assigned to other Stations. By then, it simply didn't matter very much because huge changes had taken place in the work of the Station.

Many research units had responsibilities that went well beyond the boundaries of the Station territory, and a few were national in scope. Four examples are given here. The Forest Survey unit working from Ogden conducted resource assessments in nine western states. The Fire Lab in

Missoula was one of only three in the Nation when it was established, and many of the results of work there were applicable nationally and internationally. The Wilderness Research Unit was the only such organization in the Nation and its investigators conducted studies in many parts of the country. Scientists at the Shrub Sciences Lab in Provo worked in cooperative programs that sought to improve vegetation on millions of acres throughout the Inland West.

By 1960 it was becoming common for Intermountain Station scientists to travel to the four corners of the globe, often at the behest of the Forest Service's International Forestry staff in Washington, DC. They consulted with research counterparts and resource managers in friendly countries, participated in international meetings, and even collected plants. When the Iron Curtain opened a crack, a Station scientist was among the first Americans to be allowed to travel fairly freely in the Soviet Union. When the Bamboo Curtain lifted a little, Station personnel were among early western visitors to communist China. Others worked in Nepal, Taiwan, Australia, Mexico, Brazil, Canada, Israel, and many other places.

Over the years the Station developed international mailing lists that delivered notices of new publications written by its scientists and cooperators to natural resource organizations around the world. Publications were sent to anyone who asked for them, with the exception of requests from a few countries listed by the State Department as ineligible for technical assistance. Key natural resource libraries and some major organizations automatically received copies of every publication. In 1989 the Station filled orders for more than 100,000 copies of publications, and about 15 percent went to international clients. Increasingly, Station scientists published results in international journals and the Station published proceedings of international symposia that included papers whose authors came from many lands.

In 1911 the Station's territory basically was defined by a line on a map around some 4,500 acres at Priest River. By 1997, although strong emphasis was placed on meeting the needs of managers in Forest Service Regions 1 and 4, clients were everywhere and the territory in essence had become the world.

Who Made Things Work?

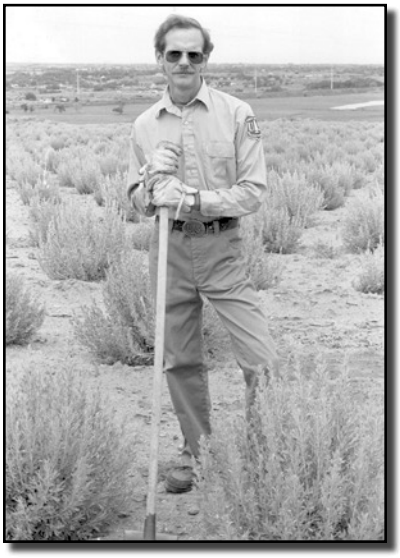
One former Chief of the Forest Service was fond of stating, "The Forest Service is its people." The statement applied at the Intermountain Station. Occasionally, successes in research come about through serendipity—unexpected discoveries that seem due to good luck more than anything else—but more often success results from hard work by good people pursuing well-defined objectives within a sound framework.

Good people who got good results were abundant throughout the Station's history. The key people, of course, were those who planned and conducted research and reported the findings. No one, however, worked in isolation. A host of technicians, support personnel, and administrators who guided programs and reviewed results helped in fulfilling the Station's mission. Also important were a great many people who were not Station employees.

Cooperators—Literally hundreds of cooperators contributed to Station programs over the years. Sometimes they did so through long-standing formal arrangements such as the partnerships between the Station and the Utah Division of Wildlife Resources and the Idaho Fish and Game Department.

The Care Takers

One group of Station employees who often got less recognition than they deserved were the technicians and professional support people. Some were caretakers in the classic sense; they were superintendents of major experimental areas, for example, John Kinney at the Desert Experimental Range and Bob Denner at the Priest River Experimental Forest. Others were assigned to specific research units or labs. They all had one thing in common. They took care of things, whether the task was shoveling snow, hosting visitors, operating sophisticated equipment, recording data, planting trees and shrubs, or showing new scientists where old study plots were located and describing the studies that applied to them. Some had remarkably long careers with the Station. Paul Hansen (see "A New Role for Great Basin," chapter 11) devoted 47 years to "taking care of things" at Great Basin. Many were remarkably versatile people. Steve Briggs was one example.



Forester Steve Briggs' years at the Station featured valuable service and a wide variety of activities.

Briggs earned a forest management degree at Utah State University but in 1993 was working at the Shrub Lab in Provo. He had been stationed at the Moscow Lab (1979-82) the Boise Lab (1982-86), and had done some work at every experimental area in the Station territory except Tenderfoot Creek and the Davis County Watershed. In addition to his "normal" duties, Briggs served as property officer and safety officer for the Provo unit. He also listed "snow relocater" as a duty.

Briggs had plenty of variety in his personal as well as professional life. A Vietnam veteran, he had been commander of the American Legion Post while at Boise. He was a junior warden of his church, taught hunter education at the local Elk's Lodge, and was active in the local chapter of the Society of American Foresters. Versatility and a service attitude were common characteristics of technicians and professional support personnel at the Station. Several of them are featured in this history.

Research cooperators came from many organizations and brought diverse skills and knowledge to the Station program. Here Australian Range Scientist Ron Hacker (left) worked with Shrub Lab Technician Tom Monaco in 1995 to record mule deer diet preferences for different species of kochia collected from around the world.

Utah Wildlife Resources employees located at Ephraim worked so closely with Station scientists that everyone considered them to be part of the Intermountain Station family. Other formal cooperation, usually with university professors or graduate students, was fostered by financial support from the Station. This was significant. Of the $15.5 million total Station budget in 1997, $1.4 million was allocated to fund research grants and cooperative agreements.

Many other scientists and resource managers worked with Station people at experimental forests and ranges. Manuscripts intended for publication by Station authors were given peer review by countless fellow scientists and resource agency staff people. This voluntary work helped ensure the accuracy and credibility of the products of Station research.

A tremendous debt of gratitude is owed to all the cooperators. No attempt will be made to list them all. Any such list would omit so many as to be completely inadequate. But some cooperators will be mentioned from time to time. The intent is not to assert that they were among the most important, but to cite them as examples of a much larger group that was vital to conducting the Station's work.

Special Employment Programs— Another important group of people worked within Station units but were not Forest Service employees. Earlier, the Senior Community Service Employment Program (SCSEP) was mentioned. This program was financed by the Department of Labor. SCSEP enrollees were people over 55 years of age with limited incomes. They were assigned directly to units in need of help and worked side-by-side with the Station's "regular" employees. Many SCSEP enrollees were highly regarded. They brought the skills and good work habits of mature people to the organization, and as a group were considered to be reliable and conscientious. One of the goals of the program was to help prepare enrollees for higher paying jobs. Several who worked at the Station successfully made the transition.

A somewhat similar program known as "Green Thumb" provided much-needed labor for fieldwork that helped Station scientists at the Shrub Lab conduct studies. Participants had a well-deserved reputation as hard workers.

The "College Work-Study Program" supplied needed help to several Station units. This program allowed college and university students to earn money through part-time work to help finance their educations. The educational institutions administered the program and provided individuals to fill jobs defined by the Station. The students worked parts of days between or after classes and sometimes only a few days each week. They brought the enthusiasm of youth to the units in which they worked, and learned something about natural resource research in return.

Notable People— A strong case can be made that three individuals—Harry Gisborne, Arthur Sampson, and Chuck Wellner—were giants among all who labored at the Intermountain Station and its predecessor organizations. These three stand out because of the profound influence their ideas had on major segments of natural resource science and management. However, just as we will not presume to say some cooperators were more valuable than others, with the exception of the three standouts, we believe it would be foolish to try to rank all the distinguished individuals among hundreds who appeared on the Intermountain Station's rolls over the years.

Some individuals became famous, at least in natural resource circles. For example, Bob Marshall's status as a champion of wilderness preservation was acknowledged when a premier Wilderness within the National Forest System was named for him. Some, like Gisborne, were at the Station or its predecessor organizations for all or a great part of lengthy careers. Others worked at the Station only in the early years of their careers and moved on to high positions within the Forest Service, other resource management and research organizations, or the academic world.

This history will mention some of the "notables" briefly, and describe the activities of others in some detail. Neither the brief mentions nor the detailed descriptions should be taken as suggestions that these were the most important Station people. In some cases, they are included simply because information about them is readily available in historic documents. A few, like Perry Plummer, had very long and fruitful careers at the Station and might be said to have become legendary figures. Somewhat detailed descriptions of the work of others are included mainly to try to show the successes (and sometimes failures) of Station people in human terms. Regrettably, chances are high that many who were notable have been overlooked.

Successes were many throughout the Intermountain Station's history. They were of many different types. As with descriptions of the work of outstanding individuals, this history will describe some of them, but make no attempt to include them all or to rank them or declare one "the most important."

How Did the Staff Change?

As the Intermountain Station staff grew in numbers from a handful to more than 200 it was evolving in terms of educational levels and diversity. The number of personnel with advanced academic degrees increased gradually throughout the organization's history until the 1960s, when its growth accelerated. Diversity was a different matter. There were few women in professional positions (none in the top jobs) and no ethnic minorities in the workforce until the early 1970s. Then change came rather rapidly.

Advanced Degrees—Pioneer researchers in the Intermountain Station territory seldom had academic degrees beyond the bachelor's level. Resource conservation was a rather new idea in the United States. Only a few universities offered courses in forestry, which was defined as "the preservation of forests by wise use" by President Theodore Roosevelt in his first message to Congress in 1901. Range management was a concept, not yet a discipline. It would be years before courses in fields such as wildlife and recreation management were established in colleges and universities.

The higher education system changed quite rapidly. After establishment of the first American professional forestry school at Cornell in 1898, many other universities started programs. Several schools developed range management curricula. As master's and doctoral programs emerged, more and more graduates with advanced degrees joined the ranks of Forest Service researchers. By 1997 the formal education level of Intermountain Station personnel had evolved to the point that a scientist without a M.S. or Ph.D. was a rarity. Support people with advanced degrees also had become more numerous.

The same thing happened within the National Forest System. Many histories point out that the first forest rangers were local men without college training. Some did not have high school diplomas. By the 1990s, nearly all professional positions within the service were staffed by college graduates. It was not unusual to find personnel at many levels in the organization with master's degrees or doctorates.

This general upgrade in formal education certainly increased the sophistication with which research could attack problems. Partly because the resource managers who were the principal clients also had higher education levels, the nature of what was wanted from research also changed. So education levels were one factor in the evolution of the Intermountain Station research program.

In a way, the increase in educational levels within natural resource management organizations is a tribute to research. The professors who wrote the books and trained the foresters, ecologists, range managers, engineers and other professionals got most of their information directly or indirectly from research as the state-of-the-art advanced in each field through the years. There is no question that progress would have been much slower without new knowledge generated by research. The problem is that credit to the researchers who create the new knowledge tends to diminish and then evaporate over time. It is hard for administrators to tell those who hold the purse strings "what research has done for you lately" when a direct link between scientific studies and improved management is not readily apparent. But a link always exists through the educational system.

Diversity in the Workforce—For more than a half century the U.S. Forest Service was an organization dominated by white males. All top management positions were filled with men. With rare exceptions, middle-management and first-line supervisory and professional jobs also were filled by men. Although the men frequently acknowledged the importance of women to the organization, the women by and large were confined to clerical and secretarial jobs at the lower pay levels. Ethnic minorities were virtually nonexistent in any full-time position at any level.

By 1970 there still were very few female Project Leaders in Forest Service Research and the same could be said for other professions and for minorities in any type of professional job. No women or minorities held upper-level scientific or professional positions at the Intermountain Station. This situation came about, in part, because enrollment in university natural resources training had for years consisted almost entirely of white males. The first Earth Day, April 22, 1970, provided a "kick start" that sent thousands of urban youth, including many women, into natural resource career training. In the ensuing 26 years the place of women in the Station workforce changed dramatically. Employment of minorities increased, although the progress made by minorities was much less than that by women.

Pacific Southwest and Intermountain Station Director's secretaries Cynthia Jacobs and Ollie Quirante exchanged a traditional Hawaiian hug during Jacobs' visit to participate in an Asian-Pacific American program in Ogden in 1992.

The Station directory for 1997 listed women in 23 scientist and five research forester slots. One Project Leader was a woman, seven women headed administrative units, and three women directed administrative shared services staffs. Two minority scientists were listed; one had only recently been appointed a Project Leader. Several other minorities were employed at the Station or in shared services administrative units. In a somewhat unusual example of workforce change Ollie Quirante, a man of Pacific Island heritage, had been secretary to the Station Director just a few years before 1997. Throughout Station history, until Quirante's appointment, the job had been held by a white woman.

Where it seems appropriate this history will introduce you to some of the women and minorities who gained employment or earned advancement as the workforce evolved.

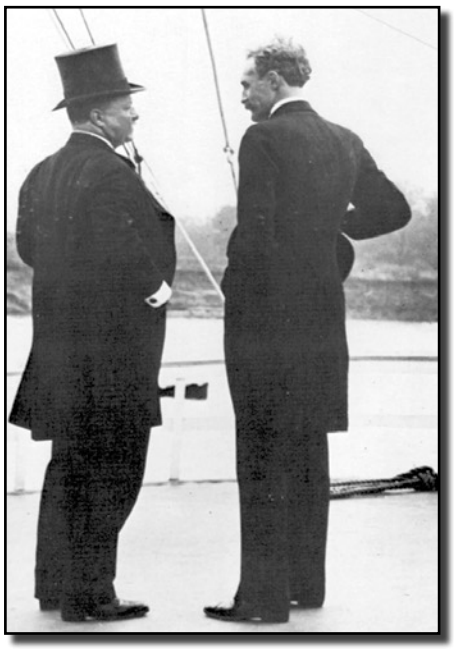
Early Forest and Range Research

Natural resource research in the U.S. Department of Agriculture predated the 1905 birth of the Forest Service, and there were early calls for establishment of experiment stations. In 1881, Franklin Hough was appointed by Congress as the first forestry agent in the Federal Government, and assigned to USDA to compile a statistical report on the condition of U.S. forests. He soon was appointed Chief of the new Division of Forestry in USDA (West 1992).

Hough wrote several major reports on forestry. One issued in 1882 included a chapter titled *Experimental Stations for Forest Culture*. The language strongly urged establishment of forest experiment stations (Storey 1975). Hough's multi-volume *Report on Forestry (1878-1884)* also called for the creation of experiment stations.

In 1898, Gifford Pinchot, a Yale graduate from a wealthy and influential family, who had studied forestry in France, became Chief of the Division of Forestry. Pinchot was critical of his predecessor, Bernard Fernow, for emphasizing technical and theoretical aspects of forestry over more practical problems (Steen 1976). Despite his criticism, Pinchot quickly established a Section of Special Investigations, which could be considered the research arm of the Division of Forestry. Although definitions were imprecise, perhaps as much as 25 percent of Pinchot's early budget was related to research (Steen 1998).

Under Pinchot, the Division of Forestry began to grow, and in 1901 became the Bureau of Forestry in USDA. Investigations on forestry, forestry reserves, forest fires, and lumbering were permitted under the 1901 appropriations act, and forest products studies that had been suspended in 1896 were restarted (Storey 1975). Pinchot's vision for the Bureau of Forestry was undoubtedly helped by the election of Theodore Roosevelt as President in 1901. Here was a President who had a strong conservation ethic, and was a friend of Pinchot's. It was a friendship that aided in the growth and influence of the bureau.



President Theodore Roosevelt (left) and Gifford Pinchot charted a course for natural resource conservation in the United States.

Under Pinchot, the Section of Special Investigations soon became a division with 55 employees, and then was merged with the Division of Forest Investigation and the Division of Forest Management to encompass all technical studies. This merged division accounted for one-third of the Bureau of Forestry's $185,000 annual budget (Steen 1976).

In terms of the Forest Service's current research program, much of the effort of the Division of Forest Investigations would not be classified as research. "Investigators" often offered empirical conclusions rather than tested hypotheses. They seldom made rigorous scientific inquiries into problems, but rather conducted random experiments or based recommendations on limited observations. Nevertheless, the work reflected Pinchot's realization that programs of practical forestry could only succeed if supported by sound information obtained through research efforts (Storey 1976).

The first experimental range area opened in 1903 as the Santa Rita Range Reserve near Tucson. The first forest experiment station opened in 1908 at Fort Valley, Arizona, and 5 years later there were six (Steen 1998). Two of the early experimental areas, Priest River and Great Basin, were the forerunners of the Intermountain Station.

Grazing Studies

Pinchot was aware of the importance of grazing in the National Forests that were formed in 1905 with the birth of the Forest Service. His interest was appropriate, for in the early years following the transfer of the forest reserves to the Forest Service, grazing produced more revenue than timber (Pisani 1992). Although Pinchot had recognized that grazing problems were the most significant ones facing the forest reserves, early range research began in USDA's Division of Botany under Frederick Colville, rather than in the Division of Forestry.

Colville believed sheep would not harm the range if properly controlled. He began studies of sheep grazing

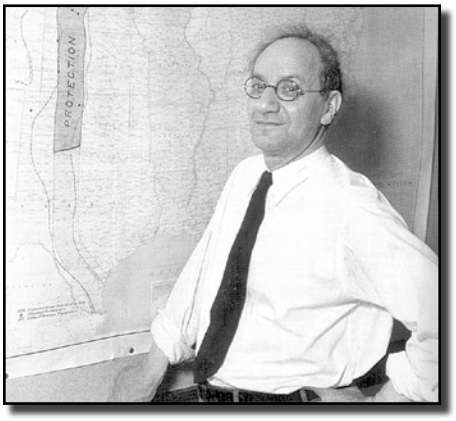
in the Oregon Cascades in 1897 to confirm or refute his beliefs. Grazing research, such as it was, continued under this arrangement until 1901 when it was placed in the Bureau of Forestry (West 1992).

Range research was given technical direction by the Office of Grazing in the Branch of Grazing in the Washington Office. Two of the earliest range researchers were James Jardine and Arthur Sampson, who in 1907 conducted studies to determine the grazing capacity of the Wallowa National Forest in Oregon. Their work provided the basis for deferred and rotation grazing, which addressed the issues of carrying capacity and numbers of stock that could be grazed in an area (West 1992). Three years later Jardine went on to establish and head the Office of Grazing. Sampson became a key person in the development of the Intermountain Station and of range science generally. Early range experiments in reseeding overgrazed areas in the Intermountain District (District 4) territory were also under way at this time (Alexander 1987).

Silviculture and Products

Silviculture and forest products research were in the domain of the Office of Silvics in Washington. This effort was headed by Raphael Zon, who got his natural resources education at the New York College of Forestry at Cornell University. Zon believed that scientific research was essential to sound resource management, a view not shared by many at the time. Zon has been considered by some as the founder of Forest Service Research. He established several of the first experiment stations, including Priest River.

All Forest Service research seemed to be carried out in rather fragmented fashion in those early days, and forest products research was no exception. There were reports of the Forest Service studying the treatment of lodgepole pine for railroad ties in conjunction with several railroad companies (Alexander 1987), but most



Raphael Zon, who established the Priest River Experiment Station in 1911, fought hard as a Forest Service official and editor of the *Journal of Forestry* for the principle that sound resource management required a scientific basis.

of the forest products work was done at various universities. In an effort to centralize forest products research, Zon selected the University of Wisconsin in Madison as the site for the Forest Products Laboratory (FPL). This was significant because FPL was the first substantial research laboratory within the Forest Service.

When FPL was dedicated in 1910, Chief Henry Graves, who left his position as Dean of the Yale Forestry School to replace Pinchot, was there to preside. In 1912, he set up the Central Investigative Committee in Washington with Zon as chairman. Zon represented silviculture; James Jardine, grazing; and Carlisle (Cap) Winslow, forest products. One of the major functions of the committee was to distinguish between administrative and investigative studies (Steen 1976). "Investigations" was the term commonly used then for what we would call "research" today.

Graves had a major concern with wood waste in harvest and manufacture, and was in favor of centralizing forest products research at FPL (Steen 1976). A side effect of FPL's establishment was the reduction, if not complete phase out, of cooperative research between the Forest Service and universities. It wasn't until the 1960s that the cooperative research program was reinstituted in a major way (Steen 1976).

Fire Studies

Fire research had begun under Pinchot when he authorized the study of 5,000 forest fires cataloged since 1754 to better understand the damage caused by fires. The urgency for and the emphasis on fire research increased dramatically when the fires of 1910 burned more than 3 million acres in northern Idaho and western Montana, killing 80 fire fighters.

Later, Chief Graves was appalled by proposals originated by scientists to use fire beneficially. He said it was inconceivable. There was concern among the Forest Service leadership that the public was confused by the concept of "good" and "bad" fires.

Graves and some on his staff also feared that complaints would be raised in the public and political arenas that the Forest Service was wasting money on research when the National Forests weren't well protected from fire. And, there were those in the Forest Service who even challenged the idea that research was a legitimate Forest Service function. Graves also took the position that no general expense money was to be used for research. Instead, the strategy was to ask Congress directly to appropriate funds for that purpose (Steen 1976).

Water Studies

In addition to interest in grazing and wildfire problems, water quantity and quality was a major Forest Service concern. Flood control was an issue in the humid and populous East; water availability was always of prime importance to the semi-arid West. Early watershed research began in 1900 with a cooperative project between the Forest Service and the Weather Bureau at Wagon Wheel Gap in the Rio Grande National Forest in Colorado. The study evaluated the effect of timber removal on water yields and helped ensure passage of the Weeks Law (West 1992).

The Weeks Law of 1911 authorized the Forest Service to buy land for National Forests for watershed

THE SEATTLE POST-INTELLIGENCER

SEATTLE, WASHINGTON, MONDAY, AUGUST 22, 1910.—FOURTEEN PAGES.—IN TWO PARTS

FOREST FLAMES WREAK HAVOC; $1,000,000 IS LOSS AT WALLACE AND 25 DEAD

Birdseye View of Wallace, Idaho, Before the Fire

IDAHO AND MONTANA TOWNS SUFFER DISASTER

Great Army of Terror Stricken Settlers Are Driven From Their Homes

Toll of Dead Unavailable

Communication Broken

Lives Lost

Rescuers Organize

MANY BELIEVED TO BE CUT OFF BY FLAMES

Twenty Forest Fire Fighters Are Reported to Have Lost Their Lives

SHOOTS WOMAN DOWN IN STREET FULL OF PEOPLE

KILLS BROTHER AND NIECE IN SUDDEN FIGHT

CAPT. E. B. WOOD IS SLAIN AT SEA BY INSANE PASSENGER

The forest fires of 1910 burned 3 million acres and caused many deaths. The city of Wallace, Idaho was devastated (below) as seen in this photo looking east into the main business district. The fires created public awareness of the need for fire research as well as better wildfire control.

protection and flood control in the East. Foresters favored watershed protection for flood control, while the Army Corps of Engineers favored construction of dams and levees.

Private land purchase by the Federal Government in the East was in marked contrast to the long-standing Federal policy of disposing of public lands in the West (West 1992). Acquisition of land for National Forests in the East not only reflected concern for protecting resources and property, but worked to change the Forest Service from a "western agency" to one representing national interests; thus its constituency and political clout also increased (West 1992). This change in Forest Service responsibilities was important to the Intermountain Station because it became a factor in annual competitions for research program dollars.

Insect Studies

In the early days, research on forest insects and diseases was not a Bureau of Forestry responsibility. Those studies were carried out in USDA's Bureau of Entomology and Bureau of Plant Industry. However, the importance of these investigations, particularly insect work, was not lost on Gifford Pinchot.

In 1899, Pinchot's first full year as head of the Division of Forestry, he appointed Andrew D. Hopkins as a collaborator to investigate forest insect problems in the Pacific Northwest. Three years later, Pinchot influenced the Bureau of Entomology to name Hopkins head of the newly created Division of Forest Insect Investigations. In that era, the insects responsible for problems in American forests were mostly unknown and undescribed. Hopkins endeavored to change that situation by specializing in bark beetle research and hiring and training field personnel (Furniss 2003).

Forest insect investigations began in the Northern Rocky Mountains in 1909 when Hopkins appointed Joseph Brunner, a big game hunter and writer who had some forestry training, as a field representative. Brunner had written to Pinchot wondering about the name

of the "little bug that makes the inner bark of freshly fallen trees its primary breeding place." Pinchot referred the letter to Hopkins, and the contact resulted in Brunner's hiring to do field work throughout the northern Rockies. Brunner's office was in Missoula.

Throughout his tenure, Brunner was antagonistic toward the Forest Service. His issues were primarily about Forest Service managers "dragging…their feet" and being inept in bark beetle control compared to other agencies and landowners. He also questioned Forest Service attitudes about the relative importance of fire and insects, and their relationships (Furniss 2003).

Brunner was skeptical when Jim Evenden, a Forest Service employee, was assigned as one of his assistants after being hired as an Entomological Ranger in 1914 (at a $900 annual salary), although he later said Evenden "appears to be promising material…" Evenden, however, quickly became dissatisfied with his new position. To keep him in the Bureau of Entomology, Hopkins moved him to Coeur d'Alene in northern Idaho to set up a sub-station. Evenden remained there, except for a break for military service during World War I, until he retired a year after being assigned to the Intermountain Station at the end of 1953.

The head-strong Brunner had a falling out with Hopkins over a personnel matter in 1917 and was separated from government service. After Brunner left, the Missoula office was closed, and forest insect operations in the Northern Rocky Mountains were centered at Coeur d'Alene under Evenden's supervision (Furniss, in preparation).

The Branch of Research

Forest Service research programs underwent significant change in 1915. Chief Henry Graves established the Branch of Research, replacing the Central Investigative Committee. Earle Clapp, one of the assistant chief foresters, was put in charge of research and remained so until 1935 when he became associate chief (and later served as acting chief through the World War II years).

The Branch of Research at first was composed of three sections: (1) Forest Investigations headed by Raphael Zon, (2) Industrial Investigations, and (3) the Forest Products Laboratory. All Forest Service research except grazing was brought together within the Branch of Research.

Establishment of the Branch of Research was significant because researchers had complained for years that they were denied recognition and independence from National Forest administrators. Thus, Clapp's appointment meant that the chief forester would settle any disputes between the assistant chief forester for research and the other assistant chief foresters. Even after this action, some controversy continued over whether the Washington Office research branch or the District offices should set research priorities. As time went on the drift was toward the Washington Office. Clapp's view was that research should be responsible only to Washington, and that District participation stifled research (Steen 1976).

The associate forester (later called the associate chief) at the time, Albert Potter, was a research advocate. He thought that the research program was the main reason the Forest Service was in Agriculture rather than Interior (Prevedel and Johnson 2005). However, when discussions were held on integrating range investigations with the other research programs, Potter appealed directly and successfully to the Secretary of Agriculture to keep the range studies under grazing administration (Steen 1998).

The United States entrance into World War I in 1917 caused a major disruption for the Forest Service because so many people went into military service. Much of the research program was dropped or curtailed, with the notable exception of war effort research centered at FPL.

Because of the diffuse nature of the research organization and continuing flat funding for research, Clapp in 1921 began to publish his ideas about the need for forest experiment stations. He covered the why, where, what, and costs proposed for this type of research organization (Storey 1975).

Congressional Support

The *Annual Report of the Forest Service* in both 1922 and 1924 cited the research program as lacking focus and recognition of its importance. The reports called for unifying legislation and specific Congressional support (Steen 1976). Congress did, in fact, take some notice of Forest Service research in its passage of the 1924 Clarke-McNary Act. The act added two areas of research: (1) Effects of tax laws on forest perpetuation, and (2) practical methods of protecting standing timber in growing forests from losses by fire and other causes (Storey 1975).

The Office of Grazing Studies in the Branch of Grazing was transferred to the Branch of Research within the Washington Office in 1926, bringing all Forest Service research together. W. R. Chapline, who replaced Jim Jardine in 1920, continued as the director of range research (Storey 1975). Chapline began his career as a grazing assistant under Arthur Sampson at Great Basin, 1913-1914.

Also in 1926, the American Tree Association published a 232-page report, *A National Program of Forest Research,* produced by the Society of American Foresters' committee on research. In the report Earle Clapp outlined what he called an organic act for Forest Service research. Clapp wanted $1 million for the Forest Products Lab, $1 million to be shared by experiment stations, $500,000 for forest inventory, and $250,000 to study grazing. The report included a description of regional experiment stations, among them a Northern Rocky Mountain Forest Experiment Station for investigations of western white pine, larch-fir, and other forests in Idaho, Montana, and eastern Washington and Oregon (Steen 1976).

Priest River—Early Days

1911

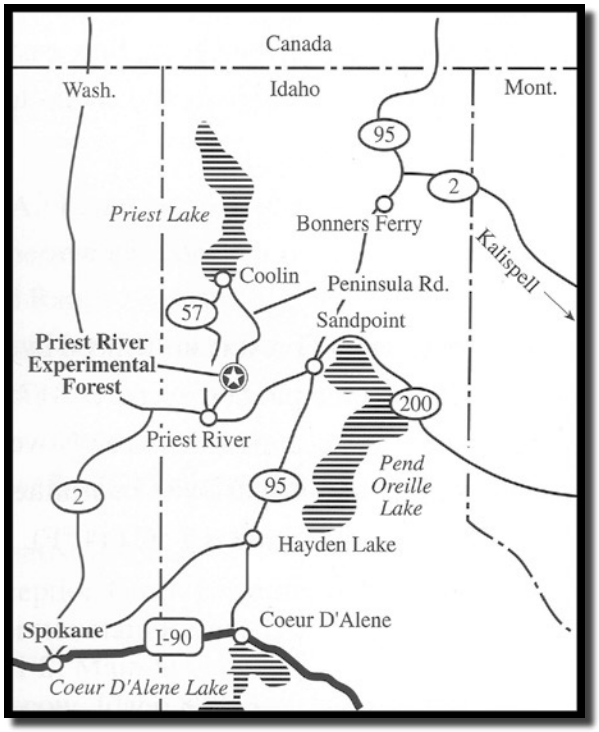
Priest River Experiment Station

Raphael Zon worked with officials of District 1 (later Region 1) to designate the Priest River Experiment Station in northern Idaho, in 1911. The purpose behind the experimental areas in the National Forests was to carry out silvicultural and forest products utilization studies, and develop an appreciation of indirect forest benefits. Model forests were part of the concept for demonstration purposes and as meeting grounds for forest supervisors, rangers, and guards. Priest River was the fourth experimental forest designated (Storey 1975).

It was a busy first year at Priest River. One of the priorities was to clear a site at the Benton Ranger Station in the Kaniksu National Forest. Donald R. Brewster was brought in from the St. Joe National Forest (southernmost of the consolidated Idaho Panhandle National Forests) on a one-month temporary assignment to oversee construction. He pitched a tent at the site and proceeded to go to work.

From September to December, 1911, work crews built a road, completed construction of a laboratory, installed a gasoline-powered electric system, and started some experiments after first melting snow off the ground by lighting bonfires. They even started a greenhouse. Brewster was so successful overseeing construction at Priest River that he was selected to stay on as the first director.

Early in the next year, ranchers from the surrounding countryside gave a "housewarming" for the lab/office building that lasted until 6 a.m. It was reported that about 50 people attended although it is not known if all were still there at the end (Wellner 1976).



Site Selection

All the experimental areas and programs were administered by the Districts in those days, so Priest River was a part of District 1. At that time, District 1 extended from the Lake

The crew that established the Priest River Experiment Station in 1911. From left: Howard Simson, Raphael Zon, W. W. Morris, Ed Brown, Donald Brewster, John Kirk, "Dad" Crosby, and F. I. Rockwell (Wellner 1976).

The first greenhouse at Priest River was not an imposing structure.

States to Washington State and had three types of "forests": (1) Northern, (2) Rocky Mountain, and (3) Pacific Coast. Other experiment stations were conducting research in the Northern and Rocky Mountain forests, so the decision was to locate an experimental forest in the Pacific Coast forest—the Idaho Panhandle.

F. I. Rockwell, in charge of silvics, and R. Y. Stuart, Assistant District Forester for Silviculture for District 1, believed because western white pine was so important that Priest River was the place to locate. Besides, Douglas-fir, larch, ponderosa pine, and lodgepole pine were also nearby in plentiful supply. Zon provided research direction from Washington, and gave major emphasis to nurseries, planting, and natural regeneration studies for the first 2 years. This direction was in response to the 1910 fires that swept across Idaho and Montana. From the beginning, the Station Director reported administratively to Assistant District Forester Stuart, who was in charge of silviculture, but received technical guidance from Zon's Office of Silvics in Washington.

The initial concept for development of Priest River was to create a miniature (4,500 acres) model forest. It was to be financially self-supporting from the sale of the annual timber growth. In addition to providing a place for research, Priest River was the site of an annual ranger training school beginning in 1915. Much time was spent in constructing facilities for the ranger school so the attendees wouldn't have to pitch tents as they did the first few years. Priest River did become a model forest, but it did not become self-supporting financially.

Members of the first families to live at the Priest River Station headed out in 1913 for church services held at the Priest River schoolhouse. Front seat, Julius, Jenny, and Margaret Larsen. Rear seat, Mrs. Donald Brewster with Priscilla and Mrs. Gerhardt Kempff with her son.

Then, as today, Federal procurement regulations had a dampening effect on getting things done in a timely and economically efficient manner. At Priest River, a $650 construction limit per building was in effect, far too little to get the jobs done. That obstacle was at least partly overcome by using the donated time and money of some of the employees. These contributions were recognized by small bronze strips placed in the window frames of buildings. In spite of the obstacles, the Priest River compound was built and could even claim a Forest Service construction first…a cottage containing a **bath tub** (Wellner 1976).

Brewster got a research assistant, Julius Ansgar Larsen, in 1913. Larsen, a Norwegian who had become a U.S. citizen, earned B.S. and M.S. forestry degrees at Yale. Known as "Skipper," he took over as director in 1917 when Brewster left for an assignment at the Forest Products Lab. Priest River also added a full-time District Ranger, Gerhardt Kempff, as part of the Station staff.

Julius Larsen in a climax stand of western hemlock in the Upper Priest River Valley in the early 1920s. His research made him an authority on conifers of the Northern Rocky Mountains.

Larsen was one of the premier scientists of his time. He authored 29 publications covering many topics, and did much to help establish silvicultural research in the Northern Rocky Mountain area. The Larsen family traveled from Montana to Priest River in 1913 by railroad and stage coach. One of the features of the Priest River Experimental Forest—Margaret Gulch—is named for Larsen's daughter.

Most of Larsen's studies at Priest River were concerned with western white pine, but he was interested in other species as well. His investigations included growth and yield, methods of cutting, natural reproduction, and thinning. His publication, *Conifers of the*

This group attended the second annual ranger training school at Priest River, in 1916. For the first two years, the trainees lived in tents. They spent most of the second year's session helping erect buildings to remedy that situation. Each training school lasted about 2 months (Wellner 1976).

Northern Rocky Mountains, was a major reference work in the 1920s.

Like many scientists, Larsen exhibited a high degree of dedication to his work. After several years as Station Director, he apparently felt a need to learn how research was being conducted in Europe. He took 6 months of leave without pay, and, traveling at his own expense, toured forest experimental areas in Denmark, Germany, England, and his native Norway (Baker and others 1993).

Program and Headquarters Changes

In 1914 District 1 was still trying to recover from the fires of 1910. Research emphasis was given to the planting program in the burned-over country near Wallace, Idaho, and to the seedling production program concentrated at the Savenac Nursery in Montana. Brewster started a thinning program near Priest River, and studies of the larch/Douglas-fir type in western Montana. During the first decade of operation, Wellner (1976) estimated the research activity at Priest River was distributed about like this:

Research area	Percent
Planting	45
Cutting methods	30
Thinning	2
Meteorological	8
Growth and yield	3
Tree studies	2
Fire	10

Each District had an investigative committee established to review both research and administrative studies, and to suggest priorities. District 1's committee discussed, in 1916, a suggestion that Priest River begin studies related to the detection and control of forest fires. As a result, a project was begun on "the rate of spread of forest fire and its relation to different weather conditions, site conditions, and variations in cover." Larsen, director and lone investigator at Priest River at the time, began to study the relationship of meteorological conditions to fire hazard and slash disposal related to fire hazard. These studies were the start of fire research in the Station (Wellner 1976). Limits on staff and funds meant that not much else was going on at Priest River at that time.

World War I had curtailed research within the Forest Service, and the post-Armistice period brought no increases in funds or staffing. Priest River was particularly hard hit in 1921. Most of its research funds were lost, so it was kept alive by using District 1's National Forest administration funds for maintenance and protection. To maintain some semblance of bureaucratic fiscal integrity, Larsen was temporarily transferred from his research assignment to work on slash studies so he could be paid. Robert H. Weidman succeeded Larsen as Station Director that year.

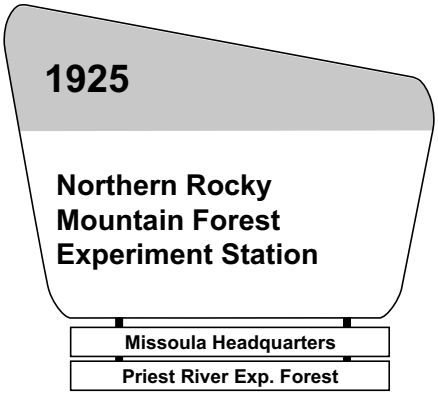
Weidman was skeptical of the concept that Priest River could become a model sustained-yield forest because no constant market for all species and sizes of trees had developed, nor had efficient trucking and railroad transportation systems become available. Nevertheless, Priest River continued to play a significant role in forestry research, education, and demonstrations.

Priest River also continued to be an important experimental site for cooperators and collaborators from universities and other government agencies. Some of this work was on matters of great concern to National Forest managers. In 1922, USDA's Office of Blister Rust Control opened an office in Moscow, Idaho, to deal with white pine blister rust. The rust, in introduced disease, had reached northern Idaho from the West Coast and posed a serious problem. In 1923, the agency moved its Seattle office to Spokane. Close working relationships were established with the Forest Service that lasted until the programs were transferred to the Intermountain Station in 1954.

In an early example of cooperative work at Priest River, Office of Blister Rust Control personnel tested eradication of *Ribes* (an alternate host of the rust) as a control measure in 1923. A crew of 15 men tested complete eradication of the bushes on 1,700 acres in the Benton Creek drainage. A total of 53,555 bushes were pulled (31 per acre) at a cost of $1.91 per acre (Wellner 1976).

In the early 1920s, research activity in the northern Rockies had gone beyond the confines of Priest River. Because of that and common use of a bewildering variety of names, repeated requests were made to Washington for a name change to the Northern Rocky Mountain Forest Experiment Station. During the period 1921-25 the following names were used: The Priest River Experiment Station; Priest River Branch Station; Priest River Station; Forest Experiment Station, Priest River, Idaho; and Priest River Experimental Forest (Wellner 1976). To

Savenac Nursery in western Montana in 1910. The 1910 fires destroyed the nursery buildings, but they were rebuilt the following year. Priest River researcher W. G. Wahlenberg conducted research to improve seedling production at the nursery and enhance planting success. He also did studies of direct seeding. Wahlenberg's work was documented in seven publications in the 1920s.



add to the confusion, the official mailing address of the Priest River Experimental Forest in Idaho was Missoula, Montana. Finally, in 1925, the name change was approved.

The mailing address confusion had started in 1916 when the headquarters of the Priest River Forest Experiment Station was moved to Missoula. Missoula was a natural choice because it was the site of District 1 Headquarters (Wellner 1976).

The Federal Building in Missoula housed the District Office (which later was renamed the Region 1 Regional Office) and also served as the Priest River and then Northern Rocky Mountain Station Headquarters until 1954. The original structure was completed in 1913. It was expanded in 1927, and in 1936 the "Forest Service wing" was added.

Before 1936, Forest Service offices were scattered in various Missoula buildings, as were other Federal offices. After the 1936 construction, all major Forest Service offices were located in the annex and east wing. On a visit in 1936, Forest Service Chief F. A. Silcox expressed "surprise and pleasure at the size of the Federal building and the quarters provided for the Forest Service." The building is on the National Register of Historic Places (Guth and Cohen 1991).

Harry Gisborne fought for and won additional laboratory space for fire research in the new wing of the building. Earlier, he had been able to acquire improved laboratory facilities and equipment at Priest River. Although he devoted considerable energy to seeking construction of an environmentally controlled wind tunnel-forest fuel combustion chamber that he planned in great detail, he was unable to realize that ambition during his lifetime. Gisborne considered this project to have national significance, and wanted it built at the Forest Products Lab in Wisconsin.

Gisborne regarded a wind tunnel-combustion chamber, which was incorporated into the Northern Forest Fire Lab in 1962, as essential to the study of the complex problems of forest fire behavior. He was able to have a small, portable wind tunnel built in the Federal Building by summer student employees. When the Fire Lab wind tunnel was constructed, it almost exactly fulfilled the requirements Gisborne described in 1931 (Hardy 1983).

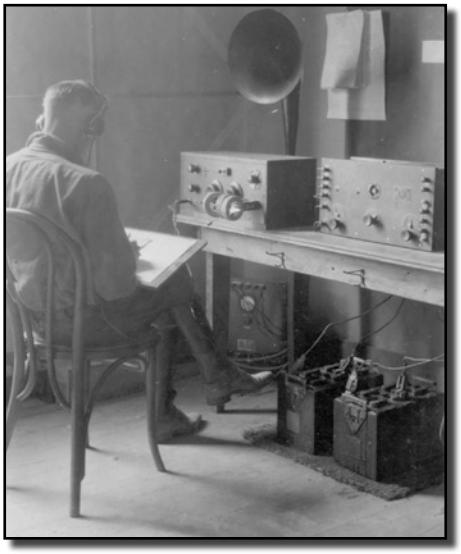
Harry Gisborne gained laboratory space in the new wing of the Missoula Federal Building in 1936. He and his associates also could compile weather data from a station on the roof of the building (Gisborne Collection, 98 (vii): 1188).

Harry Gisborne—Inspirational Leader

They named a mountain for him. They called his career an era. His boss bestowed on him the first top award given in the territory where he worked. The elite in his professional community added him to their memorial. His image presides over his legacy. A master wordsmith saluted him.

Harry Gisborne may have been the most highly honored Forest Service researcher of all time. He earned the admiration of associates during a 27-year career in which he was totally dedicated to forest fire research.

The "Forest Service Wing," photographed in 1938 from the intersection of Pattee and Pine streets, was added to the original Missoula Federal Building in 1936. This wing housed Northern Rocky Mountain Station headquarters until 1954.



Harry Gisborne getting information over his prized radio receiver at Priest River, 1924. The transmitter is at the right (Hardy 1983). Gisborn tested the ability of the equipment to receive weather reports and forecasts as part of his fire-weather research.

In 1922, Gisborne became the first full-time fire scientist assigned to the Priest River Forest Experiment Station. Forest Service Assistant Chief Earle Clapp had personally arranged for the assignment (West 1990). His forest fire research project started modestly. Funds were increased from $12,275 to $18,920 per year at Priest River in 1923 to provide for Gisborne's program.

Before Gisborne's assignment to Priest River, forest fire control had been studied only piecemeal. He was the first full-fledged student in this field (Wellner and others 1951) and thus often is referred to as "the father of forest fire research." Gisborne intensely believed that fire control had to have a scientific basis. His enthusiasm and imagination inspired his fellow workers, and many outstanding contributions to fire science were made under his leadership.

Mike Hardy, who spent two decades refining the fire danger rating system that Gisborne considered his greatest achievement (see "Fire Danger Rating Goes National," chapter 10) told how the legacy of the pioneering fire scientist inspired him in the preface to a national publication he wrote titled *The Gisborne Era of Forest Fire Research*:

> Like a second-generation laborer on a monumental cathedral, I found myself continuing a work begun by a great designer. In the case of the fire danger rating system, indeed of much of our approach to research on forest fires, the architect whose creativity inspired and guided all who followed him was Harry T. Gisborne. Much of what we know today about the origins and behavior of forest fires is his legacy. And the fire danger rating system, although repeatedly modified over the years (as he desired that it should be), is Gisborne's own monument (Hardy 1983).

By all accounts, Gisborne had great imagination and ingenuity. He was also described as an outspoken man not easy to work with or for, given to argumentation and sarcasm. But the same people also note that Gisborne inspired devotion and had a knack for selecting good people (Kingsbury 1991).

George Jemison was an example of Gisborne's ability to judge the talents of people. Jemison was Gisborne's first full-time professional employee at Priest River. He went on to become Director of the Northern Rocky Mountain and Pacific Southwest Stations and finally Deputy Chief of the Forest Service for Research. Gisborne also hired Lloyd Hornby, who pioneered work on efficient planning for fire attack facilities and manpower, and Jack Barrows, who introduced bold, high-tech approaches to fire research (see "Fire Research Takes off with Barrows," chapter 6).

Was Gisborne really a difficult person? In a document describing "The Gisborne Era" that was more detailed (and more interesting) than his national publication, Hardy (1977) included a series of statements by people who worked with Gisborne that reflected his philosophy and personality. What emerges is a portrait of a complex, extremely dedicated, yet fun-loving and sensitive individual.

Gisborne displayed his work philosophy in a 1948 note: "To some people advancement in pay or position is a controlling guide for all their actions. To them doing good work is secondary when they can get the advancement without doing good work… To others this order is reversed. The control of all their actions is to do a good job. If from this they obtain advancement they are more pleased, of course, but they are satisfied with having done a necessary or helpful job and done it well."

Apparently, Gisborne not only set high performance standards for himself, but insisted on high-level performance from those around him, sometimes down to the details of a job. Barrows said, "He was an absolute stickler for people using and maintaining instruments correctly. He would really get upset when people mishandled equipment—weather instruments in particular."

In some cases, Gisborne appeared somewhat insensitive to the needs of fellow employees. He vigorously opposed granting time off for two daily breaks and wrote to Senator Mike Mansfield protesting the trend to grant 30 days vacation with pay (for the most senior Federal employees). He also objected to Federal employee unions. Yet after reading an article critical of the motivation of Federal employees, he wrote to the editor: "Having worked for the Government in forest research ever since the first world war, I want to assure you that incentive does *not* go out the window when you enter Government service nor is it damped, diluted, or destroyed by such service."

Gisborne published what was probably the first written scientific description of a forest fire explosion (Shearer and Kempf 1999). It is a rather dramatic account that provides some insight into the complicated personality of the author. Gisborne concludes the article with a sensitive portrayal of the fate of several animals that died in the explosion (Gisborne 1929). A man devoid of feelings for other creatures could not have written that passage.

Gisborne, known as "Gis" to his associates, also had a lighter, humorous side to his nature (Hardy 1977). A. A. Brown said, "Harry's lively sense of humor was one of his saving graces. He was thoroughly delighted in nominating some visiting forest officer to their 'Numbskull Club,' for which he was eligible if he pulled a big enough boner. Harry and his associates would exaggerate a little slip to the point where he would become eligible."

Gisborne was as frank in his publications and official memos as he was in conversation. He made these comments critical of what was to become the Forest Service's long-standing "10 a.m. policy"—control every fire by 10 a.m. the day after discovery—in an article titled "Mileposts:"

> The so-called 'Forester's' policy of control by 10 a.m. (issued 1935) undoubtedly rates either a milepost or a tombstone. If and when that policy becomes clearly recognized as a temporary expedient, I believe that it will rate a milepost. If, however, it has already become or ever does become the death knell of all previous objectives based on damage, then it rates a tombstone executed in the blackest of black granite. Fires can be caught small and cheaply, often more cheaply, *without* controlling them by 10 a.m. tomorrow. If one function of research is to assemble and array all the significant facts, it seems more than possible that it might contribute something here.

Gisborne established three research priorities: (1) Measuring and forecasting fire conditions; (2) assessing the relationship between lightning and fires; and (3) forecasting rainfall and other fire-weather conditions. Later, in 1930, he began work on a fourth line of research—statistical analysis of Region 1 fire records to determine speed and strength of attack needed to successfully control fires in each important timber and fuel type in the Region (Wellner 1976).

Gisborne set up fire-weather stations in the Kaniksu, Clearwater, and Nez Perce National Forests in northern Idaho in 1922. He discovered that evaporimeters, which were supposed to predict evaporation for the next day, had no value. He learned that relative humidity of air is not a good index of moisture content or inflammability of duff and other forest materials, but that temperature is an important variable in moisture content. Most important, he concluded that there was no single factor that could be used to measure or predict forest inflammability. One important factor was moisture content in the duff on forest floors. In 1923, Gisborne and Forest Products Lab scientist M. E. Dunlap developed and tested the first duff hygrometer to make the necessary measurements (Rocky Mountain Research Station 2004). In 1928, Gisborne published the first technical report comparing duff and wood moisture content with various weather elements.

Gisborne also came up with an idea for an inexpensive instrument to measure windspeed, a vital factor in predicting fire spread rates. A local plumber made 160 of the devices. Each was a bit different and had to be individually calibrated. One at a time, Jemison mounted the gauges on the front of his car. As his wife drove at 5, 10, and 15 miles per hour, he lay on the fender and counted revolutions. Jemison said of this imaginative approach, "it was primitive but very effective compared to other methods" (Steen 1998).

In studies of the lightning-forest fire relationship, Gisborne analyzed nearly 15,000 storms over 5 years in three Forest Service Regions and British Columbia. His study resulted in improved levels of protection from lightning fires by increased surveillance, knowledge of the difference between a "fire-starting" storm and a "safe" storm, and more accurate forecasts of storm occurrences.

Forecasting rainfall turned out to be a very difficult task. Yet, working with the U.S. Weather Bureau, Gisborne developed a statistical method of showing the relative probability that a given spring or summer would be wetter or drier than the previous one. In 1925, he announced creation of a system for predicting rainfall monthly from April through September, based on 44 years of precipitation records (Kingsbury 1991).

Gisborne created a small cardboard envelope with windows and two slides in 1932—the first fire danger meter. It was designed to liberate managers from the time-consuming tasks of consulting numerous charts to get an estimate of the level of fire hazard in the forests under their care. Gisborne and his staff at Priest River also designed a visibility meter to help gauge fire danger. Visibility was one of the multiple components of the early fire danger rating system.

Other developments followed. To meet the need for integrating the new tools into action programs, Gisborne initiated the never-ending process of fire-control planning. Emergency

Harry Gisborne using one of the atmospheric visibility meters he and his staff designed in 1935 as a fire danger indicator. (Gisborne Collection, 98 (vii): 49)

program funds during the great depression helped by supporting major projects in fuel type mapping, seen-area mapping, and transportation planning. These and other studies in fire behavior, including the effect of topographic slope and aspect, ultimately resulted in tables giving the relationship between rate-of-spread and resistance-to-control of ongoing fires (Hardy 1977).

All of Gisborne's projects were conducted with considerable coordination with knowledgeable field foresters. Because they participated in planning, and sometimes conducting, the research, results were readily accepted and generally put into practice. Wellner (1976) said, "At every step of the way he worked with land managers. He focused his research on critical problems of fire control…He worked with the Weather Bureau to get better forecasts but set up stations on National Forests to supply information that would improve forecasts. By the time he developed his first fire danger meter in 1932 he had worked with the National Forests to establish fire danger stations to measure key factors. They were able to use the danger meter immediately."

Despite the successes, the heyday of fire research in "The Gisborne Era" ended in 1938 (Hardy 1983). Allotments shrank, emergency crews and budgets vanished, projects were terminated and vacancies went unfilled. A series of easy fire years reduced the Forest Service's interest in fire research. Gisborne found this period distressing. Once again he had to do most of the work alone. Despite the lack of a

large organization to help, Gisborne continued effective fire control research. In 1947, the Secretary of Agriculture gave a Superior Service Award to Gisborne. He was the first individual in the Northern Rocky Mountain territory to receive that honor.

World War II brought most Forest Service research to a near-standstill, and Gisborne's studies were no exception. Gisborne turned his attention to planning, and in 1944 prepared a detailed analysis of major research areas he believed needed action to support reaching regional and national goals of adequate fire control at the least cost. His personal planning included ambitious goals, as usual. He said in a memo,

> "I want to keep my eye on the ball—the two main balls are fire danger rating and fire control planning—and, if possible, to have these two big projects neatly packaged and pretty well sewed up by the time I retire… I have to hurry and keep my eye on the ball or I will not make it."

Gisborne did not make it. In 1948, he said, "I am nearing the end of my official work for the Forest Service. I expect to retire at age 60. These five years will be gone before I clean up my work" He was to have less than one year.

On August 5, 1949, a forest fire roared up Mann Gulch, near Helena, Montana, killing 13 of the 16 firefighters (all but one were smokejumpers) on the scene. Mike Hardy (unpublished text of talk) described Gisborne's involvement in a tribute titled "The Fourteenth Victim?"

Hardy said Gisborne was involved in a cloud-seeding study and couldn't go to the fire, but he immediately began asking detailed questions about it and developed a theory about how it happened. The Chief of the Forest Service wanted complete information, and Gisborne went to the area on November 9. Northern Rocky Mountain Station Director Charles Tebbe said, "Harry is not a young man…he had a heart condition and knew it…Reluctantly I approved the trip but on condition that he made it and the inspection of the area and the fireline by jeep."

November 9 was a rainy, miserable day. Gisborne and Bob Jansson, the District Ranger, went to the fire scene

Retired fire scientists Mike Hardy (left) and Art Brackebusch paused after the dedication of the Wildland Firefighters Memorial in Missoula to remember the man who inspired their careers.

nevertheless. The jeep was not able to carry them as far as they wanted, and disregarding Jansson's cautions, Gisborne insisted they go the rest of the way on foot. Gisborne promised to stop every 100 yards or so to reduce stress on his heart. He took copious notes and was excited to learn that the evidence completely disproved his theory about how the fire developed. Late in the day the pair took one last breather near the river on their way back to the jeep—Gisborne's heart stopped beating there.

An important period in Priest River and Northern Rocky Mountain Station history came to a close with Gisborne's death, but his many associates made sure he and his work would not be forgotten. In 1951, a dedication ceremony was held on the summit of Looking Glass Mountain at Priest River to rename the peak Gisborne Mountain. The plaque placed there read, "Harry T. Gisborne, 1893-1949, inspiring, enthusiastic, far-seeing pioneer in forest fire research." Appropriately, the fire lookout at Priest River also was renamed for Gisborne.

Chuck Wellner, a colleague and friend for 15 years, took it upon himself to preserve Gisborne's papers and records. In 1982, Wellner presented the collection for safekeeping to the University of Montana's Mansfield Library. It includes 321 published and unpublished manuscripts, photos, scrapbooks, official and personal correspondence, and taped interviews (by Mike Hardy) with former associates.

An oil portrait of Gisborne by Intermountain Station artist Bryan Owen hangs in a prominent position at the Fire Lab, overlooking the entrance area to the modern facility that was one of his dreams. Having labored in a primitive laboratory at Priest River, Gisborne was a constant advocate of better physical facilities in which to perform fire research.

Gisborne was accorded an honor that might have pleased him above all others, given his interactions with firefighters and fire control managers over many years. The smokejumpers were considered an elite group within the Forest Service fire organization, reluctant to accept others into their fraternity. In 1999, Robert Sallee, the only living survivor of the Mann Gulch Fire, unveiled a bronze plaque in the Merriwether Picnic Area in Missoula that depicted a smokejumper's jacket and helmet. In his remarks, Sallee recognized Gisborne as the 14th victim of the fire (Graham 2004).

The ceremony was in recognition of the 50th anniversary of the fire. Forest Service Chief Mike Dombeck and Montana Governor Marc Racicot hosted the event. The site features a small hill and rock wall built to resemble the scene where 12 smokejumpers and a forest guard died. Engraved stones represent the places where their bodies were found. Just over the hill is a marker in remembrance of where Gisborne died (*INTercom* June/91).

Noted author Norman Maclean wrote eloquently about the events before, during, and after the Mann Gulch fire in a best-selling work (Maclean 1992). The book includes a dramatic description of Gisborne's death at the fire site. Maclean's research apparently caused him to form several firm opinions about the value of Gisborne's pioneering and his standing in the fire community.

Maclean called Gisborne "the man above all others who made the study of fire a science." Referring to District Ranger Jansson, the author said, "To Jansson, Gisborne was an idol, as he was to nearly all those who first approached the study of forest fires scientifically, and as he is to some of us still living."

Marshall Hikes Into History

Bob Marshall came to Priest River in 1925 as a junior forester in silvicultural investigations, the year the experimental forest became a unit of the Northern Rocky Mountain Station. Marshall was raised in wealth on Park Avenue in New York. He acquired a taste for the out-of-doors playing "explorer" on the family's summer estate in the Adirondacks. He worked in the Northern Rockies for a relatively short time.

In June 1928, Marshall began a Ph.D.program in plant physiology, which he completed at Johns Hopkins University in 1930. He continued to be employed by the Station during that time; an early personnel record shows him with the Northern Rocky Mountain Station until 1932. Marshall is remembered today as one of the founders of the Wilderness System on Federal lands (West 1990).

Most of the research at Priest River during Marshall's stay centered on western white pine. Marshall worked on all aspects of white pine studies, including methods of cutting, reproduction, intermediate cuttings, yield, reforestation, and fire. As part of the fire research, he traveled to remote lumber camps and Ranger Stations, which more than satisfied his needs for solitude. His work involved the detailed study of how trees grew back after fire or logging operations. Counting seedlings and collecting data on sunlight, soil composition, slope, logging debris, ground cover, and other variables consumed his time. He wrote seven research reports during his service at Priest River (Graham 2004).

A few years after completing his studies at Johns Hopkins, Marshall was rehired by the Forest Service to write the recreation section in the *National Plan for American Forestry*, the 1933 "Copeland Report." In that report, Marshall foresaw a need to place 10 percent of all forest lands in the United States into recreational areas, ranging from large parks to wilderness areas to roadside campsites (West 1992). To ensure that citizens would monitor public agencies' protected sites, he helped found and fund the Wilderness Society (his initial contribution was $1,000). Marshall had earlier worked as chief forester for the Bureau of Indian Affairs, where he supported maintaining roadless areas on reservations. He returned to the Department of the Interior when he finished the recreation report for the Forest Service.

In 1937, Marshall became chief of the new Division of Recreation and Lands in the Washington Office of the Forest Service, where he drafted regulations giving greater protection to wilderness areas by banning timber cutting, road construction, summer homes, and even motorboats and aircraft. He also checked plans for recreational development in National Forests to see if they included access for lower income groups, a real concern during the years of the Great Depression.

Marshall died at the age of 39, two years after his appointment as recreation chief. An eccentric and a maverick, Marshall was famed for both his vigorous 40-mile hikes and his radical political opinions. Unable to endure the constrictions of working

Bob Marshall observed tree seedlings in 1927 at a burned-area study site in the Kaniksu National Forest.

A Code That Changed

Most photos of Bob Marshall show him in hiking attire. But he was pictured resplendent in coat and tie in about 1926 while a member of the Northern Rocky Mountain Station staff. Early researchers in office settings usually were pictured dressed in uniforms or coats and ties. The female office workers were shown wearing conservative dresses or blouses and long skirts.

Dress codes were a part of Station culture that changed dramatically over the years. Although dress became more casual much earlier at Labs, most men working at Intermountain Station Headquarters in professional or administrative jobs wore ties until the early 1980s, and some did after that. Women continued to dress conservatively through the same period. By 1990, dress had become very casual everywhere within the organization, except for very special occasions.

Bob Marshall in mufti while working about 1926 as a Northern Rocky Mountain Station silvicultural researcher. His usual "uniform" consisted of boots and rough shirt and trousers for outdoor work or hiking.

within the bureaucracy, he had planned to resign from the Forest Service, but then suffered an unexpected fatal heart attack while aboard an overnight train from Washington, DC, to New York City (West 1992). Marshall left one-third of his estate, nearly $500,000, to the Wilderness Society.

"He was a good scientist and things that he put in the records were correct, but kind of a mess and not systematic," said Chuck Wellner in a 1991 interview (*INTercom* Oct./91). Wellner, who knew Marshall, started his career at Priest River shortly after Marshall left. He took over research on some of the projects Marshall had started.

Marshall believed that 80 percent of American forests in private ownership would be destroyed for short-term profit unless they were nationalized. He also thought workers in the lumber industry were being exploited by their employers, and was not bashful about saying so in public. Wellner recalled that Forest Service scientists who had worked with Marshall never criticized him for his political beliefs, even when they disagreed.

Marshall had many liberal friends and associates and when Forest Service Chief Ferdinand Silcox appointed him as the first Director of Recreation and Lands, he had an opportunity to apply his philosophies to civil rights matters. Marshall learned African-Americans were not welcome in many campgrounds in the South. It was common elsewhere for resorts holding permits to operate on National Forest lands to advertise that "people of the Jewish faith are not accepted." Marshall's father was a Jewish immigrant. Marshall succeeded in getting a clause added to special use permits prohibiting discrimination, but failed to end the *de facto* segregation in southern campgrounds.

Left to right, Station Ranger Gerhardt Kempff, pioneer fire scientist Harry Gisborne, Station Director Robert Weidman, and scientist Bob Marshall pose with a Forest Service truck at Priest River in 1928.

Marshall also fought for the civil rights of government employees. In a letter to the Washington Post he wrote: "I can not conceive why any person working for the public must accept an inferior position as a citizen to one who received a salary from private enterprise. The real danger to American institutions and American democracy will come, not when government officials participate as citizens in the democratic determination of policies, but when a large body of American citizens who are government workers become permanently muzzled" (Glover 1986).

Marshall's outspoken activism won him the distinction of being one of the first eight out of 1,121 Americans investigated by the House committee probing un-American activities. Forest Service Chief Silcox was another of the first eight victims of what became known as "McCarthyism," after Wisconsin Senator Joe McCarthy who chaired the Senate committee conducting the same sort of investigations.

Years later, Chief Richard McArdle got the opportunity to review the FBI's records from their investigation. "I never found anything to prove or even hint that Bob Marshall wasn't absolutely loyal to the U.S.A.," McArdle said (Glover and Glover 1986).

The Wilderness Act of 1964 gave the Bob Marshall Wilderness in northwestern Montana statutory recognition. The million-acre wilderness includes parts of the Lolo, Flathead, and Lewis and Clark National Forests. "The Bob" is often referred to as "the crown jewel" of the Wilderness System.

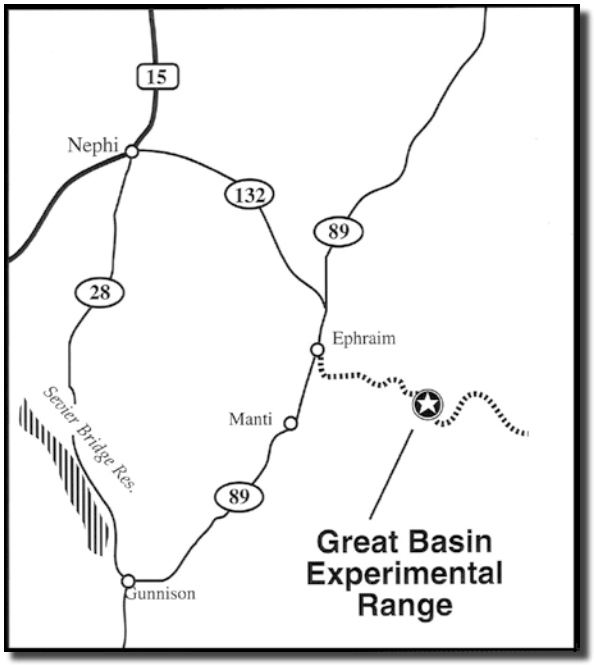
Great Basin—Early Days

1912

Utah Experiment Station

In Utah and Idaho, administrative studies on grazing and related watersheds had begun several years before the establishment of the Utah Experiment Station. Because of the heavy grazing use, studies on methods of seed collection, eradication of poisonous plants, and methods of range examination were expanded. In the Sawtooth National Forest, studies were under way showing how natural regeneration of range could occur by excluding sheep. Range seeding trials also were undertaken. District Forester Clyde Leavitt probably supported the regeneration studies because he thought the real purpose of the National Forests was to grow trees and that sheep interfered with that (Alexander 1987).

Because the development of range research in the Forest Service was a function of the Office of Grazing Studies, Raphael Zon wasn't involved in the site selection for the Utah Experiment Station. Instead, the site was selected by A. E. Sherman, the District Forester of District 4, Homer Fenn, V. R. Reynolds, and Manti National Forest Supervisor A. W. Jensen. The four men got into a horse-drawn buggy and checked out the Nebo area, then Fairview Canyon, then Bluebell Flat, then Kenore Tom's Dugway, and settled on a site at 8,850 feet elevation along the west slope of the Wasatch Plateau near the town of Ephraim.



This tent, pictured in the spring of 1913, was the first dwelling at Great Basin.

Arthur Sampson, who with Jim Jardine, had already been engaged in Forest Service range research in Oregon, was named director of the Utah Experiment Station in 1912. Construction moved at a slower pace than at Priest River thanks to both constraining high-elevation weather conditions and Congress. Appropriations for fiscal year 1913 were to be passed by July 1, 1912, but Congress was slow to act and by the time the bill was passed it was too late in the season to start construction. Work began in the late spring of 1913 after snow melt allowed horse-drawn wagons to haul lumber and other building supplies up the mountain side from Ephraim.

Early studies at the Utah Experiment Station included:

- Effect of grazing on aspen reproduction
- Natural revegetation of seriously overgrazed lands
- Soil acidity related to artificial range reseeding
- Growth and yield of aspen
- Erosion and stream flow
- Effect of grazing on water quality

By the end of the summer of 1913, the director's house, lab building, barn, and fences were completed, and an assistant's house was started. The fences were needed to protect the grounds and some experimental areas from being overrun by livestock. Director Sampson's first annual report devoted more than 20 pages to describing the completed work and explaining what other improvements were needed in the immediate future. At the end of the next summer, the assistant's house was finished along with blacksmith, carpenter, tool storage, wood storage, and cistern facilities (Keck 1972).

Because heavy snows limited use of the site to the period of late spring to early fall, the staff at the Station moved to District 4's headquarters in Ogden for the late fall and winter months. Thus the staff had the use of government housing for the summer, but most had to negotiate rental housing for the remainder of the year. It was an annual process that undoubtedly added to life's difficulties for the Station's staff and their families.

Ogden, in 1908, had been selected as headquarters for District 4 and as the supply depot for all six Districts of the Forest Service. Ogdenite Fred J. Kiesel had offered to construct a building at the corner of Lincoln Avenue and 24th Street, to house both the supply depot and District 4 headquarters. While waiting for that development, Clyde Leavitt, the first District Forester, operated out of temporary quarters at the First National Bank Building on Washington Boulevard. This is the current site of the Weber Center, a county and commercial office building. As a major railroad center, Ogden was a natural pick for the supply depot location (Alexander 1987).

With a total annual budget of just over $9,500 for research on forest management, growth and yield, erosion, fire, economics, and forest products, one must surmise that the research coverage in these areas was rather thin. District 4 was spending about $4,400 on administrative studies at the same time. Some collaborative research was in evidence. For example, the Station, the District Office, and the Union Pacific Railroad were involved in service tests of treated and untreated railroad ties (Annual Report, UES, 1913). However, collaboration and coordination among research and administrative studies did not appear to be the rule.

Arthur Sampson—Father of Range Management

Arthur Sampson was a fine scientist, extraordinary teacher, and the architect of early studies of range and watershed ecology that over many years provided the basis for huge improvements in western land stewardship. He is often referred to in the world literature as "the father of range management."

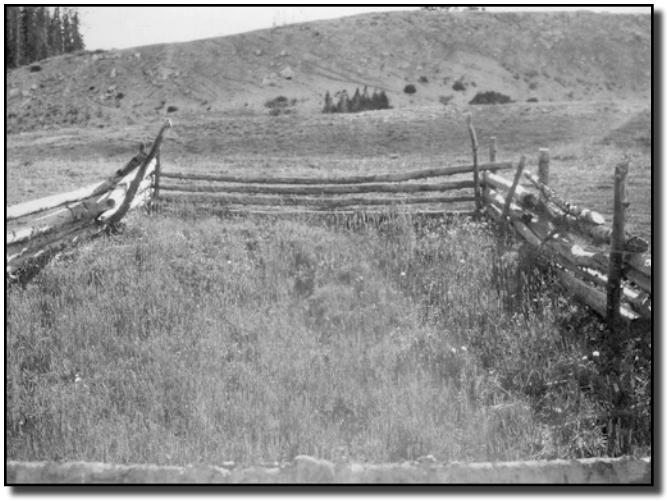
Sampson was the first range ecologist hired by the Forest Service. He and Jim Jardine, who was appointed head of the newly created Office of Grazing Studies in 1910, conducted grazing research beginning in 1907 in the Wallowa National Forest in Oregon (West 1992). Sampson was appointed the first director of the Utah Experiment Station in 1912. Known to his associates as "Sammy," he displayed a wry sense of humor throughout his life. Excerpts from a 1936 letter recalling the experiment station establishment (*INTercom* Jan./Feb.91) are an example. Emphases are Sampson's:

> In the spring of 1907, Mr. Albert F. Potter, then Chief of the Branch of Grazing of the Forest Service…induced the Secretary of Agriculture (James Wilson) to appoint two men to solve vexing range problems with a view to clearing up *immediately* and *forever* all administrative difficulties. The very best men available in the *world* at that time were, of course, James T. Jardine and your humble correspondent; as a matter of fact, these selections worked out to a 50 percent batting average (which is considered good even today with the more exacting Civil Service machinery for appointment); for "Jim" Jardine is now one of the most prominent and influential officers in the U.S. Department of Agriculture.
>
> Although by 1911 we had succeeded in solving *all* the intricate range problems that handicapped administrators in the North West, our first detailed work being done in Eastern Oregon, a few trifling questions remained to be cleared up elsewhere. In other words, the time had arrived for the location of a place where one could "hang his hat" and initiate really fundamental work…

Sampson (right) and an unidentified assistant posed for this picture to poke fun at the living and working conditions in the early days at the Utah Experiment Station (*INTercom* Sept./93), and perhaps as a way to urge District authorities to accelerate construction of improvements. The humorous approach may have worked. By the end of the next year a director's house was completed.

Sampson "hung his hat" for a decade at what became the Great Basin Station. He scored some important firsts in range science. He was the first to promote deferred and rotational grazing strategies (Keck 1972). He also was the first to develop usable concepts of indicator species and plant succession for managers to quickly evaluate range condition.

Even before building a place to live at Great Basin, Sampson built grazing exclosures. He then mapped "quadrat" plots both inside the exclosures and outside in grazed areas to document the plant composition and amount of bare soil. Range scientist Steve Monsen



Timothy was growing well in 1924 in this exclosure built in 1912 by Arthur Sampson to compare grazed and ungrazed areas at Great Basin.

Arthur Sampson earned renown as a professor of range management at the University of California-Berkeley.

(*INTercom* July/90) said, "Sampson was a true ecologist." Monsen described how each exclosure, built at a specific elevation, was tied to a climate station that recorded weather data for the site. He added that Sampson started some of the first range phenology, or plant development, studies correlated with both elevation and weather patterns. The sites were useful in studies of watershed reclamation as well as range revegetation, and continued to have application to modern research on climate change (Tippets and Anderson 1991).

Sampson didn't waste much time in getting to work. The first of more than 100 scientific publications he wrote during his career came out just 1 year after he joined the Forest Service. The last appeared in 1963, more than a half century later. Despite his interest in fundamental research, Sampson's first goal was to develop practical range evaluation methods useful to managers. The "indicator species" concept for evaluating range condition was one of his contributions to reaching that goal. From lengthy descriptions of what Sampson saw as four stages of plant succession, the more simplistic classifications of "excellent, good, fair, and poor" range conditions evolved (Rowley 1985).

At Great Basin, Sampson's studies fit three categories: (1) production of maximum forage through artificial and natural seeding; (2) utilization of forage by livestock without undue damage to vegetative reproduction and watershed conditions; and (3) securing the greatest grazing efficiency per unit area, including herding methods, water development, and poisonous plant research (Kingsbury 1991b). He initiated the A and B watershed study (see "Wisdom Flows from Watersheds," chapter 7) in 1912. This paired-watershed experiment was the first of its kind to demonstrate that herbaceous vegetation can profoundly affect storm runoff and erosion—a hydrologic fact that most livestock grazers, many engineers, and some foresters had been unwilling to accept (Chapline 1967).

Local historian Albert Andrei (1993) said Sampson was a familiar figure in both the Sanpete and Sevier Valleys near the experiment station. Among his activities were racing horses and wrestling professionally at county fairs. Andrei reported, "Local recollections of him have been generally friendly, and it has been said, the ladies in Ephraim were not unaware of him."

Not everyone in the Forest Service was on good terms with local residents during the early days of the Manti National Forest and Great Basin. The local people had some difficulty relating to new, non-local forest officers, especially when they were in the difficult position of carrying out policies that restricted stockmen's privileges. The reaction to scientific investigation was somewhat similar. Most citizens referred to Station workers as "grass counters" in jest or contempt (Antrei 1971). Antrei said that when stockmen took "pot shots" at a technician just for sport, one of the riflemen said later, "We just wanted to see how fast he could run."

Sampson had a lifetime interest in athletics and physical fitness (see "Tough Guys (and Gals) Do Research," chapter 11). At the University of Nebraska where he studied botany and plant ecology and received B.S. and M.A. degrees, he boxed and wrestled and lettered in track for three years. Four years after graduation he won a track medal in a race at Georgetown University (Parker 1967). He continued his athletic endeavors while pursuing post-graduate studies at the same time he was leading research at Great Basin. He was awarded a Ph.D. in plant ecology and climatology by George Washington University in 1917.

As a graduate student, Sampson once had a job that entailed a weekly 7-mile hike and a 3,000-foot climb up a mountain to change the record sheet on temperature recording instruments. It must have been good training; later he broke a record for sprinting to the summit of Pikes Peak (Kingsbury 1991b).

Apparently, Sampson couldn't resist a natural impulse to teach. He even taught the local pea growers near Ephraim the value of pea silage as cattle feed. Until he demonstrated that, the farmers of Sanpete County had been disposing of the ill-smelling stuff as quickly as possible (Antrei 1993). During his last years at Great Basin, Sampson gave short courses in range management at the universities of Nebraska, Syracuse, and

Cornell. Those assignments whetted his appetite for teaching (Parker 1967).

Sampson didn't stop his research, but he switched his emphasis to teaching in 1922 when he accepted an appointment as Associate Professor of Forestry at the University of California, Berkeley. There he became the first to teach a regular and continuing course in range management. He also was among the first to use lysimeters to determine the amount of water-soluble matter in soil, grow grasses in phytometers in different soil horizons, grow grasses in nutrient solution to determine effect of various levels of defoliation, and study the movement of carbohydrates in range forage plants (Parker 1967).

Sampson's *Range and Pasture Management*, published in 1923, was the first comprehensive textbook on range management. He wrote three more textbooks. One was the first on range plants. Another was the first text on range animal husbandry. Sampson became a full professor in 1936 at Berkeley, and served the school until his death in 1967.

Sampson retired in 1951, but as Professor Emeritus he continued to maintain regular office hours. His research, before and after retirement, was concentrated on the role of fire in the ecology of California brushlands. He also continued studies of forage growth and the impact of grazing, and researched methods of controlling undesirable plants. During his retirement years, Sampson devoted a great deal of time and energy to preparing scientific statements used to promote sound public policies for the management and conservation of natural resources (Krueger and others 1968).

Parker (1967) said Sampson's "sense of humor was great, but a 'salty' story always had to have a point He would often relate these stories with serious mien as a personal experience, much to the amazement and disbelief of the listener. He always had an anecdote in store for the campus policeman, the janitor, or whoever he thought might appreciate it."

There also were stories aplenty about "Sammy" among former students and associates. One said he was so wrapped up in his teaching and research that he was inclined to be absentminded. His apartment was close enough so that he usually walked to his office. He once reported his car as being stolen from his garage, and the police advised him it was parked on the street where he had left it, with seven overnight parking tickets! (Parker 1967).

"Sammy" was said to have an intense interest in the lives, welfare, and future prospects of students and associates. He was known as a "soft touch" for temporary loans. He was adept at finding jobs for needy students; it was said he occasionally found a "job" that had few or no duties if the student desperately needed income. Sampson pitched horseshoes in contests with his students behind the Forestry School Building.

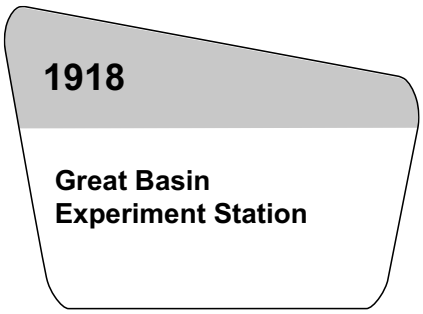
Sampson's accomplishments were recognized in many ways. He was elected a Fellow of the Society of American Foresters, voted a Certificate of Merit by the Society for Range Management, given the fifth Eminent Ecologist Award by the Ecological Society of America, presented with a Distinguished Service Award by the American Forestry Association, and declared a Distinguished Alumnus by the University of Nebraska.

After Sampson's death at age 82, to encourage students to study range management or related subjects, his friends established the Arthur W. Sampson Scholarship at the University of California.

Direction and Name Problems

The Investigative Committee annual report for 1917 cited a definite lack of centralization of research responsibility in the District 4 office: "It was demonstrated repeatedly that detailed research work cannot be conducted as an adjunct to regular administrative work." The proposed remedy was to assign a forest officer to the District Office having direct supervision over all work falling under the Branch of Research. Remember that both Utah Experiment Station Director Sampson and the work at the Station were guided by the Branch of Grazing in Washington, not the Branch of Research. The various National Forest staffs and District 4 office personnel were frustrated in their attempts to get both administrative and research studies accomplished and coordinated among the units.

Limitations at the Utah Station were reflected in proposals to establish silvicultural research in central Idaho under a proposed Idaho Experiment Station, because the Utah Station's high-elevation location was not well situated for ponderosa and lodgepole pine silvicultural studies. Under this concept, a central laboratory for soil analysis, seed testing, and other physiological work was proposed. This was at a time when Sampson was still hoping for an electric powerline hook-up for the Utah Station (Annual Report, UES, 1917).



Just as Priest River had problems with its name in the early years, so did Sampson's Utah Experiment Station. In Utah, the name was changed to the Great Basin Experiment Station because of confusion with the Utah Agricultural Experiment Station at Utah State Agricultural College in Logan. It subsequently was known as the Great Basin Branch Experiment Station (1918-1947), Great Basin Research Center (1947-1970), and Great Basin Experimental Range after 1970. Sampson's staffing situation wasn't much different than Larsen's at Priest River. In 1913, he was the only year-long employee, aided by three temporary assistants and one permanent assistant during the field season (Keck 1972).

The end of World War I in 1919 negated a war-time plan to curtail Sampson's research and send him out to work on depleted rangelands. The plan was to have him stimulate application of plant indicator work as a measure of range quality. Sampson made use

of the annual report that year to chide the District 4 administrative staff for giving him property without telling him about it first. Apparently, the District 4 office staff had assigned him 5-gallon water bottles for which he said he had no use, soil augers that didn't work, and rain gauges of which he had too many (Annual Report, GB, 1920). Researchers and administrative staff people had their minor tiffs throughout Station history.

On a more positive note, 1919 also saw the issuance of the first comprehensive report on range management. The report said the Forest Service had the best model range management program of any organization in the country.

Ponderosa pines that looked healthy, but would not reproduce, were planted by Great Basin researchers about 1915. This photo was taken from the Ephraim-Orangeville road in 1970 (Keck 1972).

Plantings Fail to Take Root

Administrative studies often failed to produce benefits of lasting value. District 4 opened a number of small tree nurseries in the early days and made numerous trials of planting seedlings. Results were not good and, in many instances, costs were considered excessively high. By the end of World War I, the District administration, realizing that it did not know how to plant trees successfully, closed its nurseries (Alexander 1987). By 1923, reforestation had virtually come to a halt in District 4.

Experimental reforestation work, however, continued. In the early 1930s the administration, now renamed Region 4, began working in cooperation with the Intermountain Station to try to find effective methods. As with the early administrative studies, results were not encouraging. Methods other than planting were studied. In 1932, the Station tried to restore a burned area in the Boise Basin by broadcasting ponderosa pine seed. The experiment failed because birds ate the seed.

Early researchers at Great Basin had been among those intrigued by the "pineless belt," a large belt of brushland running through the center of the usual habitat of ponderosa pine, but containing few of the valuable trees (Keck 1972). One such area is the oakbrush zone that covers many acres in Utah, including part of Ephraim Canyon. Pioneer silvicultural researchers Fred Baker and Clarence Korstian planted some 4,500 trees, 2,000 of them ponderosa pines, in the zone and established a comparison plot 25 miles away on the east side of the Wasatch Plateau where ponderosa grows naturally in commercial stands.

The planted ponderosas grew well, but they never produced offspring. Baker and Korstian reported that distribution of rainfall during the summer in the Utah brush areas "is notably different from that either to the north or south." There is not enough rain in July and August, and what there is accumulates late in August only shortly before early autumn frosts, making it impossible for ponderosa pines to reproduce. The researchers also noted differences in soils between sites where ponderosas thrive and are absent, but believed the rainfall situation was the major limiting factor. Baker and Korstian both went on to become distinguished university professors and wrote widely used textbooks on silviculture.

Region 4 planted 20,000 to 30,000 trees annually in the early 1930s with emergency employment program labor—mostly in Utah. The Region continued to monitor older plantations. Research on sample plots by Station scientists in Idaho focused on logging techniques to promote maximum growth, natural restocking, and watershed protection. Results of this research provided much of the basis for managing ponderosa pine stands.

By the mid-1930s, the Region began to plant more extensively. In 1934 a cooperative planting was started on the Quartzburg burn in Idaho, and in 1935 the Boise Basin Branch of the Station planted about 10,000 seedlings on the Bannock Creek brush field, the Elk Creek burn, and the Quartzburg burn. In 1936 the Region opened the Tony Grove Nursery in Logan Canyon, Utah. It was designed to produce 2 million seedlings annually for use in Utah and Idaho. Also in 1936, the Boise National Forest opened a small nursery at Bannock Creek. By the early 1940s, a second major nursery had been opened at McCall, and despite some problems, it was expected to help significantly in supplying the Region's needs.

Unfortunately, even in the late 1930s, techniques for tree planting were poorly understood. Research and monitoring in the Boise Basin and on the Davis County watershed in Utah showed that seedlings did not survive well. Boise Basin survival rates for Douglas-fir and ponderosa pine averaged 22 and 45 percent, respectively. In Davis County, the survival rate in 1937 for a 1935 planting was only 20 percent (Alexander 1987).

The generally dry conditions in Region 4 forests were a factor in a lack of planting success, but foresters to the north in Region 1 territory experienced problems also. Chuck Wellner (1976) said, "Pressing problems in the District's planting program and at Savenac Nursery resulted in a decision in 1914 to concentrate nursery and planting research at Savenac and Placer Creek in country burned over in 1910 near Wallace, Idaho. Research on seed testing and certain fundamental nursery and planting studies begun at Priest River was continued by Larsen."

Years later, Regional timber management staff personnel, nurserymen at Coeur d'Alene and Boise, and Intermountain Station scientists mounted a joint attack on reforestation problems and the result was dramatic improvement in planting success rates. Station geneticists were key people in tree improvement programs designed to improve the quality of seedlings used in the expanded planting programs of the 1960s and 1970s (see "Tree Planting Success Soars," chapter 10).

Early administrative trials of range reseeding did not fare any better than tree planting. A Targhee National Forest experiment in 1910 was "a total failure," owing to the "drouth of that season." In 1912, after this and other such failures, District Forester Sherman told District 4 Forest Supervisors who requested permission to reseed ranges to wait until the Great Basin Station completed experiments to determine "the plants that are most likely to succeed in soil and climatic conditions common in the Utah mountain ranges" (Alexander 1987).

The research at the Station over the years helped reverse the situation. By the 1950s, considerable scientific information demonstrated which plant species were best suited to particular geographic and climatic conditions. The information base continued to be expanded by geneticists and research foresters in subsequent years.

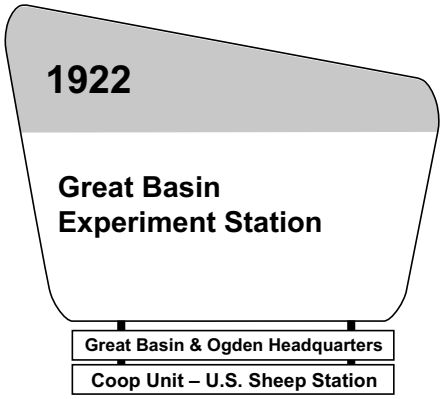
Range Research Ventures Beyond Great Basin

After Arthur Sampson left Great Basin in 1922, he was replaced by Clarence L. Forsling, the only full-time "technical man" at the Station. Two temporary field assistants rounded out the staff. Their vehicle fleet consisted of one newly acquired light Ford truck.

Forsling naturally wanted more help, and asked to have a ranger assigned at Great Basin so he wouldn't have to rely on the Manti District Ranger for part-time assistance (Annual Report, GB, 1923). In spite of the small size of the Station and its remote location, the research work was considered important enough to draw a visit by Forest Service Chief William B. Greeley.

The next year's manpower needs were as great as ever and chances of getting help were as slim as ever. Forsling was able to get some student help for the summer at a wage rate of $70 per month, plus bonus. He thought the students should get $120. Funds were urgently needed to repaint some of the 10-year-old Great Basin buildings.

Forsling and others had noted the advantages of an annual field day held at the U.S. Sheep Experiment Station (established by USDA's Bureau of Animal Industry in 1915) at Dubois, a remote site in southeastern Idaho. The field day provided an opportunity to display research results and discuss them directly with ranchers and resource managers. It also was a way to heighten visibility of the work and facilities with the public. Forsling also began cooperative studies at the Sheep Station, the first significant expansion of the range research program beyond the Great Basin Station at Ephraim.



While the Bureau of Animal Industry's research program at Dubois focused on sheep breeding, the Station focused on the range resource. A series of pastures were used to assess proper use and season of use, carrying capacity and range forage requirements, grazing systems to promote rangland health, range improvements, and sheep management procedures (Mitchell and others 2005).

Research at what later was designated the Station's Upper Snake River Center at the U.S. Sheep Station had wide-ranging applications. The experimental area represented several major ecosystems of the Intermountain West, including desert sagebrush and bluebunch wheatgrass, intermediate subalpine sagebrush-grasslands such as Idaho fescue, mountain bromegrass, and others on the foothills of the high-elevation summer ranges, and subalpine meadows and forests along the Continental Divide (Schmidt and Friede 1996). About 30,000 acres were sagebrush-wheatgrass range where Intermountain Station scientists concentrated their work because they were grazed by sheep in the spring and fall (Crafts 1938), and were typical of vast areas of western rangelands

Long-term, season-of-use grazing trials, started in 1922, compared vegetation response on areas with spring grazing only, with fall grazing only, and with no grazing. Striking differences in vegetative composition were apparent in these and other long-term exclosures.

Other research included the effect of removing big sagebrush by fire on forage production, and management methods on burned areas, which was done in cooperation with local livestock associations (Crafts 1938). Station studies also included the effect of climate on plant growth and forage production, methods of reseeding depleted and burned-over rangelands, and ways to control exotic weed invasions of range lands.

In 1938, Joe Pechanec and George Stewart conducted landmark research to determine the number and sizes of plots needed to measure vegetation with an acceptable degree of confidence. The study, using the newest statistical techniques and hand calculations (long division, square roots), was the first to document how intensive sampling must be to accurately describe the vegetation of a larger area and determine with confidence that the treatments applied did, in fact, alter the vegetation (Seefeldt and Laycock, in preparation).

In addition to work at Dubois, Station researchers conducted studies in 1936 at a work area in Fremont County, Wyoming, the Utah State Agricultural Experiment Station area near Logan, a work area near Kemmerer, Wyoming, an area on the Colorado River, and in Nevada at Wells and Paradise Valley.

Jim Blaisdell spent two summers (1941 and 1942) as a temporary worker at the Snake River Center and returned as a scientist in 1946. He was in charge of the Station's research program there until 1954. In 1949, he hired range scientist Walt Mueggler, and the pair constituted the entire full-time Station staff. Mueggler took over as Center Leader in 1954 when Blaisdell transferred to Missoula. Mueggler was reassigned to the Inland Empire Research Center in Spokane in 1955 (Laycock 1990).

The two full-time Station researchers outside the office of the Upper Snake River Research Center at Dubois, Idaho, in about 1952. Center Leader Jim Blaisdell (left) and Walt Mueggler conducted studies on spring/fall sagebrush-grass rangelands in conjunction with sheep breeding research by the Bureau of Animal Industry. Blaisdell went on to become an Assistant Station Director. Mueggler had a long career with the Station as a Project Leader and scientist conducting grassland and shrubland research.

The U.S. Sheep Station location was remote, and for those who lived there winters could be tedious. Walt Mueggler said he and Jim Blaisdell usually developed severe cases of "cabin fever" shortly before spring weather arrived. Then, Division Chief Linc Ellison would show up to give them a pep talk, and "we'd be fired up again" (Mueggler, personal communication). This photo was taken June 1, 1933, after a somewhat unusual late-season snow storm.

Some highlights of Mueggler's career after he left Dubois illustrate how, a half century ago, Station researchers moved with program shifts and as needs for their expertise changed. Mueggler made fundamental scientific contributions by developing classification systems throughout his career. At Spokane, he made a study of seral shrub communities in northern Idaho; the results became his Ph.D. dissertation and were published in 1965 as an Ecological Monograph.

Mueggler moved to the new Bozeman Lab in 1961 as Project Leader of a mountain grassland unit. There he developed a habitat type classification for the grasslands and shrublands of western Montana, described in a major publication issued in 1980. His research at Bozeman included a variety of smaller studies, including one of elk-shrub interactions, reflecting the increasing emphasis by Station range scientists on wildlife habitat research. The next stop was Logan, where Mueggler served as Project Leader of the mountain grassland and aspen ecology unit from 1974 until he retired in 1988. Again, the most time-consuming personal study involved development of a classification system, this time for aspen community types of the Intermountain Region (Mueggler, personal communication).

Station research was discontinued at the Sheep Station after 1972 for budgetary reasons. All research responsibilities were assumed by the Agricultural Research Service in 1974. A link to the Station work was provided when ARS hired Bob Murray, a scientist at the Boise Lab. Murray continued to do research at the Sheep Station until he retired in 1987 (Laycock 1990).

The Station also expanded range research by establishing artificial range reseeding nurseries near Ogden and Logan, Utah. The research program had close contact with National Forest administration in carrying out these studies because it was the only Station doing any work with sagebrush, considered a problem for a number of National Forests (Pechanec interview, 1993).

The Cowboy Forester

Despite what sounded like an expanding program, Station Director Forsling found himself the only person to direct at the Great Basin Station in the winter of 1924. This happened because one of his assistants resigned to join Sampson as a professor at the University of California, and the other assistant was promoted to a job with the Wyoming National Forest. Nevertheless, his plan for a summer field day went forward and the Station's first field day was held August 29-30, 1924. More than 125 stockmen, Forest Service officers, and Extension people attended (Annual Report, GB, 1925).

Raised on a ranch, Forsling became a forester because of the romantic image of forest rangers portrayed in the magazines he read as a youth (*INTercom* Jan/Feb/91). His first job in 1915 was supervising range survey crews in the Cache National Forest in Utah. The next year, he was transferred to the Jornada Experimental Range in New Mexico. There he was transformed into one of the first range scientists.

In a 1977 interview, Forsling said, "The only range management (training) that I had was picked up at home or in

Station Director C. L. Forsling skied to the headquarters on April 27, 1927. Maintenance at Great Basin was known to be excellent. A handwritten note in the Great Basin scrapbook tells the story of an occasion when a good thing may have been overdone. The arch was broken (in about 1934) by a cement truck entering the headquarters area. Repairs were made so quickly that the arch was rebuilt before the truck left the area. When the truck left, it knocked the arch down again.

the summers I spent on range surveys between school semesters." But he did have the benefit of the same strong botany program at the University of Nebraska that produced Arthur Sampson and W.R. Chapline.

Forsling's immediate success at Jornada probably stemmed from his early life as a cowboy rather than his academic training. He was the first person with the ability to achieve regulation of livestock at Jornada and he got the stockmen to cooperate in sharing their records with the researchers. Later at Great Basin he no doubt did rely on his academic background to successfully supervise completion of much of the range-watershed research started by Sampson.

Forsling served as Station Director until 1930, so he got opportunities to supervise research in forestry areas as well as range management. He then moved into the Washington Office, becoming the Deputy Chief for Research in 1937. One of his early national assignments created serious controversy. Forsling was assigned to help finish *The Western Range*, a 600-page report that took 4 years to prepare. It bluntly stated that rangelands were seriously deteriorated for two basic reasons—Interior had failed to live up to its management responsibilities and the 1934 Taylor Grazing Act gave the livestock industry too much power. The report said the solution was to have the Forest Service manage all Federal rangelands.

Interior Secretary Harold Ickes and the livestock industry took exception. They vigorously challenged the Forest Service research findings. Stockmen did a study of their own that showed lack of rainfall, not overgrazing, caused range depletion (Steen 1998). A period of tense relations between the two Federal departments began that lasted for decades.

Station Director C. L. Forsling led an inter-regional fire inspection party in 1932 on Grass Mountain in the old Idaho National Forest.

Some Help Arrives, but Not Much

In 1925 the Station staff was back to three "technical men" on a full-year basis. More help arrived for the summer season, causing Forsling to plead for another house to be built at the Station. Two families, a cook, and another person were all housed in one building. In addition, three other people joined them for meals. In his annual report, Forsling said, "…such a 'family' could be happy under one roof only under extraordinary circumstances." Another Forsling statement reflected how personnel policies have changed since the 1920s: "Every effort will be made to have an unmarried clerk in the future, but there is no saying to what extent we will be successful in heading off matrimony even though we start out with an unmarried clerk." The idea was to get a male clerk who could

be used to help with manual labor in the field when clerking duties got a bit slack.

Also in 1925, District 4 decided to get back into administrative studies involving lodgepole pine, ponderosa pine, and aspen. The Investigative Committee complained about the 2-to 3-year length of time it took to get study results from manuscript to print. Forest Service researchers and editors are light years faster in getting research results disseminated now, but the work can never be done promptly enough. There will always be complaints that editorial and production work is not fast enough.

Pressures to publish and difficulty in getting work published must have been considerably different in the 1920's than they were later. By 1926, the Great Basin Station listed only six publications since its 1912 inception. Of course, the permanent staff was still a slim total of three "technical men" with one to three summer assistants.

In addition to research under way at Ephraim, browse studies were being conducted in the Dixie National Forest in southern Utah, and cooperative studies at the U.S. Sheep Station. Some help was received from National Forest officers detailed to the Station for four weeks of training at the three sites. The detailers included forest supervisors, deputy supervisors, rangers, and range examiners. Still, compilation and analysis of field data was not keeping up with data collection. Forsling wanted to hire a man for a $2,400 salary and $600 expenses to do the job.

Equipment was so scarce that employees were using their own cars on the rough dirt roads much of the time. What was needed, according to Forsling, was a properly equipped Dodge touring car for $1,000. Another building at the Great Basin site was still on the wish list to relieve the crowding pressures of families and single persons living and eating together during the summer field season.

Was the Work Important?

Total funding for the Great Basin Station reached only $12,901 in 1926, and Forsling began questioning openly whether research findings related to range management were being recognized within the administrative ranks of the Forest Service. Research had been under way for 20 years without gaining much support; and, in the beginning, Forest Service administrative leaders had been skeptical or indifferent about the possibilities of range management. Apparently, Forsling wasn't sure if those attitudes had changed much over the years (Annual Report, GB, 1927).

Forsling left the Forest Service in 1944 to head Interior's Grazing Service . "No doubt it was the cowboy in me that led me away from forest research into the Grazing Service," he said. Shortly after the Bureau of Land Management was created with the Grazing Service as a key component, Forsling retired with 39 years of government service.

Investigations and administrative studies in District 4 were placed in four categories in 1927: (1) range research at the Great Basin Station, paid for by research funds; (2) administrative range projects; (3) administrative forest management projects conducted by National Forest staffs under direction of the District Office; and, (4) fish and game management studies conducted by National Forest personnel in cooperation with the Office of Lands.

The research activity within District 4 carried out by the Great Basin Station was of quite limited scale and scope. Forest Service research was not involved in areas other than range research within District 4 territory, so the District and its National Forests had to rely on administrative studies to provide needed information.

The research emphasis placed on range, given limited resources, was undoubtedly proper. A 1923 census estimated 1.3 million cattle and 5.7 million sheep in the District 4 territory. Range management was a major activity for the National Forests of the District, and the 1927 programs reflected that. The District 4 Investigative Committee stated that the essentials of the research program were to ensure maintenance and full development of industries utilizing water and providing water; to make full use of 80 percent of the land area for production of timber, forage, and associated resources; and to supply as much as possible of the commodities while affording recreation, hunting, outdoor life, and scenery viewing opportunities. This was one of the early mentions of the nonconsumptive uses of the National Forests in a document describing research, but they were not given the same status as the production of water, timber, and forage (Annual Report, GB, 1928).

Congress Authorizes Stations

Although the Experiment Stations were a fairly early creation within the Forest Service, the first Stations were much different than those that developed later. The early Stations were minuscule in both staffing and funding, and were administratively part of a National Forest District (now National Forest System Region).

Even with the establishment of experiment stations at a number of western locations, research was almost wholly submerged in the Forest Service's efforts to administer the National Forests. Administration was a huge task that started almost from scratch because Interior had done little with the forest reserves, so there was no program to build on. Compared to National Forest Administration, Research was out of sight and out of mind for most Forest Service people (Storey 1975). Research faced another big problem, according to Assistant Chief Forester Earle Clapp. He wrote, "That the national requirements for forest research have not been met during the last decade is primarily because sufficient men with the necessary mental equipment and training have for one reason or another been nonavailable." Clapp also said the agency routinely used Research as a dumping ground for those who did not fit well in Administration (Steen 1998).

Eight years of efforts by Clapp to gain legislative recognition of the Forest Service research organization paid off in 1928 when the McSweeney-McNary Act was passed as the organic act for research. Congress authorized $3.575 million for research annually through 1938, in much the manner envisioned by Clapp in 1926 when he proposed a revamped and vastly expanded national program. The authorization put research funding at a ratio of 1:20 with other Forest Service activities.

The McSweeney-McNary Act gave the Branch of Research a more important place within the Forest Service. It strengthened the ability to deal with other agencies, dealt with nonfederal research, and began to balance funding for silvicultural and products research (Steen 1998). The Act expanded the areas of research responsibility, and provided for funding by a specific research budget line item. There was no overnight transformation for the Stations, however. The promise of the Act for research was soon dampened by a national economic downturn following the stock market crash of 1929 and the Great Depression, which lasted from the early 1930s until World War II. Thus, the flowering of the Forest Service research program came many years later than hoped for by the Forest Service leadership.

The act followed Clapp's national program concept by authorizing a number of Experiment Stations, including the Northern Rocky Mountain Station already operating under that name, and adding a Station for "the intermountain region of Utah and adjoining States." It also provided $100,000 to USDA's Bureau of Plant Industry to study native and naturalized diseases of forests and forest products, including white pine blister rust. Forest insect research assigned to the Bureau of Entomology fared better in funding because bark beetles destroyed more timber than was removed by fires and timber harvesting combined.

McSweeney-McNary instituted a nationwide survey of all forested areas, a new program that would become important to the Northern Rocky Mountain Station and later to the Intermountain Station. It took a few years for the program to develop.

Wildlife research was also authorized by the act—to be conducted by USDA's Biological Survey, not by the Forest Service. Investigations of weather related to forest fires also were authorized. The Forest Service was to do the research necessary to aid the U.S. Weather Bureau in making forecasts of forest fire hazards.

The McSweeney-McNary Act was a tremendous benefit to Forest Service research through expanding the scope of the program, authorizing the establishment of experiment stations, and increasing the research budget. In the first year following passage in 1928, Forest Service research was funded at $906,000; this increased to $2.6 million by 1938. Part of this was in increase on paper only, however. Appropriations during the first decade of the act never reached the levels authorized.

The first year, there were no funding increases at all. President Calvin Coolidge had obtained a promise from Congress that the research budget would remain as it was for a year, so the 1929-1930 fiscal year was the first to include McSweeney-McNary appropriation increases. They totaled 20 percent. Included in the bill was authorization for the Intermountain Forest and Range Experiment Station in Ogden. Of significance to the Northern Rocky Mountain Station was $40,000 to begin the Forest Survey (Steen 1998).

Twenty percent sounds like a big hike, but the starting point was low. For example, the Northern Rocky Mountain Station in 1928 had only a four-man technical staff, a female clerk, and a budget of $22,254 One staff person was the Station Ranger, one covered forest management, one

covered fire, and Station Director R. H. Weidman handled supervision and special projects (Wellner 1976). A plea was made for more research help to (1) work on fire control by detecting fires more quickly and getting men to the fire more quickly, (2) determine growth and yield of western larch in Montana, and (3) address the most important national problem…leaving and maintaining cut-over land in a productive condition. No funds were available for grazing research; yet grazing problems in the District 1 National Forests were second only to timber management problems.

Only $136,000 was being spent by all agencies combined for research in the Northern Rockies that year. The Station and District 1 together spent $45,100. By contrast, the Office of Blister Rust Control spent $54,000.

The Northern Rocky Mountain Station, 1926-1953

Wildland fire was a major research area for the Northern Rocky Mountain Station throughout its history. At the Station's inception, fire did more than pose difficult scientific questions. Its very presence interfered with the research program.

A disastrous fire season in 1926 seriously interrupted research field work in northern Idaho and western Montana. Forest Service policy at the time was to give fire fighting top priority, and that meant researchers were shifted from their normal duties to the fire lines as needed. Although current policy calls for research personnel to continue with their research assignments except for serious emergency situations, the old policy was understandable because the Stations continued to be units of the National Forest System Districts.

The Northern Rocky Mountain Station annual report for the preceding year stated, "Although it is questionable whether the highest efficiency is served by keeping research men on fire lines for protracted periods of a normal fire season, as was done for nearly four man-months in 1925, there is no doubt that in such a grave emergency as last summer the research man should be mobilized."

The northern Rockies have a short field season, and the field assistants, who were mainly forestry students, returned to their universities in September. Thus, a bad fire season was a significant impediment to research progress. Harry Gisborne was out on so many fires in the summer of 1926 that he planned on no research getting done. But, in spite of the bad fire season, the energetic Gisborne was able to prepare a manuscript, *Measuring Forest Fire Danger in Northern Idaho*.

As a means to expand the Station's research program, cooperative research

Harry Gisborne speaking to University of Montana Forestry School seniors in 1940 at the Priest River clearcut inflammability station. Priest River was a place for natural resource students to learn from its earliest days as a research and demonstration area.

was undertaken with the University of Idaho, University of Montana, the Forest Products Lab, the Bureau of Entomology and the Bureau of Plant Industry. Of course, the extent of cooperation varied with the organizations involved.

Cooperation with the University of Idaho went beyond research activity. The Idaho School of Forestry began to hold a field session at Priest River covering investigative work and timber sale practices as taught by the staff of the Kaniksu National Forest (Wellner1976). Although the idea of Priest River as a model sustained-yield forest had been discarded, the demonstration forest concept was very much in effect to show foresters and lumbermen a variety of things without the small research staff having to travel over a wide area.

Other USDA agencies were studying mountain pine beetle control in lodgepole and ponderosa pine stands, along with *Ribes* ecology and chemical control of white pine blister rust. Early estimates were that it would take 15 years to control blister rust in the northern Rockies. This turned out to be a wildly optimistic projection. The same report also claimed mountain pine beetle control was being done for 5 cents per acre, but didn't indicate its effectiveness.

Progress was made in several administrative areas. The trail system at Priest River almost reached completion, and the University of Idaho started the Idaho Forest Experiment Station. The Northern Rocky Mountain Station also began to look at the possibilities of creating additional experimental forests. District 1 changed the name of its Investigative Committee to Investigative Council and expanded its membership outside the Forest Service for the first time. Members were concerned that some projects being submitted to the council really were not research items. The council undertook, apparently for the first time in District 1, to define the terms "research," "investigation," "study," and "experiment." They identified 63 categories of research, including, for example, "nursery practices" and "wood chemistry."

Experimental Areas—Establishment and Disestablishment

Despite continued meager funding, the Station began expansion plans to have three experimental forests for western white pine, and one in each of the lodgepole pine, ponderosa pine, and larch-fir types. Priest River and Bernice in Montana already existed, and an experimental forest at Coram, Montana, was approved. Priest River and Bernice had been earmarked much earlier for research purposes, but their use as

experimental forests was not confirmed with an official designation until 1931.

Two years later, Deception Creek gained formal recognition as an experimental forest. At about the same time, the Station concentrated its range research at what was known initially as the U.S. Range Livestock Experiment Station at Fort Keough, Montana.

Before the 1930s, the Forest Service did not have mechanisms to make meaningful designations of experimental forests and ranges. New regulations administered by the Secretary of Agriculture changed that (Regulation L-20 was usually the authority for establishing experimental areas). The change was important in preserving the areas for their intended purposes. When an experimental forest or range was designated officially, it also was withdrawn by the Department of the Interior from mining entry. If this was not done, mining law (until 1994) allowed private parties to prospect for valuable deposits, stake a claim, and take title to the land should the claim produce commercial quantities of ore. Even if the claim did not change title by being "patented," the miner could occupy and work the land by paying small annual fees and demonstrating that some development work had been done. This apparently did not happen within experimental areas in the Station territory, but it surely could have, especially in heavily mineralized parts of Montana and central Idaho.

At Priest River, a different kind of problem took 17 years to unravel (Wellner 1976). At the time the experimental forest was being established, officials of the State of Idaho and USDA were reaching an agreement to convey lands to the State to compensate for sections within National Forest boundaries. This would have removed all of the experimental forest lands from Federal ownership.

The State and the Forest Service agreed that ownership of the Priest River lands would remain as it was, but somehow that agreement never got to the right people. The lands were selected by the State and the transfer was approved by the Secretary of the Interior. No one in State government had authority to correct the mistake. Finally, it was necessary for the Federal government to bring a "friendly lawsuit" against Idaho to recover the lands. This was done, and the Supreme Court decreed that ownership would be returned to the United States.

Other problems with land titles in the Benton and Canyon Creek drainages were gradually solved without recourse to the highest court in the land. But it was 20 years from the time Priest River was established until the Chief of the Forest Service signed an order making it official in 1931. Some other ownership changes followed, and another 30 years passed before Public Land Order 2377 withdrew the final 6,368-acre experimental forest. Even then, the order had the acreage wrong!

The specter of severe disruption of research studies by mining activities and questionable land ownership, such as that at Priest River, evidentally caused Forest Service Research to start a program to formalize designations. Getting everything in order took a long time. In a 1955 letter to the Chief, Reed Bailey, director of the newly merged Northern Rocky Mountain and Intermountain Stations, reported progress, but also listed several actions still to be taken (Bailey 1955). Two areas in the old Northern Rocky Mountain Station territory never achieved formal status.

Bailey's report listed a 5,000-acre "Piquette Creek Experimental Forest" on National Forest land near Darby, Montana, that was "established Dec. 20, 1939 by administrative approval of [the] Regional Forester." In the remarks section, Bailey listed "none." All or part of this tract may have been used for research in an informal way for years. Ultimately, the Lick Creek Ecosystem Management/Research Demonstration Area was established in this part of Montana by a cooperative agreement between the Intermountain Station and Bitterroot National Forest in 1991 (see "The Ecosystem Approach Comes to Lick Creek," chapter 11). Wellner (1976) noted that the "Piquette Experimental Forest" was in a ponderosa pine timber area within the Bitterroot National Forest, and that it had been "disestablished." Because it never had been established formally at the national level, this change probably simply involved a revocation by the Regional Forester of the approval to use it as a research area.

Bailey also said that a "Fort Missoula Experimental Range" of 40 acres had been established in 1949 by "informal agreement" with the Regional Forester on land transferred from the War Department to the Bureau of Land Management. The report noted that the area was reserved for research use by the Forest Service, although no studies had been started there, and the newly formed Agricultural Research Service might want to use it for revegetation research.

Bernice and Priest River were formally designated, but their use and development were much different. Although subject to big swings in funding, research generally grew and diversified at Priest River over the years. It never really got going at Bernice.

Station administrative files contain a chart titled "Bernice Experimental Forest," with data from a timber inventory made in 1914. Bernice included 2,909 acres in the Deerlodge National Forest near Basin, about 30 miles from Butte. Most of the area was covered by timber, and 70 percent of the trees were lodgepole pine.

Because Butte was booming at the time as a center of the mining industry, and the mines needed large numbers of timbers, it was thought there would be a ready market for Bernice timber. This situation, and the presence of a local charcoal burner that used small-diameter wood, fit into the District 1 plans for experiments at Bernice. Early documents said the area was "teeming with deer and elk," so studies of effects of various habitat alterations on big game also were envisioned.

The master plan was to make a variety of selection, strip, and clear cuts on a regular, sustained-yield basis to gain experimental data and conduct management demonstrations. To transport the logs, a 3-mile road was built into the area in 1917. However, World War I manpower needs and transfers of several people most interested in the project prevented further development of the area by District 1. The 1931 experimental forest establishment document said, "Research was not able to do work on the area, because of limited

This composite photo of central Montana slopes covered with lodgepole pine was made in 1915 as part of an intensive topographic and mapping survey of the Bernice Experimental Forest area. The map makers added landmark information by hand to supplement data from old survey markers they found to define the Bernice location.

funds and the need to concentrate its activity in the western white pine type."

The research organization never was able to do work at Bernice, although Harry Gisborne, chief of the division of forest management research in 1942, encouraged development of the demonstration forest concept. Gisborne said he was confident that the Bernice District Forest Ranger and a willing local timber operator would be able to conduct a harvesting program that would "leave on the ground some excellent demonstration of applied silviculture, utilization, and brush disposal which will be of great value to future foresters." Not surprisingly "the father of forest fire research" included a bit of advice about cutting and leaving brush in a few areas so that "if a fire gets in there, the results will be obvious."

The single road was extended to cross the Bernice parcel and some timber was cut. The largest timber sales were made during World War II years, not for experimental purposes, but as part of the war effort to provide timbers and charcoal wood for the local copper mines and smelters.

Acting on the recommendation of the Station, the Forest Service disestablished the Bernice Experimental Forest in 1962. The land was returned to the Deerlodge National Forest for general management purposes. The disestablishment recommendation said "no investigative work had been done" there and that Bernice had "no outstanding characteristics to qualify it above other comparable National Forest lands as an area for future research."

The original proposal by research was to hold "from 100 to 500 acres" within the experimental forest as a Research Natural Area (see next section). Gisborne assessed the parcel in 1943 and recommended a 300-acre RNA. The District Ranger posted it as a "closed area." When Bernice was disestablished in 1962, the report said the tract had never been recommended to the Washington Office for formal designation as a natural area. The report said, "Because there appears to be no sentiment either public or Forest Service against abandoning the proposed natural area, all boundary signs shall be removed."

The report authors apparently hadn't checked the "sentiment" of Chuck Wellner, the Station's persistent champion of RNA establishment (See "Chuck Wellner—Forest Science Visionary," chapter 11). Wellner probably put the area on his "to examine" list. After a detailed analysis, a 451-acre Bernice Research Natural Area was formally designated in 1996.

Wellner (1976) said national research reorganization away from research centers to single-discipline projects in the 1960s threatened the continued existence of Priest River as an experimental forest. Part of the reorganization was a move away from experimental forests to laboratories.

The buildings and other improvements at Priest River required costly maintenance and national office personnel suggested that the experimental forest should be disestablished as Bernice and Piquette had been, or at least that many buildings should be closed and Priest River should operate only as a summer facility. Station management insisted that Priest River was needed, and it was retained. In 1961, Intermountain Station Director Bailey decided all the headquarters buildings would remain and so would year-round operations (Wellner 1976). However, funding problems continued.

One side effect of the move to single-discipline research was that funding was provided by several individual units rather than as a lump sum allocated by Station Headquarters. Disagreements flourished over how much each unit should contribute, and how the funds would be spent. The bickering became so extreme that some high-profile research was moved away from Priest River to other National Forest lands.

The strong-willed scientists got together some years later and devised a three-tiered funding system that created different levels of contributions by various types of users. The Priest River system worked so well that after the Intermountain-Rocky Mountain Station merger, the new Station applied it to other experimental forests (Graham 2004).

Other Special Areas

Nine Research Natural Areas (RNAs) were selected by forest type in 1929, and District 1 began looking for possible wilderness areas to set aside. RNAs are special areas designated by the Forest Service within National Forests that are permanently protected and maintained in

natural conditions to conserve biological diversity. They are available for research that does not manipulate the vegetation and for low-impact educational activities. Stations are responsible for administering research activities in RNAs. The National Forests have general administrative and protection responsibilities for them. RNAs should not be confused with wilderness areas, which are established by Congress under provisions of the Wilderness Act of 1964, and have different purposes.

The Wilderness Act refers to research use only in a very general way. One provision states: "Except as otherwise provided…wilderness areas shall be devoted to the public purposes of recreational, scenic, *scientific* (emphasis added), educational, conservation, and historical use." Stations are not specifically made responsible for scientific activities within designated wildernesses, as they are for RNAs. The National Forests that administer the acreage exercise control over scientific activities in wildernesses, although individual cases often involve consultation with Station personnel, and Intermountain Station scientists conducted studies in wilderness starting in the early 1960s.

The concept of wilderness in the late 1920s and early 1930s differed from that defined in the Wilderness Act and generally understood today (Alexander 1987). A major purpose of National Forest wilderness areas under the early concept was to recapture a sense of past times, but resource use was allowed. Forest Service Chief Robert Y. Stuart argued consistently in 1928 that wilderness designation would not unduly "curtail timber cutting, grazing, water development, mining, or other forms of economic utilization…but rather…guard against their unnecessary invasion by roads, resorts, summer-home communities, or other forms of use incompatible with the public enjoyment of their major values."

Thus, some forms of environmental change could be allowed, but economic activities and recreation involving technological development were excluded. Stuart envisioned areas "within which primitive conditions of subsistence, habitation, transportation, and environment will permanently be maintained to the fullest practicable degree."

The first National Forest "wilderness" had been designated in 1924 in New Mexico. In 1928 the Forest Service developed a formal program to assess lands and designate those with wilderness qualities as primitive areas. By 1937 the service had set aside 72 primitive areas encompassing 13.5 million acres in 10 western States (Alexander 1987). The area served by the Northern Rocky Mountain Station eventually included millions of acres of designated Wilderness, an important consideration in locating the Nation's first wilderness research unit in Missoula.

Cooperators Join Council

In 1929, District 1 still had its Investigative Council chaired by Evan Kelley, the District Forester. Included in the council were the forestry schools of Idaho and Montana, the Office of Blister Rust Control, consulting foresters, private timber operators, the Weather Bureau, the Bureau of Entomology, forestry researchers in British Columbia, State Foresters, the Timber Protective Association, and the Indian Service. At the annual meeting in Spokane, emphasis was placed on speeding publication and getting research results out and into use (Annual Report, NRM 1930). District 1 was still in the research business via administrative studies. In fact, District 1 was doing more research in 1929 through administrative studies than was the Station. Cooperation between the two units appeared to be good, however, with the Station using District 1 field men to work on research projects.

Four more centers of blister rust infection of western white pine were found during the year, adding to the urgency of blister rust research. Mountain pine beetles continued to be significant pests as well. Control techniques studied included the use of parasites, peeling and burning the bark of infested trees, and the use of chemicals to kill the beetles (Annual Report, NRM 1930).

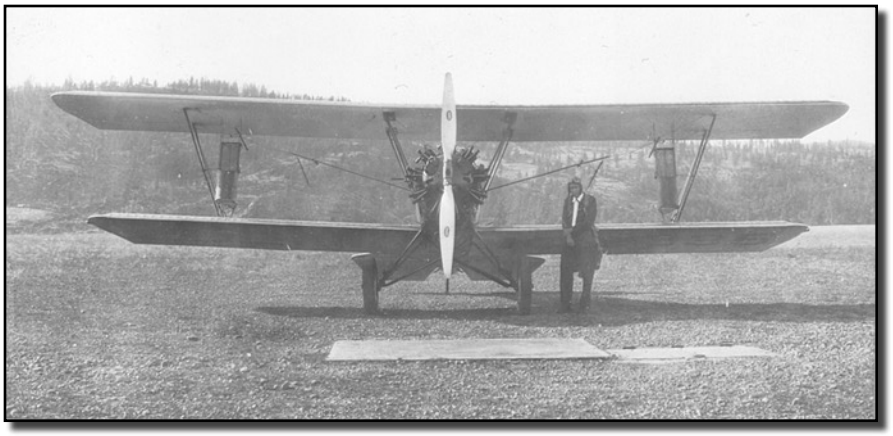
A variety of studies of forest insects was being conducted by Bureau of Entomology researchers working out of the Coeur d' Alene field laboratory. During the lab's existence, under the direction of Jim Evenden, research involved the biology and natural enemies (parasites and predators) of the mountain pine beetle; biology of the Douglas-fir beetle; methods of controlling bark beetles, including using toxic sprays; the western spruce budworm; and surveys of insect infestations.

Tom Terrell was the second staff member hired by Evenden. His career in forest entomology began quite accidentally. Terrell was reporting to work as a fire guard for the Forest Service when, he said, "At Wisdom (Montana) I got on the wrong Forest Service truck and ended up at a bark beetle control camp where I met Jim Evenden. Jim thought that I might be a good spotter (locating infested trees to be treated)."

In 1930 Terrell scored a first in the survey work that was to become an Intermountain Station responsibility in 1954. He made the first aerial survey of forest insect damage in the Northern Rocky Mountains, covering Yellowstone National Park. The first flight of the survey, from a field in Livingston, Montana, was an adventure, and an unsuccessful one at that (Furniss, in preparation). Terrell gave this account:

> Away we went and got lost in the Absaroka Mountains where we were caught in a violent rainstorm. The plane was a small open-cockpit biplane, the pilot in the rear and me up front. The engine went quiet! Then loud pounding behind me! I was about to dive over the side and pull the ripcord when I discovered that the pilot was pounding on the plane to get my attention. He got it. He wanted to know if I didn't think we ought to go back? He had cut the engine so he could talk to me. I most certainly agreed with him. I was scared stiff. We made it back to the field where Jim Evenden was waiting. By that time the storm was real bad. The pilot taxied the plane up to the fence where we jumped out and with the help of Jim hung onto the plane and the fence to keep the plane on the ground until the storm let up.

The Station staff didn't change in 1931 but the first major increases in funds in a decade materialized. Funding jumped from $22,254 to $45,000. A big share, $20,000, was to start the Forest Survey. Fire research received $15,000,



Tom Terrell posed at the Spokane airport in 1932 with a plane equipped by the Bureau of Entomology with insect traps mounted between the wings. The plane was ready for a flight over Priest Lake country in studies to "test out flight habits of beetles at high altitude." Terrell used a similar aircraft for his historic insect damage survey flights over Yellowstone National Park in 1930.

and $10,000 went to the cooperative range research program at Fort Keogh, Montana. The range program gained recognition of the highest order—the Station added it to its name. The organization officially became the Northern Rocky Mountain Forest and Range Experiment Station (Wellner 1976).

Forest Survey Begins and Interest Grows in Other Work

Congress had authorized a nationwide survey of all forested areas, irrespective of ownership, in the McSweeney-McNary Act of 1928. There was, however, little enthusiasm to start the survey at a time the market for timber was virtually nonexistent at the beginning of the Great Depression. A committee did meet in 1930 to establish policy for the survey (Baker and others 1993).

Using the $20,000 it received earlier, the Station began its first survey in northern Idaho in 1932. It was completed in 1937. During the project, private and public information on the condition and volume of timber was checked and adjusted to conform to Forest Survey standards. Areas that included merchantable timber for which information was unavailable were cruised using the line-transect method.

The Montana inventory, including the collection of growth and timber removal information, began in 1934. Before its interruption by World War II, the survey was completed for that part of the State west of the Continental Divide and in four counties east of the Divide.

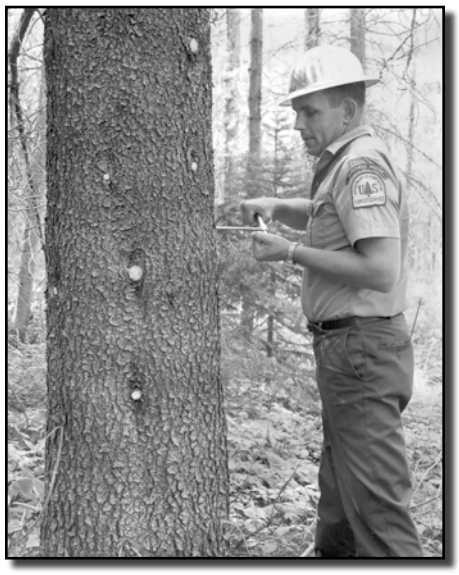
While the nationwide Forest Survey proceeded, independent forest inventories were conducted by the National Forests to strengthen the data base for management planning. These inventories, however, were limited in scope because of a drastic reduction in funding for timber survey allotments. The entire District was allocated $5,100 to $5,700 for surveys during each fiscal year between 1929 and 1935. The work usually was done for the commercial timber parts of each National Forest and defined by block, working circle, or some other geographic area.

From 1929 to 1938 some form of timber inventory work was conducted by most of the National Forests of the District, and in several, including the Deerlodge and St. Joe, five inventories were made during the 8-year period. These inventories, although limited, facilitated the development of timber management plans and contributed to early attempts to develop sustained-yield programs (Baker and others 1993).

In 1932, District 1 was using $10,000 per year for studies on the placement of fire lookouts, smoke chasers, roads, trails, and telephone lines, reflecting the high interest the Forest Service had, and continued to have, in forest fire control in the northern Rockies. Because Forest Service policy now was to place all research activity within the Stations, forest products, fire, and silviculture research undertaken by the District were transferred to the Station, adding $14,000 to the Station budget.

An increase of $43,000 went to fire research, Forest Survey, and range research. The Station was slow to expand in the latter two areas because of the impossibility of recruiting trained personnel during fire season. Range research was centralized at Fort Keogh.

District 1's 1931 annual meeting of the Investigative Council had produced a number of significant recommendations. All of the research agencies, including the Station, were again criticized for failure to get much-needed information out to forest administrators and lumbermen promptly and in a form showing direct application to forest practice. This was neither the first nor last time research organizations were to hear this criticism. As a partial solution to the problem council members asked that



Inventory work in National Forests sometimes turned up surprises. This lodgepole pine, having an increment core removed here by Region 1 forester Harvey Toko, was 19 inches in diameter in 1966. It and other lodgepoles were the largest trees in a white pine plantation established in 1911 in the Coeur d'Alene National Forest.

Onward and Upward

Three men who served at the Northern Rocky Mountain Station went on to become Deputy Chief for Research, the highest administrative position in the research arm of the Forest Service.

George Jemison's first Forest Service job was in 1931 as a junior forester at Priest River in fire research under the direction of Harry Gisborne. After several career advancements, Jemison was named Northern Rocky Mountain Station Director in 1950. In 1953 he moved to the Pacific Southwest Station as Director and then spent 12 years in the Washington Office, where he became Deputy Chief. Jemison had great respect for Gisborne. He maintained his interest in fire research throughout his career, and made numerous efforts to obtain financial support for fire programs in general, including those at universities (Maunder 1978).

George Jemison started his career in fire research at Priest River.

Jemison led the first group of U.S. foresters ever to visit Russia to observe forest conditions and practices. He served for 3 years as President of the International Union of Forest Research Organizations. After leaving the Forest Service, he became a professor at Oregon State University.

M. B. Dickerman, who had served at the old Lake States Station, as a member of the War Production Board (1943-44), and as a forester with the Allied Control Commission after World War II, came to the Station in Missoula in 1947. He was put in charge of the economics unit and Forest Survey.

Dickerman returned to the Lake States Station in 1951 as Director. He served there for 14 years and started many new programs. Among them was recreation research in the Boundary Waters Canoe Area. To head the program, Dickerman hired Bob Lucas, a social scientist (see "Aha! The Wilderness Unit Discovers a Better Approach," chapter 10). Hiring a social scientist for Forest Service research work was a novel idea at the time, but Dickerman said, "Bob Lucas had the capacity to understand that there were many social implications in recreation and forestry."

Dickerman moved to Washington in 1965 for a special assignment in USDA research planning. He became Associate Deputy Chief for Research in 1972 and Deputy Chief in 1973 (Arnold and others 1994).

Bob Buckman was looking for a job in 1953 and landed one with Forest Survey in Missoula (Jemison was Station Director). Near year end, the merger with the Intermountain Station was announced, and part of the plan was to move Forest Survey to Ogden. Instead of making the move, Buckman chose to return to school for a Ph.D. program at the University of Michigan.

Buckman became a scientist at the Lake States Station, moved to the Washington Office, and then served many years as Director of the Pacific Northwest Station. He was named Deputy Chief for Research after Dickerman retired (Arnold and others 1994).

Applied Forestry Notes, discontinued in 1926, be revived.

Questions arose regarding the Forest Service's ability to perpetuate western white pine, the prime timber species of the area. Western white pine was difficult to protect from fire, was attacked during pine beetle epidemics, and was susceptible to blister rust. With the onset of the Great Depression some unemployment relief funds were made available to use for blister rust control at the same time regular blister rust control funds were being reduced. With the potential demise of western white pine as a commercial species, it was apparent to the District 1 timber management staff that little research information was available to help stem the losses. This was true as well for western redcedar, another commercially valuable species.

The summer of 1931 proved to be a bad fire season in the District, necessitating calling the Station staff to help fight fires. The annual report of the Station included the comment, "It was necessary to practically turn Station manpower over to District 1."

Changes in 1932 weren't restricted to research. The National Forest System Districts were renamed Regions to avoid confusion with Ranger Districts. The identifying numbers used throughout the Forest Service were unchanged: District 1 became Region 1; District 4 was designated Region 4.

Depression Years

The stock market crashed in October 1929 signaling in dramatic fashion the start of the Great Depression, which lasted for a decade. Following the crash, many businesses folded, investments were lost, and unemployment soared. Lack of recovery from the depression caused voters to defeat President Herbert Hoover in his reelection bid in favor of Franklin D. Roosevelt and a Congress dominated by the Democratic Party. Roosevelt immediately initiated his "New Deal" of activist Federal Government programs to attempt to bring the Nation out of the depression.

Thus, 1932 found the Forest Service in a position of financial retrenchment,

but with the New Deal programs the Federal Government became the employer of last resort and the Forest Service was a beneficiary of many of the make-work programs. Both the Northern Rocky Mountain and Intermountain Station programs were impacted by funding cuts and New Deal attempts to put people to work.

The general economic depression in the Midwest and West was made worse by drought in the Great Plains during the early 1930s. The drought and Great Depression came on the heels of an existing agricultural depression, which had been going on for years before the stock market crash. The West suffered a loss of many farms and ranches and diminishing livestock numbers.

In eastern Montana the number of farms decreased by more than 10,000 over a decade. Thousands of acres of dry farms and homesteads were abandoned. Within Region 1's territory, the numbers of horses and cattle decreased gradually from 202,000 head in 1919 to 146,000 in 1930—a 26-percent drop. Sheep numbers went from 988,000 to 765,000 during the same period. The human population also dropped in the plains. In the mountains to the west, the distressing economic conditions meant forest land was rapidly being cut over and abandoned as tax-delinquent property.

The Federal Government began to emphasize land-use planning as one tool in its efforts to combat the depression. These plans placed demands on the Station for various kinds of data about standing timber species, growth, size, and removal. The Station's annual report for 1934 said it was satisfying to have various Federal agencies using its data in connection with livestock loans and land evaluation.

Some of the Northern Rocky Mountain Station's programs, Forest Survey for example, were maintained as in earlier years with money and manpower help from Region 1. Survey work was done largely by men assigned to the Station from the Region for short periods of time, but lack of funds meant the cycle between surveys was too long. To this day, pressure to reduce cycle time remains, regardless of the area of the country, because users of survey information clamor to get the data the moment it is taken.

In addition to help from Region 1, emergency program funds from the "alphabet soup" New Deal programs such as the National Industrial Recovery Act (NIRA), the Emergency Work Corps (EWC), and the Economic Recovery Act (ERA) helped to replace the regular appropriations cuts.

The Investigative Council went on record recommending several additional experimental forests be set aside in 1933. These included a western white pine experimental forest at Deception Creek in the Coeur d'Alene National Forest and another at Pine Creek in the Clearwater National Forest, both in Idaho, and a larch-fir experimental forest near Coram in the Flathead National Forest and a ponderosa pine experimental forest at Little Trapper Creek in the Bitterroot National Forest, both in Montana.

Recommendations to establish Deception Creek and Coram Experimental Forests were forwarded to Washington, but no immediate answers were forthcoming. When the answers came, they were positive.

Where the Tall Timber Grew

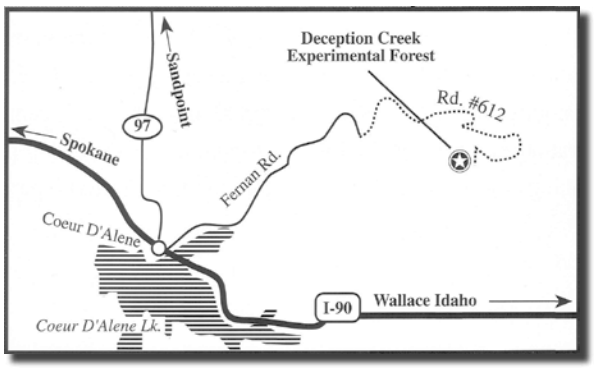
Deception Creek Experimental Forest was established in 1933 in the heart of one of the most productive forest areas in the Rocky Mountains. Priest River had been supervised directly by Rocky Mountain Station Director George Jemison with advice by the Divisions of Silviculture and Fire, but when he left the responsibility largely passed to Gisborne's Fire Research Division, although Silviculture remained responsible for many activities. Fire research activities were growing, and eventually there was no room for a strong silvicultural program at Priest River. So Priest River became the center for fire research and Deception Creek led the way in silvicultural studies. Considerable rivalry between the two divisions ensued (Wellner 1976).

Facilities at the Deception Creek Experimental Forest were built by a 250-man CCC contingent working from a camp established at Skookum Creek in 1934. The first CCC camp superintendent was Elton Bentley, who provided an oral history many years later (Russell 1984). Bentley said some of the CCC boys had never known work and "wouldn't recognize discipline." He related a story of an incident where discipline was established in a forceful way.

Bob Nearing was foreman for a crew building trail. One boy sat down and refused to work. Nearing said, "If you don't pick up that shovel and help the others, I'll throw you in the river." The boy didn't move, and Nearing picked him up and tossed him into the river. The crewmen had been members of a street gang in New York City, and they understood physical demonstrations of power. Bentley said they worshipped Nearing after the incident.

Bentley became superintendent at the Deception Creek Experimental Forest in 1937. Working under the supervision of a silviculturist, he led crews developing planting experiments and special cutting studies. Bentley served at Deception Creek until 1942, when he left the Forest Service. He said, "It became obvious that without a college degree I'd reached the maximum advancement."

While at Deception Creek, the Bentley family was assigned a house "with nice hardwood floors, plastered walls and heated by a furnace." Bentley said the home was treated with respect. Loggers took off their caulked boots to sit on the front porch during summer evenings, and Forest Service personnel wouldn't sit on the family davenport



until a protective blanket was thrown over it. Some things weren't ultra-modern, however. Bentley said the caretaker at the nearby Riverside Mine once invited the Deception Creek ladies, including his wife Doris, for a special visit to inspect a newly installed flush toilet.

Western white pine was by far the most valuable tree in great supply in the region, but it was declining because of its susceptibility to fire and insect and disease attacks. Funds were available to make valiant attempts to control fire, blister rust, and the mountain pine beetle, so the hard question of whether it was economically feasible to grow white pine was deferred (Wellner 1976), and Station silvicultural research continued to focus on white pine. Deception Creek was a good place to do that.

Deception Creek, 22 miles from Coeur d'Alene, consisted of 3,520 acres that included large stands of old-growth white pine and associated species. It was an excellent place for timber management and forest ecology research, and even after the white pine there declined markedly in the 1940s it thrived as a center for regeneration, growth, and genetic studies. Fire effects, insect and disease, watershed, and soils studies were added after the early years (Jain and Graham 1996).

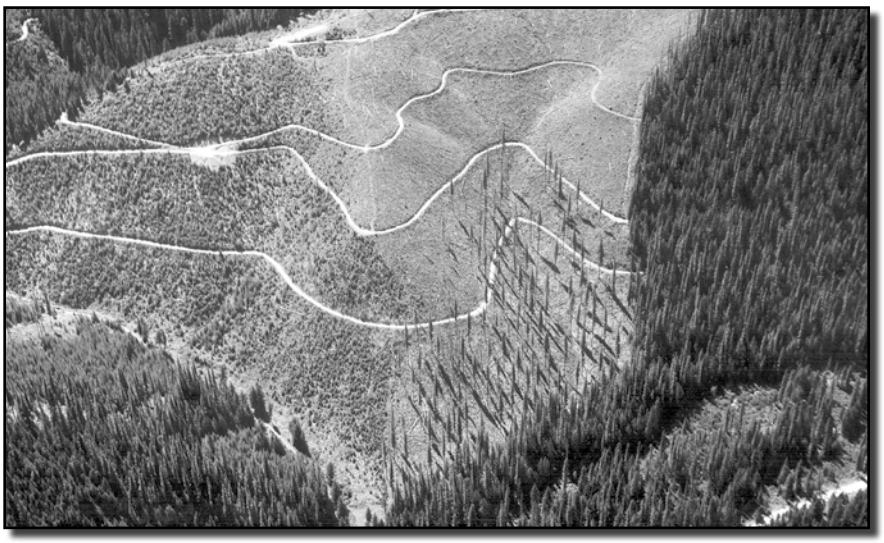
The forest included the 330-acre Montford Creek Natural Area, which was set aside as a sample of virgin, old-growth timber in the western white pine type. Deception Creek was divided into five blocks for research and demonstration purposes. In addition to Montford Creek, two blocks were for small-plot studies, one for continuing tests of tree vigor after selection cutting, and one for demonstrations.

As was true for every unit throughout Station history, the research program at Deception Creek grew or shrank with the national economic situation and the unstable nature of Federal funding. World War II had many effects. One might have included a little bit of good with the bad. In 1942, the Station combined the Fire and Silvics divisions under Harry Gisborne to conserve funds. That probably ended most of the reported rivalry that strained relations between the two units. However, a

The headquarters compound at Deception Creek in the 1940s. The 160 acres surrounding the headquarters was once a homestead claim. Most of the white pine was cut in 1914 and 1915, leaving a stand of grand fir and hemlock. The young white pines adjacent to the buildings in this scene came in after the land next to the old homestead buildings was cleared from about 1905 to 1910 (Wellner and Foiles 1951).

report by Gisborne in 1942 showed just how trying the times were at Deception Creek and Priest River:

> …the major effort of both silvicultural and fire research has been to maintain the continuity and standards of the most essential long-time research projects which were under way when the war started. Gisborne, Lyman, and Helmers constituted the total technical staff, with Miss Johnson continuing to serve as compilation clerk and stenographer for the division. A high school boy served at Deception Creek Experimental Forest and a college professor at Priest River Experimental Forest as temporary assistants during most of June, July, and August. Three Civilian Public Service men from the R-1 smokejumper squad



This aerial view of part of Deception Creek in 1957 included more than 20 study and demonstration areas featuring various types of regeneration methods and stand ages.

helped on the silvicultural fall plot work from September 15 to November 25. One of these men is being used throughout the winter at Missoula on compilation of plot data, while two others are serving as caretakers at Deception Creek. These men receive no salary and cost us only $5 per month plus their actual travel and subsistence.

Despite the obstacles, research produced useful results over the long term. Ray Boyd summarized a few of them from the early years of silvicultural research (Boyd 1960) in a leaflet describing Deception Creek:

- White pine regenerated well naturally following strip clear cutting, shelterwood, and seed tree cuttings, except on south and southwest exposure slopes.
- Planting was the best artificial regeneration method. Direct seeding was often successful, but not as dependable.
- Thinning usually proved to be a poor investment in white pine stands of pole-sized trees, unless the thinnings could be sold. Thinning by removing commercial-sized timber could be successful without reducing general productivity.
- Carefully designed selective cutting in mature stands was useful to salvage weak or diseased trees, aid blister rust control, and develop good distribution of age classes, although it could not be safely used where less than half the trees had excellent or good vigor.

These summaries are presented to show the scope of early silvicultural research within the Station, and to illustrate how the studies resulted in specific management guidelines. Later research became progressively broader as it addressed more general problems and more scientific disciplines were included.

By the 1990s, research at Deception Creek involved studies of how forest management affects ecosystem structures and functions. Scientists assumed that clearcuts probably would be used less in future forest management. Therefore, many variations in both even-age and uneven-age silviculture were being studied. Other studies included fire effects on sedimentation and soil nutrients, management effects on overstory and understory species composition, growth and yield, forest genetics, and root disease (Jain and Graham 1996).

Elizabeth Reinhardt, research forester in the fire effects unit, collected samples from a cutting unit at Deception Creek in 1986 before crews from the Fernan Ranger District burned slash.

The multidisciplinary nature of research that developed was reflected in studies started in the mid-1980s. Research Forester Russ Graham announced plans to harvest 100 acres of old-growth timber for silvicultural research at Deception Creek and invited others to participate. Fire Effects Project Leader Jim Brown wanted to test existing fuel consumption models and develop new ones, so personnel in his unit took advantage of the opportunity to design burns of the logging slash to gain new data. Fire management personnel from the Fernan Ranger District handled the burning. When the fire work was done, personnel from the Station's silviculture and pathology unit at the Moscow moved in to plant tree seedlings and determine how the soil was impacted by the fire (*INTercom* 7/24/86).

The Boys Roll Up Their Sleeves—The CCC Era

Regular appropriations were reduced in 1934, but the Station was much better prepared than in the previous year to handle the infusion of New Deal program workers with trained temporary supervisors. Civilian Conservation Corps (CCC) camps were established at Priest River, Deception Creek, and Coram. The young men at these camps were under off-duty supervision by the U.S. Army, and were employed on Forest Service projects during work hours. Road construction was the major activity, but they did other things such as establishing thinning and stand improvement plots, treating old burns to reduce fire hazards, pulling *Ribes* bushes, poisoning rodents, planting trees, and making timber surveys of the experimental forests. The camp at Priest River was a full-year operation, the Coram camp closed for half the winter and Deception Creek operated only in the summer.

NIRA funds were used to make major improvements at Priest River. In fact, most of the buildings currently at Priest River were constructed at this time. A fire-weather observation tower, a four-room cottage, five three-room dwellings, garages, a gas house, a water system, and electric power lines were built. New facilities also were constructed at Deception Creek and Fort Keogh.

The intensity of cooperative research with the Bureau of Animal Industry at Fort Keogh was increased in 1934, particularly studies of artificial reseeding techniques for the range on the short-grass plains of eastern Montana (Crafts 1938).

In addition to experimental forests, new experimental ranges were proposed during this period as the Station saw opportunities for expansion, particularly with the passage of the Taylor Grazing Act. The act was of great importance in the West. Its passage in 1934 effectively ended previously free and unregulated grazing use of vast acreages of public lands and introduced Federal protection and management of the lands and their resources.

Among other things, the Taylor Grazing Act shaped the Bureau of Land Management's range management program. The act also reversed the long-standing Federal policy of encouraging settlement by granting homestead ownership of public lands to farmers.

Much of this land in the semi-arid West was unsuitable for crop agriculture, and several million acres were reacquired through purchase by the Federal Government when the homesteaders went bankrupt during drought years (USDI 1984).

The most serious drought then on record in eastern Montana occurred in 1934. Miles City, for example, received only 5.5 inches of precipitation for the entire year. Some of the range research focused on artificial reseeding of abandoned dry-land ranches. Proposals for experimental ranges at Rochester Basin and Vigilante in the Beaverhead National Forest in Montana were made to accommodate new research on high mountain ranges. Experimental forests at Clearwater and Pleasant Valley, Idaho, to address ponderosa pine research were also proposed.

Fire research, under Gisborne, produced a technique for measuring dryness and flammability of dead branchwood and duff under field conditions. By this time, the results of Gisborne's fire control planning and fire danger measurement research were so good that they were applied by National Forests and various State and private fire protective systems. The research results guided organizational planning for manpower and physical facilities needed in fire control. In Region 1 the improved efficiencies in construction and location of fire lookouts and transportation systems, along with allocation of smoke chasers, resulted in an estimated 20-percent reduction in fire fighting costs.

During the depression years, there was a strong feeling that lumbering was and would continue to be the major industry of the Inland Empire (northeastern Washington, northern Idaho, and Montana west of the Continental Divide). The Anaconda Copper Company, which exerted tremendous political and economic influence in Montana, expressed interest in the possibilities of practicing sustained yield forestry on its considerable acreage of forest lands. In contrast, however, many private landowners were liquidating their investments by clearcutting due to distressed economic conditions. In the 1930s, this was the environment in which silvicultural research was operating.

I. T. Haig, who had studied western white pine at Priest River for 12 years, transferred into the Washington Office, and Ken Davis, field superintendent at Deception Creek, took on responsibility for leading western white pine research. Davis went on in later years to serve as head of the Forestry Department in the University of Michigan's School of Natural Resources. Lloyd Hornby, who had transferred from fire control to the Station, was in charge of silviculture research.

When Melvin Bradner became acting director of the Station in 1938, white pine was still the backbone of the forest products industry as it had been since pioneer days. It was the only Inland Empire species able to compete in the large market centers of the U.S. closer to major timber supplies.

The majestic, commercially valuable western white pine long was the mainstay of the timber industry in northern Idaho. Its decline due to logging and effects of fire, insects, and blister rust caused Station scientists to begin focusing their attention on other species during the 1930s.

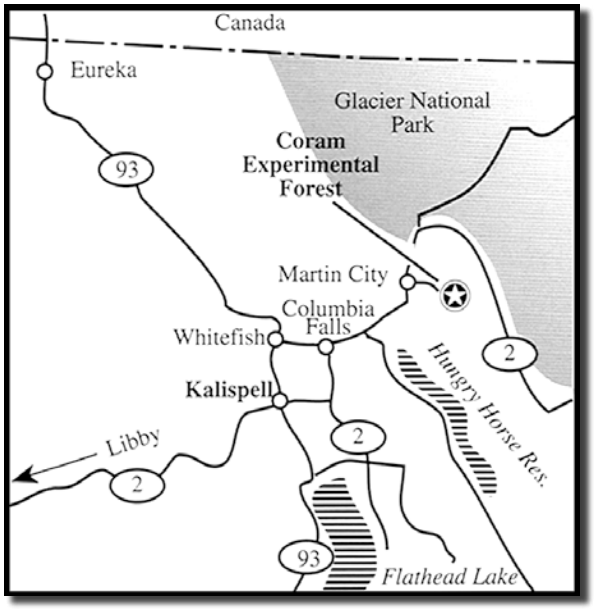
Western white pine commanded premium prices because of its many favorable characteristics. Its wood was straight grained, not resinous, and relatively easy to machine because it was softer than the wood of many other conifers. Clear grades did not shrink or swell very much with moisture changes and therefore were desirable for high-value uses such as pattern making, furniture making, and home hobby projects. Most grades were highly desired for the manufacture of moldings and trim boards, products that carried higher retail prices than general construction lumber. White pine could be processed to produce decorative plywood as well as plywood for industrial uses (Burns and Honkala 1990).

The species had problems with fire, insects, and disease, and these problems continued to serve as much of the justification for the Station's research program in the 1930s. But, as western white pine declined, research began to shift slowly toward western larch. Once Station researchers moved their focus to larch, they assembled a huge knowledge base to guide management of the species in the northern Rockies. Their field laboratory, the Coram Experimental Forest, was to become recognized as a world center for larch information.

Learning About Larch

The Coram Experimental Forest was established in 1933 on 7,460 acres within the Flathead National Forest. Western larch and Douglas-fir were the dominant tree species. Many were older than 300 and a few larch were more than 500 years of age. Second-growth trees ranged in age from 5 to more than 50. Earlier work was done at Coram, but Station research began there in earnest in 1948 (Shearer 1996).

Two leaders in western larch research, Ray Shearer (left) and Wyman Schmidt, were equally at home in the Missoula Forestry Sciences Lab and in the field at Coram.



Fifty years after Station scientists concentrated on work at Coram, Research Silviculturist Ray Shearer wrote a detailed summary of all the studies conducted there and the results (Shearer and Kempf 1999). Shearer, Project Leader Wyman Schmidt, and Forester Jack Schmidt were the guiding lights over many years in making Coram a successful experimental forest.

Shearer summarized the research by decade:

- Studies in the late 1940s and the 1950s determined how to regenerate larch and other conifers naturally using even- and uneven-age cutting strategies coupled with a wide range of site preparation methods.
- Research in the 1960s centered on how to regenerate larch using seeding and planting and how young larch forests, grown with a wide range of tree densities, respond in growth, understory vegetation development, water use, and insect, disease, and animal interactions.
- Studies in the 1970s and 1980s determined how to establish desired tree mixtures after cutting leaving varying amounts of woody residue, determined effects of thinning on tree and understory vegetation development, and sought to reduce insect and disease problems, and enhance watershed, esthetic, and bird and other wildlife habitat values.

The new emphasis on wildlife habitat featured establishing permanent study plots within the Coram Research Natural Area, which included 839 acres in an undisturbed area of old-growth forest. As in other natural areas, no timber cutting of any kind was permitted, and controlled fires used in other parts of the experimental forest also were prohibited.

One result of research that included plots in the natural area was a summary of studies of breeding birds. As part of his master's degree program at the University of Montana, Zoologist Bret Tobalske studied the presence of 32 species of small birds in various small logged areas and the undisturbed natural area plots. The results showed the significance of logging methods and the number of snags left on the sites in maintaining bird populations. The Station research paper presenting the findings included numerous management recommendations.

The first comprehensive research and development program in the Northern Rocky Mountains to evaluate multiple factors associated with intensive forest management was centered at Coram (see "Special Programs Bring Special Problems and Achievements," chapter 11). In 1974, a multidisciplinary team used Coram to investigate alternative tree harvesting practices that promote intensive, environmentally compatible, tree utilization. Participants had skills in engineering, wood technology, economics, meteorology, microbiology, mycology, pathology, entomology, silviculture, fire management, hydrology, and wildlife habitat. Although the studies were site-specific, results at Coram and other program study sites in the Rocky Mountains had application to management of coniferous forests in general (Shearer and Kempf 1999).

Research results from Coram studies had been presented in more than 200 publications by 1997. Shearer was senior author of 29, Wyman Schmidt produced 20. Jack Schmidt provided data for many publications, and was a co-author

Participants in a novel Station research and development program studied numerous techniques at Coram for harvesting and regenerating larch effectively, such as this strip thinning operation in a 30- to 40-year-old larch and lodgepole pine stand.

of several. Jack Schmidt served as superintendent and the research contact person for Coram for many years.

Early in Coram's history, researchers began to collect climate data, a process automated to a great extent later with advanced instrumentation. Data collected at 18 locations at various times were summarized and published by researchers from Missoula in 1984. In the late 1990s, seven climate stations were operating at Coram, measuring air, soil and water temperatures; wind directions and intensities; precipitation; stream flows; and relative humidity (Shearer 1996).

In 1976, Coram entered the international arena in a big way. It and nearby Glacier National Park were designated as Biosphere Reserves by the United Nations Educational, Scientific, and Cultural Organization (UNESCO). UNESCO followed up in 1979 with a similar designation for Waterton Lakes National Park in Canada, which abuts Glacier Park. The trio of special areas became known as "The Crown of the Continent Biosphere Reserves."

The UNESCO program sought, where possible, to pair one manipulated research area, such as Coram, with one essentially preserved area. Glacier and Coram were a good fit because they were very close to each other and had similar terrain, soil, plants, and animal populations. Their designations were commemorated at a joint ceremony featuring Station, Flathead National Forest, Park Service, and U.N. officials. The designation assured that research from Coram on the ecology and management of western larch forests would be shared worldwide. The purpose of the three reserves was to play a major role in protecting and conserving examples of the world's alpine and subalpine ecosystems, provide scientific research opportunities, and monitor the sustainability of development.

Coram added to its status as an international center for larch research in 1992. Wyman Schmidt chaired the first comprehensive examination of larch species of the world, a symposium that drew 340 participants to Whitefish, Montana. The gathering was sponsored by 10 natural resource agencies and organizations in the U.S. and Canada.

Station Director Roger Bay unveiled the plaque recognizing Coram as a Biosphere Reserve during dedication ceremonies in 1980.

The 521-page proceedings (Schmidt and McDonald 1995), published by the Station, included more than 100 papers by authors from 20 countries (Kingsbury 1992). It was the largest compendium of information on larch ever issued. Many of the papers by U.S. scientists reported on research wholly or partly conducted at Coram.

A highlight of symposium activities was establishment of the International *Larix* Arboretum, featuring plantings of all larch species of the world, on a 1.2-acre site next to the Coram forest headquarters at Hungry Horse. The goal was to provide a place for species comparisons and genetics research. It was a large undertaking. Spanning much of southern Canada and the northern United States, larch forests also cross parts of Western Europe and Eurasia. The trees occur as 10 species with numerous varieties and hybrids.

Shearer and Jack Schmidt designed the arboretum, and Schmidt assumed the maintenance job, making annual measurements of survival and growth of all the plantings. He took photos as part of the assessments, so the information made available at Coram included images of virtually all the types of larch found in forests worldwide. These photos added to Coram imagery already available to scientists in several sets of aerial photos taken in the 1950s.

Larch genetics research was important. Hybrids from western and alpine larch, the two naturally occurring species in the northern Rockies, had potential to produce seedlings that could better survive freezing, a subject of great interest to foresters in Iceland, Germany, and Switzerland. Other genetics work had potential to extend the range of the hardy larches southward in the U.S. by improving resistance to insects and diseases (Tippets 1996a).

Not all the genetics research on larch originated at Coram. Research Forester Clint Carlson and University of Montana Professor George Blake found rare offspring of western and alpine larch produced by natural cross-pollination growing on a rocky outcrop in the Carlton Ridge Research Natural Area in the late 1960s. Carlson produced additional hybrids through controlled cross-pollination and sent seeds to Iceland for growth trials on harsh sites. Seedlings were planted in eastern and western Canada, and a commercial tree grower in the U.S. was interested in the hybrids.

A small greenhouse was built at the Forestry Sciences Lab in Missoula to perform tests in several environments and develop additional hybrids. Some 700 hybrids were growing in the greenhouse by the early 1990s. The work was jointly funded by the Station and Region 1.

"This study demonstrates the importance of Research Natural Areas in forestry research," Carlson said. "Studies conducted in these RNA's, such as Carlton Ridge, lead to a better understanding of forest ecosystems and more appropriate management of forest resources" (*INTercom* June/93).

Coram was rich in demonstration sites, and most were within short walking distance from roads. A self-guided auto tour featured stops at eight sites, plus the entrance to two nature trails that provided outdoor classrooms for schools. Guided tours were available. For example, Region 1 held a 1-day field tour as part of its annual meeting of forest timber staff officers in 1986. Timber Management Director John Hughes said of the event, "The group was especially interested in viewing the western larch studies because much of what Region 1 is doing regarding management of larch is based on information gained from research conducted at Coram" (*INTercom* 5/29/86).

Forester Jack Schmidt installed an identification sign for Japanese larch at the International *Larix* Arboretum established in 1992 next to Coram Experimental Forest headquarters.

Greening the Grasslands and Summer Ranges

After the Northern Rocky Mountain and Intermountain Stations merged in 1954, the tendency was to think of the northern part of the territory as the forestry research area and the southern part as the center of range and watershed research. This was not the case throughout the time the Northern Rocky Mountain Station existed as a separate entity. Although Station research continued to concentrate on fire and silvicultural studies as it had in early days at Priest River, range research begun in a small way in the 1920s was expanded as management problems increased in Region 1. The common territory of both the Region and Station included vast rangelands in eastern Montana, North Dakota, and part of South Dakota, plus many higher elevation summer grazing areas important to livestock operations.

Until 1934, virtually the entire region had experienced dramatic increases in livestock use for almost a half century. In early years of the Forest Service, policies strongly favored increased use of public rangelands in the Region 1 National Forests. Later, demands for permits increased use on many allotments into the early 1930s even as overuse became apparent (Wyckoff and Hansen 1991). In the Great Plains part of Region 1, a combination of forces resulted in "dust bowl" conditions that led to New Deal land utilization projects and subsequent creation of National Grasslands.

The National Grasslands had a checkered history. Much of the land within and near them was homesteaded late, some in the 1910-20 era. The family farms did fairly well for a time, but in the late 1920s and early 1930s grasshoppers, dust storms, and the collapse of farm prices wiped them out. The Federal Government stepped in, bought up the ruined farm land, and resettled farmers to irrigated areas where crop agriculture was sustainable. The 4 million acres of utilization areas acquired by the Government in the Northern Great Plains were first administered by the Farm Security Administration; they were transferred to the Soil Conservation Service in 1941. The Forest Service was given jurisdiction in 1954.

The Montana land utilization acreage was transferred in 1958 to the Bureau of Land Management, despite Forest Service protests, especially by Johnny Forsman, Supervisor of the Custer National Forest. He called the transfer "a tragic mistake." The rest of the lands (about 1.2 million acres) became part of the National Forest System and were designated as National Grasslands in 1961. The National Grasslands came to be recognized as some of the best grazing lands in the semi-arid West (Baker and others 1993). Northern Rocky Mountain Station research played a major role in the improved management that resulted in that happy situation and in parallel improvements in the mountain grazing areas in the National Forests to the west.

Research at what became known as the Fort Keogh Livestock and Range Research Laboratory was a key to converting the failed dryland farms within the land utilization projects to highly productive rangelands. The facility, near Miles City, Montana, was operated by USDA's Bureau of Animal Industry. Station researchers began cooperative work there in 1924 shortly after the area was established as a research site when Congress transferred the land from the U.S. Army to USDA (Wellner 1976).

Fort Keogh originally was set aside as a military post following the Battle of Little Big Horn in which General George Custer and his men were overwhelmed by Indian warriors. It included 55,000 acres southwest of Miles City, and was composed mainly of native grasslands typical of the Northern Great Plains that historically supported vast numbers of buffalo (Schmidt and Friede 1996).

Early cooperative research at Fort Keogh included evaluations of sheep, turkeys, swine, horses, and cattle and their relationship to the range. The work was the major part of the total Northern Rocky Mountain Station range program. It included studies of forage plant development and range readiness for livestock grazing, evaluations of grazing impacts, studies of grazing patterns and range utilization, and development in nurseries of grasses and legumes suitable for improving rangelands. Tony Evanko, retired Station range scientist, thought the most important studies were of range readiness, with work on range revegetation next in importance (interview, 2005).

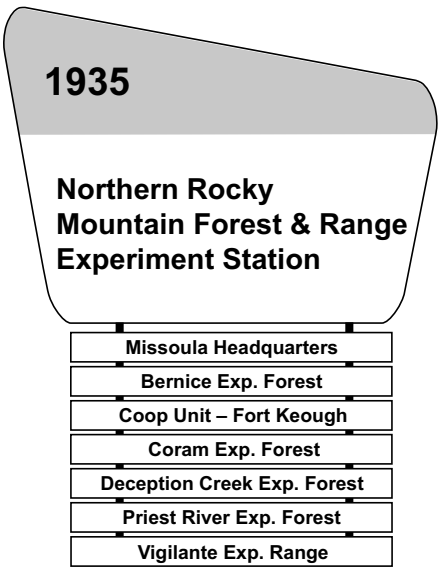
Management of the extensive grasslands in the land utilization project areas had an unusual cooperative aspect. The Soil Conservation Service had promoted formation of large grazing associations when it was responsible for the lands, and the Forest Service continued to have close relationships with these groups.

By working with the boards of directors of the associations, rather than individual stockmen, the Forest Service could resolve issues and transfer research results most effectively. The Region 1 associations ultimately organized into an Association of National Grasslands, which operated nationally. Private lands were intermingled with public lands in the grassland areas,

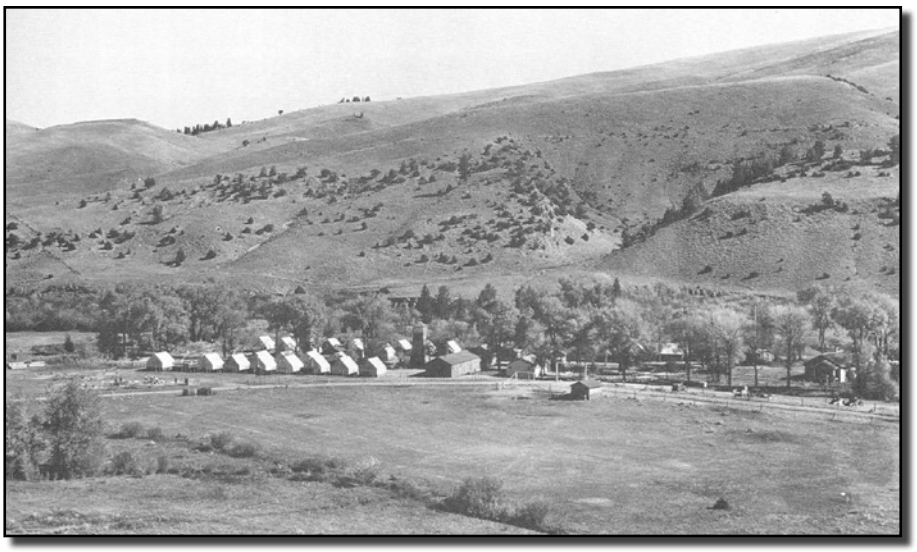
so through communication with the associations, management policies and research results were applied to almost twice the 1.2 million grassland acres under the jurisdiction of the Custer National Forest (Baker and others 1993).

Evanko said working relations in the area "were the best encountered in my career, especially with private land owners—both ranchers and farmers—whose utilization of research information was most rewarding and beneficial to all parties."

More than 1 million acres of privately owned lands were seeded in the late 1930s and early 1940s as a result of the range research programs conducted by the Station at Fort Keogh (Baker and others 1993). Improvements in the grasslands and higher elevation ranges in National Forests to the west continued, and Evanko attributed some of them to valuable range and watershed information generated by Station scientists at the Research Center in Spokane, which opened in 1948.



Fort Keogh was assigned to the Agricultural Research Service as part of the 1954 USDA reorganization. Research continued in cooperation with the Montana Agricultural Experiment Station, Montana State University. Although Forest Service research no longer was directly involved, lands managed by the Custer National Forest and other grasslands continued to benefit from studies of plant genetics and reproduction, nutrition and growth of beef cattle, and range pasture development, improvement, and management (Schmidt and Friede 1996). The 1954 reorganization also assigned primary Forest Service research responsibilities in North Dakota, western South Dakota, and eastern Washington to other Stations.



The first CCC camp in Region 1 was set up in 1933 at the Ruby River Ranger Station (Guth and Cohen 1991) where the Vigilante Experimental Range was established in 1935. The building at far right, erected before 1925, became an experimental range cottage.

The Vigilante Experimental Range was established in 1935 on 8,468 acres in the Beaverhead National Forest near Alder to study the problems of the high-elevation summer ranges in southwestern Montana. Mountain bunchgrass studies had begun there in 1924, but were discontinued in 1928, so the establishment marked a reentry into that line of research (Crafts 1938). A 3,937-acre cattle allotment was fenced and used for grazing experiments. A 126-acre area within a large sheep allotment was fenced and also used for research.

The Forest Service was adept at selecting names for its facilities that conjured up romantic images of the "Old West," and Vigilante was a prime example. It was located in the Virginia City-Bannack area where gold strikes in 1863 caused a mass influx of miners accompanied by assorted unsavory characters. Miscreants were tried by "miners' courts," but justice apparently was too slow and unevenly applied to suit some residents. They formed a Vigilante Committee patterned after an earlier group in San Francisco and launched a wave of lynchings. In 6 weeks, the Montana Vigilantes hanged 22 men after "trials" conducted in secrecy. On one occasion, the Vigilantes hanged a man for murder while his victim was still alive. The victim later recovered (Schmittroth 1998).

Development and use of the Vigilante Experimental Range appears to have been nearly as inconsistent as the early frontier justice in the area. The original plan was to divide the whole area into pastures for seasonal grazing and other management studies. This plan was abandoned, presumably for lack of funds. The proposal to disestablish the range in 1962 said "only limited range research has been done, and no studies of grazing techniques." The range was closed at the start of World War II and reactived in 1948, but initially the post-war staff consisted of a single scientist. Nevertheless, research at Vigilante produced useful results.

Seeding trials started shortly after Vigilante was established formed part of the basis for a Department of Agriculture

The "south house" where Station personnel lived when the Vigilante Experimental Range was an active research site, 1935-41 and 1954-62. The photo was taken in 1987.

bulletin, *Regrassing Montana Range Lands*, published in 1943. After the site reopened in 1954, Tony Evanko, the "one-man staff," did research that resulted in publications on methods to control undesirable range plants. Seasonal trends in cattle weights were defined over a 3-year period and the results were of interest to area stockmen. Range Scientist Jack Schmautz authored publications on the weight gain work and vegetation preferences of cattle on summer range. Schmautz left the Station to join the Region 1 range management staff in the early 1960s. Some of the data from vegetation surveys and plots at Vigilante were used by Region 1 in 1961 to develop a simplified approach to estimate forage utilization.

The first Civilian Conservation Corps camp in Region 1 was established at Vigilante in 1933. Corpsmen built most of the improvements used by Station scientists and seasonal workers over the years. These included a three-room dwelling, a water system, a combination woodshed and garage, a corral, more than 12 miles of fence, and an outdoor toilet.

Someone involved in the construction knew at least part of Vigilante history in the area. The mark "3-7-77" was set into the brick work of the dwelling's fireplace. Local legend said this mark was branded or painted on the doors of suspected "bad guys" by the Vigilantes. It was said to represent the grave the villain would occupy if he didn't get out of the territory—a space 3 feet wide, 7 feet long, and 77 inches deep (Prevedel interview, 2005).

A scale house was built near Cottonwood Creek where Station researchers weighed cattle as part of their studies. Results of the cattle-weighing research had benefits in some cases. One finding was that weight gains stopped or diminished after mid-September, an incentive for ranchers to remove their stock from the public lands earlier than was customary, giving the range a slightly longer rest period. Retired Ranger Dan Chisholm said in 2005 that years later he intended to sell the scales as surplus property. When he arrived at the site, he found that persons unknown had made off with the scales (Tippets interview, 2005).

The CCC-built facilities, plus an older four-room dwelling, were turned over to the Beaverhead National Forest in 1963 when the experimental range was disestablished. The value of the outhouse was listed as $100.42 in the official property transfer records. No indication was given as to how that figure was determined. Earlier, the Ranger Station had become the Ruby River Work Center, and administration of its area was assigned to the Sheridan Ranger District.

The disestablishment recommendation (Shepherd 1962) gave two main reasons for returning the Vigilante acreage to National Forest management: (1) The area represented only one of several kinds of range for which research was needed; and (2) the Station did not have funds to develop and operate Vigilante as an effective experimental facility.

The Beaverhead National Forest agreed to maintain many of the study plots that Station scientists said would continue to provide useful data. Montana State University continued some studies at Vigilante after administration of the area was returned to the National Forest.

Sagebrush-grass rangeland management in Region 1 also benefited from results of research at the U.S. Sheep Experiment Station near Dubois, Idaho. The sheep station's experimental area represented several major ecosystems and included thousands of acres in the Centennial Mountains in Montana. Although of less importance than in Region 4, spring-fall grazing studies conducted by Intermountain Station scientists, including use of fire as a management tool, were applicable to many Region 1 areas.

World War II Intervenes

Concerns about decreasing funding from New Deal emergency programs proved to be well-founded, because by 1940 the regular research appropriations for fire, silviculture, and forest products were 30 percent less than in 1931 when all lines of research were transferred from Region 1 to the Northern Rocky Mountain Station (Annual Report, NRM 1940). The country still had not completely pulled out of the Great Depression, although the economic situation had improved from the worst days. But along with the improvement, a new uncertainty was brought about by the start of World War II in Europe in the late 1930's.

World War II created a major impact on the Northern Rocky Mountain Station, just as it did on almost every aspect of American life. Many Forest Service employees were drafted or volunteered for military service. Rationing of resources such as gasoline, rubber, metals, wood, and other materials needed for the war effort meant they weren't available for civilian pursuits. In many areas of research, the programs were essentially put on hold for the duration of the war.

Thirteen men and women from the Station were in military service, and only one of the vacant positions was filled, largely because the salary and operating expense funds for the vacant

Not only the men went to war. Helen B. Davis, a member of the clerical staff of the Northern Rocky Mountain Station, served in the Women's Army Corps.

positions had gone to war, too. The money simply wasn't there to allow the Station to hire anyone. Forest Survey was busy because of the relatively high priority given to working with the War Production Board. Silviculture research, at the other extreme, was down to a one-man effort.

World War II was a relatively short span in the history of the Northern Rocky Mountain Station, but a significant one. Not only did many of the staff leave for military service, but some never returned to the Forest Service after the war. Other resources necessary for the conduct of research weren't available because the military had first call on them. Much of the activity that did go on was related to the war effort.

Some degree of post-war planning was initiated before the war ended and it provided an opportunity to think about change both in research and in organization. Post-war planning at the Northern Rocky Mountain Station foresaw changes from the over-cutting taking place in the forests of Idaho and Montana toward a sustained-yield management system. A shift from western white pine as the premier timber species to greater utilization of western larch and lodgepole pine was also predicted.

Research Recovers

World War II ended in August of 1945, beginning a post-war period of recovery for Forest Service research at the Northern Rocky Mountain Station. Expectations were that the research programs that had been reduced during the war would not only regain their former vigor, but also grow.

The war had caused a backlog in the dissemination of research results. The Forest Research Council was revived in Missoula, and forest products research at the various Stations was organized into a newly formed Forest Utilization Service conceived by the Washington Office. Its concept was to have utilization experts at the Stations capable of discerning forest products industry research needs (mainly for consideration at the Forest Products Lab), and disseminating utilization research findings to industry.

In American society "research" was a word used more frequently in relation to human and industrial events than ever before. Every man and woman on the street knew that the atomic bomb was the result of scientific research. People were associating the word "research" with progress. Three bills were introduced in Congress in 1946 to expand nearly all types of scientific research. Dr. Vannever Bush, high-profile director of the U.S. Office of Scientific Research and Development, wrote *Science the Endless Frontier.* The Stations strove to develop statements of research needs in concert with the Bush report, hoping for more forestry research support.

As expected, lumber demand increased dramatically during the war, but the lumber went to the war effort and few new homes were built. Post-war demand for housing was spurred by the formation of new families as ex-servicemen married and reentered the civilian labor force. Lumber demand doubled and the cut from the National Forests in 1946 increased 200 percent over the average for the previous five years. Forest Service research funding, however, remained down.

Everything about timber gained importance in the Forest Service, including programs to control forest insects that defoliated or killed trees. Two entomologists who later transferred to the Intermountain Station provided technical guidance in 1947 for the largest aerial spraying project undertaken up to that time in western forests. Jim Evenden, assisted by Phil Johnson, gave scientific advice for a project to control an outbreak of the Douglas-fir tussock moth that threatened to defoliate 400,000 acres of forest in northern Idaho. Eleven assorted aircraft (three crashed during the project) sprayed one pound of DDT in one gallon of oil per acre in the area centered in Latah County.

Coincidentally, the western spruce budworm had begun to infest vast areas in Oregon and Washington. The apparent success of the Idaho tussock moth project caused Bureau of Entomology personnel to test the spray successfully against the budworm in 1948. Thereafter, 9 million acres were sprayed during the 1949-58 period, mostly in Oregon, Washington, and Idaho but also in Montana and the northern part of Yellowstone National Park (Furniss, in preparation).

The Research Center Concept

Ed Kotok, Sr. was the Deputy Chief for Research in 1946 and he promoted the concept of research centers, some of them at existing experimental forests and ranges. (His son, Ed Kotok, Jr. headed the Forest Utilization Service unit at the Intermountain Station in the 1960s). Centers were intended to be tied to a geographical area or a single-problem area, and to be staffed by researchers from more than one discipline.

Mel Bradner, who had served as Northern Rocky Mountain Station Director since 1938, died in early 1946 and was replaced by Charles L. Tebbe. In the interim, Harry Gisborne, serving as Acting Station Director in 1946, announced the establishment of a western Montana forest research work center in Missoula. It was to be one of several included in long-range plans developed under Deputy Chief Kotok's concept of research centers. Investigations conducted by researchers at the Missoula center included:

- Timber harvesting methods to increase the yield of forest products

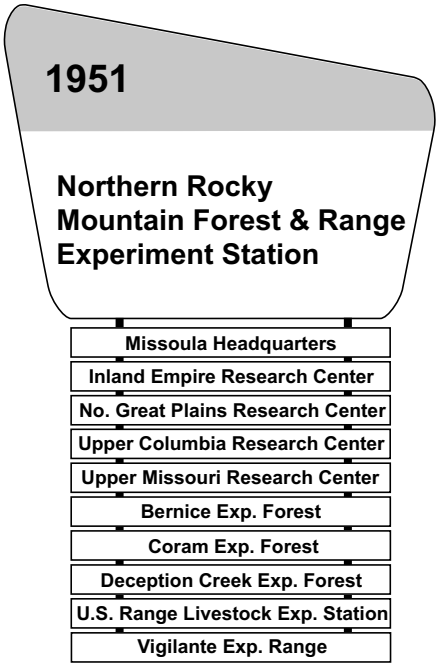
- Regenerating forests following logging
- Improving young timber stands by cultural practices such as thinning

A press release quoted Gisborne as saying, "Expansion of this kind of research in western Montana is urgently needed…[because] much of the Station's forest research has heretofore been concentrated in the more intensively exploited white pine territory of Idaho. Now because of the national scarcity of lumber, increasing demands are being made on Montana forests for all kinds of forest products" (NRM 1946). Russell K. LeBarron, Chief of the Station's Division of Silvicultural Research, was put in charge of the new Missoula Research Center.

Establishment of this center proved timely. New markets for lodgepole pine timber from the northern Rockies began to develop in 1947 as the pulp and paper industry in the Lake States sought new pulpwood supplies for the mills concentrated there. The demands for timber species that practically couldn't be given away prior to World War II were spectacular. The cut of timber from Region 1 National Forests rose 150 percent above 1940 levels.

Research centers were decidedly nonuniform. Each was assigned a geographic area that was normally, but not always, at or near an experimental forest or range. They were planned to solve the primary management problems of an area, although some at times were assigned problems not specific to the area. Usually a center had research involving several functional fields, but this was not always the case. By 1947, Forest Service Research had established 34 centers; 19 more were authorized and established that year. The plan was to have 80 centers eventually (Storey 1975).

By 1948, the Northern Rocky Mountain Station was on the way to reaching its goal of establishing research centers at Bozeman, Priest River, Fort Keough, and Spokane, as well as the one in Missoula. Under the research center concept, each organization was headed by a center leader who served as a line officer in charge of all the research at the center, regardless of discipline. Division chiefs had the staff responsibility, at Station



headquarters, for coordinating research within disciplines among the centers.

Having research centers at both Priest River and Spokane was a very temporary arrangement. Chuck Wellner was named center leader for both operations. Less than a year later, the Spokane organization was renamed the Inland Empire Research Center. Wellner continued as leader. Priest River was returned to its earlier designation as an experimental forest. Wellner said this change made no real difference—the two locations already were being managed as one (Wellner 1976).

At Spokane, plans called for studies of:

- Converting old-growth forests to managed forests
- Cutting young, second-growth forests to obtain the most products
- Determining the growth rate of forested areas
- Starting new forests, both naturally and artificially
- Restoring depleted rangeland to full productivity
- Managing rangeland to yield the most products

Wellner served as Center Leader for 10 years until he was named Chief of the Intermountain Station's Division of Forest Management Research (INT 1958). When Wellner left Spokane, he was replaced by Bob Callaham, who later became Director of the Pacific Southwest Station.

"Empire" may have been a fitting descriptive word for the Spokane operation in more ways than one. Al Stage recalled, "In those days, Research Centers were on the verge of becoming little Experiment Stations. Their leaders had considerable political pull. They also had a very close involvement with forest professionals in industry, the State, and the rest of the Forest Service" (Stage 2003).

Stage noted that people concerned with forest research and management had an organization in Spokane called the Hoo Hoo Club, a place where industry and Forest Service people got together once a month for lunch and talked about problems. "And then some of them would go talk to their politicians," he said. "And problems generated money. Money generated people, and that's sort of how things grew the way they did."

Stage pointed out that because all the scientists at a Research Center reported directly to the center leader, the organizations were long on cooperation. He said, however, they were "rather shallow technically in any one field." Stage believed this situation reversed later when centers were discontinued in favor of research work units at laboratories.

Some of the fundamental strengths of the centers led to abandonment of the concept. Each center was specifically identified in Congressional appropriations measures. Some Forest Service administrators came to believe that strong center leaders and strong local ties lessened support of the broader goals of the Stations. There was also unwanted pressure from Congress to establish unneeded centers. In the future, Research leaders would be challenged to control the situation without losing scientific creativity (Steen 1998).

Organizational changes occurred in the Washington Office as well as at the Stations in the late 1940s. The Division of Forest Fire and Atmospheric Sciences Research was established (West 1990), a development that was to be of great importance to the Station.

Sticks for Cash

Because of the success of Harry Gisborne's earlier work with fuel moisture indicator sticks used in evaluating fire hazard, the Station in 1948 was given the assignment of manufacturing the sticks for all the forest protective agencies west of the Mississippi River. The job was transferred from Region 5 (the California Region) to Priest River where 1,500 sets per year were manufactured at a cost of $1.50 per set. It was not big money, but the fuel moisture indicator sticks became important tools in forecasting forest fire danger.

By 1954, the process of making indicator sticks had been automated and moved to a Forest Service warehouse in Spokane. A two-man team worked 6 or 7 weeks each winter producing 1,800 sticks. All indicator sticks used at fire-weather stations were replaced annually (Hardy 1954).

Chuck Wellner displayed the half-inch versions of Harry Gisborne's fuel moisture indicator sticks that earned a few extra dollars for the Northern Rocky Mountain Station. (Gisborne Collection, 98 (vii): 205)

New Emphasis Areas

As the 1940s came to a close, changes occurring in the forest products industry began to influence changes in the Station's Forest Utilization Service program. Lodgepole pine, small in size, growing at high elevations with difficult access and far from markets, had not been extensively utilized. Yet, the volume of lodgepole pine in the forests of the northern Rockies was significant. The Station's efforts to aid industrial development were directed toward utilization of lodgepole pine in a developing pole industry, and in aiding the pulp and paper industry's consideration of establishing pulp mills in the Inland Empire.

Federal funding for wildlife research went to the U.S. Fish and Wildlife Service (USFWS), with none to the Forest Service. However, because management of the National Forests obviously involved wildlife habitat, the problem of addressing Forest Service research needs in this area was met by assigning USFWS personnel to Forest Service research locations. In the Northern Rocky Mountain Station area, wildlife research was done by a USFWS biologist located at the Missoula Research Center (Annual Report, NRM 1949).

The late 40s and early 50s continued to feature change in research program emphases. Watershed management research was assuming more importance in the eyes of forest managers by 1949, and the Station cited the need to integrate watershed research into the area called "forest influences." The allocation of funds for forest economics research began, adding a new dimension to the research programs.

Research programs within the Stations, including the Northern Rocky Mountain, were still organized according to functional divisions—timber management, fire, range management—but there was a realization that some integration was desirable and should occur. It also was recognized that funds and people were still out of balance with the research needs identified by the Station (Annual Report, NRM 1948).

The effectiveness of efforts to stem the losses of western white pine to blister rust through *Ribes* eradication began to receive serious challenges, and a new problem labeled "pole blight" emerged. Pole blight ravaged pole-sized stands of western white pine, and its cause and ways to control it were unknown. It joined the list of research problems addressed by the Station.

Post-war shifts in agricultural livestock production were also reflected in changes in the Station's range research program. In the Interior West, Sheep numbers were down 51 percent from their 1942 peak of 3.9 million; horses were in a steady decline from 450,000 in 1930 to 173,000. But there were twice as many cattle as in 1938, reaching an all-time high of 1.8 million in January 1945. On the Great Plains, wheat acreage was increasing because farmers were plowing fields that hadn't been used in years.

By 1950, the United States was already involved in a cold war with the Soviet Union and other communist countries. That summer, a hot war broke out in Korea as communist North Korea invaded South Korea, immediately involving the U.S. in the fighting. This dramatic change in events was reflected in the Station's annual report. The authors wondered if events were leading toward World War III, and what the Station's role would be.

It was also a time when the Forest Service began viewing forest genetics as the "glamour item" within forestry research. Significant and well-publicized gains had been made in agricultural crop production. If productivity gains could be made in agriculture, why not in forestry? The question came naturally because commodity production as a goal was common in the Forest Service at that time. This was reflected in the Station's mission statement: "The Northern Rocky Mountain Station's mission is to aid in the production of timber, forage, and water (in harmony with animals)."

Some frustration was evident in a 1948 annual report statement, "The general public may not be aware that Forest Service research is under way, or if they are, is skeptical about its value." Such frustrations and sentiments were

not unique to either the Station or the time. They have been voiced by many Forest Service researchers and research administrators through the years. Developments in fire research were soon to make Forest Service research more visible to the public and to demonstrate its value.

Fire Research Takes off with Barrows

Harry Gisborne convinced Jack Barrows to join the Northern Rocky Mountain Station staff in 1946. Barrows was destined to carry fire research into new realms made possible by wartime technological developments (Hardy 1983).

Gisborne and Barrows admired each other. They had become close friends during the 1930s when Barrows conducted fire control and fire behavior workshops and later became Chief of Fire Control Training for the National Park Service. Gisborne thought Barrows was exactly the right person to continue research started by Lloyd Hornby, who had developed the first basic principles for fire control planning. Barrows said Gisborne was "certainly a man that I wanted to know and be associated with because he was obviously way ahead of his time. His concepts, his thinking, his vigorous approach to problems were absolutely infectious to people. He inspired me to do things" (Hardy 1977).

The 3-year Barrows-Gisborne association didn't turn out to be exactly what Gisborne envisioned. After less than a month getting ready to analyze a huge backlog of fire reports to begin his planning research, Barrows was detailed to lead a new Aerial Bombing Project for the Forest Service. According to Hardy, Gisborne might have been a bit disappointed in this change, because Gisborne had waited a long time to restart fire control planning work. But Gisborne had picked the right man to move the total program forward.

"Barrows was not one to let anything stand still if he was convinced it should start moving," Hardy said. Despite his reassignment, during his first winter in Gisborne's unit Barrows prepared a detailed working plan and started machine compilation of 23,000 punch-carded National Forest fire reports. This work was the foundation of an improved design for fire control planning that capitalized more fully on new knowledge of fire behavior in the northern Rockies and new equipment and techniques available to field forces.

So Barrows did fulfill his obligation to resume work in the general fire control planning arena, but he made his mark using his boundless energy, organizational skills, and military and political connections to introduce revolutionary "high-tech" methods into wildland fire research and management.

Barrows' military assignments during World War II had included serving as a Lieutenant Colonel on the staff of Gen. Curtis LeMay doing work related to the incendiary fire bombing of Japan. After spending 3 years formulating aerial bombing strategy and tactics with the Army Air Corps in the Pacific, he was discharged and accepted the employment offer Gisborne had made in a letter while Barrows was still in the Air Corps. Because of his military experience, Barrows was a natural choice as liaison between the Army Air Corps and the Forest Service in the cooperative work that was necessary for the Aerial Bombing Project to succeed.

Gisborne was enthusiastic about the Aerial Bombing Project. He had backed a few abortive attempts at testing water drops on fires in the 1930s. One was a drop of an oak beer barrel filled with water from 250 feet. It created a hole and a wet spot. "Looked as if someone had tried to drown out a badger," said Gisborne's close friend and cooperator Howard Flint (Hardy 1977). The next try was with a specially built iron can. It broke "like a fresh egg dropped on a concrete walk." Other attempts were drops from a Ford Trimotor equipped with a 100-gallon tank. This technique eventually worked from 30 feet above ground but didn't provide enough water to "faze a light grass fire."

Flint said Gisborne wondered if foam fire suppressants might be applied from the air. So for several hours he and a technician filled paper shopping bags with foam. They were hauled to the top of a 150-foot tower with a rope and dropped at targets on the ground. Results were "less than promising."

Despite Gisborne's interest, he turned the entire Aerial Bombing Project over to Barrows, limiting his participation to providing occasional advice. Massive, fast-moving enterprises were really not Gisborne's thing. When the project ended, he was reluctant to go along with sweeping conclusions based on limited data and experience. Big, high-tech enterprises and quick results definitely were Barrows' thing.

The project sought to use wartime bombsights, modern aircraft, and other innovations to make accurate drops and try to find an ideal drop height. It was strongly backed by David Godwin, the Forest Service Director of Fire Control, who was a close friend of Air Force Commander Hap Arnold. The first season was devoted to fitting the "bombs" with fins and fuses and preparing a fire site about 20 miles from Missoula.

The exciting part started in 1947. A B-29 Superfortress and two P-47 Thunderbolts arrived from Eglin Air Force Base and made many practice runs, first over level ground and later in mountainous terrain. The P-47s bombed a few fires caused by lightning near the end of the season; results of those attacks are unknown.

Hardy (1977) said, "This probably was the most publicized fire research endeavor ever to occur in this Region (Region 1)." At a public ceremony at Great Falls, the mayor christened the B-29 the "Rocky Mountain Ranger." Frequent newspaper articles kept the public well-posted on developments in the project. Three progress reports were issued, the last an 83-page illustrated document giving details of the research, recommendations, and conclusions. It was prepared jointly late in 1947 by the Station and the Air Force Proving Ground Command.

Ambitious plans were made for tests in 1948. They included using bigger and better bombs, trials of foam and chemical retardants, bombing a large fire head, and formation bombing. None of this came about. The project was terminated.

Jack Barrows spoke at the christening of the B-29 Superfortress, "The Rocky Mountain Ranger," which was outfitted to drop water in large containers that would burst on or above the ground as part of the Aerial Bombing Project.

C. S. Crocker, Region 1 Chief of Fire Control, blamed the old guard. He said, "There were too many Forest Service men that were back in the horse and buggy days" and didn't want this kind of work continued. A different view was given by a project representative who attended an Air Force meeting at the Pentagon: "I got the feeling that the junior officers were interested and sympathetic toward continuing the program, but the senior officer, who was new, and presumed to represent the Secretary, was very adamant that orders from above were to discontinue it. I never learned exactly why" (Hardy 1977).

The idea of fighting wildfires with the aid of aerial retardant drops was pretty much put on hold by the Forest Service until 1954 when tests began in California of dropping free-falling or cascading water as part of "Operation Firestop." Producing new retardant technology became an important part of the Missoula Fire Lab program later, and aerial fire attack became a vital part of fire control efforts throughout the world.

Undaunted by termination of the aerial bombing program, Gisborne and Barrows became involved in another high-tech fire research adventure—cloud seeding to control the lightning that was by far the principal cause of wildfires throughout the western United States.

Immediately after World War II, Irving Langmuir and Vincent J. Schaefer of the General Electric Company's research laboratory in Schenectady, New York, accidentally discovered that when dry ice (frozen carbon dioxide) was dropped into a freezer containing a fog cloud, snow resulted and the cloud vanished. Gisborne, who apparently kept track of all sorts of people and things, had met Langmuir in 1933. Barrows said when Gisborne learned about the new dry ice test results, "he just sparked immediately and proceeded to find out if it could become a tool in fire control" (Hardy 1977).

Although the Forest Service did not want to be involved in cloud-seeding research because other agencies already were working in this area, Schaefer was invited to Priest River to visit for a month in the summer of 1948. Informal meetings and experiments that included Gisborne and Barrows during his stay resulted in a sort of "bootleg" participation by the Station in cloud-seeding research.

The next summer, Region 1 made a contract C-47 aircraft available and it was rigged with a dry-ice hopper and oxygen tubes leading to the rear of the cabin where the crew could chop and cascade dry ice. On a test flight, each man was tied to the plane by a rope in case he fell out the door. Bob Johnson, founder of the Johnson Flying Service that owned the plane, gave this account of the flight:

> We got to 26,000 feet but the darned thunderhead was moving up pretty near as fast as we were. We finally got into and almost on top of it and they started letting loose the dry ice. But in the deal somebody back there either stepped on the oxygen tube or kicked it loose, letting it run all over the plane. I don't know what [happened], but they had no oxygen and all at once Gisborne came busting up to the cockpit yelling "go down, go down, do down, we got no oxygen." Gis' face was purple. But anyway we took the nose down and we came down pretty fast—a lot faster than we went up.

The C-47 proved to be unsuitable for cloud-seeding, so Barrows used his connections to get a B-29 from Fairchild Air Force Base. It was equipped with a specially designed ice hopper and Forest Service radios. Although the plane made several test runs near Priest River that summer, no clouds appeared that were suitable for a proper experiment. Gisborne said he "got heavy pressure to get busy and do something, go up and ice a cloud, any cloud, and see what happens." "But," he said, "I am not going to do that. I am not going to try to plug the gap by pulling a stunt instead of

Jack Barrows (right) operated the radio near a mobile radar unit in 1956 as Don Fuquay (left) and Vincent Schaefer used a cloud theodolite to check cloud speed and direction.

conducting an experiment, as much as I would like to go up and see what we can do" (Hardy 1977).

Schaefer wrote a report in January of 1949 that summarized the efforts up to then and proposed a detailed procedure for conducting further research on cloud seeding for fire prevention. He said in an interview, "It was Harry Gisborne, along with his young assistant Jack Barrows, who planted the seed in my mind for the development of the full-blown research endeavor which became Project Skyfire." Gisborne died that year. Barrows took his place as Division Chief of Forest Fire Research at the Station and also as the chief advocate of Project Skyfire.

Langmuir and Schaefer came to Priest River in 1952 to help conduct the first training school for lookouts who would keep track of lightning storms and make cloud surveys. Skyfire became a formal Forest Service research program in 1953, a move enthusiastically supported by Barrows.

Project Skyfire came to include many diverse cooperators, and assembling and keeping the team together and motivated was a role Barrows played well. He was a master at locating and obtaining funding and the right personnel. In a progress report (Barrows 1954) he said the first Station cooperator was the Munitalp Foundation, a private, nonprofit organization dedicated to fostering basic research in meteorology. "The man who endowed the money that made this foundation possible was a mining engineer who did not wish to publicize his own name," Barrows said. "However, he did make his fortune in platinum and therefore Munitalp is simply platinum spelled backwards." The name of the foundation's benefactor remains unknown.

With funds in hand, Barrows hired Meteorologist Don Fuquay to lead the Station research. Fuquay had conducted research on thunderstorms and lightning physics at the University of Washington, where he earned BS and MS degrees in meteorology, and also for the Munitalp Foundation. He designed much of the specialized research equipment used in the Skyfire program.

The Project Skyfire cooperator list mushroomed. It came to include the U.S. Weather Bureau, Montana State University, the University of Washington, the General Electric Research Laboratory, Boeing, the National Park Service, the California Experiment Station, the California State Division of Forestry, and all Forest Service western Regions. The broad objectives were to (1) gain basic information on the occurrence, behavior, and control of lightning-caused forest fires and the characteristics of storms that produce the fires, and (2) to develop methods for suppression of lightning fires, including cloud modification (Barrows and others 1957).

The list of Skyfire activities was as impressive as the role call of cooperators (Barrows and others 1957). It included:

- Statistical studies of lightning fires throughout the western U.S. that showed where lightning-caused fires were most prevalent, dates and times of occurrences, the speed of detection, rate of fire spread, areas burned and other data.
- Development of a network of 22 lookout stations that provided information on clouds and lightning storms in the Northern Rocky Mountains.
- Studies of the theory of cloud seeding and techniques for cloud modification.
- Specially developed equipment, including a mobile atmospheric laboratory, mobile radar unit, airborne cloud-seeding generator, ground-based cloud-seeding generator, wind tunnel for generator tests, and many modifications of standard meteorological equipment.
- Special time-lapse motion picture cameras used at numerous points to record the life cycle of clouds and thunderstorms.
- Studies of the origin, development, and intensity of thunderstorms in the Northern Rocky Mountain area, and of the associated atmospheric factors.
- Studies in Arizona and the northern Rockies of freezing nuclei of silver iodide and other seeding agents.
- Detailed analyses of the results of cloud seeding experiments.
- Studies of lightning storm forecasting to determine methods for predicting storms in local areas and differences in the storms.

The researchers found that they could reduce the incidence of lightning, but national Forest Service officials put a stop to the studies for fear of lawsuits filed by people adversely affected by induced weather changes (Rothermel interview, 1993). The research, however, produced several spinoffs. One of the most important to natural resource management agencies was the early work on development of lightning detectors placed on mountain tops, which ultimately became part of a network of remote reporting stations recording lightning conditions and feeding the data into the National Interagency Fire Center in Boise.

Barrows and Gisborne shared several characteristics, perhaps most notable their personal dedication to fire research, meticulous organization skills, and an emphasis on meeting ambitious goals. But there were differences, too. Gisborne tended to demand perfection from himself, his subordinates, and cooperators. Barrows appears to have shared this appreciation for excellent work, but he tempered it with diplomacy.

In the course of his unending crusade for better fire-weather forecasting, Gisborne created some bitter relationships with personnel of the U.S. Weather Bureau (later Service). His impatience with progress in weather forecasting turned to irascibility in his later years (Hardy 1983). The Region 1 Director of Fire Control, Crocker, berated Gisborne in 1948: "You advocate (and practice) needling, aggravating, fighting, and antagonizing the Bureau. That approach over the years has brought us nothing that could not have been realized through other more ethical means."

Barrows healed wounds by including the Weather Bureau in Project Skyfire as an important partner and carefully acknowledging good work by bureau personnel and other cooperators in his progress reports. Like Gisborne,

Barrows campaigned for improved funding for fire research. Gisborne openly criticized the Forest Service's budget for fire studies as "grossly inadequate." Barrows worked more indirectly with key individuals, including Montana Senator Mike Mansfield, to gain increased funding (*INTercom* 3/16/89). One result was establishment of the Fire Lab at Missoula, which cost $1 million to build and opened in 1960 with Barrows as chief administrator (see "The Fire Lab Fires Up," chapter 10).

A firefighting tragedy was another impetus for fire research, and ultimately construction of the Fire Lab. Thirteen firefighters, 12 of them smokejumpers, lost their lives in the Mann Gulch Fire in Montana in 1949. This was not the biggest loss of life due to wildland fire before 1949 or since, but it and several investigations that followed the disaster captured the attention of national news media and thus the public and politicians. *Red Skies of Montana*, a movie starring Richard Widmark that appeared in television reruns for many years, was said to have been based on events during the Mann Gulch Fire. It was produced by Twentieth Century Fox in 1952, when investigations and lawsuits related to the fire were still in progress. Mann Gulch did not immediately inspire a quest for new knowledge of forest fire behavior, but over time it did (Maclean 1992). It also was the place where Harry Gisborne died.

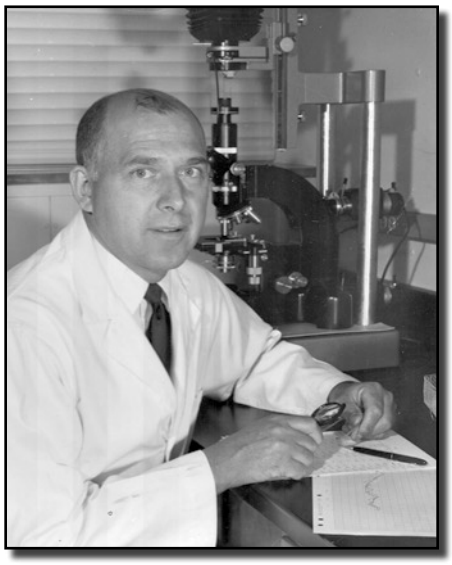
Barrows' administrative talents and connections to the military did not go unnoticed in Washington, DC. In 1964, he was promoted to Chief of Fire and Atmospheric Sciences Research. He continued to be a strong advocate of fire behavior research and control methods that incorporated new technology. Evidence of Barrows' political instincts and effective use of contacts to make things happen is shown in the 19-fold increase in fire research funding from 1945 to 1970. Other research budget items increased 5- to 8-fold during the same period. Barrows taught at Colorado State University, where he had earned his bachelor's degree in forestry, for several years after his retirement in 1972.

The spot where Smokejumper Stanley J. Reba died was one of 13 marked at the Mann Gulch fire site. The place where Harry Gisborne died nearby was marked later. The tragic Mann Gulch fire focused national public attention on wildland fire fighting and one result was increased support for the Station's fire research program.

After he died in 1989, Barrows was honored with a scholarship fund in his name at Colorado State to help graduate students studying fire management or research subjects. His former research associates recognized his achievements by displaying his portrait in the Fire Lab, an honor he shared with his friend Harry Gisborne.

Art Brackebusch took over as Fire Lab Chief in 1964, and the high-tech research programs continued and expanded. By 1968, the staff numbered 50, and as many as 100 were employed during summer fire seasons. Brackebusch said the staff was working on six major projects, including infrared sensing, lightning detection and control, fire retardants, fuel combustion, and computer data analysis (Morrison 1968).

Brackebusch was the last Fire Lab Chief. The Lab had functioned much as the large research centers did. The lab chief, like a strong center leader, had considerable autonomy and was able to develop political contacts. The Fire Lab had its own administrative officer with several assistants to deal with management of the physical plant and personnel and financial matters, plus a few employees performing publishing and public information program functions. This situation made the lab a prime candidate for change when Forest Service Research decided to move to research work unit-Assistant Station Director configurations, with general support functions managed from Station headquarters (see "Administrative Changes," chapter 11). Although the transition took several years, the lab chief position was abolished and the administrative support personnel ultimately were moved out of the lab and supervised from Station Headquarters in Ogden.



Research Forester Art Brackebush took the helm at the Fire Lab in 1964 when Jack Barrows was promoted to direct the Forest Service's national fire science program.

The Intermountain Station, 1928-1953

Passage of the McSweeney-McNary Act in 1928 provided for establishment of the Intermountain Station, but the language was much less specific than it was for the Northern Rocky Mountain Station and the other 10 experiment stations. The act simply authorized an additional station for Utah and adjoining States. Clapp's *National Program of Forest Research,* published in 1926, had not described the Intermountain Station as it had the others. Nevertheless, a plan for the Intermountain Station was developed envisioning various work centers and substations.

The organization was to be similar to the State agricultural experiment stations. Included in the plan was an advisory council. The plan also called for the correlation of research on allied land management problems and for cooperation with other institutions. The plan was not put fully into effect until 1930. In the meantime, Great Basin continued to function as before.

McSweeney-McNary had an immediate effect on the Great Basin Station budget. In 1929, base funds reached $14,300, plus an increase of $14,500 for range investigations and $5,000 for special erosion research. Some of the new range and erosion funding was allocated to studies in the Boise River watershed in Idaho. This watershed was selected because conditions representative of many western drainages were present. Accelerated erosion, vegetation loss, and flooding resulting from excessive cattle and sheep grazing were common in the West (Shaw 1990).

The early Idaho watershed researchers, George Craddock and Fred Renner, were based in Ogden. They worked across much of the overstressed range land in the southern part of the Boise National Forest, living in tents or at Forest Guard Stations near study areas. They returned to Ogden during the winter months (Haupt, personal communication).

Craddock and Renner participated in a survey of erosion conditions and factors related to erosion in the late 1920s on about 370,000 acres of land between the Middle and South Forks of the Boise River. Factors included slope gradient, soil features, type of plant community, amount of ground cover, rodent infestations, and accessibility to livestock (Holmgren 1984).

About the same time, the organization that was soon to officially become the Intermountain Station began other studies in the Boise Basin. The early research was on the effects of various timber cutting methods on reproduction of ponderosa pine, snow recession in mountainous areas, and snow measurement methods.

Renner, Pearse, and Peg-leg Annie

Fred Renner was a famous range conservationist, but few know he laid the technical foundation as a Station range scientist for a career that led to his post as Chief of the Soil Conservation Service's Range Conservation Division and a term as President of the Society for Range Management. Renner also became known as the leading authority on the work of cowboy-artist Charlie Russell, and he had a substantial collection of works by Russell.

In 1933 Ken Pearse photographed Fred Renner inspecting erosion damage in Wood Tick Creek in the Boise National Forest.

Conservationist, Art Collector

Fred Renner was the second President of the Society for Range Management (SRM), following Joe Pechanec. In 1949, Society Secretary W. James Anderson suggested a need for an emblem for SRM. Earlier, Renner had received a typewritten copy of the program for the 1950 annual meeting for printing. In response, he attached a photograph of Charles M. Russell's drawing of "The Trail Boss" to the program instructing the printer to reproduce it in the center of the cover.

This was the first use of "The Trail Boss" in society materials. It inspired so many favorable comments that the SRM Board of Directors obtained permission to use it as the society emblem. Except for a few years in the 1970s, "The Trail Boss" appeared as an underprint on the covers of the *Journal of Range Management* and it was widely used elsewhere as the official emblem of the society.

Renner said the drawing "had long symbolized qualities that it occurred to me were particularly appropriate to our newly formed Society: the importance of strong leadership, the necessity of all hands working together, and a willingness to travel uncharted trails" (Wasser and others 1987).

Renner pursued his range conservation work with great zeal and he was equally relentless about his art collection hobby, which became a full-time occupation after he retired from the Soil Conservation Service in 1961. He was honored for both activities. The Frederic G. Renner Award is the highest honor bestowed by the Society for Range Management. The Frederic G. Renner Library in the C. M. Russell Museum at Great Falls, Montana, is a research library dedicated to the study of western art and Charles Russell materials.

Renner wrote *Charles M. Russell*, the book Russellphiles consider the most authoritative ever written about the works of the legendary artist (Chohlis 1980). Few original Russell works were purchased during Renner's lengthy lifetime without his authentication. Collectors, auction houses, dealers, museums, and most others wanted his opinion before buying. Renner's opinions were backed by a huge photo collection and library that he spent decades assembling. He also assembled one of the largest personal collections of Russell works.

Renner studied forestry and animal husbandry and became a National Forest administrator in Oregon in 1916. He changed course in 1928 when he moved to the Great Basin Station as a range examiner and started studies in the Boise Basin, where he worked until 1936. Like most of the first range scientists, Renner focused his early research on the link between overgrazing and soil erosion. He pioneered snow survey work as part of his range-watershed research, and was especially proud of having planned and conducted the first scientific snow survey.

According to his widow in 1990 (*INTercom* Jan/Feb/91) Renner frequently reminisced about his early years in the Boise Basin. He told a story about surviving a blizzard in Peg-leg Annie's cabin and the connection to Annie's own story of winter survival.

Annie and another lady of the evening, "Dutch Em," worked the gold rush mining camps of Atlanta and Rocky Bar. During May 1898 they decided to walk from Atlanta to Rocky Bar on the crusted snow. Halfway there, the two were caught in a blizzard that killed Dutch Em and froze Annie's feet. Mining camp doctors saved Annie's life by "filling her with whiskey" and amputating both feet.

By the time Renner met Annie she was an old woman living in the mountains, supported by the charity of the miners who still worked claims around Atlanta. In a strange twist of fate, Renner was caught in an unexpected blizzard while on a snow survey. He weathered the storm by sleeping on the floor of Annie's cabin. Old timers recall that the story of Renner and Peg-leg Annie was printed in early training manuals for snow surveyors. Their experiences motivated the Soil Conservation Service to build survival cabins on many snow courses where survey sites were located.

Ken Pearse created some of the first experiments using artificial rainmakers to measure surface erosion on rangeland. After graduating from the University of Chicago in 1929 with a B.S. degree in plant ecology, Pearse spent a year working at the Jornada and Great Basin Stations before joining Renner to study the relationship of domestic grazing to erosion (*INTercom* Jan/Feb/ 91).

Pearse apparently had a knack for inventing things. In time for the 1933 field season, he and Joe Pechanec designed an improvement in the pantographs used by range researchers to translate data from field plots to maps or graphs. The creation was a new tubular aluminum arm that improved the performance of the

Station scientists pioneered snow survey research like that shown in this 1932 photo in the Payette National Forest near McCall, Idaho.

Ken Pearse (left) and an unidentified assistant demonstrated the improved pantograph he and Joe Pechanec developed.

Artificial rainmaking equipment designed by Ken Pearse was set up to measure surface erosion from this Idaho rangeland that had been heavily overgrazed by domestic sheep.

pantograph. It is not known how information on new instruments or modifications was transmitted in the 1930s, but in later years Station scientists and technicians were encouraged to publish Research Notes to describe equipment advances or new techniques. The knowledge then was readily available worldwide to anyone in research and resource management who had an interest.

Many of the range study exclosures built in the 1930s were criticized later as being too small, but Pearse and Renner constructed some exclosures as large as 40 acres, and one in Elk Creek in the South Fork of the Boise River drainage covered a half section. The Elk Creek exclosure was designated a Research Natural Area in 1979 as an excellent example of sagebrush-steppe plant communities on granitic soils. The site, including the fence, was burned by a wildfire in 1992.

Pearse and Renner made big plans for a comparative watershed study at Arrowrock similar to the successful one already under way at Great Basin. The Arrowrock study was planned for a much larger area than watersheds A and B at Great Basin. The duo built a field station at the location of the comparative watersheds. They installed fences and other facilities necessary to measure sediment from a control watershed and a manipulated and grazed watershed. Just as they were ready to start collecting data, disaster struck.

"The research project was screwed up because the Boise Forest closed the whole area to grazing…so we had no comparison," Pearse lamented in an interview in the early 1990s.

Renner headed to the California Experiment Station where he supervised the creation of the San Joaquin Experimental Range before leaving the Forest Service to assume his leadership role with the Soil Conservation Service. In California, he finished writing a comprehensive technical bulletin on erosion in the Boise River watershed (Renner 1936).

Pearse stayed in Idaho, and between 1932 and 1938 conducted the research that he later described as the most significant accomplishment of his career—the artificial rainmaker work. Many years later, Station research engineers and hydrologists used the technique for important studies of erosion from forest roads. Pearse died at age 89 in 1996. He directed that when his wife died, their ashes were to be scattered at the Arrowrock substation where they had lived more than 50 years earlier.

Hail to the Chiefs

Thirteen Chiefs led the Forest Service during Station history. Two of them—Lyle Watts and John McGuire—worked at the Station early in their careers. A third—Ed Cliff—was born and grew up in the Intermountain West and was strongly influenced by Station people.

Lyle Watts was a scientist and administrator. He left a post as head of the forestry department at Utah State Agricultural College in Logan to become a senior silviculturist for the Great Basin Station in 1929. He conducted research in the southern parts of the Boise National Forest in Idaho.

Watts served briefly as an Assistant Station Director of the newly designated Intermountain Station before becoming Northern Rocky Mountain Station Director in 1931. In 1936, he moved to Milwaukee as Regional Forester of the Eastern Region and became Regional Forester for the Pacific Northwest Region before being appointed Chief in 1943. He believed that after World War II the National Forests should be opened to development that was scientific and orderly.

Watts encouraged hiring new college graduates, many of them who got their education with help from the GI bill, to assist in development of forest road systems and intensively managed, sustained-yield forests (Williams 1993). Watts served as Chief until 1952.

New Deal emergency programs were responsible for the hiring of John McGuire for the brief time he spent at the Station at the start of his career.

Lyle Watts as Northern Rocky Mountain Station Director. Was pipe smoking the mark of a forestry leader? Watts, McGuire, and Cliff all smoked pipes.

Chiefs and their top assistants often visited field units. This group was unusually high-powered. Visiting Priest River in 1912 were (left to right) Regional Forester William Greeley (Chief 1920-28), Tanner (first name unknown), David Mason, Ferdinand Silcox (Chief 1933-39), James Girard, M. H. Wolff, Chief Henry Graves (1910-20), and Mallory Stickney.

McGuire was an emergency program assistant to Station technicians for only about a year, but that experience may have influenced his future. He decided to go back to school to become a research forester. He earned a masters degree from Yale University, entered the Army where he attained the rank of Major in the Corps of Engineers, and then worked at the Northeastern Station, where he also earned a masters degree in economics.

McGuire became Director of the Pacific Southwest Station and later moved to Washington. He was named Chief in 1971 at a time of increasing public environmental awareness. During his 7 years in office, McGuire strengthened the roles of Research and State and Private Forestry and led reviews and changes in forest management practices (Williams 1993).

Forest Service Chief John McGuire (center) returned to where his career began three decades earlier when he visited the Intermountain Station in the 1970s. He met with Station Director Roger Bay (left) and Region 4 Regional Forester Vern Hamre at Station Headquarters and held a family meeting for all employees in Ogden.

"Lyle Watts was really one of my heroes," wrote Ed Cliff, who became the ninth Chief of the Forest Service (Hartzer 1981). Cliff was born in Heber City, Utah, and first worked with the Forest Service as a summer field assistant in 1929 for the Cache National Forest. Watts recommended him for the job.

Cliff attended what later became Utah State University where he took basic courses in agriculture and animal husbandry the first year. The following year, 1929, Watts was selected as the first head of the Department of Forestry. Range management was shifted to the new department. Watts became Cliff's mentor and was a major influence on his outlook and subsequent career (Hartzer 1981). Arthur Sampson, first Director of the Great Basin Station, wrote the primary range management textbook Cliff studied in college.

Cliff moved up through various positions in the Pacific Northwest Region and the Intermountain Region before becoming Regional Forester for the Rocky Mountain Region in 1950. Two years later he moved to Washington and was appointed Chief in 1962. He experienced a decade of rapid change in the agency. One of Cliff's accomplishments was helping to develop a long-range research program.

Forest Service Chiefs did not sit around in offices in Washington and depend on reports to learn what was going on. Most Chiefs maintained hectic travel schedules, visiting as many field units as possible to see first-hand how

operations were going and to personally deliver messages to employees. When a Chief visited headquarters sites such as Missoula or Ogden, he almost always presided over a "family meeting" attended by all employees in the area. Everyone was free to ask questions. The Station got its share of visits by Chiefs (see examples, chapter 14).

As places that played a role in the development of five Deputy Chiefs for Research—Clarence Forsling, George Jemison, M. B. Dickerman, Bob Buckman, and Jerry Sesco—and three Chiefs, the Intermountain Station and its predecessor organizations made significant contributions to Forest Service leadership through the years.

Intermountain Officially Arrives

The organizational plan for the Intermountain Forest and Range Experiment Station was finally implemented on July 1, 1930, making it the eleventh of the 12 Stations called for in the McSweeney-McNary Act. Ogden was selected as the headquarters city because of the strong relationship established between research and national forest administration (Region 4) headquartered there, and because of the city's location as a railroad transportation hub. Clarence Forsling was the first Station Director, which was not a significant change because he had been the director at Great Basin since 1922.

A Forest Service luminary, Charles Connaughton, was hired in 1930 as a temporary assistant compiler. He went on to become well known in natural resource research and management circles, serving as Director of the Southern and Rocky Mountain Stations and Regional Forester for the Southern, California, and Pacific Northwest Regions (Hartzer 1981).

By 1931, the Station was expanding. The headquarters was firmly established in Ogden, Great Basin had become a Branch Station, and cooperative work continued at the U.S. Sheep Station in Dubois, Idaho. Plans were made to create a Boise Branch Station, primarily for watershed erosion and streamflow studies. A ponderosa pine experimental forest was planned for Idaho, and a promise made that a desert shrub experimental range would receive early attention. Two alternative sites were selected for both the ponderosa pine and desert units. Laboratory facilities were limited, so some discussion was held about a proposed central laboratory to service the various experimental forests and ranges.

The Station's research program included studies in forest and range management, erosion, and stream flow, along with "biological investigations" dealing with pocket gophers and big game. It is not clear how the Station was involved in the biological studies, because they still were the responsibility of USDA's Biological Survey at that time.

Charles Connaughton, who became a Station Director and Regional Forester, rested on the running board of the Intermountain Station's "deluxe truck" on a snow survey research project in the old Idaho National Forest in 1931. Lyle Watts, who became Chief of the Forest Service, took the photo.

The Station staff numbered 12. Ray Price, who served as Director of the Rocky Mountain Station in Fort Collins, Colorado, in the latter years of his career, joined the Intermountain Station as a junior range examiner. Joe Pechanec signed on as a temporary employee. Pechanec, then a student at the University of Idaho, soon found himself fighting fires for most of the summer. He was selected for fire duty because he had three summers of experience as a lookout for the Salmon National Forest.

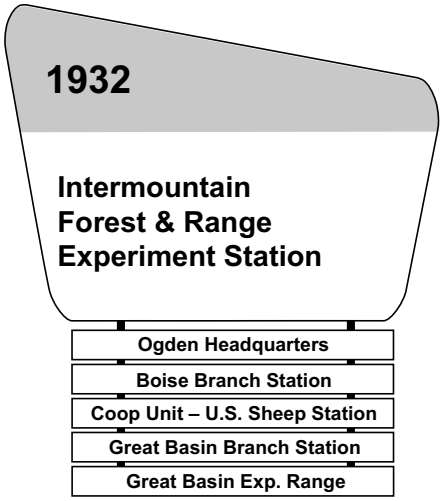
Pechanec started out as a forestry student, but decided he didn't like that field because he thought forestry students seemed too concerned with figures and money and not enough with the plants themselves. He took all the botany and range courses he could, and left the forestry students to worry about the figures and money.

A half century after starting his career in range research, Pechanec clearly recalled the early days (Appendix A). Much later, he served as Director of the Southeastern Station in Asheville, North Carolina, and from 1962 to 1971, the Intermountain Station. A strong advocate of range research, he was one of the founders, and served as the first president, of the Society for Range Management. He also served for several years as editor of the *Journal of Range Management*.

The Committee Complains, but Advances are Made

As was the case with Region 1 to the north, in 1931 Region 4 still maintained an Investigative Committee that made suggestions for both research by Station scientists and administrative studies by Region 4 personnel. The Great Depression had resulted in curtailed regular funds and each expenditure had to be carefully justified. So the Investigative Committee, in the spirit of the times, suggested "that research expenditures be for the study of problems as will be directly useful to the public in meeting the problems of the day."

The committee complained at its 1931 annual meeting that "some investigations are so drawn out that by the time results are obtained the purpose



of initiating the research is forgotten." Another comment was "the path from the experimental plot to the stockman could be infinitely straightened and shortened." These comments reflect the normal tension that existed then and continued to exist between the action and research components of the Forest Service. The prime questions being asked of research by ranchers were how to obtain seed of desirable forage plants, and how to seed depleted lands. These questions were answered by Station research findings in the years ahead.

Data processing had advanced to the point where punch cards were sorted by Hollerith machines (card sorters). These machines were invented to serve the needs of the U.S. Census, and soon found many other uses including data handling in the Forest Service. It's not known when the Station obtained its first machine, but initially all Station data punch cards were sent to Washington for compilation.

C. L. Forsling's enthusiasm for field days as a method for disseminating research results had proved to be justified. The biennial field day at the Great Basin Branch Station in August 1931 drew more than 200 stockmen and range managers. It was important enough to attract U.S. Senator Reed Smoot of Utah, who addressed the group around an evening campfire.

It was a significant year for research methodology, too. The Ecological Society of America took the lead in convening the first major get-together of people interested in range research methods. Representatives from three Forest Service Experiment Stations, the Washington Office, the Bureau of Animal Industry, the Biological Survey, and seven universities and colleges attended (Annual Report, INT 1932).

Of direct importance to the western livestock industry and ultimately to the Forest Service and the Station's range research program was passage of the Taylor Grazing Act of 1934, placing 80 million acres of public lands into grazing districts. Before the act, grazing on the public lands had been unrestricted, reducing the forage value of much of it to desert (Holmgren 1973).

Region 4's Investigative Committee was still active in 1934 and they tried to do something similar to the Region 1 Investigative Council's classification of research. They established three categories: (1) Short studies to solve administrative problems, (2) long-term administrative studies, and (3) academic problems that require fundamental research. Station research related to timber stand improvement and erosion control was of particular importance to the Region as the staff planned work for their contingent of CCC men.

Some concern was expressed at the Investigative Committee's annual meeting that information from the administrative studies and research was not fully disseminated throughout the Region…a comment with a familiar ring. Suggestions offered to deal with the concern were to mimeograph brief reports on research and administrative study results and to review research accomplishments at District Ranger and Forest Supervisor meetings (Annual Report, INT 1934).

New Deal Was a Good Deal for the Station

New Deal economic emergency public works programs created in an attempt to lift the nation out of the Great Depression had a tremendous positive impact on Intermountain Station facilities and programs.

As it did for the Northern Rocky Mountain Station, the Civilian Conservation Corps (CCC) program

Civilian Conservation Corps crews built badly needed research and housing facilities such as the End House shown under construction at Great Basin in 1934. See "A New Role for Great Basin," chapter 11, for a photo of the End House after it was restored for use by students nearly 60 years later.

beneffited the Intermountain Station. At Great Basin, CCC enrollees built an additional cottage, a mess hall-bunkhouse, a garage-storeroom, and a power line, and also did landscaping and constructed fences. At the Upper Snake River Research Center, the "3C's" built a four-room cottage, two-car garage, and a storehouse. All of the buildings had standard Forest Service "Ranger Station" designs. They were simple one and one-half- or two-story wood-frame structures, painted white, with green roofs.

Reed Bailey, who became an Intermountain Station Director, was hired in 1933 as an emergency program conservationist. Bailey served as Director longer than any other person—for 27 years from 1935 to 1962. Bailey found emergency program funds to be a big help, but they presented problems because of the uncertainty of the funding. Restrictive personnel policies, which accompanied the emergency programs, also created unjust inequalities in salaries. Nevertheless, morale was high.

When Bailey became Director, the Station staff included more emergency program employees than regular personnel. The Station had 25 Civil Works Administration (CWA) workers of whom 20 were called "computers," allowing data compilation to be brought up to date (Annual Report, INT 1934).

Bailey's appointment was a bit unusual because of his professional training. Unlike those who preceded and followed him as Director, he was not a

Reed Bailey's background as a geologist served him well as Station Director at a time when watershed research was gaining importance.

forestry or range specialist and had very little previous Forest Service experience. Bailey was a geologist and was serving as a Professor of Geology at Utah State Agricultural College (later, Utah State University) when he got the appointment as Station Director.

Years later, Chief Ed Cliff said that Bailey's appointment "was one of the early recognitions by the Forest Service that soils and geology were important disciplines and had to be reckoned with in the management of rangelands on mountain watersheds." Cliff also cited Bailey's status as a Station Director in refuting assertions by critics that a person had to be a professional forester to reach the top levels in the Forest Service (Hartzer 1981).

Science Grows in the Boise Basin

New Deal programs facilitated expansion of the Station's modest watershed and silviculture research programs in southwestern Idaho. The Boise Basin Experimental Forest was established in 1933 on 3,540 acres within the Boise National Forest (Sloan and Steele 1996). A site at Idaho City became the hub of activities by Boise Branch Station employees after the Civilian Conservation Corps built facilities there.

Ten buildings were constructed at Idaho City using emergency program funds and CCC labor. From 1933 to 1951, they provided office, lab space, and housing for scientists (and their families) who were assigned to conduct forest and rangeland research (Haupt, personal communication). The research program expanded considerably over the years, and tents were needed to house cooperators, visitors, and temporary employees.

The first silviculture studies after the experimental forest was established began in 1935 to evaluate different methods of selecting mature trees for harvest and the effects of remaining tree patterns on growth, reproduction, and undergrowth vegetation. Crews installed permanent plots for monitoring tree reproduction and undergrowth vegetation (Sloan and Steele 1996).

Later studies considered factors affecting germination, survival, and growth of young ponderosa pine and effects of climate on trees and undergrowth in ponderosa pine forests. Competition factors for planted and natural pine seedlings were investigated in 1937, followed by two studies of seed storage, viability, and germination for ponderosa pine and Douglas-fir (Sloan and Steele 1996). Subsequent research dealt with such varied aspects of stand management as root systems of trees and seedlings, porcupine feeding relationships with ponderosa pine, and thinning and pruning methods.

On Research Hill

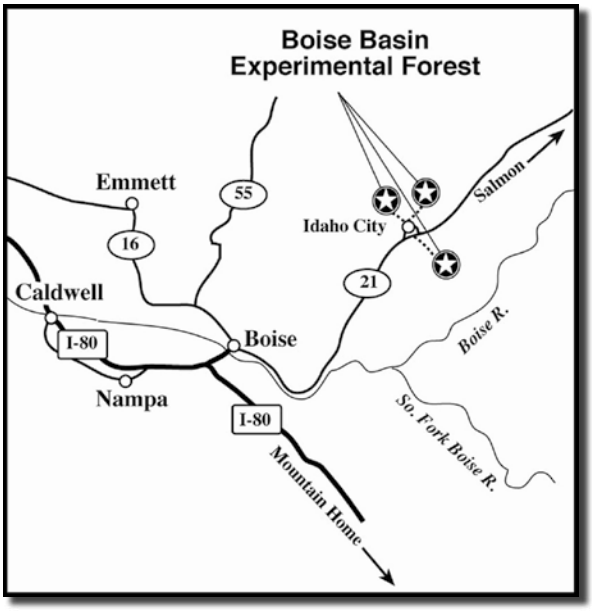
The Boise Branch Station area at Idaho City was known as "Research Hill." Harold and Barbara Haupt moved there in 1949 when he was hired as a watershed scientist in the unit led by Paul Packer. They lived in "The Lodge." This account of life on Research Hill was given by the Haupts in 2005.

A dormitory building constructed in 1933 on what was known as "Research Hill" at the Boise Basin Branch Station at Idaho City.

The wood stove was a challenge, but Barbara eventually mastered it enough to bake cinnamon rolls. Aging plumbing and wiring and the monster furnace in the basement also provided episodes of discontent—especially when Harold was away on assignment in Ogden.

Otherwise, we thought living on the hill was idyllic and a great place to raise our family. Ours and the Packer and Curtis (Jim) kids roamed freely all over the hill. The wives coffeed together and shared frustrations and pleasures. Potluck picnics and dinners were organized. Square dancing, bridge, and canasta provided social outlets during the winter.

A rare treat was a trip to Boise to shop and have a meal out. The women learned how to put on chains when it was necessary to make a trip into town without husbands. Pine Tree Club meetings for all Forest Service wives at a Boise downtown hotel were welcome nights out and some wives traveled lonely mountain roads to attend. Dinner and cards were features, and once we staged a comedy making fun of the all-too-familiar, hunter-abandoned wife and family scenario.



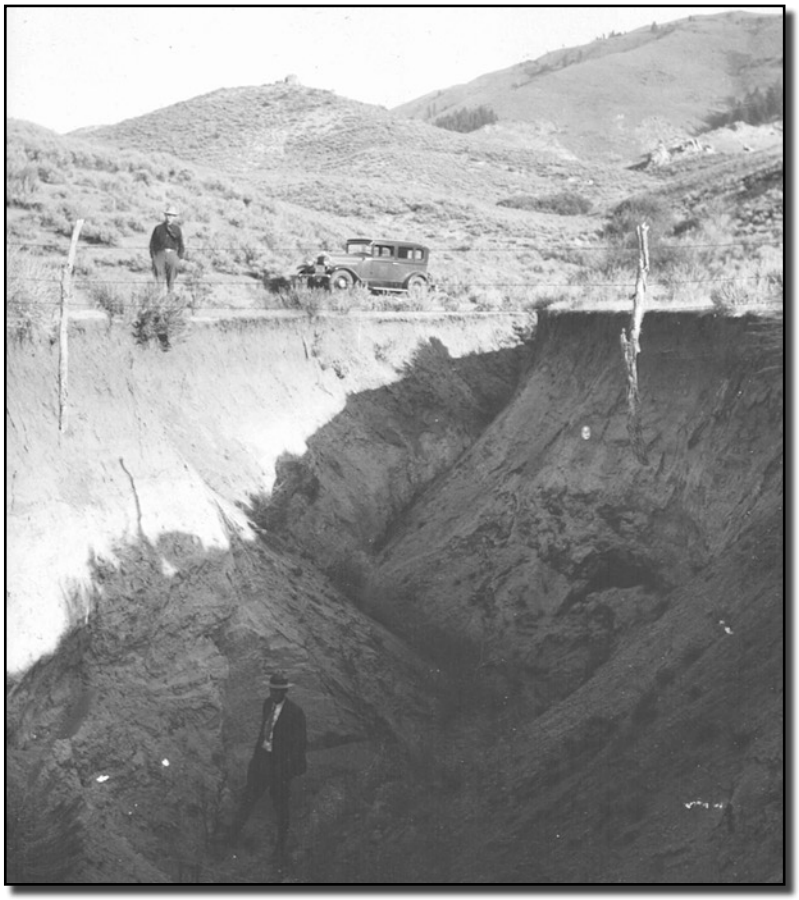
Fred Renner had installed the "old Boise exclosures" at high, medium, and low elevations to determine the effects of grazing on the range in the area. The purpose was to examine the effect of livestock exclusion on erosion rates and secondary plant succession on sites suffering from soil loss and in some cases invasion by annual weeds. These exclosures were monitored yearly through the 1930s with the help of CCC labor, and periodically into the 1950s and 1970s by others.

Species selection and planting techniques for rangelands were a major Station emphasis in the 1930s and 1940s. A.C. Hull was the first researcher assigned at the Boise Branch who was a range scientist, not primarily a watershed investigator. Hull established experimental plantings and worked on site preparation and cheatgrass invasion problems. He transferred to the newly formed Agricultural Research Service in 1954, as did several other Forest Service scientists who specialized in range reseeding (Shaw 1990).

Sediment problems were particularly serious at Arrowrock Reservoir and streams feeding into it because severe overgrazing had denuded lands in the area, allowing large amounts of eroded soil to enter the creeks and the Boise River. Several structures were built in 1936 for research use at the Arrowrock Substation, 25 miles southeast of Boise. Studies there were concerned with streamflow and siltation measurements and natural and artificial revegetation throughout the Boise River watershed. Arrowrock was an active research site until the dwelling burned down in 1943 (Smith 1983).

After the Arrowrock dwelling was destroyed, Station personnel were housed along with Boise National Forest staff in the Old Assay Office on Main

During the summers of 1932 and 1933, Liter Spence, an instructor at the University of Idaho, was hired by the Station to map roots of common range plants in the Boise Basin. He mapped some 100 separate systems, several of which were more than 7 feet deep, with a lot of help from CCC workers (Holmgren 1984).



Large amounts of sediment that clogged Arrowrock Reservoir in the 1930s came from places like this near the mouth of Case Creek where severe erosion left fence posts "floating in air" some 8 feet from the banks that previously supported them. Pioneer watershed scientist Fred Renner took this photo in the fall of 1929.

Street in Boise. This building is now on the National Register of Historic Places. Other office space in Boise probably was used at various times by Station people.

Harold Haupt said "the bottom fell out" of the research program at Idaho City when World War II began. The program was suspended and the work center was closed for the duration of the war, one of the casualties when the Intermountain Station suffered severe cuts in funding (Haupt and Haupt 2005).

After the war, the Station hired Jim Curtis, a University of Maine forestry professor, to revive the program. Curtis, a silviculturist, resumed the dormant studies and started new ones. Soon he was joined by watershed scientist Paul Packer, who launched intensive infiltrometer studies and developed a compact rainfall applicator for the work (see photo in "Meeting the Challenges," chapter 10).

In 1951, the Station staff in southwestern Idaho was consolidated and moved to the Boise National Forest warehouses on Myrtle Street, which were remodeled and named the Boise Research Center. Later, the buildings were redesignated as the Boise Forestry Sciences Laboratory. With the change, the "Research Hill" buildings at Idaho City became much less necessary for Station work and they were eventually turned over to the Idaho City Ranger District.

The Boise warehouses had been built by the Works Progress Administration (WPA) in 1940. Although these buildings would not be a first choice for housing a research program, continuing modifications and improvements made the facility a usable low-cost research site.

After the Intermountain and Northern Rocky Mountain Stations merged in 1954, watershed research received heavy emphasis at the new Station. Packer was assigned to open a new watershed research project in Montana. Haupt became Project Leader at Boise and Joe Kidd transferred from the Northeastern Station to assist him. Haupt left to set up a new watershed unit in Reno, but was back in 1961 as Project Leader when concerns over soil stability and sediment production in the Idaho Batholith came to a head (see "Sediment Spells Trouble for Salmon," chapter 10).

The Boise Lab buildings did not provide first-class laboratory or office space, but they served well for a half century. Demands developed for the land for other uses, and after complex negotiations, new facilities were acquired nearby and the staff moved into them in 2005.

The Station succeeded in gaining formal approval of the Tenderfoot Creek Experimental Forest in Montana as a watershed study site in 1961. However, serious problems with sediment in the Salmon River dictated that the Station direct most of its watershed research funding to the Idaho Batholith. Research at Tenderfoot Creek had to wait (see "A New Experimental Forest (Finally)," chapter 11).

Wildlife habitat studies also gained emphasis in the Boise Basin. A long-term cooperative agreement with the Idaho Fish and Game Department ran from 1949 through 1973 and provided Pittman-Robertson funding for research to improve big game winter range. The work involved developing methods to establish bitterbrush and other shrubs, bitterbrush-insect relations, shrub utilization techniques, and methods for producing container-grown nursery stock. This research was conducted by Ralph Holmgren, Bob Ferguson, Justin Smith, Joe Basile, Dean Medin, and others.

Wildlife habitat research by scientists based at the Boise Lab continued until 1984. Ferguson, Medin, and Steve Monsen were key participants. They were joined by Nancy Shaw, who began working on the shrub project in

Research in the Boise Basin showed that competing vegetation had to be removed for plantings or seedings to be successful. Where equipment could not operate, implements were developed such as this hoe for scalping plots to be seeded to bitterbrush for big game use in winter. The inventors of this tool were truly creative; it was made from a scoop shovel and a section of a cross-cut saw.

1977. Monsen later transferred to the Shrub Lab in Provo, but continued to work in Idaho on the Bureau of Land Management's range revegetation program (Shaw 1990).

Additional research especially important to the BLM started in 1959 when Jim Klemmendson, later a professor in the University of Arizona Range Department, and Henry Wright, who became Chairman of the Range Department at Texas A&M University, began the Saylor Creek grazing studies. The research later was continued by Bob Murray and Roy Harniss, and some aspects of it were subsequently carried on by the Shrub Lab's biology and restoration project.

Saylor Creek was a 4,200-acre BLM experimental area in Elmore County, Idaho, selected as typical of millions of acres of sagebrush-grass rangelands that had become infested by cheatgrass, an annual that is a fire hazard and not very useful for forage. The primary goal was to develop grazing systems that would encourage replacing cheatgrass with desirable perennial grasses and create ranges with greater forage production and protection against erosion.

The BLM built a headquarters that provided offices and living quarters; fenced 73 pastures, paddocks, and exclosures; and installed a weather station and scales for weighing livestock. The range managers also built corrals and a system to distribute well water to all pastures (Pechanec 1967).

How to deal with cheatgrass presented a difficult problem. Station scientists produced some help in four areas: (1) providing results from the original grazing systems research at Saylor Creek; (2) conducting research on trials of "green stripping," a method of constructing fuelbreaks; (3) assisting in development and testing of equipment to reseed cheatgrass areas; and (4) developing improved plant materials.

Existing knowledge in these areas was summarized at two symposia, both of which had proceedings published by the Station in the early 1990s. *Proceedings—Symposium on Cheatgrass Invasion, Shrub Die-off, and Other Aspects of Shrub Biology and Management* was sponsored by the Shrub Research Consortium and compiled by Durant McArthur and three cooperators. *Proceedings—Ecology and Management of Annual Rangelands,* was compiled by Steve Monsen and Stanley Kitchen.

Pastures in the Saylor Creek Experimental Area provided Station scientists based in Boise with places to compare effects of various grazing systems on ranges invaded by cheatgrass.

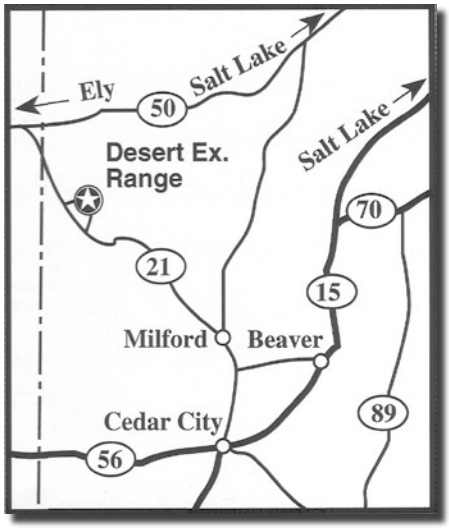
The first proceedings included a discussion of green stripping and development of a disk chain that buried unwanted vegetation and distributed seed in one pass provided by BLM Greenstripping Specialist Mike Pellant at the symposium. The disk chain development was a cooperative project of the Station, BLM, and the Forest Service's Equipment Development Center in Missoula. Pellant assumed a major role in developing the program for the second symposium. Both proceedings featured papers by many Station scientists and cooperators, including contributions from personnel of the Shrubland Biology and Restoration Project located in Provo and Boise.

Although research by scientists based in Boise continued at many other locations, it gradually was phased out in the Boise Basin Experimental Forest. No new studies were started in the experimental forest between 1971 and the early 1990s, and the last ones were short-lived (see "Boise Basin Research Regenerated, Briefly," chapter 11).

Experimental Ranges Created

President Hoover, on February 1, 1933 shortly before he left office, set aside by presidential proclamation 55,000 acres from the public domain in west-central Utah, as an "agricultural range experiment station." In 1934, it became the Station's Desert Experimental Range Branch. The experimental range was typical of the high-elevation, cold desert found in the Great Basin and used as livestock winter range. New Deal CCC and NIRA emergency program funds provided for construction of two dwellings, a mess hall/bunk house, office, deep well, barn, well house, two two-car garages, a water system, and an electric plant. Special facilities were necessary because the nearest town of any size was Milford, Utah, 48 miles to the east. Ely, Nevada, was nearly 100 miles away to the northwest.

More than 118 miles of fence were built at the experimental range using 24,000 juniper fence posts hauled 60 to 100 miles to the site. In the late 1990s a stack of unused fence posts remained at the range, apparently in good condition after years of exposure to the elements. Coils of barbed wire from the



Buildings constructed in the 1930s at the Desert Range were typical Forest Service wood-frame structures.

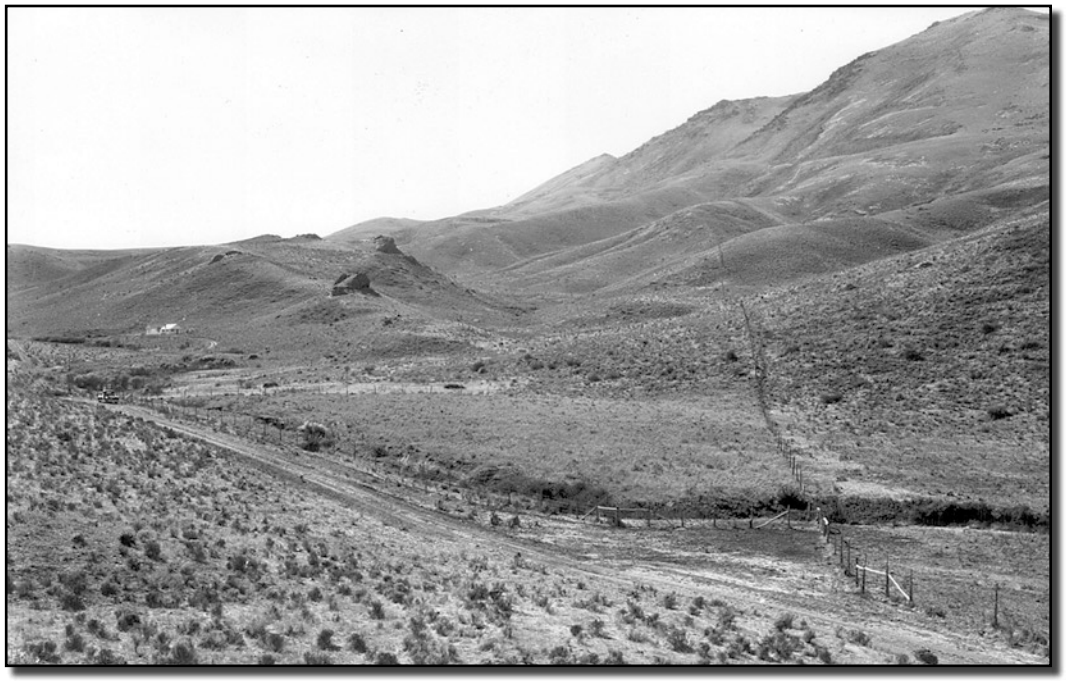
fence-building days, with labels intact and in perfect condition, were still stored in the warehouse. The dry desert climate had slowed the deterioration of both wood and metal.

Although other range research sites were established earlier, the basic sheep season and grazing intensity study, which continued for more than 70 years at the Desert Range, was probably the longest, continuous, specific grazing study in existence anywhere. Some results of early work at the Desert Range contributed to improving the basic foundation of much range research. One was a modification of plot sizes to put them in harmony with the wide spacing of desert vegetation. Another was demonstrating to ecologists that they should use statistical methods to obtain results from data that were not apparent to the eye (Clary and Holmgren 1982).

This period also saw activation of the Ruby Experimental Range Area near Wells in northeastern Nevada, and the Paradise Valley Experimental Range Area near Winnemucca in northwestern Nevada. Both typified the sagebrush-wheatgrass ranges of northern Nevada, which at one time were choice grazing lands for both cattle and sheep. Studies on artificial reseeding of depleted range and range management investigations were conducted at both sites (Crafts 1938).

The Ruby area, on the north end of the East Humboldt Mountains, had been a forest administrative site—the Clover Ranger Station. The 80-acre site was withdrawn from public domain lands in 1908, the pasture was fenced, and a cabin was built. The cabin and fence were valued at $599 in 1921. By 1933 the fence was considered unusable and it and the cabin probably were torn down. The Ruby area was then redeveloped for Station research use. The CCC built a dwelling and garage. One study site was a 2.2-acre fenced pasture, which was reseeded in the fall of 1940.

In 1961, the dwelling was moved to the Ruby Ranger Station. The garage was relocated to a warehouse compound in Wells in 1969 (Wilson, personal communication). Never formally designated as an experimental range, the Ruby area



Station researchers studied reseeding of depleted Nevada rangelands at the Ruby experimental area, which was seeded in 1940 and grazed by livestock for the next 6 years. The house and garage built with CCC labor for Station use are barely discernible in the far left-center of this 1947 photo.

Native grasses within the Cabin Creek exclosure thrived and resisted invasion by sagebrush following a fire and reseeding in 1941 at the Paradise Valley experimental area near Winnemucca, Nevada. The photo was taken about 1948.

Watersheds A and B received more than 60 years of continuous observation and study, and climate records were maintained over the same lengthy time span. They were typical, small (11 and 9 acres, respectively) high-elevation (10,000 feet) watersheds about 900 feet apart. At the lower ends of each area, stream gauges and sediment collecting basins were built in 1915 to measure surface runoff and sediment after storms.

When studies started in 1912, vegetation on Watershed A had been depleted by overgrazing. The scientists maintained this condition for 8 years by continuing to allow heavy grazing.

became known as the Clover Creek Administrative Site, and was used as a horse pasture by National Forest personnel.

Paradise Valley, also 80 acres, was located at what was known as the Lamance administrative site, which was established by executive orders in 1914 and 1921 (Bailey 1955). Lamance was outside the boundary of the Humboldt National Forest, but the executive orders placed it under Forest Service jurisdiction. The Station used it for research in cooperation with the University of Nevada Agricultural Experiment Station through an agreement with Region 4.

A house and garage were built in 1937 at Paradise Valley with CCC labor. Mature trees planted near the buildings were still there in 2004. In 1957, the two-story house was moved to serve as office space for the newly formed Reno Research Center.

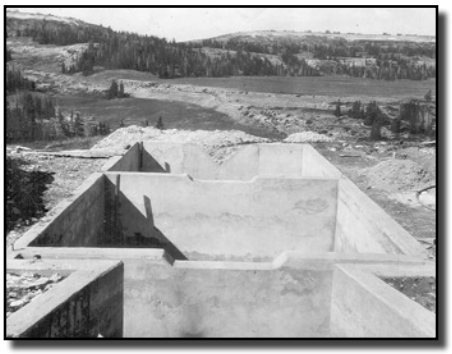
The principal research feature at Paradise Valley appears to have been the large Cabin Creek exclosure. A fire in 1942 had nearly eliminated big sagebrush in the area, and, after reseeding, native grasses were able to hold off reinvasion by the shrubs where livestock were excluded. The Station turned the Paradise Valley area over to the Humboldt National Forest in 1956. It then was used as a pasture by Ranger District personnel (Wilson, personal communication).

Wisdom Flows from Watersheds

They were not the first watersheds to be studied by Forest Service researchers, and they certainly did not have catchy names, but Watersheds A and B at Great Basin were important pieces of real estate. There Arthur Sampson, Harold Croft, Clarence Forsling, and scientists who followed them conclusively proved the relationships between plant cover and erosion.

In 1995, Acting Intermountain Station Director Dick Krebill said the results of work at Watersheds A and B may have been "INT's most major science contribution of all time" (personal communication). Under Sampson's direction, Croft carefully examined the watersheds in 1912 to establish baseline conditions. Although observations continued for several decades, the first studies used controlled grazing to reduce ground cover (Steen 1998).

Results showed beyond question the need for maintaining certain minimal vegetation on high-elevation rangeland to prevent overland water flow, flooding, and erosion following typical high-intensity summer storms (Keck 1972). This knowledge was the basis for the realization that range management was the key to solving watershed problems in many parts of the Interior West.



Concrete sediment catchment tanks at the low corner of Watershed A. Arthur Sampson observed as much as 50,000 pounds of dry dirt and rock deposited after being washed down from the overgrazed, denuded 11-acre area by a single storm.

The eastern boundary area of Watershed A in 1970. Almost the entire watershed was covered by grass, forbs, and shrubs. When the study began in 1912, vegetation here had been depleted to 16 percent cover.

Watershed B initially had good plant cover, and it was maintained over the same time period by limiting grazing. During the 8 years, Watershed A produced five times as much storm run-off and sediment as Watershed B.

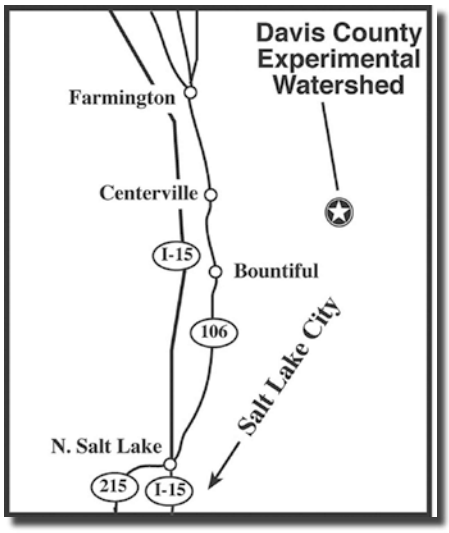
Starting in 1921, Watershed A was protected from grazing, and the vegetation recovered naturally. By 1946, conditions on both watersheds were similar. Then the study was repeated in reverse for 7 years. The overgrazed Watershed B produced four times more water run-off and 12 times more sediment that Watershed A. In 1952, Watershed B was artificially restored by contour furrowing and seeding. After that, it produced very little sediment (Keck 1972).

To the north, recurring floods in Davis County became an issue in 1923 when six people (four Boy Scouts and a young married couple) were killed by a mud-rock deluge from Farmington Canyon. The flood also caused a shocking loss of property. It would be 7 years, however, before much was done officially to make use of the wisdom gained at Watersheds A and B to prevent such catastrophes. Then a repeat disaster in Farmington Canyon triggered by torrential rain on relatively small, but steep, slopes caused mud-rock floods that carried boulders the size of houses, dug deep channels, and wrecked farms and homes (Croft 1981).

One reason Reed Bailey became Station Director was his service on a special study committee of Forest Service and university experts appointed by the Governor of Utah to recommend actions following the floods along the Wasatch Front. The study findings led directly to establishment of the Davis County Watershed, where some of the Station's most notable research was conducted.

Plans for the Davis County Experimental Watershed and offices at Farmington designated as the Wasatch Branch Station were put into effect in 1934. The site was the scene of a massive research and management flood control project that included considerable local involvement.

Private lands in six canyons were purchased by individuals and local governments and turned over to the Forest



Service. Private individuals put pressure on their congressional representatives to extend the boundaries of the Wasatch National Forest and purchase additional lands, and the protected area gradually was increased. One purchase was 10,400 acres from the Farmington Land and Stock Company. It included a half-acre parcel known as the Rice Creek Canyon Field Station about 6 miles up Farmington Canyon. In 1939, a house was built there for the Station to serve as a dormitory (Wilson 2005).

The combination of results from research and administrative studies, plus the labor available from New Deal emergency programs, resulted in 65 miles of terraces being constructed along contours of eroding slopes. The terraces were seeded to native plants and trees. Forty-five thousand Douglas-firs were planted along the terraces in the spring of 1935 (Annual Report, INT 1935).

According to Russell "Buss" Croft (1981), who headed the project for the Station for 17 years, there was a philosophical debate before the work could get under way. Floods had been well-documented along the Wasatch Front since 1912 and were known to have occurred earlier. Conventional wisdom was that these were "acts of God." The notion that the mud-rock flows were due to "mistakes of man" as research had shown at Watersheds A and B at Great Basin was not yet universally accepted. In fact, a University of Utah professor and a representative of the Geological Survey on the Governor's commission did not accept it. Croft said, "Neither of these men ever got very far off the highway or out of their automobiles in their investigation of the floods."

The "mistakes of man" proponents, including Reed Bailey, won out. Rehabilitation work was carried forward by those who believed humans could take action to correct the causes of damage they had created by their actions.

Following his successful work at Davis County, Croft moved on to serve as the Director of Watershed Management for Region 4 for many years. The arboretum at Weber State University in Ogden is named in his honor.

The Davis County Watershed, within the Wasatch National Forest, eventually included 1,300 acres, about 96 percent of it federally owned. Forest

This building in Farmington Canyon housed Station personnel working at the Davis County Watershed. In 1975, the Station signed an agreement with the Davis County Sheriff, allowing his personnel to use the cabin as a substation. Ten years later the Station transferred the cabin to the Salt Lake Ranger District.

A single mud-rock flood in 1930 caused damage at the mouth of Parrish Creek in Davis County that exceeded $158,000, a substantial amount of money in those days. (Utah Historical Society collection)

Contour trenches were constructed (above) by CCC workers at the head of Ford Canyon in Davis County in 1934. The same area (below) as it appeared in 1945.

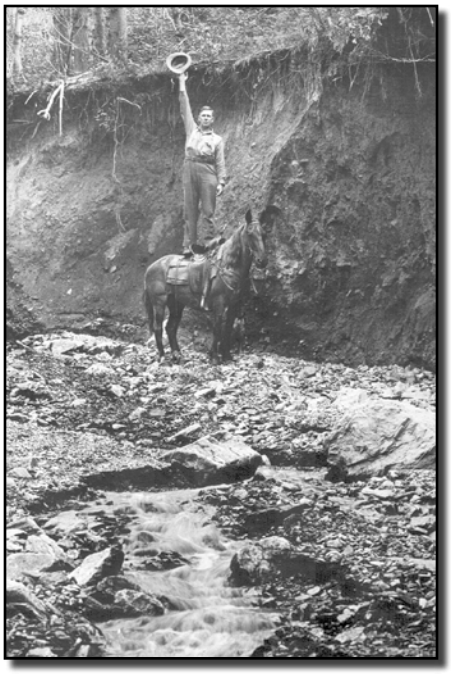
Service managers eliminated grazing by domestic livestock on the west-facing drainages of this part of the Wasatch Mountains and instituted fire control programs.

As research tested and evaluated the effectiveness of contour trenching and reseeding, these techniques were applied on flood-source lands throughout the project area (DeByle 1996). The work was done by crews of Civilian Conservation Corps enrollees and Works Progress Administration laborers, who were paid 50 cents per hour, over a 5-year period.

At the request of the Davis County flood committee, a CCC camp was set up at Woods Cross and men assigned there built a road to the head of Parrish Creek and did topographic mapping in addition to constructing contour trenches (Otis and others 1986). The WPA and CCC crews established stream gauging stations in four creeks and on most tributaries of Farmington Creek. Station researchers working from Farmington established a network of climatic stations and snow courses and installed a group of runoff-erosion plots at the head of Parrish Canyon. Data were gathered from many of these monitoring sites until the 1960s (DeByle 1996).

Station Foreman Harry Pledger pointed out some of the obstacles faced by work crews. The project area was largely unroaded at the start. Pack trains of seven to nine horses were used to transport lumber, reinforcing steel, cement, nails, food for the construction crews and their personal belongings from the mouth of Farmington Canyon to a camp near an old log cabin and to different job sites where weirs were built (Pledger 1980).

Pledger said work on the weirs was nearing completion in December of 1941 when Croft and George Craddock, the Station's Chief of Watershed Research, asked him to build a flume at the mouth of Farmington Canyon to be completed before early spring. Pledger pointed out that the men would be working in a dark area where cold winds blew constantly, and some of them would have to wade in water. He said the crews could complete the job in time providing the government would



Station Construction Foreman Harry Pledger demonstrated in 1936 the depth of channel cutting in Whipple Creek in the Wasatch National Forest.

furnish unlimited coffee and sugar and cream free of charge. Pledger argued that the men, most of whom were local farmers in the WPA program, would feel better and do better if they knew they could get a hot cup of coffee anytime they wanted it. Croft and Craddock checked the regulations, and responded, "Yes, go ahead. The coffee, cream, and sugar is OK."

All the men decided to work. They started the job in January and finished it in plenty of time for spring runoff (Pledger 1980). After the flume job was completed and World War II started, the Davis County Watershed, as a "nondefense project," lost its financing and construction was suspended for the duration.

DeByle (1996) said, "The success of the watershed rehabilitation program and accompanying research is self-evident; no floods have emanated from the treated areas since restoration even though intense summer storms continue to occur on what once were flood-source areas. Land treatments restored watershed stability and flood control."

Before 1933, contour trenching had not been used extensively in North America to contain rainfall on steep, erodible slopes of mountain watersheds. After the successful experimental use on the Wasatch Front, many thousands of miles of trenches patterned after those at Davis County were installed on burned or overgrazed watershed lands in the United States and other countries (Intermountain Forest and Range Experiment Station, undated tour guide).

Beginning in 1960, the major research emphasis at Davis County shifted to water yields. Studies of practices that might increase yields in semiarid territory without adversely affecting water quality were conducted for the next 2 decades. This change in emphasis, and the closure of the Wasatch Research Center at Farmington, forced the end of data gathering on a long-term basis at most of the earlier network of stream gauges, weather stations, and runoff plots (DeByle 1996).

Construction resumed, however, on structures for the water yield studies. Work crews contour-trenched the top of Halfway Creek in 1964, gauged the Chicken Creek watersheds in 1965, and established other weather stations. A few selected monitoring stations from the old network continued to be used for water yield work, at the time conducted by Station scientists at the Logan Lab. This new research program resulted in 46 publications by 1984. Earlier, Plant Ecologist Norb DeByle and Technician Ezra Hookano listed and summarized 48 publications that had resulted from the flood control research (DeByle and Hookano 1973).

For nearly a half century, hundreds of scientists, land managers, and members of the public were told of the history of the Davis County Watershed, its rehabilitation, and the success of the research programs through many personal contacts, technical and popular publications (including one by Bernard DeVoto in *Readers Digest*), and numerous tours. DeVoto, who was born and grew up in Ogden, was a Pulitzer Prize winning historian and environmental writer in the 1920-50 period. Summer field trips were conducted almost weekly at the Davis watershed until the mid-1970s. The watershed became internationally known as an example of successful rehabilitation of abused land (DeByle 1996). A detailed auto tour guide featuring 16 stops was available to the general public.

Water quality and yield research ended in 1976, but some data continued to be gathered until 1981. The Davis County Experimental Watershed became inactive as a research site and was managed by the Wasatch-Cache National Forest as a protected watershed area with limited recreational opportunities.

The know-how developed at Great Basin and Davis County was urgently needed in Idaho in 1959—the year of the Boise floods.

Station scientists had experimented with contour furrowing in Idaho, as on this 320-acre experimental watershed in the Boise National Forest using a side-hill drill they developed. However, areas that flooded Boise City with mud in 1959 were too steep for furrowing to be effective. Terracing as developed in Davis County, Utah, was used to stabilize the slopes.

Most Boiseans were unaware that over a period of years cheatgrass had replaced native vegetation on the overgrazed watersheds north and east of the city, providing a huge reservoir of fuel for wildfires. On August 3 the Lucky Peak fire started in all that fuel, burning 9,000 acres in 24 hours. The fire was finally contained by 250 Forest Service and Bureau of Land Management firefighters, bulldozers, water tankers, and retardant drops from two converted B-25 bombers (Intermountain Region 1959).

Two weeks later gentle rainfall started, but a sudden severe thunderstorm turned the welcome moisture into a torrent of mud that swept into Boise. In a single 10-minute period, the city's weather station registered more than a quarter inch of rainfall, and it was probably greater high in the watersheds.

The mud flowed into the northeast section of the city in volumes sufficient to cause police to awake sleeping residents with loudspeakers and urge evacuation. Water carrying silt churned through the streets, flooded basements, destroyed merchandise in businesses, and damaged equipment and records, bringing normal activity to a standstill (Intermountain Region 1959). Total damage was estimated at more than a half million dollars.

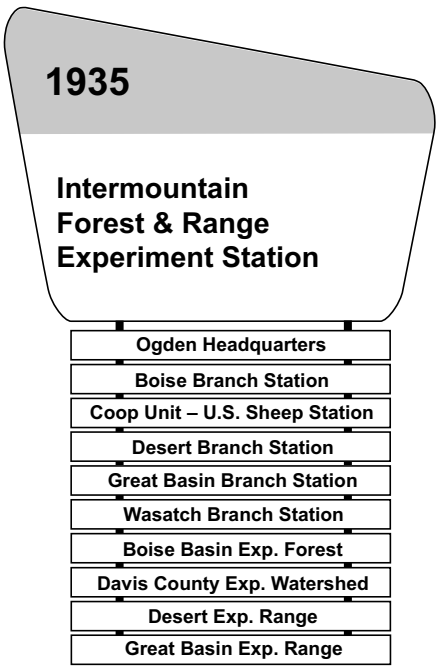
Organizing to provide a remedy was a task in itself. More than 6,000 of the burned acres belonged to private individuals or the State of Idaho. Nearly 3,000 were administered by the Bureau of Land Management. About 260 were within the Boise National Forest. But the parties got together, built fences to restrict grazing, and started construction of a vast series of contour trenches using technology developed by Station scientists at the Davis Country Watershed.

A squad of Forest Service and BLM bulldozers carved trenches on more than 1,500 acres above Boise. After reseeding, the contour system proved its merit. Never again did severe summer thunderstorms send mudflows into Boise.

The Forest Service produced a movie, *When the Pot Boiled Over*, which proved popular for many years with those interested in the wisdom Station scientists produced from watershed studies—fail to maintain adequate vegetation on high-elevation areas and the results can be disastrous and the remedies costly.

Range Remains Important

In 1935, Secretary of Agriculture Henry Wallace asked the Forest Service for a report on grazing. W. R. Chapline was one of 35 authors assigned to write the *Western Range* report prepared under the auspices of Assistant Chief Earle Clapp's Division of Research in Washington. The report advocated the Forest Service managing all Federal ranges, raising the ire of Secretary of the Interior Harold Ickes and many stockmen (Steen 1976). Interior had established its Division of Grazing the same year. As the Division developed over time it merged with the General Land Office and became the Bureau of Land Management in 1946 (Steen 1976).



Range research was still the major part of the Station's program. An estimated 1 million cattle and 5 million sheep in the Station's territory depended heavily on public rangelands for their forage, although their numbers were down substantially from the 1930-35 period due to drought, range depletion, and the economic depression. Depending on location, 40 to 95 percent of the feed supply for stock came from the public lands. The range research program emphases were (1) summer range—Great Basin Branch; (2) sagebrush-grass, spring-fall range—cooperative work at the U.S. Sheep Station; (3) winter range—Desert Branch; and (4) reseeding—Ogden and all branch locations.

The Old Headquarters—An Ogden Landmark

The concept of a central laboratory facility in Ogden to serve the various field units became reality in the new headquarters building completed in 1934. The structure had three principal laboratory rooms, a soil lab, and a small greenhouse on the roof. The building, designed as Station Headquarters and the Regional Office for Region 4, included a full basement and four floors. The Station initially occupied part of the third floor, all of the fourth floor, and the greenhouse.

The architectural design of the building was art deco, popular at the time, and the same style used for Ogden High School and the Municipal Building. Architects considered the Forest Service Building, Ogden High School, and the Salt Lake City Hall to be the three outstanding examples of art deco design in Utah (Kingsbury interview, 2004). The building served as Station Headquarters for a half century, first for the original Intermountain Station and later for the combined Intermountain and Northern Rocky Mountain Stations.

A great deal is known about events leading to the erection of the building and the details of its construction thanks to Regional Architect George Nichols, who before his retirement in 1956 compiled a detailed report about the structure (Nichols unpublished). Nichols traced the history of efforts to obtain Federal construction funds, quoted newspaper accounts of progress, and included considerable detail about the design and materials used in construction. He attached 32 photos of

various stages of construction to the report.

Several histories point out that the Forest Service regional operations, which included research in the early days, came to Ogden because of railroad connections. The fact that Ogden was a railroad center probably was the principal reason, but there were other reasons and some political horse-trading took place to ensure that the major offices stayed in "Junction City." In 1906, the Forest Service was broken down into six Districts, with headquarters in Missoula, Denver, Albuquerque, Salt Lake City, San Francisco, and Portland. All but Salt Lake City continued as Regional Office locations for many years. The District 4 office was moved to Ogden in 1908 because the city was a railroad transportation hub, but also because Salt Lake City had higher living costs, lacked warehouse space, and had a labor shortage at the time (Intermountain Region 1991).

The District 4 offices were in rented buildings in Ogden, and as the organization grew the main facility became inadequate. The District people were scattered at several locations in the city, and on November 1, 1930, 4 months after it became an independent entity, the Intermountain Station personnel moved out of the crowded main building into the Hotel Bigelow, later renamed the Ben Lomond Hotel, where they stayed until the Forest Service Building was completed.

A new building wasn't a sure thing from 1928, when the Forest Service started design work, until 1932 when the site was purchased for $20,000. In 1929 the Regional Forester wrote to the Washington Office requesting support for adequate housing to accommodate Region 4 administration, the "Branch of Research," and the Ogden Supply Depot. One week later the Ogden Chamber of Commerce asked that a "proper official" be sent to the city to study the building needs of the Forest Service.

Senator Reed Smoot came to Ogden to confer with the Chamber of Commerce and Forest Service. Although pressed hard by two Chamber members, Smoot declined to promise anything specific about a new building. He did, however, state that the Forest Service was to stay in Ogden. In return for that promise, he said he would "exact support of Ogden people in securing a Veteran's Hospital for Salt Lake City." (Nichols, unpublished). Old time Ogden residents sometimes joked about the allocation of taxpayer-supported facilities between the two cities, "Salt Lake gets symphony hall, we get the reform school." In 1929 it appears that both cities got a good deal.

Bickering over better Forest Service facilities continued. The Treasury Department sent a representative to Ogden to study the situation. The owners of the building leased as a Regional Office tried to influence Treasury to buy their building. Consideration was given to including Forest Service offices in a remodeled Federal Building in Ogden. This was rejected, but the Federal Building project was given priority over the Forest Service needs. Another rejected plan was to include Forest Service offices in the Ogden Post Office building. The Ogden Chamber of Commerce continued to lobby for a separate, new Forest Service building. Finally, in 1931 word was received that the Federal Government had budgeted $300,000 for construction of a new building conforming to Forest Service specifications.

The last of 427 wood piles that support the Forest Service Building was driven on March 25, 1933. Architect George Nichols' report said the pile-driving machine attracted considerable attention. "There has been little pile driving in this vicinity, and while any number of unemployed men can tell you what a steam shovel looks like in operation, few could explain a pile-driving machine."

It almost happened that way. After construction bids were opened in Washington, DC and a contract was awarded, the National Lumbermen's Association requested greater utilization of wood in construction of the building. The specifications were changed to include: (1) wood piling instead of concrete; (2) wood frames and sashes for first floor windows; (3) oak floors for all offices; (4) wood baseboards in all offices; and (5) wood "within the bounds of financial possibilities" for trim on the first floor.

The piling substitution caused a construction delay, according to an *Ogden Standard-Examiner* article reprinted by Architect Nichols. The Douglas-fir pilings were shipped from Washington and Oregon. They were 30- to 45-feet long, 8 inches in diameter at the bottom and 12 at the top. The first of 427 piles arrived within 10 days of the order, but then they had to be treated with creosote and have concrete caps and bases added, processes that took 6 weeks to 2 months.

The use of wood was a little unusual in a major government building, and this building had several other unusual features, most of which still existed in 2004. The lobby was finished in golden travertine Utah marble, and the terra cotta entrance had white bronze doors. The exterior had a gray granite base, two-tone terra cotta walls, and included nearly 1 million bricks, which were produced by the Salt Lake Pressed Brick Company.

In 1933 the superintendent of the construction firm announced that a cornerstone laying ceremony would be held

Laying the cornerstone of Ogden's Forest Service Building was an occasion for great pomp and ceremony in 1933.

under the auspices of the Grand Lodge of Utah, Free and Accepted Masons. Apparently, it was not unusual in those days for the fraternal order to turn out for ceremonies involving construction of major public buildings. The Masons arrived complete with top hats and their ritual aprons. So did several hundred Ogden citizens who witnessed the laying of the granite stone. The following year when the building was dedicated, 3,000 Ogdenites turned out to tour the structure. Forest Service people guided groups of visitors through the building from mid-morning until well into the evening.

The finished building had 80 offices, a library, an assembly room, two elevators, and more than 53,000 square feet of usable space. The budget provided $300 for landscaping. When all the construction was finished, one thing remained to be done. The one-room shack used by the Treasury Department as an office for their construction supervisor was put up for bids and sold for $55.50.

In addition to being pretty fancy, the old building was solid. When Larry Lassen arrived from New Orleans in 1983 as the new Station Director he held a "get acquainted" meeting with the two Assistant Directors located in Ogden and the five headquarters Group Leaders in a small conference room next to his office. About midway through the meeting the conference table started to vibrate something like Ouija boards are said to do. Lassen looked startled and asked, "What the heck is that?" Assistant Director Duane Lloyd smiled and calmly said, "Oh that's nothing to worry about, Larry, just a little earthquake." The headquarters staffers continued the meeting without further comment about the vibrations.

The earthquake that day was strong enough to cause the Federal Building two blocks away to sway. Employees there were evacuated because of concerns that aftershocks or another quake might bring the building down. The Forest Service Building did shake a little, but it didn't sway, and Station Headquarters personnel stayed on the job. They were proud of the old building that day, as many Forest Service employees have been since 1934.

The Forest Service Building completed in May 1934 housed 49 regular and 23 temporary Regional Office employees and 21 regular and 25 temporary Station employees.

Field Day Concept Spreads

The field day concept first applied in Station territory at the U.S. Sheep Station had spread over the next 3 years to the Great Basin Branch and then to the Wasatch and Desert Branches. The Utah Agricultural Extension Service was involved in a cooperative way with staging these field days. Secretary of Agriculture Henry Wallace attended one at Great Basin that drew 350 to 500 people.

The Desert Branch, despite its isolated location, was able to attract 200 people, including the President of the University of Utah and Assistant Secretary of Agriculture M. L. Wilson, to one of its field days. Ralph Holmgren was still leading field day orientations there in the 1970s (see Appendix B). Much closer to population centers, the Wasatch Branch (Davis County Watershed), was able to draw Secretary Wallace three times, along with Forest Service Chief Ferdinand Silcox,

Secretary of Agriculture Henry A. Wallace (left), Senior Forest Ecologist George Stewart (center), and Range Ecologist Ray Price examined experimental plantings at a Great Basin field day in 1935.

Associate Chief Earle Clapp, the emergency civil works director, many other notables, and college classes (Annual Report, INT 1937).

Field days had dual purposes. One was to better acquaint the public, through attendance by community leaders, with the work being done by Station scientists. The other was to train managers. Bill Hurst, who became Deputy Regional Forester for Region 4 and later Southwest Regional Forester, reported attending a field day at the Benmore Experimental Area in Tooele Country, Utah, in 1952. The same year he and two other young rangers drove to the Desert Range for a field day attended by about 100 people, mostly livestock men and State and Federal employees from conservation-related organizations (Hurst 2000).

Another Forest Service public information technique in which Station personnel participated was the trail ride. Hurst recounted joining a group of 70 riders in Utah for a trip sponsored by the Cache Valley Riding Club. Station Director Reed Bailey participated and addressed the group on conservation issues at the evening campfire gathering. There was an annual ride to Wellsville Mountain, which included 100 riders in 1949. Station Ecologist Linc Ellison was the featured speaker.

By the 1970s the trail ride concept had evolved into a bus ride. The Station participated with Regions 1 and 4 in annual "Deans Tours." The trips, hosted by one of the Regions in alternate years, included deans and other prominent educators from natural resource schools. Station research pertinent to the area visited was included each year.

At first the Deans Tours primarily were "show and tell" events designed to acquaint the educators with resource management problems. In the last years before the tours were discontinued in the early 1990s, there was more give and take in the discussions, with the Forest Service personnel soliciting comments on the management and research programs. The tours usually lasted three to four days, providing a good chance for the participants to get to know each other and exchange a lot of information.

The concept of field days at the Intermountain Station originated at the U.S. Sheep Station, and the research orientations continued there for many years, including this gathering of stockmen and forest officers in 1938.

By 1938, the Station's budget had reached $155,000; the next year it increased to $173,000. The 1939 research programs were organized into four divisions: (1) Forest management; (2) range investigations; (3) forest influences; and (4) range economics. Talk began of launching research into new areas, such as forest recreation, lodgepole pine silviculture, and cheatgrass control. At the time, wildlife research was still a function of USDA's Biological Survey, which later became the core of Interior's U.S. Fish and Wildlife Service (Annual Report, INT 1939).

The Station adopted a mission statement in 1940 that showed a strong commitment to resource improvement and use. It also reflected a concern for the poor conditions existing on some of the public lands, primarily rangelands. It read, "The aim of the Intermountain Station's program is to develop methods of improving deteriorated resources, and utilizing resources once restored in ways that will enhance rather than lessen value" (Annual Report, INT 1941).

Time Out for War

World War II dictated a reorientation of research programs to meet wartime needs. Emphasis at the Intermountain Station was given to increased food and fiber production, especially more meat, hides, and wool. Only parts of the regular research program continued. Those regular programs that had to be continued to prevent irrecoverable loss of past investments of time and money received priority. Most of the time was spent in compilation and analysis of data from past research and in war programs dealing with livestock operators and various government agencies.

For example, the Station worked with the Army Corps of Engineers in planning construction of military facilities in Utah. Water supply, flood control, and conservation measures were areas in which Station personnel could help. At the Ogden Arsenal, sand and dust-producing areas were holding up ordnance production. The Station helped there by introducing reseeding practices,

and produced a handbook for the Army on soil stabilization and camouflage for war industries and military camps in the West.

New war-related industries such as a steel plant, ordnance plant, hospitals, and supply depots created water demand problems. Aside from industrial use of water, demands by a rapidly increasing population added to the problems. The population of some Utah counties doubled in 2 years. Ogden alone added 27,000 workers to its labor force in 1941-1942. (Annual Report, INT 1943).

Not only did the Stations lose staff as the war progressed, but funding also declined. At the Intermountain Station, the budget was 37 percent less in 1943 than in 1939. Post-war planning started in 1943, when the war was a long way from over, and occupied an increasing amount of time by 1944 for the staff of 21 still remaining.

Some research programs formulated back in 1942 were still being continued in 1944, including correlating unsatisfactory range-watershed conditions in the National Forests, sagebrush eradication, and work on the condition and trend of rangeland quality. A new range study was started at Benmore of methods to establish crested wheatgrass for range rehabilitation (Annual Report, INT 1945).

Early post-World War II hopes for research expansion at the Intermountain Station fared no better than at the Northern Rocky Mountain Station. The slow expansion of Forest Service research was not restricted to the two western Stations, however. To counter this slow growth, Deputy Chief Vern Harper directed appraisals be made at all Stations regarding future directions and development. At the Intermountain Station, the appraisal indicated a need for a four- to five-fold expansion of the program (Annual Report, INT 1953).

While acknowledging the significant positive changes brought about under Harper's leadership of research, Joe Pechanec believed that Harper wanted little help in developing programs, getting more funding, or for that matter really desired any help in any area.

As was true in World War I, so many Station people entered the military in World War II that the personnel shortage was a factor in the research program being severely constrained. Station employees also answered the call during other military actions. Watershed scientist Harold Haupt enlisted in the Marines during World War II before he joined the Station, and stayed in the organization as a reservist. When the Korean War broke out, he was recalled to active duty as an officer and was away for 15 months.

Harper offered strong "top-down" leadership. In any case, research programs started to grow, with Harper's blessing, in the Lake States, South, and East through the political efforts of the Station Directors. Control got away from Harper, however, when the Station Directors realized they had a better chance of building programs through political end-runs than through the formal program development and budgeting process of the Forest Service.

One of the noteworthy changes at the Intermountain Station during this period was initiation of wildlife habitat research following a meeting of Station people with representatives of the U.S. Fish and Wildlife Service and the Utah Fish and Game Commission. The three organizations sought to develop a cooperative effort in both management and research. The cooperative relationship between the Station and the Utah Division of Wildlife Resources at Ephraim remained strong for many years.

USDA's Bureau of Entomology, a major cooperator with the Northern Rocky Mountain Station and Region 1, gave relatively little attention to forest insect problems in Intermountain Station-Region 4 territory until after World War II. At various times, the area that included southern Idaho, Utah, and Nevada was assigned to Bureau field labs at Coeur d'Alene, Idaho, and Fort Collins, Colorado. However, entomologists seldom visited the territory, perhaps because of travel distances or a perceived lesser importance of forest resources and diversity and severity of insect problems.

Whatever the reasons for the neglect, the situation began to change in July 1949 when Leslie Orr was transferred to Ogden from the Washington Office of the Bureau's Division of Forest Insect Investigations. Orr was soon joined at what was dubbed the Ogden USDA Forest Insect Laboratory by Dick Washburn, shortly after Washburn graduated from Colorado State College (now University). Washburn was assigned to conduct activities in the Dixie National Forest in southern Utah involving study and control of the mountain pine beetle, then known as the "Black Hills beetle," in ponderosa pine stands (Furniss, in preparation).

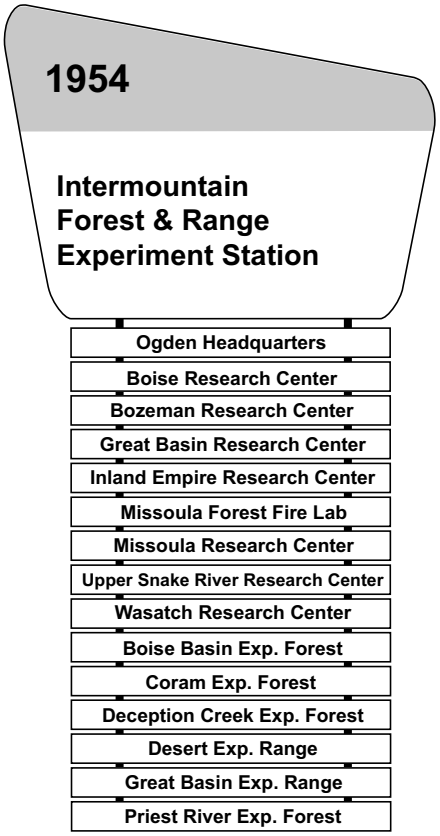
Merger and Change, 1954

The Department of Agriculture announced a major reorganization in late 1953 that affected a number of agencies including the Forest Service. Among the changes was a merger of the Intermountain and Northern Rocky Mountain Stations, effective on January 1, 1954. The combined unit was to carry the Intermountain Station name.

The reasons given for the merger suggested good things would happen, but they were very general. The announcement said that the merger "would reduce administrative costs and increase the amount of actual research on wildland problems." The decision to merge the two organizations was recommended by the Chief of the Forest Service to the Secretary of Agriculture. Territory for the new Intermountain Station included northwestern South Dakota, eastern Washington, and a bit of eastern California as well as western Wyoming and all of Utah, Nevada, Idaho, and Montana.

Forest Survey and fire control and forest products utilization research, which had been at the Northern Rocky Mountain Station, continued as important parts of the program of the new Intermountain Station (Annual Report, INT 1954). Forest Survey personnel were transferred to Ogden. The fire and utilization work remained in Montana.

The original reorganization plan was to transfer all Forest Service range research to the Pasture Branch of the Crops Research Division in the newly formed Agricultural Research Service. Deputy Chief Harper learned that the transfer had been proposed by the livestock industry to the new Secretary of Agriculture, Ezra Taft Benson, who was sympathetic. Harper suggested that only portions of range research that dealt with treeless areas be transferred.



Most range research on the Great Plains, plus some studies of reseeding and control of undesirable species of range plants, was transferred from the Forest Service to ARS (ARS was the product of the old Bureau of Plant Industry plus parts of other organizations). The Forest Service was left with research on grazing management of forest and related ranges, range ecology, plant control by grazing management, and fire related to range (Steen 1998).

This was the start of a "treaty" between the Forest Service and the ARS delineating agency responsibilities for range research, a delineation that became a bit fuzzy over time. One of the fallouts from the reorganization was the transfer of the Northern Rocky Mountain Station range research at Fort Keough to the ARS. Not long after the transfer, the Vigilante Experimental Range in the Beaverhead National Forest was disestablished.

A significant change brought about by the reorganization added two key research programs to Intermountain Station responsibilities. Forest insect studies, surveys of insect infestations, and technical aid programs to control insects were transferred from the Bureau of Entomology and Plant Quarantine to the Forest Service. Similarly, programs in forest diseases formerly carried out by the Division of Pathology in the Bureau of Plant Industry, Soils, and Agricultural Engineering came to the Forest Service. The Intermountain Station was assigned responsibility for insect studies and infestation surveys throughout its territory, and also for research on blister rust and other diseases important primarily in the northern Rockies.

The Headquarters Question

One of the many questions had been where the new Station Headquarters would be—Missoula or Ogden? Reed Bailey, Intermountain Station Director at the time, had senior status as a longtime director, and was not in the best of health. In the merger arrangement, he was supposed to move to Berkeley to direct the California (later Pacific Southwest) Station. He did not want to go, and told Deputy Chief Harper he would not go. Harper didn't want to lose him as a Station Director, so George

Division Chiefs of the newly formed Intermountain Forest and Range Experiment Station gathered in March 1954 at Station Headquarters in Ogden. Pictured meeting in the Station Library were (left to right) Lincoln Ellison, Range; Walter M. Zillgitt, Forest Management; Irvin V. Anderson, Forest Utilization Service; Walter E. Mann, Administrative Officer; James C. Evenden, Forest Insect Research; Reed W. Bailey, Station Director; Jack S. Barrows, Fire; Harry W. Camp, Jr., Forest Economics; and George W. Craddock, Forest Influences.

Jemison, Northern Rocky Mountain Station Director, was sent to California instead. Bailey then decided he didn't want to move to Missoula either.

One retired project leader recalled a meeting of Station personnel in Missoula, during which Bailey said he chose to have Station headquarters remain in Ogden because Missoula was too dominated by one organization—the Anaconda Company. Bailey's rationale was interesting. Although the Anaconda Company was certainly a dominant factor in Montana politics and power, Missoula was also a Forest Service town In fact, if there was ever anything approaching a Forest Service "company town" it was Missoula. Perhaps Bailey simply chose to make the Anaconda Company the reason for not wanting to move.

Perhaps Bailey simply did not want to discuss what no doubt was a very important factor in the location of the Station Headquarters. Any plan to merge major Forest Service units required approval by the Secretary of Agriculture. The Secretary in 1953 was Ezra Taft Benson, an apostle and later president of the Mormon Church.

Benson was born and grew up in southeastern Idaho, an area with strong ties to Utah. In Washington, the Benson family maintained close social ties with Utah people, including Forest Service officials from the Beehive State (Hurst 2000). It seems unlikely that Benson would have approved a plan that moved a major unit headquarters out of Utah unless there was a compelling reason to do so.

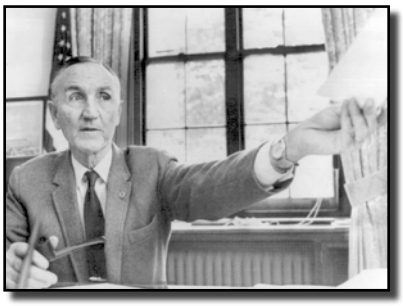
A Time of Adjustment

The USDA reorganization and related Station merger meant that 1954 was a year of adjustment. The announcement of the merger made in late 1953 had been met with mixed feelings. Each group that was combined had previously achieved a certain stature in its field and territory and was reluctant to be absorbed into a new organization.

A "Numbskull" (see chapter 13) turned over to the Intermountain Station by Northern Rocky Mountain Station

A Slight Long Remembered

When Roger Bay was appointed Intermountain Station Director in 1974 he was stationed in the Washington Office. Before leaving for Ogden, he took advantage of the opportunity to introduce himself by visiting offices of the Senators and Congressmen representing the States in Station territory. Montana Senator Mike Mansfield, majority leader at a time the Senate was controlled by his Democratic Party, was one of most powerful politicians in the country. When Bay was ushered into his office, Mansfield's first words were, "I hope you're not thinking of pulling the rest of the research program out of Montana!"



Mike Mansfield was said to be one of the most powerful people in America when he presided over the U.S. Senate as majority leader. He had a keen interest in Station research facilities and activities in Montana (K. Ross Toole Archives, Maureen and Mike Mansfield Library, University of Montana-Missoula, 99-1743).

Bay said the ensuing discussion revealed that Mansfield was unhappy because, as a junior legislator when the Republican Party controlled Congress in 1953, he had either not been consulted about the Northern Rocky Mountain-Intermountain Station merger, or felt he had been insufficiently consulted. The fact that the new Station headquarters was located in Ogden rather than Missoula galled the Senator 20 years after the event.

During his time as Station Director, Bay was diligent in maintaining contacts with Members of Congress. He often made visits with the Region 1 and Region 4 Regional Foresters. Bay said it was natural that the legislators usually showed the most interest in high-profile Forest Service management activities, and weren't too aware of or interested in the research program. Mansfield, however, was an exception. He knew about Forest Service research and had a keen interest in what was happening with programs and facilities in Montana. He made sure he never was bypassed again (Bay interview, 2004).

personnel after the merger carried two bits of wry humor reflecting such attitudes. One said, "This wretched old skull may not be a sweet sight, but it is all NRM had when she gave up the fight." The other proclaimed, "Old NRM Station has been laid to rest, but she left this old skull as a final bequest." Both statements were dated January 1954. The official outlook, cited in the Intermountain Station's annual report (1955), was that the reorganization meant, "A better coordinated, more efficient, and better balanced research program."

Among the stated merger advantages were less travel by the Station Director and the Division Chiefs; expansion of watershed research because work out of Missoula included the Columbia and Missouri River basins; and a strengthening of forest management research, including attack on the western white pine pole blight problem. Combination of local and regional approaches to research was perceived as the greatest benefit.

The Northern Rocky Mountain Station headquarters had been located in the Missoula Federal Building. With the decision to have the merged Station headquarters in Ogden, the facility was designated the Missoula Field Research Center. In addition to existing forest management research activity already in Missoula, room was made for the move of the former Bureau of Entomology Forest Insect Laboratory from Coeur d'Alene as it became part of the Station. The newly established Forest Fire Laboratory was also housed at the center. Although stationed in Missoula, the fire researchers continued to use Priest River as a field laboratory. Jack Barrows, who was serving as Fire Research Division Chief, was assigned to also head the fire lab.

Management styles were different at the two Stations, and this called for some adjustments. Chuck Wellner recalled specifically that as a Northern Rocky Mountain Station Center Leader he had the use of extensive discretionary funds, but Walt Mann, Assistant Station Director for Administration at the Intermountain Station, wanted much tighter control of funds by Station Headquarters (interview, 1993).

Beetles, Budworms, and Bushes Get Lots of Attention

Abolishment of USDA's Bureau of Entomology and transfer of its forest insect investigation personnel to the Forest Service starting in late 1953 brought the first of what became a larger group of entomologists to the Intermountain Station. Several of the scientists played lead roles in forest insect research in the Interior West for the next 30 years. In the first change, Bureau scientists at Coeur d'Alene were assigned to the Northern Rocky Mountain Station and those in Ogden joined the Intermountain Station staff. About a month later, when the merger of the two Stations took effect, new research units were formed and a series of personnel moves began.

Mal Furniss transferred from the Bureau of Entomology's Berkeley (California) Forest Insect Laboratory to Ogden in October 1954. Les Orr moved from Ogden to the Southern Station at New Orleans, leaving Dick Washburn as the remaining entomologist from the Bureau's Ogden Forest Insect Lab. Furniss and Washburn soon were joined by Walt Cole after he graduated from Colorado State University. While a student, Cole had worked for the Bureau of Entomology in California during summers as a member of insect survey and control crews.

Jim Evenden, who had supervised work at Coeur d'Alene for 37 years, served as Division Chief for Forest Insect Research for the Intermountain Station until he retired at the end of 1954. The remaining staff members at the Coeur d 'Alene insect lab, including Phil Johnson and Bob Denton, were transferred to Missoula by the end of 1955 (Furniss, in preparation).

In 1957, Dave Fellin and Dick Schmitz made the first discovery of the larch casebearer in the western U.S. while driving from Oregon State University to Missoula for summer employment. Just south of Missoula, Schmitz asked Fellin what was causing fading (discoloration) of western larch foliage. Fellin, who was partially color blind, saw nothing wrong. However,

Project Leader Phil Johnson zeroed in on a forest insect in 1962 at the new Missoula Forestry Sciences Lab.

they stopped and collected some foliage that had many case-bearing caterpillars feeding on the needles. After arriving in Missoula, Fellin and Schmitz presented the specimens to Johnson, who referred to eastern U.S. literature on larch defoliators and identified the insects. Johnson served as Project Leader at Missoula until he retired in 1969 (Furniss, in preparation).

Schmitz was hired at the Missoula lab to study the pine engraver beetle; he later moved to Moscow where he continued the work. Fellin also became a Station scientist at Missoula after he began a career in spruce budworm work with what became the Idaho Panhandle National Forests. He started as a field entomologist on a survey team, and much of his early work revolved around massive DDT spray programs aimed at suppressing budworm populations (*INTercom* 4/4/85). Fellin, who was born and raised only 100 miles from Missoula, remained stationed there throughout his long career as a Station entomologist, making him a rarity in an era when Station scientists often were asked to move or were reassigned as budgets, program emphases, and units changed.

Denton began studies of the larch casebearer in 1957 at Missoula, and continued the work after he transferred to Moscow. Washburn participated in casebearer research after he transferred to Moscow from Ogden, but specialized in spruce budworm studies. Denton's research at Moscow mainly involved use of introduced parasitic wasps, but also included testing nonpersistent

insecticides. In 1967, he and other members of the Moscow staff documented a nearly total collapse of the needle-mining stage of the casebearer due to extreme hot, dry weather. Aided by this diminishment of the population, the various introduced and native parasites gained control and maintained casebearer populations to the point that it was thought of as "naturalized." Its presence, if it existed at all on a particular tree, could only be noted by careful scrutiny (Furniss, personal communication).

In May 1955, Furniss and Cole were moved from Ogden to the Boise Research Center because of large outbreaks of the pine butterfly and western spruce budworm in southern Idaho. Furniss was entomologist in charge of spraying 1 million acres of forest land in a chemical control program that summer. It was the largest such project ever undertaken in Idaho (Furniss, in preparation). Cole received a USDA Superior Service Award for his performance in budworm and butterfly surveys, control efforts, and research at Boise (*INTercom* 4/5/84). The Station insect units had responsibility for surveys and technical supervision of control projects until 1961, when those functions were transferred to Regions 1 and 4. Cole moved to Ogden in 1960 as Project Leader of a new mountain pine beetle research unit, which was destined to be the Intermountain Station's last forest insect unit.

Furniss was assigned to Douglas-fir beetle research in 1956. He selected a study area on the South Fork of the Salmon River in the Payette National Forest, and until 1963 he and his family spent entire summers living in a building that had been constructed in the 1930s by CCC enrollees.

The building had no electricity or phone. Irene Furniss cooked on a wood stove that also heated water via a pipe leading into the firebox. A wringer washing machine was rigged to be operated by a gasoline engine. Lanterns fueled with white gas provided light, and a kerosene burning refrigerator cooled food (Furniss, in preparation).

Joe Basile, a wildlife biologist then with the Idaho Department of Fish and Game, and Station Range Scientist Bob Ferguson were assigned to the Boise Research Center at the time Furniss worked there. At a coffee break, Furniss chided them about not including insects in their studies of why bitterbrush was dying or not regenerating on deer winter range in the Payette and Boise River drainages. He was challenged to participate, and discovered that a stink bug was feeding on seed in its juice stage, drastically lowering the amount of viable seed. An article that resulted, "Six-Legged Seed Eaters," was published in the Fish and Game Department's magazine. Shrub entomology eventually was made part of the research assigned to Furniss, and he studied insects on five genera of shrubs in the Northwest. He continued this work on willows in Alaska after retirement, sponsored by Forest Service Region 10 (Furniss, in preparation).

The Station's forest insect research staff posed with visitors in front of the new Moscow Lab in 1963. Front, left to right, Dave Fellin (Missoula), Mal Furniss (Moscow), Dick Schmitz (Missoula), Walt Cole (Ogden). Standing, Bob Denton (Missoula), Division Chief Don Parker (Ogden), Station Director Joe Pechanec, and Project Leader Phil Johnson (Missoula.) Furniss recalled inviting the group to his home for the evening: "We had the entire crew up for dinner and drinks and afterward we played ping-pong in the basement. Parker and Pechanec were regular guys."

In 1963, Furniss transferred to the newly built Moscow Lab (see "Modern Labs Matriculate," chapter 10) and enrolled in entomology graduate studies at the University of Idaho under the Government Employees Training Act. In 1969, Johnson retired as Project Leader at Missoula and a new research unit was established at Moscow to conduct research on insects affecting forest trees and wildland shrubs in the Northern Rocky Mountains. Furniss was named Project Leader.

Early work at the Coeur d' Alene insect lab and at Ogden, Boise, Missoula, and Moscow laid a solid foundation for subsequent research by Station scientists that played a part in changing the way managers viewed insects and attempted to control them. Throughout the existence of the lab at Coeur d'Alene and in early years at Missoula, results of all phases of the work, including surveys, control supervision, and research, were summarized annually in typed reports. To preserve the records Denton, in 1959, listed 548 reports covering the years 1915-58. Furniss later scanned copies and saw that they were deposited in the University of Idaho library.

In 1975, Johnson (as a volunteer in retirement) and Denton studied old survey records and reports and published a comprehensive review titled *Outbreaks of the Western Spruce Budworm in the American Northern Rocky Mountain Area, 1922-1971*. The volume, issued by the Station, was useful to forest historians as well as scientists working on budworm problems (*INTercom* 2/26/76). The same year, Furniss and his major professor at the University of Idaho, William Barr, authored a Station publication summarizing knowledge of 43 insects that affected important native shrubs in the northwestern U.S.

The work summarized in these documents and other work by Station entomologists and cooperators helped to pave the way for radical shifts in Forest

Blister rust devastated stands of western white pine such as this one in the Clearwater National Forest. About half the prime pine stands were decimated in northern Idaho, northeastern Washington, northwestern Montana, and south-central British Columbia before resistant seedlings became available (Kingsbury 1984).

Service philosophy regarding insect control (see "Integrating Insects with Management," chapter 11).

Work by Station research foresters and pathologists also contributed to great changes in how the "disease" part of Forest Insect and Disease Management was handled in the Forest Service. Blister rust was the disease most seriously affecting the most valuable timber in the Northern Rocky Mountains.

White pine blister rust was inadvertently introduced to North America from Europe as early as 1898 when infected pine seedlings were widely planted in the northeastern United States. In 1910, the rust arrived in Vancouver, British Columbia, on infected seedlings from France, and by 1923, it had begun to infect Idaho's white pines. By the 1940s blister rust was epidemic, and millions of western white pines were dying throughout the Inland Northwest.

The rust is caused by a fungus (*Cronartium ribicola*) that lives part of its life on *Ribes* plants (gooseberries and currants) and the other part on white pine trees. This devastating pathogen needs both hosts to complete its life cycle (Fins and others 2001).

European pathologists and foresters had long known about blister rust and how to control it, but there were no important commercial stands of white pine in Europe. Cultivated *Ribes* were important crops. So in Europe, control was really out of the question, and the white pine was sacrificed to retain the *Ribes*.

In America, the situation was the reverse. *Ribes* was plentiful, mostly growing in the wild, and of little economic importance. The vast white pine forests of both the East and West, however, provided the basis for a thriving timber industry. The choice confronting American authorities when the first infected pine was discovered in New York State in 1909 seemed clear: Either remove *Ribes* in and near white pine stands while the disease was just becoming established, or face the ultimate loss of much white pine.

The Blister Rust Control Program was formed. Its membership, which included the Department of Agriculture from the start, waged a gigantic fight for 70 years to protect the white pines of America from coast to coast. The program affected the lives of thousands and the economic development of countless communities. It was successful in many places, but in some it was a failure (Benedict 1981).

Early attempts to halt the spread of blister rust by eradicating *Ribes* within and near valuable white pine stands were successful in reducing infection in the Lake States. Eradication work began in Region 1 in 1924 and lasted for more than 40 years. The first experimental work was in the Priest River Experimental Forest (see "Program and Headquarters Changes," chapter 3). Results of *Ribes* eradication trials were considered encouraging (Benedict 1981).

Subsequently, thousands of young men were employed in the blister rust program. At its peak in 1936, the *Ribes* eradication work involved 8,728 laborers and 125 camps. Many workers were enrolled in the Civilian Conservation Corps or were hired through other emergency employment programs. Many others who worked pulling bushes over the years were natural resource students who hired on during summers to earn money to further their educations. So the program had some positive effects for many people. Unfortunately, the positive effect on the western white pine was negligible.

Unlike the situation in the Midwest, difficult or inaccessible terrain in the mountainous West doomed the plant pulling to failure. Eradication crews consistently missed their goals. One camp foreman with eastern experience observed, "We miss more *Ribes* per acre than are pulled by the crews of the East" (Benedict 1981). Attempts at control with chemical sprays also were ineffective.

Region 1 gave up in 1968. A survey showed that even when only a few bushes per acre remained after an eradication attempt the proportion of pines infected was not significantly reduced. And even when eradication efforts met goals, mountain winds merely blew some rust spores to other areas a mile or more away. The conclusion was that

Civilian Conservation Corps enrollees grubbed out *Ribes* along Merry Creek in northern Idaho in 1933.

Ribes eradication was not economically feasible in the Northern Rocky Mountains. In essence, Region 1 gave up on the white pine. Three major policy changes were made: (1) western white pine planting was discontinued; (2) thinning operations were to favor species other than white pine; and (3) salvage of white pine damaged by blister rust or bark beetles was accelerated. White pine had been abandoned, at least temporarily, in timber management (Hagle and others 1989).

However, pathologists and research foresters who were part of the control program did not abandon the western white pine. Through genetics research and a team approach to producing disease-resistant seedlings, they scored a notable victory in the struggle with blister rust to retain the white pine as a major species in Northern Rocky Mountain forests.

Bingham's Team Turns the Tide

In the summer of 1948, representatives of organizations with an interest in controlling white pine blister rust met at the North Fork of the Clearwater River in Idaho. The eastern white pine workers chided the westerners for not having a western white pine rust resistance genetics program.

Dick Bingham, then a scientist with the Bureau of Entomology and Plant Quarantine, spoke up and said he was working on it. Actually, the "research" was being conducted in a window-sill box at his office in downtown Spokane. From this meager start, Bingham went on to lead a genetics research effort that was very successful (Hoff interview, 1993).

In 1950, five USDA units, including the bureau, the Northern Rocky Mountain Station, Region 1, the Pacific Southwest Station (California's sugar pines also were being attacked), and the Office of Blister Rust Control began a long-term genetics project. There were no illusions about the difficulty of the problem. The program was planned to run until the year 2000. Bingham, Research Forester Tony Squillace, and Forest Geneticist John Duffield were in charge. They began by isolating individual rust-free western white pines, often lone survivors in stands that had been exposed to the disease for at least 20 years (Kingsbury 1984).

The researchers suspected these trees were genetically resistant to blister rust, and tests proved the hunch was correct. When they bred the disease-free trees with each other, many of the seedlings resulting from the crosses were resistant to the rust.

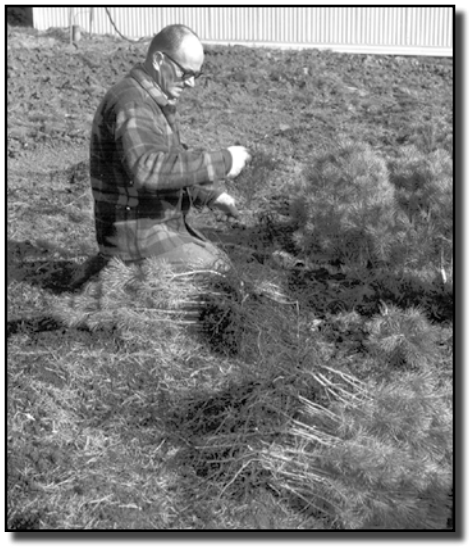
Summer after summer, Bingham, Squillace, Duffield, and field workers scoured forests, traveling miles into the backcountry, looking for rust-resistant trees and then cross-breeding them. They literally wore out the bottom branches of some often-climbed trees as they covered pollinated cones with protective individual bags. During the 25-year research project, the crews climbed well over 5,000 trees.

The bags were somewhat innovative. The cotton flour sacks in which field workers carried their lunches doubled as cone bags. "They were a never-ending surprise and delight," Bingham said. "They were printed in a wide variety of brightly colored and imaginatively patterned checks, calicos, and floral designs for use by thrifty home seamstresses."

Bingham's appreciation of the art deco characteristics of the bags was a surprise to some. A Marine during World War II and a "no-nonsense" hard worker, he was known by colleagues to hate cowboy hats, striped overalls, shorts, and tennis shoes in the woods (Kingsbury 1984).

Beginning in 1957, using the most resistant seedlings from their crosses, Bingham and his colleagues established a breeding orchard on the University of Idaho campus. When they made controlled crosses between trees in the orchard and tested the seedlings, about 66 percent of the offspring had no rust cankers after 2.5 years. That was good enough to ensure survival of adequate numbers of resistant trees in the field, although scientists continued research to improve the numbers of rust-free trees produced in the cross-breeding work.

The breeding orchard in Moscow began producing small seed crops in about 1970. In the 1980s, it was converted to a seed orchard and managed to produce large amounts of seed. The first major crop was generated in 1985. In its first 20 years of operation, the orchard produced some 10,000 pounds of seed (more than 200 million seeds). In 1999 the orchard was renamed the R. T. Bingham White Pine Seed Orchard.



Dick Bingham lifted white pine seedlings from a progeny test plot at Moscow during part of the genetics research program in the mid-1950s.

The research by Bingham and his colleagues, and the orchard they started, provided the foundation for ongoing efforts to increase rust resistance levels in white pine. By planting genetically improved, rust-resistant seedlings produced by regional tree improvement programs and managing the stands to promote high survival and growth, it became possible to restore western white pine to its native ecosystems. Management techniques available to maintain healthy white pine stands were described in a Station publication by Susan Hagle, Region 1 plant pathologist; Geral McDonald, a Station pathologist based in Moscow; and Gene Norby, retired silviculturist for the Clearwater National Forest (Hagle and others 1989).

By 1993, Region 1 was shipping 5 million rust-resistant seedlings a year from its Coeur d'Alene Nursery. About another 5 million resistant seedlings were being grown in industrial, private, and Idaho State forest nurseries annually (Boyd interview, 1993). Although Forest Service planting programs

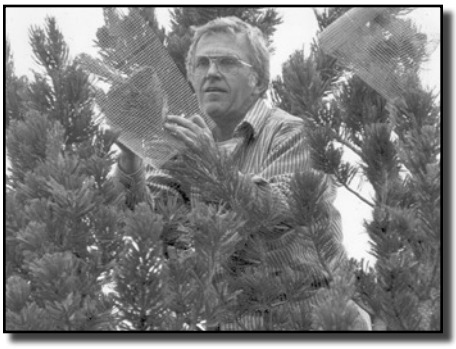
began to decline as timber harvests declined, the application of blister rust genetics research results continued to be significant. Bingham estimated that the selective breeding program cost about $2 million compared to some $50 million invested in traditional manual blister rust control work between 1926 and 1967, achieving an impressive savings for present and future generations (Baker and others 1993).

One estimate was that Federal, State, industrial, and other organizations planted resistant seedlings on about 250,000 acres in the Inland Northwest between 1976 and 1996. Much remained to be done, however. The acreage was only about 5 percent of the estimated 5 million acres with potential to grow white pine in the region (Fins and others 2001).

Despite the successes, both researchers and forest managers worried that new strains of the rust would develop. These concerns led researchers to pursue another line of studies where the question was how the fungus could be made to grow more slowly (Hoff interview, 1993). Other problems were possible. In fact, Scientist Emeritus McDonald and Biological Technician Bryce Richardson of the Moscow Lab discovered two new alternate *C. ribicola* hosts in 2004 (which may partially explain why the Ribes eradication program was not successful) .

Bingham retired in 1974. Ray Hoff, who had a 33-year career in genetics at the Station became Project Leader for the unit. Hoff studied many host-pest systems, and made major contributions to the success of the white pine blister rust research. In basic studies, he found 12 resistance mechanisms that protected white pine from blister rust or slowed the growth of the rust. Some mechanisms were controlled by single genes; others were controlled by many genes. Hoff was a leader in defining and putting into use a breeding program to incorporate multiple-gene resistance into western white pine populations (Ferguson 1994).

One of Hoff's contributions came from what unit members called "Bingham's Garbage Patch." Bingham made tests of white pine progeny in the early 1950s near Elk River, Idaho. He



Project Leader Ray Hoff put squirrel-proof mesh over whitebark pine cones as he worked to develop improved trees for planting projects in high-elevation grizzly bear habitat where blister rust was killing large numbers of trees.

moved rust-resistant seedlings from the test area to the arboretum in Moscow and abandoned the rest. Fifteen years later Hoff and McDonald visited the Elk River site and observed that some of the rust-infected, abandoned trees were still living. They turned out to be examples of "horizontal resistance" to blister rust.

Hoff took cuttings from the "garbage patch" trees and rooted them. The seedlings were taken to the Priest River Experimental Forest, where they were used to provide an additional mechanism in breeding rust-resistant white pine (Hoff interview, 2000).

In applied work, Hoff (with technician Dale Coffen) published *Recommendations for Selection and Management of Seed Orchards of Western White Pine*. He wrote another Station publication, *How to Recognize Blister Rust Infection on Whitebark Pine*, to help foresters cope with an increasing problem in important grizzly bear habitat. Hoff played an important role as a scientist in the genetics unit early in his career and as its leader following Bingham's retirement.

After his retirement, Bingham wrote a detailed Station publication describing the program to which he devoted his professional career. The document (Bingham 1983) summed up the patient, meticulous work that was the basis for restoring a beautiful, useful tree species to western forest ecosystems. Bingham was elected a Fellow by the Society of American Foresters in 1978. He was awarded the society's Barrington Moore Memorial Award in 1989 for leadership in forest genetics.

When asked how it felt to be involved in a project so long term that the scientists probably would never see final results of their labors, Bingham said, "I felt like any other forester. It was a job that needed to be done" (Kingsbury 1984).

Hoff saw Bingham's efforts differently, "He has done more than 10 other foresters would have done. He worked hard, both physically and mentally. He was the right person for the right time."

Bingham didn't stop working in retirement. He contributed 8 years of volunteer time with a fellow retiree, Clyde J. Miller, to compile a comprehensive plant index for the Seven Devils Mountains in the Hells Canyon National Recreation Area in Idaho (*INTercom* 4/18/85).

Each year the pair collected and identified native plants along a 60-mile stretch of the Seven Devils area above 5,000 feet elevation. Their effort resulted in the most comprehensive list of native plants available for the area, numbering 722 species, subspecies, or varieties. The Wallowa-Whitman National Forest used the information to publish a 70-page pamphlet describing the 210 most common plants for tourists visiting Hells Canyon.

An element of detective work and a whole lot of persistence were involved in compiling and verifying the plant list. Bingham combed through seven herbaria, reviewing more than 100,000 plant specimens. He found more than 2,700 individual specimens from the Seven Devils area. Bingham also reviewed field notes by 16 previous plant collectors dating back to 1899.

Range Is Rearranged

The USDA reorganization in 1954 signaled the start of fundamental changes in range research at the Station that continued for many years. Although some of the finest achievements in range science were right around the corner, the range program began a process of consolidation and adjustment. Eventually,

the "range research" designation nearly disappeared, although the knowledge gained in the program was vital to "ecosystem research" that became dominant in much of the Station program.

Throughout the Intermountain Station territory its range research no longer was "the only game in town." Universities had developed range research programs as their natural resource schools grew. The creation of the Agricultural Research Service (ARS) changed part of the Stations' traditional responsibilities and, coupled with reassignments of Forest Service research territories, ended the Station role in the Northern Great Plains altogether. There was much more competition for range research funding.

The Station responded to the challenges by adjusting units and personnel assignments and moving aggressively into cooperative arrangements with universities, State agencies, the ARS, the Soil Conservation Service, and the Bureau of Land Management. Fortunately, a strong group of range scientists was on hand to adapt the program to the new realities. Forty years of range research at the Station had produced substantial results, and the researchers put them to work to bring about important improvements in range management in the Interior West. Some of the positive change was inspired by Lincoln Ellison, who was the Station's Division Chief for Range Research at the time of the reorganization.

Some budding environmentalists in the 1960s might have been surprised to learn that ecological science wasn't invented then. Forest and range ecologists were prominent in Forest Service research 50 years earlier. Arthur Sampson was the first Forest Service range ecologist, but "Linc" Ellison might have become the greatest to study and attempt to define the complex interactions that take place in the natural environment. Ellison built on Sampson's work and refined some of the principles (Tippets interview, 2004). Unfortunately, his life ended prematurely in 1958 when he was killed at the height of his career in an avalanche while skiing at Snow Basin near Ogden. He was 49.

Ellison earned degrees at the University of California at Los Angeles and the University of Minnesota. He concentrated on botany, but also included geology and biometry in his graduate studies. He served at the Northern Rocky Mountain Station (1932-37), with his last post at Fort Keough but was best known for his work at Great Basin and the Intermountain Station. He has been recognized as one of the most influential individuals who succeeded in creating a high level of awareness about erosion tragedies within the Forest Service (Prevedel and others 2005).

In his first major scientific article in 1937, Ellison pointed out the necessity for the populace to be in ecological balance with its environment. This was a theme he was to advance throughout his career. He was named Director at Great Basin in 1938, and moved to Ogden in 1945 to serve as Division Chief for Range Research for the Intermountain Station (Norman 2005).

Ellison completed many studies on the relationship between soil and vegetation and believed that reverence for the ecological balance was an economic, esthetic, and ethical obligation. His 100-page monograph on subalpine vegetation of the Wasatch Plateau (Ellison 1954) was considered a classic work. Perhaps his most notable contribution to range management was a publication on condition and trend that was still valid in 2005 (Mitchell and others 2005). He wrote many other publications related to the ecology and management of high-mountain watersheds. Almost a half century after Ellison's death, his work was still being cited in sources as diverse as "Soviet Soil Science" and reports on the ecology of the steppes of Inner Mongolia (Prevedel and others 2005).

Lincoln Ellison's brief, but significant, career as a Station ecologist was commemorated by a simple monument atop Elk's Knoll at Great Basin.

At his inaugural address as president of the Utah Academy of Sciences,

Hold That Pose, Linc

Most of the prominent individuals in the history of range management research at the Station were present for a photo of the Division of Range Research taken at a meeting in 1954 at Great Basin. Back row, from left were Linc Ellison, the division chief; Neil Frischknecht; Odell Julander; Selar Hutchings; Ralph Holmgren; and Tony Evanko. Front, same order, Perry Plummer, Jim Blaisdell, Walt Mueggler, Justin Smith, and Jack Schmautz.

Ellison had all the division scientists get together every summer for a field meeting (Mueggler, personal communication). Mueggler said, "Linc was (arguably) the foremost plant ecologist in the West, and a very inspirational leader who had a profound effect on my development."

Always meticulous, Ellison took an abnormally long time setting up his antiquated camera to get things just right for this group photo. The slow process stimulated Holmgren to finally ask, "What do you do if you need to take a fast picture—like catching a stage of ecological succession?" (Blaisdell 1989).

Arts and Letters in 1955, Ellison said, "Survival rests not only on sound management; sound management itself rests on moral values. If we ignore or despise our environment, it will destroy us. If we reverently strive to understand our environment and our place in it, if we develop an attitude of respect and love for it, we have laid the groundwork for survival."

The almost mystical attitude toward the environment was nearly matched by the reverence for Ellison often expressed by his colleagues and those who worked under his direction. Ellison's family asked Range Scientist Perry Plummer and Technician Paul Hansen to spread Linc's ashes on Elk's Knoll and place a monument to him there. Hansen contributed to local Great Basin lore by stating that every time he later climbed up Elk's Knoll a red-tailed hawk dove out of the sky and screeched at him. Hansen firmly believed the hawk was Ellison's spirit watching over his favorite place (Stevens 1994).

More New Directions

The Department of Agriculture, having brought about significant organizational changes in 1954, was not through. In 1956, USDA had each agency prepare a 10-year research plan. Intermountain Station's emphasis areas (Annual Report, INT 1956) were:

- Guides for wise use of ponderosa pine lands
- Understanding proper relationships of grazing use, erosion control, and water yield for mountain herb lands
- Better management of western white pine and associated species
- Management and utilization of lodgepole pine
- Erosion control and forage improvement on sagebrush-juniper range
- Improved guides for western larch/Douglas-fir management
- Protection and management of interior Douglas-fir
- Silviculture and protection of Engelmann spruce-subalpine fir
- Restoration of Sierra pine-brushlands
- Management of aspen-fir stands
- Grazing management and erosion control of salt-desert shrubs
- Erosion control and forage production in southern desert shrublands

Richard McArdle, who had come from a Forest Service Research background, was Chief of the Forest Service at this time. McArdle, sensing the need for expanding research into forest recreation, asked long-time friend Sam Dana, Dean of the University of Michigan's School of Natural Resources, to look into the possibilities and report his findings. The report, issued in 1957, called for establishing a forest recreation research staff. Not long afterward, the staff was established in Washington. This provided the basis for the Station's entry into recreation research.

Arthur Roe, who had been engaged in forest management research at Missoula since 1946, was selected to head the Missoula Field Research Center. The center was charged with investigations of methods of harvesting, regenerating, and caring for the larch/Douglas-fir, spruce, lodgepole pine, and ponderosa pine timber types. High mountain range and watershed research was also planned for the unit (Annual Report, INT 1955). Elsewhere within the Station, heightened interest was given to forest genetics research and regeneration studies, and calls from the National Forests for improved mensurational aids were heeded.

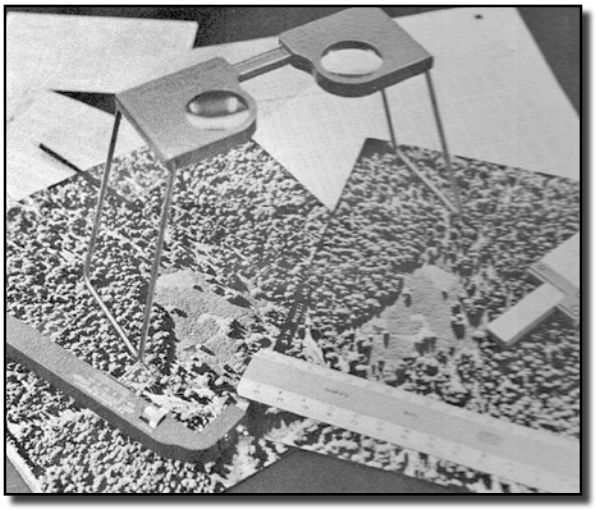
Forest Survey, the inventory of the Nation's standing timber resources, had begun in 1930; but by merger time only 31 percent of the forested land in the eight States assigned to the Missoula unit had been covered. Much of the standing timber resources of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming had not been inventoried. Most of the forested areas were in the unroaded mountains of Idaho and Montana and were difficult to reach. Improved inventory techniques using punch cards for compiling areas and volumes and adaptations of aerial photography technology developed during World War II gave promise of speeding up the survey process.

The beginnings of aerial photography in the Forest Service actually predated World War II. The first photos taken from an airplane in Region 1 were snapped in 1926. In 1936, Region 1 hosted a national conference on aerial photography and explained the processes it had developed to do some phases of forest survey work from the air (Baker and others 1993). With the benefit of World War II technology, aerial photography techniques improved markedly, but it was one thing to take the photos and quite another to interpret them. Karl Moessner had a big impact on correcting the imbalance.

Moessner joined the Station's Forest Survey unit in 1955 shortly after Survey was moved from Missoula to Ogden. According to Dave Born, who worked with him for many years, Moessner became the leading authority on photogrammetry in the Forest Service (interview, 2005). Moessner made basic research contributions to the art and science of obtaining reliable measurements from photography and also devoted considerable time to training others in photo interpretation.

Moessner had 9 years of experience working on National Forest staffs in the Lake States where he perfected methods for using aerial photos in fire planning, mapping, and trail location. Called to active military duty in 1942 as a First Lieutenant, he served with the Army Air Corps in a photo intelligence unit. He later advanced to the rank of Lt. Colonel in the reserves. After the war, Moessner's second assignment with the Forest Service was to head photo interpretation activities for the newly organized Forest Survey of the Central States. When the initial survey was completed, he transferred to the Intermountain Station where he worked until retirement.

Moessner developed methods for estimating the slope of terrain, tree heights, tree volumes, and even the depth of forest lakes from aerial photos. He also analyzed the effectiveness of various devices used in interpretation. Moessner, however, became best known for his efforts in training managers to use the techniques



Karl Moessner developed new techniques for aerial photo interpretation and taught resource managers how to use them effectively as a member of the Station's Forest Survey staff.

of photo interpretation effectively. The centerpiece of this work was a training handbook, *Basic Techniques in Forest Photo Interpretation*, published by the Station in 1960. It was widely used in several Forest Service Regions and by other resource management organizations.

Moessner was a staunch advocate of a "hands on" approach to training. In the introduction of the manual, he said, "Recent graduates and many experienced foresters have studied existing textbooks and manuals in the hope of learning how to use aerial photos effectively. These foresters may have varying amounts of working knowledge and experience with photogrammetry, but they have one thing in common—lack of success in learning techniques or skills by merely reading about them. Effective use of aerial photos is a skill that can be acquired only by practice."

The manual outlined problem-solving exercises for the students and was liberally illustrated with landscape photo examples and photos of devices used for interpretation. Moessner sought to train engineers and other resource management personnel, as well as foresters, to use aerial photos for purposes other than mapping—to estimate timber volumes, do range and watershed reconnaissance work, and find the best locations for roads and trails. Although he was the sole author of the manual, he acknowledged contributions by Region 4 Engineering, Utah State University, the Central States and Northeastern Stations, and Intermountain Station personnel at the Boise Research Center.

The Expansion Era

An event in the Soviet Union in 1957 had a significant long-term influence on Forest Service research, marking the starting point for the greatest expansion period ever. In October, the Soviet Union launched Sputnik, a tiny satellite orbiting the Earth. It was a wakeup call that the United States was behind in the exploration of space; and, more ominously, behind in the development of weapons in the Cold War. The U.S. began a strong effort to strengthen the teaching of science and math within the educational system, and to increase the research capabilities of the national defense establishment inside and outside the Federal Government.

The Forest Service research program was a beneficiary of the Federal Government's reaction to Sputnik. But it was a coat-tail effect stemming from Cold War concerns more than a heightened concern about natural resources. The environmental movement had not become a strong political force at the time.

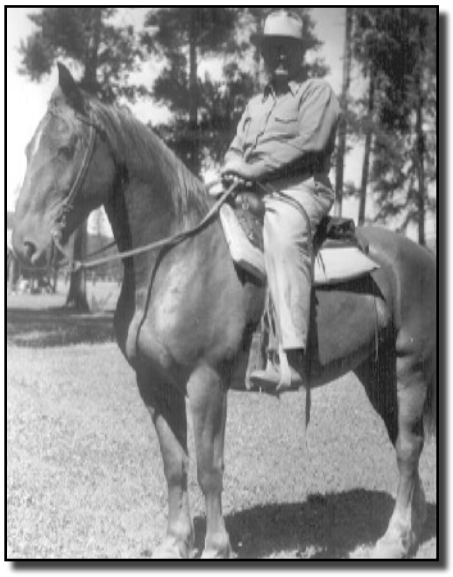
Other factors were involved in this unprecedented period of growth of Forest Service research funding, facilities, and personnel. One of those was Senator John Stennis of Mississippi. Stennis, chairman of the Senate appropriations committee,was a timberland owner and thus had an interest in forestry. He realized both the increasing importance of forestry to the economy of the South and the potential of research to advance the forest products industry. As chairman of the appropriations committee he had the political power to see that Forest Service research funding increased, and he used it.

Harper's Influence

Deputy Chief for Research Vern L. Harper was a major factor in the expansion of Forest Service research. Although some of his direction was controversial within the research organization, Harper responded to the heightened Congressional interest in research with a plan for expansion that was right for the times. The plan, calling for expanding research programs and building laboratories and other facilities as part of the Forest Service's *Program for the National Forests,* was submitted to Secretary of Agriculture Ezra Taft Benson. Benson was a staunch conservative, interested in reducing government programs, yet he backed several funding increases for Forest Service research (Hartzer 1981).

It never hurts to be a good host for your boss, and Benson's support of research may have been fostered somewhat by a lengthy summer vacation at Priest River planned and conducted by Station personnel. Priest River Superintendent James W. Hanover gave this account (Wellner 1976):

> The experimental forest had the unique and pleasant experience of being 'home' for Secretary of Agriculture Ezra Taft Benson and his family for six weeks during 1957. The distinguished guests occupied the Lodge from July 2 to August 13. Secretary Benson's summer at the forest enabled him to become familiar with Forest Service programs by means of extensive and local trips scheduled for him. The Secretary spent many hours relaxing and enjoying the station's scenery and facilities.



Secretary of Agriculture Ezra Taft Benson was ready for a ride on a horse loaned to him by Station personnel during a 6-week family vacation at Priest River in 1957 (Utah Historical Society collection).

Harper served on a committee with other USDA research administrators that produced a 1960 report, *An Evaluation of Agricultural Research*. It contained recommendations for changes in research direction and expansion within USDA. As part of these exercises, he prepared a list of suitable sites for Forest Service research laboratories, mostly located on university campuses, and gave it to Congress. The list became the basis for Congress, interested third parties, and the Forest Service to push a rapid expansion of programs and facilities. Forest Service research programs had doubled from 1954 to 1960 and doubled again by 1966, even using deflated

dollars. The latter period, especially, saw construction of many Forest Service laboratories (Storey 1975).

Yet another factor was the role Station Directors played in encouraging political support for increased funds and facilities. Federal employees are prohibited from lobbying, and as part of the executive branch of government they are obligated to support the President's budget proposal to Congress. But answering questions was not only permissible, but required when Members of Congress were making the inquiries. The Station Directors provided information about funding needs to Congress directly or through third parties. This proved to be an effective technique in encouraging Congress to increase the research funding above levels recommended in the President's budget proposal.

The research center concept, adopted beginning in 1946, was coming into serious question by the mid-1950s. Deficiences noted were some superficial research, some center leaders becoming too independent, and certain administrative tasks being duplicated unnecessarily at several places within a Station. Forest Service Research hired a consulting firm to examine the entire administrative structure. Among its many recommendations was one to continue the research center concept. Harper found that unacceptable. In a major decision, the Chief and Staff backed Harper, rejected the recommendation, and adopted instead a project-based system. Project Leaders emerged as the key people in accomplishing research objectives.

The project-based organizations allowed transfer of some administrative tasks to Station Headquarters and increased the depth of research. Also, geographic boundaries became less significant (Steen 1998). The adjustments took considerable time and were not greeted with enthusiasm by everyone.

Harper and his counterparts in the Agricultural Research Service and the Economic Research Service began to push for "man-in-the-job" peer review for the evaluation of scientist grades. This was an effort to evaluate scientists on the basis of their research accomplishments, rather than on their administrative responsibilities. The research grade evaluation guide that resulted treated Forest Service scientists more along the lines of university faculty than as traditional bureaucrats whose salary levels usually were based on organization size.

Before the Research Grade Evaluation System went into effect, the ability of a scientist to advance depended on willingness to transfer. Al Stage recalled being told when he was contemplating buying a home at Moscow that "you could figure on 3 to 5 years at one place and then you'd be moving on" (Stage 2003).

Stage said the only way a scientist could advance was by gaining broad experience, presumably through several transfers, and then moving into research administration. The broad experience could qualify a person to become a research center leader. From there, a move was possible to the Washington Office or to Station Headquarters as a Division Chief.

Stage said, "With the advent of the Research Grade Evaluation System you could advance in place. You could get more money for doing the things you really loved to do—better….What it did is give individuals a lot more control over their destiny. It gave the administration a lot less control over who was where."

Forestry Schools Grow

Relationships between the Forest Service and the university forestry schools were generally good at this time. The late '50s saw the start or expansion of natural resource research programs at many of the schools. The McIntire-Stennis Act provided federal funds for forestry research to the land grant universities based on a formula tied to the acreage of commercial forest land within their respective States. Formula funding of this sort tended to favor the schools in States with large forest acreages, and was not necessarily related to the research capability of the university. However, McIntire-Stennis funds were important for expanded research at the existing forestry schools, and for the initiation of research at a number of newly created forestry schools.

The expansion of natural resource research within both the Forest Service and the universities was greatly facilitated by passage of the Government Employees Training Act (GETA) in 1958. This act provided an opportunity to send researchers back to graduate schools for further graduate or post-doctoral training. It proved to be a major step in upgrading the scientific skills of the Forest Service research staff. Even before passage of the act, Harper had pushed advanced training to the extent that about 10 percent of the research staff was involved in graduate education. These numbers peaked at 20 percent in 1967, but fell to 5 percent in 1974 because nearly 75 percent of the professional research employees had advanced degrees by then (Storey 1975). Thirty percent of those taking graduate training in 1962 did so under GETA. By 1974, 97 percent were under GETA.

Research expansion was coincidental with that of other Forest Service programs, particularly those in the State and Private Forestry (S&PF) arena. Research administrators had some concern that the build up of S&PF programs and the interest in those programs at the Chief's level could make things difficult for research expansion. Some even thought funding for the S&PF programs could eventually exceed that for the National Forest System. While those situations did not come to pass, the concerns reflect the type of internal competition common in government agencies (Pechanec interview, 1993).

Station Growth, 1955-1971

The period of research expansion in the Forest Service was a period of unparalleled growth at the Intermountain Station as well. The growth included addition of major new facilities and the start of new research programs and expansion of others. By 1961, the Station's forest economics research program had been expanded to include a multiple-use economics unit and a small recreation unit. A unit in Missoula devoted to wildlife habitat research was organized in 1962.

The growth was not uniform, however. By the mid-1960s support for the traditionally strong range research program began to decline gradually, an early warning of the unit consolidations and reorganizations that became necessary in the 1970s.

In Missoula, a major development came in 1958 when Congress appropriated funds for the Northern Forest Fire Laboratory. It was to be one of three regional forest fire laboratories planned for the Forest Service (the others were at Riverside, California, and Macon, Georgia).

On the national scene, 1960 saw passage of the Multiple-Use Sustained-Yield Act. Its purpose was to formally state that the National Forests were to be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes. Other laws provided for the mining of government-owned minerals on National Forest land. The Multiple-Use Act, although aimed at the National Forests, had a major carry-over effect on the Forest Service's research program. It was an important event in the Forest Service's development of policy (Steen 1976).

The need for a clearer legislative basis for Forest Service management was never more apparent than in Region 4 when disputes erupted over managers' attempts to improve range conditions by reducing the number of sheep and cattle permitted to graze on National Forest lands. Some in the livestock industry disputed the decisions by asserting that the Forest Service had no legal right to manage the lands. Such claims seemed a bit farfetched to most people in later years, but they were very real matters to be dealt with before passage of the Multiple-Use Act.

Research Helps Win "Range Wars"

In the late 1950s and early 1960s Forest Service range managers in Region 4 moved aggressively to cut the numbers of sheep and cattle permitted on National Forest grazing allotments where overuse was damaging the vegetation and causing serious erosion problems, especially in streamside areas and canyon bottoms. Point men in the struggles that ensued were the District Rangers and Forest Supervisors who had direct dealings with the cattle and sheep ranchers. They had the unwavering backing of Regional Forester Floyd Iverson and his staff. Station researchers played a smaller, but significant, support role.

Bill Hurst was Chief of the Division of Range and Wildlife Management in Region 4 during most of the period (he later became Regional Forester for the Southwestern Region). His memoirs (Hurst 2000) provide a first-hand account of the so-called "range wars." Hurst said there were many problem areas throughout the four States in the Region. His recollections, however, mainly describe situations in Utah and Idaho.

Forest Supervisors made livestock reductions based on the situation in individual allotments, usually after a general announcement that adjustments were coming. A few were dramatic. Supervisor Clarence Thornock notified permittees in the Hobble Creek allotment of the Wasatch National Forest that their livestock numbers would be reduced 83 percent, adding to an already volatile range controversy in Utah. Twenty-percent reductions for Grantsville and Logan Canyon units caused opponents to assert that the Forest Service really didn't know the carrying capacity of the lands and was merely guessing. The livestock industry vigorously disputed the reductions.

The Governor of Utah entered the fray, prevailing on the Utah State University School of Forestry to study the units in question. Academics were divided. Some sided with the livestock industry. Walter Cottam of the University of Utah, however, commended the Forest Service actions in public letters and speeches. Cottam had conducted personal research at Station experimental areas (see Appendix A), and was knowledgeable about other Station research. *The Salt Lake Tribune* supported the Forest Service editorially. *The Deseret News*, owned by the Mormon Church, supported the ranchers.

According to Hurst, who was a Mormon, the conflicts had a deep philosophical basis. Many of the stockmen believed that the pioneer people, the Mormons in Utah in particular, had tamed and subdued the wild lands and

thus earned a moral right to dictate their use. They did not accept government intervention. The Forest Service position was that National Forests did not belong to any one interest group and the lands should be managed for the common good of the people of the United States.

The Hobble Creek case was fought bitterly in the appeal and political arenas for 3 years. The Forest Service won a decisive victory when Secretary of Agriculture Ezra Taft Benson, who probably was under pressure from his fellow Mormon Church leaders to rule otherwise, upheld the original decision. The Grantsville and Logan Canyon reductions were sustained when the permittees decided to withdraw their case before an Appeals Board could rule.

The "range war" period featured many meetings with stockmen, politicians, and academics by Forest Service managers and scientists who explained and defended the service's position. Hurst notes participation by Station scientist Selar Hutchings in several reviews of overuse situations. Station Director Reed Bailey hosted a meeting for Washington officials at Great Basin in 1958. Alexander (1987) includes a Station watershed specialist, Neil Frischknecht, in a list of expert witnesses who met with Mormon Church leaders in Salt Lake City in an attempt to convince them of the merits of the Forest Service position. To get background information, Hurst spent 5 days in 1959 reviewing alpine study plots with Weldon Shepherd, head of range research at the Station.

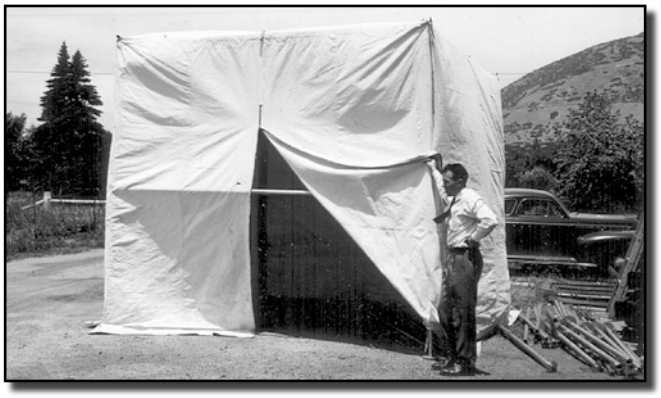
In the appeal of the Grantsville allotment reduction, lawyers for the permittees called in a number of experts; including John F. Valentine of the Extension Service, C. Wayne Cook, research professor in range management at Utah State, and L. A. Stoddard, head of the department of range management at Utah State. Regional Forester Iverson countered their arguments by citing research by Station Ecologist Linc Ellison, and the Forest Service ultimately prevailed (Alexander 1987). Regarding the total stock reduction program, Alexander states, "Research at the Intermountain Station and the introduction of more precise measures of condition and trend…provided the data the Service needed to inaugurate the tougher corrective measures required."

Shepherd journeyed to the University of Idaho with Hurst and others to explain the Forest Service position regarding grazing reductions. The Deans of the schools of Forestry and Agriculture decided to stay neutral in the

Meeting the Challenges

Region 4 managers acknowledged "excellent studies" by Paul Packer that helped them prevail in controversies over range allotments in central Idaho in the late 1950s. It was not the last time Packer generated research results to help meet the challenge of public controversies.

In a long career at the Station, Packer recorded important accomplishments in developing watershed protection measures for range lands, establishing criteria for locating and designing logging roads to prevent stream sedimentation, and testing and applying techniques to reclaim mined areas. He worked at Great Basin, Boise, Missoula, and Logan from 1939 until he retired in 1980.



Station Watershed Scientist Paul Packer provided information that helped the Forest Service prevail in controversies over reducing grazing in the Idaho Batholith. Here, Packer checked infiltrometer equipment used to simulate rainfall in hydrologic studies at Wood Tick Creek in the Boise National Forest in 1947.

Sedimentation from forest road building in the fragile Boise Basin was a major concern and similar concerns later emerged in Region 1 National Forests. Packer brought science to bear on problems in both areas as Project Leader of watershed management research units at Boise from 1951 through 1955 and and then at Missoula until 1962. He published several articles on sedimentation in the Boise Basin and in 1964 wrote a handbook, *Guides for Controlling Sediment from Secondary Logging Roads*, which was published jointly by the Station and Region 1. The manual was in a notebook format so it could be carried easily in a Forest Service uniform pocket.

Assistant Regional Forester Gordon Watts said, "Paul E. Packer of the Intermountain Station produced some particularly valuable recommendations for road construction on granitic soils. These recommendations were published and given broad distribution to Region 4 foresters and engineers, who put them to use on the ground" (Alexander 1987).

Packer moved to Logan to lead watershed research, and in 1971 unit members developed a comprehensive proposal for a West-wide research program on rehabilitating surface-mined land (*INTercom* 3/25/76). It became a cornerstone of the Forest Service's Surface Environment and Mining Program (See "Special Programs Bring Special Problems and Achievements," chapter 11).

At Logan, Packer also functioned as a professor in the College of Natural Resources at Utah State University. He lectured, conducted seminars, and participated in teaching short courses for Federal and State agency personnel. Packer had been an Air Force pilot during World War II, and piloted his own plane for many years, including on some Station business trips (*INTercom* 3/25/76).

conflicts occurring in Idaho, although some individual faculty members backed the stockmen.

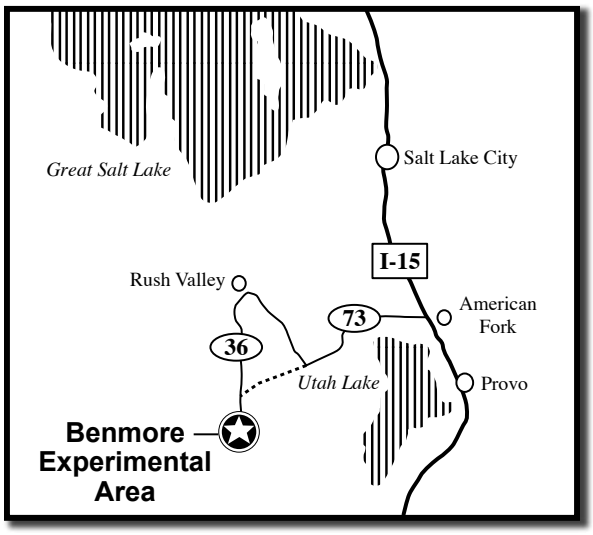
Sheep men using allotments in the Idaho Batholith were concerned because research there showed the soils could not stand the impact of grazing in many areas. Even those who admitted damage was unacceptable thought the Forest Service reductions were too severe. In a meeting of a public land committee in Boise, Hurst was taken to task by an agronomist for "trying to destroy one of Idaho's great industries." Hurst said, "I held firm and had the benefit of excellent studies by Paul Packer of the Intermountain Forest and Range Experiment Station and those of Tom Phillips, range scientist on the Sawtooth, to back me up."

Hurst believed that many desirable results followed the conflicts in Utah and Idaho in addition to gains in condition of the land. The greatest, he thought, was the mutual respect achieved between the livestock permittees and the Forest Service. He also cited as a benefit an atmosphere of cooperation that developed between Utah State University, the Extension Service, and the Forest Service. An example given was the start of a study in Logan Canyon by Utah State and the Station to address range suitability standards that had been disputed during the "wars." Suitability standards had been one of the fundamental technical questions during the period of greatest conflict.

At the annual convention of the National Cattle Growers in Salt Lake City in 1962, a delegation from Arizona questioned the reliability and defensibility of the range suitability standards used by Region 4. According to Hurst, Arthur Findley, a Hobble Creek permittee, responded with something like, "If you don't believe these Forest Service boys can defend their suitability standards, just get yourself $10,000 and go to court with them." Findley and his associates had been there.

The Beef Was at Benmore

Research at the Benmore Experimental Area near Vernon in north-central Utah was a prime example of the kind of cooperation between the Forest Service and Utah State University that Bill Hurst saw as a beneficial outcome of the controversies over range management of the late 1950s and early 1960s.



Benmore was a 3,200-acre parcel in a 45,000-acre tract of land acquired by the Federal Government in 1935 as part of the Central Utah Dryland Adjustment Project. Many such acquisitions were made in the Dust Bowl days of the Depression in attempts to return to productive use lands that proved unsuitable for crop agriculture and were abandoned. Benmore was earmarked as a research area from the start, although it never received an official designation as an experimental range. Studies were conducted there through several agreements between the research and management organizations.

The range was fenced and seeded to improved grasses during the late 1930s. A series of attempts at dryland wheat farming had failed and the land was in poor condition. Dense brush stands occupied considerable acreage. It was a good place for research on how to convert abused land to productive spring-fall range. Nearby ranchers cooperated with Station and Utah State researchers in many studies.

Management varied over the years. The area was first under the jurisdiction of the Soil Conservation Service, and the Station established some research there in cooperation with SCS. In 1940 research got under way formally through a cooperative agreement between SCS, the Forest Service, the Utah Agricultural Experiment Station, and the Bureau of Plant Industry. In 1954, the entire area was made part of the Wasatch National Forest. The Station assumed management responsibility for the research program and some of the maintenance at Benmore and it kept that role until the 1970s, when administration was turned over to the Uintah National Forest. Utah State continued to use the area for a livestock breeding study after the Station ended its research work there.

Although some research at Benmore involved sheep, the emphasis was on cattle. One of the more intriguing studies, however, focused on sheep. A common way thought to improve

Stockmen from the Benmore area worked with Station and Utah State researchers in checking and weighing cattle.

rangeland at the time was to remove big sagebrush and replace it by seeding the area to grow crested wheatgrass. However, the wheatgrass stands were very vulnerable to reinvasion by sagebrush. Unless control measures were maintained, the brush became dominant and conditions soon returned to what they had been.

A 6-year study at Benmore showed that if the sagebrush density could be kept low, the seeded grass would continue to do well. Sheep maintained their weight in areas where sagebrush density was light, but lost weight where the brush was dominant. If sheep were put on the range in late fall before reinvading sagebrush became too dense, they did an excellent control job. Cattle failed completely to control the sagebrush. This resulted in a recommendation that cattle ranchers might maintain range in good condition if they used sheep as "brush controllers" (*Forestry Research West* Feb./75).

Many Station scientists conducted research at Benmore. The early scientists sometimes stayed there, although the headquarters consisted of an old farmhouse and several dilapidated outbuildings. Range Scientist Neil Frischknecht, whose career at the Station spanned 34 years, became closely associated with the work there. So did Utah State University researchers. The university personnel established permanent study plots in part of the Benmore area. The principal author of the report summarizing 40 years of research results at Benmore was a Utah State graduate student. Frischknecht was the co-author, and the Station published the document (Astroth and Frischknecht 1984). The cooperators, including extension workers and Wasatch Forest staff, sponsored field days and training sessions at Benmore. Tours for range management students at Utah State made the site a regular stop.

Frischknecht was the senior author of 14 publications covering a wide range of research results at Benmore, and he collaborated with others on many more reports. He was said to have loved the place and he resisted being transferred to other projects where his talents were needed, even after he had solved the major problems assigned to him at Benmore (Blaisdell 1989). He did leave for a few years to conduct mined land reclamation research, but couldn't stay away. Frischknecht returned to Benmore as a volunteer after he retired to work on several projects in cooperation with Utah State. His retirement "hobby" was producing seed from improved plants on private land he owned at Vernon.

Range Scientist Neil Frischknecht determined cattle weight gains at Benmore in 1962 in one of his many studies at the experimental area in Tooele County.

Frischknecht was a charter member of the Society for Range Management and an ardent supporter of the organization. He was named a fellow of the society in 1986. He was serving as newsletter editor for the Utah Section when he died at 71.

Developing the scientific basis for rehabilitation and management of abused dry rangelands, such as those at Benmore, was no simple matter. Preferred grasses and forbs had declined and shrubs increased beyond acceptable levels. Early experiences at Benmore and elsewhere showed that perennial grasses seeded into dense stands of sagebrush or cheatgrass failed to become established. The condition of the soil at seeding was critical, and this depended to a considerble extent on how and when the brush was removed.

Scientists at Benmore found answers to rehabilitation and management problems through a variety of studies of the vegetation, animals, and management systems. The results were documented in some 80 publications. The recommendations included:

- Guidelines for deciding which lands to treat, what equipment to use in various situations, whether burning should be an alternative, and how long livestock should be kept off the area after treatment to allow new vegetation to establish.
- Recommendations of the best methods of seeding, preferred grass species, and rates, times, and planting depths applicable to most areas in ecosystems similar to Benmore. The scientists recognized that no single approach would work in all areas, and much of the research pointed out variances from the recommendations that applied on rangelands with varying climate, soil, topographic features and vegetative competition.
- Guidelines for managing the seeded rangelands, with emphasis on the spring season most important to livestock that often came off winter ranges in fair or poor condition. A rotational grazing system was recommended, and the recommendations even included advice on when to sell livestock.
- Ways to control reinvasion of the rehabilitated rangelands by undesirable vegetation.
- Recommendations for conducting rehabilitation work to minimize negative impacts on bird populations.
- Guidelines on how to defer grazing to combat poisonous plants.

The Station ended its research activities at Benmore in a final cooperative agreement with Utah State. It resulted in the Astroth-Frischknecht publication summarizing results of 44 of years of studies. The last product stemming from the agreement was a self-guided auto tour brochure issued by the Cooperative Extension Service of Utah State. Printed in 1986, the guide was made available to range management and botany classes at Utah State and Brigham Young University, vocational-agricultural

students in high schools near Benmore, the Farm Bureau, and the Cattlemen's Association.

Although Station research was suspended, the message from Benmore explaining the benefits of sound range management and suggesting ways it could be achieved continued to go out.

Sediment Spells Trouble for Salmon

Serious concerns about management and use of areas with granitic soils in Idaho developed in the late 1920s as a result of reservoir sedimentation and damage to stream environments in the Boise and Payette River drainages. These concerns caused Great Basin Experiment Station scientists to begin studies in the drainages in 1928, shortly before the organization was renamed the Intermountain Station.

The river drainages are within the Idaho Batholith, a huge area that makes up almost one-fifth of the total land area of Idaho and extends into Montana and northeastern Washington. The main core area in central Idaho includes about 16,000 square miles, making it nearly the size of West Virginia. It spans parts of six National Forests. The climate can be very dry in summer and very cold in winter. Much of the batholith features steep slopes and granitic rock covered by shallow soil prone to slide, wash, or blow away when disturbances strip away the vegetation (*Forestry Research West* Feb./75).

Livestock grazing and mining were the major disturbances caused by humans before 1940 (Seyedbagheri and others 1987). The pioneering Station research helped Forest Service managers justify tighter controls over grazing. Some areas, particularly in the Boise and Payette National Forests, were completely withdrawn from management activities that had been demonstrated to cause severe erosion and sediment production. Over a period of years, the numbers of sheep and cattle permitted to graze were reduced considerably in other areas (see "Research Helps Win 'Range Wars,'" this chapter). Mining activities, which were responsible for

In much of the Idaho Batholith the granitic rock fractures and soil erodes if the thin protective vegetation mantle is removed.

significant deposits of sediment and chemicals into the stream systems, declined gradually as ore deposits played out and prices for some metals declined, although rehabilitation in many areas was still needed decades later.

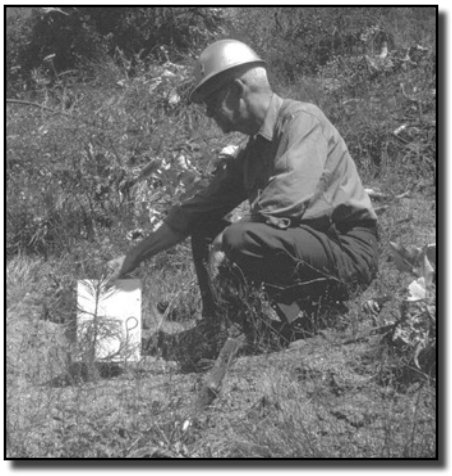
As happened throughout the West, timber harvesting and associated road building in National Forests expanded rapidly after World War II and these activities created a whole new round of concerns about erosion on the fragile lands. Key areas were drainages of the Clearwater River in Region 1 and the South Fork of the Salmon River in Region 4, with the latter getting the most attention. The South Fork system supported populations of resident fish, such as trout and char, and anadromous salmon and steelhead. Historically, the South Fork and its tributaries hosted Idaho's largest population of summer chinook salmon. Populations that started to decline in the 1950s were in serious trouble later. The number of adult chinooks returning from the ocean to their spawning areas was estimated at about 10,000 in the mid-1950s. The estimate in 1979 was only 250 fish (Seyedbagheri and others 1987).

Downstream influences of commercial and sport fishing and the presence of eight mainstream hydroelectyric dams on the Columbia and Snake Rivers certainly contributed to anadromous fish population declines. But degradation of upriver spawning areas due primarily to new road networks required by loggers was a contributing factor. Questions about timber harvesting programs and practices within the batholith began to be raised within and outside the Forest Service.

The Station and Region 4 responded to the concerns in a small way in 1958 by establishing the Zena Creek watershed study in the Payette National Forest. The early work was led by Ned Bethlahmy, watershed research unit Project Leader, and Research Engineer Rulon Gardner. Jim Curtis, Project Leader of the silviculture unit at Boise, planned studies to determine the limitations of hand-planting seedlings in areas with shallow soils that were too steep for machine planting. Joe Kidd, a hydrologist in the watershed unit, participated in the early studies.

The first studies were at Deep Creek, a sub-drainage of Zena Creek that had a series of small basins to catch sediment. Zena Creek is a tributary of the Secesh River, which flows into the South Fork of the Salmon River. Tailholt and Circle End creeks flow directly into the South Fork. Instruments were installed in Circle End and Tailholt Creeks to measure changes in streamflow and sediment production resulting from logging and roading (Craddock 1967). Circle End Creek was to be the undisturbed control. Much later, in 1996, most of the Circle Creek drainage (1,464 acres) was designated a Research Natural Area.

Payette Forest personnel prepared a large, long-term timber sale that included several roads in the Tailholt drainage. The sale called for various types of cuttings and using jammer and skyline logging equipment as specifed by the Station engineers. Previous Station research on effects of logging



Project Leader Jim Curtis checked the health of a planted ponderosa pine seedling at Zena Creek in 1965.

in the batholith had been confined to tractor skidding operations and single- and group-selection cutting on relatively gently slopes in the Boise Basin Experimental Forest. The jammer yarding system required roads spaced at about 200-yard intervals along steep slopes.

Craddock (1967) concluded later that (1) the logging system used in Zena Creek was not an ultimate answer for timber harvesting in the batholith; (2) some steep areas could be logged economically without watershed damage if the work was done carefully; and (3) some parts of the batholith were too fragile to be logged unless an aerial system could be devised to yard logs long distances without building roads.

Unfortunately, findings from Zena Creek came too late to avoid major problems. In 1962, Harold Haupt was the watershed unit Project Leader in Boise. He said:

> The Payette National Forest had been logging in the South Fork for some time and red flags were showing up. A disaster was in the making. In 1962, an intense rainstorm swept in off the Pacific Ocean and deluged the South Fork. Erosion damage was so extensive that sections of roads were swept away…Our watershed project had installed a great number of small runoff plots on logging roads upon which we were testing a variety of restabilization techniques. These plots for the most part did not stand up under the fury of the storm. The next year (1963) we would reassess our entire effort in the South Fork (Haupt, personal communication).

The research reassessment resulted in many changes in the program at Zena Creek. When the timber sale was completed, Payette Forest personnel evaluated the total watershed and related conditions using a Channel Condition Classification Guide developed by Walt Megahan, Regional Hydrologist at the time, and data on sedimentation supplied by Kidd. In rethinking the program, Station administrators concluded that Zena Creek was only one small site in the larger problem area. Although data continued to be collected there for nearly 20 years, the program was expanded rapidly in other areas.

The Silver Creek Experimental Area created by the Station and Boise National Forest in 1961 was a key to considering the larger problem. The 2,300-acre study site along a tributary of the Middle Fork of the Payette River was representative of much of the range of conditions found in the Idaho Batholith. Research data collected there ultimately provided a storehouse of information unparalleled anywhere else in the batholith. The research considered much more than erosion. Station scientists designed studies to learn how logging and attendant road construction affected cycling of soil nutrients, wildlife (including birds and small mammals), reforestation, streamflow and water chemistry, patterns of vegetative succession, and many other facets of forest communities (Noble 1980).

Field studies at Silver Creek were conducted on eight small, unlogged watersheds. Access roads were built in three watersheds. In one, accepted practices to minimize erosion and sedimentation were used. In the other two, newer, more progressive measures were used to reduce erosion. The first logging was done in 1976. Eventually, helicopter, skyline, and tractor logging systems were used and evaluated. Balloon logging was tried nearby from 1971 through 1973 along the Middle Fork of the Payette River as a cooperative venture by the Station, Boise National Forest, and Boise-Cascade Corporation. Results were reported in publications by Station and National Forest personnel (*Forestry Research West* Aug. /74). Some studies at Silver Creek ran through the 1980s. For example, in 1989 Research Forester Kathy Geier-Hayes published a report on vegetation responses to helicopter logging and broadcast burning.

In 1964 and 1965 extreme natural events triggered an erosion and sedimentation disaster for fish habitat in the South Fork Salmon River. Heavy rains on snow caused massive amounts of sediment to move into the streams. As sediment production reached its peak historical level (162 percent of normal), anadromous fish production decreased to its lowest level, 20 percent of potential (Seyedbagheri and others 1987).

In 1965, Region 4 imposed a moratorium on logging and road construction on nearly 350,000 acres in the South Fork drainage, an area where a dense road network had been built to support an average annual timber harvest of 16 million board feet. The area contained the majority of the spawning and rearing habitat used by anadromous fish in the South Fork system. The Region also started a watershed rehabilitation program and established a special study team located in Boise. The Station increased funding for its Boise research unit and stepped up work at Silver Creek and other smaller sites in the batholith.

The storms caused a significant number of landslides at Zena Creek. Gonsior and Gardner summarized results of a number of studies of road failures due to the slides and wrote a Station paper in 1971 that documented 11 recommendations they made to engineers and managers for future logging road construction they thought would minimize erosion. An evaluation also was made on the China Glenn Road in the Payette National Forest, which was constructed in 1970 to provide access to a salvage timber sale. It was the first road built since the 1965 moratorium and a major goal was to verify principles intended to minimize erosion problems.

Although no hard data were available, Gardner said "there is strong evidence that the effort to minimize environmental and esthetic impact produced good results." He, Research Engineer Bill Hartsog, and Forest Planning Engineer Kelly Dye wrote

a Station publication, *Road Design Guidelines for the Idaho Batholith Based on the China Glenn Road Study*, which presented eight principles the authors said "will usually produce good results for reducing road impacts in the batholith and elsewhere."

In a nutshell, the inability to define in concrete terms the impacts of logging and associated road building was the problem requiring research in the Idaho Batholith. Walt Megahan, who became the watershed unit Project Leader in Boise in 1967, said, "It has been impossible to accurately predict the onsite and offsite effects of the environmental consequences, posing a crucial problem for the land manager. He is unable to define limitations to use, if and how management practices might be applied, and possible tradeoffs in the various uses and values, even though he is required to do so for environmental analysis reports." Station scientists set about solving the quantification problem, and they were remarkably successful.

In 1972, Megahan and Kidd analyzed 6 years of data from the Zena Creek logging study and concluded that skidding logs with tractors or by skyline or jammer systems was a relatively minor cause of sedimentation. The culprit was the road system, which increased sediment production an average of 750 times over the natural rate for the 6-year period following construction. Reporting in the *Journal of Forestry*, the scientists recommended keeping road building to a minimum and avoiding erosion-prone areas. They followed up with a Station publication, *Effect of Logging Roads on Sediment Production Rates in the Idaho Batholith*, which explored in greater detail the relationship between roadbuilding and erosion (*Forestry Research West* Feb./75).

Megahan worked on many aspects of erosion in the batholith during his first few years in Boise, but he was best known for his model on time trends in erosion on disturbed slopes. Published by the Station in 1974, *Erosion Over Time on Severely Disturbed Granitic Soils: A Model*, was still widely used in the 1990s (Clayton 1991).

Megahan's later research, including many studies at Silver Creek, expanded to deal with slope hydrology, subsurface flow, and sediment transport in streams. His reputation grew, and he was widely sought out in the national and international watershed science communities (Clayton 1991). Nevertheless, Megahan never forgot the needs of resource managers. In 1977, he published tables of geometry for low-standard roads, which could be used in situations where limited budgets precluded detailed engineering design or where engineering talents were unavailable. Using the tables, a designer could estimate the extent of slope alteration before road construction and evaluate potential watershed impacts (*Forestry Research West* Apr. /77).

The National Wildlife Federation honored Megahan in 1969 as "Forest Conservationist of the Year" for the State of Idaho. In 1988, he received a USDA Superior Service Award and the first Forest Service Chief's Stewardship Award. The Stewardship Award cited his "exceptional job of working with staff and line officials to translate scientific principles and research findings into usable guides for 'on-the-ground' application" (*INTercom* 2/16/89).

Project Leader Walt Megahan received an award in 1989 from Forest Service Chief Dale Robertson for his research in the Idaho Batholith that led to improved road building practices. Megahan was nominated for the honor by two Regional Foresters in addition to Station Director Larry Lassen.

Soil Scientist Jim Clayton joined the Boise unit in 1967, as the work on quantifying factors in erosion and sedimentation was getting into full swing. A cooperative study between Station scientists and Delon Hampton of Howard University was under way to identify basic physical, chemical, and hydrological properties of both soil and bedrock. From early data, Clayton and John Arnold, Batholith Liaison Officer for Region 4, developed a method for classifying the weathering and fracturing properties of granitic rocks. The technique, documented in a Station publication in 1972, helped identify areas where massive landslides might occur after roadbuilding or logging (*Forestry Research West* Feb. /75).

Clayton conducted studies of soil and bedrock properties and how they were altered by weathering in a variety of areas throughout the Idaho Batholith. He also published reports on soil development and nutrient cycling in forest ecosystems in the batholith, and the consequences of timber harvest, accelerated erosion, and fire on nutrients.

A Batholith Steering Committee set up in 1967 by the Station and Regions 1 and 4 had identified research needs, including the work conducted by Megahan, Clayton, and others. The committee said studies to improve knowledge of the requirements of anadromous fish for food, spawning and resting areas, and the effects of "granitic" sediments on them were "urgently needed." They pointed out that this work would require developing strong cooperation with the Idaho Fish and Game Department, and

Soil Scientist Jim Clayton developed methods to classify key properties of granitic rocks in research conducted at the Boise Lab in the early 1970s.

that it called for the skills of a hydrologist and a fisheries specialist (Intermountain Forest and Range Experiment Station 1968). Megahan was the hydrologist, Bill Platts became the fisheries specialist when he moved to the Station in 1977 after 10 years as the Idaho Zone Fisheries Biologist for Region 4, including work with the South Fork watershed rehabilitation team. Platts previously had worked for the Idaho Fish and Game Department, and he had close ties with personnel there.

Platts had conducted considerable research on anadromous fish habitat before he joined the Boise unit. From 1967 through 1974 he wrote eight reports on results of habitat surveys and evaluations of sediment levels, movement, and damages in the South Fork. Survey data were gathered from 325 randomly selected sites in the river, 90 spawning areas, and numerous core samples of the river bottom. The work covered chinook salmon, steelhead, and other species (Seyedbagheri and others 1987).

After joining the Station, Platts authored or co-authored seven reports, papers, and publications covering sampling techniques, additional habitat surveys, effects of sediments, and invasive fish species in the South Fork and tributary streams. The addition of Platts and other fishery biologists to the staff at Boise was the start of a blending of the talents of biologists and watershed researchers that ultimately resulted in a single research unit directing its efforts to solving problems over large geographic areas (see, "Aquatic Science Moves into the Mainstream," chapter 11).

Just as Silver Creek had become the primary research-administrative site for watershed work in Region 4, Horse Creek within the Nez Perce National Forest became a major area for watershed studies in Region 1. In 1984, after a tour by representatives of both Regions, the Station, and the Washington Office, a joint steering committee was formed to guide research at both areas. The goal of the arrangement was to apply results from studies at both locations to help the Regions strengthen forest planning and management of similar lands.

Hydrologist Jack King was a Station representative on the tour. He was well-acquainted with the research at Horse Creek. He had joined the Station in 1979 as a research hydrologist stationed at Moscow after serving as an Associate Professor at the University of Idaho. King's research concentrated on developing and testing models to predict steamflow and sediment responses in Northern Rocky Mountain streams to logging and road construction. In what was a novel approach to technology transfer at the time, he presented road construction guidelines to managers in a video tape produced in 1986 (see "Publishing Firsts," chapter 11). King transferred to Boise in 1988 and, when Megahan retired in 1991, became Project Leader of what had become the Soil and Water Management research unit (*INTercom* Mar. /91).

By that time, every National Forest with lands in and near the Idaho Batholith was using guidelines based on research by Station scientists (King 1989). Although all involved realized that many refinements were needed, major advances had been made in gaining knowledge to maintain or improve fragile fish habitats.

In 1991, Hydrologist Carolyn Bohn and Megahan reported on conditions in the South Fork at a nonpoint source water quality monitoring workshop in Boise. They said results of remeasurements at study sites established 24 years earlier "demonstrated that a large amount of sediment, primarily sand-size, has moved out of the study area. The decrease in the volume of stored sediment suggests that the sources of sediment have stabilized to some degree, and that stream power has been sufficient to transport sediment out of the study area at a greater rate than new sediment has been supplied."

Watershed Work Changes Course in the North

Although early research at Priest River focused on silvicultural and fire studies, some of the work in those areas contributed to the "forest influences" investigations that came to be known as watershed research. Over the years, valuable climatic and streamflow records accumulated for the experimental forest.

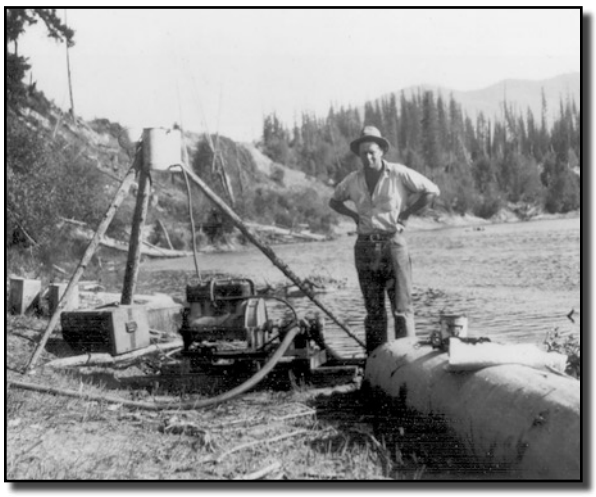
A disastrous Columbia River flood in 1948 caused the Northern Rocky Mountain Station to establish a new Division of Flood Control Surveys. Austin Helmers moved to Priest River in November and he and several assistants worked around the clock to establish a network of weather stations and snow courses before winter set in. The snow studies program came to a sudden end in 1952 when funds for flood control surveys were seriously curtailed. Data from the Priest River studies were analyzed and results were reported by Paul Packer after the Northern Rocky Mountain and Intermountain Stations merged.

Another emergency project was assigned to Helmers after the snow studies ended. It was an extension of contract research the Forest Service was conducting for the U.S. Army Corps of Engineers' Waterways Experiment Station at Vicksburg, Mississippi, on soil infiltration as a means to estimate the ability of Army vehicles to travel over terrain where muddy conditions made the going difficult. Scientists made studies at Priest River for a year before the emphasis shifted to soils in an area south of Spokane. The study ended in 1954 (Wellner 1968).

Streamflow records were maintained for Benton Creek starting in 1938 and they and the 1948-52 snow study data provided a start for making it a model watershed. Harold Haupt transferred to the Moscow Lab in 1963 to start a new watershed management research program. He began basic studies at Benton Creek the next year with the goal of understanding the hydrology of a densely forested watershed with relatively stable soils.

A network of stations—climatic, snow, soil, streamflow, and sediment—was established over the watershed to obtain data on factors affecting the hydrologic cycle. By 1968 there were 13 different stations with a total of 58 instruments. Measurements provided a data base for understanding the hydrology of Benton Creek and a framework for cooperative studies (Wellner 1968).

Haupt interested scientists at Washington State University and the University of Idaho in doing cooperative work involving several studies conducted over the next 10 years. During



A "Pacific Pump" was used in 1938 at Benton Creek to provide water to control an experimental broadcast burn in studies of slash disposal. The Benton Creek drainage later was instrumented to make it a model watershed. (Gisborne collection, 98(vii): 662)

that time, national events caused a rapid change in the watershed program. Haupt (personal communication) said the environmental movement created increased emphasis on water quality in land management. The new Environmental Protection Agency made a large grant to the Station to study the quality of water flowing from National Forest lands, and the Moscow project got a chunk of it.

The project hired chemist Gordon Snyder, who had a master's degree in watershed science, to conduct analyses. A camper was converted into a mobile chemistry lab and mounted on a Station truck. Much of the work was summarized in a 1975 Station publication, *Clearcutting and Burning Slash Alter Quality of Stream Water in Northern Idaho*, by Snyder, Haupt, and George Belt, an associate professor of forestry at the University of Idaho.

The focus of watershed research in northern Idaho shifted to Horse Creek to deal with problems involving logging in the Selway and Clearwater River systems, which included anadromous fisheries. By 1978 most of the work by Station scientists at Priest River had ended, although cooperative studies continued.

The Horse Creek administrative-research site was a cooperative venture of the Station, Nez Perce National Forest, and the University of Idaho where the research emphasis was on effects of building logging roads. It included a Main Fork basin where monitoring instruments were installed in 15 small watersheds. Roads were built to various standards in 11 of the watersheds. Clearcut logging in relatively small patches and tractor and skyline logging were specified in several sales arranged by National Forest personnel (King 1989). As at Silver Creek, research results were produced at Horse Creek for many years.

Bud Jeffers, dubbed "Mr. Horse Creek" by coworkers for his dedication to the research there, serviced a precipitation gauge at the study site.

The Fire Lab Fires Up

The Northern Forest Fire Laboratory was dedicated in ceremonies on September 12, 1960, by Forest Service Chief Richard McArdle. The main building housed offices and several small laboratories, plus two wind tunnels. A unique feature was the world's largest controlled-environment combustion chamber used in forest fire research. It was a 120,000-cubic-foot chamber where burning experiments could be conducted under controlled temperature, humidity, and wind conditions.

The lab's location at Johnson-Bell airport adjacent to the Forest Service's Aerial Fire Depot promoted interaction with fire fighting personnel and the use of aircraft in experiments. The personal interactions were a strong feature of the program that benefited both research and management. The scientists did some very fundamental fire science research, yet they also produced applied research that could be integrated into management planning, and they often developed innovative approaches to transfer the knowledge they generated. Many served as trainers in fire management courses, and this personal contact made them part of the "fire community."

Over the years, research at the fire lab formed the basis for technology used throughout the Station territory, the United States, and often the world. Some of the major developments were:

- Infrared aerial scanning that detects and photographs wildland fires at night or through heavy smoke cover.

In the 66-foot-high combustion chamber at the Fire Lab, temperature, relative humidity, and atmospheric pressure could be controlled and regulated for experiments such as this one in the early 1960s when researchers were measuring the spread and intensity of a model fire.

The Fire Lab's location had several advantages, including an opportunity for high-tech cooperative work with the U.S. Weather Bureau. The bureau's Point Six Radar Station, located on an 8,000-foot peak near the Missoula airport, transmitted signals via microwave to the airport and from there via coaxial cable to monitoring scopes in the Fire Lab.

- Effective chemical fire retardants and specialized aerial delivery systems.
- The National Fire Danger Rating System that measures and describes daily fire danger.
- A fire behavior prediction system used for fire management planning by predicting how different types of fires are likely to develop.
- Prescribed burning guidelines tailored to a wide variety of habitat and fuel conditions.
- Basic inventories of fuel quantities and methods to predict them under various management systems.
- Detection systems for lightning and meteorology aids to facilitate understanding of fire-weather relations.
- Chemical detection and analysis techniques to identify components of fire emissions from various fuels and to define their effects.

The first full year of operation for the Northern Forest Fire Laboratory in Missoula was 1961. Studies of fire behavior and fire physics and engineering were under way, but the lab was far from being adequately staffed with the proper mix of scientific and engineering skills. Before the Lab was dedicated, the employment roster showed 15 regular personnel in fire research, including clerical staff. Only three scientific disciplines were represented. This was not the type of staffing Lab Chief Jack Barrows needed if the organization was to develop a fire research program that would be "helping to bring the full strength of modern science to American forests" (Barrows 1963).

Shortly after the Lab opened, Barrows' personnel list had expanded to 27 positions. Seven jobs had been filled by new appointees, and six were waiting to be filled. A physicist, mathematician, two engineers, and several technicians specializing in electronics and instrumentation had been added to the skills mix. Barrows knew the right place to go to fill key vacancies—the Idaho National Engineering Laboratory (INEL) operated by General Electric Corporation near Idaho Falls. Fortunately for him, the INEL was a fertile source of talent because a number of scientists and engineers were being laid off with cancellation of the government's nuclear-powered aircraft program.

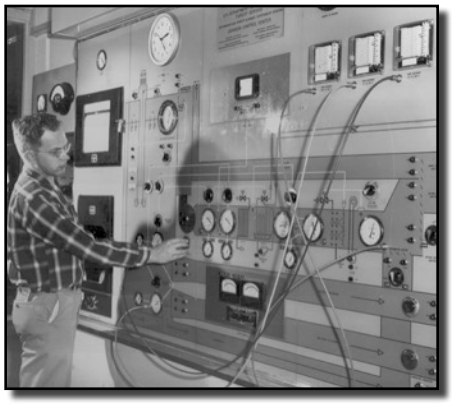
Barrows succeeded in hiring Hal Anderson, Stan Hirsch, and Dick Rothermel. All three proved to be leaders at the Fire Lab and in Forest Service wildland fire research for years to come. Two INEL technicians arrived to bolster the staff. The first was Erwin Breuer. The second was Electronics Technician Merlin Brown, who moved from INEL to Los Alamos and then to the Fire Lab.

Anderson was a physicist whose work for General Electric was on thermal and nuclear instrumentation. He served as Project Leader for fire physics research at the Fire Lab from 1962 to 1966 and of the fuel science unit from 1966 to 1979. He then became team leader of the basic research section in the fire behavior unit concerned with fundamentals and system development. Anderson made many contributions to the understanding of basic mechanisms of how fire spreads throughout his career at the Station. His Station publication documenting extreme fire behavior in the 1967 Sundance Fire, was a landmark report still in demand more than 20 years after it was published (*INTercom* 5/24/90).

Hirsch, an electrical engineer, started working on fire detection using infrared equipment (see "Seeing in the Dark," this chapter). The adaptation of infrared techniques to forest fire detection and mapping was one of the most useful and beneficial pieces of research done at the Fire Lab. Rothermel was an aeronautical engineer who had an outstanding 33-year career at the lab. His successes in developing models and methods for predicting fire behavior and getting the

Dedication of the Northern Forest Fire Laboratory in Missoula in 1960 fulfilled a dream of Harry Gisborne, Jack Barrows, and others of getting a first-class facility for wildland fire research.

The Fire Lab was just the type of facility Jack Barrows wanted to bring modern science to bear on fire management problems.



Physicist Hal Anderson made adjustments at the Fire Lab's control center in 1962. The functions of this impressive array of controls eventually were replaced by the keyboard at a single computer terminal.

results applied brought him international recognition (see next section).

Barrows and his restructured Fire Lab staff set about using advanced technology in a research program designed to elevate effective and efficient wildland fire control to levels that would have pleased even the perfectionist Gisborne. Although Barrows was said by some to be concerned only with control, research on the use of fire to improve forest conditions was part of the program. In the years ahead, it was to become a more important part.

The Good Old Days?

The Fire Lab had a modern design and included a lot of high-tech equipment when it opened, but what was considered "modern" in 1960 might provoke a few chuckles 40 years later.

Bobbie Bartlette started working at the Lab in 1968. In 2005, she said of the early days, "We measured fire spread rates with string and stop watches and did calculations on huge calculators with banks of number keys. It is astounding, thinking back, at how far we have come."

Bobbie Bartlette readied samples of fuels for analytical testing to determine their chemical properties at the Fire Lab in 1969. She started as a technician and moved up to a professional job at the Lab.

As it did elsewhere within the Station, the culture at the Lab changed over the years as dramatically as did equipment and procedures. Bartlette recalled that when she first was employed all the women were required to wear dresses and most of the men wore ties. She was a short lady whose job caused her to climb up on chairs and counters to reach the tops of some of the equipment she used for fuel chemistry and heat content tests. Dresses were worn above the knee at the time, Bartlette was 18 years old, and she felt uncomfortable climbing up to operate the equipment when nearly everyone in the room was a man.

Bartlette asked for permission to wear "nice pants suits" at work. She got approval, but only on days when her work involved climbing! She was told if there were any complaints at all, she would have to return to wearing dresses. She was offered a longer lab coat (Bartlette, personal communication).

Rothermel Had the Right Formula

Dick Rothermel had a talent for systems analysis and problem solving. His research at the Fire Lab into the mechanisms of fire spread resulted in the model that became the cornerstone for fire behavior and rating systems used by managers world-wide.

Having a model carry your name, as "Rothermel's Fire Spread Model" did from the time it appeared in 1972, is a high honor. But there was more to Rothermel's 33-year career at the Fire Lab than a single development, no matter how important that one was. In addition to performing basic research, he worked diligently to make new knowledge useful to fire managers. He also led a unit whose members shared the same dedication to pursuing fundamental discoveries, packaging research results in sometimes novel ways, and teaching fire managers how to use the products. Rothermel interested a number of others in working on the fire spread model. For example, Physicist Bill Frandsen developed the theoretical base

and equation based on the conservation of energy principle (J. Brown, personal communication).

Frandsen came to the Fire Lab in 1967 from the Naval Weapons Center at China Lake, California, where he had been employed for 12 years in research on infrared detection systems and the effects of ultrasound on metals. At the Fire Lab, he conducted studies of the thermodynamics of fire. Frandsen developed one of the early programs that made it possible to use the fire spread model with a programmable calculator. He published the documentation in 1973 in a Station technical report.

Rothermel earned a bachelor's degree in aeronautical engineering at the University of Washington in 1953 and a master's in mechanical engineering from the University of Colorado in 1971. He served in the U.S. Air Force (1953-1955) as a special weapons aircraft development officer. After his discharge, he went to work for Douglas Aircraft as a designer and trouble-shooter in the armament group. In 1957 Rothermel moved to the nuclear aircraft propulsion department at the National Reactor Testing Station in Idaho, where Jack Barrows found him and added the young engineer to the staff of the brand-new Fire Lab. New staff members went through a learning experience. Rothermel described it in 1984:

> …there was a sense of being overwhelmed, not only by all the unknowns of wildfire behavior, but also by how to use the new facility. There were at least two schools of thought in regard to the wind tunnels at the Laboratory: (1) bring in boxcar loads of fuel from all over the country for burning in the wind tunnels, and (2) weld the doors shut until we could develop a logical plan for the use of the facilities.

The researchers rejected both approaches, but they did work hard at understanding fire spread and adapting concepts of modeling and systems to the problems of forest fire prediction (Noble 1984). Rothermel, working closely with Hal Anderson, conducted fire experiments in the controlled laboratory conditions to test hypotheses he generated while observing and working on wildfires (Andrews and Frandsen 1994). The process took 10 years, but the payoff was significant. Rothermel's Station publication, *A Mathematical Model for Predicting Fire Spread in Wildland Fuels*, became one of the most frequently referenced documents in fire science history.

The model offered for the first time a system to evaluate rate of spread and fire intensity in surface fuels that account for more than 90 percent of all wildland fires. It was based on the philosophy that no fire measurements should be required to estimate the rate of spread. Estimates of spread rates were generated from prefire assessments of fuel, weather, and topography. The next decade of Rothermel's career was devoted to learning how well the model would work in field conditions and interpreting the results for use by the "man on the ground" (Nobel 1984).

A key development came in 1977 when Mechanical Engineer Frank Albini "let the genie out of the bottle" by using Rothermel's model equations as the basis for nomograms (graphs) that were easily used to predict fire behavior. The nomograms described behavior of the leading edge of a surface fire. Managers could use them in the office or in the field to estimate forward rate of fire spread, intensity, flame length, and crown scorch height. Albini also developed FIREMOD, an early computer program to predict fire behavior and effects. He became internationally recognized as an authority on modeling wildland fire behavior.

In 1979, scientists at the Fire Lab made another significant advance when Research Forester Bob Burgan spearheaded development of a computer chip to estimate fire behavior based on Rothermel's equations. Installed in a commercially available hand-held calculator, this bit of technology allowed fire fighters at an incident command post to plug in data about the fire and get back instant estimates of its future behavior. This was a valuable tool in helping a fire boss determine strategy for fighting the fire and what kinds and amounts of men and materials were needed.

Users of the calculator were required to take a course in how it worked at the Forest Service training center at Marana, Arizona. They were not given a chip until they successfully completed the course, so quality control was automatic. Improvements in the technology continued. In 1986, two new computer chips were developed, allowing both fire behavior and fire danger ratings to be estimated with hand-held calculators (Rothermel interview, 1993).

Another tool was designed to be helpful to fire behavior officers, who were assigned to management teams for large fires. Mathematician Pat Andrews and Rothermel developed charts to interpret characteristics of fire behavior. Using them, the behavior officer could get specific information about different sectors of the fire. The information could help determine where conditions would likely be good for direct attack on the fire, when air operations should be scheduled, and how personnel should be deployed for maximum safety (Noble 1984).

Dick Rothermel (left) and Electronics Technician Merlin Brown placed a battery of thermocouples used to record data in the base of a fuel bed before starting a combustion experiment in 1963 at the Fire Lab.

A TI-59 calculator with a chip programmed by Fire Lab scientists proved useful for estimating fire behavior on the fireline in 1983.

Mathematical models to calculate fire danger or fire behavior require descriptions of fuel properties (fuel models). Having the correct fuel model is vital. So development of fuel models went on in tandem with work on behavior models at the Fire Lab. In 1982, Anderson summed up the research to that time in a publication presenting 13 fuel models in four groups, with cross-references to 20 National Fire Danger Rating System models (*Forestry Research West*, Jan. /83).

The Station's fire behavior scientists worked closely with managers for many years. When the first fire behavior officer course was organized at Marana the researchers were asked to develop an information package that could be used on the fire line and taught in 2 weeks. Rothermel said, "The course was very successful; however, some of the early material was so weak that the students should have chased all of us instructors off the base. Instead, their support encouraged us to improve the course" (Noble 1984).

One improvement was preparation of a manual, *How to Predict the Spread and Intensity of Forest and Range Fires*, which was authored by Rothermel and summarized 20 years of studies. The manual did not replace the training, but it served as a self-study text for those who could not attend the course and a reference for those who did. One course goal was to train key people who would train others, so a reference work was especially important.

Rothermel was good at explaining the complexities of fire behavior, and he did just that with publications describing two historic wildfires that occurred in the northern Rockies. Author Norman Maclean asked if Rothermel and Albini would use fire behavior prediction methods to answer several questions regarding the Mann Gulch Fire that had not been resolved completely in the 38 years following the tragedy. Rothermel with help from Rod Norum, a fellow fire scientist, set about analyzing the probable behavior of the fire and the movements of the crew during the last 20 minutes of the disaster. Norum, who was in excellent physical condition, sprinted up the Mann Gulch slope as the doomed firefighters had done. Rothermel assembled existing data to reconstruct the fire scene and analyzed the fire's behavior. The result was a popular Station publication, *Mann Gulch Fire: A Race That Couldn't Be Won* (Rothermel 1993).

This report was the first Forest Service Research serial publication posted on the agency's internet site (see "Publishing Firsts," chapter 11).

In 1988 severe crown fires in the Greater Yellowstone Area and elsewhere in the West drew national attention. Fires swept through almost a million acres in Yellowstone National Park and adjacent lands. Rothermel and Burgan represented the Forest Service on a team of six fire behavior experts (the others were with the National Park Service) assembled by the fire command at West Yellowstone to prepare quick estimates of how fires in and near the park would grow by the end of the burning season. Conditions limited normal data gathering, and in July and August unprecedented high winds and low humidity surprised the experts. Several major fires spread much farther and faster than predicted (Reynolds 1989a).

Existing fire models were not directed toward crown fires, which are only a small percentage of all wildfires, although their effects are severe. Rothermel built on work of several other fire scientists and summed up the results in *Predicting Behavior and Size of Crown Fires in the Northern Rocky Mountains,* a 1991 Station publication that gave managers methods to make calculations for running crown fires in fuels and weather conditions common in the northern Rockies.

Rothermel saw the Yellowstone conflagration as a call for accelerated research to develop methods of assessing extreme fire behavior. Methods were needed to predict occurrence, intensity, and spread rates; model behavior of large fires; and train fire behavior analysts to make predictions. After 27 years as Project Leader of the fire behavior unit, Rothermel gave up the administrative duties to concentrate on personal research characterizing extreme fire behavior and crown fire spread. The models were used with Geographic Information Systems to produce three-dimensional maps of predicted fire spread (Andrews and Frandsen 1994).

Rothermel was showered with honors for his work. In 1981 he received a USDA Superior Service Honor Award. A decade later, he received a second superior service award, a feat matched by very few scientists in the history of Forest Service research. He credited work by members of the fire behavior unit (*INTercom* June/91). The National Association of State Foresters honored Rothermel for "outstanding service to

Available fire behavior models did not describe crown fires like this one during the Mink Fire in the Bridger-Teton National Forest south of Yellowstone Park in July of 1988. Fire lab scientists developed new models to fill the void.

fire management." He and Research Applications Team Leader Bob Mutch received awards from the Chief of the Forest Service for their technology transfer work following the Yellowstone fires. The Marana Training Center recognized Rothermel's fire behavior training leadership in 1981 with a $500 cash award. USDA bid a lot higher than that. In 1992, the Department reviewed Rothermel's performance and determined that his pay grade would be increased to the equivalent of GM-16, roughly a Station Director level. Only 20 people in USDA had similar classifications.

On his retirement in 1994, Rothermel's career was perhaps summarized best by two fellow scientists: "He has been a true leader among fire researchers, providing new ideas, challenging folks to work together in teams, and producing results useful to understanding and managing wildland fire" (Andrews and Frandsen 1994).

Pat Andrews—Reluctant "First Lady"

Pat Andrews became the Station's first woman research scientist in 1975, but she declined to participate in making that fact widely known.

The Station newsletter editor spotted the Andrews appointment as a mathematician in the Fire Lab's fire behavior unit on a routine list of personnel actions. The editor thought someone being "first" deserved a story and perhaps a news release, and phoned Andrews to get the details. What she got was a statement that Andrews was opposed to having any article printed. The editor went along with Andrews' wishes, and the newsletter did not report the "first" until 17 years later (*INTercom* June/92).

Andrews said she was not comfortable being the first woman scientist at the Intermountain Station. "I didn't go out to break new ground," she said. "I was just doing what I enjoyed."

She began working in 1973 as a temporary physical science technician in the old fire physics unit, which later became the fire behavior unit. Andrews had a bachelor's degree in mathematics and chemistry from Eastern Montana College and earned a master's in mathematics and computer science at the University of Montana in 1973. She used her training in working with others in the unit to develop mathematical models, but concentrated her efforts on putting the models into forms easily understood and used by fire managers.

Pat Andrews was the first woman to earn a scientist appointment at the Intermountain Station, a distinction she did not want publicized.

Managers used the products of the unit's research as guidance in prefire planning, fire suppression, prescribed burning, and evaluating fire effects. The BEHAVE fire prediction system, a development with which Andrews was closely associated, became widely known and used in the wildland fire community. Use was worldwide; BEHAVE was translated into Spanish, Chinese, and other languages. BEHAVE got its first stern test in 1984 when it was used successfully to analyze the expected behavior of the North Hills Fire near Helena, Montana, when it burned into the Gates of the Mountains Wilderness. Hundreds of thousands of dollars were saved by the decision not to suppress the fire in the Wilderness when BEHAVE projections indicated the fire would cause no further problems. Such savings more than paid for development of the program (*INTercom* 6/13/85).

Andrews became leader of the behavior unit's Applied Research Team in 1988 and advanced to Project Leader in 1992 when Dick Rothermel vacated the position to concentrate on personal research. She considered following Rothermel "an honor." She received several top honors of her own over the years.

Much of the recognition Andrews earned was based on training efforts. In the early 1980s she trained fire managers and fire behavior officers in using a preprogrammed calculator to predict fire behavior. She, Rothermel, and fellow scientist Bob Burgan started a major technology transfer program in 1983. Andrews was in charge of the effort to gain approval to make BEHAVE a fully operational national system in the Forest Service. The three scientists, with help from others at the Fire Lab, designed and conducted specialized training sessions.

In the first sessions, trainees worked on 12 computer terminals simultaneously at different locations. Trainees eventually included people with a variety of fire management responsibilities from eight Forest Service Regions, the Bureau of Land Management, Bureau of Indian Affairs, National Park Service, National Weather Service, universities, and State agencies. The training was successful, and participants spread the word within their organizations.

In 1985, Andrews received a USDA Superior Service Award for her work with BEHAVE. Burgan also received a Superior Service Award at the same ceremony in Washington, an indication of the team approach taken in the behavior unit. Ten years later, Forest Service Chief Jack Ward Thomas presented a Superior Science Award to Andrews. In 1990, *Computerland* magazine featured

Pat Andrews presided over a training fire in 1983 at Marana, Arizona, during part of the Fire Behavior Analyst course taught by Fire Lab scientists.

her as "The U.S. Forest Service's Mathematician."

The Station's first lady scientist, given the opportunity, no doubt would have balked at being labeled "the" mathematician. She was always quick to credit the contributions of others, and spent no time resting on her laurels. In the late 1990s, Andrews was engaged in what she enjoyed doing, moving ahead with cooperative research on a computer tool to analyze historical fire danger and occurrence, computer architecture to aid integration of various simulation models, and a new program to simulate spread and behavior of prescribed natural fires.

Seeing in the Dark

Research on using infrared systems to detect and map forest fires started in 1962 at the Fire Lab. The infrared research was dubbed Project FIRESCAN, with Electrical Engineer Stan Hirsch as Project Leader. Over 14 years Hirsch, Physicist Ralph Wilson, and technicians Forrest Madden and Dale Gable developed the basic tenets for using thermal infrared systems in fire management.

Some 20 years later, although improved by additional research, the basic systems developed by the Station scientists were employed by fire-fighting agencies worldwide. Using electromagnetic radiation to "see" through smoke, the dark, and various forest tree canopies was compared to "what radar means to air controllers and X-rays to doctors, dentists, and security checkers" (Warren and Celarier 1991).

The Station research built on knowledge gained by the military during World War II. The early research and development was done in cooperation with the Department of Defense Office of Civil Defense and the Defense Advanced Research Project Agency. Military aircraft and pilots were indispensable in making FIRESCAN successful. But the Forest Service systems, the only ones in the world known to be designed and developed specifically for fire detection and mapping, were products of the creativity and hard work of Hirsch, Wilson, and other individuals.

After the basic theory was established, a separate team headed by Bob Bjornsen was set up to develop fire mapping operational procedures. Bjornsen became the Forest Service director at the Boise Interagency Fire Center (BIFC), later renamed the National Interagency Fire Center. He was instrumental in establishing infrared operations as standard procedure, and equipment was installed in Forest Service and Bureau of Land Management (BLM) aircraft (Rothermel interview, 1993). The BLM made especially good use of infrared techniques in Alaska, where it was responsible for fire protection in large, remote areas where surveillance on the ground was difficult or impossible.

The first test of airborne infrared mapping came early in Project FIRESCAN. In the fall of 1962, the scientists successfully mapped a 300-acre controlled slash fire in the bottom of a deep canyon (Hirsch 1965). A temperature inversion occurred during the night, and most of the smoke was trapped in the valley when the infrared map was made the following morning. The smoke layer was about 2,000 feet deep, and people at the fire scene had to drive vehicles with headlights on to see through the smokescreen. The infrared image was unaffected, and the experiment confirmed that the newly developed theoretical information was correct.

Project Leader Stan Hirsch (foreground) and pilot Stan Butryn with the U.S. Army's Mohawk aircraft, which was used in Project FIRESCAN research.

Electronic Technicians John Voth (left) and Dale Gable used an infrared sensor inside an aircraft in 1971 to locate small forest fires, record the imagery, and identify a ground location with the interpreter's map.

Wilson, who came to the Fire Lab in 1964 from the U.S. Navy Aviation Ordinance Department, made an early innovative contribution to the project by developing a dual polar image system (Warren and Celarier 1991). Later, modifications were made to the system's scanner, which was an obsolete military device. During the first full test season, the system was operated in a Beechcraft AT-11 plane. However, the same aircraft also had to be used for fire detection experiments. To eliminate this conflict, a Forest Service Aero Commander was made available to the mapping team in 1964 (Hirsch 1965).

Over 2 years, 42 fires ranging in size from 10 to 60,000 acres were mapped. Some were controlled burns, but most were wildfires. Missions were scheduled to provide information to the wildland fire managers at times it would be most useful in formulating control strategies. Interviews with fire managers revealed that the best time was midnight, and the ability of infrared systems to supply information then was one of its principal advantages over other systems.

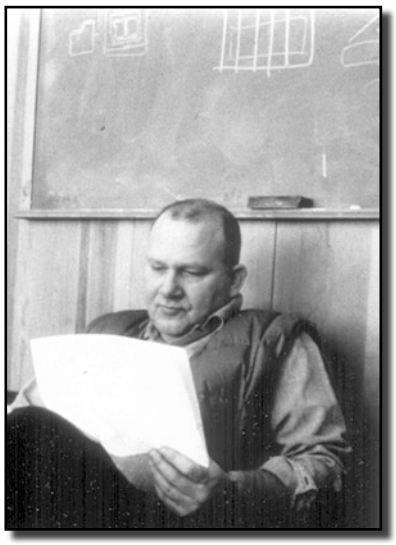
In the early testing, information was either dropped directly to the fire camps from the aircraft, or delivered to the fire scene from a landing area by vehicle. Operational testing improved delivery as well as acquisition methods, although delivery remained a challenge. Still far from perfected, infrared fire mapping was turned over to the Forest Service fire control organization at BIFC in 1966. It was used immediately because it provided badly needed fire intelligence, and development continued.

Fire detection using infrared imagery was a more difficult problem than mapping. The technical roadblocks to detecting small fires in large areas were significant. Nevertheless, by 1970 a very sophisticated fire surveillance system had been developed by Project FIRESCAN. Properly equipped aircraft were capable of patrolling 2,000 square miles per hour and detecting small "hot areas," with a high probability that they were fires (Warren and Wilson 1981). The system also had greatly improved fire mapping capabilities.

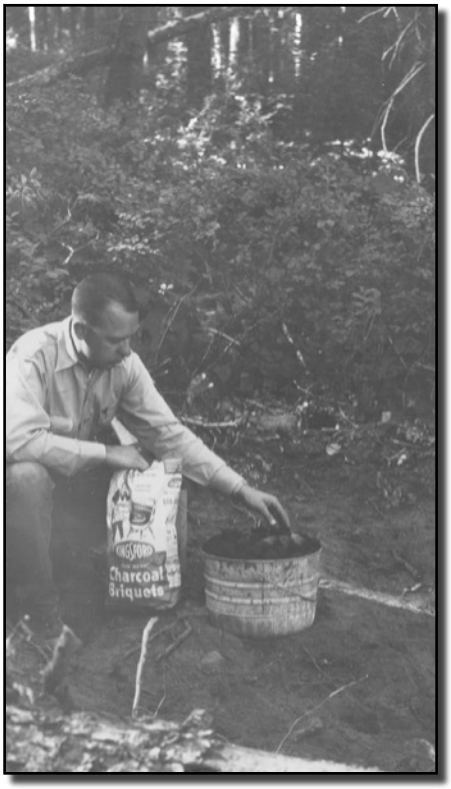
Hirsch was enthused. He was reported to have said (Spokane Daily Chronicle 1967) that about seven large aircraft with infrared detector equipment "could effectively patrol all of the Nation's forests. They would cost a total of $2.8 million, and I believe they would save that much during their first year of operation."

At the time, two planes were being operated by Project FIRESCAN in the Northwest. One was a Convair "flying laboratory" carrying several thousand pounds of equipment. It was designed to fly in the wake of thunderstorms and take infrared pictures of fires only minutes old. The other, smaller plane was used to record infrared images of larger fires.

The detection system was tested by Region 1's Division of Fire Control in 1971 and 1972, but with marginal success. Improvements were made with help from Fire Lab personnel, and technical responsibilities were transferred to BIFC in 1974. The fire detection capability was made available nationally, but the military-based version using large aircraft saw limited use. This line scanning system was best used for detection in large areas and first-time large fire mapping. More flexible, less costly, systems came to be used to gather information needed for



Physicist Ralph Wilson contributed fundamental concepts that helped in developing methods for using thermal infared systems to detect fires.



Research Forester Nonan Noste prepared a spot fire bed for an aerial detection test in 1962; the briquettes provided a hot coal bed during the test runs.

quick decisions or to determine specific conditions.

Small forward-looking infrared (FLIR) systems became commercially available in 1979 (Warren and Celarier 1991). They were designed to cover smaller areas, but produced clear images that could be recorded on standard VCR equipment. Hand-held FLIRs or units on simple mounts could be operated from helicopters or small aircraft. Thus, use of infrared technology moved forward as more options were introduced.

Raising the Education Bar

Joe Pechanec, who had left the Station for a stint on the range research staff in Washington, DC, and then went on to serve as Director of the Southeastern Station in Asheville, North Carolina, returned to the Intermountain Station in 1962 to replace Reed Bailey. Bailey had witnessed an amazing change in the scope and magnitude of the Station's research programs and the start of development of many new physical facilities during his 27-year tenure as Station Director. He also had presided over a big change in the educational level of the Station's personnel.

Ferguson Describes His Advancement

One of the great success stories of personal advancement at the Station through educational programs was that of Dennis Ferguson, who started at the lowest employment level and became Project Leader of a large research unit at the Moscow Lab. In response to a request in 2004, and a little arm-twisting, Ferguson provided this description of his rise from card punch operator to research forester and Project Leader.

I graduated from the University of Idaho with a Business Administration degree in 1969; then served as a stenographer in the Army. After discharge, I returned to the University of Idaho to obtain a forestry degree, but the GI Bill wasn't enough to meet living expenses. I saw an advertisement for a part-time job as a keypunch operator with the Moscow Forestry Sciences Laboratory. I knew keypunching was similar to typing and I knew I could type, so I signed up to take the keypunching test. I had never seen a keypunch machine before.

The test consisted of several pages of data entry for fictitious people's names and social security numbers. Well, I'd just spent the last few years *always* typing names and social security numbers together on various military forms. I wasn't the fastest person who took the test, but I was the most accurate. Because the Moscow lab did not have a keypunch machine that also verified, they chose accuracy over speed. In December 1973, I became a GS-2 Card Punch Operator at $2.73 per hour. I figured I'd be at the lab for a year or two.

School at the University of Idaho progressed in a surprisingly coordinated manner with work at the lab. I learned theoretical and practical knowledge at the university, which I applied at work. The tasks I performed at the lab reinforced the classes I took. My duties at the lab were expanded to include helping research foresters. I was able to qualify as a GS-3 forestry aid in 1974.

One day, I was talking with my supervisor, Ray Boyd, and told him that I really liked working at the lab and I wondered what I needed to do to get a permanent job as a researcher. He said, "Get a master of science degree." So, I began working toward the M.S.; meanwhile, job opportunities opened up at the lab. In 1976, I became a GS-4 forestry technician. I completed the master's degree in 1978 and was hired as a GS-7 forester, then was promoted to GS-9 in 1980.

In 1981, I achieved my goal of becoming a research forester. Meanwhile, both my co-workers and my previous advisor at the University of Idaho kept encouraging me to work on a Ph.D. I avoided the issue for several years, but came to a dead end when Dave Adams (my advisor for the master's degree) was at the lab one day. He stuck his head in my office and said, "If you don't come visit me about a Ph.D. program by the end of next week, I'm coming over here." "Okay," I thought, "I'm ready to work on a Ph.D."

The Station was fully supportive of the Ph.D. program because the research was part of our mission. I attended classes and studied on my own time, and conducted the research as part of my regular duties. The Ph.D. was awarded in 1991. With the Station's help, I had exceeded my expectations, and I settled in for many productive years of research.

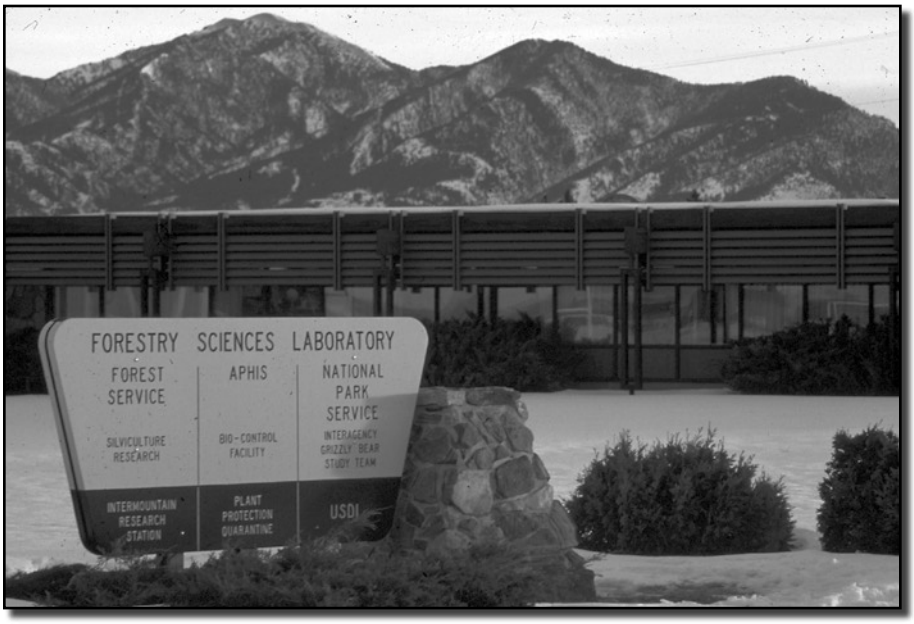
Less than a year later, Ray Hoff stepped down as Project Leader and he nominated me as the new PL. The Station appointed me as Acting PL for a 6-month trial period. I guess I didn't goof up too badly, because the appointment became permanent after 6 months. That was 12 years ago.

Project Leader Dennis Ferguson got "right down to business" in 2001 as he measured very small trees and entered data in a computer. Use of hand-held computers in the field was one reason the Station largely stopped hiring people whose primary responsibility was data entry, the first job Ferguson had in 1973.

The opportunities to "earn and learn" at the Moscow lab have been fabulous. I earned a living and participated in exciting research. I learned a tremendous amount about forestry—both at the lab and at the University of Idaho. People *always* gave me the opportunity to grow. That's the way it is at the Station.

Ten years before Pechanec took over as Station Director only 39 percent of Station scientists had master's degrees or doctorates. By 1962, 71 percent had advanced degrees, 20 percent were Ph.D.'s, and 17 percent were taking graduate courses. Scientific disciplines within the Station workforce had increased from seven to 16. The benefits of the Government Employees Training Act were beginning to be realized.

The trend toward increased numbers of Ph.D.'s on the research rolls continued after Pechanec's arrival. For the individuals who participated in education programs, the road to an advanced degree could be long and hard, but the rewards could be great. There were benefits to the organization, because the research required to earn the advanced degrees fit directly into the Station's programs in most cases.



Initially, the Bozeman Lab housed Station engineering, silviculture, and range management research units. The Station role there gradually diminished and the Lab became home for units of three different agencies. The National Park Service unit's mission was research on grizzly bears in the Yellowstone ecosystem.

Modern Labs Matriculate

The Bozeman Lab was completed in 1962, the Moscow Lab was under construction, funds for the Logan Lab had been appropriated, and the Montana Congressional Delegation was busy paving the way for a new lab on the University of Montana campus. The physical plant of the Station was changing fast, and that helped to some extent with an emerging problem. The cost of research per scientist had doubled in the previous decade, and competition for well-trained scientists was acute. Costs of doing business continued to rise throughout Station history. The presence of modern laboratories on or near university campuses was helpful in attracting qualified scientists.

Bozeman and Lodgepole—Before the Bozeman Lab opened, the Station had established the Bozeman Research Center in 1960 at Montana State University for lodgepole pine research. Bozeman was in the heart of about 10 million acres of small-stem lodgepole and rugged terrain covered with commercial-sized timber that was difficult to access. Resource managers were becoming increasingly concerned about damage to the forest environment and tree reproduction when conventional logging and transportation systems were used on steep slopes.

In Washington, DC, forest engineering research had been formally established with a staff (as a part of forest products research) and included in the Forest Service budget as a separate item for the first time. Montana State had a well-regarded engineering school, so locating the Intermountain Station's first engineering unit there paved the way for cooperative studies to tackle resource problems in the surrounding area. H. M. Huckeby, Regional Engineer for Region 4, was appointed to head the Bozeman unit for the Station. A complex of buildings was planned, with the Lab as the centerpiece (*Western Conservation Journal* 1962). The complex was never fully developed at Bozeman, and engineering research later was moved to Moscow.

Establishing a Lab at Bozeman and starting the engineering research unit there required some rather delicate negotiations because officials in the School of Forestry at the University of Montana were concerned that development of a Station research program at Montana State might adversely affect development and expansion of Station programs in Missoula. Bozeman had somewhat of an inside track, because land grant universities generally were favored as sites for new Forest Service labs. Montana State was a land grant institution, the University of Montana was not. Politics also may have been a factor (Wellner interview, 1993). The Dean at the University of Montana was a Republican; his counterpart at Montana State was a Democrat. However the concerns arose, they had been sufficiently dealt with by 1961 to allow construction at Bozeman to proceed.

Early research at the new Lab included designing new equipment to harvest small-stem trees from steep slopes, together with related transportation systems. Studies also sought improved mechanical methods to improve timber stands, particularly in rugged country.

Among the more novel engineering studies was research on transporting wood chips in pipelines. The thought was that lodgepole pine could be chipped at remote harvest sites and moved via pipeline to established transportation networks. The Navy, with an interest in ship-to-shore loading rather than lodgepole pine, funded some of the work. Immediately after the Bozeman Lab was completed, the

pipeline research started with Professor William Hunt of the Montana State Civil Engineering Department and Rulon Gardner, a Station research engineer, leading the way. The research went almost directly to the pilot stage. A 2,000-foot loop of 8- and 12-inch diameter pipe was laid and connected to a pump to form a prototype hydraulic woodchip pipeline.

Results were positive. Studies showed that the pipeline system could significantly reduce the costs of transporting large volumes of chipped wood residues to pulpmills or other processing or shipping points. There were no distance, terrain, or weather constraints. Tests showed that moving wood chips by hydraulic pipeline could reduce costs 50 percent or more (*Forestry Research West* Oct./78).

Gardner presented the study results to an international symposium on transport and handling in the pulp and paper industry in Rotterdam, the Netherlands. Despite his favorable report, the research was soon discontinued. A hydraulic chip pipeline was an interesting concept, but it was never developed on a commercial scale.

The lodgepole pine research thrust at Bozeman in the early 60s was timely. A substantial increase in timber cut had occurred in the Northern Rocky Mountains between 1952 and 1962 as roads and mills were built and utilization standards within the forest products industry changed to create markets for smaller logs and species other than white and ponderosa pine. Among the Forest Utilization Service interests was the use of lodgepole pine from Montana as a source of wood for pulp and paper mills as far away as Wisconsin. Forest Service economics research was directed to update a national compilation of timber supplies last done in the 1952 *Timber Resources Review*.

When the research center in Spokane closed, part of the range research activity was transferred to Bozeman. The assignment was to conduct research on managing livestock and elk ranges in Northern Rocky Mountain grasslands. Former Spokane studies related to deer-elk compatibility with timber management were assigned to Missoula.

Construction of a 2,000-foot hydraulic chip pipeline at Bozeman for cooperative studies by the Station and Montana State was near the halfway point in this photo.

Genetics Breed Moscow Lab—Intermountain Station research on the University of Idaho campus originated in 1958 with studies of the genetic resistance of western white pine to blister rust led by Dick Bingham (see "Bingham's Team Turns the Tide," chapter 8). Bingham had observed phenotypical resistant white pines in nature, indicating that such trees might be inherently resistant to blister rust. To explore this possibility, he and his associates needed a few acres for a small office building and greenhouse, plus a larger area for a breeding arboretum (Ferguson 2004).

The university provided 40 acres for the arboretum near the Washington-Idaho border and made land available for office and greenhouse space on south Main Street. The installation became the Northern Idaho Forest Genetics Center. Its presence made Moscow a logical place to relocate other units from the Spokane Research Center when Forest Service Research decided to discontinue research centers in favor of modern laboratories housing research work units. Approval to build a laboratory at Moscow came a year after the Genetics Center was established in 1958.

The Inland Empire Research Center was housed in a Forest Service fire supply warehouse in downtown Spokane. Despite concern by the Washington Office about possible opposition from the Spokane Chamber of Commerce, the move to Moscow appears to have been made without serious opposition. Working relationships already existed with the University of Idaho's College of Forestry, Wildlife, and Range Sciences, and they were enhanced by the change. After the Spokane center was closed, the entire State of Washington was included in the Pacific Northwest Station's territory.

One of the benefits of closing the research center at Spokane in favor of Moscow was access to the large mainframe computer at Washington State University in Pullman—just 8 miles from Moscow. The move sped the transition from relying on punch card equipment in use since 1928. The mainframe could process large amounts of data, but it also eventually became obsolete. By the mid-1990s, personal computers on the desks of many Station scientists were more powerful than the mainframe at WSU was in the early 1960s.

Al Stage reportedly was so excited about the new ability to use large computer capacity in his forest measurement research that he "chose to walk through

When the groundbreaking ceremony for the Moscow Lab was held in 1962 Dick Bingham made sure the dignitaries who participated had the right tools for the job.

The Moscow Lab provided modern facilities and easy access to cooperators at the University of Idaho. A major addition in 1991 increased the lab's size to that shown here.

the new plate glass window [in the Moscow Lab], neglecting to take advantage of much easier access available through an open door" (Quantitative Analysis Unit 1995).

A lot of finishing touches were needed in preparation for the lab's dedication in May 1963. Entomologist Mal Furniss recalled seeing Bingham on a tractor landscaping the grounds. Stage and others were out along Main Street putting up posts and rails for a fence that had been destroyed a few days earlier in a street expansion project (Furniss e-mail to Tonn, 2004).

The new Moscow Lab was home for five research units. Entomology was staffed by Furniss, who moved from Boise. He was joined later by Dick Washburn and others. Furniss occupied the "annex," which had been the home of Bingham's genetics laboratory. Furniss arranged to have his insectary trucked to Moscow from Boise. The driver had to let air out of the tires to clear the superstructure of the bridge across the Salmon River at Riggins.

Other units included watershed, staffed by Harold Haupt, who transferred from Reno; silviculture, staffed by Glen Deitschman, Ray Boyd, and Marv Foiles (who transferred from Spokane); and white pine genetics and pathology, staffed by Bingham and several others, including Jim Hanover, a geneticist and recent PhD graduate from Washington State University. Bingham had studied pathology, not genetics, at the University of Idaho. He was on a first-name basis with Dean Ernest Wohletz of the College of Forestry, which no doubt was an asset in developing the relationship between the Station and the University of Idaho (Furniss, personal communication).

Missoula Lab Leaves Downtown— Early in 1967, Station employees moved from the Federal Building in downtown Missoula to the new Forestry Sciences Lab on the edge of the University of Montana campus. The building was on a 2.6-acre site leased to the Station by the university for 99 years for one dollar a year. The university welcomed the lab, and so did Montana politicians. Senator Lee Metcalf gave the dedication address.

The *Missoulian* carried a story, "Forest Research Expanded," that described the Forest Service rationale for moving research facilities to university campuses: "Research scientists depend not only on their own ideas and talents but on substantial and well-organized libraries, fellow scientists within their own disciplines, and scientists in associated disciplines." The proximity to university facilities and faculty met the needs.

The new lab housed seven units. They included studies of the silviculture of western larch and Engelmann spruce, wildlife habitat, bark beetles and defoliators, and wildlife biology (in cooperation with the Fish and Wildlife Service). A new forest products marketing unit had recently joined the organization, and a wilderness research unit was proposed. The goal of the marketing unit was to identify customers for wood products that could be produced by Montana mills.

Everybody Wanted the Logan Lab— Dedicated in 1964, the Logan Lab was located on 3.5 acres of land leased to the Station by Utah State University. Initial construction costs were $300,000. The facility included the main building that housed offices, laboratories, and a library and conference room. Four greenhouses, a lath house, and an environmental growth chamber building were used for studies that required special controls for humidity, light, air circulation, and temperature. The program included

Market Analyst Bob Benson briefed visitors on the mission of the new wood products marketing research unit during an open house following the dedication of the Missoula Forestry Sciences Lab in 1967.

The Missoula Forestry Sciences Lab was close to University of Montana library facilities and the School of Forestry.

research on watershed management, water yield improvement, forest insects, surface mine rehabilitation, and management of aspen forests and associated mountain grasslands.

As at most of the new laboratories, there were ambitious plans for major expansion in the future. The plans envisioned construction of another building of equal size to be linked to the original lab by a large wing. More greenhouses and a shop-storage building also were planned. As at most of the other new labs, the expansion plans never were fully carried out.

Former Station Director Joe Pechanec recalled that getting the Forestry Sciences Lab built in Logan was relatively easy because the Dean of the School of Natural Resources at Utah State University was in favor of it. Pechanec also credited Station Director Reed Bailey's political skills and contacts with helping.

Provo Took More Time— A lab in Provo did not materialize so quickly. It was the last new Intermountain Station Lab to open—in 1975. First, Forest Service top management needed to be convinced of the need. Pechanec, Perry Plummer, and probably others worked on that. Deputy Chief for Research Vern Harper told part of the story in a 1985 letter (McArthur 2001):

> …I was doing a Research Inspection of the Intermountain Station (about 1960)….One of the centers Director Joe Pechanec and I visited was the work on shrub research. After listening to the Project Leader's (Perry Plummer's) presentation and viewing some of the field experiments, I turned to Joe and said "maybe we ought to amend the Ten-year Research Program to include a new laboratory at Provo…featuring shrub research including genetics, etc." Joe grinned broadly and said, "I hoped you would see justification for such a laboratory to be located on the grounds of Brigham Young University…" He further remarked, "I have outlined a speech which I can now cut short, giving a big pitch for the lab."

Pechanec said that his predecessor, Reed Bailey, brought his political skills to bear at Provo to gain university approval for the lab. The Station hadn't been getting sufficient funds to support research at the Desert Range. Bailey sought the aid of Roger Walker, who had worked for the Station in about 1933, and later held a high position with the Agricultural Research Service (ARS) in Washington. Walker, because he loved to teach, left ARS and became a soils professor at Brigham Young University (BYU) late in his career.

The Logan Lab was planned and built without the controversy or political intrigue that preceded other new facility construction in the 1960s.

Walker pointed out to the university administration that, although BYU was a private institution of the Mormon Church with a strong interest in safeguarding its independence from any form of federal influence, the school would not be compromising its principles by having a Forest Service lab on the campus. Howard Stutz, a professor in the Department of Botany and Range Science at BYU, also worked hard in the cause of establishing a Station lab at the university.

The BYU administration was convinced and became a strong advocate for construction of the Shrub Lab with both the Washington Office of the Forest Service and Congress. That advocacy resulted in bi-partisan support for the lab by Utah's Congressional Delegation.

The Shrub Sciences Laboratory almost was named the "Shrub Improvement Laboratory." The plan was to call it that, and the metal letters to attach the name to the new building had been delivered. Range Scientist Neil Frischknecht objected. He suggested a different title was needed to reflect the broad scope of the research that would be conducted at the facility.

Frischknecht prevailed. Station Director Roger Bay presented the unused "Improvement" letters to Jim Blaisdell and Perry Plummer with a few humorous comments at a meeting held shortly after the Shrub Sciences Laboratory was dedicated (McArthur 2001).

Reno Gets a Better Deal— At the University of Nevada-Reno, a new director of the Nevada Agricultural Experiment Station wanted to get a range research program going, but wasn't getting much support from his own people. Consequently, he began pressuring Bailey to establish a range research unit at Reno. A unit was started, but serious plans for construction of a Forest Service laboratory building were

The new laboratory at Provo was the only one in the U.S. to carry a "Shrub Sciences" label. From the start, the research program there involved extensive cooperation with other agencies and university scientists.

never developed. What did develop was a major improvement in working space for the Reno unit.

In the spring of 1957, Harold Haupt was transferred from Boise to Reno to set up a new watershed project. Range Scientist Ralph Holmgren soon followed to take on the task of reviving the old Nevada range research program that had been dormant since World War II. The plan was to set up operations on the University of Nevada campus, but facilities were not immediately available. Haupt and Holmgren were given offices in make-shift rooms in a Toiyabe National Forest warehouse at 1350 E. 2nd Street.

The situation improved modestly when the Station researchers occupied a two-story, wood-frame house that was moved from the Paradise Valley research area north of Winnemucca. Haupt said moving the building was an adventure:

> The distance that the building had to be moved from Paradise Valley to Reno was 210 miles, most of it along the narrow, busy U.S. Highway 40. As the building very slowly rolled down the highway I held my breath. Occasionally along the way the moving crew had to carefully prop up power and telephone lines in order to let the building pass underneath. Except for a few impatient motorists, the whole precarious exercise came off without a hitch (Haupt, personal communication).

Haupt said that the structure soon was set on a foundation in the warehouse compound, and it served as the Station's first office in Reno It was known as the Nevada Research Center until "center" designations were changed to "laboratory." Nearly 2 years passed before the Station scientists finally moved across town into much better offices and a lab in the new Max C. Fleischman College of Agriculture building on campus.

Ivan Sack, Supervisor of the Toiyabe National Forest, was largely responsible for that move as well as having a place to move to. "Ivan was a very good friend of research," Haupt said. "He was also very influential in Reno. For one thing, he served as a trustee of the Fleischman Foundation (that yeast built) and through his persistent urging had earlier convinced the other trustees to grant a considerable sum of money to construct the new Max C. Fleischman building."

Retired Project Leader Dick Meeuwig, who led studies that concentrated on ecology and management of pinyon-juniper rangelands for many years, recalled that the university built the Knudsen Renewable Natural Resources Center on Valley Road in 1967 or 1968. The Station unit moved into it, as did the Agricultural Research Service. This provided an opportunity for cooperative work by the two Federal groups that continued throughout Station history.

1967

Intermountain Forest & Range Experiment Station

- Ogden Headquarters
- Boise Forestry Sciences Lab
- Bozeman Forestry Sciences Lab
- Logan Forestry Sciences Lab
- Missoula Forestry Sciences Lab
- Moscow Forestry Sciences Lab
- Northern Forest Fire Lab
- Reno Forestry Sciences Lab
- Boise Basin Exp. Forest
- Coram Exp. Forest
- Deception Creek Exp. Forest
- Desert Exp. Range
- Great Basin Exp. Range
- Priest River Exp. Forest
- Tenderfoot Creek Exp. Forest

This 1930s-style dwelling was moved 210 miles from Paradise Valley in 1957 to house the Station's Nevada Research Center.

To Spray, or Not to Spray

By the end of 1963, the remaining work at Spokane, consisting of studies on direct seeding of western white pine and use of herbicides to manage vegetation, had been moved to Moscow. Attention to the herbicide trials was, in part, influenced by the public concerns stemming from Rachel Carson's book, *Silent Spring*. Carson mounted an attack on the indiscriminate use of herbicides and pesticides, particularly in agriculture; but forestry also was affected. Although there wasn't much support for herbicide research from the National Forests initially, the issue of massive chemical treatments in managing forest stands became a major factor in National Forest management, particularly in the Pacific Northwest.

Concerns about chemical use provided some unexpected financial help for the Station when research budgets were starting to tighten. Region 1 had been criticized in the press for using Agent Orange, a Vietnam War chemical defoliant, on 60,000 acres without any scientific basis showing it would aid in solving the regeneration problem on that area by suppressing unwanted vegetation. As a result, the Regional Silviculturist authorized spraying only if the project was cleared by Research.

To support the effort, the Washington Office allowed the Regions to use funds normally allocated to reforestation work to sponsor studies related to vegetation management. Those funds proved to be a great benefit to the work of the research unit (Boyd interview, 1993).

In the late 1960s, the issue of chemical treatments was so controversial that Neil Rahm, Regional Forester for Region 1, decided that no chemicals were to be used for vegetation

management. Undesirable vegetation was to be removed by hand instead. This put the Station's vegetation management research unit into limbo. The unit was discontinued, although some of the ongoing herbicide research work was continued in other units at Moscow (Boyd interview, 1993).

Aha! The Wilderness Unit Discovers a Better Approach

A pair of "Aha moments" inspired the creation of the first Forest Service wilderness management research unit and one of the major accomplishments by scientists in the unit.

The first revelation was no real surprise. Station administrators must have quickly realized they were in a strong position to gain a wilderness research capability in 1966 when the Senate appropriations committee asked the Forest Service to develop a proposal for a unit. The Station had a new Forestry Sciences Lab in Missoula ready to house staff. Missoula was an ideal location for wilderness research, because 7.3 million acres of existing or proposed wilderness was nearby, the largest concentration of such areas in the contiguous 48 States.

The Station made a proposal, it was accepted, and the unit was established in 1967. It was to be the only Federal research unit focusing on wilderness management throughout the remaining 30 years of Intermountain Station history. Bob Lucas moved from the North Central Station to serve as Project Leader. He soon was joined by George Stankey. The two social scientists embarked on a series of studies concentrating on the ecological as well as social problems involved in managing and protecting established Wildernesses and Primitive Areas (Noble 1976).

Ecological studies ranged from determining the impact of visitors and their horses on plants, soil, water, and wildlife to identifying processes of ecological change, such as wildfire, that affect the whole wilderness. Stankey made several studies over time about

Project Leader Bob Lucas (standing) visited the Hilgard Basin area of the Gallatin National Forest with Australian scientist Peter Valentine and others in 1981. Valentine spent 10 months with the wilderness research unit as a visiting scholar.

wilderness visitors' attitudes toward wildfire that showed a strong trend toward more understanding and acceptance of fire's natural role (Lucas, personal communication).

Lucas did a series of surveys of wilderness use and users that yielded baseline data for management studies. They described the amount, type, and distribution of use, and visitors' characteristics, objectives, and knowledge and attitudes regarding wilderness conditions and management alternatives. Stankey conducted some similar research. Sometimes, conventional wisdom was disproved. For example, the studies showed there were far more hikers relative to horse use than had been generally thought. And there was far more day use relative to long overnight trips than managers supposed.

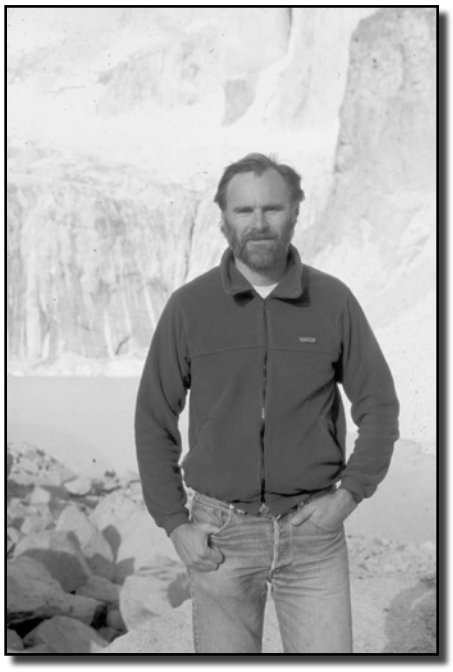
Lucas said the researchers at first were "trying to lay a foundation of general studies of visitors and develop better research methods for more detailed studies later." He believed this "should provide the most relevant, helpful research in the long run and seems a better bet to us than crash programs dealing with individual 'brushfire' crises" (Noble 1976).

Much of the unit's research was cooperative work, and a considerable part of that was with Sid Frissell, a professor at the University of Montana. Ecologist David Cole was another primary cooperator in the early years. For part of that time, Cole was employed by Systems for Environmental Management, a nonprofit group in Missoula specializing in natural resources research. He received a temporary appointment in the Station research unit in 1978, and achieved permanent status in 1987 (*INTercom* 12/8/88).

The revelation that led to what Lucas believed was the unit's major accomplishment came in the early 1980s. The achievement was development of the Limits of Acceptable Change (LAC) system for managing wilderness recreational use. LAC "turned what had long been referred to as 'carrying capacity' into a practical management tool," Lucas said (personal communication).

Lucas described how LAC was born:

> With the benefit of hindsight, it is obvious that we were on the wrong track, asking the wrong question. We had lots of research that showed that type of use, user behavior, timing of use, and location of use was more important than amount. Finally, in one of those 'aha!' moments, several of us in the research work unit (George Stankey was maybe



Wilderness unit scientists were in demand world-wide. Ecologist David Cole was in Torres Del Paine National Park, Chile, in 1997 as a member of a group giving a workshop on recreation ecology and parks management to the Chilean agency that managed that country's national forests and parks.

> the first to see the problem in a new light, but he and I and several others brainstormed to develop the concept into a useful tool) realized that by defining acceptable conditions for different parts of the wilderness…managers could deal with the specific problem.
>
> "The question was not, 'How much use is too much?, but 'What kinds of conditions should be protected as essential to wilderness?' As soon as we focused on the needs of wilderness, the way to go was obvious," Lucas said (Close 1988c).

The fundamental concept underlying LAC wasn't new. "It was a form of management by objectives, I guess," Lucas said. What was new was how the idea was developed into a system and applied to land management.

Cole described the development and importance of the LAC system:

> Development of LAC involved extending various concepts advanced by team members and other scientists and integrating them in a framework that could be readily used by managers and planners. Since its development, LAC has been adopted in numerous situations, nationally and internationally, both within and beyond wilderness. It is hard to overestimate its influence on recreation planning. Its concepts (the focus on future conditions and the notion of acceptability) have influenced National Forest planning generally and have been adopted by other Federal agencies. In addition to North America, LAC is being used for park planning in South America, Central America, Africa, Europe, Australia, and Asia (Cole, personal communication).

The team summed things up in 1985 in a Station publication by Stankey, Cole, Lucas, Frissell, and Research Forester Margaret Petersen. *The Limits of Acceptable Change (LAC) System for Wilderness Planning* presented a logical, nine-step approach managers could use to cope with increasing demands on recreational areas. The system allowed for public participation and made it easy to show wilderness users the steps taken in making decisions. Cole, Petersen, and Lucas followed up in 1987 with *Managing Wilderness Recreation Use: Common Problems and Potential Solutions*, a Station publication that summarized information on alternative management tactics available for dealing with common problems.

Field personnel gathered data from visitors for many wilderness studies by Station scientists, but sometimes special arrangements were made to gather large amounts of information without having to make personal contacts.

Other important research by the wilderness management unit was work on the specific impacts caused by visitors. "David Cole did excellent research on the impact of recreational use on vegetation at campsites mainly, but also trails," Lucas said. "He showed clearly that a little use caused a lot of impact and more use added relatively little to damage. Managers were making the situation worse by trying to disperse camping use widely. He also showed clearly that some vegetation types were more durable and resilient, recovering faster" (Lucas, personal communication).

Cole's findings influenced management actions, and they also were applied to defining low-impact practices. A major result was *Soft Paths: How to Enjoy Wilderness without Harming It*, a book written by Cole and Bruce Hampton, senior staff instructor with the National Outdoor Leadership School in Wyoming. *Soft Paths* was the first of many books on low-impact practices. The principles and recommendations provided the foundation and curriculum for the "Leave No Trace" program, a cooperative endeavor of public land management agencies, non-governmental groups, and industry (Cole, personal communication).

The "Leave No Trace" program agreement was signed in 1991 by all the cooperators. National Outdoor Leadership School instructors became "headmasters" and the Soft Paths book and a video produced from it became aids to teach master instructors who in turn taught trainers to spread the concepts and techniques of low-impact use of the land (Tippets 1992a).

Not all work by the Station unit was adopted for general use. Lucas said, "Some great studies flopped on technology transfer. The wilderness travel simulation model looked like a very useful tool for planning trailhead use quotas and minimizing regulation. It would have complemented LAC nicely. It probably demanded too much data, and was ahead of its time. Computer phobia was still common in the Forest Service in the 1970s" (Lucas, personal communication).

On the 20th anniversary of passage of the 1964 Wilderness Act, *INTercom* (9/6/84) noted that the Station research unit had conducted studies in more than 25 wildernesses in Montana, Idaho, Wyoming, Utah, Alaska, California, Minnesota, and North Carolina. By that time, Research Social Scientist Alan Watson had joined the unit. He specialized in research on characteristics of visitors and their expectations, and worked on several of the studies in States outside the Rocky Mountain area.

Although always a relatively small unit (Lucas and Stankey were the only full-time scientists for many years), the wilderness researchers had a great positive influence on management of millions of acres of wildlands. Part of the reason was a concentrated effort to work with a broad group of fellow scientists and resource managers. That started when the unit started, with participation in a 1973 symposium sponsored by the Forest Service in Seattle titled "Management Implications of Wilderness Research." The gathering brought together managers, researchers, and environmentalists to discuss mutual

Research Social Scientist Alan Watson specialized in studies of the characteristics of wilderness visitors and their expectations.

concerns for managing wilderness and the need for new and relevant information (*INTercom* 3/8/79).

At the symposium, the need for a compendium of existing knowledge was discussed, which led to a national Forest Service publication, *Wilderness Management*. The book was the first to specifically address the issues and problems applicable to lands managed by the Forest Service, National Park Service, Fish and Wildlife Service, and Bureau of Land Management. Several years in preparation, *Wilderness Management* also served to synthesize most of the Station unit's early accumulated knowledge in a useful package. Stankey had principal responsibility for preparation of four chapters. Lucas headed work on three others.

In 1984-85, Lucas and Stankey presented the unit's research findings in a series of workshops for Forest Service personnel held across the Country. Both participated in sessions in the Southwest and Pacific Northwest Regions. Stankey served as an instructor at workshops in the other five regions. The unit's 20 years of research results were blended with wilderness management knowledge from throughout the world at a 1985 "National Wilderness Research Conference," co-sponsored by the Station with Federal management agencies, The American Wilderness Alliance, and Colorado State and Oregon State Universities. Lucas compiled the proceedings, published by the Station in two volumes.

The first volume contained 70 papers, including contributions from Taiwanese, Scottish, and Canadian scientists. The papers presented research results in nine subject areas. The second volume had 35 perspectives on wilderness values and states-of-knowledge for wilderness resources, user research, and future research directions. "The Wilderness Research Foundation," a nonprofit organization to support and sponsor research was established at the conference, with Lucas as a member of the board of directors.

The conference information formed a basis for an upgrade of the *Wilderness Handbook* started shortly before Stankey made a major career change in 1987 when he accepted a position in Australia with the New South Wales National Parks and Wildlife Service. He also taught in the Department of Leisure Studies at Kuring-gai College in Sydney (*INTercom* 4/2/87). Lucas finished his part of the handbook revision as a volunteer after retirement in 1989. The revision was issued by a private publisher.

Cole took over as unit Project Leader shortly before Lucas retired. He expanded the research into new geographic areas and started studies of the underlying reasons for conflicts between different types of wilderness users (*INTercom* 3/1/90). Cole handled the Project Leader duties until the unit became part of the inter-agency Aldo Leopold Wilderness Research Institute in 1993 (see "The Leopold Wilderness Institute," chapter 11).

Tree Planting Success Soars

In the late 1950s and early 1960s demand for National Forest timber surged. As harvest levels rose in Regions 1 and 4, reforestation became increasingly critical. Depending on natural processes to reestablish tree stands too often proved inadequate. Seedling survival rates historically had not been good, especially in Region 4 (see "Plantings Fail to Take Root," chapter 4), and something had to be done to improve both production and survival.

A lot was done. Region and Station personnel worked together in many areas to bring about dramatic improvements.

Region 1 moved its nursery operations in 1969 from Savenac where short growing seasons had long hampered seedling production, to a more favorable site near Coeur d'Alene. There, Station scientist Ray Boyd (Moscow) conducted research on soil fumigation, seed sowing dates, and seedbed densities, and conveyed the results to nursery managers (Boyd interview, 1993).

Region 4 developed a new nursery at Lucky Peak near Boise, and by 1965 it had the capability to produce 11 million seedlings annually (Alexander 1987). Station Project Leader Russ Ryker (Boise) launched studies similar to Boyd's work, and his efforts helped Lucky Peak managers overcome several production and quality problems.

Other Station research resulted in guidelines for preparing planting sites and safe and effective methods of using fertilizers and herbicides to control weeds in nursery stock seedbeds. Ryker received a national award in 1980 for his role in the cooperative Western Forest Tree Nursery Herbicide Study, which resulted in registration of several chemical herbicides for nursery use.

Ryker, fellow Station scientist Bob Ferguson, and Ed Ballard, a Boise National Forest electronics technician, developed a portable oscilloscope that sent an electronic signal through plant tissue to determine dormancy of nursery tree and shrub seedlings. The shape of waves on a screen produced by the

signals told whether the plant was actively growing, dormant, or dead. Personnel at Lucky Peak started using the equipment in 1974 to determine dormancy of planting stock before fall lifting. The developers wrote a Station publication describing the technology, *Portable Oscilloscope Techniques for Detecting Dormancy in Nursery Stock* (*Forestry Research West* Oct./76). Nurseryman Frank Morby and Ryker wrote an article for *Tree Planter's Notes* describing how seedlings lifted in the fall at the nursery had been successfully planted early the following spring.

Ferguson said in a 2005 interview, "We had a lot of fun testing all sorts of plants with the oscilloscope around the City of Boise." Local lore was that the researchers even attached the electrodes to a telephone pole to ensure that the device was correctly determining that dead plants were indeed deceased and not merely "playing dead" in dormancy.

Improvements at the nurseries helped, but Regional and Station silviculturists recognized the importance of developing and putting into practice optimum methods for shipping, storing, handling, and planting seedlings. In Region 4, Al Dahlgren worked closely with Station researchers. He became known for pushing a "tender, loving care" approach and personally showing National Forest field crews how to properly handle and plant seedlings (Bryan Ferguson interview, 2005).

Dahlgren wrote a guide to successful seedling storage in snow caches, which the Station published in 1974. Ryker and Morby helped the cause by writing a 1975 Station publication, *Winter Storage and Packaging Effects on Lucky Peak Seedlings*. Similar research and development work in Region 1 was summarized in a 1983 Station publication, *Lifting, Storage, Planting Practices Influence Growth of Conifer Seedlings in the Northern Rockies,* written by Boyd and Coeur d'Alene nursery personnel Stephen McDonald and Donald Sears. Station scientists later conducted studies in both Regions of the performance of containerized planting stock versus the bare-root seedlings the nurseries were producing.

Ponderosa pine is one of the most widely distributed and valuable pines,

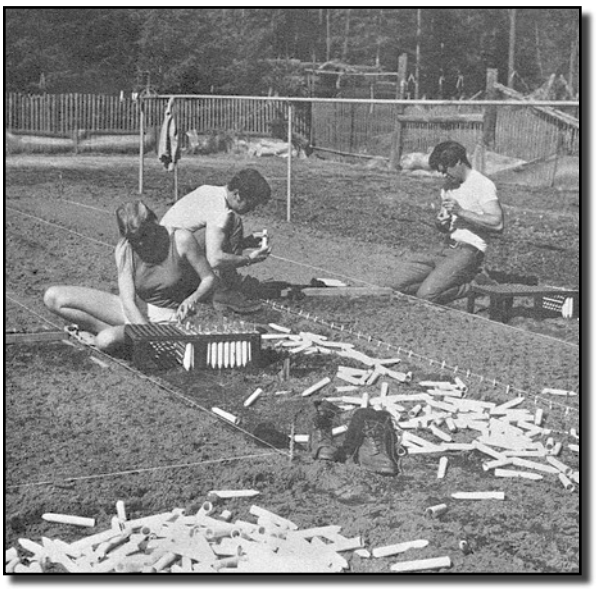
Frank Morby, nurseryman at Lucky Peak Nursery, used a portable oscilloscope developed by Station scientists Bob Ferguson and Russ Ryker and Boise National Forest technician Ed Ballard to test seedling dormancy in 1976.

but by the 1970s many cutover areas had been invaded by brush or less desirable tree species (*Forestry Research West* July/1975). Station scientists had a wealth of information to bring to bear on the problems. Research on ponderosa pine regeneration had started in 1911 at Priest River and in 1928 in the Boise Basin. In 1973, the Station issued a state-of-the-art publication by Marv Foiles, silviculturist at Moscow, and Jim Curtis. Curtis preceded Ryker as Project Leader at Boise.

In *Regeneration of Ponderosa Pine in the Northern Rocky Mountain-Intermountain Region* Foiles and Curtis pointed out that healthy nursery stock and care in handling and field planting were essential, but they also said, "Selection of a proper seed source is an important first step in any reforestation effort." The nature of a "proper seed source" could vary widely among different tree species. The quality of seed trees was always a factor, but considerations could include elevation, climate, habitat type, and distance from the planting area.

Geneticist Jerry Rehfeldt was a leader in defining optimum seed sources and advising managers on how to locate them. In one study, he developed seed zones for inland Douglas-fir that was the basis for a tree improvement program with the species based on eight zones and 300 superior trees within each zone (Noble 1978a). Rehfeldt wrote Station publications presenting seed transfer guidelines for Douglas-fir in northern Idaho, central Idaho, and western Montana. He also published seed transfer guidelines for western larch throughout the Northern Rocky Mountains.

Another study, with coworker Ray Steinhoff, had a surprising result. Rehfeldt and Steinhoff found that western white pine, in contrast to Douglas-fir, did not vary genetically in the Northern Rocky Mountains with geographical or habitat factors. Breeders of western white pine were delighted; they could concentrate on developing blister rust resistance and other desirable traits without concern about environmental adaptation.



Seasonal employees planted container-grown Douglas-fir seedlings in 1978 at Priest River for a study to determine if success rates would exceed those of bare-root stock.

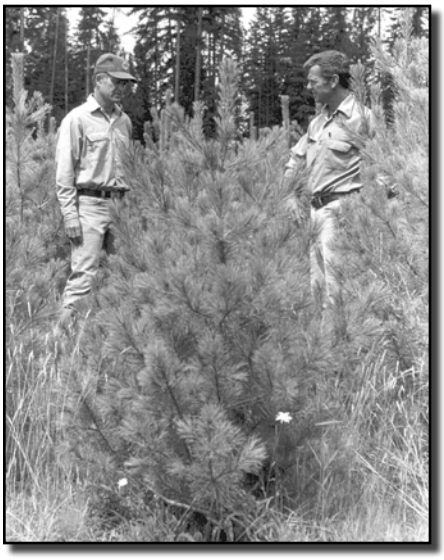
Rehfeldt also did basic research on genetic variability, and published frequently in scientific journals. He, Project Leader Ray Hoff, and others in the genetics unit at Moscow were interested in developing a variety of desirable tree traits, such as resistance to forest pests (*INTercom* 11/25/86). Growth rate improvement was also an objective. In his work with Douglas-fir, Rehfeldt found that a 30 percent gain in growth rate could occur when the fast-growing coastal variety was crossed with the hardier inland variety.

The genetics unit members extended their expertise into day-to-day operations when Regions 1 and 4 created regional geneticist positions. The first person to hold the job in Region 1, George Howe, was stationed with the Moscow unit for several months of training. Rehfeldt and Technician Pat Wells received letters of commendation from Region 4 for working with the regional geneticist in providing "excellent information and field assistance in developing the Region's tree improvement and seed collection programs." (*INTercom* 7/23/81).

The Intermountain and Rocky Mountain Stations made a contribution to tree improvement generally by agreeing to publish annual proceedings of the Intermountain Nurseryman's Association. The Stations handled the task in alternate years.

Did the research and management efforts improve planting success? In 1971, the average first-year seedling survival rate in Region 4 was 70 percent, considered poor performance because survival generally declines in subsequent years (Bryan Ferguson interview 2005). The average rate between 1979 and 1983 improved to a very good 83 percent, and in 1983 the Region reached the 92-percent level, putting it among the top Regions nationally. Alexander (1987) said Region 4 had become "enormously successful in its regeneration efforts."

Despite successes, improvement work continued. Shortly before he retired in 1985, Ryker was selected as coordinator for a joint national program by Timber Management and Timber Management Research to set up a consistent, systematic method of



Geneticist Jerry Rehfeldt (left) and Technician Pat Wells, shown here looking at variation in trees growing in a uniform garden at Priest River, played major rolls in improving planting stock and survival in Regions 1 and 4.

management at the 11 Forest Service nurseries. The concept was that the good performances had depended heavily on the knowledge and skills of individual nurserymen, and there was a need to develop "corporate memory" for a unified approach to nursery operations.

Geneticists at Moscow continued to make major advancements in the science of reforestation. The understanding of adaptation of conifers to local environments was coupled with predictions of site-specific forest climates and theories of climate change. This enabled managers to determine which seed sources would be adapted to sites as climate change progresses. Rehfeldt and colleagues learned to predict how conifer species distributions would change over time and which seed sources would be adapted to changed climates in the western United States.

The Stamp of Quality

In 1967 the Station took a big step toward developing and maintaining high-level statistical efficiency and integrity throughout the research program. A Station Statistician position was created at Headquarters, and Chet Jensen moved from the Northeastern Station to fill the job.

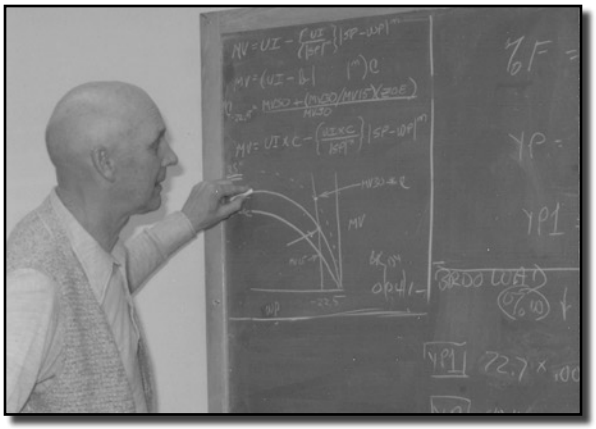
The Station had statistical expertise in some units before Jensen's arrival. Having the central position, however, freed the scientists from some review tasks and also made biometric expertise readily available to all research units. Jensen reviewed and approved publication manuscripts that included statistical analysis, worked with individual scientists to develop sound statistical designs for studies, and conducted personal research.

His personal work resulted in creation of MATCHACURVE, a technique used to portray the relations between interacting variables in complex biological and physical systems. MATCHACURVE was described in a series of Station publications, putting it into use world-wide. In 1978, the technique earned Jensen a USDA Superior Service Award for "pioneering and far-reaching efforts in the development and application of an advanced regression analysis technique that has greatly enhanced the analytical skills of scientists" (*INTercom* 6/8/78).

A Brazilian scientist cited his group's use of MATCHACURVE to describe river level fluctuations in the Amazonian system (*INTercom* 9/9/76), and two Finnish researchers said they used the technique in a study to provide a long-term production model for growing stock. The Finns closed their letter with, "Our best thanks and congratulations to the founding father of the new revolutionary regression analysis techniques" (*INTercom* 10/30/75).

Jensen retired in 1980 after nearly 36 years with the Forest Service. He was succeeded by Gordon Booth, a mathematical statistician with the Agricultural Research Service at Ames, Iowa. Booth headed what evolved into the Station's Statistics and Computer Science Group for 14 years.

Booth was active in the American Statistical Association, and was elected President of the Utah Chapter in 1986. He served as the only Forest Service member on a national committee of government, industry, and university people seeking better use of statistical methods in studying such environmental issues



Chet Jensen created MATCHACURVE, and many statisticians found the procedures useful.

as acid rain, stream contamination, toxic waste, and radiation (*INTercom* 9/1/88) .

In 1985, the Statistics Group, which then included Gayle Yamasaki and Charles Graham, extended its advisory function by starting a newsletter to better communicate with research personnel (*INTercom* 9/19/85). The newsletter emphasized areas that appeared frequently during reviews of manuscripts and study plans by the statisticians and also contained information on using statistics with personal computers, a relatively new area at the time.

Jensen, Booth, and their coworkers put the stamp of quality on a great many research products throughout a large part of Intermountain Station history.

Introducing Friendly Fires

Station scientists studied and advocated the use of fire in resource management from the very beginnings of the organization.

Julius Larsen studied fire behavior at Priest River as part of his early silvicultural research. At Great Basin, Arthur Sampson published his first report on the role of fire in aspen regeneration in 1916. Bob Marshall looked into the effects of wildfire on white pine regeneration in 1928. Joe Pechanec published the first treatise on the good and bad effects of fire in sagebrush ecosystems in 1944.

Station scientists were among the leading proponents of allowing wildfires to play their natural role in some ecosystems, a position that could be lonesome in an organization like the Forest Service with an historic bias for all-out fire control. But planned introduction of fire or tolerance of wildfire in certain circumstances, both forms of "prescribed fire," eventually came to be seen as beneficial by resource managers and a growing segment of the general public.

Setting Friendly Fires—The Miller Creek and Newman Ridge studies, started in 1967 in the Flathead National Forest near Whitefish, Montana, were milestones in documenting the behavior and effects of prescribed burns. Before the 1960s, foresters almost exclusively used fire to dispose of tree tops and branches (slash) after logging. Research results at Miller Creek showed managers how to predict effects of fire on tree regeneration and the response of animals and other plants (Latham and others 1998). This helped make prescribed fire acceptable as a professional tool in forest management, not just a way to eliminate logging residue.

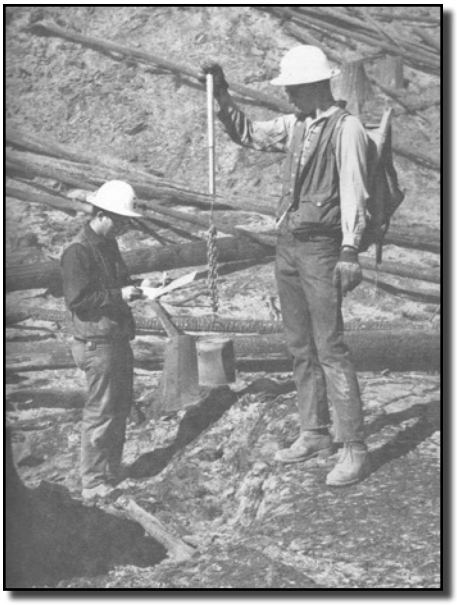
The Flathead National Forest set aside 5,500 acres for studies at Miller Creek and a multidisciplinary team of scientists from seven research units worked closely with Ranger District personnel to locate plots and make measurements before, during, and after timber harvests and prescribed burning (Shearer and Wirt 1996). Sixty units on different slopes were marked for clearcutting and burning; most of the work was completed by fall 1968. In August 1967, a wildfire had burned through 13 units, providing a rare opportunity to compare regeneration and plant succession on similar areas burned naturally and by prescribed fire.

Most of the original studies ended in 1974, but some research on plant succession extended through 1989. A general study combining succession and tree development investigations was planned to continue indefinitely. The plant succession research was an important part of a larger study spearheaded by personnel in the wildlife habitat research unit (see next section).

Similar research began at Newman Ridge near St. Regis, Montana, in the Lolo National Forest almost at the same time studies started at Miller Creek. The area covered was smaller—16 units were logged and burned—but the scope of the research was somewhat broader. The Newman Ridge studies were tied to preparation of a revised National Fire Danger Rating System and also included watershed effects and air quality considerations.

Fire Lab Chief Art Brackebusch was quoted in *The Missoulian* as saying, "This is the first time in the history of forestry research that such a comprehensive, integrated approach has ever been undertaken to provide the answers to pressing resource management questions."

The apprehension within the Forest Service and the general public about the idea of deliberately starting a forest fire was addressed in reassuring statements



Station personnel weighed water cans before and after a prescribed fire at Miller Creek. Differences in weight helped them calculate the energy released by the intense burn.

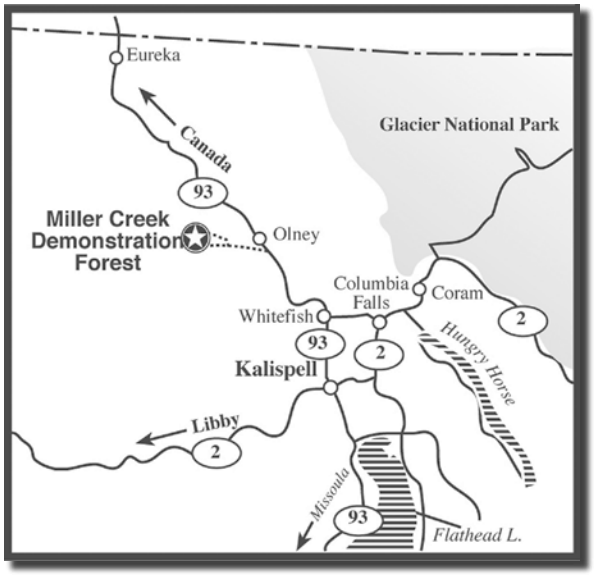
by Sam Evans, Region 1 silviculturist who was a member of the steering committee for the Miller Creek-Newman Ridge studies. Evans said, "The decision of the Forest Service deliberately setting fires in a critical hot weather, high-burning-index period was not made lightly. The idea of the Forest Service going against Smokey Bear's teachings was not passed over lightly. Still we needed information so badly that we had to take a real calculated risk to go ahead with the study during a period when we normally try to avoid fire" (Eggensperger 1967).

There was a risk. A research fire set in mid-July at Newman Ridge escaped and burned about 90 acres of standing timber before Ranger District firefighters got it under control. The Forest Service headed off any controversy by sponsoring a "show me" trip to the area that included news media. Apparently, the explanations were successful in convincing any skeptics that the potential benefits of prescribed burning more than balanced losses should a fire get away.

Fire Lab scientists Bill Beaufait, Mike Hardy, and Bill Fischer summarized Miller Creek-Newman Ridge fire research results in a Station publication issued in 1977. Beaufait was the main coordinating scientist during the Miller Creek-Newman Ridge studies. He was primarily responsible for the study design and application of fire treatments (J. Brown, personal communication).

Prescribed fire research in western larch-Douglas-fir tree stands cut selectively was conducted elsewhere in Montana by Rod Norum. All the results eventually were available to managers as part of prescribed burning guidelines. In 1981, Watershed Scientist Norb DeByle compiled and wrote a Station publication, *Clearcutting and Fire in the Larch/Douglas-Fir Forests of Western Montana-a Multi-faceted Research Summary*, which presented all the Miller Creek-Newman Ridge results to that time. It included contributions by 10 Station scientists and three cooperators who conducted the studies.

Workshops and tours for resource managers provided a more personal approach to getting the research results into use. Twenty years after the research started, one workshop attracted 100 forest managers and wildlife and timber specialists from Federal and State agencies. Region 1 Ecologist Wendell Hann attended and commented on the value of the Miller Creek-Newman Ridge work: "We have learned and applied a great deal from this study. Study results have helped guide our policies toward prescribed fire. Other information from this study is helping us manage timber from a multi-resource standpoint" (*INTercom* 7/23/87).



The basic timber management conclusion from the research was undeniable. In the extensive western larch forests of Montana, prescribed fire after clearcutting meant more seedlings established faster than if nothing was done, regardless of when the fires were set. An economy factor was involved; using the study results managers could avoid unnecessary planting costs by waiting for inevitable natural regeneration to take place. The wildfire that allowed unusual tree-growing studies also produced an interesting result for wildlife. It created hundreds of acres of redstem ceanothus and willow, and the food supply led to the highest density of moose of any place in the lower 48 States at Miller Creek (Tippets 1996a).

The research illustrated the advantages of Station-sponsored studies. "The ability to carry on this kind of long-term research is unmatched by anyone outside the Forest Service," Station Director Larry Lassen said. "Universities can only take on 2- or 3-year studies. We can go over decades" (*INTercom* 1/8/87). Research at Miller Creek also was an early step in the evolution of utilitarian forestry to ecosystem management in which foresters placed more balanced emphasis on the nontimber parts of the ecosystem. The goal was to maintain forest health in the future (Tippets 1996a).

In 1989, the Flathead National Forest designated Miller Creek as a demonstration forest and signed an agreement with the Station to protect the study areas and promote future research.

Miller Creek's special features as a demonstration area were made available to educators and students on many levels. Research Silviculturist Ray Shearer teamed up with educators to produce two Station publications to enhance Miller Creek's use as an outdoor classroom. One was a field guide complete with commentary on two self-guided tours (Latham and others 1998). The other, with Bill Schustrom, a high school environmental science teacher, as senior author, was a guide for teachers designed as a supplement to the field guide.

The field guide was the product of a cooperative agreement by the University of Montana, the Station, and the Flathead National Forest. The agreement also resulted in a traveling exhibit, "Forest Born of Fire," which was loaned to community and government groups. Peter Stickney, a Station plant ecologist, contributed results of long-term understory vegetation studies at Miller Creek to all the educational materials.

Miller Creek was not the only place where Station scientists conducted studies to show the role and utility of fire in Region 1 and 4 forests. Steve Arno and others in the fire behavior and forest ecosystems research units based in Missoula worked in many areas of the Station territory. Arno was a prolific author and became an authority on the role of fire in forests.

Fire scars on western larch and ponderosa pine helped forest ecologists learn the natural history of fire occurrence. The scar shown here by Research Forester Ray Schearer indicated that frequent low-intensity fires created an open, park-like stand of old trees. Ecologist Steve Arno and associates dated nearly 900 individual scars on living trees to show the historic role of fire in the Bitterroot National Forest.

In 1977 Arno led a major study to determine historical frequency, intensity, and influence of fire on stand structure and composition in various forest types in the Bitterroot National Forest in west-central Montana. It was one of the foundations of ecosystem research that became a major component of the Station program in the 1990s (see "The Ecosystem Approach Comes to Lick Creek," chapter 11).

Arno and others dated nearly 900 individual fire scars on living trees, and analyzed age classes of shade-intolerant trees attributable to fire. Results of the study showed that fire was historically a major force in stand development in all forest types, but its significance had decreased markedly since the early 1900s, possibly because of organized fire suppression (*Forestry Research West* July/77).

Monitoring Friendly Fires—In late August of 1973, Orville Daniels, Supervisor of the Bitterroot National Forest, told a fire crew boss to have his men pack up their tools and leave the site where a 1,000-acre wildfire was burning. "We're not fighting this one," Daniels said. "You're in the White Cap Fire Management Area. Fires in this zone are not automatically put out" (Mutch 1974).

Daniels was watching over the first prescribed natural fire program in the National Forest System. The program was developed starting in 1970 in the Selway-Bitterroot Wilderness in Montana by Station and University of Montana scientists and forest personnel directed by Station fire researcher Bob Mutch and Dave Aldrich of the Bitterroot National Forest. The goal was to incorporate the natural role of fire into a new fire management plan for the Wilderness, starting with a 100-square-mile study area.

The area was divided into ecological zones and specific fire prescriptions were written for each zone. The prescriptions gave fire managers and dispatchers guidelines as to what could be done with different types of fires and when different options should be exercised. "Monitor the fire, but take no action," was one of the options. There were constraints on the new policy, however. Providing for the safety of people and preventing major adverse effects from occurring outside the management area were overriding considerations (*Forestry Research West* July/75).

Such plans had been made earlier by other organizations, notably the National Park Service, and proposed for many years within the Forest Service. But the White Cap management scheme was a first for the Forest Service, and as such it was closely scrutinized. Its first test was easy to pass; its second was not.

A fire caused by lightning in 1972 in the shrubfield zone was the first to be handled under the new prescriptions. It was monitored, but allowed to burn. Four days after the fire started, an aerial patrol observed that it had gone out naturally. The final size was 24 by 24 feet. This was the only fire in the study area during the year.

Extremely dry conditions prevailed in 1973, and seven fires were ignited by lightning in the study area, including the Fritz Creek Fire that eventually expanded to 1,200 acres. The prescriptions called for observing this fire, but to prevent its spread into a low-elevation timbered area. Part of the fire moved in that direction, and suppression actions were started there while the rest of the fire was allowed to burn. Part of the fire crossed White Cap Creek, starting another blaze that was suppressed. The Fritz Creek Fire burned for 43 days before being extinguished by fall rains.

Station scientists moved into the area to analyze effects of the fire on vegetation and wildlife, and to assess fuels, smoke, and opinions of people who witnessed the blaze. Thirty years later, Station scientists said they considered White Cap the most successful prescribed natural fire program in the National Forest System (Rocky Mountain Station 2004).

The White Cap study and others that followed, combined with a growing number of successful uses of prescribed fires set by foresters and range managers to improve natural environments resulted in a major Forest Service policy change in 1978. To that time, the "10 a.m. policy" was the order of the day. Basically, it mandated that any wildfire would be controlled as quickly as possible. The new policy, announced by Assistant Secretary of Agriculture M. Rupert Cutler, said, "In the future some forest fires which start on National Forest System lands will be used for predetermined beneficial purposes rather than being put out immediately."

Fire management activities were to be determined by objectives set forth in National Forest plans. Those objectives included improving timber stands and wildlife habitat and reducing the threat of large fires by preventing the accumulation of excessive amounts of fuel (Noble 1988). The early research efforts to explain the natural role of fire and its importance in ecosystems also led to a major organizational change in the Forest Service. The Division of Fire Control was changed to the Division of Fire Management. The implications of this name change were huge (J. Brown, personal communication).

Fueling Friendly Fires—Before prescribed fire of any type can be used effectively, fundamental knowledge of the nature of the fuels is needed. Without this knowledge in the form of "fuel models," fire behavior models and the National Fire Danger Rating System could not operate effectively. Assembling the necessary knowledge and packaging it for use by managers was the job of the Station's fire effects unit.

Jim Brown was a participant in changing the role of fire in the Station territory for three decades. He joined the fire effects unit at the Fire Lab in 1965 and became Project Leader in 1979. When he received a Superior Science Award from the Chief of the Forest Service in 1993, Assistant Station Director Dick Krebill said Brown was "the foremost wildland fuels person in the United States, and probably the world." Brown was a forester who received a bachelor's degree from the University of Minnesota, a master's from Yale, and a Ph.D. from Michigan (*INTercom* Feb./93). He led what was at first a relatively small unit at the Fire Lab, but it was a very effective unit.

Arno provided ecological research skills, Research Forester Bill Fischer was a technology transfer leader, Meteorologist Arnold Finklin added climate data, Cam Johnston contributed computer skills, and Research Forester Kevin Ryan and Forester Dennis Simmerman worked on a variety of field studies.

The unit's end products were field guides and computer information systems. Because of the emphasis on creating ways to package information for easy use, the researchers were referring to their unit as a "research and development" group in the early 1980s, many years before Forest Service Research added "Development" to its official name. The nature of fire effects research involved many disciplines, so the unit worked with numerous researchers and land managers through agreements with a dozen universities, private firms, and public agencies.

Before he joined the Station, Brown did research on field measurement of fuel properties and he assumed

Project Leader Jim Brown sampled and measured dead and down woody materials to establish fuel loading relationships.

responsibility for that work and fuel inventory research at the Fire Lab. An important summary of the research was the *Handbook for Inventorying Downed Woody Material* written by Brown and published by the Station in 1974. The information was incorporated in Forest Service management handbooks throughout the U.S., and the system became popular internationally. Station authors sometimes employed unusual methods to produce manuscripts (or to avoid the writing chore), but Brown's writing environment for the handbook was unique. He was recovering from failed back surgery, and wrote the whole document while lying on the floor, the only position he was able to adopt at the time.

In 1976, Brown and Johnston developed a computer system to predict quantities of slash fuels based on characteristics of the crowns of Rocky Mountain conifers. In 1981, Fischer made some of the key research results very user-friendly when he published Station photo guides for appraising downed woody fuels in Region 1. The next year, Brown, Johnston, and Forester Rick Oberheu widened the application by publishing the *Handbook for Inventorying Surface Fuels and Biomass in the Interior West*, a Station technical report.

Drawing on experience in the White Cap study and elsewhere, Fischer in 1985 published an aid to wilderness managers developing new strategies for managing fire as a natural force. The *Wilderness Fire Management Planning Guide*, issued by the Station, presented concepts applicable nationwide. Because the whole area of wilderness fire management was relatively new and standard terminology had not been established, the report suggested common terms that were both logical and easy to understand (*INTercom* Apr./85).

The decline of aspen in the Interior West was a long-term problem. It got attention from Station scientists starting with Arthur Sampson in the early 1900s and later studies conducted by Norb DeByle, Walt Mueggler, Dale Bartos, and others. Other important research was done by scientists at the Rocky Mountain Station. The range researchers and the fire effects unit developed the scientific foundation for using prescribed fire in aspen management. Aspen stands are difficult to burn. Brown and Simmerman made a basic contribution in 1986 when they published

Forester Dennis Simmerman evaluated fire effects 4 days after a planned burn at Manning Basin in western Wyoming in 1981. Station research showed that the absence of occasional fire was one important cause of aspen trees being replaced by other vegetation on large acreages throughout the Interior West.

"*Appraising Fuels and Flammability in Western Aspen*," a Station report that told managers when and where they could burn to expect success within acceptable risk limits (Tippets 1991a).

Finding Friendly Fire Facts—The fire effects unit had a goal of developing "expert" computer systems that would give natural resource managers an easy and readily available means of accessing information regarding fire's effects on specific wildland plants, plant communities, and associated wildlife. Brown said what became the Fire Effects Information System (FEIS) was developed when managers began to frequently suggest that the unit undertake specific research, and the scientists knew the information already existed. "We wanted to do more than just direct them to the literature," Brown said (*INTercom* 5/26/88).

The information was scattered throughout many scientific reports, and some important facts were not in the scientific literature. The unit, with Fischer leading the effort, set out to develop a "fire effects encyclopedia" in 1986 (*INTercom* 10/30/86).

Fischer explained the first step: "We've collected and summarized a great deal of scientific literature that will enable us to develop the 'rules' necessary to create an expert system." The system was designed in cooperation with the University of Montana's Computer Sciences Department. The Bureau of Land Management (BLM) supported development of the prototype data base for a sagebrush ecosystem, which included information on 100 plants, 25 sagebrush cover types, and 25 wildlife species.

By 1988, the National Park Service signed on as another sponsor, the FEIS had expanded to include information on additional plants, and BLM personnel had gained considerable experience in using the system. The Station scientists began a test with Region 1 Forest Service employees, giving access and training to 50 resource managers and getting their opinions on the value of the system. Results were positive, and a training session was held for Region 4 personnel.

At that time, Brown said, "the usefulness of the information system is much broader than just for fire effects applications. The information is so comprehensive that FEIS is a multidisciplinary tool of use to everyone working with vegetation management." A Region 4 trainee agreed. "Regardless of what hat I might be wearing, as a fire coordinator or as a silviculturalist, this system seems to have a lot of applicability," he said (*INTercom* 5/26/88).

Many others saw the value of the FEIS, and it soon went national under the sponsorship of the National Wildfire Coordinating Group, which included the BLM, Forest Service, U.S. Fish and Wildlife Service, National Park Service, Bureau of Indian Affairs, and the National Association of State Foresters. Forest Service employees could access the system through the agency's standard computer network. Others could dial in through a modem. FEIS access methods were described in a concise pamphlet written by Bert Lindler, a Station editor, and circulated to thousands of fire personnel through the National Interagency Fire Center in Boise.

The brochure and other methods of publicizing FEIS were successful. In 1992 more than 4,000 resource managers requested information on fire effects; about 500 of the requests were from agencies other than the Forest Service. Foresters, ecologists, wildlife biologists, and others were using the system to help plan prescribed fire, rehabilitate burned land, prepare fire management plans, and plan forest, range, and wildlife habitat improvement projects. FEIS had expanded to include information on 625 plants, 35 wildlife species, one ecosystem, and 11 cover types. Expansion was continuing (*INTercom* Feb./93).

Fire effects scientists applied mathematical analyses and computer science to produce a model that provided another type of effects information to managers. The First Order Fire Effects Model could be used to predict fuel consumption, mineral soil exposure, tree mortality, smoke production, and other direct results of a fire for most ecosystems in the U.S. Software that worked on personal computers was distributed from the Fire Lab. A user's guide to the model, written by Research Forester Elizabeth Reinhardt, Research Ecologist Bob Keane, and Brown, was published by the Station in 1997 (*Forestry Research West* Sept./97).

Brown retired at the end of 1995. The fire effects unit that consisted of seven people when he joined it in 1965 included 18 employees.

Bill Fischer showed Region 4 Ecologist Al Winward how to use the Fire Effects Information System at a workshop in 1988.

The Fire Effects Information System developed by Station researchers gave land managers an easy way to get information needed to conduct prescribed burns that achieved desired results.

Helping Elk Thrive

Expansion of the Forest Service research program that began in the late 1950s included establishment of wildlife habitat research units, but this development moved slowly. In 1958, national reports for the first time included sections on "range and wildlife habitat research" (U.S. Department of Agriculture 1958), not simply "range research."

Although this implied that wildlife habitat studies had become widespread, for several years most of the research results reported in the sections pertained principally to domestic livestock, and only incidentally to wildlife. And wildlife other than big game animals rarely rated a mention. Forest Service national organizational directories did not include "wildlife habitat" in research division labels until 1962.

At the Intermountain Station, wildlife habitat research was cooperative work conducted by scientists employed by other agencies until Jack Lyon arrived in 1962 as Project Leader of the first research unit devoted exclusively to habitat research. Personnel in the new Missoula unit consisted of Lyon and Plant Ecologist Peter Stickney. Several years later, Wildlife Biologist Joe Basile was assigned to the project, although his office continued to be in Bozeman. The small staff and tight budgets required the unit to work in cooperative programs with resource managers, universities, and other agencies if meaningful research results were to be developed (Lyon, personal communication).

Lyon had bachelor's and master's degrees from Colorado State University in wildlife management and had worked for the Colorado Game and Fish Department as a research biologist for 6 years in a pheasant habitat research program while completing work on a Ph.D. at the University of Michigan. In Missoula, it didn't take him long to steer the new Station unit into elk habitat studies.

Although both elk and timber were high-value resources in the Northern Rocky Mountains, little research had been done to substantiate assertions that timber harvests either improved or damaged wildlife habitat. Both viewpoints were being expressed with growing vigor in the 1960s as timber harvesting accelerated in National Forests. Lyon said that a research program to resolve suspected elk and logging conflicts required (1) identification of the basic environmental requirements of elk; (2) identification of the environmental modifications caused by logging; and (3) assessments of the ability of elk to adjust to specific environmental modifications (Lyon 1971). Forest modification obviously altered the vegetation that was needed for elk food and cover. In the northern Rockies, large areas had been severely disturbed by fire and Lyon and Stickney exploited that situation by starting a long-term study of plant succession in burned areas, some of them areas where logging had been followed by broadcast burning.

Wildlife Biologist Jack Lyon became an authority on elk management with a combination of high-tech research and the ability to work effectively with many colleagues in universities and management organizations.

The goal was to generate plant succession data without the biases inherent in earlier succession research that sampled forest stands of varying ages in different locations. The previous studies failed to account for considerable variability caused by site differences and differences in the way plants colonized the disturbed sites. Stickney, later joined by Plant Ecologist Bob Campbell, recorded data from 55 sites at five locations over 25 years. The locations were prescribed burn areas and wildfire areas—Miller Creek in the Salish Mountains, Newman Ridge in the Coeur d'Alene Mountains (see previous section), a Priest River area and the Sundance Burn in the Selkirk Range, and the Plant Creek Burn in the Sapphire Range. Lyon also published results of succession research for a prescribed fire area near Ketchum, Idaho (1971) and the Sleeping Child Burn in western Montana (1976).

Stickney presented data base information at intervals in Station publications, and he and Campbell updated results in a Rocky Mountain Station summary publication (Stickney and Campbell 2000). The publication was intended to provide plant succession data that could be applied to wildlife habitat and other wildland management problems. It also was designed to serve as a data source for scientists constructing forest succession and ecosystem models.

Plant succession research continued as part of the Rocky Mountain Station's participation in the Ecosystem Management and Research Program in the Bitterroot National Forest (see "The Ecosystem Approach Comes to Lick Creek," chapter 11). Predicting succession is especially important in planning rehabilitation of wildland areas following fires, making it possible to determine which sites need planting and seeding and which are likely to make satisfactory recoveries naturally.

In 1970, the Montana Cooperative Elk-Logging Study began. The study provided an umbrella research framework for six different organizations,

Ecologist Peter Stickney took readings at permanent plots in 1992 at Cora Road near Missoula as part of the wildlife habitat unit's forest succession studies.

with each pursuing individual studies that when combined provided a vast amount of information about elk, their habitat, and the effects of various types of timber harvests on them. The organizations were the Station, Region 1, the Bureau of Land Management, the University Of Montana School of Forestry, the Montana Department of Fish, Wildlife and Parks, and the Plum Creek Timber Company.

Lyon played a lead role in the study, and administrators in the National Forest System and State wildlife management considered the results of his work to be extremely important to successful elk management in Montana. Lyon was involved in the study from start to finish (15 years), serving on the coordinating committee, planning and conducting relevant Station research, and helping to transfer results to resource managers. He provided important continuity as other lead scientists, funding, and active cooperators changed over the years.

The total study produced numerous findings and recommendations contained in some 80 publications, including 50 professional papers (14 by Lyon) and 13 graduate theses. Lyon was senior author of *Coordinating Elk and Timber Management*, published by the Montana Department of Fish, Wildlife, and Parks in 1985. The publication summarized results and included a series of recommendations and management guidelines. The bottom line was that elk and logging could co-exist if each was carefully managed.

Lyon said (personal communication) that the road density model for evaluating elk habitat effectiveness produced early in the study was "used by more people on more forests than anything else that came out of the Elk-Logging Study." A Region 1 history (Baker and others 1993) said, "The years of study and interagency cooperation resulted in more knowledgeable and effective game management in the Northern Rocky Mountain area." The history cited closure of designated forest roads, permanently or intermittently, on both public and private lands to provide security and cover to elk herds as important management actions inspired by the study.

Another duty occupied much of Lyon's effort even as the elk-logging study was being planned and starting up. He was assigned to a team of specialists, including Paul Packer, a Station watershed scientist, and Jack Schmautz, a Region 1 range conservationist who had been a Station researcher, to review forest management in the Bighorn, Shoshone, Teton, and Bridger National Forests in Wyoming. The study was initiated by Regions 2 (Rocky Mountain Region) and 4, partly because of complaints about management, especially in lodgepole pine areas, by environmental groups and Senator Gale McGee of Wyoming, and partly because of concerns by officials within the Forest Service.

The study team's 1971 report, *Forest Management in Wyoming,* revealed many problems. Clearcuts had often been too large, roads poorly designed, and attention to wildlife and esthetic values insufficient. The team recommended more attention to interdisciplinary and multiple-use values in planning timber management activities. In 1982, the study team reconvened, with the addition of three representatives of the State of Wyoming, to reexamine the situation. Their 1983 report indicated that all the National Forests had made some progress, but that improvements still were needed. The two reports served as catalysts for many management changes in Wyoming and elsewhere (Alexander 1987).

Lyon said a cooperative effort he was heavily involved with starting in the mid 1980s "succeeded beyond all our expectations." The Elk Vulnerability Symposium, hosted by the Montana Chapter of The Wildlife Society, brought 400 participants to Bozeman in 1991. It was the largest gathering of wildlife professionals ever to assemble to discuss a single wildlife species (Lyon, personal communication). Lyon said the discussions encompassed all facets of managing elk populations as a joint venture between game managers and land managers, "establishing a benchmark in ungulate management."

Symposium participants recognized a need to incorporate hunter behavior into planning, yet at the time information on that subject had been acquired almost solely through interviews. Lyon and Milo Burcham, research specialist at the University of Montana, led a study in the Garnet Mountains in western Montana to provide reliable data. During three fall hunting seasons, elk hunters were equipped with Global Positioning System recorders that showed the positions of the hunters through readings taken at 15-second intervals.

In a novel approach to wildlife habitat research, Station scientists and cooperators tracked hunters by having the hunters carry global-positioning units in their backpacks while they stalked elk.

The data showed where and how long hunters traveled and, when correlated with other information, provided a solid foundation on which a hunter density and elk vulnerability model could be developed. Lyon and Burcham presented the study results in many meetings with managers and scientists and summarized them in a 1998 Rocky Mountain Station publication, *Tracking Elk Hunters with the Global Positioning System*.

Another result of continued cooperative work was publication by the Station in 1993 of *Elk Management in the Northern Region: Considerations in Forest Plan Updates or Revisions*.

Authors were Alan Christensen, Region 1 Wildlife Program Leader, Lyon, and James Unsworth, Principal wildlife Research Biologist for the Idaho Department of Fish and Game. The report carefully defined fundamental concepts to prevent their misapplication in forest plans. Although targeted to Region 1, the publication contained information useful to big game managers elsewhere (*Forestry Research West* April/94).

Lyon's expert status resulted in an invitation to write, with Rocky Mountain Station scientist Lorin Ward, the chapter on "Elk and Land Management" which was included in *Elk of North America: Ecology and Management*. This authoritative text was published by The Wildlife Management Institute in 1982. So much new information was produced by continuing research that Lyon and Christensen completely revised the chapter for inclusion in *North American Elk: Ecology and Management,* published in 2002 by The Wildlife Management Institute and the Smithsonian Institution as an extensively updated version of the 1982 work.

Lyon was first author among seven scientists who produced another important state-of-knowledge publication in 1978. *Effects of Fire on Fauna* was issued as a national document by the Forest Service. Continuing research brought big changes in the knowledge recorded, just as it did for the elk ecology and management text. In 2000, the Rocky Mountain Station published a comprehensive revision, with Lyon as senior author of several sections and Ecologist Jane Kapler Smith (Fire Lab) serving as editor and leading the compilation effort.

In addition to plant succession and elk habitat and management research, the wildlife habitat project over the years was involved, either directly or peripherally, in studies of grizzly bears, caribou, wolves, and many other forest wildlife species. Lyon served on the Research Subcommittee of the Interagency Grizzly Bear Committee for several years and was influential in coordinating the overall program even when funding for this purpose was quite limited. Eventually, the wildlife unit was able to branch out to include small birds and old-growth forests in the habitat research program. Wildlife Biologist Sally Hejl conducted most of the research in this area from 1987 until she accepted a teaching position at Texas A&M University in 1998.

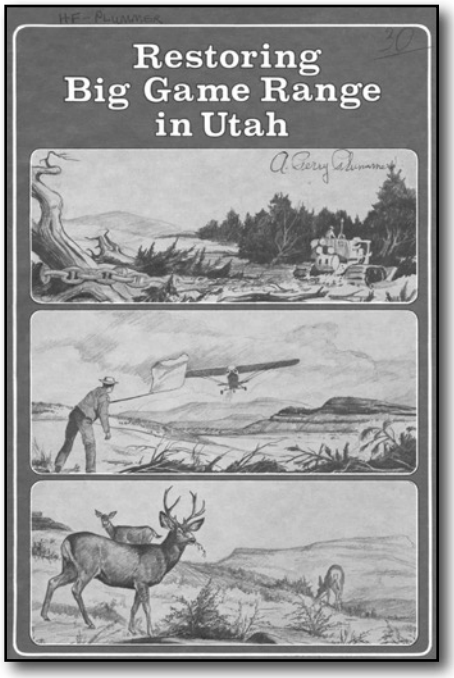
During Lyon's 32-year tenure as Project Leader, the wildlife habitat unit gained a reputation for providing sound advice to managers, both general and specific. Region 1 in 1990 gave Lyon a Regional Forester's Award for "sustained and consistently superior support to elk management on National Forest System lands" at a meeting of field wildlife biologists. The Montana Chapter of the Wildlife Society presented him with its "Distinguished Service Award" in 1993. In 1994, Lyon received an Honor Award from the Secretary of Agriculture.

Lyon decided in 1994 to devote full-time to personal research and completing several manuscripts. He was succeeded as Project Leader by Len Ruggiero, who transferred from the Rocky Mountain Station. Ruggiero was an expert in pine marten ecology who brought first-hand experience in carnivore habitat research to the Missoula unit.

Mr. Plummer's Opus

Most researchers would consider publication of a blockbuster reference book the "great work" of a lifetime, but for Perry Plummer it was only a milestone. Plummer's true great work was a dazzling array of achievements as a scientist and research administrator during a 42-year career at the Station.

The milestone was *Restoring Big Game Range in Utah* (Plummer and others 1968), published by the Utah Department of Natural Resources, Division of Fish and Game. It was "the bible" of range restoration in the Interior West for three decades. Like most Plummer endeavors, the publication involved others. The other authors were Division of Fish and Game Biologists Don Christensen and Steve Monsen. Monsen later joined the Station, and was one of a group known to many as "Perry's boys."



The "bible" of wildlife range restoration.

The three were part of an integrated Federal and State work group lead by Plummer and located at Great Basin and Ephraim. As indicated by the title, their publication was largely based on research in Utah and geared toward reclamation in that State, but much of the advice was broad enough to be useful elsewhere.

The volume served land managers well. Although it had been out of print for several years, in 2004 there were still many dog-eared copies in offices and libraries in Utah and elsewhere around the West, according to Durant McArthur, another of "Perry's boys." McArthur also noted the work had been cited many times in peer-reviewed literature over several decades (foreword, Monsen and others 2004).

The partnership also served land managers well. Plummer already had enjoyed a full career in plant ecology and range improvement when he was asked to head cooperative work between the Station and Utah Division of Wildlife Resources (DWR) in 1954 (*INTercom* Dec./91). The DWR had earlier approached the Station through Plummer with a request for assistance in finding ways to increase the carrying capacity of Utah's winter ranges.

The partnership thrived and expanded. And it got results beyond just feeding more deer. Utah's elk herds have expanded dramatically in areas where the research results have been applied to range improvement. Reducing winter deer and elk movements onto alfalfa fields and to haystacks has reduced conflicts with private landowners. Deer mortality on highways has been reduced where deer once crossed at night to invade farms and ranches.

Plummer initiated studies of planting methods and equipment, as well as plant materials for range improvement. The team tested chaining, cabling, burning, disking, and pipe harrowing to find the best site-preparation techniques. Chaining has often been controversial on public lands, but Richard Stevens, one of the primary DWR teammates, said that environmental groups have never opposed wildlife habitat improvement projects that followed team guidelines (*INTercom* Dec./91).

Plummer is said to have had a favorite comment regarding research results: "If you can't see it, it's not there." The cooperative work provided plenty to see. In the first 20 years, successful restoration programs had been completed on more than 120,000 acres within Utah. An important feature of the project was the unusually early use of results of the research. Treatments developed by the project were so successful that other public land managing agencies in Utah and neighboring States quickly adopted them or used them with only minor changes. DWR reports showed performance ratings completed for more than 300 species of shrubs, forbs, and grasses after initial tests of more than 3,000 species and variants (Keck 1972). The numbers of acres improved and plants screened mushroomed as the partnership endured and the years went by.

Plummer started his career with the Station in 1936 as a junior range examiner. He became Director of the Great Basin Station and later Project Leader for the shrub improvement and revegetation unit, which became the core of range restoration research. Plummer was a genial, soft-spoken man, and almost everyone knew him as "Perry." Almost everyone. Plant Geneticist Durant McArthur, who considered Plummer his mentor, called him "Mr. Plummer."

Station and DWR researchers led by Perry Plummer evaluated equipment such as the "Australian stump-jump plow" for preparing seedbeds on depleted rangelands. The plow's disks could jump up to allow rocks and debris to pass underneath.

McArthur studied at the University of Leeds in England shortly before starting work at the Station. His supervisor there was a "Reader" who was addressed as "Mr." as a sign of respect for a distinguished educator. "I always called Perry 'Mr. Plummer' because he deserved equal respect," McArthur said (McArthur 1991).

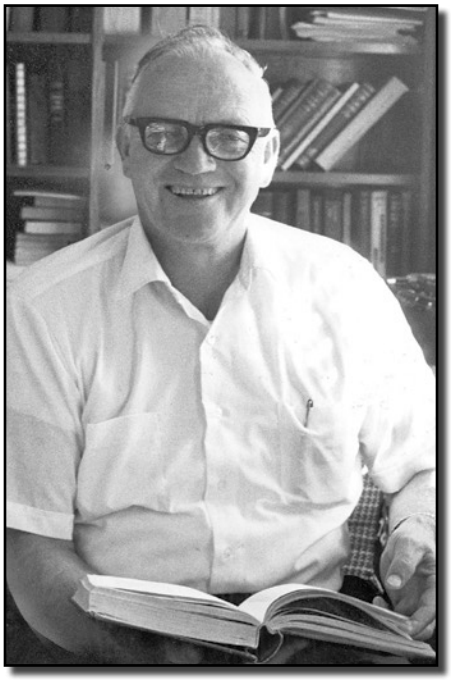
McArthur believed Plummer's finest work was as a teacher, showing others how to see everything in a given ecosystem and appreciate how the elements worked together. He was especially effective with individuals and small groups, but also established a wildland shrub biology class at Brigham Young University after the Shrub Lab started operations on the edge of the campus in 1975 (McArthur 1992).

Plummer was a doer. He didn't just ask his subordinates to get something done. He did it with them. McArthur said, "As a new Ph.D. I didn't expect to be on the business end of a hoe, but then I didn't expect my boss to be in that situation either." Plummer was known to show up anywhere a work crew was located and pitch in to help with vigor and energy. He expected anyone working to do the same. McArthur recalled that Plummer often appeared at work sites at 11:30 or 4:30, oblivious to the impending lunch hour or quitting time.

In 1977, Plummer suffered a heart attack while on a plant-collecting trip in the Soviet Union. His legendary vigor was reflected in a letter from a hospital in the northern Caucasus Mountain area. "It was probably a mistake letting them put me here—I don't think I was that bad off. The doctors here are extremely cautious. They say I move too fast and must slow down" (*INTercom* 9/1/77). Plummer was out of the hospital, back home, and back at work in just a few weeks.

Perry Plummer (foreground) grabbed a shovel and helped technician Paul Hansen clear out a sediment tank after heavy summer storms at Great Basin (about 1940).

Some exceptional thinkers are known to be absent minded on occasion.



Perry Plummer in his office about 1975. He had no trouble finding the right document from the many surrounding him.

Plummer remembered everything. Dave Prevedel, range conservationist for the Ferron Ranger District of the Manti-LaSal National Forest at the time, was amazed when he visited Plummer's office in Ephraim in 1973. Prevedel said papers and books were piled from floor to ceiling, and Plummer occupied only a small u-shaped area in the middle of the clutter. "But when I would ask him a question," Prevedel said, "he wheeled around in his swivel chair and grabbed the right document out of those piles to support his answer. He knew exactly where everything was" (Prevedel interview, 2005).

McArthur (1991) said Plummer had a prodigious memory. He could remember who, what, when, and why from years earlier. For example, he could recall a particular day, say June 24, 1957, and tell you where he was, who he was with, what they were doing, which plants were present, and other details.

Most people who labor in botany or associated fields would be delighted to have a plant named for them during their lifetime. Plummer had two.

'Appar' Lewis flax was the first of several plant releases made through a cooperative program of the Station, Utah Division of Wildlife Resources, the Soil Conservation Service, and several State universities. The "App" in Appar stands for Plummer's initials. Seeds of the flax became commercially available in 1980. *Grayia brandegei* ssp. *plummeri*, a variety of spineless hopsage, was named for its discoverer—Mr. Plummer. McArthur (1991) observed that the two plants reflect the breadth of Plummer's work in both pure and applied science. The flax is a showy cultivar discovered and tested by Plummer that had practical use in range rehabilitation and even gardening. The hopsage variety turned out to be new to science. Its practical use remained to be discovered.

Plummer wrote more than 80 scientific publications in his career. He was a charter member of the Society for Range Management; served a term as president of the Utah Section, received the society's Outstanding Achievement Award (1974) and the premier Frederic G. Renner Award (1976), and was named an SRM Fellow in 1977. In 1965, the Utah Wildlife Federation honored him as Conservationist of the Year. The Utah Chapter of the Soil Conservation Society of America gave him its Recognition Award in 1973. Plummer received a USDA Superior Service Award in 1969. Somehow, Plummer also found time to devote years of service to the Ephraim Library Board and the Utah Historical Society.

McArthur ended one of the two tributes he wrote after Plummer died in 1991 at age 80 with this statement: "A. Perry Plummer was a giant among men. Speaking for the many scientists who consider ourselves as Perry's boys, we are proud of our ties to him."

Fire Danger Rating Goes National

A major milestone in fire research was reached when Harry Gisborne put together his first trial fire danger meter in the winter of 1931-32 (Wellner 1976). Gisborne's first 10 years of research culminated in the meter. His work had included various fuel moisture studies, weather and lightning storm analyses, and determination of the key factors included in fire danger (Hardy 1977).

Gisborne's fire danger rating system gained in sophistication and use in Region 1 for many years, but suffered general deterioration during World War II. Some fire-weather stations were no longer manned, instruments were not performing accurately, and weather observers were careless, or more often ignorant, about the proper way to measure and record events (Hardy 1977). At the urging of Gisborne, Region 1 Fire Control set up a program in 1947 to join with Gisborne and Jack Barrows in a concerted effort to upgrade the entire system. The U.S. Weather Bureau also was involved in the quest for increased accuracy.

In 1951, C. E. (Mike) Hardy, a forester with the Kaniksu National Forest, was assigned to spend a major part of his time coordinating the system upgrading. His work was supported jointly by Region 1 and the Station. Hardy spent most of the next 22 years of his career refining the system that

Tommie Thompson, Superintendent of the Priest River Experimental Forest, 1928-37, is shown computing fire danger in 1935. Harry Gisborne created the first Fire Danger Meter 3 years earlier.

Gisborne had inspired. The first major developmental stage that evolved was named the Intermountain Fire Danger Rating System. In 1952, it was rebuilt to incorporate cumulative effects as well as immediate effects of weather and interpret them for specific times, places, and fuels. By 1958, the Intermountain system included 303 fire weather reporting stations in Montana, Idaho, Nevada, Utah, northeastern Washington, and western Wyoming. Nine other local systems existed in the U.S. (Hardy and Brackebusch 1959).

The Forest Service's Division of Fire Research began a development program to produce a single fire danger rating system that could be used by all fire managers in the U.S. The work was enthusiastically promoted by Jack Barrows while he was Chief of the Fire Lab. By 1965, most State and Federal fire management agencies were using the first new index—the spread index—in some form. A second research program started in 1968 at the Rocky Mountain Station, using the wind tunnels at the Fire Lab in Missoula. The goal was to produce a complete system that would include probability of ignition, evaluations of risk, rate of

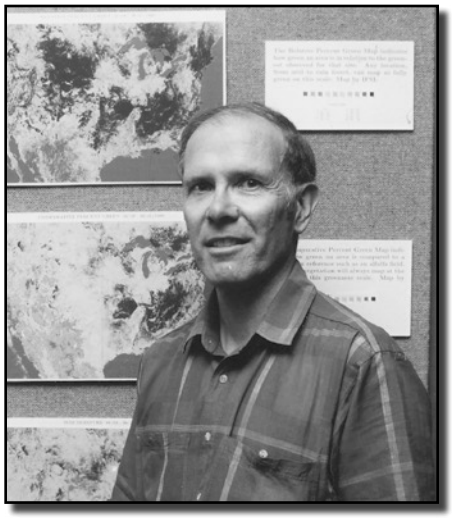
spread, and rate of energy release (Noble 1978b).

Using Rothermel's fire spread model as a basis (see "Rothermel Had the Right Formula," this chapter), the first National Fire Danger Rating System (NFDRS) was released in 1972. Five years later the NFDRS was being used by all Federal agencies and 38 State agencies charged with forest and rangeland fire protection.

Research continued to generate new knowledge of combustion physics, characteristics of fuels, and factors that influenced the occurrence of wildfires. Two years after the first NFDRS was released, the Forest Service and cooperators started a new program to update the system. The cooperative program channeled information from the Rocky Mountain and North Central Stations to the Intermountain Station's NFDRS research unit at the Fire Lab. Project Leader John Deeming said the updated system released in 1978 could not have been developed by a single research group. In addition to the Rocky Mountain and North Central contributions, other Intermountain Station research units took part.

NFDRS changes were significant. Fuel models were increased from nine to 20. Effects of droughts were included for the first time, as were changes in daylight hours with the seasons. The accuracy of lightning fire predictions was greatly increased by including a new statistic. Users were better able to make adjustments based on local fuel and climate considerations. Deeming, Bob Burgan, and Jack Cohen authored Station publications containing basic instructions for applying and interpreting the system, one set for users of a newly developed computer program and one for those who used manual methods. Eleven regional teams including personnel from Federal and State agencies conducted training on use of the new system (Noble 1978b).

In the first summer of use, data from 1,050 fire weather stations and 35 fire weather forecast offices throughout the Country were processed through the new computer system. More than 500 additional data sets were processed manually. Despite the progress, the NFDRS was not working well in the eastern States. Burgan was reassigned to the Macon Lab in 1989 for a 2-year period to fix the problems. He did, and that earned him an Outstanding Service in Fire Management Award from the National Association of State Foresters and the Forest Service (*INTercom* June/91). Deeming had earned the same award in 1978. Burgan, Deeming, and Cohen received cash bonuses from the Station for their work. Burgan returned to the Fire Lab in 1991 to work on another NFDRS improvement—using imagery from satellites circling the globe.



Research Forester Bob Burgan with maps produced from satellite data that were used in improving the National Fire Danger Rating system.

In the mid-1990s, the fire behavior unit at the Fire Lab was busy developing the next generation fire danger rating system. Combined with fire behavior forecasts, it was called the Wildland Fire Assessment System. The system was intended to use new technology and research results—satellite data, advanced weather modeling, and new fire models. The first phase of the project built on the existing fire danger system by adding multicolored maps of fire danger across the U.S. The maps depicted windspeed, temperature, precipitation, relative humidity, fire potential, a drought index, moisture content of large fuels, and an atmospheric stability index (Intermountain and Rocky Mountain Stations 1995).

Fire danger rating had progressed to the point where it was useful in many decisions made by fire managers. It was used to determine levels of preparedness before fire seasons started, where to locate suppression personnel and equipment, and which fire detection strategies to use. As a fire suppression tool, it guided selection of initial attack strategies. It became a factor in issuing public fire warnings, regulating public and industrial activities when fire danger is high, closing areas when necessary, and deciding when to field patrolmen to emphasize fire prevention.

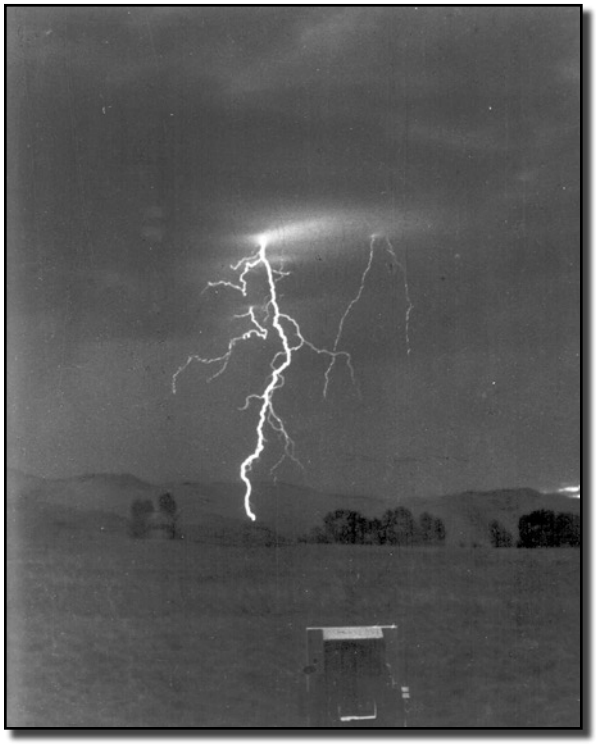
Fire danger rating, although subject to constant improvement, had approached a level of sophistication beyond Harry Gisborne's greatest hopes.

Thunder Joins Lightning at the Fire Lab

Although Project Skyfire came to an end as a special program in the late 1960s, research on the characteristics of lightning and its relationship to wildfires continued at the Fire Lab throughout the rest of Intermountain Station history. Climatology, or weather science, was an integral partner of fire science and forestry and range science, as pioneer Station researchers recognized when they set up weather recording stations in the very first days of development of experimental areas at Priest River and Great Basin.

Project Leader Don Fuquay's personal research emphasized atmospheric physics and electricity as it related to lightning and its ignition potential. He designed and built innovative scientific instruments and equipment, including special generators for cloud seeding experiments and systems for measuring lightning. Fuquay also did considerable research on electronics, and was a pioneer in the use of radar gear for detecting, tracking, and measuring lightning in storms. His work in this field was a major factor influencing construction of the first mountaintop radar in the Nation by the U.S. Weather Bureau (*INTercom* 9/23/76).

In 1967, Fuquay received the Society of American Foresters' Barrington Moore Memorial Award for outstanding achievement in research contributing to



Lightning causes most wildfires in the West, and its complexities were the subject of studies by Station scientists throughout the organization's history.

the advancement of forestry. He received a scientific achievement award in 1971 from the International Union of Forestry Research Organizations.

Soon after Fuquay came to the fire research staff in 1958 he was joined by Meteorologist Bob Baughman, who had been with the U.S. Army Corps of Engineers in Alaska. In 1976, Meteorologist/Physicist Don Latham joined the project. Latham had been teaching and doing research on atmospheric electricity at the University of Miami after earning advanced degrees in earth science at the New Mexico Institute of Mining and Technology.

The trio collaborated on a publication in 1979 that consolidated years of basic research results. *A Model for Predicting Lightning-Fire Ignition in Wildland Fuels*, issued by the Station, presented methods to correlate cloud and storm development with the expected amount of cloud-to-ground lightning. The model was based on a concept outlined by Fuquay several years earlier. Fuquay followed up with a publication providing guidelines for forecasting the number of lightning-fire ignitions under various weather conditions. Both products were incorporated into a major revision of the National Fire Danger Rating System. The scientists recognized that much remained to be done.

In the rugged terrain of the Inland West, locating the many summer lightning strikes and determining which resulting fires required control remained a difficult problem. Lookouts, pilots, and infrared techniques combined were less than perfect at doing the job. The Bureau of Land Management started using a system in 1976 that offered promise for improving the situation and reducing costs. The system was made possible by a device that located lightning strokes. Latham reported on the system, first used in Alaska and then in the Great Basin, in a Station publication, *Progress Toward Locating Lightning Fires*, issued in 1979. He included detailed comments on what was needed to refine the system.

During the next 4 years, Latham and associates at the Fire Lab filled a big gap by developing computer programs and documentation reported in the Station publication, *LLAFFS—A Lightning-Locating and Fire-Forecasting System*, which Latham wrote. The system provided the means to more accurately locate probable fires and included a simple way to store data and transmit it to managers.

In another significant climatology development at the Fire Lab, Computer Specialist Cam Johnston recognized the usefulness of Remote Automatic Weather Station (RAWS) technology and developed a system to fit fire management needs. RAWS stations were portable, solar-powered, and needed no human attention for up to 6 months. Thus, they were ideal for recording and transmitting weather data from areas where access was difficult and no power lines existed.

RAWS stations beamed messages to satellites, which in turn could transmit information to personnel in fire "nerve centers" to keep them informed about temperatures, winds, precipitation, humidity and other factors at the remote site. RAWS data were especially useful initially in planning controlled burns, but during a Montana fire emergency personnel from the Station's fire behavior unit and others used the system to supply fire bosses in the field with instant data about the wildfires they were working to control (*INTercom* 11/1/84).

The first Forest Service research into RAWS capabilities began in 1975. The Bureau of Land Management soon joined the research and development program. The first 10 RAWS stations were purchased and deployed in 1977.

The RAWS network evolved into a valuable interagency resource. By 2002, all fire weather forecasters and fire managers in the 50 States were using the system to acquire essential weather data for use in the National Fire Danger Rating System, to predict behavior of

Station researchers did early work in developing Remote Area Weather Stations that could feed climate data from remote locations via satellite to fire planning and management personnel.

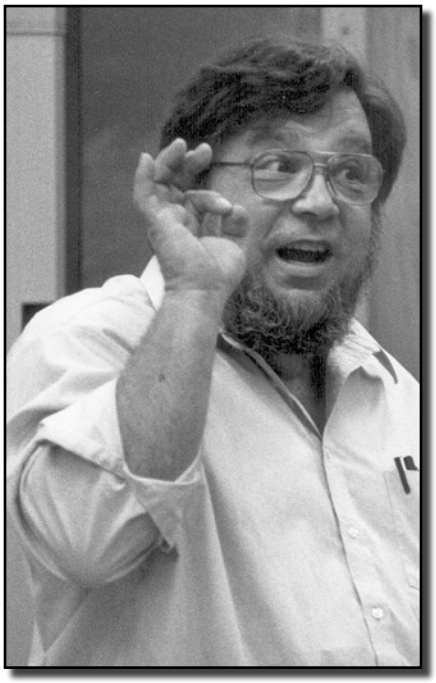
ongoing fires, and to plan the use of fire. There were 1,900 RAWS stations in operation. The list of participating wildfire management agencies had expanded to include the Bureau of Indian Affairs, Federal Emergency Management Agency, National Park Service, U.S. Fish and Wildlife Service, and State agencies. Personnel in the Department of Defense and Department of Energy used RAWS in their work (Zachariassen and others 2003).

Latham was best known for his research on lightning ignitions. He also became a leader in the Forest Service in bringing "artificial intelligence" techniques to bear on natural resource problems. Latham's ignition studies involved simulating lightning in the laboratory with an electric arc. A series of 40 large truck batteries were needed to provide power for the experiments. The system was designed by Latham to be driven by fiber optics and pneumatics, so the arc circuitry would not be dangerous to operators or spectators. It took 4 years to design and build the equipment. Technician Paul Sopko had the job of zapping a variety of fuels with simulated lightning bolts, at the rate of 15 to 20 simulations per day. The study lasted a year. "If someone asks what I do for a living, I just say I make lightning," Sopko said (*INTercom* 5/13/87).

Latham studied lightning for a living, and he introduced a new twist to the research by determining how large wildfires created thunderclouds and lightning. In 1992, New Mexico's Langmuir Laboratory for Atmospheric Research gave him its annual award for research excellence for this work.

The thunder of giant airtankers taking off from western bases to drop retardant on hotspots or in front of advancing wildfires became a normal part of fire control efforts by the 1970s. Research by Fire Lab scientists in the suppression unit was an important part of making this form of aerial attack efficient and effective.

Early work at Missoula supported research at the Forest Service's Riverside Lab in California, where studies of retardant delivery were centered. Missoula Lab tests involved chemical analysis of properties of various retardants and controlled experiments to determine



Don Latham (also known at the Fire Lab as "The Wizard") explained how to put thunder and lightning into a mathematical model.

effectiveness of the formulations in extinguishing fire or preventing ignition in common fuels.

By 1970, the entire Forest Service fire research program had become more sophisticated, and this maturity coincided with a bad fire year and a period of slack time for the aerospace industry's military programs in California. President Richard Nixon, a native Californian, wanted to get military technology into use in civilian programs. So the Forest Service was ready and willing when The Aerospace Corporation in California proposed industry-government cooperation to develop a command and control system for deploying equipment on forest fires, using helicopters with night-vision equipment and high-altitude drops of fire retardant.

The result of this coming together of circumstances was the FIRESCOPE Program, developed by the Pacific Southwest Station. The Intermountain Station fire suppression unit, led by Project Leader Chuck George, became heavily involved in several aspects of FIRESCOPE. Retardant research had been moved in 1965 from Riverside to the Missoula Fire Lab (George interview, 1993).

Fire Lab researchers studied the efficiency of various aircraft and the effects of different types of retardants and delivery systems in retardant drop tests, such as this one in 1983.

The Fire Lab retardant work was organized into five study areas: formulation effectiveness, physical properties, corrosion effects on containers, delivery systems, and environmental impact. Numerous interrelated studies were conducted by other Forest Service scientists, private sector contractors, and State and Federal fire management agencies (*Forestry Research West* Oct./76).

One of the most valuable research tools was a computer model designed by Honeywell, Inc. to meet Forest Service needs. The model was used to assess the fire control value of retardants in relation to various characteristics, such as droplet size, film thickness, salt content, concentration, and application amounts. The model was expanded to include ways to evaluate the "extinguish" and "retard" functions of retardant mixtures, and to relate them to delivery methods.

Assessing delivery systems was a major Station effort. An early test was made at Porterville, California, in 1970 using a modified Navy TBM torpedo-bomber. A large-scale test was made in 1975 at Chico, California. Both tests were made in cooperation with the California Department of Forestry. The field work at Chico tested an experimental aircraft tank and release system. The 2,000-gallon tank was instrumented to permit controlled experiments on the release of retardants and to note

Hundreds of cups collected fire retardant from test drops to provide data on coverage patterns and concentrations of the liquid in various parts of the drop area.

changes that took place in the chemicals and their dispersion during drops. The scientists were able to regulate the size and duration of drop gate openings, the tank pressure, and the kinds of material drawn from any of the tank's nine compartments. All were factors affecting the physical characteristics of the retardants upon release.

Aircraft drop heights and speeds, retardant paths, and retardant breakup were determined from photos taken with high-speed cameras. A ground crew collected retardant samples reaching some 2,000 cups placed throughout the drop zone to measure retardant distribution and concentration.

Experience indicated that the environmental effects of fire retardants mainly concerned water quality, and thus fish and other aquatic life. A Station publication described a system for computing quick, general estimates of potential fish kills if retardants were released into streams during firefighting operations. The system gave managers a way to decide, before ordering a retardant drop, whether or not the immediate fire control need was great enough to warrant possible fish losses (*Forestry Research West* Oct./76).

In 1976, the scientists made their first venture into providing user guides for tanker aircraft when the Station issued *Air Tanker Performance Guides: General Instruction Manual*. It was

Chuck George prepared test materials in 1966 for research at the Fire Lab that screened and evaluated fire retardants.

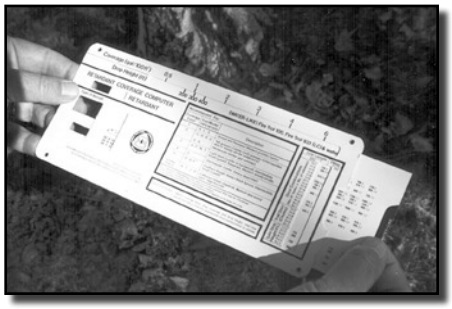
written by two Honeywell employees and George. The suppression project made many refinements as research progressed, and by 1986 George and his associates had developed detailed guides for every aircraft used for retardant drops. George documented the work and provided a framework for future guide development in 1990 when he authored a Station publication, *Developing Air Tanker Performance Guidelines*.

The guides contained a large amount of information. They included (1) brief descriptions of the aircraft, its retardant tank, and gating system; (2) recommended coverage levels for each of the National Fire Danger Rating System fuel models (there were 21 models at the time), charts showing retardant patterns for various types of drops and retardants and instructions on how to interpret them; (3) "best strategies" to use for specific coverages and line lengths; and (4) detailed tables of data used to develop the strategies. The researchers simplified use of the guidelines for tanker pilots and equipment operators by inventing a device that worked much like a traditional slide rule. The instructions for using a "retardant coverage computer" consisted of a single sentence.

In the mid-1980s, the research focus shifted to ways to improve the cost-effectiveness of retardant use. The stakes were high. Fire management agencies in the U.S. —the Forest Service, Bureau of Land Management, and California Department of Forestry were the largest—were using 20 to 25 million gallons of retardant annually. Costs for retardant alone were more than $15 million in a typical year. Considering delivery and base operations, annual costs ranged from $40 to $50 million (Prouty 1985).

The Station, National Forest System, and California Department of Forestry started a cooperative effort to improve cost effectiveness. It was dubbed the Operational Retardant Evaluation Study (ORE). At the same time, Forest Service Aviation and Fire Management set up a national committee (George was one of seven members) to determine which fire retardant chemical provided the best performance in relation to cost at every retardant base in the U.S.

ORE was an ambitious, long-term enterprise to collect enough data to



Retardant coverage computers developed by fire suppression scientists allowed pilots and retardant system operators to quickly determine optimum release strategies for individual aircraft and fires.

reconstruct the fire suppression history of particular fires and then provide very specific information on retardant effectiveness. An observer plane recorded the fire with both a color video camera and an infrared video system. A ground team, shuttled by helicopter into areas where retardant was recently applied, inventoried forest fuels, collected information on the amount and effectiveness of retardant, and recorded fire behavior. Air tanker crews allowed ORE team members to record plane speed and altitude when retardant was dropped, plus the amount, rate, and pattern of the retardant released. Recordings were made of all radio communications during suppression efforts.

As a byproduct, the research generated enthusiasm among fire managers to adopt infrared imagery, a product of other Fire Lab research, as a tool. With it, the scientists could "see" through dense smoke. They relayed the information to the managers, who were greatly impressed with the results.

On one occasion, by having cameras in the right place at the right time, the ORE team provided a service to firefighters in another way. The team had just arrived at a northern California fire when a fire burst forced a crew of firefighters to get under their shelters to escape the flames. The ORE video cameras captured the episode on film. The rare and dramatic footage was invaluable to investigators sent to study the situation. The film also was used in firefighter training (*INTercom* 9/17/87).

The ORE study started or inspired research in new areas. One was the pros and cons of using foam retardants rather than liquid chemicals. Another was using helicopters to deliver retardants. The Station's suppression unit devoted several years of research, much by Chemist Cecilia Johnson, to evaluating the effectiveness of foams. Field trials were conducted through the ORE program. In 1992, the unit hosted a Helicopter Delivery Systems Performance Workshop, the first time that people representing all facets of helicopter application of fire retardants had been together. Fifty helicopter manufacturers and operators, bucket and tank manufacturers, agency helicopter specialists, chemical suppliers, and fire managers from throughout the U.S. and Canada attended (*INTercom* May/92).

Also in 1992, the Chief of the Forest Service honored the entire suppression unit for achievements in "transfer of guides and specifications for using fire retardants to suppress wildfires." In a letter, the Chief said members of the unit were an example of the kind of performance and leadership in technology transfer that he would like to see throughout the Forest Service.

Direct Suppression

Station scientists responsible for fire retardant research were in demand as consultants in many countries. In one case, Chuck George and Dave Blakely got a "too close for comfort" look at Australian wildfire.

George and Blakely were in Australia in 1983 as part of a special project to evaluate the effectiveness of large airtankers and compare their cost with that of conventional fire suppression methods. Aussie Fire Scientist Dave Packham invited the pair to dinner at his home in the brush-covered mountains near Melbourne. That afternoon, the main run of a wildfire enveloped the mud-brick house in flames. The heat was so intense that the beams in the ceiling caught fire. George, Blakely, and Packham and his wife spent the rest of the day fighting the fire to save the house from destruction.

Inspecting the damaged beams later, George equated the fire effects with those produced by atomic radiation. "You couldn't get a hotter area than we experienced there," he said (*INTercom* 5/12/83).

New Approaches, 1971-1990

As Deputy Chief for Research, Vern Harper had developed an organization built around single-discipline research work units. Silviculturists were in one unit, hydrologists in another, and engineers in another, although all could be housed in the same laboratory.

Along with the change to research work units, Division Chief jobs were abolished and Assistant Station Director slots were established. Initially, the former Division Chiefs filled the Assistant Director positions. The Division Chiefs had been technically oriented, with personal research backgrounds in the subject matter of the area they supervised. The Assistant Directors supervised all research units in a geographic area. It was impossible for them to be technically competent in all the disciplines represented. Thus, top-level supervision became more general and the Project Leaders assumed the technical expert role.

Al Stage (interview, 2005) observed the changes during his 44-year career at the Moscow lab. He said that once none of the former Division Chiefs remained as Assistant Directors the approach had changed from organized, long-term research to a "self aggrandizement" situation in which Project Leaders could decide what the research program would be and channel studies to make individual scientists in the unit look good. During this era of transition, an individual scientist's research program shifted from studies that were mainly assigned by supervisors to personal research that was mainly suggested by scientists as being high priority.

According to Chuck Wellner, Harper wanted the disciplinary problem orientation because the Washington Office had lost control of the budget process. Stations in the South and East had more political clout than those in the West because their States had larger Congressional delegations and more Congressmen in senior positions. The southern and eastern Station Directors were going outside the Forest Service and administration's budget process, lobbying Congress directly or indirectly to build research programs. The western Station Directors weren't averse to following the same practices, but their Congressional delegations were much fewer in number and didn't have as much political clout.

At a 1971 inspection with Wellner in charge, the Station proposed an organization in which all disciplines would attack problems in a multidisciplinary approach. George Jemison, who had succeeded Harper, wouldn't let Wellner make a presentation to the Washington Office research staffs on the proposed change. Instead, Wellner reported that Jemison said the Washington Office was going to tell the Stations how to organize to "save" research.

Wellner was disappointed, but far from defeated. Failing to get his ideas considered at the national level, he merely went ahead to establish "ecosystem management research" on a smaller scale at the Station—20 years before the Forest Service decided it was a great idea!

Chuck Wellner—Forest Science Visionary

Chuck Wellner was a far-sighted champion of high-quality forestry for more than 60 years. Over much of that time, he was many years ahead of most of his colleagues in forest science.

Wellner started his career as a member of a silvicultural field crew at Priest River in 1932. A graduate of the University of Idaho, he earned a M.S. degree in forestry at Yale University in 1938, *Magna Cum Laude*. Following 13 years of distinguished

Chuck Wellner taking measurements in seedling survival studies at Priest River in 1932.

silvicultural research with the Northern Rocky Mountain Station, interrupted by 2 years in the U.S. Navy, he became an administrator.

From its inception in 1948 until 1958, Wellner was leader of the Inland Empire Research Center in Spokane. He then was Division Chief for Timber Management and Forest Disease Research at the Intermountain Station. In 1965 he became Assistant Station Director for research programs in the northern part of Station territory.

Wellner left his Assistant Director post in 1972 to create and coordinate a forest ecosystems research program for the Station at the Moscow lab. He retired in 1973, but worked for the next 25 years virtually full-time as a volunteer with the Station and at the University of Idaho, where he was an Affiliate Professor of Forest Resources. Wellner was author or coauthor of some 60 scientific publications, most concerning silviculture, protection, and management of Northern Rocky Mountain forests.

Wellner made the ecosystem program at Moscow a practical demonstration of his vision of how Forest Service research should be conducted. It was the Station's first multi-project program (*INTercom* 5/12/77). Wellner established the research unit concerned with silviculture of cedar-hemlock-grand fir forests of the Northern Rocky Mountains as the program's core unit. The silviculture unit's mission included methods to inventory forest land and timber resources. Its members also sought better ways to measure, predict, and interpret effects of management practices on forest stands, and to apply the information to forest management planning.

The program combined efforts in forest insect, disease, watershed management, and genetic improvement as they applied to intensive management of the ecosystem. This meant active participation by five different research work units. Adding another dimension, the silviculture unit was one of the first in Forest Service Timber Management Research to fund studies of forest esthetics (Stage interview).

There was considerable participation by forest managers. Wellner had a pet saying about research results: "If it's not already in practice because of your personal interaction with managers, it probably is not worth publishing" (Stage, interview). Wellner saw publications as documentation of something that already was tested and working.

When Wellner retired, Al Stage assumed responsibility for the program. It ran for 5 more years, until its charter expired and Station management chose not to renew it during a reorganization. However, the inter-unit cooperation at Moscow continued for many years. Years later, Stage said, "We came through with a product at exactly the time it was needed, something that doesn't always happen in research. The reason that happened was what Chuck Wellner started—the multi-project program." (Stage 2003).

Many of the program concepts, including the "core unit" idea, were included in the Forest Residues R&D program launched at the Station in 1974 (see "Special Programs Bring Special Problems and Achievements," this chapter). Wellner's influence was important there, and also in subsequent R&D and RD&A programs in other areas of the Station. He also influenced the individual research units at Moscow, particularly the pathology unit, to move away from studies in narrow areas, such as individual diseases, to considering ecological problems.

Was Wellner's program truly far ahead of its time? Two decades later, in the 1990s, the Forest Service started a national effort to promote a strategic planning process at each Station to emphasize multi-disciplinary research along with the more traditional "functional" research (Hamre 2005). The planning resulted in building research work units with interdisciplinary teams of scientists focusing on multifaceted problems facing resource managers. Each Station also established "ecosystem management" research specific to areas.

Rocky Mountain Station Director Denver Burns listed three advantages:

- Synergy of scientists from different disciplines, universities, and management attacking complex issues, rather than individuals looking at pieces of problems.
- Larger units with fewer Project Leaders, producing savings in paperwork and travel.
- Limited funding and personnel focused more on problems of public resource management, and less on personal disciplinary interests.

"Ecosystem research" in 1994 sounded a whole lot like what Chuck Wellner tried to present to Forest Service leadership in 1971. And it sounded very much like what he demonstrated to be effective at Moscow, starting in 1972. Ecosystem research was one of several areas in which he proved to be visionary.

Wellner was among the first to see that greater losses were being caused by forest insects and diseases than by fire. He also recognized that these problems were far from being adequately studied. In 1939, he helped initiate cooperative research with the University of Idaho on white pine blister rust, years before a campaign to curtail blister rust became a national priority. Wellner was the prime organizer of many programs that interlocked Federal, State, university, and industry efforts on forest pest problems (Lassen, personal communication).

Wellner was the first to recognize the value of Rexford Daubenmire's habitat typing classification system as a basis for forest management prescriptions (Stage, personal communication). He was an enthusiastic supporter of habitat typing research throughout the inland West, and it became one of the Intermountain Station's finest achievements (see next section).

Research supported by Wellner got done. He was a quiet, likeable gentleman, but he was persistent in pursuing his goals. Scientists who worked under his direction were motivated by the example he set and his insightful way of dealing with them. Wellner had tremendous dedication to quality work in every detail. Al Stage learned about that early in their relationship when they shared a room on a business trip. He said Wellner was up at 3:30 or 4:00 a.m., reviewing manuscripts, reading study plans and memos, and making notes. He was taking care of all the details before the main business of the day got started. Stage said one of Wellner's other virtues as Division Chief and Assistant Director

was that he "took care of all the junk" that came down from higher levels, allowing the scientists to concentrate on their work. "We never saw it," Stage said. "ADs who followed him passed a lot of it along to us."

Wellner consistently and effectively provided training for scientists and others on project staffs under his direction, which greatly enhanced the effectiveness of the people (Pechanec, personal communication). He fostered creativity by allowing scientists to spend 20 percent of their time studying things of particular interest to them. Entomologist Mal Furniss said this policy helped him get involved in applying knowledge of insects to research on shrubs (Furniss, personal communication). Furniss said he stretched the 20 percent limit occasionally, but nobody seemed to mind as long as the assigned work was accomplished.

Often recognized by his peers as a "forester's forester," Wellner carried his interest in advanced training into the formal education system. He worked with several professors at the University of Idaho to establish the Continuing Education in Forest Ecology and Silviculture program. Wellner served on numerous graduate committees and led instructional programs for silviculture students from across the Country (McMurray 2004).

The quiet little man could get excited, especially when the topic was one of his favorites. Long after Wellner retired, Station Director Lassen recalls visiting him in his home (Lassen interview, 2005). After Wellner made breakfast, they set off on a trail leading to a potential Research Natural Area. Wellner thought the area had special importance because it represented an ecosystem where a benchmark was needed to help settle a forest management controversy. After they viewed the area, Wellner walked backwards down the trail, waving his arms all the way, while he lectured the Station Director on the importance of Research Natural Areas in general, and the one they had just seen in particular.

Wellner's interest in establishing Research Natural Areas started early in his career. He contributed information in 1935 to the first RNA proposal in Region 1—Tepee Creek on Priest Lake. In 1937 he prepared establishment reports for the next three. The early work kindled a life-long passion for guaranteeing that pieces of land exist where researchers, natural resource managers, and students can examine untouched specimens of the ecosystem and compare them to areas that were similar before human activities intervened (Stolz 1986).

Chuck Wellner in 1990 with The Nature Conservancy's Susan Bernatas after fording a stream in the Pony Creek Research Natural Area in the Payette National Forest.

Through the years, the Forest Service established a few Research Natural Areas, the Bureau of Land Management recommended others, and the Nature Conservancy set aside several nature preserves. Despite Wellner's prodding, the efforts were sporadic and seldom were people made available to do the work. When Wellner retired in 1973 he realized that many prime ecosystem examples would be lost unless RNA designations were speeded up, and he started a crusade to accomplish that.

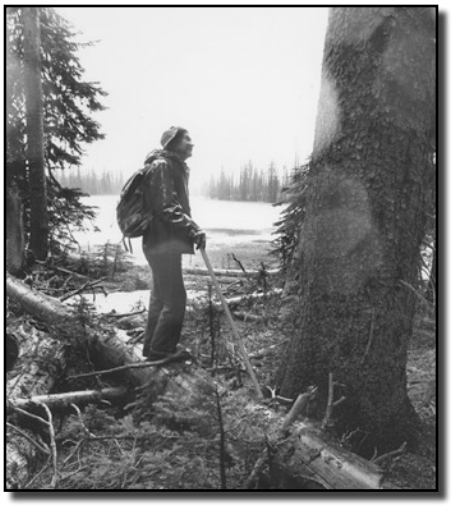
The first step was to arrange a gathering of some 60 experts and lay people in Boise to discuss the need for RNAs. The workshop was led by Station Director Roger Bay and John Ehrenreich, Dean of the University of Idaho College of Forestry, Wildlife and Range Sciences. The participants formed the Idaho Natural Areas Coordinating Committee, with Wellner as chairman.

The coordinating group set up six technical committees, led by experts in aquatics, grasslands and shrublands, forests, alpine habitat, rare and endangered plants, and endangered animals. The committees tackled the details of the RNA project, classifying the natural diversity of Idaho, noting which elements reserved lands already encompassed, and which elements needed protection (Stolz 1986).

Wellner devoted the rest of his life to the program as an organizer, leader, and field worker. He visited hundreds of sites and wrote 120 establishment reports. Early in his work, Congress gave the program a big boost. The 1976 National Forest Management Act tied RNA establishment to forest planning (Tippets 1990). By 1983, the Forest Service network of RNAs contained 148 areas representing more than 80 of 145 forest cover types recognized by the Society of American Foresters. Of those, 17 had been established in the previous 4 years. The Station, working with Regions 1 and 4 was responsible for establishing 11, or 65 percent, of the new additions (*INTercom* 2/3/83). The two Regions and the Station jointly funded a Program Manager position, filled by Angela Evenden. She worked closely with Wellner and the coordinating group and progress accelerated.

A 2001 Rocky Mountain Station publication cataloging proposed or established RNAs listed 226 areas on National Forest System lands in Idaho, Montana, Nevada, Utah, and western Wyoming. Wellner had been instrumental in identifying and nominating more than 200 of them. The total was far and away the largest in the Forest Service for any Station territory. The national total was 450.

Establishment of one area was especially gratifying to Wellner, and also an indication of his persistence. In 1937, Wellner wrote an establishment report for a 982-acre tract in the Selkirk Mountains within the Priest River Experimental Forest. Although the



Chuck Wellner admired an old-growth spruce in a Research Natural Area in central Idaho in 1991.

report was approved by Stephen Wyckoff, Northern Rocky Mountain Station Director, and Regional Forester Evan Kelley, it never reached the Chief's desk for approval. Kelley did not submit the report, maintaining that RNAs didn't need approval by the Chief (*INTercom* 5/15/86).

Wellner said he was unsuccessful in establishing RNAs in Region 1 during Kelley's tenure, because the "very practical minded Regional Forester didn't believe that RNAs were a high enough priority to bother the Chief about" (Tippets 1990). Nevertheless, Wellner got the job done eventually. In 1986, he wrote a new establishment record for the Selkirk Mountain area, saw that it was properly forwarded, and obtained approval from Forest Service Chief Max Peterson.

Wellner was honored frequently during his lengthy career with the Forest Service and as a volunteer. He received USDA Superior Service Awards in 1962 and 1972, a rare double honor. He was elected a trustee of the Northwest Scientific Association in 1976. The Society of American Foresters elected him a Fellow in 1977. The Inland Empire Section of the society named him forester of the year in 1979. The University of Idaho College of Forestry made him an honor alumnus in 1982. The Nature Conservancy gave him its coveted "Oak Leaf Award" in 1984 for his RNA work.

In 1989, Wellner was recognized with a Chevron Conservation Award presented at a banquet in Washington, DC. He was one of 10 "citizen conservationists" recognized nationwide that year. The last sentence in a letter nominating him for the award said, "His contributions will serve society forever."

To ensure that his name would forever be associated with a Priest River ecosystem that was one of his favorites, the Rocky Mountain Station and Region 1 officially designated the Wellner Cliffs Research Natural Area in 2005. It was the only RNA of the more than 100 in Idaho to be named in remembrance of a person (London 2005).

A Better Way to See the Forest

The Station and Region 1 began a cooperative study in 1971 to extend habitat typing concepts to Montana. This was the start of a large team effort to develop ecological land classifications that was to command attention from many Station scientists and cooperators for the next 15 years. The cumulative results of the work were a major contribution to improving scientific resource management throughout the Station territory and beyond.

Rexford Daubenmire, a Washington State University botany professor, provided the concepts underlying the team's work. Chuck Wellner promoted the program. Bob Pfister, Project Leader of the forest ecosystems research unit at Missoula, served as a key participant and coach for many others. Some of the more valuable team members within the Station were Bob Steele and Kathy Geier-Hayes (Boise), Steve Arno (Missoula), and Walt Mueggler (Logan).

Wellner said that before Daubenmire the forest classification system in the Northern Rocky Mountains from an ecological standpoint "was simply chaos." He pointed out that several existing classifications were largely to regulate forests, help in planning timber sales, and define the timber supply situation (Wellner 1987). They were geared primarily to economic considerations, and did not reflect the capability of the land to produce a variety of resources.

Daubenmire created his habitat typing system in the early 1950s, and after a lengthy period of development and trials, used it to describe the forest vegetation of northern Idaho and eastern Washington in a 1968 Washington State University technical bulletin coauthored with Jean Daubenmire. The system proved valuable, and it served as a model for classification work throughout western forests (Noble 1977).

Daubenmire had close ties to the Station. He worked at Priest River on personal research in the 1950s and participated in cooperative research with the Station from 1961 until 1975. In 1968, he mapped habitat types for much of the Priest River Experimental Forest, defining eight types and large areas of ecotones between the types (Wellner 1976).

Habitat types are based on potential climax tree and undergrowth vegetation for given sites. The system classifies sites using the entire plant community as an indicator of environmental factors as they affect species reproduction, competition, and plant community development (Pfister 1976). Successional trends toward climax vegetation can usually be identified even in rather young stands. Thus, a given habitat type includes all land areas potentially capable of producing similar plant communities when the vegetation reaches climax, even though existing vegetation might be dominated by successional species.

Pfister was a disciple of Daubenmire. He joined the Station in 1961 as a research forester at Moscow and in the mid-1960s was assigned to help solve serious regeneration problems Region 4 was having with spruce stands in southern Utah. Pfister concluded that the spruce forests needed to be classified on an ecological basis. He developed a habitat type classification of high-elevation forests in Utah as his Ph.D. dissertation, working under Daubenmire. Wellner (1987) said of that work, "We were modestly on our way to developing a habitat type classification for forests of Utah."

The Montana habitat typing project was the first such classification based

on a large-scale reconnaissance study. It illustrated the huge amount of data gathering and analysis required to produce classifications covering broad areas. More than 1,500 forest stands in 10 National Forests were sampled. Developing the classification involved a progressive series of analyses by Pfister and his associates and included 4 years of field testing by land managers and researchers. Region 1 provided major financial assistance, and the University of Montana's Forestry School and Botany Department provided administrative and technical support (Noble 1977).

The team defined 64 habitat types. The 1977 Station publication, *Forest Habitat Types of Montana,* that summarized the work included photographs of examples and a key that allowed foresters to identify types after minimal training. The authors were Pfister, Bernard Kovalchik, who became a timber management planner for the Helena National Forest, Arno, and Richard Presby, later biotic planning specialist for the Idaho Panhandle National Forests.

Properly trained personnel were essential to the success of habitat typing projects. Early efforts used graduate students or survey workers with little training to gather data. Resurveys of plots in Montana showed only about 50 percent were classified correctly. This led to intensive training in the habitat type concept by university and Forest Service ecologists and the inclusion of habitat type classification in university courses (Wellner 1987).

Bob Pfister conducted the first habitat typing in the Intermountain West that was based on a large-scale reconnaissance. He oversaw expansion of ecosystem classifications throughout the Station territory for 15 years.

Habitat typing gained general acceptance and spread throughout Regions 1 and 4. Areas in northern Idaho originally typed by Daubenmire were resurveyed to fill gaps and adjust some descriptions.

Research Forester Art Roe and Entomologist Gene Amman were the first to base risk of mountain pine beetle infestation on habitat type. They surveyed many stands in the Teton and Targhee National Forests in Wyoming and Idaho and found that the highest probability of infestation was in the *Abies lasiocarpa/Pachistima myrsinite* habitat type. The research was documented in a 1970 Station publication, *The Mountain Pine Beetle in Lodgepole Pine Forests*.

Bob Steele, silviculture Project Leader at Boise, led work from 1972 to 1979 on habitat typing for upland forests in central Idaho and eastern Idaho-western Wyoming. Steele then launched studies of succession and management strategies for eight habitat types in central Idaho. He and Forester Kathy Geier-Hayes wrote the reports. The work was recognized as a major contribution to the understanding of the ecology of upland forest ecosystems and how people have influenced them (Sloan and others 1994).

By the late 1980s, an impressive number of habitat type classifications had been completed throughout the western United States. Most parts of the Station territory were covered, and the

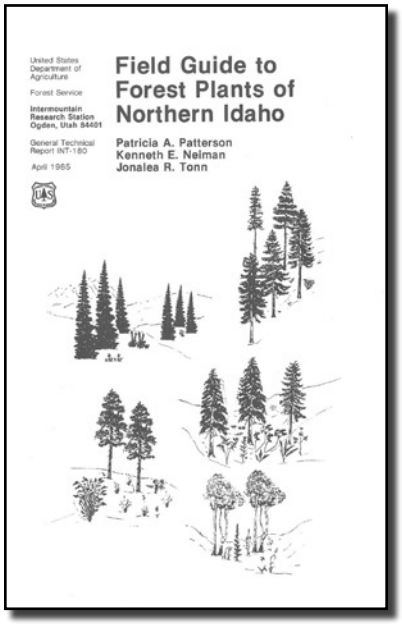
A Modest Start for a "Best Seller"

Forester Jonalea Tonn (center) used plant drawing copies for field crew training in northern Idaho before *Field Guide to Forest Plants of Northern Idaho* was published.

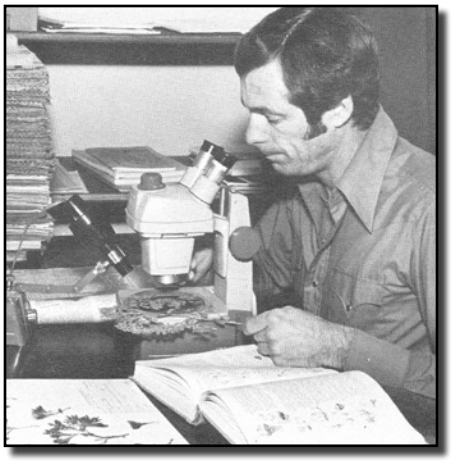
A guide that started out very modestly in the late 1970s became one of the Station's most popular publications. Back then, Forester Jonalea Tonn (Moscow) copied plant drawings from various manuals as handouts for summer field crews who needed to make accurate identifications of vegetation. After the northern Idaho habitat typing refinement project got under way, Patricia Patterson, a forester with the Clearwater National Forest, was assigned major responsibility for developing a field guide.

Patterson, Tonn, and Ken Neiman, Clearwater Forest ecologist who was co-leader of the habitat project, wrote *Field Guide to Forest Plants of Northern Idaho*. The guide was designed for use by people with minimal botanical training. It described nearly 200 plant species having ecological indicator value in northern Idaho and included drawings and identification keys.

The guide was issued by the Station in April 1985. Demand was heavy, and it was reprinted 12 times for a total of more than 20,000 copies up to 2001. That year it became available on a disc (RMRS-GTR-118-CD) and no longer was in print. Users could print out sections of interest to take to the field, or view the guide on a lap-top screen if they were field-going computer users.



A "best seller" aided habitat typing work.



Bob Steele, shown here identifying unknown plants from habitat type classification plots, made major contributions to understanding the ecology of forest ecosystems in central Idaho and western Wyoming.

Station had issued publications describing key areas. These included:

- *Forest Habitat Types of Northern Idaho: A Second Approximation*, by Stephen Cooper, University of Montana; Ken Neiman, Clearwater National Forest; Steele; and David Roberts, Utah State University.
- *Coniferous Forest Habitat Types of Northern Utah*, by Ronald Mauk and Jan Henderson, Utah State University.
- *Grassland and Shrubland Habitat Types of Western Montana*, by Station Ecologist Walt Mueggler and William Stewart, a range conservationist.
- *Aspen Community Types of the Intermountain Region*, by Mueggler. This classification was based on existing plant communities because of the ill-defined successional status of communities within the general aspen ecosystem.
- *Forest Habitat Types of Central Idaho*, by Steele, Pfister, Russ Ryker, Project Leader of the forest ecosystems unit at Boise at the time, and Jay Kittams, forestry technician at Boise.
- *Forest Habitat Types of Eastern Idaho-Western Wyoming*, by Steele, Cooper, David Ondov, a technician at the Missoula Forestry Sciences Lab, Roberts, and Pfister.
- *Coniferous Forest Habitat Types of Central and Southern Utah*, by Andrew Youngblood, Region 4 ecologist, and Mauk.

By 1981, forest ecologists had been employed by every western Forest Service Region, and they were carrying habitat typing work forward. Station management believed that the research basis for habitat typing was well-established and enough National Forest personnel had been trained to continue with the application aspects of the development.

Station Director Bay and Assistant Director Thadd Harrington wanted Pfister to move to Moscow to lead silvicultural research there. Pfister declined, and instead left the Station and joined the University of Montana faculty. He was named Director of the Mission-Oriented Research Program. Pfister continued work on habitat typing, and in 2005 was involved in leading new developments in forest classification systems at the national level. Bay said Pfister "was a good fit for the university. He really did a fine job teaching and mentoring grad students in the forestry school."

Pfister and other authors included some management implications in their classification summaries, but the original intention was to carry this much further with additional studies of plant succession within the habitat types and more complete assessments of management applications (Wellner 1987). This was done to some extent by Station researchers after Pfister left, although Wellner said the program lost much of the support needed to fully accomplish those objectives.

Steve Arno and Dennis Simmerman of the Fire Lab and Bob Keane, a cooperator at the time, wrote publications on succession in Montana forests. Bill Fischer, Biologist Anne Bradley, and Plant Ecologist Marilyn Crane, of Systems for Environmental Management in Missoula, compiled reports describing fire ecology based on habitat types in Montana. Jane Kapler Smith, forest ecologist at the Fire Lab, and Fischer described fire ecology based on habitat types of northern Idaho.

In 1987, the Station lent support to habitat type use by cosponsoring with the University of Idaho a 3-day symposium, "Land Classifications Based on Vegetation: Applications for Resource Management." Topics were chosen to highlight practical applications of ecosystem classifications as well as theoretical concepts. Daubenmire was the keynote speaker. Wellner, Pfister, Steele, and Arno were among those presenting papers. The Station published the proceedings, compiled by Dennis Ferguson, research forester at the Moscow Lab; Penny Morgan, an assistant professor at the university; and Fred Johnson, professor of forest ecology at the university.

Speakers at the symposium described uses of ecosystem classifications in evaluating wildlife habitat, rating livestock forage needs, fire management, setting reforestation standards, determining optimum systems to harvest trees, managing forest pests, and predicting special watershed management needs.

How important was the development of habitat typing? Ron Stoleson, retired Region 4 Director of Vegetation Management, provided his thoughts in 2004:

> In the late 1960s, the Forest Service in Region 1 began utilizing habitat typing to categorize land that up until then had been referred to on the basis of the dominant tree vegetation (spruce-fir type, ponderosa pine type, etc.). I was a District Ranger at the time and thought that this was a great step forward because its use required foresters to practice a lot of botany and to look at relationships between the many components of the environment, not just trees…
>
> Development of the habitat type concept continued and it became an important tool, especially for silviculturists who could use it for prescribing land treatments based on a more full knowledge of the ecological components with which they were dealing. Other disciplines also found the concept helpful in making inferences about the suitability of land for various uses such as wildlife habitat and recreational potential.
>
> I believe that the development and use of habitat typing has been one of the greatest professional

accomplishments by the Forest Service during my 42 years of service (Stoleson, personal communication).

Dr. Stage Made the Right Prognosis

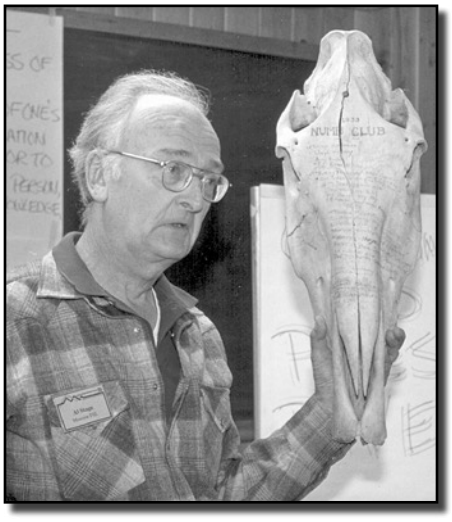
Forecasting the future condition of anything as complex and dynamic as a forest area is a difficult business. Al Stage proved again and again that it was a business he was very good at.

Stage would tell you that the creation and constant improvement of the Prognosis Model for Stand Development was a teamwork operation. Members of the team who worked most closely with him would tell you that Prognosis was his concept, and the continuing improvements in the scope and utility of the model were in large measure the result of his leadership.

Bill Wykoff, who worked for nearly 30 years in the unit Stage led at the Moscow Lab, said "…Al's vision, his quiet but persuasive prodding and his firm grasp of biophysical, mathematical, and statistical concepts have served as a strong foundation for the system" (Wykoff 2002). Others in the unit wrote, "One of Al's many contributions to the success of the work unit is the feeling of teamwork and cooperation that he instilled in each of the members of the project"(Quantitative Analysis Unit 1995).

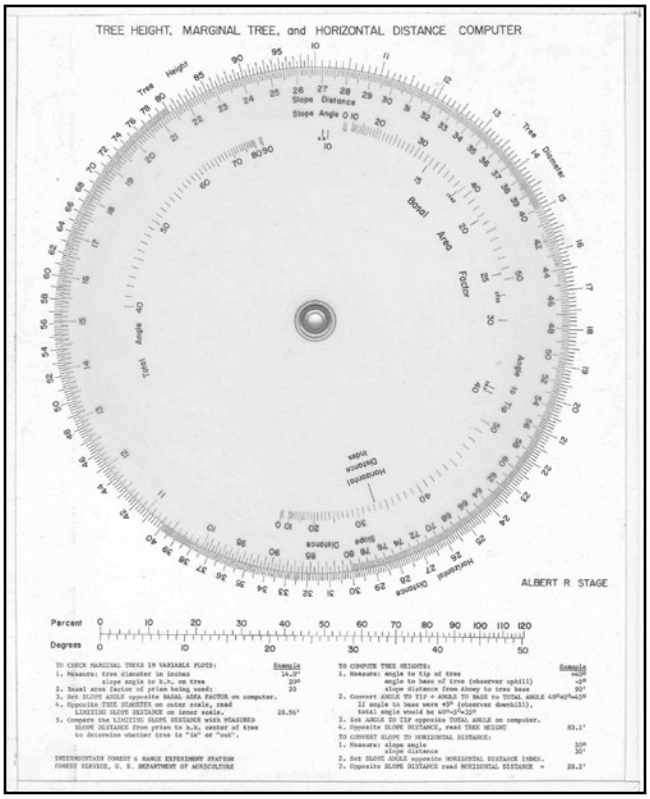
The Prognosis team in the mid-1980s (left to right) Dave Hamilton, Bill Wykoff, Nick Crookston, Bob Monserud, Dennis Ferguson, Al Stage, and Melinda Moeur.

Stage built his own foundation for work on the Prognosis Model through a variety of experiences in forest management and research. He earned a bachelor's degree in Forest Management at the University of Michigan 1951 and was hired by the Northern Rocky Mountain Station as superintendent of the Priest River Experimental Forest. The next year Stage completed a master's program in Forest Ecology at Michigan. Through military service during the Korean War, he got a taste of measurement work as a member of a regiment making surveys in the Philippines.



Al Stage's long experience at Moscow and Priest River gave him knowledge of many things, including the origins of the Numbskull Club of America (see chapter 13).

Well before portable computing was possible, Al Stage developed the "Stage Gauge," a circular slide device that aided foresters in making calculations in the field.



Stage resumed his education at Michigan in the 1960s, earning a master's in Mathematical Statistics and a Ph.D. in Forest Mensuration. In 1962, he moved to the new Moscow Lab, gaining access to the mainframe computer at the nearby University of Washington. This was crucial to the success of large-scale forest measurement research and model development (Quantitative Analysis Unit 1995).

That year the Forest Service was engaged in a high-priority assessment of the Nation's timber resources, and an important part of the effort was predicting future timber supplies. Assistant Station Director Chuck Wellner learned that large amounts of data from growth and yield research in the Northern Rocky Mountains were not being used, and he dispatched Stage to Washington, DC, to find out why. Stage joined the assessment team to get answers from first-hand experience. He found several reasons why existing data were not very useful for making forecasts. For example, the yield tables developed by research applied only to even-aged stands consisting of a single tree species, although most stands in the West included a variety of species and ages.

Stage conceived a new way to forecast the future condition of forested areas. He published the framework in 1973 as a Station research paper, *Prognosis Model for Stand Development*. As Project Leader for the Quantitative Analysis Research Work Unit at Moscow until 1995 when he retired, Stage recruited a cadre of scientists who participated in making the model more accurate, more versatile, and more accessible as the years went by, and it became a powerful tool for forest managers and planners (Prouty 1987a).

The unit was best known for its work with Prognosis, but the mission was broader. It included virtually all aspects of ways to acquire samples and compile and analyze data to improve forest inventories. In the 1970s, the group became the core unit in the Station's first multi-project program, which combined efforts in insect, disease, watershed, and genetic improvement research on mixed-species timber stands in the northern Rockies (*INTercom* 5/12/77).

Prognosis had many strong points. It primarily used data acquired through normal Forest Survey inventories. It used habitat types, based on climax vegetation, as a major area descriptor (See "A Better Way to See the Forest," this chapter). Several extensions represented insect/disease impacts, allowing managers concerned with these problems to estimate benefits of selected treatments (Noble 1982). Publications written by unit members described or provided user guidelines for many extensions and improvements in Prognosis. Some of these were:

- User guides and reports by Research Analyst Nick Crookston on spruce budworm modeling, an event monitor, parallel processing, and a fire and fuels extension.
- User guides and discussions of a regeneration establishment extension by Research Forester Dennis Ferguson.
- Discussions of Prognosis variables and multipliers and modeling individual tree mortality by Research Forester Dave Hamilton.
- A user guide to shrub and tree canopy extensions by Research Forester Melinda Moeur.
- A user guide to a combined Prognosis and tussock moth outbreak model and a programmer's guide to an optimization model by Research Forester Bob Monserud.
- User guides to two major updates of Prognosis in 1982 and 1986 by Research Forester Bill Wykoff.

Along the way, modifications were made in Prognosis in reaction to suggestions by users, many of whom were trained in workshops conducted by Stage and his associates. There were many users. By 1985 Prognosis was being used in National Forest planning by Regions 1, 4, and parts of 6 (*INTercom* 3/21/85). Ten years later, 14 variants of the Prognosis Model were in use in all regions of the United States, and Monserud had worked with a colleague in Austria to produce "Prognaus," proving that the unit's modeling approach could be used to replace traditional European yield tables with a more advanced forecasting system (Intermountain and Rocky Mountain Stations 1995).

Stage and his unit members worked with hundreds of colleagues and cooperators in developing Prognosis. The Project Leader wrote more than 75 research publications during his career, 50 of them coauthored with fellow scientists, on a wide array of topics. He presented papers before scientific audiences in many parts of the world. For his efforts, Stage received a Superior Service Honor Award from the Secretary of Agriculture in 1983. He also was named a Fellow of the Society of American Foresters and a Distinguished Alumnus by the School of Natural Resources at the University of Michigan.

In the early 1990s the Forest Service designated the Forest Vegetation Simulator (FVS) as its forecasting tool to integrate scientific knowledge of ecosystem components and describe current and future forest conditions at the same level of detail. The FVS is based on the Prognosis Model (Teck and others 1996). All the basic concepts outlined by Al Stage 20 years earlier were incorporated into FVS.

Administrative Changes

In 1971, Joe Pechanec retired as Station Director and was replaced by Robert Harris, also a former range researcher, who transferred from his post as Assistant Director at the Pacific Northwest Station. Harris left the Intermountain Station for the Station Director position at the Pacific Southwest Station in 1974, and later went to the Washington Office as an Associate Deputy Chief for Research.

Keith Arnold succeeded Jemison as Deputy Chief for Research in 1973 and took a new approach to Station administrative organization. The stated purposes were to enhance outreach to research users, better coordinate research planning, and improve technology transfer.

The new organization established an Associate Station Director (later called Deputy Director) position, created a

An Extended Asian Adventure

What he thought would be a few trips to Taiwan in 1973 became a whole new way of life for Dave Born. Taiwan had not made an inventory of its substantial forest resources for 23 years, and Born was dispatched from Forest Survey to provide advice on how to conduct a new inventory and assessment. The initial trips and the program that developed were funded by a special Federal program.

It turned out that the Taiwanese wanted their survey designed from the bottom up. "I even wrote the necessary cooperative agreements for them," Born said (interview, 2005). Born's first advisory visits to the island blossomed into technical supervision of a big operation. The Taiwan Forestry Bureau provided 40 workers, several university professors were involved, and the Taiwanese Air Force supplied pilots for aerial reconnaissance.

Research Forester Dave Born (center) shared a meal in the 1970s in Taiwan with staff leaders for the island's forest survey project.

Born's program design and supervision work extended over 6 years, 1973-79. He alternated his office location, spending 3 months in Taiwan and 3 months in Ogden. In the process he learned to speak Chinese, although he said later, "I can speak some Chinese…not fluently, although I can cuss well." Born said everything about his contacts with Taiwanese culture was enjoyable, although spending half of each year away from his family was not.

Born also coordinated work in Taiwan by Survey's Gary Clendenen and John Kuilowski, Region 4 aerial photographer. Clendenen assisted with data collection procedures and computer programming. Kuilowski taught Taiwanese pilots how to maneuver to maximize aerial photography results and showed other personnel how to use the photos. Sometimes coordination tasks got a bit complex and outside the usual expertise of a research forester. The Taiwanese had no capability to process color and black-and-white aerial photos, so Born found a U.S. company that contracted to help them set up a lab. Then he arranged to ship the first equipment and supplies through the American Embassy to speed up the process.

Because of the steep terrain, Born and his associates developed a unique sampling system and plot size scheme. The components had been described by university professors in the U.S. who Born knew, but had not been used before in a large-scale survey. The innovations worked well in Taiwan. The project resulted in a Chinese-language publication, which included the inventory results and other data Born had summarized regarding forest characteristics and wood products.

Planning and Applications Assistant Director (AD) job, and converted the Division Chiefs to Research Program AD's and moved them to locations away from Station headquarters. The position of Division Chief for Station Management was renamed Assistant Station Director for Research Support Services. The plan was to pilot test the new organization at two Stations for several months; the Intermountain Station was one of the pilot locations. However, the trials never were carefully evaluated and the decision was soon made to go ahead with the new structure at all Stations.

The concept was that the Deputy Director would serve as an alter ego to the Station Director, taking over some of the day-to-day duties of Station management, which would allow the Director more time for outside contacts. The Planning and Applications AD was to aid in budget planning, develop technology transfer efforts, and serve as a liaison with the Chief's Office on program planning and development.

Locating the Research Program ADs at field sites was supposed to foster Station ties to cooperators, research users, and the research projects. At the Intermountain Station, one program AD remained at the Ogden headquarters because the research sites in the southern part of the Station territory were nearby, as was the Region 4 headquarters. The other position was moved to Missoula, where the AD had close contact with Region 1 headquarters, the Station's two labs there, and the University Of Montana School Of Forestry.

A national in-house study led to the changes. Station Directors were skeptical when the reorganization was proposed because research specialists would be reporting to generalists, but Arnold recommended the change. Chief John McGuire approved the recommendations, but attached the condition that Stations be given 4 years to comply. Years later, some personnel continued to express ill feelings about the changes (Steen 1998).

Deputy Chief Arnold also devised a Research, Development, and Applications (RD&A) Program concept designed to speed getting research results into use, particularly in critical situations. Although the Station had some experience with special programs, the advent of RD&A's had a major impact on its operations.

Special Programs Bring Special Problems and Achievements

For most of the 10-year period that started in 1972, three special programs—Fire in Multiple-Use Management, Surface Environment

and Mining (SEAM), and Systems of Timber Utilization for Environmental Management (STEM)—occupied prominent positions among Station activities. They and their impacts on the organization had several similarities, but there were substantial differences.

All were research and development programs, but the fire and SEAM programs included "application" in their designations. At the time, RD&A programs required national approval. R&D programs such as STEM did not. National approval of the RD&A program charters implied national control, and in fact such programs were subject to more inspection and guidance from Washington than were elements of the normal Station research program.

All three programs were geared to Station strengths. Experience in integrating fire research results into planning dated back to the 1930s when basic principles were established by Lloyd Hornby at Priest River and the Northern Rocky Mountain Station. This type of work was carried on by Jack Barrows and passed to others at the Fire Lab. The SEAM program took advantage of a lengthy history of scientific achievement in range, watershed, and associated soils research at the Station; many of the principles could be applied to mined-area rehabilitation. The STEM program tapped into engineering and forestry studies that for 10 years had focused on ways to remove timber from steep, often fragile slopes with minimal negative environmental effects.

In the previous decade, cooperative research with universities and private organizations had expanded in most parts of the Station program. With it came experience in handling grants and cooperative agreements, special personnel matters, shared use of facilities, and cooperative publishing arrangements. This helped the Station accommodate the special programs. The advent of the programs, however, introduced some stresses and strains in administrative units. Often, they had to absorb bigger workloads without parallel increases in personnel because Station funding in general had entered a period of decline.

The SEAM Program came with ample funding. It was authorized by Congress and had a specific budget item for its operation. This proved to be both a blessing and a curse. The fire and STEM programs basically had to operate with regular Station funds—that was no blessing. No doubt there were hopes that successes would breed increased funding. There were successes, but no financial support materialized and these programs were discontinued when their managers retired.

One small difference was that the Fire in Multiple-Use Program, unlike SEAM and STEM, did not have an acronym. This may have put it in an elite category of endeavors that somehow avoided becoming ingredients in the "alphabet soup" of special government programs.

The Fire in Multiple-Use Management RD&A Program—The fire program took a completely different approach than that pursued in the old fire control planning efforts. "Our approach assumes that fire management exists to support land management programs," Program Manager Jim Lotan said. The idea was to improve the capability of managers to integrate fire management into general land management plans and activities, considering fire as a way to meet objectives rather than a force to be controlled (Noble 1978c).

Lotan was an expert in the lodgepole pine-fire relationship, particularly through studies of lodgepole cone serotiny (serotinous cones need fire to open and disperse seeds) that earned him a Ph.D. from the University of Michigan. He was Project Leader of the silvicultural unit at the Bozeman Lab before assuming the RD&A manager duties.

The Fire in Multiple-Use Management RD&A Program had a logo, but did not have an acronym—perhaps putting it in a special category among Federal Government programs.

The program was given its mission and goals by a policy panel that included research and National Forest administrators. The goals were: (1) to define the role of fire in forest and range ecosystems and enhance the manager's ability to predict fire behavior and effects, (2) to develop techniques to meet the fire management needs of land managers, and (3) to apply fire management plans in selected demonstration areas (Lotan 1979).

The program emphasized applying existing knowledge, not conducting new research. There was heavy manager involvement, and a network of scientists and managers outside the Forest Service was established. Work on defining the program started in 1973 at the Fire Lab, but Lotan was not assigned to lead it until 1974, so one problem was that he led an effort he had not participated in originating. Another was that it took some time for the physical scientists at the Fire Lab to adjust to the blending of the physical and biological sciences and scientists that the program required.

The program had to "borrow" personnel from existing Station research units in almost all cases, a situation with built-in difficulties. Despite the obstacles, the program had some excellent achievements and was successful in developing a greater appreciation for cooperative research among the various units at the Fire Lab and other units within and outside the Station.

By mid-1976, so many activities were going on that Lotan started a newsletter to keep those concerned abreast of developments. The first went to about 1,000 people in the international fire community. Responses were good, and circulation ultimately expanded to nearly 2,000. "We want to inform our readers of the many activities of the program, and to alert them of possible ways that we can help them," Lotan said (*INTercom* 8/26/76). Two activities were somewhat unusual.

Wildlife Biologist George Gruell joined the program in 1978 to plan and conduct studies of wildlife management and fire ecology. His research, done in a nontraditional way, resulted in publishing comparison photographs that showed graphically how fire influenced vegetation on forest and range lands.

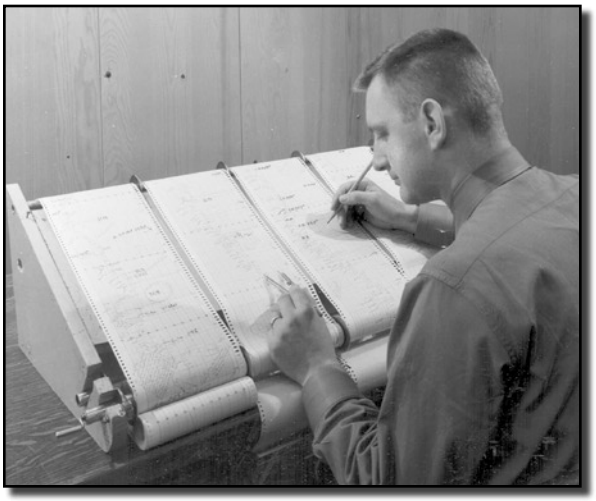
Gruell's first project was to compile an extensive photographic record of changes to the land in the Bridger-Teton National Forest in Wyoming, where he had served on the staff. He complemented a collection of "then" photos with "now" scenes and then selected 85 photo pairs that spanned 103 years of vegetation history. The result was a Station Research Paper, *Fire's Influence on the Wildlife Habitat on the Bridger-Teton National Forest, Wyoming*, a two-volume publication. The second volume discussed management implications of the vegetation changes (Kingsbury 1981b).

Gruell refined and expanded his technique, and later authored *Fire and Vegetative Trends in the Northern Rockies: Interpretations from 1871-1982 Photographs*. The document was a popular Station publication, and was considered significant in influencing thinking about the historical role of fire. Gruell also wrote several papers on the influence of fires started by Indians in the Interior West, a practice much more widespread than many people thought. This work also increased understanding about the role of fire in years past.

In 1994, some 15 years after Gruell's photo comparison publications appeared, there was great renewed interest in them that continued for several years after The Forest Ecosystem Mangement Assessment Team led by Jack Ward Thomas issued its report describing an ecological, economic, and social assessment of Pacific Northwest forests. The report sparked intense interest in ecosystem management. Gruell's documents finally were converted to electronic versions when demand eclipsed available printing funds (Kingsbury, personal communication).

Assembling and publishing bibliographies were standard practices in science, but the fire program took the concept further. Research Forester Alan (Pete) Taylor led development of FIREBASE, a system that provided technical information from wildland fire literature quickly and in a very usable form to anyone in the international fire community.

Like an annotated bibliography, most FIREBASE entries included digests of the base documents prepared by people knowledgeable about the subject. Unlike standard bibliographies of the time, all information was retrievable by computer and the system was dynamic. Its database could be constantly updated and corrected. FIREBASE included unpublished, as well as published, information and specialized training materials, some of them audio-visual items. When copyright or other regulations permitted, users interested in the original documents could receive copies on microfilm.



Research Forester Alan (Pete) Taylor operated a multiple strip-chart analyzer in the Fire Lab's meteorology laboratory in about 1962. The analyzer aided transcription of field data on lightning strikes. A decade later, Taylor led development of FIREBASE, a program to aid managers who wanted easy access to information about wildland fire.

To get services, users merely needed to phone or write an access center, where an operator would search the computer file and send the pertinent citations and digests, usually within 3 days. Access centers were set up at Berkeley, Atlanta, Boise, and Washington, DC. International cooperation was handled by a United Nations agency. Other major cooperators in developing the system were the Bureau of Land Management and Oak Ridge National Laboratories.

After it was developed by Taylor and others, FIREBASE was tested and evaluated for 2 years. It then attained full use as an approved Forest Service computer-assisted system with an operations center at the Boise Interagency Fire Center (Taylor and Eckels 1977).

Some other significant program accomplishments were:

- Participation in various demonstration projects that showed managers how prescribed fire and tolerance of natural fire under preplanned conditions could meet management objectives (see "Introducing Friendly Fires," chapter 10).
- Creating guidelines for prescribed burning on rangelands primarily managed by the Bureau of Land Management (BLM). This was facilitated in 1976 by the assignment of James Linne, a BLM resource specialist, as one of the three program team leaders. The guidelines were tested by the BLM in the Great Basin and northern and southern Great Plains.
- Design, development, and evaluation of a fire management decision model. This work was headed by Team Leader Dick Barney.
- Through a contract with a private research foundation, development of FORPLAN, a user-oriented simulation language that enabled field managers to access more complex computer systems using relatively simple terms. The system was evaluated by Lewis and Clark National Forest personnel in Montana.
- Production of state-of-the-art fire effects and prescribed fire guides. Complementary work was done by Team Leader Bill Fischer, who described a new plan and report format in a Station publication, *Planning and Evaluating Prescribed Fires…a Standard Procedure*.

Station Director Larry Lassen announced termination of the program in 1984. He noted that assignments in

the RD&A program charter had been satisfactorily completed. Lotan moved to the Forestry Sciences Lab in Missoula and took on a special task to write three national handbooks before he retired (*INTercom* 10/4/84).

The STEM R&D Program—The Systems of Timber Utilization for Environmental Management program was chartered in 1979, but its foundation was laid 5 years earlier. In 1974, the Station had started the Forest Logging Residues R&D Program. Its objective was to investigate alternative timber harvesting practices that might produce more intensive, environmentally compatible timber utilization in coniferous forests.

The residues program, with Ron Barger as manager, conducted research in ecosystems common to the larch, lodgepole pine, and Douglas-fir forests of Wyoming and Montana. Study sites were at the University of Montana's Lubrecht Experimental Forest, an area in the Gros Ventre Ranger District of the Bridger-Teton National Forest, the Solo-Hemlock area in the Priest Lake Ranger District of the Idaho Panhandle National Forests, and at the Station's Coram Experimental Forest (see "Learning about Larch," chapter 6).

Many disciplines and cooperators were involved in the residue program work. Results were presented at a 1979 symposium in Missoula, "Environmental Consequences of Timber Harvesting in Rocky Mountain Coniferous Forests," and made available in a Station publication with the same name. The program was renamed and rechartered and STEM got under way, with Barger as Program Manager, and a quite different mission than the old program had.

Research Forester Bill Fischer (left) and Program Manager Ron Barger discussed fire and utilization studies conducted by Station scientists at the University of Montana's Lubrecht Experimental Forest during an educator's tour in 1980.

The STEM program, headquartered in Missoula, was charged with providing managers with methods to use more of the under-utilized, small-diameter trees in the Northern Rocky Mountains, but with a major emphasis on environmental concerns. Watershed protection, wildlife habitat improvement, maintenance of esthetics, and insect and disease control were important to forest management, and STEM was to design specific timber harvesting recommendations to achieve nontimber goals. A dominant aspect of STEM was selection and development of field sites as demonstration areas, with each site representing a small-timber management problem typical of the forest in which it was located (*INTercom* 1/17/80).

The program was designed like a research umbrella, providing a special emphasis over several of the Station's existing projects. It was never funded or staffed as a separate entity (Close 1988a). STEM had three core units—economics, with Erv Schuster as Project Leader; utilization technology, led by Mick Gonsior; and engineering technology, headed by Ed Burroughs. Later, Barger assumed dual roles as Project Leader of the utilization unit in addition to his Program Manager duties. All the work of the three units contributed to STEM goals. In other areas, the program served an integration function, combining results by core unit researchers with those of cooperating projects.

Barger used the economics unit to illustrate how STEM worked. "Take for example the research in the Forest Economics project on below-cost timber sales," he said. "Erv Schuster's excellent and widely publicized work is seldom thought of as directly linked to STEM, but the below-cost sale issue is at the heart of the problem with small-stem harvesting." He also pointed out that through the economics unit, the Bureau of Business and Economic Research at the University of Montana produced several widely referenced works on product uses and the costs and availability of forest residues that were useful in meeting program objectives (Close 1988a).

The STEM program started out with no species emphasis. All Inland West areas that included trees considered marginal, small-stem timber were included. But during early problem analysis, Forest Service managers in Regions 1 and 4 emphasized that their number one priority problem was clearly management of small, overstocked

Branches and tops left after logging were chipped at harvest sites in one study sponsored by the Forest Logging Residues R&D Program in the early 1970s.

Studies of skyline logging systems in the Flathead National Forest, Montana, were part of the STEM program quest to find ways to harvest small-diameter timber efficiently without creating unacceptable impacts on the forest environment.

lodgepole pine stands. This gave STEM a focus, and Peter Koch's arrival as a staff member in 1983 brought needed wood technology expertise to attack the problem (see "Peter Koch—Superstar," this chapter). "His work soon became almost 50 percent of what STEM was about," Barger said.

At the time the program started, foresters generally thought they had to clearcut lodgepole pine stands if they were to harvest them at all. But considerations involving wildlife, recreation, watershed, and other uses often made partial or intermediate harvesting methods a better choice. Lodgepole had only recently emerged as a bona fide timber tree, so little information about alternative harvesting methods was available. Barger said, "Managers needed more alternatives, and STEM set out to find them" (Close 1988).

They found the right harvesting prescriptions in the Station's subalpine forest silviculture unit in Bozeman, which became a principal collaborator (See "Willkommen to High-Elevation Forestry," this chapter). "This unit should have been with STEM since day one," Barger said. "It just turned out to be one of those instances where our program needs and their research objectives meshed."

Managers got to see results at 25 field study sites in Montana, Utah, and Wyoming. The sites were selected to represent as wide an array as possible of stand age, tree size, and density within natural stands where trees were 3 to 7 inches in diameter. National Forest personnel helped select the sites and arranged commercial logging operations based on research specifications. That approach made the local foresters well-aware of what was going on and resulted in lots of visitors to the areas on an informal basis, and also for field days sponsored by the program and the forests.

Involving the managers helped define precisely what they wanted from the studies. Using various harvest methods to achieve a combination of timber-oriented and nontimber objectives raised economic questions of costs and benefits, at the time of harvest and in the future. STEM-sponsored research identified all objectives of concern and defined the costs and benefits associated with each. Barger was recognized in 1976 with a USDA Superior Service Honor Award for his imaginative work in setting up the program to emphasize "technically, economically, and environmentally viable alternatives" useful to managers.

Like all formally chartered R&D programs at the time, STEM had an expiration date. Although its original 5-year limit was extended once, it came to an end in 1986. Results and outlines of work that might continue within other frameworks were presented at a workshop attended by more than 100 scientists and managers at Fairmont Hot Springs, Montana. The Station published a summary document, *Management of Small-Stem Stands of Lodgepole Pine—Workshop Proceedings*, compiled by Barger.

Although the many technical publications that resulted from STEM formed a foundation of knowledge to serve as a basis for future utilization work, Barger expressed regret about the program's demise. "Five or seven years is just too short," he said. "We don't get the chance to benefit fully from what we learned. That's a problem with every R&D program trying to come to an orderly conclusion. You may have arrived at the end, but the program is not yet completed. If we could just do one iteration of our field studies, we would unquestionably come much closer to defining the most promising harvesting systems and techniques" (Close 1988a).

Barger retired in 1987, ending a distinguished Forest Service career that began in 1948 when he was a lookout and firefighter in the Apache National Forest in Arizona. He immediately started working as a visiting professor at the University of Montana's School of Forestry, where he was twice chosen Outstanding Professor of the Year by students. He died in 1993 of a heart attack, and the University of Montana Foundation established a scholarship fund in his name (*INTercom* June/93).

The SEAM RD&A Program—In the early 1970s there was a lot of interest in surface mining. More than 200 million acres in the Interior West, much of it public land, was underlain by coal, phosphate, uranium, and oil shale deposits. There were additional vast deposits of more than 80 other minerals that could be mined economically. Energy demand was rising throughout the U.S.

Interest in the environmental effects of "strip mining" was growing, and although 60 percent of surface mining was occurring in the East, the potential for expansion was much greater in the less developed western areas. There was little doubt that many essentially agrarian communities in the West would experience both social and economic impacts as they changed from rural to industrial cultures and the governors of western States were concerned about that.

The Forest Service had started a small research program at the Northeastern Station in 1962 to develop methods of reducing or preventing damage to the environment and forest resources during surface mining operations and to restore values after mining. Results had been used by States in developing reclamation laws and regulations, and by the mining industry, National Forests, and the Tennessee Valley Authority to guide reclamation practices.

Problems, especially in revegetation, were different in the West. So in 1972 the Forest Service completed planning for the Surface Environment and Mining Program to coordinate with many western research groups, land managers, and State and local government units. The goal was to develop and apply information to minimize environmental and socio-economic impacts from surface mining while providing needed energy sources and minerals (Bay, personal communication).

At its inception, SEAM was managed by the State and Private Forestry arm of the Forest Service. A small administrative staff was stationed in Billings, Montana. Several Program Managers supervised SEAM during its 9-year existence. The first, Jean Hassel, later became Regional Forester of Region 3. Research had a major role in SEAM, and the Station's watershed (later renamed disturbed lands reclamation) unit at Logan was heavily involved from the start.

Project Leader Paul Packer wrote a Station publication issued in 1974 that was to guide a large part of SEAM program work in Wyoming, Montana, and North and South Dakota, the four States that contained most of the Nation's federally owned coal deposits. Packer classified 3,000 square miles into "rehabilitation-response units." The areas included 22 surface coal mines. His work predicted rehabilitation success by area based on many factors. *Rehabilitation Potentials and Limitations of Surface-Mined Land in the Northern Great Plains* included detailed maps showing his ratings for 146 areas in 36 counties with a description of pertinent ecosystems.

Another influential early publication was *Revegetation on the Decker Coal Mine in Southeastern Montana* by the four scientists in the Station unit, Gene Farmer, Ray Brown, Bland Richardson, and Packer. It gave early results of studies at the Decker Mine, which developed into one of the largest surface coal mines in the U.S. This research provided the knowledge necessary to establish rehabilitation demonstration areas open to industry and the public at the State-owned site (Klade 1975).

Station researchers planted various seed mixtures and used different fertilizer, irrigation, and mulch treatments on study plots located on graded spoils at the Decker Coal Mine in southeastern Montana.

In August 1975, the Station assumed responsibility for SEAM. The Program Manager continued to reside in Billings, but reported to the Station Director. The program by then had active projects in 10 western States, and four reclamation demonstration areas were in operation, with two more planned. The work involved 10 universities, all the Forest Service western regions, State and other Federal agencies, and the mining industry (*INTercom* 8/21/75).

Although the Logan unit conducted or arranged for the bulk of the research, studies also were made by scientists at the Rocky Mountain and Pacific Southwest Stations. The Agricultural Research Service, at Mandan, North Dakota, conducted a SEAM-funded study of the chemical properties of overburden materials that affect water quality, plant establishment, and successful reclamation.

Obtaining seed for native plants was a problem in the West, and SEAM personnel worked with nurseries and Soil Conservation Service Plant Materials Centers to set up mechanisms for obtaining plant materials. In 1976, more than 50,000 containerized native shrubs were produced through this part of the program and shipped to various reclamation sites in the West. Shrub Lab scientists at Provo provided expertise for this development.

The Station added a new dimension to the research part of SEAM in 1976 when Neil Frischknecht and Bob Ferguson were assigned to work as a special team studying revegetation of oil shale and coal spoils on semiarid lands. Sites were established for oil shale studies near Grand Junction, Colorado, and southwest of Vernal, Utah. The pair worked in cooperation with the Bureau of Land Management at the Alton Coal Mine in Utah, one of three places in the State where coal could be strip mined. Ferguson summed up the research results shortly after the SEAM program ended with two Station publications, *Revegetating Processed Oil Shale in the Upper Mountainbrush Zone of Colorado* and *Reclamation on Utah's Emery and Alton Coalfields: Techniques and Plant Materials*.

Most western surface coal mines were in alkaline soils, and the acid waste problems associated with coal mining in the East did not exist, but there were acid pollution problems associated with western mines producing metals in certain areas (Bay personal communication). Farmer addressed one aspect of the problem with a 1976 Station publication, *Revegetation of Acid Mining Wastes in Central Idaho*.

Mining sites at high elevations had special problems, and Brown discussed some of them in *Revegetation of an*

Station scientists established one of the SEAM demonstration projects at an abandoned gold mine in the Custer National Forest in Montana. The spoils were shaped, covered with topsoil, and seeded with native plants. Rubber sheets, buried under the surface, helped retain moisture and control acid drainage.

Alpine Mine Disturbance: *Beartooth Plateau, Montana*, also issued in 1976. This topic was to receive continuing attention from Brown and other Station scientists after the SEAM program ended (see "Reclaiming the High Country," this chapter).

A large area in southeastern Idaho holds one of the world's richest known phosphate reserves, with more than a billion tons of recoverable minerals. The same area is known for its excellent wildlife habitat, especially for sage grouse, sandhill cranes, moose, elk, and cutthroat trout. Huge waste dumps result from the surface mining that extracts prosphate, and before the mid-1970s little was being done to reclaim mined areas (Kingsbury 1981a).

Station researchers began working with Caribou National Forest personnel to develop reclamation technology in 1972, and the scope broadened under SEAM program sponsorship in 1974. Phosphate mining firms were very interested in the research, and were quick to begin restoring waste dumps located on public land once advice on techniques became available. Major projects were at the Ballard Mine (Monsanto Chemical Co.), where the Station research began, the Wooley Valley Mine (Stauffer Mining Co.), the Maybe Canyon Mine (Beker Industries), and the Conda and Gay Mines (J.R. Simplot Co.).

Two pressing, related problems had to be solved. One was erosion and mass instability caused by the steepness of waste dump slopes and pockets saturated by groundwater within the dumps. The other was how to revegetate the barren and nutrient-poor dump materials to restore wildlife habitat. Farmer used nuclear measuring devices and models to define instability problems and show miners how to properly construct waste dumps or rebuild existing dumps. Richardson, working with Station scientists at the Provo Lab, demonstrated how to apply revegetation research to prepare sites and plant vegetation that would do well on the sites.

Studies at the phosphate mines resulted in recommendations for revegetation techniques at other mining operations, including coal, heavy metals, oil shale, and barite. By 1981, more than 60 mines operating in the western United States had nearly 500 people involved in reclaiming waste dumps (Kingsbury 1981a).

Shortly before Packer retired, he said, "I would like to look at a hill and not know whether it was mined or not." That

During a review of the Station research program, a revegetation plot at the Maybe Canyon phosphate mine in southeastern Idaho was checked by (left to right) a Caribou National Forest representative; Paul Packer, Project Leader of the mined-land rehabilitation research unit; Bob Buckman, Deputy Chief of the Forest Service for Research, Roger Bay, Station Director, and a representative of Beker Industries, the company mining the phosphate.

became possible at many sites where the results of SEAM-sponsored research were properly applied.

Starting in 1977, the focus of SEAM application work shifted from setting up demonstration areas to developing other ways to transfer knowledge to user groups. One product was a computerized literature searching capability developed through a contract with a university. Another was MOSAIC, a photomontage system produced by Aerospace Corporation in California to accurately portray how such things as power lines, roads, and pipelines would look before any development started (Colling 1977). The system was used by landscape architects in several types of project planning.

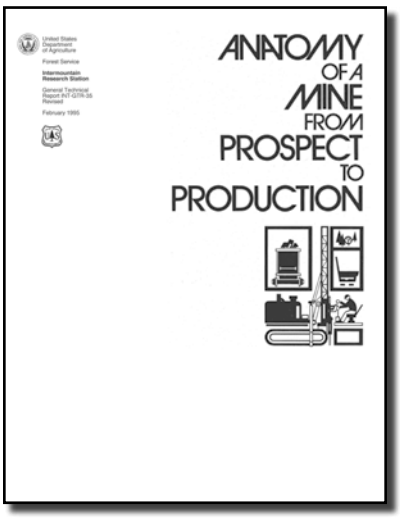
With SEAM activity slowing in 1980, the major thrusts became to package and distribute results. A series of workshops were held in Denver where all program participants focused on relating the major SEAM areas of concern to planning. They provided material for user-oriented handbooks published by the Station the next year. The user guides were for vegetation, soils, hydrology, engineering, and sociology and economics (*Forestry Research West* Aug./80).

The entire Station research unit—Packer, Brown, Richardson, Farmer, and technicians Bryan Williams and Michael Collins—received a USDA Superior Service Honor Award for the research work. When SEAM ended, the remnants of the research program were assigned to the Logan unit.

SEAM had been unique among Station special programs with Congressional funding as a separate budget item. During its first 2 years, the Program Manager reported to the Washington Office. There were advantages to that type of organization, but also drawbacks. It was always a battle to get research funds sent to the Forest Service units rather than to the various universities who wanted a piece of the action. Later, the visibility of the separate budget item made the program a target for Congressional cuts. Funds for SEAM gradually diminished and were eliminated in 1981. The danger of exposing an individual research program to specific Congressional cuts was a lesson somewhat painfully learned by the national Forest Service office and the Stations.

The Most Popular Pub

The most popular serial publication in Intermountain Station history was a product of the SEAM Program. General Technical Report 35, *Anatomy of a Mine from Prospect to Production*, was first issued in July 1977. It was reprinted nine times. A total of 34,500 copies were produced, and a revised version remained in demand in 2004.



Anatomy was first prepared in loose-leaf form in 1975 as an aid to Forest Service managers and other administrators with mineral area responsibilities. The material summarized legislation affecting mining, defined mining terms, and discussed basics of mineral exploration, development, and operations in the West. The guide was financed through the SEAM Program and prepared under direction of the Minerals Area Management Staff of Region 4. It was written primarily by private mining consultants James H. Bright and Anthony L. Payne.

The guide quickly became popular with land managers in many State and Federal agencies, and was used often in training courses. Planners, environmentalists, and mining industry personnel sought copies. Educators from elementary through college levels requested copies for classroom use. In 1977, a revision was edited and published by the Intermountain Station, which had taken over responsibility for the SEAM Program. The document was updated again before a reprinting in 1983.

Several reprintings were funded by the Region 4 minerals staff. The 1995 edition was paid for by the Minerals and Geology Management Staff in the national office of the Forest Service. Throughout the publication's history, combined efforts of Region 4 and Intermountain Station personnel and consultants in other Forest Service Regions in reviewing and updating material resulted in bringing readers current minerals management information (adapted from the Foreword of the 1995 revision).

The Challenge of Managing Change

In the early 1970s the flowering of the environmental and civil rights movements signaled big changes to come throughout the Forest Service. By the middle of the decade, change was sweeping through the agency. The management arm started consolidating Ranger Districts and National Forests in a search for greater efficiencies, more specialists in fields such as landscape architecture and wildlife biology were hired, and "public involvement" programs were begun in efforts to find consensus support for projects and programs. Pressures grew to radically change the workforce by hiring and advancing more women and ethnic minorities.

The same pressures affected Forest Service research, and it also was hit with another serious problem. Research funding generally not only stopped growing, it began to shrink or hold level as expenses rose. This turned out to be a long-term trend. The expansion era at the Intermountain Station had ended and "good times" for research had not reappeared by the close of the century.

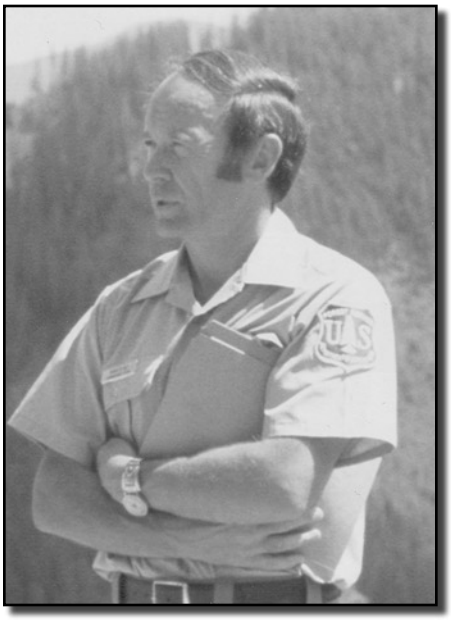
The Station's last new major facility was opened in 1975 when the Shrub Lab was dedicated, despite the fact that some buildings still in use at several locations were more than 40 years old. Over the next 3 decades, the only improvements in Station facilities of any consequence

were an addition to the Moscow Lab opened in 1991, some changes in interior laboratory space at the Fire Lab, construction of a greenhouse at Provo, and a bit of remodeling of the 1940s-era Boise Lab buildings that was primarily cosmetic. Several experimental areas were closed out or had Station use sharply curtailed mainly because funds no longer were available to maintain them.

As elsewhere in the Forest Service, personnel costs were up and were continuing to rise. Federal employee salaries historically had been low in comparison to private sector pay. When the Nixon administration came into office in 1968, reports were circulating that the gap was as much as 30 percent. Veteran employees recalled that reimbursements for travel expenses also were woefully inadequate.

In the late 1960s, employees were reimbursed a flat $16.00 per day for official travel expenses. Most people required to visit the Washington Office stayed at the Franklin Park Hotel, where the room rate was $13.00—the cheapest lodging anywhere near Forest Service Headquarters in the Department of Agriculture complex. The Franklin Park, a second-rate hotel later demolished, had two attractions. It served a hefty, although somewhat greasy, breakfast buffet for $1.00. A visitor could walk from the Franklin to headquarters, although it was a pretty good hike. After eating as much as possible and hiking to work, a traveler had the grand total of $2.00 remaining for food during the rest of the day and any miscellaneous expenses. Anything more came out of the employee's personal pocket.

The Nixon administration had a policy of encouraging private sector people to enter government service, and to accomplish that it had to do something about the compensation problem. Civil Service salaries gradually were improved and so were expense reimbursements (the flat rate for room and meals was increased to $25.00 per day in 1969). Annual salary adjustments exceeded the inflation rate for several years, although most analysts believed the gap between private and government compensation was never fully closed. The compensation news was good for most employees, but the added costs of doing business posed a problem for top administrators who had fewer discretionary dollars to use in keeping programs running.



Roger Bay responded to changing conditions in the 1970s with innovative management activities and a style that inspired confidence in subordinates. Bay was the third consecutive University of Idaho graduate to head the Intermountain Station, following Joe Pechanec and Bob Harris. The university's College of Natural Resources named Bay 1994 Honor Alumnus for his career achievements and service to the school.

Thanks in part to Deputy Chief Arnold's changes in Forest Service research Roger Bay faced plenty of challenges in 1974 when he succeeded Bob Harris as Station Director. The top staff had not had time to fully adjust to the new Deputy Director and Assistant Director roles and the demise of the old Division Chief system. RD&A and R&D programs were largely experimental, and the Station was involved in three major ones.

At about the time Bay arrived in Ogden, the Forest Service signaled its awareness of the growing environmental movement by producing a document labeled the "Environmental Program for the Future." The program described action and research programs, highlighting 18 areas of research emphasis for the next 10 years (Steen 1976). Most of the emphasis items involved some degree of change at the Stations. Adding in budget and workforce adjustments meant a lot of change was going on.

Bay was a special assistant to the Deputy Chief for Research in Washington when named Station Director, and before that assignment was a Branch Chief in Watershed Management Research. He had considerable early experience that perhaps gave him unusual insights useful in coping with the changes going on at the Station. His research expertise was in watershed and soils, important areas in the Station program. He had experience in the northern part of the Station territory as a forestry graduate of the University of Idaho. He knew about fire from a summer as a smokejumper in Missoula and also had worked on insect survey crews while a student. His first career job with the Forest Service was in timber sale administration with the Flathead National Forest.

One later experience turned out to be a perfect fit for the Station situation. While serving in Washington, Bay was appointed to represent USDA in an interagency group that worked with western States on coal mining and power project development impacts. Coincidentally, the Surface Environment and Mining Program was being developed to address Montana and Wyoming concerns. The SEAM concept meshed with interests of the group Bay was working with, and he was able to help the new program get through the Washington approval process. At the time he didn't know he would be moving to the Intermountain Station and be given major responsibility for SEAM in the field. Bay said the contacts he made with State officials during the special Washington assignment were helpful later when dealing with Montana officials (Bay, personal communication).

At the Station, Bay personally initiated some new approaches to management and presided over others. He instituted a Director's Advisory Committee of Scientists and Administrators, which included representatives from each lab and changed its membership annually. The committee had dual roles. Members were asked to advise Bay on specific

Station issues. It also was a mechanism for employees to bring concerns to the attention of the Director without having to go through the traditional supervisory "chain of command." The committee served as a communication link in another way. Meetings often included briefings by headquarters personnel on their areas of responsibility, information the committee members carried back to their home units.

Bay also started holding occasional staff retreats to help the Deputy and Assistant Directors become comfortable working together. These typically were 2- or 3-day informal meetings away from Station Headquarters. There were some formal reports and agenda items, but most of the agenda called for open discussion of whatever was of interest to the participants.

One significant question was how the three Program Managers would fit into the organization. Bay made them *de facto* Assistant Directors. They attended monthly staff meetings with the Assistant Directors and had much of the same responsibilities and authority within their program areas as the ADs did for research units under their supervision.

Bay said one major change he tried to bring about didn't work out. Other Stations had been successful in organizing "consortiums" to bring together university and government research expertise in coordinated programs. Bay tried to organize this type of effort with the Shrub Lab as a hub, but said the consortium idea just didn't catch on.

Although Bay failed to get a shrub consortium started, his promotion of the idea paid off. Less than a year after he left the Station the Provo Lab announced formation of a Shrub Research Consortium consisting of the Station, Utah Division of Wildlife Resources, Brigham Young University, and Utah State University to coordinate research on improving shrubs and their use on western rangelands.

During Bay's tenure as Director, the Station formed a Civil Rights Committee whose members represented a cross-section of units and employment levels. The committee helped set employment and training goals designed to increase diversity in the workforce. Regular employee orientation sessions were instituted, and they helped create understanding between scientific and administrative personnel. Bay credited Bev Holmes (see "Bev Holmes—Ace Administrator," chapter 12) with getting these activities started, but he gave them strong support (Bay interview, 2005).

Occasionally, Bay's management style resulted in events probably not seen before or since at the Station. For example, after the retirement of George Gruschow, long-time Assistant Director for Administration, Bay called a meeting of the five Group Leaders who reported to the AD for Administration. He read a list of candidates to replace Gruschow, and asked each Group Leader what he knew about the person and if he would recommend the candidate for the job. Giving people a voice in selecting their own supervisor definitely was not standard Forest Service procedure! Bay had a special knack for making subordinates at all levels feel they were important, and exercises such as rating a future boss certainly made the raters believe they were part of the management team.

Giving Station personnel a voice in matters that directly affected them was a Bay characteristic that often had very positive results. Long-time Project Leader Al Stage recalled one year when a severe budget crunch threatened the entire research program. Rather than dictate percentage or individual cuts in research units, Bay called a special meeting of the Project Leaders and merely laid what the total cut was likely to be, where the Station stood in the national picture, and what was needed to maintain a viable program. The Project Leaders returned home, thought it over, and went out and raised funds from outside sponsors. Enough "soft money" was forthcoming to maintain the Station program that year (Stage, interview).

This was not the first time direct funding came to research work units from sources other than annual appropriations. The practice grew, however, as constraints on the "regular" research budget continued. Retired Assistant Station Director Keith Evans said in 2005, "The amount and level of 'soft dollars' coming into the Station would surprise many. In later years, soft dollars set the priorities for the scientists. The Washington Office and Station Headquarters had very little influence on research direction. The research work unit descriptions became meaningless."

Bay's style was his own but it had some features of "participatory management," "transactional analysis," and other tactics advocated by management gurus of the time. It also included elements of "Total Quality Management," which was widely heralded in government and industry circles some years later. Asked how he would characterize his approach, he said, "I just thought it was important to involve a lot of people. We didn't have a name for it, we just did it."

The P&A Training Ground

Four men—Otis Copeland, Ron Lindmark, Jerry Sesco, and Keith Evans—served as the Planning and Applications Assistant Director during Intermountain Station history. Although the job was not formally designated as a "stepping stone" to higher positions, with one exception, all advanced to more important administrative posts in Forest Service Research.

The exception was Copeland, the first of the P&A ADs, who was only 2 years from retirement when the job was created in 1972. The principal reason P&A slots were established was a mountain of new work required by the Renewable Resources Planning Act and other Federal legislation mandating long-range natural resource planning. The timing, however, coincided with the change from Division Chiefs to Assistant Station Directors—Research at all Stations. The AD-Rs got more pay than the P&A ADs, and supervised a large number of personnel in research units. Evans called them "AD—Reals" (personal communication). P&A ADs usually had only secretarial help, no supervisory authority, and basically served as staff assistants to the Station Directors.

Copeland, a watershed scientist, had been a Division Chief. The other Division Chiefs got AD-R appointments. He "drew the short straw," and became

Otis Copeland was the first Planning and Applications Assistant Director at the Intermountain Station.

the P&A AD. He was not happy about this turn of events, and wasn't bashful about letting fellow employees know how he felt. Nevertheless, Copeland shared a trait common to all the Intermountain Station P&A ADs. He was an industrious person who got things done. He strongly supported the Station's Surface Environment and Mining Program when it was brand-new and required a great deal of coordination with Forest Service Regions and other organizations. In 1975, the Utah Chapter of the Soil Conservation Society of America gave him its Merit Award for his work with SEAM.

Lindmark took over as liaison between the Station Director's Office and the SEAM Program when he moved to the P&A job in 1974 from a post as Project Leader of the marketing research unit at the North Central Station. He recalled that the P&A position still was "relatively new and not well defined" (personal communication). During his tenure, Lindmark said two major activities consumed most of the P&A ADs time. Both were planning programs. One was responding to requirements of the Resources Planning Act, the other to a national/regional research planning activity conducted in cooperation with the Cooperative State Research Service

Ron Lindmark (standing) was involved in 1976 in some intense study of a planning document with (left) Forest Products Laboratory P&A AD Paul O'Connel and Professor Irv Holland of the University of Illinois. The exercise was part of a national/regional research planning program.

and forestry schools. Lindmark said very little of his time was spent on work that could be considered "applications," with perhaps the exception of arranging educator's tours.

When Lindmark moved to the Washington Office in 1977 his first job was as an assistant to the Deputy Chief for Research, responsible for planning. Later he served as research budget coordinator. After a stint working as a Congressional assistant to Representative Ralph Regula of Ohio, he became Staff Director of Forest Environment Research. Lindmark said the common expectation for people going to Washington was that they would stay 2 years. "My 2-year stay turned out to be 10," he said. "A slow learner, I guess."

Lindmark apparently learned well. In 1987 he was appointed Director of the North Central Station. He served in that position until retirement.

It was coincidental, but the next P&A AD followed right behind Lindmark during part of his career. Jerry Sesco became Project Leader of the marketing unit at the North Central Station when Lindmark left for Ogden. Some years later, after moving to the Washington Office, his second post there was following Lindmark as a staff assistant to the Deputy Chief for Research. Their appointments at the Intermountain Station were no coincidence, however. Station Director Roger Bay, who hired both men, said their strong backgrounds in economics were important to the planning part of the job that was emphasized at the time, and he believed their knowledge would put them in a good position to advance into future positions that required planning skills.

Sesco served 3 years as P&A AD. Like Lindmark, he said most of his time was spent on the "P" part of the job—long-range planning and budget. "The application part of the job never received the emphasis it deserved," he said. "However, INT was a leader in establishing and operating RD&A programs, which were very successful. It was our feeling that a long-range cultural change needed to occur to get scientists to build closer relationships with users, especially National Forest System managers" (personal communication).

Sesco moved from Washington to the Southeast Station as an AD-R in 1984. He was appointed Station Director in 1986. In 1988, he moved back to Washington as Associate Deputy

Jerry Sesco (left) returned to the Station in 1993 as Deputy Chief for Research to review the program and present awards, including one for Economics Project Leader Erv Schuster in recognition of Schuster's work in assembling and analyzing rural development data for a national program.

Chief for Research and after only 1 month was appointed to the highest administrative position in Forest Service Research—Deputy Chief.

Evans was the third consecutive P&A AD to come from the North Central Station when he replaced Sesco in 1981. A wildlife biologist with a special interest in ornithology, he was Project Leader for range and wildlife habitat research at North Central's unit in Columbia, MO. Planning continued to be an important part of the P&A job, but there was more balance as the national planning programs got less emphasis. Evans was involved more in budget formulation and technology transfer than his predecessors had been.

Evans said at some Stations there were conflicts between the P&A AD and the Budget Officer, but that wasn't true in Ogden. "Carlos Elwood (the Budget Officer) and I got along real well," he said. "I always referred to my part as 'funny money' and worked on budgets before the appropriations committee passed their bill. As soon as the appropriations bill was passed and the money crossed to the west over the Mississippi River, Carlos took over and did a great job." Elwood assumed the long-range budgeting work when Evans went to the Washington Office in 1985. The P&A position was not filled after Evans' transfer (Evans, personal communication).

In the technology transfer phase of the job, Evans helped organize several important symposia. He also spent considerable time coordinating a "Research Needs Response Program." This was an effort to solicit ideas directly from resource managers at all levels about what their most compelling problems were and which ones research should work on. This program was not a great success, and later was discontinued (see "Getting the Word Out—the Station's Strong Suit," this chapter).

Evans went to Washington after qualifying as a Congressional Fellow. He worked for then Congressman Dick Cheney and later Senator Malcolm Wallop, both of Wyoming. He also worked on the Forest Service Legislative Affairs Staff and served as a staff specialist in the Forest Environment Research office. Life in Washington could be hectic. During 4 years there,

Keith Evans supervised the original wilderness research unit as part of his job as an Assistant Station Director for Research. When the Aldo Leopold Wilderness Institute opened in 1993 Evans was on hand to present a commemorative T-shirt designed by the old unit's David Spildie to Dorothy Bradley, Aldo Leopold's step-granddaughter.

Evans lived in four apartments, held three positions, and occupied seven different offices (*INTercom* 11/9/89). He got his reward in 1989 when he returned to the Station as an "AD—Real," supervising a large group of research units, a job he served in until retirement.

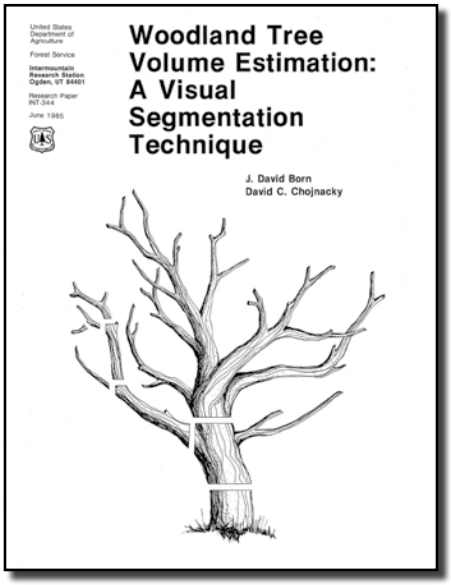
The P&A job at the Station proved to be an excellent transition position between scientist and research administrator roles. The P&A AD was a member of the Station's executive team and participated in all the meetings where budgets, personnel, and other matters were discussed and decisions were made.

A Lot More to Survey

On the national scene, passage of the Forest and Rangeland Renewable Resources Planning Act (RPA) in 1974 had important effects on the Forest Service. RPA called for the Service to make an assessment of natural resource needs every 10 years, and to produce a plan every 5 years to address those needs (West 1990). A significant amendment to RPA was passed in 1976, titled the National Forest Management Act. NFMA called for a comprehensive management plan for each National Forest. RPA had an impact on the Stations, but the planning effort required at each National Forest placed much greater demands on time and human resources. To many Forest Service employees, and perhaps the public, RPA and NFMA changed the Forest Service from a "doing" to a "planning" organization.

The Resources Planning Act created the original need for Planning and Applications Assistant Station Directors, and it created a lot more work for Forest Survey. The act broadened the inventory mandate to include not just commercial timberlands, but all forest land. In the Intermountain West this meant that vast areas of pinyon-juniper and other species considered noncommercial had to be included in Statewide surveys.

This task was difficult if not impossible with existing technology. Pinyon and juniper trees tend to have multiple stems and heavy branching. Traditional measurement methods could not provide accurate estimates of the volume and growth of these woodland types. The Station's survey unit, working in coop-



Dave Born and Dave Chojnacky of Forest Survey wrote several publications describing the segmentation technique for determining volume and growth of dryland trees and later refinements to the system.

eration with Region 3 (the Southwestern Region) and Station scientists at Reno, solved this problem in the mid-1970s by developing a procedure for measuring these trees that involved segmenting the stems and branches and then computing estimates of volume and growth (Van Hooser, personal communication).

The procedures worked so well that the Pacific Northwest Survey Unit, based in Portland, used them for the inventory of the chaparral type in southern California and for the western juniper type in Oregon and Washington. During the 1990s, the Forest Service's International Forestry Staff exported the Intermountain Station segmentation procedures to Sudan and Somalia, where they were successfully used to measure and inventory shrubby vegetation in those countries.

The unit developed useful new technology again when it was time to do a Statewide survey in Arizona, where mesquite is common. Mesquite was too dense to allow foresters to extract cores to measure growth, the usual method. Survey researchers developed a model to predict growth from other easily measured variables. Results were used to estimate wood volume growth for 1.2 million acres of mesquite inventoried in Arizona.

The growth model was incorporated into the University of Arizona's larger computer projection model for southwestern woodlands. Model information was requested by resource management agencies in Arizona, Nevada, New Mexico, and Texas. Because Arizona's mesquite was one of 40 mesquite species distributed worldwide, there was considerable international interest in the model (*INTercom* Nov./92).

Family Fights Erupt

As pointed out earlier, over the years there sometimes were tensions within the Forest Service between Research and National Forest System personnel. On occasion, tensions escalated into clashes over situations in which scientific findings were at variance with prevailing management philosophy or actitivites. Two examples of unusual situations are described here to illustrate what could happen.

The Forest Service was embroiled in controversies in the 1970s. The environmental movement had added a new dimension to conflicts between people with differing viewpoints that are inherent in a multiple-use management program. The Forest Service was caught in the middle. Some criticism was leveled at the use of chemicals in programs to control insect pests or unwanted vegetation. A lot of criticism was directed at the quantity and quality of timber harvesting in the National Forests. Chief Ed Cliff said he welcomed the environmental movement but acknowledged that top Forest Service officials may have misjudged its power and effect…"The movement wasn't new, but it certainly gained momentum and grew beyond all stretches of the imagination during the sixties" (Hartzer 1981).

One of the flaps in the early 70s pitted a Station researcher and a management specialist against several managers. Gene Amman, a research entomologist stationed in Ogden, and Bruce Baker, an entomologist with the Timber Management Staff in the Region 4 Regional Office, collaborated on a study of methods for controlling mountain pine beetles, including using chemicals (one method was to spray tree trunks with ethylene dibromide mixed into diesel oil). Amman and Baker concluded that the chemical treatments did not stop the spread of infestations. They wrote a paper intended for publication in the *Journal of Forestry*, and the manuscript went out for review by several scientists and managers. According to Amman (personal communication), the review process stimulated stiff opposition from National Forest managers in several Regions.

Amman visited Assistant Station Director Chuck Wellner and asked if Wellner thought the paper should be withdrawn. The usually mild-mannered Wellner got red in the face, banged his fist on the desk top, and exclaimed, "It's the truth and by damn we are going to publish it!" The paper was published by the journal in April 1972.

Not long afterward, Amman got a call from the Office of Management and Budget seeking his comments about the study. Soon after that, forest-wide programs to control mountain pine beetles with chemicals were discontinued.

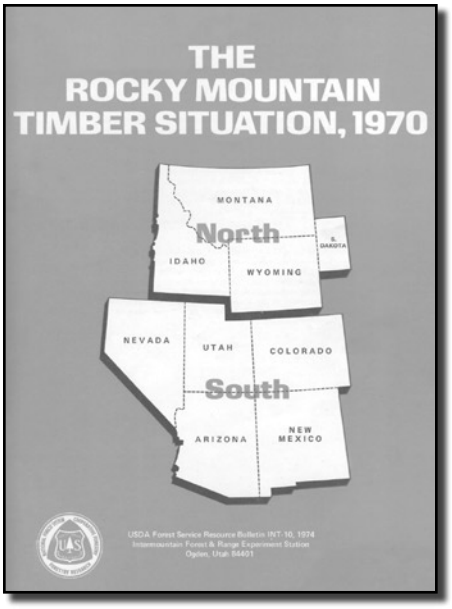
Amman said Attorney Dean Gardner of the USDA Office of the General Counsel told him of an unintended consequence of the study and publication. The Targhee National Forest in Idaho made a lodgepole pine sale in an area of beetle infestations to a timber operator with the stated purpose of protecting trees that would be left after the timber cutting. The operator didn't complete the harvest, and the Forest Service sued him. The logger used the Amman-Baker study results in his defense, and won the case.

Amman said, "That is the way with science; some of it works for the Agency and some works against it."

By 1974 national controversies over timber harvesting, particularly clearcutting, had escalated. It was just the right or wrong time (depending on one's viewpoint) for the Intermountain Station to issue a timber supply situation report. It happened to be the time when huge amounts of data gathered over a 10-year period for and by Forest Survey in its nine-State area of responsibility had been assembled, analyzed, and interpreted. The Station published the results in *The Rocky Mountain Timber Situation, 1970*, by Al Green and Ted Setzer.

Green was a veteran research forester who had multiple academic degrees, including one in economics. He had considerable experience in silviculture and regeneration research and had worked for several years as Superintendent of the Amana Experimental Forest in eastern Iowa. He was serving as Assistant Project Leader for Forest Survey, and in that capacity wrote or participated in writing many reports. Setzer had a wealth of experience in research work on timber removals and inventory planning and had been a forest manager and sawmill operator, also in the Amana Colonies.

Green was good with words. He was considered one of the best writers in the Station at the time. His writing was clear, usually interesting, and sometimes eloquent. Unfortunately, Green got a bit carried away in the situation report,



and the transgression slipped into print. Discussing the gap between timber cutting and reforestation, Green wrote, "If the current trend continues, the 2.7 million acres (the acres that hadn't been reforested after timber harvests) will blossom into more than 4 million acres of nonstocked land by 1980. To prevent this kind of galloping desolation would take a regeneration program about six times the magnitude of the 1970 program."

The statement was backed up by a lot of solid data and sound analysis in the report. Nevertheless, Station people soon learned that several National Forest System officials thought "galloping desolation" was a little bit extreme.

The Station issued a news release as it commonly did in those days when any publication was thought to be of interest to the public. A copy of the publication was mailed with each release. This topic indeed was of interest. The *Denver Post* carried the story under a major headline across the top of page one. The *Salt Lake Tribune,* the *Missoulian*, and other newspapers displayed it prominently. Most of the backlog of unstocked acres was in Region 1, and a reaction came quickly after the *Missoulian* hit the streets.

A Regional Information Office staff man called Station Headquarters to find out how the story got into the media. After being informed about the news release, and reminded that an advance copy had been sent to his office, the Regional representative was asked if anybody was upset. He chuckled and said, "Well, for one thing the Director of Timber Management is muttering something about desolation and bouncing off his office walls like a ping pong ball."

That no doubt was an exaggeration, but official protests to Station Director Bay soon followed. He turned the ruckus into a positive situation by dispatching Green and Setzer to Montana to explain the statistics and their conclusions in several meetings with timber management specialists and Forest Supervisors. Reports were that the meetings went quite well and most participants wound up agreeing that the publication was accurate.

Most of the time researchers and resource managers had excellent relations. Occasionally, there was a collision between researchers who believe they must maintain scientific objectivity and managers who took justifiable pride in doing a difficult job well. The 1974 timber situation conflict illustrates one reason the Forest Service has maintained research as an independent branch within the organization since 1928. Had the Station been subject to Regional Office authority the forthright report probably would not have been published. Even if it had been issued, it almost certainly would not have been called to public attention by the Forest Service. Chief Cliff, incidentally, just before he retired strongly endorsed the continued separation of research and management in his final report to his boss, the Secretary of Agriculture (Hartzer 1981).

Willkommen to High-Elevation Forestry

Silvicultural research at the Station started at the lower elevations where the most valuable timber grew. At Priest River, and later Deception Creek, studies of cutting methods and regrowth centered on western white pine. In the Boise Basin and in Montana, researchers were concerned almost exclusively with ponderosa pine. As the supply situation changed and demands grew, silviculture studies moved upward in elevation to include more species and outward to include values beyond commercial use for wood products. With the emphasis on subalpine forestry they eventually took on a decidedly international flavor.

Project Leader Wyman Schmidt could dress the part as he hosted international exchanges of knowledge on subalpine tree species long neglected in the United States.

Wyman Schmidt's career at the Station spanned most of the changes. Some of his first research after he joined the silviculture unit in Missoula in 1960 was on methods of cultivating Douglas-fir Christmas trees, a forest product important in Montana that was usually grown at lower elevations. One of his last major activities before retiring in 1994 was hosting an international workshop on ecosystems featuring subalpine stone pines—whitebark pine in North America and four similar species in Asia and Europe. Stone pines have little commercial value for forest products, but are of great ecological importance in the high-elevation areas where they grow.

In 1961, the Missoula unit added spruce to the lineup of tree species studied, and included the role of fire as a forest process. Silvicultural research came to Bozeman the same year with a new unit studying lodgepole pine. The units were combined in 1972, and about 4 years later added the spruce budworm-silviculture relationship as an area of interest, following Schmidt's

appointment as Project Leader (see "Integrating Insects with Management," next section). Ten years later non-commercial values and resources other than timber were being given more emphasis, and by the time Schmidt retired the unit had been renamed Ecology and Silviculture and included ecosystem management, landscape-scale vegetation modeling, and biocontrol of invasive plants.

Why did the original Montana unit survive and continue to be an important part of the Station research program with all the changes in organization and direction? Schmidt believed it was because of the integral nature of silviculture. He said, "Silviculture is the science and art of managing forests to meet resource needs. No matter the resource or management objective—be it esthetics, water, timber, wildlife, or recreation—silvicultural practices are the driving force, the means used to achieve the desired end" (Prouty 1987).

Schmidt also believed in integrated attacks on research problems, and that involved cooperation with other Station units. Examples of silviculture unit members working with fire effects, mountain pine beetle, watershed, wildlife, and other researchers in many parts of Station territory appear throughout this history. Key unit members during most of Schmidt's tenure were Research Forester Clint Carlson, Silviculturists Ray Shearer and Dennis Cole, Research Forester Ward McCaughey, Forester Jack Schmidt, and Biological Technician Leon Theroux.

With its members often working in different places at different times, how did the unit stay focused on its mission? "Each year we all gather to discuss the general thrust of our work. During the rest of the year there's constant communication among the group. We jointly develop direction of our research, assign it to individuals, and then give them a lot of independence. I believe independence is essential to creativity, and that's what research is all about," Schmidt said (Prouty 1987).

McCaughey (personal communication) said he believed Schmidt's management skills resulted in his greatest contributions to forest science and management. He said the Project Leader "did an outstanding job organizing, hosting, and compiling results of a number of important regional and international symposia." Four proceedings compiled by Schmidt were issued as important Station publications.

Dead or dying whitebark pines signaled a problem in many high-elevation ecosystems.

The first, *Future Forests of the Mountain West: a Stand Culture Symposium*, assembled a vast amount of technical information about young forests that grew from the east slopes of the Sierra and Cascade Mountains to the high plains of the mountain west. It was published in 1988 following a gathering in Missoula of 300 scientists and forest managers at which 57 papers were presented.

Ecology and Management of Larix Forests: a Look Ahead showed the extension of the silviculture unit's interests into international forestry by including many reports by scientists and managers from Europe and Asia as well as North America (see "Learning About Larch," chapter 6).

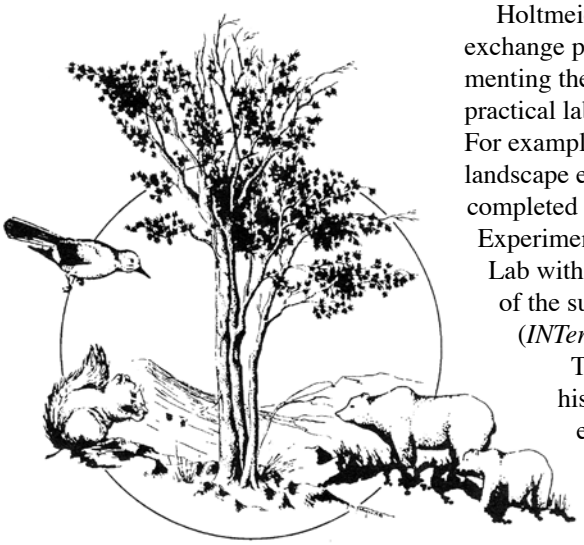
When considerable interest developed in the decline of whitebark pine, Schmidt organized and hosted a 1989 symposium focused on holistic management of high-mountain ecosystems in western North America where the pine was the predominant tree. The result was *Proceedings—Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource*. The presenters included several Station scientists working on various aspects of problems in the high-elevation ecosystems. For a variety of reasons, whitebark pines were declining in many areas.

Ray Hoff reported on work in identifying disease-resistant whiteback pines for use in developing seedlings to reforest burned or cutover areas. Ward McCaughey and Schmidt described studies on basic characteristics of whitebark pine ecology, including cone and seed development and several aspects of natural and artificial regeneration. Steve Arno and Bob Keane gave papers describing whitebark ecology and fire effects. Dale Bartos reported on the role of mountain pine beetles in whitebark areas. David Cole defined recreation impacts in high-elevation areas where whitebark was found.

Some of the Station research had a quick payoff when $300,000 was raised in a campaign by *Country Living* magazine and the Arbor Day Foundation to plant new forests in areas damaged by the 1988 Yellowstone fires. Many burned areas were whitebark ecosystems and McCaughey helped prepare planting guidelines. The work improved planting success and reduced the cost of restoring the whitebark pine forests (*INTercom* Jan./92).

Hoff and associates at the Moscow Lab provided some good news in 1995. They found a significant number of whitebark seedlings in the wild that were resistant to blister rust. They planned to create natural seed orchards, a move that would substantially reduce the time needed for whitebark pine to be restored to its role in high-elevation ecosystems (Intermountain and Rocky Mountain Stations 1995).

Only one of the 52 presenters at the 1989 symposium was from Europe, but that one, Friedrich-Karl Holtmeier,



The relationship of a small bird—Clark's nutcracker—whitebark pine forests, squirrels, and grizzly bears was described in reports presented in two symposia organized by Wyman Schmidt. The nutcracker was a primary disperser of whitebark seeds. Squirrels stored the seeds, and grizzlies found the caches and used the seeds as food sources. Research on this subject was a specialty of Diana Tomback, a Station cooperator who was an Associate Professor at the University of Colorado in the late 1980s.

turned out to be a key associate in ventures that took high-elevation forestry research to new levels of international cooperation.

Holtmeier was a professor at Westfalische Wilhelms Universitat in Muenster, Germany. He and Schmidt developed a close professional relationship. One result was a gathering in Switzerland of 50 scientists from 12 counties who exchanged findings on the world's five stone pine ecosystems. The stone pines occupy vast areas in the Northern Hemisphere and protect important watersheds, are prominent esthetic features, provide wood products in some places, and are important to several wildlife species. The information exchange resulted in a document compiled by Schmidt and Holtmeier, *Proceedings—International Workshop on Subalpine Stone Pines and Their Environment: the Status of our Knowledge* (*INTercom* Dec./94).

Holtmeier and Schmidt set up an exchange program for students complementing their academic work with practical laboratory and field experience. For example, Bettina Gerlemann, a landscape ecology major from Germany, completed her "practicum" at the Coram Experimental Forest and the Bozeman Lab with guidance from members of the subalpine silviculture unit (*INTercom* Nov./90).

The research by Schmidt and his colleagues aimed at high-elevation forest problems was important because past management techniques were mostly borrowed from sites that had better growing conditions and high sawtimber values. Schmidt and his associates had a major role in developing more advanced concepts, which grew from a foundation based on natural processes. Ecosystem management in high-elevation forests combined natural fire prescriptions with managed prescribed fire and carefully planned tree thinnings and harvests. The idea was to give primary consideration to regenerating forest areas or to leave them in a natural state when that was most appropriate (*INTercom* July/92).

The Montana Section of the Society of American Foresters honored Schmidt as "Forester of the Year" in 1989. The national group elected him a SAF Fellow the next year. In 1992, The Department of Agriculture gave him its highest recognition, an Honor Award for Superior Service, for his leadership in ecosystem management research.

Integrating Insects with Management

In 1972, the U.S. Environmental Protection Agency announced that general use of the "miracle" pesticide DDT was no longer legal in the United States, ending nearly three decades of reliance on the chemical to control the spruce budworm and other forest defoliators (U.S. Environmental Protection Agency 1972). This action resulted primarily from the discovery of harmful effects on nontarget species such as eagles and fish. The national ban drove home the point that more effective and ecologically sound approaches to pest control were needed.

Station scientists had known that for some time, and several veteran entomologists could base their knowledge on personal experience with chemical spray programs. Among them were Dave Fellin, Mal Furniss, and Walt Cole, all of whom had supervised or participated in chemical control operations (see "Beetles, Budworms, and Bushes Get Lots of Attention," chapter 8). Statements such as the opening paragraph of the Station's 1963 annual report's section on insects showed the direction the program had taken:

> Studies of forest insect populations and their behavior form the foundation of our research program on bark beetles, defoliators, and insects affecting regeneration. These studies emphasize the determination of factors that affect population changes. Development of methods of control by biological, cultural, chemical, or combinations of these methods will depend upon greater knowledge of population dynamics.

Knowledge of insect population dynamics was pursued by researchers at Moscow, Missoula, and Ogden. That knowledge was one of the key needs when USDA announced with some fanfare in the 1970s that its agencies, including the Forest Service, would henceforth practice "integrated pest management." At first, quite a few people weren't sure what that meant.

Thirty years later, the integrated approach still had a variety of definitions, although nearly all natural resource management organizations said they practiced it and educational institutions universally advocated its use. Several common threads run through the various definitions: (1) eradicating the pests is an unrealistic goal; they are part of the environment and the goal should be to keep populations at acceptable levels; (2) knowledge of the pest and its environment must be combined to determine which actions might be safe, effective, and economical; (3) all possible control methods and combinations of them should be considered; and (4) long-term solutions should be

emphasized, especially for forest and range lands.

Station scientists played key roles in the journey toward that type of thinking from the days of the massive chemical spray programs. When Fellen retired in 1985 he said, "In the past we tried quick fixes with pesticides, now managers recognize the need for long-term management approaches. I'd like to think my work in the past 30 years has had something to do with this change in thinking" (*INTercom* 4/4/85).

As Project Leader at Moscow, Furniss conducted personal research and supervised a unit that worked on new approaches to control a variety of insects in diverse natural environments. He did extensive research and field testing on using pheromones to control insects.

Early in the discussions about integrated pest management, Cole was citing a "great need to integrate beetle control strategies into forest management practices" in talks at workshops and in publications (for example, Cole and Klade 1975). At the time, he and colleagues had acquired basic knowledge of beetle biology and developed several new control strategies.

Problems with research funding that materialized in the 1970s at the national level included the beginnings of large cuts for insect and disease studies. Partly to counter this trend, the Forest Service Research staff developed the "Three Big Bug" programs (gypsy moth, southern pine bark beetle, and tussock mouth) as a way of focusing efforts on major insect pests. To gain political support, universities were brought in as partners, along with USDA's Cooperative State Research Service.

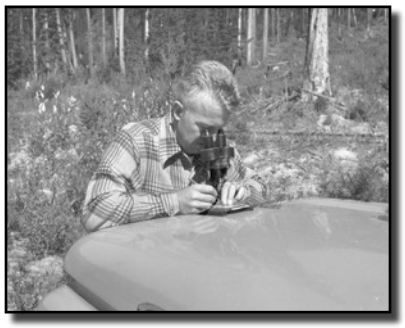
The "Three Big Bug" programs were successful in temporarily stemming the erosion of insect and disease research funds, helping build a working alliance of researchers between the Forest Service and the universities, and serving to improve the application of research results by forest managers. At the Station, budworm research was enhanced through participation in the Canada and U.S.A. (CANUSA) R&D program. This program was unique in that it involved several western Stations in addition to Canada.

Witness for the Defense (or was that the Prosecution?)

Becoming known as an expert can get a scientist involved in some unusual situations.

In 1983, Entomologist Dave Fellin published a detailed commentary on three decades of experience with attempts to control the spruce budworm with chemicals. He concluded that, overall, the spray programs had not controlled the budworm, changed the course of a major regional outbreak, or made any significant improvement in the budworm problem. The article also had a positive side, describing and commenting favorably on efforts to manage stands on nearly a million acres with long-term silvicultural treatments (Fellin 1983).

One result of the article's appearance was an assignment as an expert witness-consultant in a lawsuit filed by Boise-Cascade Corporation against the Forest Service. The suit alleged that the Forest Service did not spray lands adjacent to Boise-Cascade property that had been sprayed, and it should have done so to make the company's operation successful. Fellin appeared in court in defense of the Forest Service. The Forest Service won the case.



Dave Fellin earned his reputation as a spruce budworm expert partly because he took his studies to the scene of the problems. Here he examined insect-infested foliage with a field microscope on the hood of his vehicle.

In a lawsuit in Region 3 (Southwestern Region), an environmental group sued the Forest Service because it did spray. Fellin got a subpoena to appear in Santa Fe to give a deposition. The issue was settled out of court. Had it gone to trial, Fellin (personal communication) said the same testimony he offered in defense of the Forest Service in Idaho would have been used against it in New Mexico.

Fellin's experience and expertise meant he also was in demand for less unusual assignments outside the Station's basic territory. He was selected to serve on several national task forces dealing with comprehensive programs of budworm research throughout the United States (*INTercom* 2/23/86). He also made important contributions as a member of a special team that recommended new management approaches for National Forests in Region 3.

Fellin started working in cooperation with the CANUSA program at its inception as a Team Leader within the Station's Silviculture of Subalpine Forests research unit. The team included Research Forester Clint Carlson, Entomologist Chuck Tiernan, Forester Ward McCaughey, Biological Technician Leon Theroux, and several temporary and work-study employees.

The team gained somewhat unusual laboratory-office space in 1980. What had been known as "the old white matchbox" when it was built in 1957 for $3,550 as a warehouse and garage was renovated and expanded to include an insectary in the 1960s. Starting in 1978 it was again renovated and then moved to a site next to the Missoula Forestry Sciences Lab. Included in the work was a face lift featuring a new cedar-shingle roof and exterior siding. The small wood-frame structure became an attractive, functional research building (*INTercom* 4/24/80). The 1978 renovations and move cost about $50,000, a small amount to develop a research facility. But by that time, the Station had very little money available to devote to facility improvements, and innovative approaches were a necessity.

The entomology-silviculture research integration at Missoula resulted in new knowledge being translated into silvicultural prescriptions that became cornerstones for integrated forest management in many areas (*INTercom* July/92). The foundations for new

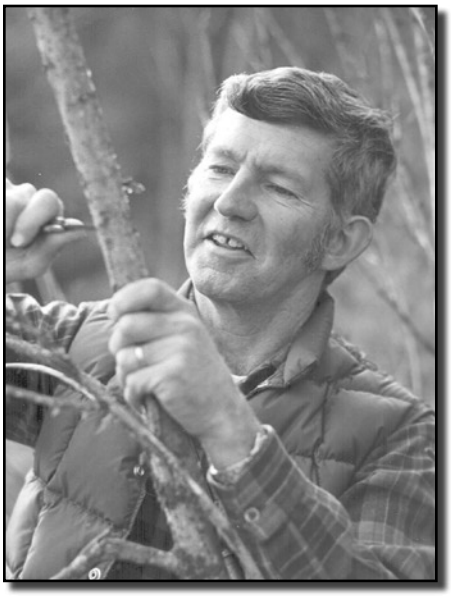
management recommendations were laid by considerable research into the budworm's relationship to its environment (Reynolds 1989b). The work included consideration of climate; tree and stand vigor; stand composition, density and structure; susceptibility to the budworm with acreage changes; and the historical role of fire.

CANUSA program interests in the budworm extended throughout most of Idaho, Washington, Oregon, and western Montana. Results were issued in a series of handbooks and other documents. One of the most comprehensive general publications was a national USDA handbook written by Carlson and William Wulf, Clearwater National Forest silviculturist. It reviewed the results of traditional management, which excluded fire, and discussed silvicultural systems that could result in healthier ecosystems, including using prescribed fires.

The Missoula team published many reports more specific to Montana and Idaho. One was a guide to rating budworm hazards, issued by Region 1 (Reynolds 1989b). The researchers also helped produce models predicting budworm impacts on future tree stands, which were linked to the PROGNOSIS system developed at Moscow (Wykoff 2002). In a somewhat unusual approach, Carlson worked with Brigham Young University professor Rex Cates on studies of interactions between tree foliage chemistry and the budworm. They found that several compounds inhibited feeding by the budworm (*INTercom* Nov./92). Carlson, Fellin, Project Leader Wyman Schmidt, and other team members and cooperators appeared at many workshops and field tours to discuss and recommend silvicultural methods to control budworm infestations.

Although the budworm research team registered many successes, they were not sufficient to stop the erosion in forest insect program funding. When Fellin retired in 1986, he was the last Intermountain Station entomologist to be located in the Northern Rocky Mountains, ending staffing begun in 1909 by the Bureau of Entomology.

Starting in 1972, Furniss field tested various bark beetle pheromones and proved the anti-aggregative effect of methylcyclohexonone produced by Douglas-fir beetles after mating. The discoverer of the pheromone had thought it to be an attractant. Furniss then conducted a cooperative 10-year research and development project that resulted in a controlled-release formulation of the pheromone and the technology for applying it by helicopter to prevent populations of beetles from developing in storm-damaged trees from which they generated outbreaks. Region 1 personnel conducted a pilot test of the method in 1982. It was registered for use by the Environmental Protection Agency in 1999.



Mal Furniss, shown here in 1976 examining a willow for insects, had a long and productive career at the Station after being transferred from the Bureau of Entomology in 1954.

In 1974 during a trip in the Sierra Madre Mountains of northern Mexico, Furniss found the Douglas-fir beetle, the first documented case of its discovery in Mexico. Later, he described the population as a subspecies, named after his Mexican guide.

Furniss made many trips to Alaska and obtained numerous new records of bark beetles from that State. He field-tested pheromones of the spruce beetle and larch beetle, and published the only information known on the biology of the "willow bark beetle" and the "boreal spruce beetle." He also published the biology of a previously unstudied leafblotch miner, which infested vast areas of willow in the Yukon River drainages.

Furniss was a pioneer in making systematic studies of insects on wildland shrubs in the Northwest and Alaska. He was an author of a U.S. Fish and Wildlife Service publication on the defoliator of curlleaf mountain mahogany in the Charles Sheldon Wildlife Refuge in Nevada. The publication was considered a classic, incorporating taxonomy, biology, and community ecology in a single document.

In the course of his research, Furniss collected and reared thousands of insects and associated organisms. Three organisms were named after him. After he retired, Furniss was appointed visiting Research Professor of Entomology at the University of Idaho. He presented seminars, conducted workshops on insect photography and bark beetle identification, and taught directed study courses. He also chaired the history committee of the Western Forest Insect Work conference and published six articles on early developments in American forest entomology. In 2002, Furniss published "A Field Guide to the Bark Beetles of Idaho and Adjacent Regions," the only guide of its kind.

During the 1970s, the other entomologists at Moscow retired (Washburn and Denton) or transferred (Schmitz went to Ogden). The unit was discontinued when Furniss retired in 1982. His departure ended the continuous residence of a USDA forest research entomologist in Idaho that began in 1915 when Jim Evenden was assigned to work at Coeur d'Alene (Furniss, in preparation).

The mountain pine beetle was truly a "big bug" throughout Station territory and beyond. It lives with lodgepole pine on some 60 million acres, 13 million in the U.S. and 47 million in Canada. Periodic epidemics kill large numbers of lodgepole, and some ponderosa, pines. During epidemics, a single National Forest may lose more than a million trees per year. More than 3 million lodgepole pines were killed in the Targhee National Forest in Idaho in 1976 (Noble 1983).

Although the way the beetle shapes forest environments can be beneficial in some cases, depending on a landowner's desires, it is devastating when forest

product production and esthetic values are primary interests. It was no wonder that holding beetle populations to a level compatible with productive lodgepole pine stands was a priority research and management problem throughout four decades of Station history. Starting in the early 1960s, the attack on the problems featured a strong cooperative program conducted by the Station and Regions 1, 2, and 4.

In the laboratory and in the field, entomologists and managers sprayed, trapped, counted, and reared the beetles, and harvested some lodgepole stands to learn how insect populations were affected by various cutting schemes. After sufficient knowledge was developed to recommend silvicultural treatments as control methods, the Station-Region partners established several demonstration areas to show the results to managers, especially to convince skeptics that partial cuts and thinnings could be effective.

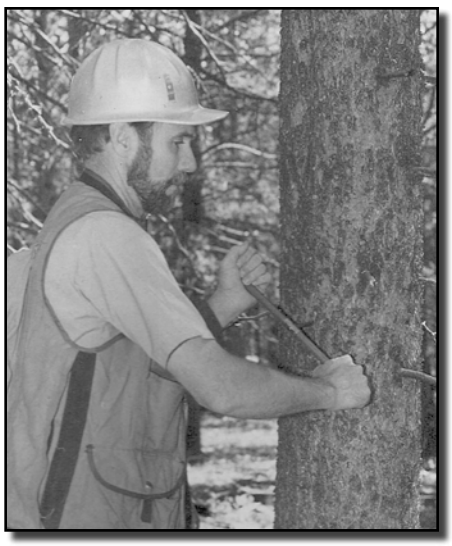
Project Leader Cole was joined in Ogden by Technician Lynn Rasmussen and Entomologist Gene Amman. The trio worked together and with forest pest management personnel for many years to develop cutting and thinning strategies to reduce tree losses to beetles. Amman said an early study with Rasmussen and Bruce Baker, a Region 4 specialist, helped guide the work toward silvicultural treatments. The trio compared lodgepole stands in the Teton and Targhee National Forests that had been treated with chemicals and stands without control measures. They found that the control methods weren't doing much good (see "Family Fights Erupt," this chapter).

That and other findings led the research unit to focus on the interaction of the beetles and lodgepole forests. Ogden research unit personnel and their cooperators made many field trials of various levels of thinning as beetle control measures. One partial cutting trial was made on 4,000 acres in Colorado administered by the Bureau of Land Management. Another took place in the West Yellowstone area of Montana in 1974. A third test was made in the Shoshone National Forest in Wyoming. Cole found the results encouraging, with tree losses in the partial cuts far less than in unharvested blocks of timber (Noble 1983). Cole and Amman published many findings over 15 years, and wrote three summary documents in the 1980s that were considered landmark publications. The three volumes issued by the Station covered the course of infestations, beetle population dynamics, and population sampling and monitoring under the general title, *Mountain Pine Beetle Dynamics in Lodgepole Pine Forests*.

Walt Cole, Project Leader for the Ogden mountain pine beetle research unit, used a bow to shoot a nylon line over a lodgepole limb so that a passive barrier (unbaited) trap could be hoisted into the tree to trap flying beetles.

Two pieces of research were instrumental in establishing Amman as an eminent pine beetle scientist. In 1977 he and Region 1, 2, and 4 colleagues Mark McGregor, Don Cahill, and Bill Klein devised a Stand Hazard Rating System, which was used to assess lodgepole stand susceptibility to beetle infestations and substantial tree loss. The other major accomplishment was called a "serendipitous find" by Amman. He and Rasmussen were curious as to why beetles tended to concentrate on larger diameter lodgepole trees, and wondered if it was a result of stress. They discovered that the thicker bark was preferred by the beetles when laying eggs. After the beetles killed the trees with thicker bark, the insect populations declined (*INTercom* Jan./93). Amman related that discovery to the thickness of phloem, a layer just beneath outer bark, and to the density of egg galleries. He published a summary of the findings in a Station research paper in 1986. Amman was named Project Leader of the mountain pine beetle unit in 1984 after Cole retired.

Dick Schmitz had studied the biology of the pine engraver beetle at Missoula, clarifying that it produced two generations annually, an important consideration in formulating preventive management practices. After he transferred to Moscow, he assisted Furniss in pheromone studies involving the Douglas-fir beetle, and biological control of the larch casebearer. Schmitz transferred from Moscow to the Ogden project in 1976. He conducted several studies of mountain pine beetles using passive-barrier traps, which established the height above ground that most beetles traveled when moving through stands. Schmitz, McGregor, and Amman found that very few beetles traveling through thinned stands stopped to infest trees, compared to those infesting trees in unthinned stands. They theorized that the openness of the thinned stands interrupted pheromone communication among the beetles.



Gene Amman earned many honors for his research on the mountain pine beetle and its role in forest ecosystems.

Amman earned a USDA Superior Service award in 1983 for his research. When he received the Utah Governor's Medal for Science and Technology in 1991, Station Director Larry Lassen said, "Dr. Amman's research on the importance of tree age and development of thick inner bark tissues to beetle population dynamics resulted in a major scientific breakthrough. It reversed existing dogma that beetle epidemics were brought on by drought." Amman also received the "Founders Award" from the Western Forest Insect Work Conference in 1994 for "his outstanding contribution to forest entomology in the West." Conference members were entomologists from western Canada, the western U.S., and Mexico. When Jesse Logan took over as Project Leader shortly before Amman retired in 1992, he referred to Amman as "Mr. Pine Beetle" (*INTercom* Oct./92).

Logan presided over two changes in the research unit. The first was a move from Ogden to the Logan Lab (see "Co-locations," chapter 12). The second was a shift in philosophy from "protection ecology" to one of "disturbance ecology," which resulted in a change in emphasis from protecting particular commodities, such as timber, to one of seeking more fundamental understanding of how mountain pine beetles function within the ecosystem (*INTercom* Oct./92). Logan was no stranger to the unit or its work. He had been involved in modeling insect population dynamics and phenology, the timing of various life stages of the insect, for many years. Much of his work was conducted through cooperative agreements with the Station. He spent 4 years as an associate professor of entomology and forestry at Virginia Polytechnic Institute and 10 years as a senior scientist at the Natural Resource Ecology Laboratory at Colorado State University.

Logan also had strong interests in applying advanced computer technology to resource management. As leader of the pine beetle unit he emphasized integration of complex ecological information with advanced technologies such as computer models, remote sensing, and data base management systems. An example of this type of work was a publication he authored in *Environmental Entomology* in 1988 that discussed applying "expert systems" to development of pest simulation models.

Barbara Bentz scaled a ladder to collect larvae and Jesse Logan recorded data in 1994 studies to learn how winter temperatures influence mountain pine beetle development.

Although the "big bug" approach may have helped stem the decline in insect research funding, it certainly did not stop it. When Barbara Bentz qualified for a scientist position in 1992, she was only the second new scientist employed in the pine beetle unit in 20 years (*INTercom* Jan./92). Bentz worked her way up to the scientist position, serving as a seasonal employee while completing academic work as a cooperative education student. Along the way to a doctorate, she gained academic distinction by being named to the National Deans List and appearing in "Who's Who in American Colleges and Universities."

Bentz published on attack dynamics of the mountain pine beetle, adding a new dimension to the earlier work by unit members on population dynamics. She and Logan also conducted novel studies on the role of temperature as a key factor driving phases of the beetle's life cycle (Chojnacky 1994). Bentz and Logan alternated serving as Project Leader during the 1990s, allowing the scientist who was "out of office" a period of time to concentrate on personal research. Both researchers continued the unit's traditionally strong commitment to technology transfer.

Getting the Word Out—The Station's Strong Suit

Perhaps it was seen as a duty based on tradition. Perhaps it was motivated by the attitude of Station leaders. Perhaps it was because the Station territory contained huge acreages of National Forest and other public lands. Whatever the reason or combination of reasons, if one characteristic distinguished the Intermountain Station from many other research organizations it was a strong emphasis on applied studies and technology transfer.

The Priest River and Great Basin Experiment Stations from their beginnings served as places where scientists helped train managers by explaining their research results, giving demonstrations, and showing the consequences of management alternatives at experimental plots. The first Priest River training school for Forest Rangers was held in 1915. In 1919, while the Station was under District 1 administration, W. C. Lowdermilk, an Oxford scholar, was appointed liaison officer. His major responsibility was to interpret results of research and put them into practice by working with land managers, making him one of the first technology transfer specialists. Lowdermilk started the publication, *Applied Forestry Notes*, which was issued for many years by District 1 (Wellner 1976).

Great Basin served as a training site for District 4 managers from the start. Field days that began in the early 1920s expanded the audience to include land managers from a variety of State and Federal agencies. Private individuals and companies were welcome throughout Station history to come to both Priest River and Great Basin to learn. Both sites were visited many times by forestry

The original purposes of Priest River and Great Basin included serving as training centers for District Rangers and other managers. Here Director C. L. Forsling spoke to a group of Forest Supervisors at Great Basin in 1926.

and range management students over the years.

The bias of early leaders toward working to solve local managers' problems continued in more contemporary times. Commenting on the value of habitat typing research, retired Station Director Roger Bay said:

> I always thought the project was one of several INT research efforts that were outstanding examples of the primary mission of regional research stations—address the forestry problems within our local regions (not necessarily Forest Service regions). Sure, we had a few research studies going that addressed national or multi-regional problems too—like the Fire Lab, Forest Survey, Al Stage's modeling (Prognosis), and the recreation research program, but the original concept of research stations was to solve resource problems in their respective areas. Of course, knowledge is not bound by artificial boundaries, so it was an extra bonus to see some research results being applied to national problems (Bay, personal communication).

Evidence of the emphasis on applied research and technology transfer shows up in publication records. In the 25 years (1972-1997) that General Technical Reports (GTRs) were published before the Intermountain-Rocky Mountain merger, the Intermountain Station ranked second among all Forest Service Stations. Its number of GTRs was exceeded only by the Pacific Northwest Station, a much larger organization in both personnel and funding.

Forest Service Research Stations ranked by number of General Technical Reports produced, 1972-1997:

Pacific Northwest	399
Intermountain	373
Rocky Mountain	299
Northeastern	241
North Central	194
Pacific Southwest	102
Southeastern	96
Southern	93

GTRs during the quarter century of interest included three broad categories of material—summaries of existing knowledge on a subject, also known as "state-of-the-art publications"; proceedings of symposia and workshops; and presentations of methods useful in solving management problems. They were not reports of results of individual research studies, which were published in other types of Station publications or in journals. Although we have no data for publishing in scientific journals over the same period, it is reasonable to assume that the Intermountain Station would not rank well in that category, which usually was reserved for reports of basic research studies. These could be of great importance to solving management problems in the long run, but they rarely had immediate application.

Traditional research publications were one way to transfer results, but they were far from the only mechanism used. At the Intermountain Station, publications written for nonresearch audiences, technology transfer specialists, what might be called "gadgets and gizmos," information retrieval and circulation systems, and general public educational media all played roles in getting the word out.

The Reporters—Station public affairs specialists and editors often helped bridge what could be a significant gap between typical scientific writing and more easily understandable accounts presenting research programs and findings. When the information specialists authored such reports, they sent draft articles to the scientists involved for review to ensure accuracy. When the scientist was the author, the specialists offered advice and criticism to help get the material into formats that publications with broad readership would accept.

One publication that featured popularized accounts of both research programs and results was *Forestry Research West*, which was produced for 25 years by the four western Stations. The magazine first appeared in 1973 as *Forestry Research: What's New in the West*. The shorter title was suggested by Intermountain Station representatives at a 1974 coordination meeting in Berkeley. The coordination meetings sometimes did not produce perfect harmony. It took 5 years for the other three Stations to agree to the change.

Publication ceased after the September 1999 issue when the Pacific Northwest Station decided to withdraw its support, leaving the Rocky Mountain and Pacific Southwest Stations as the only participants. That caused the Rocky Mountain Station to discontinue the publication in favor of a new quarterly report, *RMRScience* (Fletcher, personal communication).

Forestry Research West was created by the Pacific Southwest Station, where early issues were edited, and prepared for printing. In 1976, Rick Fletcher joined the Rocky Mountain Station staff as a Public Affairs Specialist and took

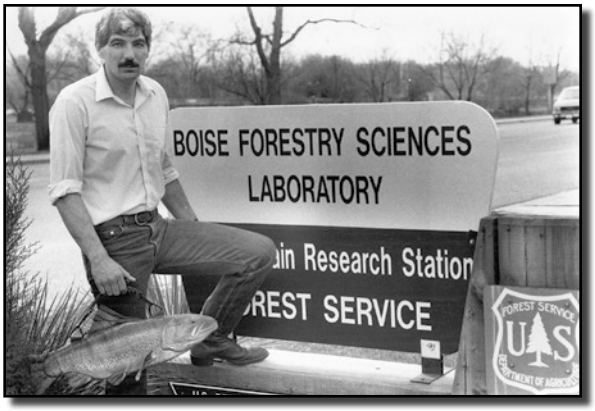
over as editor. Publishing duties also were shifted to Fort Collins. Typical issues contained a feature article highlighting a particular research area for each Station, plus a dozen or more announcements of publications thought to be of direct interest to managers. With few exceptions, material was written by public affairs specialists.

Copies were distributed by each Station. The primary audience was Forest Service managers, and copies went to every office west of the Mississippi down to the Ranger District level. Distributions also were made to other Federal agencies, State agencies, universities, and private organizations. Individuals who requested personal copies were added to mailing lists. Circulation totaled about 8,000 copies for most issues (Fletcher, personal communication).

A variety of other magazines and newsletters were used to good effect to communicate research results and management advice based on research. Within the wildland fire community, *Fire Management Notes* issued from Washington, DC was widely read by managers. Station scientists published frequently in it for many years, sometimes at the request of the editors. *Western Wildlands*, produced by the University of Montana, was a vehicle that covered a wide range of topics. Other favorites were *Rangelands*, *American Forests*, and the *Journal of Forestry*, which became a semi-popular magazine after *Forest Science* was created to carry technical papers of interest to members of the Society of American Foresters. Usually, Station scientists authored articles for these magazines, although public affairs specialists sometimes wrote submissions.

The TT Specialists—Commenting on technology transfer, retired Assistant Station Director Keith Evans said, "We had some real good TT people—the best probably being Kerry Overton" (personal communication). Being considered among the best was a high compliment—the Station had several outstanding technology transfer people.

Overton joined the fishery habitat unit at Boise in 1990 to work on developing, evaluating, and transferring technical tools to assist National Forest fishery biologists. He had for 20 years been a fishery biologist at the District, Forest, and Regional levels in Region 5 (the Pacific Southwest Region). His assignment at Boise was supposed to be short term. The idea was to bring a management person into the research unit temporarily and then have him return to the National Forest System to spread the word. Overton proved to be so valuable at Boise that the habitat unit kept him permanently (McIntyre, personal communication).



Technology Transfer Specialist Kerry Overton had a novel way to steer the conversation to fisheries habitat questions during lunch hours. The "fish" he carried was his lunch bucket.

Like other TT specialists at the Station, Overton developed and maintained many personal contacts with resource specialists and managers. He also wrote four GTRs on fish habitat conditions and inventory procedures (see "Aquatic Science Moves into the Mainstream," this chapter). In 1993, Region 4 gave Overton a special award "for his role as the overall coordinator" in providing exceptional assistance to the Region's anadromous fisheries program (*INTercom* May/93).

In at least one case, a TT process was developed that worked in reverse—the primary specialist was a National Forest System employee and the Station participants worked through him. In 1985, the Station and Region 4 set up a system to "put research results into the hands of people who need them most" that later was cited as a national model by the Forest Service's Director of Minerals and Geology (*INTercom* 5/16/85). The Region 4 mining reclamation specialist, Ben Albrechtsen, traveled throughout the territory helping field personnel solve or mitigate problems. He kept a list of projects requiring the expertise of Station scientists in the mined-land reclamation unit at Logan. The Region paid travel expenses for the researchers when special consultation trips were required to solve the problems.

The partnership produced a document useful throughout Region 4 and other areas of the West. Albrechtsen and Gene Farmer, a former researcher at Logan, compiled a regional Reclamation Field Guide as a ready reference for field personnel. The guide included Forest Service reclamation policy and authorities, a logical sequence of events for managing the reclamation process, a summary of key principles, and a checklist of technical information to be applied to a project (*INTercom* 1/7/88).

If there was a perfect background for a TT specialist, Bob Mutch had it. He was one of the first employees when the Fire Lab opened in Missoula in 1960. After several years in research, he became the fire management officer for the Lolo National Forest, where he served as a fire behavior officer on hot running fires and wrote several prescribed fire plans. He moved to the national office where he was assigned to State and Private Forestry. There he served as Program Manager of the Disaster Assistance Support Program and helped a number of other nations prepare to respond to natural disasters. He also worked with others to help Brazil establish a science-based program to manage wildfire. Mutch returned to the Fire Lab in 1991 as Research Applications Leader to "provide national and international leadership in transferring research results" (*INTercom* June/91; Tippets 1994).

Mutch believed that the fire research TT process was unique because the most important research information was rapidly transferred to users through mandatory fire training courses. Often information was transferred and applied in the field by users before the first

publication appeared about the new knowledge. During much of Station history, when a Fire Lab scientist was ready to introduce new information to the fire community the scientist did the initial training personally, while also getting comments on the research from students. Later the training role was shifted to others. Part of Mutch's work before he retired in 1994 was to serve as an instructor, taking some of the pressure off scientists who were in great demand to participate in training.

Bill Fischer said (*INTercom* June/91) that Mutch's outgoing personality and sincerity added to his qualifications. "The person he's with at the time is the most important thing he's dealing with," Fischer said.

Fischer did some impressive TT work himself. A research forester at the Fire Lab, he devoted most of his time to transferring knowledge, an endeavor that often held few rewards for scientists. "You have to have a boss that will encourage you to do it and still call you a researcher," Fischer said, crediting Project Leader Jim Brown for supporting his work (*INTercom* June/91).

Like Mutch, Fischer had a background in resource management. He spent 10 years with the Boise National Forest as a forester, resource assistant, and assistant fire staff officer. Mike Hardy hired Fischer to work at the Fire Lab in 1966, primarily because of his experience and understanding of the application of fire danger rating at the forest level (*INTercom* June/91). Fischer, however, made his mark later in the fire effects unit.

Some of Fischer's most useful work was compiling three photo guides, issued as Station GTRs, which allowed fire managers and specialists to accurately estimate the amount of downed woody material in Montana and other Northern Rocky Mountain forests. The guides permitted an easy method to calculate fire potential, something that had been difficult or impossible previously where a variety of fuels were present (*Forestry Research West* Mar./83). They applied to all the forest cover types over a vast area. To help managers in other areas produce similar guides, Fischer wrote a Research Note describing the techniques used to determine the weight and size class distribution of the fuels and how to rate potential fire behavior for them.

Fischer's best achievement, however, probably was his role in the design and development of the user-friendly Fire Effects Information System. The system saved managers writing fire prescriptions tremendous amounts of time (see "Introducing Friendly Fires," chapter 10). Primarily for his work on the system and bringing it into national use, Fischer received the Forest Service Chief's Award for Technology Transfer in 1991. A second reason for the award was creation of the Wildland Home Fire Risk Meter, a device thought up by Forester Dennis Simmerman and Fischer. Unlike the high-tech fire effects system, the meter was a simple device with a wheel riveted to it. With it, any homeowner could assess the risk to his or her forest dwelling should a wildfire occur (*INTercom* June/91).

Bill Fischer showed off the Home Fire Risk Meter that helped him win a national award for technology transfer excellence (at left) in 1991.

The technology for the meter had been around for a long time according to Fischer. He and Simmerman just put it in a package "a homeowner could relate to." The meter was one in a group of gadgets Station researchers dreamed up over the years to relay information outside the constraints of the traditional publishing system.

Gadgets and Gizmos—Other sections of this history display a number of unusual creations by Station scientists that conveyed useful knowledge. Harry Gisborne's early fire danger meter, the "Stage Gauge," air tanker performance slide rules, and chips carrying fire behavior data into hand-held calculators were among them. Station leaders also were quite willing to employ unusual methods to call attention to results of the research program.

At a national meeting of Station Directors and Regional Foresters, Director Roger Bay introduced the hand-held calculator concept in a light way. He presented t-shirts to Forest Service Chief Max Peterson and Associate Chief Doug Liesz that were imprinted with a photo of a TI-59 calculator, one of the machines that used the chip developed at the Fire Lab. Bay said he was presenting the shirts so that Peterson and Liesz would have a tool to "calculate fire behavior wherever they may be" (*INTercom* 8/14/80).

Bookmarks are used by many organizations to carry various messages. But, a wilderness message? Personnel in the wilderness research unit in Missoula and Public Affairs Specialist Liz Close came up with one in the 1980s that served three purposes. The bookmark introduced recipients to the unit's work with a brief description of its mission. It also listed actions that readers could take to protect Wilderness, several based on research by Station unit members. The main purpose was as an incentive award to get people to complete research surveys in Region 1 and in Georgia, Texas, and Arkansas (Watson, personal communication).

In 1989, the bookmark was one of the items selected by those participating in the National Interagency Wilderness Management Forum in Minneapolis for inclusion in a National Wilderness Time Capsule. The activity was part of a celebration of the 25th anniversary of the Wilderness Act. The capsule was turned over to the Forest History Society for safekeeping until the 50th anniversary of the act (*INTercom* 10/12/89).

The Knowledge Brokers—In the early 1980s, the Intermountain Station operated an ambitious "Research Needs

Response" program patterned after similar programs at other Stations. The idea was to have a formal mechanism through which resource managers and specialists in the National Forest System (NFS) at all levels could define problems that required research. The Research Needs Response system did not function well and was terminated after several years.

Keith Evans, who devoted considerable time to the system as the Planning and Applications Assistant Director said he got a lot of "research needs" responses from all NFS levels. However, most of the "needs" were not research needs at all, but information needs (personal communication). He also pointed out that the research program changed very slowly. If a manager identified a new need, researchers would have had to start working on it 10 years earlier to be able to make an immediate response. Evans said that when the Station Library started working closely with NFS and Bureau of Land Management personnel on needs identification and dissemination of appropriate information, the transfer process was much more successful.

The transformation of the library from a small, traditional collection in Ogden mainly filling needs of scientists that were not met at Labs to a technical information service with thousands of resource managers and specialists as clients started in 1978. Acting on the recommendation of a study team led by Alan (Pete) Taylor of the Fire Lab, the Station joined WESTFORNET (the Western Forestry Information Network). WESTFORNET was a geographic expansion of a network first operated at the Pacific Southwest Station (CALFORNET) to provide special library-based information to Forest Service employees and cooperators (*INTercom* 1/19/78). Centers were located at Berkeley, Seattle, and Fort Collins, in addition to Ogden.

The Ogden WESTFORNET center was designed to serve the Station and Regions 1 and 4. The Regions provided 80 percent of the financing, and experience soon revealed that they received about that percentage of the services or more. Liz Close had become the Station Librarian just in time to face the challenge of setting up the new center.

The first two services were up and running within 6 months of the center's inception. Monthly Alerts, announcing new publications related to natural resources in the western States, went to all professional employees and supervisors in the Station and Regions 1 and 4. Typical early issues announced about 200 items. Recipients mailed back order forms and received loan or retention copies. General Document Delivery allowed center users to order all other published materials they learned about in any manner. Document delivery was facilitated by a network of cooperating university libraries established by the centers over the years, and by connections to national sources. Customized literature searches were added later at the Ogden center, enabling clients to find documentation on almost any subject. Reference librarians also made the center a place where almost any question could be answered if the answer existed in some retrievable form.

Carol Ayer showed a resource manager how to access the FS INFO database at a 1990 Region 4 symposium in Saint George, Utah.

WESTFORNET was a big success. A survey of activities at all centers after less than 2 years of operation showed 8,000 people used the services in 1980. More than 100,000 requests were received for Monthly Alert items, and some 30,000 other documents were supplied. The centers made 1,600 literature searches and handled more than 5,000 reference questions (*INTercom* 2/5/81). The survey showed that the information was heavily used for preparing environmental impact statements, staff papers, and other "reports requiring research information."

Demand for services from the Ogden center grew rapidly. All four centers kept statistics on their service levels. Over a 10-year period starting in the mid-1980s, the Ogden operation led all centers in every category of service. In a record year during this period, the center provided 80,000 Monthly Alert items. The leadership role no doubt was due in large measure to Close's willingness to make presentations about center services at Ranger Districts and Forest Supervisor's offices throughout Regions 1 and 4.

The library network expanded nationally. Soon after its start, a SOUTHFORNET Center was established. In 1985 the database, with funding by the Washington Office, went national. The network was renamed FS INFO. In 1987, Close moved to the Station's Public Affairs Specialist job and Carol Ayer took over supervision of what had become FS INFO-Intermountain. Ayer had worked in Juneau, Alaska, where she managed the library that became FS INFO-Alaska and later set up the FS INFO-Central office in Washington, DC. By that time, the Ogden center had added to its services by providing training to database users and referrals to experts (*INTercom* Mar./93).

Despite continued high demand for services, the network came full circle with central office activities delegated out of Washington and funding concerns causing myriad adjustments throughout the system. In 1994, central database operations moved to Region 8 (the Southern Region), although the national office agreed to fund the operation. Shortly after the Intermountain-Rocky Mountain merger, Ayer was named supervisor of the libraries and associated information center activities in both Ogden and Fort Collins. The national office cancelled its funding for the Region 8 staff in 1999, resulting in closure of

the central processing unit and transfer of the database to the new Rocky Mountain Research Station. Ayer in effect became the leader of the national library network.

The Educators—Many Intermountain Station employees were strong supporters of educational programs at all levels, evidenced by activities ranging from designing tour routes and brochures for school-age groups and the general public to numerous teaching activities in classrooms from grade schools to universities. Given their historic interest in using a variety of TT methods, it's no surprise that Fire Lab personnel came up with some novel approaches to helping educators meet their goals.

While Bob Mutch was the technology transfer leader at the Fire Lab, he and Dave Tippets, Station Public Affairs Specialist, created a "Living with Fire" educational computer game for use in the visitor center at the Aerial Fire Depot in Missoula. The game puts a player in the place of a fire manager. It was based on research and tools developed for real-world fire management, and recommended for people ages 10 and up. After Wayne Cook took over TT duties at the Lab he updated the exhibit material and put it on the internet so it became accessible world-wide. "Living with Fire" also was made available on a disk with other materials for FIREWORKS, another educational innovation based on fire science.

FIREWORKS was designed by Ecologist Jane Kapler Smith and Biological Science Technician Nanka McMurray. A program intended for students in grades 1-12, it addressed five main themes: (1) fire behavior; (2) characteristics that enable plant and animal populations to survive fire; (3) forest history, especially related to fire; (4) change in forests over time; and (5) human safety and fire management. FIREWORKS featured ponderosa, lodgepole, and whitebark pine forests and was delivered in a trunk full of educational materials for hands-on learning. The curriculum linked each activity to national educational standards so it could be used as a prototype for wildland fire education in many geographic areas.

Shirley Waters used both "show and tell" and hands-on demonstrations to interest students in careers in science.

The first version of the curriculum was released in 1997. In 1998, Smith and McMurray received the Forest Service Chief's Award for Conservation Education for developing FIREWORKS.

More general educational work by Station people was typified by Forest Survey Computer Programmer Shirley Waters, who earned a special award in 1992 during Public Service Recognition Week for her work in career education programs. Waters gave more than 50 presentations to some 1,500 students ranging from first grade through high school. Her goal was to expose the youngsters to career options available in the Forest Service, with emphasis on science and math.

Waters served as the Forest Service representative for the "Expanding Your Horizons" career program, sponsored by the Utah Math and Science Network for women. In addition to her own programs, she arranged and coordinated appearances by 10 other speakers. She also participated in the "Great American Teach-in" sponsored by one of the local school districts, and in the American Indian Math and Science Camp in Montana.

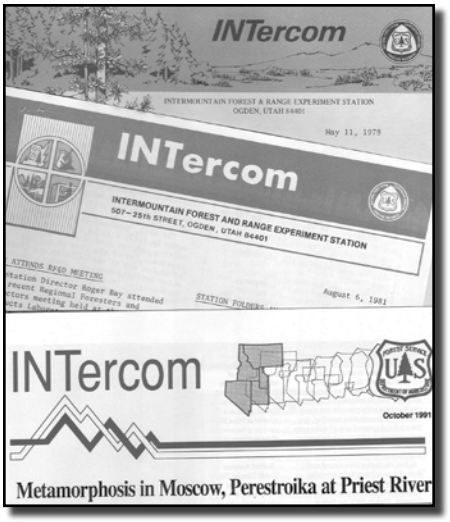
"I preface my presentations with my feelings about being prepared for life with additional education and career options," Waters said. "I let them know that I had the best of both worlds when I worked part-time for 15 years. I could continue my career with opportunities for growth yet it allowed me additional time to spend with my young family."

Waters' demonstrations included equipment used to collect tree data. She also let students experience 3-D aerial photography, and said this resulted in comments like "cool," "totally rad,", and "awesome." The students located their school on maps and also got to observe bark beetle specimens in different stages of development (*INTercom* Feb./92).

INTercom Makes the Connection

The Intermountain Station launched an employee newsletter in 1975. Apparently, it was the only one published on a regular basis by the organization or its predecessors. Newsletters were common within the Forest Service and elsewhere; the Station's was designed to be a little different. It was brief—a single sheet of paper printed on both sides. It appeared often—every two weeks, skipping one issue only in December each year during the holiday season. Although the stated goal was "to keep employees in nine far-flung locations up-to-date on news of the Station" (*INTercom* 1/9/75), the founders of the newsletter hoped it also would help in getting research results to users.

The first issue went to all Station employees and a few copies were sent to each Forest Service Region and Station. Soon, Regions 1 and 4 agreed to forward copies to Regional Office staffs and Ranger Districts. Circulation jumped from about 300 copies in 1975 to nearly 700 in 1979, and it grew after that as other resource management organizations were added to the mailing list. In addition to the usual personnel news, *INTercom* carried announcements of new Station publications, descriptions



INTercom evolved from a single-sheet, chatty newsletter to a magazine-style publication with a central theme for each issue.

of new studies and special programs, and, when space permitted, small feature stories about Station administrators and researchers. These items were intended to acquaint managers with the work of the Station on a continuing basis. Phone calls and notes from resource managers and staff people were evidence that this approach was somewhat successful (Noble, personal communication).

The earliest issues appeared with a temporary title, "INT News." The first issue announced a contest to "select a permanent, sprightlier name." The prize, a dinner for two, was paid for with personal funds donated by the Research Information staff. The response to the contest was good, including a surprise, long-distance entry from an employee of the Pacific Southwest Station in Berkeley. The April edition announced that Renee Ingram, who worked in Administrative Services at Station Headquarters, had won the contest with her suggestion, *INTercom*. Pete Taylor at the Fire Lab submitted 22 entries, and the contest judges decided he deserved a reward for effort. They gave a $10 prize to Taylor.

INTercom lived for 21 years. The final issue was in December 1995. The content evolved, partly because the editors periodically asked readers what they wanted to have included. In mid-1990 a radical change was made when the newsletter was converted to a monthly magazine format. Pages were added, more photos were included, and issues often had a central theme. Toward the end of its life, *INTercom* sometimes ran as many as 16 pages. When Denver Burns became acting Station Director he chose to discontinue *INTercom* and replace its internal communication functions with *Director's Notes*, an electronic newsletter produced in Fort Collins.

Delpha Noble was the first *INTercom* editor. The publication had five subsequent editors—Mike Prouty, Liz Close, Fran Reynolds, Dave Tippets, and Dave Stalling—between the time Noble retired and its demise in 1995. Throughout this period, Louise Kingsbury was a major contributor of articles and she also served as editor at times when the public information job was vacant. Design and layout became increasingly sophisticated; Deborah Renteria and Joyce Stoddard handled those chores.

In 1993 while Tippets was serving as editor, *INTercom* was one of two newsletters in the Forest Service to win the "Associate Chief's Award for Outstanding Internal Communications." Twenty-five newsletters were entered in the competition. As a prize, Associate Chief George Leonard granted $5,000 to the Intermountain Station to be used by the publishing staff for "any official work relating to your ongoing employee communications work." (Leonard, personal communication). Even considering inflation, it was a pretty good return on investment for the staff that put up $30 of their own money in 1975 to help get *INTercom* started.

50 Years of Noble Service

Delpha Noble never missed a deadline in the 10 years she held the *INTercom* editor post. That remarkable record is a reflection of the dedication and perseverance Noble displayed during a career that, with a few interruptions, spanned 50 years.

Ed Noble, Delpha's husband who retired as branch chief of watershed management in Region 4, was District Ranger at Leadore in the Salmon (Idaho) National Forest in 1948. In a 1985

Retired from Station employment, but still on the job conducting writing workshops, Delpha Noble returned to the Station in 1993 as a volunteer to describe her days as a ranger's wife during a Women's History Month celebration.

interview (Alexander 1987), he recalled Delpha's role as an unpaid "official collaborator" for the District and later at the Malta Ranger District, Minidoka National Forest, from 1950 to 1955. "If you couldn't type and your wife couldn't type, you were in trouble," he said. Wives were "classed as collaborators, which entitled them to no pay, but since they did have regular appointment papers they could get a license so they could drive the government equipment." Delpha, Ed said, "would run the District, answer the phone and the radio," while he was out on week-long pack trips. If a fire broke out, she would "get some people to go fight the fire."

Delpha Noble confirmed her husband's recollections some years later (personal communication). "After I passed the required government driving test I could go with Ed into the field, pulling the horse and trailer, to a site on the District where he would establish a base camp. He would then take 3 or 4 days riding 'Old Red' to places inaccessible by vehicles. Later in the week I would drive the truck to his campsite and pick up him and 'Old Red' to drive back to the Ranger Station. I also did most of his clerical work; I was a much better typist than he. Because he was in the field so much during the summer, I

got acquainted with many ranchers and others who would come to the office for permits or information while he was gone."

"My collaborator duties continued during our 4 years at Malta," Noble said. "After our first child was born Ed would switch tasks with me. I would work in the office, typing allotment plans and reports, while he stayed in the house taking care of our daughter. I enjoyed my 'unpaid' duties. The designation gave me the opportunity to be included in Ed's work and to learn more about the Forest Service as well."

Noble switched from a "no pay" Forest Service collaborator to a "low pay" regular employee in 1969. Her experiences illustrate the obstacles in those days to a woman getting employment and moving up the career ladder. Noble brushed up on her secretarial skills, and carried her manual typewriter to the State Employment Office to take the required test. After the test, the supervisor told Noble she was the first person ever to get 100 percent on the spelling segment, and her typing accuracy was very high.

"She then proceeded to tell me I would have a hard time getting a job because of my age," Noble said. "For heavens sake, I was only 46." The test supervisor also said employment was unlikely unless Nobel "knew somebody."

Noble couldn't work in the Regional Office in Ogden, because Ed was employed there and the Forest Service had iron-clad rules against spouses working in the same organization. But she did "know somebody," so she went to see George Gruschow, Assistant Station Director for Research Support Services, who took her to the publishing unit where clerical help was needed. She was hired on a part-time basis, which was fine with her because she could be home in the late afternoons when her children got back from school. She was eligible for a GS-5 appointment according to her test results, but the Station offered only a GS-3 at the lowest salary step. A few years later, Noble said she asked Grant Mortensen, the head of Personnel Management, why that was done. "Well, Delpha," he said, "We didn't know what you could do." And during the first day on the new job when Noble was reading proofs with Editorial Assistant Ruth Reed said, "Oh, you can spell."

Five years later Noble reached the GS-5 level she probably should have started at. About that time the Station established a Public Information Specialist position targeted as a GS-11 under a relatively new program known as "Upward Mobility." People in those types of jobs could get periodic promotions provided they performed well at each succeeding level of difficulty as more responsibilities were added. Noble applied for the job and got it. She progressed on schedule to the GS-7 and GS-9 levels, but her advancement stalled for months when the normal time came for the promotion to GS-11. She finally decided to practice the assertiveness she preached as the Station's first Federal Woman's Program Coordinator. She went to an Assistant Station Director and complained. She soon got the promotion.

The Federal Woman's Program task was an "other duty as assigned." Working with coordinators in Regions 1 and 4, Noble planned and conducted programs in Ogden and Missoula. "I stressed that women should prepare themselves for any opportunities that might come up," she said. If ever a philosophy was based on experience, this one was.

Noble retired briefly in 1984. A few months later, a Region 4 representative phoned and asked if she would be interested in conducting some writing workshops. "Some" turned into 46 sessions during the next 14 years, several as far away as Oregon and Washington State. Noble was asked to expand the standard course curriculum furnished by the Forest Service's Washington Office. She developed material, including a workbook, which added a full day to the workshops. Noble retired again when she adjourned the last workshop in 1998. It was almost exactly a half century after her first unpaid assignment to occasionally "run the District" for the Forest Service.

Major Program Shifts

The Station moved aggressively in the 1970s to change the research program in several important areas. Some adjustments were motivated by declines in funding in traditional parts of the program. Other changes began moving the Station in the direction of ecosystem work that was to become the new standard for Forest Service research in the 1990s. Among significant changes were those in pathology and engineering units, and throughout the Station in traditional range research.

Emphasis shifts occurred in the Moscow forest pathology unit in the 1970s and 1980s. The movement away from studying individual problems such as white pine blister rust organisms toward situations as well as organisms was significant. Of the shift to addressing ecological problems instead of singular "bad guys," Project Leader Al Harvey said, "Up to the mid-1970s, if you had suggested controlling root rot of Douglas-fir by aggressive management, you'd have been laughed out of the room."

The Organic Team—Harvey and a group of Moscow Lab researchers and

Project Leader Al Harvey (left) guided the pathology research unit in Moscow to an ecosystem approach that showed how forest management practices could combat tree diseases.

Research Forester Terrie Jain took soil samples as part of interdisciplinary research by the "Organic Team."

cooperators dubbed "The Organic Team" started taking an ecological approach in 1973, and nobody was laughing by the mid-1980s when their work had become widely accepted and applied.

The team included Russ Graham, Deborah Page-Dumroese, Jonalea Tonn, and Terrie Jain, all of the Moscow Lab; Michael Larsen from the Forest Products Lab; and Martin Jurgensen of Michigan Technological University. The interdisciplinary group demonstrated the importance of keeping large woody material on the forest floor to preserve habitat for mycorrhizae and maintain healthy microbial processes in forest ecosystems. Their work showed the importance of soil microbes to forest productivity and sustainability (*INTercom* May/92).

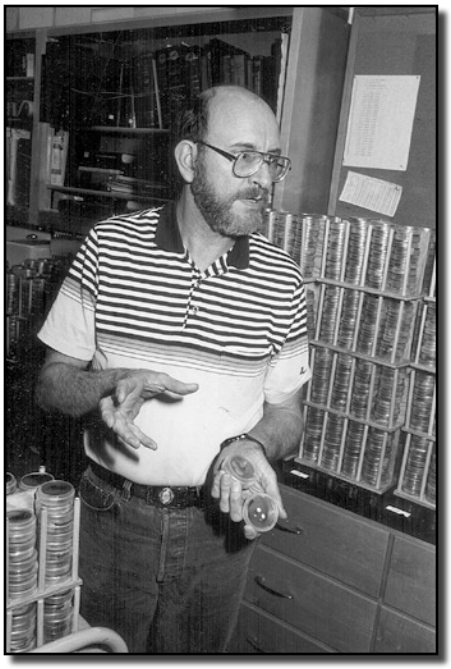
The research monitored effects on soil quality of timber harvesting, different wood utilization levels, and different fire intensities. During summers, many graduate students from Michigan Tech were involved, taking soil samples, analyzing the layers, and counting microscopic fungal root tips in thousands of cores (Graham 2004).

It was a radical break from traditional forestry when the team's research results convinced foresters to leave 10 to 15 tons of slash on the ground after logging. The team's guidelines for slash disposal were incorporated into almost all forest plans in Regions 1 and 4, and began to appear in forest plans in other western regions by the early 1990s.

Because of the diversity of Rocky Mountain forest ecosystems, the amount of organic debris needed for forest health varied greatly. The team refined its studies, and in the mid-1990s provided guidelines tailored to specific ecosystems. For example, in ponderosa pine forests of Arizona they recommended leaving 5 to 13 tons per acre, in contrast to 25 tons recommended for hemlock forests of northern Idaho to feed the soil (Intermountain and Rocky Mountain Stations 1995).

Research Forester Russ Graham inspected a study plot where coarse woody debris was left after timber harvesting to ensure long-term productivity and the health of the soil.

Plant pathologists at Moscow took a different tack in attempting to find ways to mitigate detrimental activities of *Armillaria*, a fungus that attacked roots and killed many trees in the Northern Rocky Mountains. In some places the problem was a full-blown epidemic.

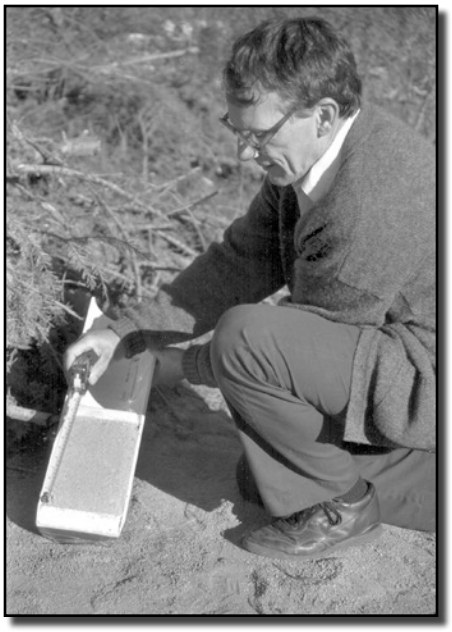


Surrounded by Petri dishes, Plant Pathologist Geral McDonald showed the growth of *Amillaria* isolates.

One action was to gather information on the occurrence and effects of the fungus. This resulted in an extension of the "Prognosis Model" developed by mensurationists at the Moscow Lab. That gave managers a way to predict the probability of infection in different types of stands under different management strategies.

The broader problem required considerable basic research. Pathologist Geral McDonald said of *Amillaria*, "We thought we knew more about it than we do." He devoted much of his work to better understanding the characteristics of the organism. McDonald succeeded in isolating four species active in the Inland West, including two suspected of being the chief damage agents. The goal was to produce new knowledge of ecosystem patterns and responses and integrate it into broad-based models that could guide forest management (Close 1988b).

Engineers Seek Stability—For 15 years the Station's engineering research unit at Bozeman had featured logging equipment evaluations and studies of timber harvesting systems in steep terrain. That changed in a fundamental way early in 1976. Ed Burroughs was named



Project Leader Ed Burroughs searched for a fire-induced hydrophobic soil layer in 1991 in one of the many types of research the engineering technology unit conducted.

Project Leader of a new work unit operating at Bozeman and Logan concerned with alleviating physical and hydrologic impacts of surface mining activities. The old unit was deactivated a few months later (*INTercom* 1/29/76).

Funds for surface mining research soon began to diminish, however, and the engineering unit shifted its program to focus on slope stability problems, forest road construction techniques, and related watershed research. It became the only one of five engineering research units in the Forest Service not studying timber harvesting equipment and systems (Prouty 1986).

Burroughs' unusual background related directly to the new research mission. He had a forestry degree from the University of Montana and also earned bachelors and masters degrees in civil engineering at Montana State University. After working as a research engineer at Missoula, Moscow, and Oxford, Mississippi, he completed a Ph.D. program at Colorado State University in watershed management. Burroughs then worked for the Bureau of Land Management in Oregon for 4 years as a hydrologist in the State Office. While with the BLM, he and two associates wrote a 100-page technical bulletin, *Slope Stability in Road Construction*, which presented guidelines for location and construction of stable roads in forested areas of western Oregon and northern California (*INTercom* 10/21/76).

Personnel in the engineering technology unit worked in three broad areas: (1) Developing techniques to reduce costs and environmental impacts of road construction; (2) devising methods to estimate road surface erosion and ways to deal with the problem; and (3) developing a planning framework to evaluate landslide hazards (Prouty 1986). Cooperators included the civil engineering and geology departments at the Universities of Idaho and Montana, the Nezperce National Forest, the Region 1 engineering staff, and the Station's watershed research unit at Boise.

Burroughs strongly believed that the unit mission was focused on urgent road engineering problems affecting the National Forests, but was concerned that Bozeman was not close to areas most in need of the research findings. In response to this concern, the unit was moved to Moscow in 1985. It then was closer to road and slope stability problems related to the granitic soils of Idaho forests and also closer to Pacific Northwest forests where slope stability was a problem and logging and associated roadbuilding were major activities.

Forest road-building goals and methods had changed by the 1980s in response to cost and environmental impact concerns. Low-impact roads that fit the terrain, minimized resource damage, and kept construction costs down were the new standard. The lower standard roads were being built with backhoes rather than bulldozers, but the Forest Service system for estimating costs was still based on production rates for the larger road-building equipment. The Station researchers made new production studies and devised new cost equations for Regions 1 and 4. The equations allowed National Forest engineers to more accurately estimate road costs during the timber sale planning process. The new cost information was computerized and made available service-wide through the standard system used at the time, and later on widely available minicomputers and programmable calculators (Noble 1993).

Predicting sediment production from surface erosion was facilitated by using a "rainulator" to simulate rainfall. The "rainulator" was a complicated sprinkler system that allowed scientists to quickly compare the effect of a known amount of precipitation at a known intensity on a variety of road surfaces and designs.

Station research engineers collected sediment washed off a burned hillside plot by an artificial rain simulator in 1995 as part of a study in the Boise River drainage.

Data from it and studies of road segments where instruments were installed to measure natural precipitation led to computer programs that displayed effectiveness and costs of various erosion control methods (Prouty 1986).

Research Engineer Rod Prellwitz, Geologist Carol Hammond, and University of Idaho cooperators developed systems to identify and predict the stability of soil for use in planning. The concept was to avoid landslides that often occurred when forest roads were incorrectly located. Prellwitz trained engineers, soils scientists, and hydrologists in Forest Service Regions 1, 2, 5, and 6; the Federal Highway Administration; State agencies; the BLM; and private firms in use of the system to rate slope stability and landslide hazards. He was nominated for a national technology transfer award for his efforts (*INTercom* 6/21/90).

In the mid-1980s, the engineering technology unit became heavily involved in the national Water Erosion Prediction Project (WEPP). This relationship was to continue throughout the balance of Intermountain Station history and beyond. WEPP was conceived by Agricultural Research Service and Soil Conservation Service scientists who wanted to develop a large database that would enable them to model hydrologic response, sediment detachment, and sediment transport for a wide range of conditions. The Forest Service and BLM joined the program as cooperators, and Burroughs was the first Forest Service Research representative to serve on the program's core team.

Being a part of WEPP allowed the Forest Service to provide technology for estimating runoff and sediment yield from forest road-building, timber harvesting, and wildfire areas to the national system and also was an opportunity to have the Soil Conservation Service perform all lab work associated with characterizing soils. Data were collected nationwide by the Moscow unit and other WEPP participants, and the Federal agencies made results available to all (*INTercom* 3/5/87).

Working within a national framework could produce benefits for local National Forest managers. One was documented in a 1989 Station publication, *Reduction of Soil Erosion on Forest Roads*, by Burroughs and Jack King of the Boise watershed research unit. The researchers used national and local study results to provide recommendations for improvements in guides developed earlier to predict sediment yields in Regions 1 and 4.

In 1990, Burroughs and other members of the WEPP core team received a USDA Superior Service award. Burroughs was honored for providing a family of models that estimated sediment production from disturbed forest sites. Burroughs died unexpectedly in November 1991 of a heart attack while visiting the Logan Lab. He was replaced as Project Leader of the engineering research unit by Bill Elliot, who continued the alliance of engineering and watershed researchers and the work within the WEPP framework.

A 2-year study on roads in the Willamette National Forest in Oregon by Research Engineer Randy Foltz, Hydrologist Ben Kopyscianski, Engineering Technician Serita Barrietua and several cooperators produced one of the more novel results to be introduced into WEPP models. The researchers measured sedimentation generated by logging trucks on four road segments when the trucks had normal and reduced tire pressures.

Foltz said that trucks with reduced tire pressure created only about half as much runoff and sediment as those with normal pressure. This information could be used for any truck with a Central Tire Inflation system, which allowed tire pressure adjustments from inside the cab. It was particularly useful where managers could specify pressure in areas where sediment runoff could have significant impacts on stream quality and related fisheries (*INTercom* May/93).

The Central Tire Inflation technology was not widely adopted because of costs and complexity. The reasons for the reduced erosion, however, led to a new understanding of road erosion processes. Reduced tire pressures led to less rutting. This finding led to the conclusion that any practice to minimize rutting will reduce road erosion, including the use of high-quality gravel, frequent blading, or seasonal road closures.

During his tenure in Moscow, Burroughs advocated construction of an indoor rainfall simulator. A simulator eventually was built at the Moscow site. It was completed in 1994, and has provided research support for National Forest System and timber industry personnel as well as Station scientists. To recognize Burroughs' enthusiasm for his work and the simulator facility, the building was named the E. R. Burroughs Engineering Laboratory and dedicated during 40th anniversary ceremonies for the Moscow Lab in 2003 (Elliot, personal communication).

In 1996, engineering unit personnel made a major contribution to another national project when they teamed up with a long list of National Forest and Regional geotechnical engineers to produce three giant reference works for geologists and engineers trying to answer difficult questions about slope stability. The reference works, published by the Forest Service's Washington Office Engineering Staff, were divided into sections for those who needed theoretical background and managers who were working on specific problems (Tippets 1996b).

The national WEPP model was subject to constant improvement through introductions of new data. By the late 1990s more than 200 scientists had participated in its development. Elliot and Computer Programmer/Analyst David Hall of the Moscow unit provided up-to-date forest user information in 1997 in a Station publication titled *Water Erosion Prediction Project (WEPP) Forest Applications*. They told potential users how to obtain the model, run various versions, and make modifications to describe local situations. The authors acknowledged research contributions by Foltz, Research Engineer Pete Robichaud, and Research Hydrologist Charles Luce (Boise) to determining forest soil erosion processes and soil erodibility.

Validations Prove Invalid—The early 1970s saw USDA pushing programs of expanded red meat production, a short time before health groups began advocating less red meat consumption to reduce incidences of heart disease. The Forest Service, trying to be responsive to USDA, produced a report under the

leadership of Bob Rummel, director of range in the Washington Office, entitled, *Range Resources—A Forest- Range Environment Study*. It was commonly known as the FRES report (Forest-Range Task Force 1972).

FRES used a linear program model of all grazing resources of the U.S., including management procedures, outputs, and where money could be spent to increase forage for cattle while maintaining environmental quality. Tests or "validations" were to be held in eastern Oregon, the South, and in the Great Basin part of the Intermountain Station territory. The Station badly needed an infusion of funds into its range management research program. Units were being consolidated and missions changed. Project Leader Walt Mueggler moved from Bozeman to Logan in 1973 to head a new research unit focusing on mountain herb, brush, and aspen ranges. This signaled the end of range research in Bozeman.

Station management requested the transfer of Warren Clary, a range scientist at the Southern Station, to plan how the Station could contribute to the "validation" effort in the Great Basin. In 1977, about $8 million was supposedly available on the national scene, and Station Director Bay thought the Intermountain Station could get about $2.2 million of the total. The money never materialized, however, and the proposal faded away. Clary, who was supposed to become assistant program manager for the validation work, instead replaced Ralph Holmgren as Project Leader of the salt-desert shrub research unit at Provo after Holmgren retired.

Clary made plans to shift work from salt-desert shrub studies to bolster the Great Basin FRES "validation," for which there were no funds. Region 4 did have some money available, however, and was willing to assist. That led to work in the Fishlake National Forest at Oak Creek, Utah, to "validate" the effect of pinyon-juniper removal on forage production for livestock and deer. However, two fairly large range fires caused the Oak Creek work to change into a fire rehabilitation and revegetation study. Initiation of the "validation" work marked the time when salt-desert range studies became a secondary emphasis item at the Provo Lab.

Reclaiming the High Country

The Surface Environment and Mining Program (SEAM) expired in 1981, but disturbed land reclamation research continued as an important part of the research program for the remainder of Station history. The research component of SEAM was assigned to the Mine Spoil Reclamation unit in Logan, whose members had conducted the bulk of SEAM research since the special program began in 1972.

Under the SEAM umbrella, the Logan unit had been a team operation (see "Special Programs Bring Special Problems and Achievements," this chapter). It continued to be. However, the personnel changed, the teams were smaller, and the work focused increasingly on high-elevation areas. Plant Physiologist Ray Brown was a member of almost all the teams, served as Project Leader for many years, and continued his involvement as a volunteer after retirement. From the start, Brown's research emphasized plant-soil-water relations and reclamation of disturbed alpine areas.

The availability of water and its movement through soil and plants obviously was important in arid and semi-arid western areas at lower elevations. It was equally important in alpine areas where landscapes featured sparse and stunted vegetation and persistent, strong winds dried the soil and plants. Brown's early research in the use and design of thermocouple psychrometers, devices for measuring soil and plant water potential, made him an expert on this type of equipment. Psychrometers that included modifications proposed by Brown were widely used in the environmental sciences and adopted by several private firms for commercial use. There were plenty of places to use the devices.

About 7.5 million acres, or 12 percent, of the alpine tundra in the West had been disturbed by 1970. Disturbances ranged from obvious scars left by mining operations to the effects of domestic sheep trailing to summer ranges. Disturbances caused by hikers and campers were becoming a growing concern. Keeping the alpine ecosystems healthy is important. The high

The McLaren mine provided a good place for Station scientists to locate a large reclamation demonstration area and reference areas in the New World Mining District in southern Montana near the corner of Yellowstone National Park. This photo was taken looking northward toward Fisher Mountain (10,300-ft elevation).

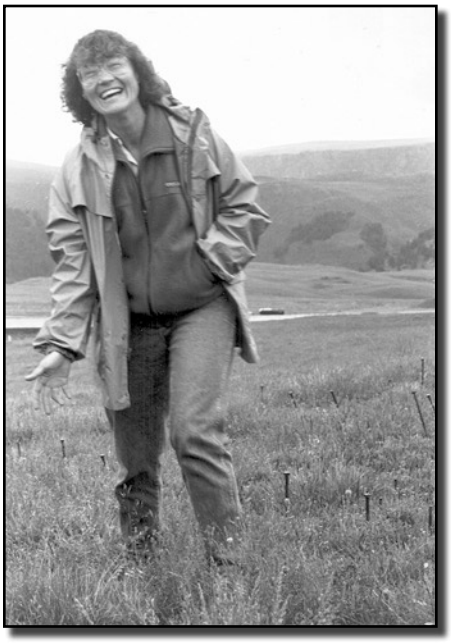
mountains trap and store water for thousands of lowland farmers and city dwellers. When alpine watersheds deteriorate, the whole hydrologic system below them can come unraveled (Tippets 1991b).

Rehabilitation posed difficult problems. The alpine areas have short growing seasons and rocky and shallow soils. They experience low temperatures and high ultra-violet radiation, in addition to high winds. Reestablishing vegetation takes relatively long periods of time. However, Brown and associates in the SEAM program observed early in their work that there was no evidence that alpine environments were hostile to organisms that had adapted to them.

The Beartooth Plateau near the northeastern corner of Yellowstone National Park in Montana was an excellent place to study alpine disturbances and reclamation methods. There, past exploration and surface and underground operations in the New World Mining District had created numerous disturbed sites. Disturbances included road construction areas, drilling sites, exploration holes, trenches, mining camp sites, and abandoned copper, silver, and gold mines.

As part of the SEAM program, Brown and his associates in 1976 started a long-term study at the McLaren Mine, an abandoned gold, copper, and silver mine. Surface operations had removed all vegetation and topsoil from about 35 acres. Also planned as a demonstration area, the research site was relatively large. At the time, most knowledge about revegetation and surface reclamation of high-elevation mines was based on small-scale research plot studies. Both relatively undisturbed areas and piles of mine spoils were nearby.

The scientists studied effects of shaping and contouring, mine spoil amendments, seeding, mulching, transplanting, fertilization, and various repeat treatments. All were compared to reference areas. In the 1970s and early 80s, Brown worked closely with Hydrologist Bob Johnston. They were first and second authors of 15 papers reporting progress in the study or presenting results from parts of it. Range Scientist Jeanne Chambers joined the Logan unit in 1982 and concentrated on studies of vegetation establishment. She published



Jeanne Chambers demonstrated during a 1990 tour that plants would grow well on disturbed alpine sites when mulch and fertilizer were used in the establishment process.

23 papers reporting results of her work and was a co-author with Brown and other individuals of 10 more.

Chambers' studies combined laboratory experiments with field work on the Beartooth Plateau. She used a growth chamber, cold room, and greenhouse to determine germination requirements and responses to fertilizers of alpine plants. At the demonstration site, Chambers compared the biology of plants found on the disturbed areas to those growing in undisturbed communities. She meticulously followed the life history of each individual plant found in a series of plots and recorded how each plant responded to a variety of treatments (*Intercom* 5/28/87)

Chambers was seeking ways managers could create "safe spots" for seed germination and how they could boost the chances of seedling survival. She found several. Mulching was critical and fertilization was needed on extreme disturbances where all the native soil was lost (Tippets 1991b). Fall planting at the same time natural seeding occurred also was necessary.

Where motorized equipment could be used, recommended planting operations and treatments were relatively easy to accomplish. In remote places, such as Wilderness, reclaiming disturbed areas was another matter. However, Logan unit personnel tried several techniques, and their work proved that successful revegetation can be accomplished on small scales entirely with local materials and hand labor.

At many abandoned sites, mining wastes containing toxic chemicals have been exposed to weathering, creating material bearing little resemblance to natural soils. Such material often is concentrated in the form of spoils and tailings. Erosion from these areas can result in acid, metal, or other chemical contamination of down-slope plant communities and aquatic ecosystems. Analysis skills were needed. Mike Amacher joined the Logan unit to

Project Leader Ray Brown (left) and Gallatin National Forest Geologist Sherm Sollid held a chart showing proposed new mining activity and reclamation plans near the McLaren mine in the New World Mining District. Taking his turn as a presenter to representatives of industrial firms, environmental groups, and interested individual citizens was Allan Kirk, Noranda Exploration Company geologist.

provide them. Specially designed, solar-powered instrument systems were used to collect materials for analysis.

Throughout the 22 years of research at the New World Mining District site, Brown, Johnston, Chambers, and other Logan personnel hosted hundreds of visitors to show results of the techniques they tested and describe conclusions reached in the various individual studies. After Brown retired, he, Amacher, Walt Mueggler, and Janice Kotuby-Amacher, director of the Soil Testing Laboratory at Utah State University, wrote a Rocky Mountain Station publication (Brown and others 2003) that documented what the visitors had been shown and told for many years.

The general conclusion was that only by restoring natural ecosystem form and functioning could disturbed alpine sites be successfully reclaimed. The authors provided 10 principles to guide alpine area restoration based primarily on research at New World, but said they believed them to be equally applicable to similar disturbances throughout the West where managers want to restore natural plant communities.

Although the New World site received major attention from the Logan scientists for more than two decades, they worked in many other places. In 1988, Chambers published a report on native plant establishment at an oil drilling pad site in the Uintah Mountains in Utah. Brown and Johnston provided guidelines for revegetating disturbed alpine rangelands. From 1972 until 1997, Logan unit personnel conducted studies at 36 surface mining sites in the West, at high and low elevations. All the studies ultimately resulted in specific guidance for managers who sought ways to restore healthy plant communities to areas where human or natural disturbances had upset the normal environmental balance.

Revising the Revision

When Larry Lassen went to the Southern Station in New Orleans as its first Associate (Deputy) Director in 1974 under the new administrative system, he wasn't sure how to operate and neither were the AD's (personal communication). After about a year, the Station Director was assigned to a national systems review team, which required long periods of travel away from the Station. Lassen then took care of the day-to-day Station business for nearly a year.

When Lassen became Director of the Southern Station in 1976, he thought three program AD's would be a better use of manpower than two program AD's and a Deputy Director. He presented this plan to the Washington Office, and it was approved. Lassen also thought locating the AD's away from Station Headquarters diminished opportunities to fully use them for staff work. He observed, for example, that a monthly staff meeting with the AD's often used up the better part of three days with travel time and information sharing. Lassen reasoned that if the AD's were located at headquarters travel time for monthly meetings would be nil and each AD would be more aware of events throughout the Station, so little briefing time would be needed at each meeting.

Lassen was convinced that staff meeting time could be reduced to a few hours and focused on decision making. He also believed that locating the AD's away from headquarters diminished flexibility in assigning research units to them and fostered a parochial interest in portions of the total research program.

Deputy Directors often filled in for the Station Director, as Carter Gibbs (right) did as he entertained Forest Service Chief Dale Robertson during a visit by the Chief to Station Headquarters.

As the opportunities arose, the Southern Station AD's were relocated to Station headquarters, and the former Deputy slot was filled by a third program AD.

When Lassen came to the Intermountain Station as Director in 1983 he brought along his beliefs about how to organize Station administration for maximum effectiveness, but he encountered a different situation. The Intermountain Station had a Deputy, Carter Gibbs; a Planning and Applications AD, Keith Evans; and a program AD, Duane Lloyd; located at headquarters. Program AD Dick Krebill was in Missoula, as were Program Managers Ron Barger and Jim Lotan. Barger and Lotan had responsibilities for their operations similar to those of program AD's and also attended monthly and other staff meetings.

Lassen found that he and Gibbs worked well together, so no effort was made to eliminate the Deputy position. The two special programs were designed to have limited lives. Their major objectives had been achieved by the time Barger and Lotan retired, so the manager jobs were abolished and the remaining work was transferred to the program AD areas. Krebill was asked to move to Ogden at a time of his choosing, and he did.

Later, Evans left for a Congressional Fellowship in Washington and Gibbs took over the Planning the Application AD assignments in addition to his regular duties until he retired in 1988. Lassen did not move to fill the Deputy position, but let the vacancy stay in the approved organizational structure. This was fortunate because a short time later AD Lloyd suffered a serious back injury from a fall and his ability to travel was limited. He was appointed Deputy Director, a role that required little travel and one he fulfilled very well. About the same time, Evans finished his fellowship and subsequent assignments with Legislative Affairs and the Forest Environment staffs in Washington and returned to Ogden to take Lloyd's place as a program AD. When Lloyd retired in 1991, Lassen abolished the Deputy position in favor of a third program AD slot. The job was filled by Dean Knighton.

In retrospect it sounds much like musical chairs, but not long before Lassen

retired in 1992 he finally had the Station management arrangement he had sought first at the Southern Station, and then at the Intermountain Station.

Peter Koch—Superstar

All the notable scientists in Station history made their mark through lengthy, productive careers in the Great Basin or Northern Rocky Mountain areas or by early work at the Station that led to bigger things elsewhere. All but one. Peter Koch established himself as a research all-star in the South and came to the Station only in the last years of his Forest Service career.

Koch was a Montana native reared in a Missoula family of over-achievers. His father, Elers Koch, was a pioneer forester. Elers first worked as one of Gifford Pinchot's "young men," mapping boundaries for what became National Forests in California and the Interior West. Later, he designed new fire-control strategies and equipment. He served the last 20 years of an illustrious career as Assistant Regional Forester for Timber Management for Region 1, and took great pride in his role in establishing the Savenac Nursery and many tree plantations on burned areas (Koch 1998).

Was Peter as great an achiever as his father? Yes, according to Jack Ward Thomas, writing in the foreword to Elers Koch's book about his life:

> I spent some thirty years as a research scientist for the Forest Service before becoming chief of the agency. During those years my ambition was to become as good as our top scientist, a goal I never achieved. That scientist was Dr. Peter Koch, son of Elers Koch. Elers Koch's legacy was not limited to his own achievements in progressive natural-resource management but included those of Peter Koch as well. It would be difficult to do better in either case.

Peter graduated from Montana State College at Bozeman in 1942 with a B.S. degree in mechanical engineering. He later earned a Ph.D. in wood utilization at the University of Washington. Before starting his Forest Service research career, Koch managed a New England sawmill, owned a consulting engineering firm, and served as an associate professor at Michigan State University.

In the South, good growing conditions, level terrain, changes in land use, and closeness to newly developing markets plus technological advances have made this region home to a large segment of the lumber and pulp and paper industries. This was not always the case. While structurally strong, southern pine lumber was prone to warp and was more difficult to nail than western softwoods. Gluing problems prevented its use as structural plywood, and the lack of a good pulping process limited its use for paper and hardboard.

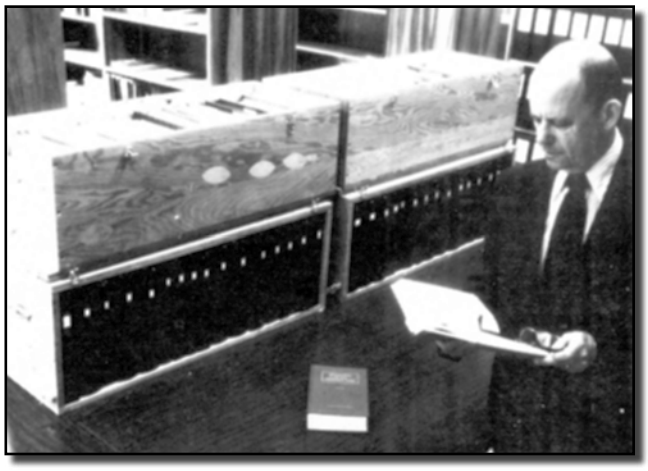
Following World War II, many saw the potential for forest industry expansion in the South. Large corporations such as Georgia-Pacific, Weyerhaeuser, and International Paper were acquiring major forest land holdings there. New processing plants didn't appear overnight, however. One of the drawbacks to industrial development was a paucity of knowledge and processing technology for the southern tree species. Powerful southern Congressional leaders, including Senator Ellender of Louisiana, took note of that and channeled money to the Southern Station to start a Forest Products Utilization Unit.

Enter Peter Koch. In 19 years of Forest Service research work in the South he wrote three major reference books, published 175 technical papers, and invented several processes widely used by the forest products industry. He became known as the leading authority on processing southern woods.

In 1972, Koch wrote Agricultural Handbook 420, *Utilization of Southern Pines,* which became a widely used reference for foresters, industrial developers, and wood technology students. The text and illustrations covered 1,675 pages in two volumes.

Before leaving the Southern Station for the Intermountain Station in 1982, Koch repeated his southern pine publishing feat by writing the manuscript for *Utilization of Handwoods Growing on Southern Pine Sites*. The landmark publication was printed as an Agricultural Handbook in 1984 and later reproduced by the Government Printing Office. It consisted of three volumes and was sold by the GPO for $75 a set.

Because Koch was hired to start a utilization research program from scratch at the Southern Station, he had the opportunity to chart his own course in a way seldom available to a Forest Service scientist. His was one of a handful of "pioneer units" in Forest Service Research. Establishment of these units was initiated by Deputy Chief Vern Harper to develop whole programs to support the efforts of a single outstanding scientist who worked essentially without supervision (Steen 1998). Koch designed the laboratory, acquired the exact equipment he wanted, and handpicked the staff. His location at the Alexandria Forestry Center in Louisiana put him in a good position to coordinate activities with managers. The Kisatchee National Forest and Southeastern Area of State and Private Forestry also had offices there. His experience as a sawmill manager provided him with



Peter Koch at the Forestry Sciences Lab in Missoula with his manuscript on southern hardwoods utilization boxed and ready to ship to Washington for printing. The boxes held 7,000 typed pages and 1,500 illustrations, which in printed form became 4,000 pages in three volumes.

valuable insights that facilitated communication and cooperation with industry people.

Koch's personal characteristics, not favorable circumstances, were what led to his success. He was totally focused and dedicated to his work. Koch single-mindedly moved his various projects forward, and he thought everyone else should move Koch projects ahead of others. He hung elaborately crafted wooden signs from the laboratory ceiling inscribed with the mission statement as constant reminders to all employees of what they were there to do.

When he finished his voluminous southern pine utilization manuscript Koch built special wood boxes to hold it, put them in a pickup truck, and drove to Washington, DC to deliver the manuscript to the Forest Service publications office. And a short time later when he learned the unopened boxes were still in a Washington hallway, he phoned the Station Director to see if pressure could be exerted to "get those people moving."

In the 1970s Forest Service Research adopted new approaches for compensating outstanding scientists. The idea was to provide premium pay for individual scientific achievement rather than limiting the top salary grades to those who supervised organizations. Researchers could draw higher salaries than their Project Leaders. A very few scientists were awarded "super grades." Peter Koch was among the elite. He was awarded a grade equal to the Station Director. Before he left the Southern Station he received another increase and was drawing more pay than any Station Director in the Forest Service.

At the Intermountain Station, Koch was assigned to the STEM (Systems of Timber Utilization for Environmental Management) R& D Program at the Missoula Forestry Sciences Lab. He began working to do for lodgepole pine what he had done for the southern pines. Lodgepole grows on hundreds of thousands of high-elevation acres in the northern Rockies, far from commercial markets. Many of the stands are stagnated or infested with mountain pine beetles. Access often is difficult and management options are limited when the trees attract mainly firewood cutters and small mills making low-quality studs or shaping timbers for log buildings.

Two years after he retired Peter Koch was trying to interest western Montana wood products firms in a new concept to use small-diameter lodgepole pine in combination with flakeboard to produce I-beam joists. Testing was done on this machine at the University of Montana.

Koch set out to determine whether lodgepole pine had other industrial potential, including chip and fiber production and as a major energy source. He launched a 10-year cooperative research study with the Canadian government to characterize the physical, mechanical, and chemical properties of lodgepole. The species has a broad range, and Koch sampled trees from northern California into the Yukon Territory to discover whether lodgepole characteristics change with latitude or elevation, and with tree diameter (*INTercom* 1/10/85).

He ran out of time to complete his lodgepole studies as a Forest Service employee, deciding to retire on the last day of 1984, but he didn't run out of energy. Before leaving Federal service he helped make arrangements for the utilization program to continue under a cooperative agreement with the University of Montana School of Forestry. He also launched a new enterprise as President of Wood Science Laboratory, Inc. in Corvallis, Montana.

In 1996 the utilization program paid dividends just as Koch had envisioned when he returned to Montana. The Forest Products Society published *Lodgepole Pine in North America* (Koch 1996), a three-volume reference describing the species' characteristics, forest values, processes to convert logs to products, and major potential products.

Koch received many honors for his work. One was an honorary doctorate conferred by the University of Maine. He got a USDA Superior Service Award in 1968, and the research unit he headed at the Southern Station received another one in 1973. He was elected president of the Forest Products Research Society, serving in 1972 and 1973. In 1974 he was named a Fellow of the International Academy of Wood Science, and later was made a Fellow of the Society of American Foresters. The University of Idaho designated him a Distinguished Affiliate Professor.

High Hopes Come Crashing Down

In the early 1980s the Station engineering unit at Bozeman played a role in plans for use of an airship that looked like something right out of a science fiction movie.

The research engineers entered into a cooperative agreement with Montana State University to conduct pretests for log transport operations by the

The Heli-Stat during a hover test at Lakehurst, New Jersey. It crashed there on July 1, 1986 after completing a series of tests.

Heli-Stat, the world's first full-sized, heavy-load, vertical-lift aircraft. The Station-University agreement provided for as much pretesting as possible so that evaluation trials of the Heli-Stat could be run efficiently (*INTercom* 8/6/81). The pretests focused on efficient methods of collecting and bunching logs in rugged terrain for pickup and transport by the airship. They involved creation of computer models and programs for simulating and selecting appropriate prebunching activities.

The Heli-Stat prototype was built for the Forest Service under a U.S. Navy contract. It was assembled from a surplus Navy dirigible and four surplus helicopters. The concept was to combine the buoyancy of the dirigible with the dynamic lift ability of the helicopters into a single hybrid airship that could move heavy loads of logs from steep slopes in fragile, inaccessible areas to yarding sites with minimum environmental impact and relatively low costs.

The dirigible, when inflated with helium to its full 1-million-cubic-foot size, was 343 feet long, making it the largest aircraft in the world at the time. The famous Hughes "Spruce Goose" flying boat wingspan was 320 feet (Piasecki Corporation 2005). The builder said even bigger versions of the Heli-Stat might be produced in the future to carry payloads ranging from 60 to 200 tons, if the prototype performed well in trials.

The trouble was it didn't perform well; it crashed.

According to the National Transportation Safety Board (report NYC86FHD01), the Heli-Stat had just completed a hover test flight successfully at Lakehurst, New Jersey, on July 1, 1986 when disaster struck. The tests were ended that day when a power loss was noted in one of the helicopters. A shift in the wind threw the airship out of control as it was about to moor after landing, and the pilot tried to lift off. A shimmy developed. The four helicopters broke off and fell to the ground. The Heli-Stat was destroyed. One pilot was killed, three were seriously injured, and one received minor injuries.

The safety board determined the probable causes of the accident were inadequacies in the design and performance of several pieces of equipment. No contract was issued for another prototype.

Although the Heli-Stat was lost, the research was not. Engineers at the Pacific Northwest Station used the Intermountain results in a cooperative program with two Forest Service Regions, three universities, and an aerospace firm to develop a computer model useful in analyzing other aerial logging systems, primarily helicopter logging. The work considered log weights, sizes, landing areas, access for workers, and many other factors (*Forestry Research West* Apr./87).

Chemists Formulate New Fire Analyses

Chemists played important roles in fire science at the Station, but for many years they were few in number and worked in units dominated by other disciplines. Charlie Philpot did the first chemistry work, followed by cooperative studies led by Fred Shafizadeh of the University of Montana faculty (J. Brown, personal communication). In 1985, there were only two chemists at the Fire Lab—Ron Susott in the fire behavior unit and Cecilia Johnson in the suppression unit. That changed dramatically over the next 2 years.

The Forest Service announced a major consolidation and redirection of the Forest Fire and Atmospheric Sciences Research program. For the Fire Lab, the new arrangement meant much more emphasis would be put on chemistry. The plan was to close down fire research at Macon, Georgia, and redistribute programs and personnel (*INTercom* 7/24/86).

The Fire Lab established a new Fire Chemistry Research Work Unit. Assistant Station Director Dick Krebill said, "Members of the Fire Chemistry RWU will be conducting fundamental research aimed at determining chemical characteristics of wildland fuels, clarifying the chemical processes of combustion, and predicting byproducts emitted under various types of combustion. Our goal is for the unit to serve as a national center for fundamental information on combustion and emissions" (INTercom 9/3/87).

Electronics Engineer Ron Babbit adjusted instruments used to measure combustion products in 1989.

Employees affected by the reorganization were given directed reassignments. Thirteen were transferred to Missoula—nine from Macon, two from Lansing, Michigan, and two from Flagstaff, Arizona. Unfortunately, only two scientists accepted the reassignments and neither one stayed in Missoula for long. So the Station had a new unit with ambitious plans, but almost no personnel to carry them out.

The staffing problem was resolved rather quickly. Susott transferred into the new unit, Electronics Engineer Ron Babbitt moved from the Bozeman Lab, and recruiting began to fill other positions. Darold Ward was named Project Leader early in 1988. Ward was a scientist with the Pacific Northwest Station in Seattle who had worked in fire research for 20 years. He had degrees in forestry from the University of Montana and was awarded a Ph.D. in fire science by the University of Washington in 1979.

Ward led an aggressive program that featured working on large-scale experiments with many cooperators, often internationally, and focusing on major public issues such as deforestation and air pollution. Babbitt and Susott played important roles in designing new

hardware and software used in field work as well as at the Fire Lab.

One of the first important international ventures had Ward traveling 7,000 miles in 3 weeks while working with the Brazilian government to collect smoke samples from deforestation burning in the Amazon River Basin. The research was prompted by a presentation given by Ward at the National Center for Atmospheric Research. It interested a National Aeronautics and Space Administration (NASA) scientist, and the two developed a pilot study to measure particles and gases released during burning in the Amazon (*INTercom* 10/12/89).

The study involved collecting samples by flying an aircraft through smoke plumes downwind of individual fire areas. Ward later had the samples analyzed at the Oregon Graduate Research Center. Results were included in several publications by Ward and others after review at a workshop sponsored by NASA and the Environmental Protection Agency.

Ward had brought the sampling equipment from the Fire Lab in 11 pieces of luggage. It took 3 days to get it through Brazilian customs. He installed the instruments in a Brazilian government plane. Samples were taken at fires in a gold mining area and agricultural settlement areas where deforestation was proceeding "on a tremendous scale" and in a savanna area that was being burned.

"Basically," Ward said, "there was smoke everywhere…there were smoke plumes all over the place." By the start of the rainy season, which ended the burning, he had collected 80 canisters of gas and "background air" samples.

In the summer of 1989, the still-small fire chemistry unit and members of the fire behavior unit embarked on a study that required extensive preparation, coordination, and data analysis. Ward and others at the Fire Lab had worked with a team of Canadian scientists for several years to plan the "International Crown Fire Experiment" to take place in the Northwest Territories.

More than 30 Canadian and American scientists studied massive fire characteristics at a large prescribed burn near Chapleau, Canada. Both groups wanted to study large-fire dynamics and the resulting smoke emissions. Also of interest were the mechanisms involved in creating fire-induced winds. The U.S. Defense Nuclear Agency was interested in the studies, and funded American participation. The agency wanted to better understand the potential for "nuclear winter," which could be created by emissions in a nuclear war. Ward's unit coordinated work by the American scientists participating in the project (*INTercom* 10/26/89).

Instruments mounted on 40-foot towers were activated by heat sensors and measured gases during three phases of combustion in large-scale cooperative fire chemistry research in Canada.

Babbitt and Susott spent weeks designing and building instruments to measure and analyze the products of combustion, including gases and particulates. They transported the equipment in boxes by van to Canada, where they mounted their devices on 40-foot towers in the study area. Meteorologist Don Latham installed anemometers to measure the velocity of the convection column that would result from the fire. He also measured differences in electrical charges between the earth's surface and the clouds created by the fire. The massive fires, ignited over 2 days, spread rapidly. The intense heat created cumulous clouds and Latham recorded six lightning discharges from one fire, which caused 2 inches of rain to fall downwind.

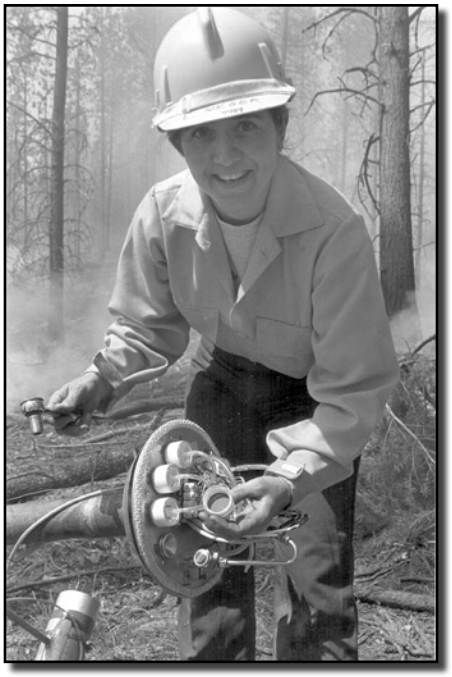
Five fixed-wing aircraft and four helicopters were involved in the studies. "There was so much going on that we had to be careful about coordinating flight patterns," Ward said. Following the experiments, the Station hosted a fire review to discuss results of the many tests. The participants assembled later to prepare a composite report.

Two complex problem areas—firefighter and community health and safety related to wildfires—drew the attention of the fire chemists in the early 1900s and continued to do so for many years.

Injuries and illnesses among wildland firefighters were a significant problem. During the 1988 Yellowstone fires, more than 30,000 medical visits were made by firefighters, of which 12,000 involved respiratory conditions. More than 600 of the firefighters with respiratory problems required subsequent medical care. The long-term health effects were not known and the relationship between smoke content and health-related problems had not been identified. A Congressional committee called for action, and one result was a research plan prepared by Johns Hopkins University and the Station chemistry unit. Results of the studies were made available to help fire managers position personnel for maximum safety (Tippets interview, 2005).

During the historic 1994 fire season, chemistry unit personnel installed instruments in an aircraft that allowed them to measure smoke emissions from several different fires, the impact of smoke on local communities, and dispersion of the smoke in the atmosphere. The system was based on the one used by Ward in Brazil.

Ward, Babbitt, and Chemist Lynn Weger made measurements in Montana's Bitterroot Valley, on the Idaho-Montana border, and in northern California. The airborne system was used for many fires in Montana, Idaho, and Oregon. One result was the knowledge that, although emissions from wildfires had characteristics similar to those from prescribed fires, the emission concentrations were much higher in wildfire smoke. This was important, considering later emphasis on the tradeoffs involved in increasing planned fires to decrease fuels that contributed



Chemist Lynn Weger checked an instrument Station scientists used to sample gas and particulate emissions from prescribed fires.

to large wildfires (Intermountain and Rocky Mountain Stations 1995).

Wei Min Hao, a chemistry professor at the University of Montana, was a frequent cooperator with the fire chemistry unit before he accepted a position with the unit. He worked in three interrelated areas: (1) health impacts of smoke emissions from biomass fumes, (2) regional air pollution from forest and grassland fires, and (3) global effects of emissions from biomass burning. Hao's involvement in global emissions research started in 1986 when he worked at the Max Planck Institute for Chemistry in Germany. He majored in chemistry in college in Taiwan, but switched to environmental chemistry for master's and Ph.D. degrees at the Massachusetts Institute of Technology.

To earn his Ph.D., Hao worked on fossil fuel combustion in power plants. He said most plants used the same type of boiler, so similar gases were produced. With biomass fires the situation was much more complicated. A complex array of fuels and meteorological and environmental conditions determine the emissions levels (*INTercom* 2/16/05). Hao became Project Leader of the Station's fire chemistry unit after Ward retired.

Long-Term Desert Range Work Completed

After 50 years of continuous research at the Desert Experimental Range (DER), Station management announced in 1984 that a primary part of the work at the southwestern Utah site was completed.

"We've succeeded in our search for the proper use of the salt-desert shrubs by sheep on winter ranges," said Assistant Station Director Duane Lloyd. "Now we have the opportunity to shift emphasis from there to other high-priority research such as studies of riparian habitats."

The 87-square-mile DER continued to be maintained as a scientific preserve and was made available for future studies, including work by qualified researchers from the academic community. Research conducted at the Desert Range included studies of disturbance and successional processes, rodent ecology, pronghorn biology and management, soil crust ecology, and bird and mammal population dynamics.

"We'll also continue sheep grazing at the DER to demonstrate the effects of different grazing treatments," Lloyd said. The DER historically played an important role as a demonstration area for ranchers, land managers, and students. Established in 1933, the DER served as a central study site to help solve the problems of misuse and damage from grazing that were occurring on millions of acres of salt-desert shrub rangelands in the Intermountain West (*INTercom* 9/20/84.

In 1972, the southern end of the DER was designated as a Research Natural Area. And in 1977, the UNESCO Man and the Biosphere Program picked the DER as a Biosphere Reserve, joining it to a worldwide network of specialized ecosystems set aside for conservation, research, and education. It was the only cold-desert Biosphere Reserve in the Western Hemisphere.

Controversies Inspire Riparian Research

Interest and controversy regarding riparian areas (land adjacent to streams, lakes, seeps, and springs) with respect to water quality, fisheries, wildlife habitat, and livestock grazing had been building

What Project Leader Warren Clary called the "unofficial dedication" of the Desert Range as a Biosphere Reserve was attended by (l. to r.) Gale Wolters, Washington Office; John Kinney, Superintendent of the Desert Range; Duane Lloyd, Assistant Station Director, and Clary. Kinney built the monument to hold the bronze plaque received from UNESCO that commemorates the biosphere designation.

for years in the Intermountain West. Controversies started to develop in the 1960s in Arizona at lower elevation sites where bird populations in riparian areas were diminishing. Within the Station's territory, the conflicts were strongest in Idaho, primarily involving livestock interests and environmental advocacy groups, but anglers concerned with stream water quality had also entered the debate.

Not much scientific knowledge about riparian areas was available, although management and use conflicts in them were of critical importance. Although riparian areas and their associated streams made up less than 2 percent of the western landscape, they were a valuable segment of lands, particularly public lands, in the Interior West. The areas provided important habitat elements for 70 percent of the wildlife, including more than 50 percent of the neotropical migrant birds. The associated streams, totaling 283,000 miles on National Forest and Bureau of Land Management lands, provided immense recreational resources.

Grazing conflicts with other values in riparian areas had escalated into a hot topic by 1984. Assistant Director Duane Lloyd thought the Station could introduce some science-based knowledge into what was becoming a debate based more on emotion than fact. This led to the move of Warren Clary, Dean Medin, and John Kinney from Provo to the Boise Lab. Their previous assignments had been tied to salt-desert range research, most of which the Station had concluded at the Desert Experimental Range.

A new unit at Boise, with Clary as Project Leader, was formed to conduct studies on stream and riparian ecosystems. Emphasis was given to studying the response of riparian areas to grazing, the structure of riparian plant communities, and wildlife relationships to riparian areas.

Clary concentrated his work on grazing issues and management. Wildlife Biologist Medin made studies of small birds and mammals. Botanist Nancy Shaw soon transferred to the new unit to conduct research on ecology of sensitive plants, and Fisheries Biologist Bill Platts joined the unit for studies of fishery responses to grazing and other disturbances. Others worked in the riparian unit at intervals until most of it was absorbed in the mid-1990s into a large integrated unit concerned with watershed processes and aquatic ecology (Clary, personal communication).

The fisheries research built on a foundation laid by 10 years of studies by Platts in the Salmon River Drainage in Idaho. After establishing plots in Nevada, Idaho, and Utah, he studied what happened to fish populations when riparian areas were damaged. His work provided hard evidence that livestock grazing, road construction, timber harvests, and mining in riparian areas often reduced the capacity of streams to produce fish. Of special concern were sites within the headwaters of the Columbia River system that were critical spawning and rearing areas for salmon and steelhead (Prouty 1987). Platts and coworkers started studies at 10 such sites in 1977 in the Boise and Sawtooth National Forests. The areas were characteristic of meadow ecosystems in the Idaho Batholith (*Forestry Research West*, Oct./77). One result was a 1978 Station publication, *Rearing of Chinook Salmon in Tributaries of the South Fork Salmon River, Idaho*, by Platts and Fred Partridge, a biological technician.

Another early result of Platts' research was development of a method to integrate streams and their fisheries into the Land Systems Inventory, at the time a major tool for planning and decisionmaking for National Forest lands (*Forestry Research West* May/80). The method could be applied to most streams in large areas of the west. Details were presented by Platts in a 1979 Station publication, *Including the Fishery System in Land Planning*.

In 1983, Platts, Hydrologist Walt Megahan, and Wayne Minshall, a professor of zoology at Idaho State University, made an important contribution to improving accuracy in evaluating stream habitats when they published *Methods for Evaluating Stream, Riparian, and Biotic Conditions,* a Station technical report. Before that, most methods in use had not been tested to determine their validity in describing conditions. In 1987, Platts and 11 other authors, including Station Statistician Gordon Booth and Botanist Steve Monsen, issued a refinement in the methodology work, *Methods for Evaluating Riparian Habitats with Applications to Management*.

Density and Biomass of Trout and Char in Western Streams, published by the Station in 1988, presented the first compilation of trout population characteristics in the western United States (*Forestry Research West*, Sept./88). Platts and Biological Technician Mike McHenry assembled and analyzed fish census data from 313 streams in six ecoregions of the West. The data showed significant differences among regions.

There also were significant differences in the vegetation in riparian areas. No two were the same. Shaw used her botanical training to help develop new information on sensitive riparian plant species. She developed techniques for handling and planting woody plants such as willow, cottonwood, and alder that could help rehabilitate damaged riparian areas (Prouty 1987c).

Revegetation techniques proposed by unit members were designed to help stabilize streambanks, to provide shade and shelter for wildlife, and to furnish desirable amounts of organic matter to the streams. Shaw summed up her work and the situation in the west in a proceedings paper published in 2000, *Plant Materials for Western Riparian Areas*.

Economist Fred Wagstaff worked part-time in the riparian unit. He provided an economic focus to the problem of sorting out competing uses. Wagstaff studied the cost effectiveness of various management practices and techniques. He addressed such questions as, "How many added recreation days of fishing justify the expense of fencing a stream?" (Prouty 1987c).

Medin's studies with the riparian unit concentrated on nongame bird and small mammal populations and ecology. He published Station research papers on populations in grazed and ungrazed areas in Idaho and northeastern Nevada (*Forestry Research West*/Dec./90; Nov. 91).

In 1991, Medin and Clary introduced a new focus to the riparian work when they published *Bird Populations in and Adjacent to a Beaver Pond Ecosystem in Idaho*, a Station paper. The study

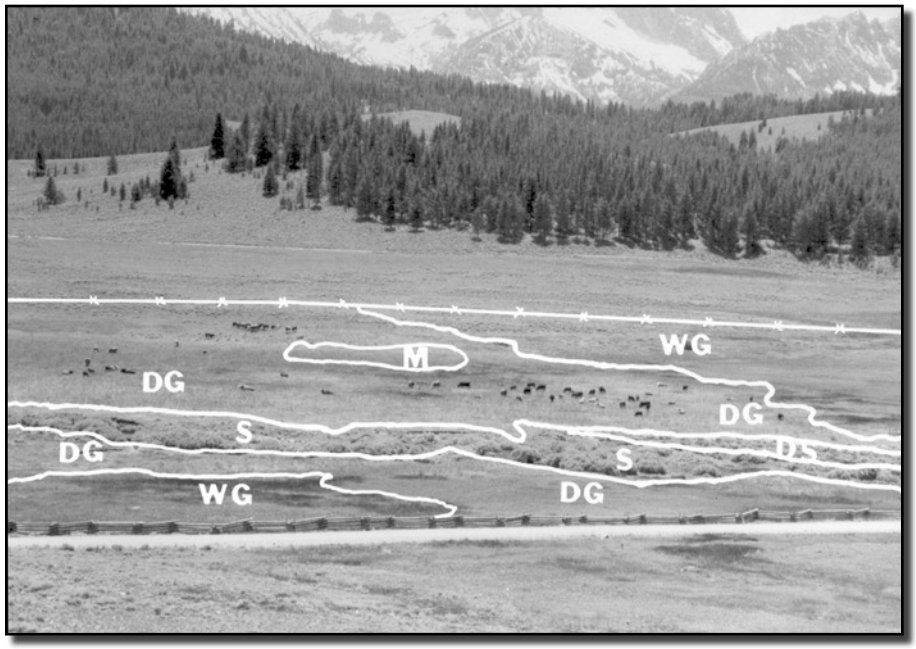
showed that beaver pond ecosystems with willows provided habitat for three times the number of birds that were found in nearby riparian areas without willows. Bird diversity also was much higher (*Forestry Research West*, Apr./91). They followed up with another report showing similar differences for small mammals.

Wildlife Biologist Victoria Saab added another dimension to the riparian studies when she joined the unit in 1989. Her specialty was neotropical birds, and her work was conducted in both riparian areas and burned pine-fir forests. For reasons not fully understood, a third of Idaho's migratory land birds were experiencing declining populations (Tippets 1994a).

Habitat along the South Fork of the Snake River provided a good outdoor laboratory for Saab to study both grazing and recreational effects on neotropical birds. Some large patches had no grazing and little recreational impact. Other sites were heavily grazed, and some near the river were heavily used by recreationists. Saab also studied the impact of grazing intensities on the birds in their winter homes in Belize, Central America. In 1992 she published five scientific papers on the results of the work, and co-authored two others.

The research in burned forest areas got started in a big way in 1994 when the Station and Boise National Forest began long-term studies on bird responses to different fire conditions in ponderosa pine/Douglas-fir forests. Saab and fellow biologist Jon Dudley summarized the findings in 1999 in a Rocky Mountain Station publication.

Wildlife Biologist Victoria Saab released a yellow warbler caught and banded in a riparian forest area along Idaho's Snake River.



Scientists in the riparian research unit used time-lapse photography to study concentrations of cattle in five parts of this meadow that had different types of vegetation.

In riparian areas, the kinds and amounts of various activities often were in dispute and long-term monitoring was required to clear up the mysteries. Clary and John Kinney used time-lapse photography to show where livestock were spending their time (Fletcher 1999a). One of the key studies was made along Stanley Creek in the Sawtooth National Recreation Area in Idaho.

Clary said, "We used time-lapse photography to document the positions of cattle within several pastures. A total of 10 to 23 days of picture sequences were obtained per pasture." He said measures typically used in range management would not have determined the proportions of time spent by the cattle on one site compared to the others. Kinney and Clary wrote a Rocky Mountain Station research note, published in 1998, that described the techniques in detail.

Clary and Bert Webster, a Sawtooth National Forest staff officer, summed up results of the photo studies and other initial riparian grazing research in a major Station publication, *Managing Grazing of Riparian Areas in the Intermountain Region*, issued in 1989. It provided guidance for planning grazing of riparian areas to reduce stream pollution and other impacts. Many of the recommendations were applicable beyond the Intermountain Region (*Forestry Research West* Jan./90).

In the foreword to the publication, Region 4 Regional Forester Stan Tixier said, "The application of these basic concepts along with riparian standards and guidelines in a Forest Plan will achieve the desired objective of healthy riparian systems."

Range Scientists Round Up the Knowledge

In the early 1980s, Station administrators and representatives of cooperating universities, stockmen's associations, and range management agencies stepped on the accelerator of four vehicles designed to speed up application of the results of decades of range research. Three took off almost immediately. The fourth required many

years to design and build, but it was a first-class product once completed.

The task was to round up research findings scattered through myriad scientific journal articles and publications and to summarize the information in formats readily usable by western ranchers and land managers. Comprehensive publications were planned for (1) sagebrush-grass ranges, (2) salt-desert shrub ranges, (3) vegetation and livestock studies at the Benmore experimental area, and (4) range improvement and use of shrubs (*INTercom* 1/7/82).

Fortunately, the Station was able to get special funding for the project from the Four Corners Regional Commission, one of five Federal commissions formed to aid regional development in economically distressed areas. The commission wanted to enhance agricultural and natural resource values in parts of Arizona, Colorado, New Mexico, and Utah where the results of work by Station scientists and cooperators were most applicable.

Station Project Leaders Warren Clary and Art Tiedemann (Provo) coordinated the work, but it was a cooperative venture. The Utah Department of Agriculture, Utah Division of Wildlife Resources, Utah State University, and various Station units made contributions. The target was to complete all four manuscripts by May 1982 and publish them by December of the same year. That proved doable for one, almost practical for two others, and enormously optimistic for the fourth.

The first product, a Station publication issued in October 1982, reflected the amount of information that was distilled into the management guides. The authors of *Managing Intermountain Rangelands—Sagebrush-Grass Ranges* based their document partly on a bibliography published some years earlier by the Station. The bibliography included 1,250 publication citations. The management guide was written by Jim Blaisdell, who had recently retired as an Assistant Station Director, Bob Murray, a range scientist for many years with the Station and later the Agricultural Research Service, and Durant McArthur, a plant geneticist at Provo who later became Project Leader for shrub improvement research.

Because of the large number of sagebrush species and plant associations involved, no attempt was made to create individual management prescriptions for each. Instead, general guides and sources of detailed information were given, so managers could use the knowledge to plan improvement or maintenance of conditions in local situations. The publication concluded with 41 summary statements.

Managing Intermountain Rangelands—Salt-Desert Shrub Ranges appeared as a Station publication in spring 1984, following the same general format but with more specific advice because the nature of the lands covered made that possible. It was written by Blaisdell and Range Scientist Ralph Holmgren, and was based largely on a half-century of research at the Desert Experimental Range. The authors concluded that although desert ecosystems are fragile and easily disrupted by improper use, "under good management deterioration can be reversed, conditions can improve, and areas in good condition can remain so under grazing use."

This guide, with current material added, replaced two out-of-print manuals written by Selar Hutchings and George Stewart in 1953 and Hutchings in 1954 that had been useful to managers for three decades. Hutchings conducted some of the first research at the Desert Range at the start of what became a 45-year career in range research and management.

Blaisdell also had a lengthy career, most of it at the Station. During his 35 years with Forest Service research he participated in and managed range research programs that included studies in all the land and vegetation types included in the accelerated application project. An Idaho native, Blaisdell earned a bachelor's degree in range management at Utah State University, a master's at the University of Idaho, and a Ph.D. in plant ecology at the University of Minnesota. He became Assistant Station Director for Continuing Research in 1972 and served in Ogden until his retirement. In that position he supervised Station research at Logan, Ogden, Provo, Reno, and Boise and was the principal liaison with Region 4 managers.

The third management guide was issued in December 1984 (Astroth and Frischknecht). See "The Beef Was at Benmore," chapter 10, for an account of the research history and study results summarized in the publication. Preparation of this guide and a complementary program to extend the results to a broad array of users was directed by Kendall Johnson of the Utah State University Range Science Department.

The fourth publication evolved into something quite different from the three summary management guides. To say it took a little longer to produce would be one of the great understatements in Station history. It missed the publication target date by 22 years.

At first glance the plan appeared to be to produce a replacement for *Restoring Big Game Range in Utah,* which had been the guide for range reclamation since it appeared in 1968

Sheep thrived on well-managed salt-desert lands at the Desert Experimental Range. So did the livestock owners. On lands managed as Station researchers recommended, net profit per ewe was twice as high as when traditional practices were followed. Results were similar when cattle began to outnumber sheep as the principal domestic livestock on this type of rangeland.

The range restoration reference compiled by Steve Monsen, Richard Stevens, and Nancy Shaw contained a wealth of information on useful species, such as the perennial small burnet being inspected by Monsen in a deer winter range improvement area above Sanpete Valley in Utah.

(see "Mr. Plummer's Opus," chapter 10). However, the concept from the start was to create a document with broader scope. What emerged was a massive reference work. Station Botanist Steve Monsen (Provo) and Richard Stevens, wildlife biologist with the Utah Division of Wildlife Resources, were team leaders for the compilation effort. Later, Botanist Nancy Shaw (Boise) became the third compiler.

When the work started in 1982, Stevens said, "We expect to bring together all the data on range restoration and improvement research that has been done in the past 30 years, and incorporate it in the report." Ultimately, this goal was met.

As a starting point and to provide an interim document, the Station, Region 4, and the Bureau of Land Management sponsored two symposia, one at Twin Falls, Idaho, and another at Elko, Nevada. The combined proceedings was compiled by Monsen and Shaw and published by the Station in 1983 as *Managing Intermountain Rangelands—Improvement of Range and Wildlife Habitats*.

When *Restoring Western Ranges and Wildlands* finally appeared as a Rocky Mountain Station publication (Monsen and others 2004) it presented the technical subject matter in detail with many illustrations and included general descriptions of rangelands in the Intermountain West, the history of range and wildlife habitat restoration efforts, and pertinent research history. It was an encyclopedia of range restoration knowledge rather than a condensed management guide, although specific management guidelines were included. Fifteen authors prepared 29 chapters. The printing bill, a cost shared by several sponsors, was $67,000.

Development of the publication took a long time for a number of reasons. McArthur recounted the major ones in a foreword. The compilers doubled as authors of major sections and they had many other demands on their time. A shift in revegetation philosophy toward holistic landscape management required much new writing and rewriting. The revegetation emphasis changed completely from heavy reliance on exotic plants to using native species, demanding more reworking throughout the text. Monsen and Stevens both retired before the work was finalized, leaving it to Shaw to handle compiler duties near the end of the work.

An army of people were involved in the production. In addition to the chapter authors, McArthur named 36 individuals who researched information, compiled and processed data, reviewed draft material, and edited, designed, and laid out the document.

Throughout the process it often seemed that publication was imminent, but then a new development extended the time frame. Research Information editors began to be told as early as 1985 that a completed manuscript would be in their hands "very soon." McArthur had christened the work the "Gold Book," to distinguish it from Plummer's work, which had a green cover. So many delivery promises were made, that one day someone in the publishing unit observed that if the manuscript ever arrived it probably would be gold plated. As the size and scope of the document evolved, so did the nicknames. After several years of delivery promises, McArthur and the editors decided the value had increased enough to rename it the "Platinum Book," and around l995 it became the "Iridium Book."

At first, the publishing people were worried that the researchers preparing the manuscript might be offended if they heard about the nicknames. But by the time Nancy Shaw arrived in Ogden in 2004 to put the finishing touches on the Iridium Book everybody involved, in the Labs and in the publishing unit, was calling it that. Did it turn out to be that valuable? Some knowledgeable people thought so. It won the Rocky Mountain Station award as the Best Technology Transfer Publication of 2004. It also was a hit with the managers it was designed to serve. As soon as the publication was announced orders flowed in from all over the West.

Shaw recalled a string of nights and weekends spent working to finalize the document. Its publication was one of several major achievements during her career. In 1989, she was the first woman and first Station employee to serve as president of the Idaho Section of the Society for Range Management. She received a national SRM Outstanding Achievement Award in 2000 for "significant contributions to the science of range management as it relates to seed biology and seedling establishment of important desert and wetland plants."

McArthur, a scientist not given to dispensing undeserved accolades, said, "I believe that the materials presented

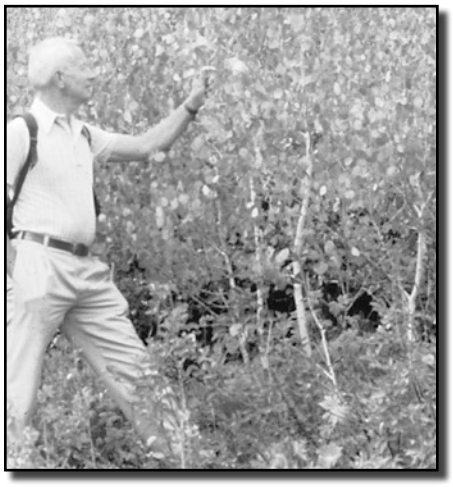
Botanist Nancy Shaw, who finalized the "Iridium Book" manuscript, checked forb seedlings in an experimental planting at Lucky Peak Nursery near Boise.

in a 'how to, what with, and why' manner will be timely and relevant for land managers and students in rehabilitation and restoration of degraded western wildlands for years into the future."

Preparation of another landmark reference work in which Station people played an important part also occurred in the mid-1980s. It was not part of the application acceleration plan funded partially by the Four Corners Commission, but it served the same purpose for a fifth large segment of rangeland in the Interior West. *Aspen: Ecology and Management in the Western United States*, issued by the Rocky Mountain Station in 1985, summed up decades of research results by Intermountain and Rocky Mountain scientists and many cooperators.

The research resulted from a 10-year cooperative endeavor by the two Stations. Norb Debyle, an ecologist at the Logan Lab, was senior editor. Twenty-one authors contributed material; most were with the two Stations.

The publication was the first comprehensive document of its type to focus exclusively on aspen in the western United States (*Forestry Research West* Mar./86). DeByle and Bob Winokur, the junior editor located at Rocky Mountain Station Headquarters, included the latest available information to provide state-of-knowledge management guidelines. Knowledge gaps also were indicated so that the document could serve as a foundation for needed new research.



Ecologist Norb DeByle inspected aspen sprouts in 1991at the Manning Basin study site in Wyoming 10 years after a prescribed burn designed to regenerate the species. DeByle was senior editor of a major reference work on aspen published by the Rocky Mountain Station in 1985.

The push in the 1980s to analyze and consolidate results from years of range research by hundreds of scientists throughout the Interior West resulted in five documents that provided a sound scientific basis for rangeland improvement and management on many millions of acres of public and private land.

The Sages of Sagebrush

Sagebrush commanded the attention of several generations of Intermountain Station scientists. In 14 States and parts of Mexico and Canada, sagebrush grows on more land than any other plant. West of the 100th meridian, sagebrush constitutes the single most common type of ecosystem.

Regarding the shrub, especially big sagebrush, as a rival of the grass that fattened their livestock, westerners spent most of a century plowing, chopping, chaining, spraying and burning it with a vengeance (Tippets 1992). Despite the best efforts of many people, sagebrush refused to be eradicated. However, much of what was said to be an 800-mile sea of sagebrush that the pioneers encountered was fragmented into relatively small patches by human developments and changes in its environment brought on mainly by human activities (Welch 2005).

Through about two-thirds of Station history, the Forest Service was oriented toward commodity production. In both World War I and II, the marching orders were to do everything possible to help ranchers and farmers produce beef and wool to support the war efforts. That meant replacing "brush" with more desirable forage wherever possible. Although research was severely curtailed during war years, Station scientists did what they could to support that approach. At other times up to the 1970s, maximum production of livestock forage was a goal, even though environmental concerns got more consideration. Most of the range research at the Station supported forage production objectives.

Station Director Joe Pechanec participated in some of the first formal research on effects of burning on sagebrush (see Appendix A) and was senior author of a summary of knowledge titled *Sagebrush Control on Rangelands*, which was published by USDA in 1965. Perry Plummer, long-time leader of Station research on shrubs was the second author. The opening paragraph of the publication said:

> Sagebrush control brings about major increases in grass production on millions of acres of western range. Getting rid of competing sagebrush and restoring a good stand of forage plants through natural or artificial seeding enables ranges to supply forage for more sheep and cattle, and is helpful in improving watersheds. In effect, new range is created on large areas, making possible a superior plant cover on adjoining ranges by better grazing management.

But the thinking began to change. In 1975, Plummer said, "It is interesting to note that for decades farmers have considered sagebrush and many other shrubs as a nuisance to be cleared off the land so grass could be planted. We now know that many of these are much more nutritious than grass. The time may soon come when farmers will plow the grass under to plant sagebrush" (Noble 1978d).

In the early 1970s, scientists who soon were to occupy the new Shrub Sciences Lab in Provo started to collect seed from what appeared to be genetically superior sagebrush parent plants. The seeds produced plants grown in a uniform garden to allow the researchers to identify real genetic variations among the 23 different species. A major goal was to develop a "super sagebrush" that might help combat the invasion of western ranges by undesirable cheatgrass. The genetics program also had other goals, depending on which desirable characteristics, such as palatability to big game animals and livestock, needed to be developed or enhanced (Tippets 1992).

Station scientists became strong advocates of the idea that sagebrush

had great value in western ecosystems, although its characteristics could be improved. Durant McArthur became a leading proponent of that view when he joined the Station in 1972. Other key members of the Shrubland Biology and Restoration unit for many years were Botanist Stan Kitchen, Ecologist Susan Meyer, Geneticist Stewart Sanderson, Plant Physiologist Bruce Welch, Plant Pathologist David Nelson, Ecologists Burton and Rosemary Pendleton, Botanist Nancy Shaw, and Botanist Steve Monsen. Shaw worked at the Boise Lab throughout her career; Monsen spent 13 years at Boise and 20 in Provo.

The scientists saw beauty as well as utility in sagebrush and other shrubs and had no qualms about making their views known. "I'm a sagebrush hugger myself. I love sagebrush," McArthur told a reporter (Siegel 1996). Welch espoused the value of sagebrush as shelter and food for wildlife, including the sage grouse, smaller birds, and a variety of mammals. In a summary of his views developed during a 36-year career, Welch (2005) said that many range management practices applied to big sagebrush ecosystems over the years had not been based on sound science. A good part of the shrubland research unit's mission was devoted to providing managers with a better understanding of sagebrush ecosystems so they could make better-informed ecosystem management decisions.

Bruce Welch participated in pioneering work at the Shrub Lab to test improved forms of sagebrush for areas where they benefitted wildlife and the range ecosystem.

Meyer's research on seed collection and germination for native plants was geared to solving some fundamental problems in restoring healthy plant diversity to large plant communities. "A lot can go wrong when you're seeding native plants," she said. "The seeds are generally collected by hand from wild plants, so quality is inconsistent even though the cost is relatively high. Seeds may or may not germinate, may or may not become established" (Reynolds 1990).

Meyer found differences in germination patterns within shrub species that account for the success of some seedings and the failure of others under similar circumstances. Such understanding makes it possible to select seeds for a planting site that have the best chance of producing healthy plants. Her work may have great importance in developing ecosystems that will resist invasion by cheatgrass (Tippets interview 2005).

Monsen had an unusual combination of ecological insights, knowledge of plant materials, and the ability to be involved in the nitty gritty of range rehabilitation. In 1990 he was honored as Range Manager of the Year at a joint Idaho-Utah meeting of members of the Society for Range Management. McArthur, who had become Project Leader by then, said, "Steve advises resource managers, departments, mining companies, government and commercial nurseries, engineering firms, and others working in related fields. He can solve many rehabilitation questions with a phone call or two" (*INTercom* 1/18/90).

Ecologist Susan Meyer recovered sagebrush seeds from a study plot in 1990. Her research aimed to solve fundamental problems in using native plant seeds to create healthy range ecosystems.

Speaking at a national Society for Range Management meeting, a BLM manager paid tribute to Monsen's technology transfer abilities in an unusual way. Somewhat to the surprise of the audience, the manager was extolling the virtues of a complex computer simulation program that was supposed to help him make management decisions. He concluded with, "If I could hire Steve Monsen, this program would be worthless. However, they keep sending me range conservationists from Delaware and New Jersey" (Evans, personal communication).

What the plant improvement work in the Provo unit could mean can be illustrated by development of 'Hobble Creek' big sagebrush. The genetically improved low-elevation mountain sagebrush was released in 1987 for commercial use after 15 years of research and evaluation. Some 186 selections of big sagebrush were tested in cooperation with the Utah Division of Wildlife Resources before 'Hobble Creek' was found to be most preferred by wintering mule deer, while also ranking high in preference by wintering domestic sheep. It exceeded typical winter forage values in several important respects (*Forestry Research West* Apr./87). Using 'Hobble Creek' to replace existing vegetation could convert sagebrush ecosystems from perceived liabilities to assets at many sites.

The shrub improvement work required cooperation with the Soil Conservation Service (later the Natural Resources Conservation Service) and often universities, as well as work with State wildlife agencies. The NRCS could test proposed new varieties at several locations, as could the universities. Once release was completed, breeder plants and foundation seeds were maintained at the NRCS Plant

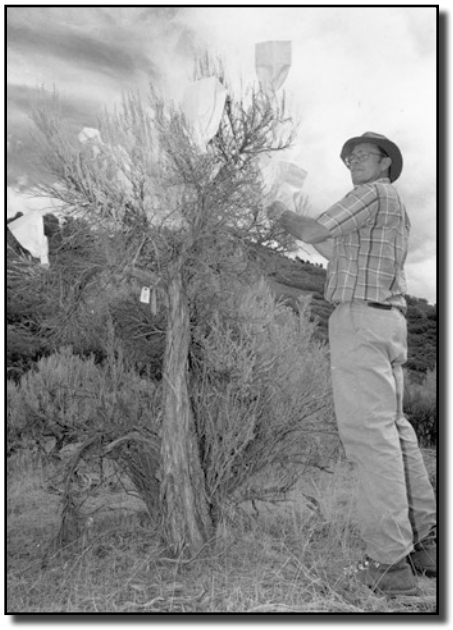
Materials Center at Aberdeen, Idaho. Seed usually was made available through NRCS Districts, university Agricultural Experiment Stations, and crop improvement associations. Thus, when 'Hobble Creek' was ready for wide use, mechanisms were available to make that possible.

In 1986, at least part of Plummer's forecast a decade earlier about the future of sagebrush came true. The Bureau of Land Management plowed some land where grass (the undesirable cheatgrass) was dominant and planted 'Hobble Creek' sagebrush as a way to replace the highly flammable grass. At about the same time, seed of improved sagebrush began to be included in seed mixtures used to revegetate rangelands.

Showing that the work of geneticists is never done, however, scientists at Provo later discovered a type of Wyoming big sagebrush, known as 'Gordon Creek,' that contained genetic material making it superior to 'Hobble Creek' at a wide range of sites with low precipitation (*Forestry Research West* May/93).

McArthur led the genetics research. Long-time colleague Shaw said in 2005 (personal communication), "His greatest contributions have been in increasing our understanding of the landscape-dominating subgenus *Tridentatae* of *Artemisia* (the sagebrushes), but he has also done extensive work with Chenopods and members of the Rosaceae family (other important western shrubs). His recent efforts include studies of hybrid zone theory and native forb genetics. Little was known about all of this before Durant came along."

The geneticist produced a three-part series of Station publications in the 1970s that reviewed and synthesized available knowledge about the characteristics and hybridization in shrubby species of the chenopod (saltbush), rose, and sunflower families. The documents immediately were in demand by scientists and managers throughout the West. Also early in his career at the Station, McArthur completed classic studies of the cytogenetics, hybridization, evolution and distribution of several other shrub species (*INTercom* 1/4/90).



Durant McArthur compiled an impressive list of achievements during a long career at the Station that continued after the Intermountain-Rocky Mountain merger.

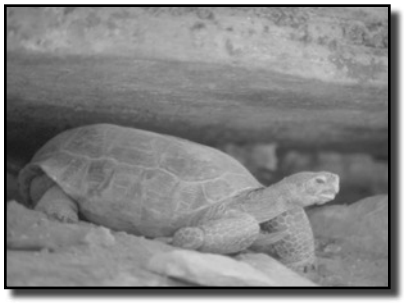
By 2005, McArthur had authored or co-authored more than 400 publications, the most known to have been produced by any Intermountain-Rocky Mountain Station researcher. His huge body of work may have made him the most productive scientist in the history of Forest Service Research (he was continuing to make contributions when this history was written).

The depth and scope of McArthur's work was as impressive as the number of documents. He published frequently in well-regarded scientific journals, assembled numerous proceedings and contributed papers to them, wrote accounts of the history and meaning of rangeland research, produced "state-of-the-art" documents, and created chapters in books (Hild and Shaw 2004). Some of his publications were abstracts co-authored with novice scientists who needed a helping hand in becoming established.

The Least Among Us

The desert tortoise isn't graceful, it isn't pretty, and it isn't particularly lovable, but it is a part of our world. In the 1990s it was in danger of leaving us.

The tortoise was threatened because of increasing human use of its limited habitat. Scientists at the Shrub Lab helped out in cooperative efforts to find what was needed to preserve the tortoise. They analyzed plants and soil at three Mojave Desert sites that are tortoise habitat to get baseline data on foods necessary to the animal's survival (*Forestry Research West* Sept/94). Project Leader Durant McArthur, Geneticist Stewart Sanderson, and Bruce Webb of Brigham Young University, described the research and presented their findings in a 1994 Station publication, *Nutritive Quality and Mineral Content of Potential Desert Tortoise Food Plants*.



The threatened desert tortoise stayed in our world with some help from Station scientists (Photo by Todd Esque, U.S. Geological Survey, Biological Resources Discipline).

Major work by Station cooperators went into reviewing all existing knowledge about the tortoise. The Station published the results in 1995 in a reference work. *Desert tortoise* (Gopherus agassizii): *Status-of-Knowledge Outline with References* was easy to use and included recommendations to land managers. This knowledge and the considerable experience at the Station in restoring depleted rangelands were combined to help guide vegetation restoration projects by the Bureau of Land Management where tortoise habitat had been destroyed or seriously altered (*INTercom* Dec./94).

The research covered every aspect of how to maintain and enhance homes for one of the creatures among us that could not continue to exist without our help.

McArthur was named Project Leader of the shrub research unit in 1983, replacing Art Tiedemann who moved to the Pacific Northwest Station. Shortly before that, Tiedemann announced formation of a Shrub Research Consortium consisting of the Station, Utah Division of Wildlife Resources, Brigham Young University, and Utah State University. Consortium activities were described as (1) improvement and development of shrub plant materials; (2) methods of seeding, planting, culture, and management of shrubs in natural settings; and (3) assisting with publishing and disseminating research results (*INTercom* 9/15/83).

Tiedemann was replaced as consortium chairman by McArthur. In 20 years under McArthur's guidance, membership expanded to include 24 Federal, State, university and private research organizations operating in all areas of the West. Research results had been summarized in 12 comprehensive symposium proceedings published by the Intermountain and Rocky Mountain Stations, one was being processed, and a 14th was planned. McArthur and other members of the shrub unit were involved in planning and compiling all of them.

McArthur received many honors for his work. They included Superior Scientist and Distinguished Scientist awards from USDA, the Rocky Mountain Station's Eminent Scientist Publication Award, an Outstanding Achievement Award from the Society for Range Management, and a Distinguished Service Award presented by members of the Shrub Research Consortium. The article describing the consortium award said he "served an inspirational role for many young scientists"…and had been one "who devoted endless hours to interagency cooperation and is always willing to consult with managers on specific shrubland management issues" (Hild and Shaw 2004).

McArthur and others who labored in the shrub biology and restoration unit shared a larger honor. They could travel widely and see that they had played a part in retaining and improving ecosystems in the West that by nature's rules were shrublands, and that of all the shrubs, sagebrush was king (Tippets 1992b).

Not often seen in each other's company, Char Houska (left) and Maureen Meisner did get together occasionally to compare notes. They capably shared a job at the Fire Lab in 1983.

Two (Happy) People, One Paycheck

Far more experiments fail than succeed in research, but the Station scored 100 percent on the success meter with workplace arrangements in the 1980s that were well ahead of their time.

In a first for the Station, Char Houska and Maureen Meisner shared a single job as secretary/typist for the fire effects research unit at the Fire Lab. One worked Monday and Tuesday of one week and Wednesday through Friday the following week, and then they switched the schedule. So each put in 40 hours during a 2-week pay period, and the office always had a secretary.

The arrangement, which was called "highly productive" and "successful beyond my expectations" by Project Leader Jim Brown, started in 1983 when Houska said she wanted to spend more time with her 19-month-old daughter, and proposed she share the job with another person. Brown said, "Why not?" A job share arrangement was a somewhat revolutionary idea, but Personnel Management found a way and Meisner was chosen from an employment roster to be the other half of the workplace duo.

Both women were enthused about job sharing and committed to making it work. Houska had more time to be with her child and Meisner was better able to pursue her passion for sports activities (*INTercom* 7/7/83).

"We're not traditional…nothing is set in stone," Ecologist Burton Pendleton said when he joined Ecologist Rosemary Pendleton as a permanent part-time scientist at the Provo Shrub Lab in 1989. The Pendletons had been working as a family team for a dozen years.

Rosemary earned her Ph.D. first because she had an opportunity to enter a cooperative education arrangement and get a good job with the Station. Her research emphasis was on the genus *Grayia* in the chenopod family of desert shrubs. Burton followed with a Ph. D. dissertation on *Atriplex*, a different genus in the same plant family. Along the way son Brian and daughter Caitlin joined the Pendleton family.

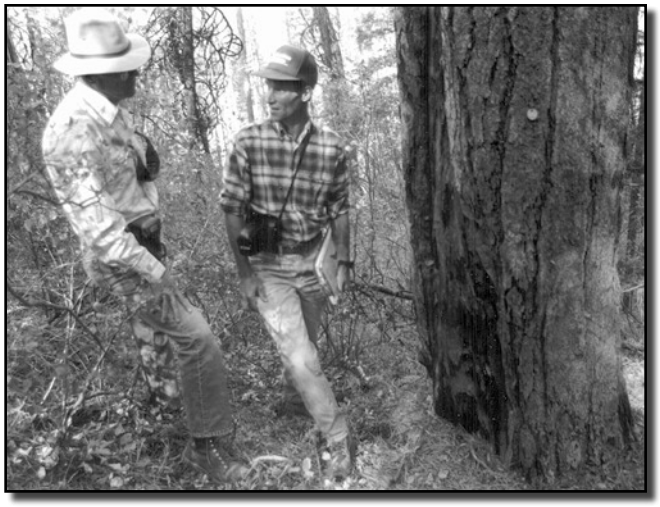
The Pendletons did not share the same job, but they shared the equivalent of a single paycheck. Rosemary worked 48 hours in an 80-hour pay period and Burton worked 32. They devoted

Rosemary Pendleton showed colleague Burton Pendleton evidence of heterodichogamy in a species of hopsage. She discovered the rare and significant reproduction phenomenon during her research at Provo.

most of their time to separate research studies, with only occasional overlap. Burton said one benefit of the arrangement was the time he could spend with the children at home, forming a close relationship few fathers who worked full-time could enjoy.

When asked if there was a problem taking the job home at night and "talking shop," both Pendletons expressed surprise at the question. "It's nice to collaborate," Burton said.

"We enjoy bouncing ideas off each other," Rosemary said, describing how fellow scientists had family members who often volunteered to work at the Provo Lab without pay, and considered it a benefit rather than a problem to be able to integrate family and professional lives (*INTercom* July/90).



Acting Project Leader Warren Clary (left) and Research Forester John Sloan discussed a lightning scar on an old-growth ponderosa pine in the Bannock Creek Research Natural Area, which is within the largest of three units in the Boise Basin Experimental Forest.

Boise Basin Research Regenerated, Briefly

The Boise Basin Experimental Forest from its establishment in 1933 until 1971 had been the scene of numerous studies that revealed the best ways to harvest and regenerate ponderosa pine. The research results formed the basis for management of the most important commercial timber species in central Idaho.

Apparently, the belief developed that little new information was likely to be generated and no new studies were started after 1971, although data continued to be taken from some study plots. In the late 1980s, with emphasis on ecosystem research growing throughout Station territory, there was a realization that more could be learned at Boise Basin. A blend of follow-up and new research was established; the work was closely coordinated with the Idaho City Ranger District.

The emphasis was on studies of how various shade densities affect planted tree seedlings on harsh sites, historical changes in tree stands, continued monitoring of 1933 transects, and creating demonstration areas related to ecosystem management and forest health. Many field tours of the demonstration areas were given to various interest groups (Sloan and Steele 1996).

Research Foresters John Sloan and Kathy Geier-Hayes designed studies and Ranger District personnel administered timber sales and other actions. It proved to be a good partnership. Sloan said several studies required thinning or harvesting so they helped the District's timber sale program. The experimental forest had good access, and administrators liked working in the area. The District silviculturist said, "We like being close to the research."

Acting Project Leader Warren Clary said, "The Forest Service went through a phase of trying to divest itself of experimental forests. But now in these days of ecosystem management and global warming concerns…we need the continuity in data" (*INTercom* Oct./94).

Smart Seeding

Applying grass seed by helicopter to help stabilize burned areas became common practice in the early 1990s. Station scientists made recommendations to make the practice more beneficial and cost-effective.

In the early 1990s, studies by scientists at the conifer ecology and regeneration unit and others at Boise dispelled some old myths and showed how to reduce the high costs of applying grass seed to large burned areas.

Catastrophic, stand-destroying fires had been common for decades in ponderosa pine-Douglas-fir forests and seeding exotic grasses to stabilize soils became common practice. The Station scientists showed that native shrubs and grasses were well-adapted to surviving wildfire and would out-perform the exotics in providing vegetative cover where seeding was needed. Thus, seeding should be limited to areas where native vegetation was sparse before the fire.

The researchers advised managers that routine aerial photographs could be used to show where seeding was needed (*Intercom* Nov./92). Because it had become a common practice in rehabilitation projects to apply the seed by helicopter, which was efficient but expensive, reductions in the amount of flying time required were big cost-savers.

The experimental forest survived, but the silvicultural research unit did not. A year after Clary's statement, Station management closed the silviculture unit at Boise. Sloan and Geier-Hayes found employment in the National Forest System. Scientific supervision of the forest was assigned to Research Forester Russ Graham at Moscow, who also was in charge of research at Priest River and Deception Creek.

Publishing Firsts

This history has reported complaints through the years that it took too much time for research results to get from scientists to users. The publication process was usually said to be the main culprit. A lot of barriers to speed are involved in scientific publishing—variable efficiency of the authors, review times that are difficult to control, editing and manuscript processing delays, and printing firms whose policies require premium pay to get priority service. The many human factors involved make setting productivity standards difficult. Nevertheless, attempts have been from time to time to define satisfactory time frames for editing and production work.

The Intermountain Station engaged in such an exercise in the mid-1980s. The publications staff defined "turnaround times" for the total time it took to process manuscripts and also "production times" for page layout, typesetting, proofing, and printing when those operations were required (Destito 1989). In 1983, average turnaround was 16 months and production time was 10 months. By 1988 the average times had been drastically reduced and staff representatives went to a national meeting of Station information people and asked if anyone had times better than 5.3 months for turnaround and 2.7 months for production. No one spoke up.

So the Station people proclaimed themselves holders of the record for publishing efficiency within Forest Service Research. No one who saw the figures or heard explanations of the definitions ever disputed that claim. Record or not, the improvement in efficiency at the Intermountain Station had been dramatic. Yet the publishing staff by 1993 had broken their own record for turnaround times nine times and bettered the production record seven times. It's possible other Stations were doing as well and merely didn't keep records, so the Intermountain Station may not really have been "first" in publishing efficiency. But it could claim several other indisputable publishing firsts.

Going Video—Video cameras were a fairly new development in the 1980s. The Forest Service was among those organizations that envisioned a variety of uses for the new audio-visual tool. Many units, especially National Forest Supervisors Offices, were soon equipped with video players, although few acquired equipment to make tapes for several more years.

Before the advent of video, Regional Offices, Stations, National Forests, and research labs had more or less (mostly less) elaborate libraries of motion picture films having to do with natural resources. Some were produced by the Forest Service. Each library usually had only one or a small number of copies of each film. They most often were loaned to employees, but the Regional Offices and some other units filled orders from the general public. Most units did little or nothing to publicize the availability of films. When video tapes became available they were added to the existing film libraries.

Research Forester Bland Richardson, who worked at the Logan Lab in the mined lands reclamation unit, showed up at Station Headquarters in 1984 with a video tape consisting of scenes he had filmed. It was a 15-minute color production titled *Before a Single Grain of Dirt is Removed*. Focusing on sites in the Bridger-Teton National Forest as examples, the narrative described five surface mining reclamation principles that applied to all sites. It also discussed differences between the "watershed protection" and "native plant" schools of thought on the best ways to reclaim mined lands.

Richardson was a good photographer, and there were no problems with the quality of his video. The question was how to get copies to mine developers and land managers. The Station information people decided the best way was to treat it just as they would a paper publication—advertise its availability as widely as possible and get a copy to anyone who ordered it. The video was listed in the normal quarterly announcement of new publications, which had a mailing list of about 7,000 people interested in a wide variety of research results. It also was announced in *INTercom*.

Bland Richardson was the first to produce a video at the Station to transfer technology. He also showed revegation research results at field demonstration sites, such as this one at the Decker Coal Mine in Montana, established in the 1970s.

The announcements offered copies on loan. Orders were handled by the publications distribution clerk. With each tape was a note advising the recipient that the item was public information and they were encouraged to duplicate it and keep and use the copy. The first dozen "loaners" went out quickly. The Station simply ordered more. People generally were good about returning the loan copies, usually within 2 weeks, and if one wasn't returned a replacement was ordered. Thus, seldom was anyone put on a waiting list, and if they were it wasn't for long.

This was the first known instance of a Station advertising an audio-visual production as a publication. The practice continued at the Station and several video tapes served as important communication devices.

Audio-Visual Specialist Gene Colling joined the Station in about 1986, providing in-house production skills for

videos. Colling created *The Horse Creek Study,* which featured an interview with Station scientist Jack King. King's remarks were targeted to forest engineers, hydrologists, and managers involved in road planning. The recommendations were designed to foster construction practices that minimize erosion.

In 1988, the Station advertised *Stalking a Forest Killer*, also produced by Colling. It showed how research develops new knowledge to combat mountain pine beetle epidemics, pest management specialists test and transfer techniques, and managers apply control strategies. Colling relied heavily on information from entomologists Walt Cole and Gene Amman. Technology had advanced once again, and the 1988 video was made available in the old three-quarter-inch style and also in the quarter-inch format that was coming into vogue and soon became the standard.

Colling moved on and eventually joined the Region 1 information staff. But his association with the Station was renewed when he produced *Fading Gold—The Decline of Aspen in the West*, a 12-minute video showing the extent that aspen stands were being replaced in western landscapes and giving recommendations on what could be done about it. Most of the information came from Dale Bartos, Project Leader of the Restoration of Disturbed Ecosystems research unit at the Logan Lab. Bartos sponsored the production. Although several cooperators also supplied information, most of the video's content was based on research done in the Station's aspen research unit, which was discontinued in 1984.

Fading Gold won a prestigious award in 2000. It took first place in the Video/Public Affairs Section of a competition sponsored by the National Association of Government Communicators. Bartos traveled to Denver to accept the award. Videos on tape now are rapidly being replaced by compact disks (CDs and DVDs) as technology races ahead. Will future readers of this history ask, "What the heck was a CD?"

Visual Information Specialist Deborah Renteria (seated) showed features of the Station's first "desktop publishing" system to Station Director Larry Lassen (front), Deputy Director Carter Gibbs, and Ruth Hyland.

Going Electronic—In January 1987, the Intermountain Station scored another first in Forest Service Research when it issued an electronically produced publication (a so-called "desktop publication"). It was a modest effort, a two-page research note written by Jack Lyon (Lyon 1987), but it was the first formal report created by computer at a Station or in the national research office. The subject matter was appropriate because Lyon's note discussed how to use a personal computer to evaluate elk cover. That coincidence was purely accidental. The publishing "first" was not.

The Station publishing unit had been getting ready to "go electronic" for several months. Without much computer expertise of their own, but armed with advice from Wally Deschene, a computer "wizard" at Missoula, and Grant Mortensen, an avid home computer user who was Operations Group Leader at Station Headquarters, the staff had acquired a Macintosh computer that could be hooked up to the only laser printer at the headquarters. Mortensen connected the equipment and the publishing production people made a few trials of creating type and doing crude layout work, but nobody felt ready to produce even a small publication with the new processes. Those processes became commonplace; publishers and individuals used them world-wide and new technology provided capabilities undreamed of in the 1980s.

The conversion process speeded up at the Station for what should be acknowledged as a wrong reason. Vince Dong, long-time editor at the Pacific Southwest Station (PSW) in Berkeley visited Ogden to compare notes about publishing systems with the Intermountain Station people. In the midst of the discussions, Dong casually mentioned that PSW was gearing up to issue an electronically generated publication, and it probably would be the first in the Forest Service research community. After he left, the Intermountain Station people decided that if someone was going to be first it might as well be them. The Lyon note appeared several months before the PSW publication.

Dale Bartos (foreground) used video as only one tool to transfer knowledge about aspen ecosystem management. Here he was participating in a field training session on the Montpelier Ranger District of the Caribou National Forest.

There apparently were no hard feelings at PSW. Dong remained a valued colleague and friend for many years. And a short time after the publishing "first," a computer specialist at PSW told the Intermountain Station people how to solve a vexing problem in translating material generated by the computer system most widely used in the Forest Service to the Station's publishing equipment. That was a breakthrough, and acquisition of a better laser printer was another because some quality had been sacrificed in Station publications when the change to computer production first was made. The change to creating type by computer instead of contracting with commercial typesetters as had been standard practice saved the Station about $30,000 annually (Destito 1989).

Being first can carry penalties. For some 2 years after they got into electronic publishing the Station people had to devote considerable time to briefing visitors about the process and giving presentations at meetings in various places. So much time was devoted to teaching that the regular publishing work suffered. This was temporary and worthwhile "for the good of the Service," however, and perhaps it was only a fitting penance for the somewhat unprofessional "one-upmanship" that took place in 1987.

Going Online—The Station scored a first for the Forest Service in 1994 when it made a publication available to readers online. *Mann Gulch Fire: A Race That Couldn't Be Won* (Rothermel 1993) was the first formal Forest Service publication that an Internet user could read on his or her computer screen. Editor Bert Lindler handled the technical work and made arrangements to make the document available through the Forest Service's national home page. Stations and Regions did not yet have their own home pages. The announcement also told those who wanted a "hard copy" of the publication how to get one.

Group Leader Louise Kingsbury said there was some opposition within the Station when Lindler proposed creating the on-line document. The criticism was that time shouldn't be wasted on new technology that probably was "just a passing fancy." She told Lindler to go ahead. By the end of 2005, the Rocky Mountain Research Station had more than 500 publications available online through its home page, including some produced by the Intermountain and Rocky Mountain Stations before their 1997 merger. The Station also joined others in making some reports available as CDs only, or as CD versions of printed copies that also were available.

The on-line documents, videos, and CDs were frowned on by some in research, according to Kingsbury, because paper publication was the "tradition." She and her supervisor, Assistant Station Director Dean Knighton, proposed to the Station Director and the other ADs that these "nontraditional" forms should be considered publications and should even be given equal weight with paper documents by promotion panels and in annual Station attainment reports. Top management was amenable, and by about 1995 the unconventional "publications" were recognized for those purposes.

The nontraditional formats became so well accepted that some publications appeared solely on the Internet or as CDs, yet were assigned publication series numbers. Kingsbury observed that because of budget cuts dating from the mid-1990s those were the only ways some research units could afford to publish some reports. "I see the 1980s 'forefathers' as having paved the way for the acceptability of alternatives in the research and user communities that ultimately have led to wider audiences throughout the world at a fraction of the cost," she said.

Exploring the Past to See the Future

Forest Service research in Nevada has a lengthy history, but it always was a small presence in a huge Great Basin land area. The focus changed from ways to increase forage production, to range management and watershed studies, to considering multiple uses of pinyon-juniper woodlands, and finally to ecosystem approaches.

The first known mention of Nevada research is a 1912 reference to studies of sagebrush-grass rangelands in the northern third of the State. This work probably consisted of administrative studies by District 4 (later Region 4) personnel. The Station apparently assumed responsibility for this research in the 1930s, but the work was later discontinued and the experimental areas were returned to National Forest administration (see "Experimental Ranges Created," chapter 7). The Station had no units in Nevada during World War II and for a dozen years thereafter.

When Station research returned to Nevada in 1957, the emphasis was on watershed studies as well as range management work. Harold Haupt led the watershed work. In 1959 and 1960 the unit concentrated on studying effects of rain-on-snow floods along the east side of the Sierra Nevada. Small runoff plots were installed at Dog Valley, California. Haupt, with help from Ralph Holmgren, used a modification of the infiltrometer developed earlier by Paul Packer for research in the Boise Basin to simulate rainfall during winter. The studies showed how runoff changed rapidly from clear to muddy water when the cushioning effect of snow was gone, and how good vegetative cover reduced soil loss (Haupt, personal communication).

When Haupt left Reno, the two emphasis areas were handled by one unit. A single unit at Reno was the norm until the 1990s, and during much of that time it was headed by Project Leader Dick Meeuwig. Meeuwig retired in 1983 after 34 years of Federal service, but continued his career with the University of Nevada-Reno.

Although the staff at Reno was small through the years, the research problems were many and complex. The work came to be focused on the pinyon-juniper type, because it was poorly understood, inadequately defined, and often misused. Pinyon and juniper grew on more than 11 million of the 17 million acres of the Great Basin. Studies in cooperation with the University of Nevada sought a useful classification of pinyon-juniper lands, which did not lend themselves to habitat type classifications. There was no method to measure the biomass of pinyon and juniper. Working with the Station's

Forest Survey unit, the Reno scientists helped develop one (see "A Lot More to Survey," this chapter).

The Reno unit worked with many cooperators on a wide range of problems. University of Nevada-Reno scientists were major collaborators, but studies also were conducted with researchers at Utah State, Oregon State, Brigham Young, Colorado State, and New Mexico universities, the Rocky Mountain Station, the Agricultural Research Service, and land management agencies (Miracle 1985). Meeuwig and associates, including Range Scientist Bob Ferguson, started much of the cooperative work. It was expanded when Rich Everett took over as Project Leader in 1983.

In 1986, existing scientific and management information and viewpoints were brought together at a West-wide pinyon-juniper conference in Reno sponsored by the University of Nevada, the Intermountain and Rocky Mountain Stations, and the Bureau of Land Management. Everett was the steering committee chairman and compiled a proceedings published by the Station early the next year. The document included comprehensive information on paleobotany, inventory and classification, synecology, silviculture, fire responses, economics, plant-water relations, woodland conversion, range management, wildlife habitat, hydrology, and nutrient cycling (*Forestry Research West* Dec./87)

The conference proceedings and other sources served as a basis for a state-of-the-art Station publication in 1988 that presented principles to help resource agency personnel more fully understand and better manage the pinyon-juniper woodlands. The author, Ray Evans, was a long-time cooperator who had just retired from the Agricultural Research Service after a 32-year career as an ecologist and range scientist. *Management of Pinyon-Juniper Woodlands* was used as source material for several workshops held to provide managers and specialists with an intensive update on the art and science of land management in the extensive woodland type (*Forestry Research West* Nov./88).

Everett moved to the Pacific Northwest Station in 1989, and Robin

Project Leader Robin Tausch processed DNA from juniper fossils to gain new knowledge about how plant communities adapted to 30,000 years of climate change in the Great Basin.

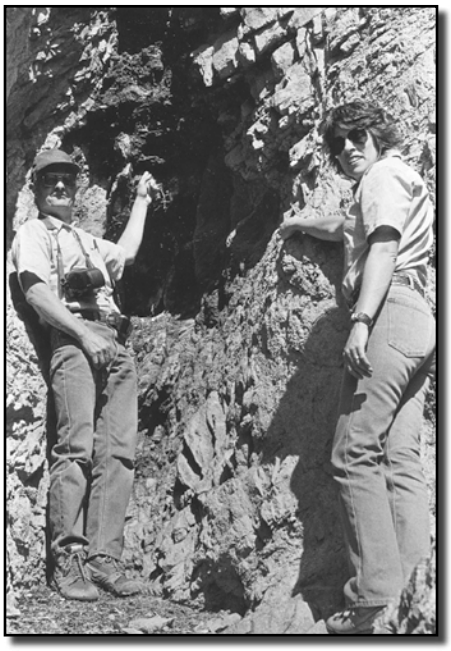
Tausch was appointed Project Leader. Tausch, a paleobotanist, brought a new emphasis to the unit. He had been a cooperator with the Station researchers as an assistant professor of range ecology at the University of Nevada-Reno, so paleobotany was not a new subject area for the unit, but it assumed more prominence in the program. Fascinating research that unlocked secrets of climate and vegetation changes going back 30,000 years in time became a centerpiece of the work at Reno.

Tausch and Biologist Cheryl Nowack devoted major amounts of time to analyzing fossilized material in woodrat middens (materials preserved by wastes at nest sites). The middens preserved a record of ecological history because the woodrats, also known as packrats, collected all sorts of items including bits of vegetation that could be dated and analyzed by advanced laboratory techniques (Tippets 1993a).

What seemed to be such fundamental and pure science had potentially revolutionary implications for resource management. The records assembled by the scientists at Reno showed that plant communities in the Great Basin were constantly changing to adapt to changing climate, and never stabilized at what was thought of as a climax stage of succession. The continual change idea challenged a concept that had been central to range ecology for nearly a century.

Tausch said, "We need to be managing for a successional process on a landscape basis that will sustain the ecosystem." He explained that resource managers needed to continue to monitor ecosystems locally, but their data should be interpreted over both time and space on a regional basis. Scientists needed to help managers by learning how to fit climate change into the equation (Tippets 1993a).

The research showed that changes in Great Basin plant species within communities reflected past changes in climate. Each species responded differently to environmental change. Some plants migrated more than 3,000 feet in elevation and 50 miles in distance, while others remained in the same location for the entire 30,000-year period studied. This history suggested to managers that the vegetation was better able to adapt to change than had been assumed (*INTercom* Nov./92). The ultimate goal of the unit was to devise meaningful



Project Leader Robin Tausch and Biologist Cheryl Nowack visited a woodrat midden that contained thousands of years of ecological history preserved in one rock chimney.

methods to restore and manage Great Basin ecosystems and watersheds that had often been abused in the past.

Research geared toward meeting the same general goal, but with a new emphasis on ecosystems principally influenced by streams, began in 1993 when the Station established the Great Basin Ecosystem Management Project at Reno with Ecologist Jeanne Chambers as Team Leader. The project took an interdisciplinary research and management approach to gathering information on the underlying processes that are the foundation of watershed and riparian ecosystems to provide approaches for their management and restoration. It was unique in including time scales dating back 8,000 years, back to 1860 settlement days, and back to 1994.

The research was conducted in cooperation with the Humboldt-Toiyabe National Forest. It included development of a demonstration area by Station researchers that showed responses to large-scale burning in pinyon-juniper ecosystems that were used to guide fuels and fire management work in Great Basin woodlands (Rocky Mountain Research Station 2005).

These and other results of the first 10 years of the ecosystem research were included in a 320-page book edited by Chambers and colleague Jerry Miller that was published in 2003. *Great Basin Riparian Ecosystems: Ecology, Management, and Restoration* won the Rocky Mountain Station's annual Best Scientific Publication Award.

Aquatic Science Moves into the Mainstream

The 1990 establishment of a new fisheries research unit at Boise was the start of increased emphasis on aquatic science, an emphasis that continued through the balance of Intermountain Station history and beyond. Previously, fish research had been part of the work of the riparian research unit.

The new unit, titled Enhancing Fish Habitats, initially was staffed by Project Leader Jack McIntyre, Fisheries Biologist Russ Thurow, and Biological Technician Rodger Nelson. The goal was to investigate the characteristics of fish habitats and define techniques for improving them. McIntyre emphasized the need to learn about ecological relationships and habitat fragmentation (*INTercom* 6/7/90).

McIntyre had 26 years of research experience in fish population biology and aquatic ecology. After completing Ph.D. requirements at Oregon State University, he went to work with the U.S. Fish and Wildlife Service. Before joining the Station, he served as leader of the Population Ecology Research Section of the National Fishery Research Center in Seattle.

Thurow had spent 13 years with the Idaho Department of Fish and Game and 2 years with the Washington Department of Fisheries, studying salmonid ecology with emphasis on salmon, native trout, and steelhead. Nelson had been with the Station for 12 years, working primarily with Bill Platts on livestock and fish habitat relationships as part of the soil and watershed research group. The unit's first studies were of habitat relationships for native trout, char, and salmon species that were showing alarming population declines and were listed as threatened or endangered.

Scientific information was sparse on the requirements of many of these species and population estimates were not very precise. One of the reasons for this lack of knowledge was the complexity and diversity of habitats that migratory salmonids used during their life cycles, making compiling data about them time-consuming and challenging (Jensen 1993). Technological advances provided new opportunities to study fish and their habitats, and personnel in the new unit used many of them and added a few innovations of their own.

The researchers used direct underwater observation (snorkeling) to count populations and tagged fish with radio transmitters that could be remotely tracked with transceivers. They also used freeze-core sampling of spawning habitats to determine their physical makeup, and used video cameras to define riparian environments and describe damaged areas.

In the "videography" work, crews made photo measurements of stream width and depth, bank stability, and vegetation at predetermined points. They produced records for streamside zones where livestock grazing or other activities were present, and also in zones where the activities were not taking place. The process resulted in stream profiles—scientific descriptions of the streams based on factors such as bank stability and width-to-depth ratios (Jensen 1993).

Technology Transfer Specialist Kerry Overton (see "Getting the Word Out—the Station's Strong Suit," this chapter) joined the unit a few months after it was formed. He saw videography as an effective tool to transfer complicated information to policy makers in an understandable form. Overton reasoned that the film records allowed natural resource managers to see what the scientists were trying to explain, helping them set policies that would have beneficial effects and be scientifically defensible.

One important innovation by the scientists at Boise was development,

Fish habitat studies using "videography" recorded the main elements of a stream environment—stream depth, width, and bank condition—at predetermined sample points in the Salmon River drainage.

Fisheries Biologist Russ Thurow used telemetry equipment to pick up signals from a radio tag implanted in a trout during a demonstration of the technique.

in collaboration with Station physical scientists and Agricultural Research Service workers, of the "Salmonid Spawning Analysis" computer model in 1992. It linked with other models created by the Corps of Engineers and the Fish and Wildlife Service to provide a more complete understanding of environmental factors in the nests (redds) where salmonids deposit their eggs.

Integrated research by fisheries and physical scientists (Jack King and Jim Clayton) confirmed that the salmonids remove fine sediment from redds when they construct their nests, but fine sediments may accumulate again while eggs are developing, reducing oxygen available to the eggs. The computer program, installed in the Forest Service's national system, helped biologists and managers estimate how much sediment is detrimental to fish survival (*Forestry Research West* Nov./92).

Although considerable work had been done earlier in efforts to standardize fishery inventory procedures, a new "Columbia River Basin Anadromous Fish Habitat Management Policy and Implementation Guide" required much more. Overton and his staff responded to the challenge with studies to develop and evaluate a standard core set of inventory procedures usable by Ranger District and National Forest biologists and sensitive enough to detect sometimes small differences in fish habitat quality caused by management activities.

Results were transferred to biologists through numerous presentations, training sessions, and personal contacts (*INTercom* Nov./92). Refined procedures were summarized in a 1997 Station publication, *R1/R4 (Northern/Intermountain Regions) Fish and Fish Habitat Standard Inventory Procedures Handbook*. Authors were Overton, fellow Station biologists Sherry Wollrab and Mike Radko, and Bruce Roberts, who coordinated inventory work for the two Regions. The research and transfer efforts were continued by the Rocky Mountain Station until 2004, when a national inventory procedures database was developed. It contained the procedures developed by the Boise researchers (Overton, personal communication).

Unit personnel also developed Desired Future Condition (DFC) values for streams. This research defined what fish habitat natural conditions would be so that biologists and managers would have a catalog of reference conditions. During the DFC research, personnel from the Station and two Regions completed surveys of more than 80 streams that had not been substantially influenced by human use (Intermountain and Rocky Mountain Stations 1995).

The DFC information was presented in a Station publication by Overton, McIntyre (in retirement as an Emeritus Scientist: see—"The Volunteers," this chapter), and three other members of the fisheries unit—Robyn Armstrong, Shari Whitwell, and Kelly Duncan. *Users Guide to Fish Habitat: Descriptions that Represent Natural Conditions in the Salmon River Basin, Idaho* was still in use 10 years after it was issued in 1995 to set baselines for good habitat conditions used in planning and making environmental assessments (Overton, personal communication).

Although the methodology and DFC handbooks were developed over several years, the research was put to use almost immediately. Training for biologists and field crews in the inventory procedures started in 1992. Every member of the fisheries unit received a special award from Region 4 in 1993 for "providing crucial technical and logistical support for the development and implementation of fish habitat inventory methodology and Desired Future Condition values for anadromous streams" (*INTercom* May/93).

Ecologist Danny Lee came to work with the unit in 1991 from Resources for the Future. He helped broaden the program to include pursuit of useful models for assessing probabilities of extinction, quantitative methods for assessing impacts of land use on important habitat, and tools to facilitate environmental decision making.

Unlike anadromous fish, bull trout spend their lifecycle in fresh water. But like many anadromous species, the trout was of concern to managers. It was considered a "sensitive" species by the Forest Service—at risk and a candidate for special protection (Chojnacky 1995). Fisheries Biologist Bruce Rieman emphasized bull trout studies when he joined the Boise unit in 1992 after 17 years of management and research experience with the Idaho Department of Fish and Game and the Oregon Department of Fish and Wildlife.

Rieman played a lead role in gathering and analyzing existing knowledge about the bull trout and worked with Thurow and several university research teams to develop new information. In 1993, he and McIntyre wrote a Station publication, *Demographic and Habitat Requirements for Conservation of the Bull Trout*, which summarized the most important knowledge about the species and analyzed it using the latest principles of conservation biology and metapopulation dynamics available at the time. The scientists outlined concepts needed to develop strategies that would minimize the risk of bull trout extinction (*Forestry Research West* Apr./94).

The researchers used radio telemetry to study bull trout habitat use, movement patterns, and mortality. They also assessed population distribution in fragmented habitats. Unit personnel made extensive use of snorkeling as a technique to nondestructively sample salmonid populations, including the bull

Fisheries researchers extracted a sample of gravels within a redd using a tri-tube "freeze coring" technique. The study helped determine the relationship of sediment to fish survival.

trout, as they developed and tested methods for monitoring at-risk species.

Thurow wrote a Station publication issued in 1994, *Underwater Methods for Study of Salmonids in the Intermountain West,* which outlined procedures for estimating salmonid abundance and habitat use and provided criteria for identifying and estimating the size of fish under water. Thurow encouraged development and use of standardized procedures to survey trout and salmon populations in the Intermountain West (Chojnacky 1995).

That year, Thurow, Biologist John Guzevich, and other Station scientists started new studies to compare the efficiencies of day snorkeling, night snorkeling, and electrofishing in making censuses of salmonid populations. The goal was to develop sampling protocols that could be applied to determine what method to use and the sampling effort required to achieve desired levels of accuracy. The unit also began to emphasize research in which the biologists worked with physical scientists in attempting to link watershed features to the location of critical fish habitats (Chojnacky 1995).

The new research thrust played a part in an ambitious inter-agency program that dominated work by the Station unit from 1994 to 1999. The Columbia Basin Ecosystem Management Project was launched by a presidential directive. Several Federal agencies teamed up to develop an ecologically sound, scientifically based strategy for managing 75 million acres of land administered by the Forest Service and Bureau of Land Management. The basin covers an area in Washington, Oregon, Idaho, western Montana, and northern Nevada that is about the size of France. Two questions were posed: (1) What are the ecological and socioeconomic trends and conditions in the basin? and (2) What land management strategy would most effectively improve the trends and conditions? The first question was assigned to a Science Integration Team. It included hundreds of scientists and specialists from Federal agencies and the larger science community (Cole and Quigley 1997).

Rieman, Lee, and Thurow were assigned to the Aquatic Science Team with lead responsibility for evaluating the status of fishes across the entire Columbia River Basin. Lee became a co-leader with Jim Sedell from the Pacific Northwest Station for the entire aquatic effort. Members of the Boise unit worked with hundreds of biologists to collect data, then summarized and analyzed it. The results were the most comprehensive assessment of fishes ever attempted for the interior Columbia River basin or anywhere in the National Forest System. The efforts contributed new insight into the processes structuring fish populations at very large scales.

The work included a novel collaboration with ecologists who specialized in wildlife research. Important areas of convergence and divergence in the conditions of terrestrial and aquatic ecosystems were shown. From this, a series of management themes were developed and used to define the implications for management across the basin.

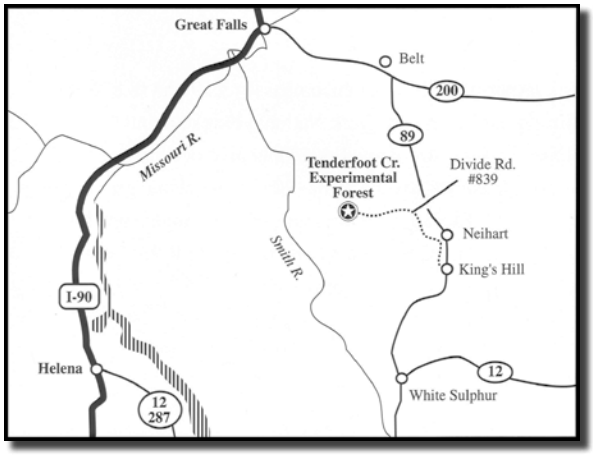
Initial analysis work was completed in 1996, and a series of publications documenting the work was issued that year and in 1997. The task turned to helping managers define alternatives and measure the consequences. The scientists provided data and analysis that created a framework for analyzing alternatives presented in Environmental Impact Statements issued in 1998-99.

The association of biologists and physical scientists (hydrologists and geomorphologists) in the consolidated Boise unit turned out to be its future. McIntyre retired in 1994. Following retirements in other units, Warren Clary served as Acting Project Leader for a combined unit that included the old riparian project, the watershed project, and the fisheries project at Boise. After Clary retired in 2000, a combination of major elements of the units was formalized and Soil Scientist Jim Clayton served as Project Leader until he retired in 2002. Rieman then was appointed Project Leader of a consolidated unit that included personnel from the old fish habitat and soil and watershed units. The emphasis on aquatic science was formalized in 2004, when the Rocky Mountain Station renamed the Boise facility the Aquatic Sciences Laboratory.

A New Experimental Forest (Finally)

Every old cowboy knows it takes time to properly break in a tenderfoot, but Tenderfoot Creek took longer than most. In 1961 it became the last experimental area in the Station territory formally dedicated to research. Then it didn't even start its training period for 30 years.

When the Tenderfoot Creek Experimental Forest, 9,125 acres within the Lewis and Clark National Forest near Great Falls, Montana, was established as a site for forest watershed research there were big plans for its use. However, in the early 1960s after building roads to potential stream monitoring sites in the experimental forest, the Station diverted watershed research



"We're trying to see what Mother Nature has given us" Schmidt said in 1993 during an ecosystem management tour. He said it would take several years to understand the existing natural ecosystem well enough to experiment with alterations. Part of the understanding was work by U.S. Geological Survey scientist Mitchell Reynolds, who mapped the geology of the area and described the drainage pattern.

Phil Farnes explained water monitoring stations for Station Research Forester Mike Cole (right) and others during a 1993 field day at Tenderfoot Creek Experimental Forest.

funding to the Idaho Batholith where erosion from unstable granitic soils was threatening valuable salmon spawning areas.

A few surveys were completed at Tenderfoot Creek, but no formal research studies were established. The situation changed in the early 1990s. In 1991 the headwaters of Tenderfoot Creek, a pristine watershed featuring even-aged lodgepole pine, proved to be an ideal location to launch new research on ecosystem processes and functions (*Forestry Research West* Oct./93).

The experimental forest included small areas of wet meadows and grassy slopes scattered throughout expansive lodgepole forests at 6,000- to 8,000-foot elevations. Tenderfoot Creek drains into the Smith River (a tributary of the Missouri River), a well-known blue-ribbon trout stream also used extensively by recreationists for floating (McCaughey 1996). The forest provided high-quality elk habitat, and easy access from Great Falls made it a popular hunting area. Tenderfoot Creek was the only experimental forest on the east slope of the northern Rockies.

The Station's subalpine silviculture unit located at Bozeman and Missoula was made responsible for research supervision in the 1980s. The small research unit had many other responsibilities, but Project Leader Wyman Schmidt and Research Forester Ward McCaughey, who was appointed manager of Tenderfoot Creek in 1988, began the process of installing hydrologic and climatic instrumentation, starting ecological studies, and gathering baseline data in the early 1990s.

Thanks to various cooperators, Tenderfoot Creek became a state-of-the-art watershed monitoring area. Phil Farnes, a retired Soil Conservation Service snow survey supervisor, joined the project through an agreement with Professor Kathy Hansen of Montana State University. Farnes spent two summers installing monitoring equipment and supervising installation of flumes, precipitation gauges, and recording stations. Two snow telemetry (SNOTEL) stations, installed by the Natural Resources Conservation Service in 2001, were designed for satellite communication, so in winter months researchers at Bozeman and Missoula could record climate data without leaving the laboratory.

Field research facilities included SNOTEL weather stations at a high-elevation site in the Onion Park Research Natural Area and at a low-elevation site at Stringer Creek, and eight sites for collecting snow and rainfall data (McCaughey 1996). Three flumes were installed in 1996, bringing the number of data collection locations to 10 permanent flumes and one channel gauge.

Baseline data gathering at Tenderfoot Creek involved work by other Station units and several cooperators. Working with McCaughey, crews assigned by Hydrologist Jack King (Boise) collected data on stream channel characteristics. Fisheries Biologist Jack McIntyre, also located at Boise, had crews collect baseline data on fish habitats.

Additional baseline data included information from vegetation classifications and surveys, soil surveys, a 400-year fire history survey, stream sediment and water quality analyses, migratory bird surveys, and a census of fish in Tenderfoot Creek conducted by the

Research Forester Ward McCaughey worked on an electronic recorder for a weather station installed in the Onion Park Research Natural Area at Tenderfoot Creek.

Montana Department of Fish, Wildlife and Parks.

When sufficient baseline data were assembled so the scientists were confident that experimental forest management practices could begin, Kings Hill Ranger District personnel became partners in testing ecological impacts of various management tactics. Special care was given to detect any ecosystem changes that would have unacceptable impacts on the Smith River (*INTercom* Oct./93).

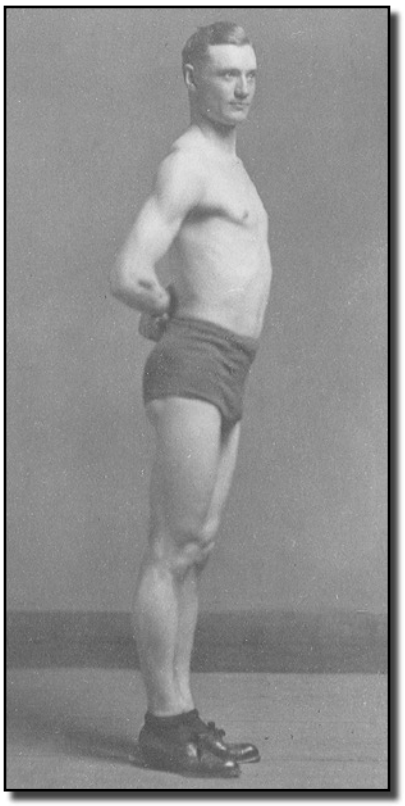
The primary management practices were thinning and prescribed burning. Studies determined effects on the reproduction of understory vegetation, growth of non-thinned trees, snow accumulation, forest fuels, water production, sedimentation, water quality, stream channel characteristics, fish habitats, and also on insect populations and behavior. Other research measured effects of prescribed fire and establishment of noxious weeds within burned and unburned areas (Rocky Mountain Research Station 2004).

Because Tenderfoot Creek was representative of vast areas of forests on the eastern slopes of the Northern Rocky Mountains, research there was expected to build the foundation for ecosystem management over a large area.

Tough Guys (and Gals) Do Research

Certainly, a few tenderfeet showed up now and then on the rolls of employees, but if anyone thought the majority of the Station's population consisted of bookish, timid souls they were thinking about some other research organization. The Intermountain Station and its predecessor organizations counted many tough guys in the ranks of researchers, administrators, and support people. And once the gals got a chance to do field work they proved to be tough enough to handle any jobs the men could do.

Early-day Athletes— Arthur Sampson, the first director of the Great Basin Station was a first-rate, and very versatile, athlete. At the University of Nebraska in the early 1900s he trained as a long-distance runner, and also earned letters in track as a sprinter. He won gold medals in the 440, 880 and mile relay track events for Nebraska in 1904, 1905, and 1906. After graduation, Sampson won gold in races at the Walla Walla (Washington) County Fair in 1908, George Washington University in 1909, and Johns Hopkins and Georgetown Universities in 1910 (Parker 1967).



Arthur Sampson stepped into the ring against local boxers as "The Utah Kid."

Sampson also boxed and wrestled, and once broke the record time for sprinting to the top of Pike's Peak in Colorado. While at Great Basin he wrestled professionally at county fairs and often entered boxing rings as "The Utah Kid." In his 10 years at Great Basin one part of his daily exercise routine was reported to be tossing a heavy medicine ball over the headquarters' flagpole. The flagpole was 70 feet high. The medicine ball, on display at the Great Basin Environmental Education Center museum, weighs 15 pounds and is 35 inches in circumference. In later years Sampson competed in horseshoes against all comers, including his students at the University of California, and was said to be able to hold his own right up to his death at age 82.

When not competing, Sampson was an avid sports fan. While on his honeymoon, he left his bride with a former student and rushed to the nearest radio in Globe, Arizona, to spend the evening listening to the broadcast of a World Championship heavyweight boxing match.

During Bob Marshall's time as a scientist at Priest River in the 1920s he was known as the "Rocky Mountain Greyhound" for his rapid and lengthy hikes through the back country of Montana and northern Idaho. He had developed a fast hiking pace as a youth in sprints to the top of Adirondack peaks in his summer home area in New York, showing an early flair for scientific study by meticulously recording his times and the distances covered (Glover 1986).

The steeper Rocky Mountains failed to slow Marshall's gait, even when he was carrying 70 pounds of equipment. His normal recreation on Sundays after a week of field work was a 40-mile hike.

Bob Marshall's idea of a vacation was to fill the days with long hikes carrying a heavy pack, like the one he was toting here in 1937 on a visit to the Boundary Waters Canoe Area in Minnesota.

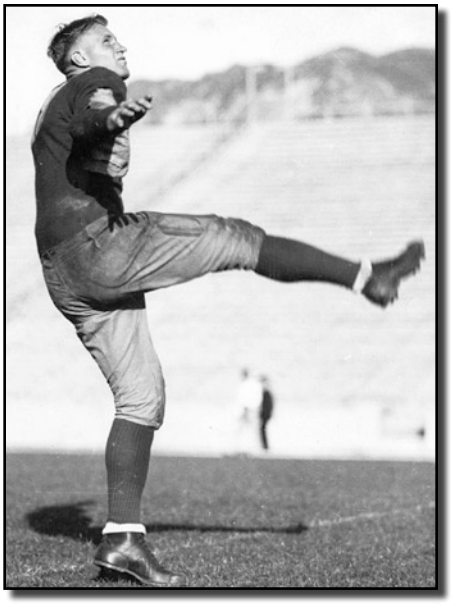
Those who have enjoyed the traditional 20-mile hike during basic training in the U.S. Army know that it took a full day and left the participants with just enough energy to pitch a tent and go to bed.

While located at Priest River, Marshall devoted as much spare time as possible to exploring remote areas, always at his customary rapid pace. Glover (1986) published a statement by a Bitterroot National Forest employee recounting how Forest Service personnel observed Marshall's expeditions. The phone was ringing frequently at the West Fork Ranger Station, but the weather was clear and calm so apparently the calls weren't related to fires or fire danger. The puzzled visitor asked the Forest Ranger what was going on, and he said, "Oh, these telephone calls are coming in from lookouts and other people in the forest who have made a wager on the time which Bob Marshall will be getting in from a 40-mile hike which he started early this morning. He is due here…some time around dark." The story doesn't say who won the bet.

Ray Price started his career as a field assistant at Great Basin in 1931, and later served many years as Director of the Rocky Mountain Station. Subordinates and colleagues probably were reluctant to start any serious arguments with Price. He was a member of the University of Utah All-Century Football Team, who was a very tough guy and looked the part.

Price warmed up for his athletic career at Utah with a year at Weber College (now Weber State University) in Ogden. There he led an undefeated football team as a blocking halfback, punter, and place kicker. He also was the center on the basketball team and threw the discus and javelin and "did a little high jumping" in track. Because baseball was not a collegiate sport at the time, Price went off-campus to play third base in the local Commercial League.

On Price's first day at the University of Utah in 1928, he encountered a husky classmate sporting a black eye. Price learned that the young man was a member of the freshman football team, and the varsity players customarily used



Before starting his research career at Great Basin, Ray Price was one of the all-time great football players at the University of Utah. He also earned letters for three years as a center on the basketball team.

the frosh as "sparing partners." Later, Coach Ike Armstrong said, "The varsity bounced the freshman about, but when Ray Price came, he bounced the varsity about!"

Price bounced a lot of people around as a halfback-fullback and kicker on Utah varsity teams that were undefeated in 1929 and again in 1930, when he was captain. Playing both offense and defense, he was all-conference both years and was an honorable mention All-American in 1930, at a time when the national honor squad was dominated by easterners. The 1930 team outscored eight opponents by a combined point total of 350 to 20.

Ed Cliff, who was to become Price's boss as Chief of the Forest Service, was an opponent in Price's last football game (see "Hail to the Chiefs," chapter 7). Cliff played guard for the Utah State team. Price's team won, 41-0. Years before that game, Jim Evenden, pioneer entomologist in the Northern Rocky Mountains, captained the Oregon State University football team in 1914.

The Toughest Guys—It's said that most smokejumpers volunteer for the job because of the adventure and excitement inherent in parachuting out of elderly aircraft into steep, rocky country often featuring dense stands of trees that are not ideal landing spots. That could be the easy part. Putting out wildfires with only the tools you carried to the site is hard physical labor, and being faced with a long mountain hike to get back for another jumping assignment probably detracts a bit from the thrill of the experience.

Nevertheless, there usually are long waiting lists to sign up for smokejumping and many jumpers come back year after year. As a group, the smokejumpers form a subculture within the Forest Service. They keep track of each other through their own national organization, show up in large numbers for reunions, and, much like the U.S. Marines, exhibit a special pride in having shared a rigorous experience. Joining a research organization might not seem to be a typical smokejumper goal, but a half dozen of them worked at the Intermountain Station.

Bob Mutch, who served as research applications leader at the Fire Lab from 1991 until he retired on 1994, was in the first rookie class of smokejumpers to train at Missoula's Aerial Fire Depot

Bob Mutch celebrated his smokejumper background when he returned to the Station in 1991 by posing with a Ford Trimotor, the same kind of airplane from which he made his first jump in 1954.

in 1954. His squad leader was Martin Onishuk, who later became a technical publications editor at the Station.

At Onishuk's retirement party, Mutch told a humorous story about how the editor "saved my life" by preventing an ill-advised leap from the plane during a smokejumper flight. Despite Mutch's light approach to telling the tale, it was a true story.

For obvious safety reasons, standard policy was to dispatch no less than two jumpers to a fire. In the fall of 1953 many small fires erupted in Montana. Most were started by campfires abandoned by hunters. There was a shortage of jumpers because many had returned to school. Smokejumper Frank Fowler wrote an account of his surprise at being assigned to jump alone on a backcountry fire (Fowler 1995). He noted that Martin Onishuk made a solo jump the same day.

After Mutch retired in 1994, his slot at the Fire Lab was filled by Wayne Cook, who may hold the record for longevity as a smokejumper among those who worked at the Station. Technology Transfer Specialist Cook was a jumper for 19 seasons, from 1977 through 1995. When asked why he stuck with the arduous job so long, Cook laughed and said, "Guess I'm just a slow learner."

Bill Carver, business manager for Station operations in Missoula for many years, also had several seasons of experience as a smokejumper. Former Station Director Roger Bay said Carver once told him that the 1949 fire season included a close call. Carver was on the jump list and ready to board the plane headed for the Mann Gulch Fire when he was pulled out to help pack parachutes (Bay interview). Twelve of the 15 jumpers who made the flight died in the flames at Mann Gulch or of burns shortly after the fire.

Bay, who was Station Director for 9 years starting in 1974, was himself among the elite firefighters. He spent the summer of 1952 while a student at the University of Idaho as a smokejumper based in Missoula.

Ross Parry, a computer specialist at Station Headquarters in Ogden in the early 1980s, spent six summers as a smokejumper. He started at Missoula in 1958 while a student at Utah State

Roger Bay became a smokejumper in 1952 and Intermountain Station Director in 1974.

University. Parry became a high school teacher, but left teaching in 1961 and on a visit to Missoula said he would be getting a year-round job and would have to give up smokejumping because he no longer would have summers free. To his surprise, he was offered a year-round job as a squad leader. He then served as a smokejumper foreman in 1962 and 1963.

Parry had about "30 seconds of fame" while a jumper. He made a cameo appearance in a film, "A Fire Called Jeremiah," which was shown several times on "The Wonderful World of Disney," a popular television program in the 1960s. "It took them about half a day to get me on for about 30 seconds," Parry said of his experience as a television star.

The Tough Gals—There were plenty of strong women in the early days of Station history, but they were relegated to supporting roles. Many lived with their researcher husbands in forest settings such as Priest River and Great Basin. They raised families, a physically demanding job in itself in those days,

The wife of an early Station researcher sighted in a rifle at Great Basin in 1915, probably in preparation for a hunting trip.

and also were known to take on such tasks as tending livestock and serving as the second person on a survey chain.

Women were not late in entering traditionally male natural resource occupations because of a lack of interest. Many were involved in the conservation movements during the early 1900s that led to the formation of the Forest Service, but they primarily stuck to traditional social activities. The lack of voting rights limited women and frustrated them greatly in political matters (*INTercom* Mar./93). All of that changed in American society, and it changed at the Intermountain Station.

As a group, Forest Survey (later Forest Inventory and Analysis [FIA]) field crews were the Station's "tough guys." Survey crew members shared the joys, and the aches and pains, of climbing mountains in Idaho, wading through spruce bogs in Montana, and hiking in the shimmering heat of Arizona deserts—and avoiding rattlesnakes, scorpions, and bears along the way. Some plots were so remote it took a full day to get to them.

At the end of what was often a long day, crews returned to camp for a meal, limited recreation opportunities such as

tossing Frisbees, and a night in a 25-foot travel trailer shared by two people. Every few weeks the crews moved the camp to a different location (Reynolds 1992). No doubt influenced by traditional Forest Service culture and perhaps believing that women would not tolerate the working and living conditions, the Station's Forest Survey unit did not assign a woman to a field crew for the first 40 years of its existence. When it finally did, the assignment was treated as a joke.

Shirley Waters, a computer programmer at Survey headquarters, became the first female crew member in the early 1970s. She said she had been "jokingly accusing" her supervisors of discrimination because no women were in field jobs. A crew member working in South Dakota left for another job shortly before the end of the field season, so Survey sent Waters to fill in for 2 weeks because the supervisor didn't want to hire a new person that late in the year. Waters was given a hard hat covered with flower stickers and told that Survey management expected to hear "no more talk about discrimination."

"It was all in fun, and I really enjoyed the experience and learned a lot," the substitute crew member said (Waters, personal communication).

It wasn't long before women no longer had to chide Survey management about discrimination; they became part of management. Renee O'Brien, in 1978, was the first woman to get a regular Survey crew assignment. After her start as a crew member, O'Brien continued her education to earn a master's degree, and advanced to become lead ecologist with FIA.

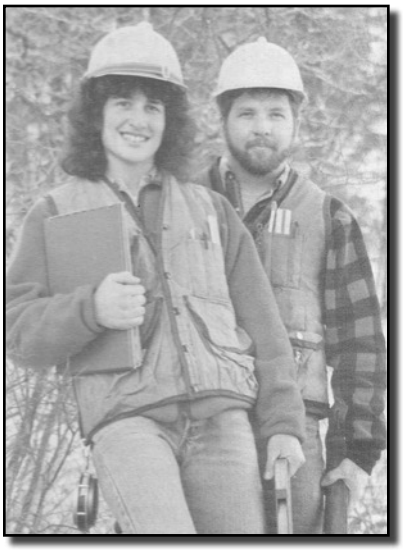
Renee O'Brien became the first woman to be a full-time Forest Survey crew member in 1978, more than 40 years after Survey began operations.

Other women soon joined field crews and several advanced into important research positions. Gretchen Moisen started working in the field, later earned a Ph.D., and became head of the FIA Techniques Research and Development Team. Moisen gained a reputation as an expert in geospatial science and gave many presentations worldwide. Tracey Frescino worked on the team led by Moisen after starting with field work while earning a master's degree. A forester, Frescino made significant contributions to the Forest Service's national fire management program.

The pioneering female crew members started a trend that continued through the remainder of Station history. In a 1982 photograph 25 percent of the crew members were women. By 1997 when FIA became a Rocky Mountain Research Station unit through the Intermountain-Rocky Mountain Station merger, about 35 percent of field workers were women. In 2004 the gender ratio was 50-50.

It was a 50-50 deal for Michael and Andrea Wilson when they both started careers with Forest Survey in 1985 as crew members. The Wilsons had just graduated from Northern Arizona University with degrees in forestry when they landed a job working on the Arizona statewide inventory. They were newlyweds, and spent their honeymoon in the luxurious confines of a Forest Survey trailer. Both started as GS-4 temporary employees.

The Wilsons worked on surveys in Arizona, Montana, Idaho, and Utah. Michael was promoted to a Supervisory Forester position in charge of scheduling and coordinating the work of all crews. Andrea advanced to a quality-control job with responsibilities for training crew members, ensuring information accuracy, and writing and editing field manuals (Reynolds 1992). In 2001 Andrea was one of the top analysts in FIA, but left the Station because of nepotism rules when Michael advanced to the top job—Program Manager. He later was named an Assistant Director at the Rocky Mountain Station.



Andrea and Michael Wilson spent their honeymoon in a Forest Survey trailer in 1985; they joined an inventory crew in Arizona 3 days after they were married.

And Many Others—Many Station people had physical jobs, from climbing lofty trees to collect samples to snorkeling in mountain streams to survey aquatic conditions. Others whose work was done in an office or laboratory setting had backgrounds as athletes or engaged in demanding sports in their free time. Some examples are given here.

Entomologist Dave Fellin ran 40 to 50 miles every week in his spare time just to stay in shape. He was a frequent competitor in races in the Missoula area and finished first in various age classes over many years. Nineteen years after Fellin retired he continued to work out at the fitness center at the University Of Montana nearly every day.

Range Scientist Walt Mueggler's entire family (his wife and six children) were athletic and competitive. Daughter Laura was the top U.S. finisher in the 15K cross-country ski race in the Winter Olympic Games held in Lillehammer, Norway. She got her early training skiing through canyons with Walt. As

part of a family tradition, the Olympian issued a challenge to Walt to climb the Grand Teton, tallest peak in the range. Walt met the challenge, taking the technical route to the top, at the tender age of 65 (*INTercom* Jan./Feb./1994).

Research Forester Clint Carlson (Missoula) ran the Boston Marathon in 1986 in 3 hours and 5 minutes, good enough to earn an invitation to compete again the following year.

Plant Geneticist Durant McArthur was said to be such a fierce competitor that a few employees declined to play in informal basketball games held after hours at Project Leader meetings in the early 1980s. They were concerned about injury if forced to battle McArthur for a rebound. At the age of 64, McArthur was still playing basketball in a church league in Provo.

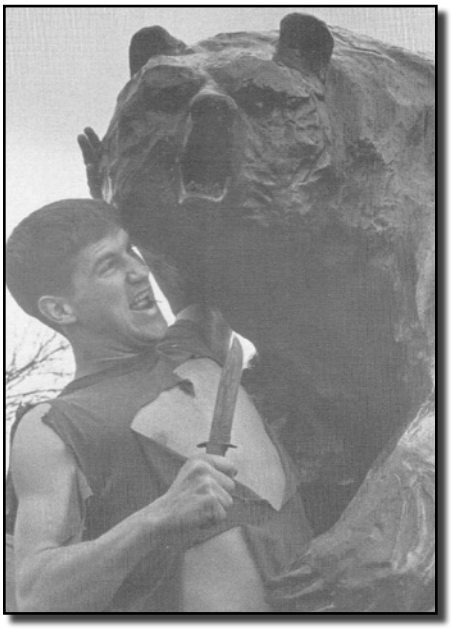
Range Scientist Roy Harniss was one of several Station people who pursued mountain climbing for recreation. Harniss climbed most of the major peaks in Washington State, including several trips up Mount Rainier. Over many years, he climbed in the Teton and Wind River Mountains of Wyoming, and in Idaho, Oregon, Utah, and Canada. In 1960 Harniss scaled Mount McKinley, the highest peak in North America, in a party of eight. The climb took 14 days. Another eight days were needed to get off the mountain because of storms. At the time, less than 300 climbers had reached the summit of McKinley.

Harniss served as a National Ski Patrol volunteer for 35 years at Taylor Mountain in Idaho, Beaver Mountain in Utah, and Hurricane Ridge in Washington. In 1990, he joined the Clallam County fire department in Sequim, Washington, as a volunteer firefighter/emergency medical technician. Harniss also served as a volunteer for the American Red Cross during national and local disasters. The duties took him to Florida in the aftermath of hurricanes, to Iowa following tornados, and to Louisiana and Washington to help deal with problems in flooded areas.

After climbing for 13 days, Assistant Station Director for Research-North Ralph Klawitter also reached the summit of Mount McKinley. He made the ascent on July 13, 1979. By that time, some 500 men and women were trying to conquer the mountain each year. About half made it to the top.

Entomologist Walt Cole was a member of a mountain climbers search and rescue unit while studying for an advanced degree in Colorado. He scaled many of Colorado's 53 peaks that have more that 14,000 feet of elevation.

Dave Stalling served the Station as a public affairs specialist in Ogden, but he also served as a sergeant in the U.S. Marine Corps. He was a reservist during his time working at Station Headquarters, but he had seen plenty of rugged action earlier. While on active duty with the Marines, Stalling took part in special missions in remote parts of the world as a member of a Force Recon unit, including serving during the first Gulf War. Before becoming a photojournalist, he had been a dishwasher, ditch-digger, tree surgeon, and lifeguard (*INTercom* Oct./92)



Public Affairs Specialist Dave Stalling didn't actually attack bears with knives, but he performed some pretty tough duties with the U.S. Marines. This photo was part of a class project for Stalling at the University of Montana School of Journalism.

Sometimes Station people were forced to "tough it out" by unusual circumstances. In the 1990s, retired entomologist Mal Furniss was working as a contractor studying willow insects throughout a vast area of Alaska. He awoke one morning while camped beside the Niukluk River to discover a grizzly 200 feet away looking at him and poised to come across the river and see what suited his taste.

Furniss decided his best course of action was to pretend the bear was a spooky horse that he needed to settle down with a low, steady, constant voice. He said, "It went on quite a while and I don't remember much of the conversation except that I told him he was a good boy and should just stay there. He apparently didn't know what to make of it and I gradually got my stuff aboard my raft, never stopping talking in reassuring tones, and paddled away downstream like you know what" (personal communication).

It was pretty common for field-going Station people to battle the elements in their work, but Research Forester Russ Graham did something uncommon. He lived with a crippling disease, multiple sclerosis, throughout most of his career. Despite gradually diminishing physical abilities, he blossomed as a forestry scientist. In this battle, Graham was the clear winner over MS.

Graham started with the Forest Service fighting fires and working on vegetation survey crews. He became a researcher in 1975 at age 26. The next year he experienced the first MS symptoms, slight pain in his eyes and blurred vision. Two years later the symptoms came back with more severity. His doctor thought MS was probably the cause, but counseled that a full, active life might be possible. It was for 10 years. Graham completed a Ph.D. program, made business trips throughout the U.S. and Canada, learned to fly, skied for recreation, and jogged daily with friends and coworkers.

He noticed in 1988 that one leg was tiring faster than the rest of his body during his usual 4- to 5-mile daily runs. This time, MS was the official diagnosis.

Still going strong a quarter century after he experienced the first symptoms of multiple sclerosis, Research Forester Russ Graham, with Rocky Mountain Station Director Marcia Patton-Mallory, briefed Congressman Mark Udall (right) and Pike-San Isabel National Forest Fire Management Officer Ted Moore at the Manitou Experimental Forest on results of the Hayman Fire Study. Graham led a team of 60 scientists and resource managers from throughout the U.S. that examined how the largest wildfire in Colorado history behaved and what its effects were on the natural and social environments.

His jogging activity slowed, and finally stopped. He often tripped and experienced loss of balance. He spent most of the 1990s learning to adapt to MS, although his career with the Station was in full swing throughout the decade.

As Graham's strength and balance diminished, he acquired a variety of canes. One was a collapsible model that fit in a suitcase for traveling. He fashioned another out of sections of plastic pipe. Its threaded sections could be changed so he could walk on forest slopes and sidehills. By the mid 1990s, he needed a cane for all activities, and had dress canes, party canes, work canes, and novelty canes. He also had to give up driving vehicles with manual transmissions, but found sports cars with automatic transmissions just as much fun.

Adjustments were more than physical. "I was no longer able to do the male thing," Graham said. "That is lift that box, cut firewood, or even mow the lawn. I needed to ask people to lift my suitcase from the turnstile at the airport and open the door for me…. Instead of being a leader and teacher in the woods I had to stay on the road and watch."

Graham had to depend on a co-worker to be his eyes and hands in much of his work. He found this discouraging in many ways, but it also made his working relationships with others much stronger. He became a better communicator and more creative in finding ways to participate in field activities. By 1998 he was using an all-terrain vehicle and arm crutches to get around in the forest. Two years later he even went hunting with a friend in Canada's Northwest Territories.

After a problem getting through Denver International Airport alone in 2000, Graham began to use a wheel chair or a motorized scooter, and he found his independence was restored. He could no longer do some things, but his working life became even busier. With a four-wheeler, he could get into forests for tours, especially at Priest River where he served as scientist-in-charge. He chaired numerous committees and spent more time producing research documents. Graham's goal was to produce more than 200 publications by the time he retired.

"Life can take you through rough times," he said, "but adapting and having a positive attitude can make it all worthwhile" (Graham, unpublished paper).

A New Role for Great Basin

The Great Basin Experiment Station headquarters site was reborn in 1993, with a new name and a new environmental education mission for the future directly linked to its conservation purpose of the past.

Station and National Forest System officials, educators, cooperators, and Utah Senator Orrin Hatch combined forces at an August dedication ceremony to christen the new operation high in the mountains east of Ephraim as the Great Basin Environmental Education Center. The 10 old buildings, some dating back to the origins of the Intermountain Station in 1912, would once again hear the echoes of youthful voices.

Years earlier, generations of scientists and their families lived at Great Basin, forming the foundation of what became the science of range management. All told, nearly 50 scientists worked at the location, compiling data and comparing their research results with those of the researchers who preceded them. Some 200 publications emerged. Resource managers and researchers from around the world came to study, changing the way people everywhere viewed rangelands. Globally focused scientists found that 80 years of data assembled at Great Basin provided a rare source of material for assessing effects of global warming (Kingsbury 1997).

Snow College manages GBEEC. That arrangement had its beginnings in 1989 with an agreement between

The voices of youth once again were heard at Great Basin.

Veteran Station and Region 4 personnel and friends turned out at the GBEEC dedication to help Snow College and the Forest Service decide what history should be captured in the museum. Outside the museum building were (top, left to right) Larry Lassen, Interpretive Specialist Phil Johnson, Public Information Specialist Dick Pine, Mont Lewis, (bottom, left to right) Blanche (Mrs. Perry) Plummer, Albert Antrei, Jim Blaisdell, and Hap Johnson.

the college and the Forest Service to convert the Great Basin buildings into an education facility. A formal, greatly expanded, partnership went into effect 3 years later. It included the college, the Utah Division of State History, Ephraim City, Sanpete County, the Intermountain Station, and the Manti-LaSal National Forest. There also were informal partners, including the Society for Range Management and the Utah Division of Wildlife Resources, whose researchers at Ephraim had long worked closely with scientists at Great Basin. The old buildings needed plenty of rehabilitation, and work on them went ahead in tandem with development of the education program.

Great Basin always was a popular place to visit, and nothing had changed. The first small group of students moved in and completed course work for college credit before the dedication took place, and even before the new paint had dried on the old headquarters. Well before the site was ready for heavy concentrations of visitors, Snow College was turning down requests from a variety of conservation organizations wanting to hold meetings there.

The Station and Snow College worked together to create a museum in the old office and laboratory building. The museum featured a restoration of what the office probably looked like during the 1920s, when the occupant was Arthur W. Sampson, first Great Basin Director.

The museum provided a look at the lives of researchers of the past, a slice of Forest Service history seen in no other location in the United States (Kingsbury 1997). Sampson's desk is on display. In one corner are skis that a technician used in the 1930s to reach a nearby creek to measure snow. There also is a special vegetation mapping instrument called a pantograph. The museum proved to be a favorite place for visitors, especially groups of school-age children. Outside was another favorite place, a trail leading to a weather station, a series of active beaver ponds, and a tennis court used by Civilian Conservation Corps men for recreation while they lived in tents and constructed the newer Great Basin buildings in the 1930s.

Visiting groups could arrange to get a first-hand view of life at Great Basin in the 1930s and see some legendary range scientists as young men with their families. Ray Price started working at Great Basin in 1931 as a field assistant. He rapidly rose up the scientific ranks and became Director of the Great Basin Station by 1935. Price made home movies. His son, Dr. Richard R. Price of Salt Lake City, edited the old black and white 8 mm films and created a video tape, which he donated to the GBEEC. Dr. Price, who lived at Great Basin as an infant and was a range aid there in 1953, maintained the family connection in other ways. He provided GBEEC with a number of artifacts, photos, books, and papers from his father, and also made financial contributions to the center (personal communication).

The video is a delight for anyone interested in Great Basin history. It shows CCC men in Bavarian costumes dancing with young ladies (probably from Ephraim) on the tennis court. The cook is seen vigorously ringing the dinner bell that still calls guests to meals. Scientists and their families, dressed in their "Sunday best" are shown at a social gathering, and a few scenes show the families using the site as a base camp for hunting expeditions in the late fall, probably after they had moved their households to Ogden for the winter. The gallery of scientists shown in the 1937 film is impressive. Perry Plummer (see "Mr. Plummer's Opus," chapter 10) lived in the old "Director's House" at the time. Several of his children are said to have become expert tennis players through hours of practice on the Great Basin court (Tippets, interview 2004). Station Director Reed Bailey appears in several scenes. Noted Forest Ecologist George Stewart was present with his family. Ray Price and his family lived in the "West House."

Price's scientific achievements provide an example of the importance

Biologist Richard Stevens, Utah Division of Wildlife Resources scientist, tried out Arthur Sampson's desk and phone in the new museum at the Great Basin Environmental Education Center. Stevens participated for many years in cooperative research with Station scientists.

of the early work at Great Basin. With Stewart and R. H. Walker, he authored a national Department of Agriculture Bulletin on procedures for reseeding intermountain range lands. It appeared in 1939. Sampson had started pioneering studies in attempts to correlate plant growth with season, climate, and other variables. With fellow ecologist Edward McCarty, head of the Botany Department at Riverside (California) Junior College and a summer employee of the Station, Price continued the research and they published results documenting carbohydrate and growth characteristics of range plants in 1942. Part of this work was done in the laboratory at Great Basin.

David Costello and Price in 1939 published results of long-term studies that provided an answer to one of the persistent questions of the time: When is range ready for early season grazing? They confirmed several of Sampson's earlier conclusions, but added a significant discovery on the importance of the date of snowmelt to range readiness for early grazing (Keck 1972). The scientists found that given a 10-year average date for snow disappearance and the current year's deviation from that date, one can predict with surprising accuracy the dates when plant growth and important development will start. This and other indicators of range readiness developed at Great Basin were subject to error, but they were great improvements over rule-of-thumb estimates used previously. Before the importance of range readiness to maintaining range health was established, livestock followed the receding snowbanks to the top of the Wasatch Plateau, seriously damaging the vegetation.

Price went on to enjoy success as a research administrator. He moved from Great Basin to the Washington Office, where he was a Senior Forest Ecologist in the Division of Range Research. He then was appointed Director of the Southwestern Station in 1942, and became Director of a greatly enlarged Rocky Mountain Station in 1953 when it and the Southwestern Station were combined. Price held that position until he retired in 1971. As a volunteer in retirement he wrote a history of those two Stations, spanning the time from 1908 until 1975 (Price 1976).

At Great Basin, the historic buildings occupied by Price and his colleagues came to the end of their service as Station facilities in 1989. In announcing the closure of the facilities, Deputy Station Director Duane Lloyd said, "In the early days researchers needed to live at the Great Basin Station during summers to gather data. Since then, research programs have changed, and much of our work is conducted in other parts of the Station territory. Also, scientists today have better transportation, so the buildings are not needed for present or anticipated research (*INTercom* 6/22/89).

Regarding the structures, Lloyd said, "Unfortunately, these are old buildings that do not meet health and safety standards. It would take a lot of money (the estimate was $750,000) to make the facilities suitable for occupancy, and current budgets are better used for conducting active research." Lloyd voiced hopes that a partnership could be formed with an organization able to restore, preserve, and manage the facilities. That came about perhaps sooner than Lloyd envisioned as Snow College became the lead organization. Renovating the buildings was not an easy task, but the college was able to use its own crews for considerable work and was in a better position than the Forest Service to arrange for low-cost work by city and county departments.

"The biggest headaches came in trying to meet Forest Service engineering specifications, Federal preservation guidelines, and a tight construction schedule," said Steve Peterson, a Snow College professor who was the first director of the new GBEEC (Kingsbury 1997).

Among the challenges were finding the right paint color for roof shingles, replacing worn-out fixtures, rewiring, insulating, installing new plumbing, and stabilizing the buildings' main structural elements. Renovation was one thing; incorporating some fundamental changes to meet the needs of the site's new education purpose was another.

Three main buildings—the Lodge, the Palmer House (named after a plush Chicago hotel by summer employees who stayed there years earlier), and the South House—needed quick attention so teachers and students could begin their environmental studies as soon as possible. The South House, a small Cape Cod building, became a dining hall for large groups with a kitchen, an upstairs dormitory, and handicap-accessible bathrooms. Renovation went smoothly until Snow College officials proposed attaching a large redwood deck to the back, about the same size of the South House itself. Historians urged a smaller, more compatible deck or detached patio. The deck finally went up, with the historically minded saying, "Well, at least it can't be seen when you're standing in front of the building."

The End House, built by the Civilian Conservation Corps in 1933, was restored to its original appearance for use in Great Basin Environmental Education Center activities.

Converting the Palmer House from a three-car garage into usable lecture space posed the problem of how to maintain the exterior door and appearance of a garage while securing the inside of the building against the weather. This and other problems eventually were solved. As the improved facilities became available, Snow College was able to grant requests for their use. Up to 1997, gatherings were held at GBEEC by the Utah Division of Wildlife Resources, a six-county economic development group, the State Board of Education, Forest Supervisors of the National Forests in Utah, the Salt Lake Astronomical Society, Manti High School, the Utah Audubon Council, the Utah Native Plant Society, and many other groups.

Research by Station scientists and cooperators did not stop at Great Basin,

Moving heavy logs for exclosures at Great Basin required teamwork. Station Director Larry Lassen (second from left) carried his share of the load.

only the headquarters buildings changed in name and use. The 4,600 acres of experimental range land surrounding the building compound included many active research sites.

Some historic sites were saved in 1990 when a team of 109 volunteers from the Manti-LaSal National Forest, the Society for Range Management, the Utah Division of Wildlife Resources, the Bureau of Land Management, the Soil Conservation Service, Brigham Young University, and the Station combined forces at the Great Basin Experimental Range to preserve some of the oldest range research sites in the world. The first exclosures dated back to 1912.

Chain saws roared and the chips flew as the volunteers sawed and chopped the notches to fit logs together into new grazing exclosure fences, replacing old structures designed to protect study sites from sheep and cattle. After the heavy logs fit properly, sledge hammer-swinging scientists, college professors, and engineers pinned them in place with huge spikes, using the same primitive skills and tools used to construct the original protective barriers 78 years earlier.

Botanist Steve Monsen, who organized the project, described the value of the long-term study data collected over 70 years with the aid of the exclosures. "What better place to learn about the potential of vegetation changes resulting from global climate change?"

By 1989 the old log-and-block exclosure fences were so rotten and dilapidated it became obvious that after one more winter's snow load some would not have enough fence left standing to keep livestock out. Neither the Manti-LaSal National Forest nor the Station had funds to replace the fences. So Monsen and Joel Frandsen, president of the Utah Section of the Society for Range Management conspired to rebuild the oldest exclosures with volunteer forces.

After two days of concentrated labor five exclosures stood completed, ready to defend the research sites from the onslaught of thousands of domestic sheep already trailing toward their high summer range (*INTercom* July/90).

Visitors to Great Basin could learn about some of the more significant research and the ecology of the area without entering a building, or even venturing into the headquarters compound. A well-signed auto tour up Ephraim Canyon introduced the vegetation zones at different elevations and described key research sites. A tour guidebook provided additional details of the history and meaning of the research. The information was authentic. Perry Plummer, one of the leading authorities on research on the experimental range, wrote the text. The guide was produced for the 60th anniversary of Great Basin in 1972 (McArthur, personal communication).

Visitors to the Great Basin area were invited to take a self-guided tour to see how ecological studies provide valuable information for management of lands in various elevation zones.

Albert Antrei was another authority on early events at Great Basin. He also came to be recognized for his work as an historian in Ephraim and Sanpete County. Antrei graduated from Colorado State University in forestry and went to work at Great Basin in the 1930s. He fell in love with a Sanpete girl, and when the Forest Service tried to transfer him against his will he rebelled, married the girl, and started another career as a teacher. He retired as Superintendent of Schools in nearby Manti. At the GBEEC dedication he commented on the nonscientific aspects of the presence of Great Basin in Ephraim Canyon:

> From the very beginning of the establishment of the Station it was to become clear that not all the effects of locating a scientific research site near Ephraim were going to be scientific. If you have a certain number of healthy young men on one side of a forest boundary, and there is an equal number of healthy young women on the other, you have the makings of what has to be acknowledged in casual gobbledygook, 'a basic social situation.'
>
> The Station's young men were all inept at cooking and bottle-washing, and to take care of such chores, as well as to perform the art of a little mothering-at-large, in 1936 there was Annie Bartholomew (the Great Basin cook) to advise the field technicians on matters of social conduct and who the girls were in Ephraim. More complete rundowns of such social weight were also available from the State's road grader, Lew Christensen.

Antrei closed his speech at the GBEEC dedication with a tribute to two friends, one who worked there so many years he might have been considered a local citizen, and one who definitely was:

> I wish at least two more people were here today to share with us the significance of this optimistic event. I wish Perry Plummer were here to flavor this moment, for of all the natural scientists who have contributed to the knowledge revealed here Perry contributed almost 20

A Lifetime of Service

Paul Hansen worked at Great Basin full-time and later on a part-time and contract basis for 44 years. When he finished his career as an employee, he promptly signed up as a volunteer to continue taking care of the research site he loved.

Richard Stevens, Wildlife Biologist with the Utah Division of Wildlife Resources, worked with Hansen for many years. He said Hansen's great love was the Great Basin Station, and he "did it all" as a tireless worker (Stevens 1994). Hansen's work included opening and closing the Station in spring and fall, building catchment basins for the famous watersheds A and B, repairing fences, collecting data, cooking, going to town for supplies, and helping to establish study plots. Hansen was said to know where every study plot was located, when it was established, where the data and maps were stored, and who worked on the study.

Technician Paul Hansen was tall, strong, ready to work, and full of good humor in 1936, 8 years after starting his career at Great Basin and nearly 40 years before he completed it as a volunteer.

Hansen "retired" in 1972. For the next 10 years he worked full time at Great Basin, 6 to 9 months a year for Utah Wildlife Resources and the rest of the year as a part-time or contract employee of the Intermountain Station. His volunteer agreement covering the next 3 years allowed him to open and close the Great Basin facilities as he had done most of his adult life and to care for experimental areas without compensation.

Stevens said, "Everyone wanted to work with Paul. If the assignments for the day were to clean toilets with Paul or collect plants with someone else, all of us young students hoped we could be assigned to work with Paul."

Great Basin played a part in almost all of Hansen's life. His father worked there as a technician when Arthur Sampson was the first director. In 1991, his granddaughter, assisted by Station Ecologist Susan Meyer, completed a high school science fair project with data collected at Great Basin. Hansen died in 1993 at 84. He was buried in his 1950s' Forest Service dress uniform with a juniper stem pinned to his lapel.

percent of the publications in his 33 years as Director, or Project Leader, of the Station. I also wish Paul E. Hansen were here. Paul was not a university trained man; Paul was a graduate of Ephraim High School. He opened and closed the Station with the seasons and was the one who came up in the winters to shovel the tons of snow off the Station roofs, repair winter breakage, and incidentally record such winter data as was needed on snow depths and snow water contents. Between Paul and the Station a kind of special relationship developed, some kind of alpha and omega, beginning and end. Let me say out loud and just for Paul: 'Everything's okay, Paul!'

The Volunteers

Although the large number of volunteers working on a single project when the Great Basin exclosures were rejuvenated was unusual, volunteer work at the Station was not. From the very earliest days when employees donated money to help erect the buildings at Priest River, volunteerism was a part of life at the Intermountain Station and its predecessor organizations. When research program expansion slowed or stopped and funding started to dry up in the 1970s, more than program redirection and new cooperative approaches were required to do the jobs that needed to be done. Volunteers were needed more than ever before, and they were welcomed not only by the Station, but throughout the Forest Service.

Some asked to help, and some were asked to help. Some did great things, and some did small things. But all were valuable. Several outstanding examples of volunteer work were noted earlier in this history. This section describes some additional activities of volunteers to provide an idea of what they did and the spirit with which they did it.

Some volunteers came from afar to help. In 1978, Rigoberto Romero, a native of Honduras, spent 3 months as a volunteer at Boise gathering data on erosion and sedimentation in the Idaho Batholith. He applied the knowledge on returning to his native land, were he was responsible for directing a program of erosion and sedimentation control on mountain slopes (*INTercom* 11/9/78). The Station enlisted 12 young men and women in the summer of 1982 as part of a national program for volunteers in various Forest Service fields. Two, Bob Rhoads and Melanie Foran, both from New York State, were featured in an *INTercom* article (10/28/82). They worked with Bureau of Land Management personnel in a cooperative inventory of pinyon-juniper woodlands in Utah and Nevada. Dwane Van Hooser, Project Leader for Forest Survey, estimated a cost savings of at least $40,000 from their work.

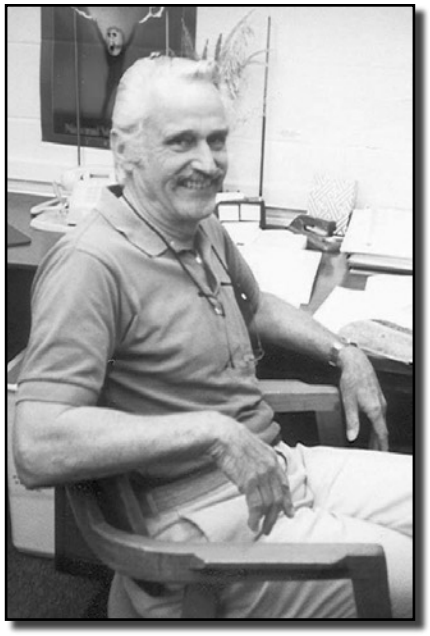
Volunteer Brian Parks spent his summer vacation helping Station scientists collect data in the Bob Marshall Wilderness. In this case, "tree hugging" served the purpose of providing a very approximate measurement of the diameter of a large whitebark pine.

The Station's work with Regions 1 and 4 in designating Research Natural Areas was widely acclaimed. Much of the progress was attributed to a huge amount of volunteer work by Chuck Wellner, but he was not alone in donating considerable time to the RNA cause. "The truth of the matter is, our program would be going nowhere if it wasn't for the tireless efforts of National Forest System volunteers and personnel from The Nature Conservancy," said Assistant Station Director Duane Lloyd (*INTercom* 4/16/87).

Volunteers ranged from the very young to seasoned veterans. Among the youngest was Tim Murray, whose mother, Nancy, worked in Operations at Station Headquarters. At age 14, Tim had donated 184 hours over two summers as a volunteer working in the mailroom and the library and publications sections of Research Information. He once even helped out in the Federal Building snack bar by running the cash register (*INTercom* Oct./94). In 1986, the Station had 20 formal volunteer agreements with spouses and children of present or former employees (*INTercom* 3/6/86).

Important volunteer work by veteran personnel was carried out in many program areas:

- Ray Boyd continued to work completing vegetation management studies at Moscow for several years after he retired as a research silviculturist.
- Retired after 30 years as an entomologist, Dave Fellin continued to work at the Missoula Forestry Sciences Lab, winding up several long-standing projects and studies.
- At Provo, Ralph Holmgren, Perry Plummer, and Neil Frischknecht periodically volunteered their time and expertise in range management research at the Shrub Sciences Lab, Great Basin, the Desert Experimental Range, and the Benmore Experimental Area after they retired.
- Following 33 years of service, retiree Ray Hoff (Moscow) continued to work as a volunteer identifying disease-resistant whitebark pines in a program to develop seedlings that could be used to regenerate forests decimated by blister rust.
- Mont Lewis, who retired as a range staff officer in Region 4, worked every day for a quarter of a century as a volunteer maintaining the Station herbarium in Ogden or collecting plants in the field (Mitchell and others 2005).



Retired Project Leader Walt Mueggler contributed more than 40,000 hours of volunteer time at the Logan Lab.

It would be difficult to choose among Wellner, Lewis, and Walt Mueggler in any contest to name an all-time volunteer champion. Fifteen years after his official retirement date Mueggler still worked a few hours most days at the Logan Lab. After "retirement," he authored or coauthored nine publications and reviewed or edited many manuscripts for others. In 2004, the Rocky Mountain Station honored Mueggler for contributing more than 40,000 hours of volunteer time. Mueggler (personal communication) said of his volunteer work, "At 78, I am beginning to think seriously about giving it up." However, a year later he was still on the job.

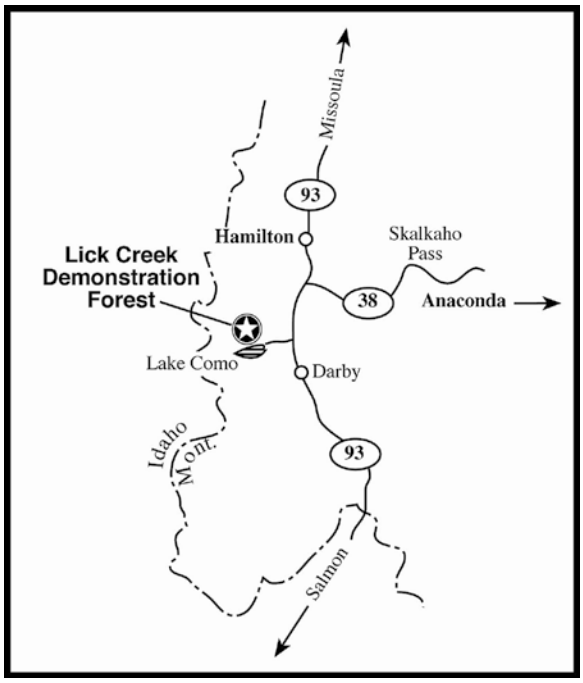
All volunteers earned the same pay—none. They could be reimbursed for travel expenses if their supervisor authorized travel as a necessary part of the task at hand. Thus the Station often benefited from the efforts of talented people at little or no cost. That changed slightly for a select group in 1994. Mueggler and Wyman Schmidt were named the first Emeritus Scientists at the Intermountain Station (*INTercom* Oct./94). Mueggler had been working for several years in retirement as a volunteer in the Disturbed Land Reclamation Project. Schmidt had recently retired as Project Leader of the Subalpine Silviculture Project at Bozeman and Missoula.

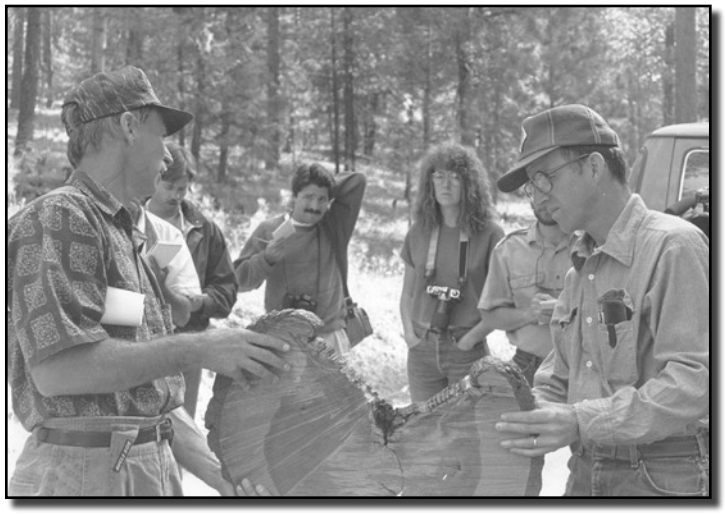
The honorary "emeritus" title was granted at or after retirement to scientists who had given significant service and agreed to continue with a line of research that would benefit the Station. Emeritus appointments, usually for 2 years, enabled retirees to complete and publish specified research, mentor or advise other scientists, enhance the continuity of long-term studies, and support formal and informal cooperation with other scientists and institutions outside the Station. The Station agreed to provide a specified level of funding, support services, and office and laboratory facilities. In special situations, the Station Director could extend the term of an emeritus agreement. However, many of the scientists stayed on the job as unpaid volunteers for years after their agreements expired.

Individuals in addition to Mueggler and Schmidt listed as Emeritus Scientists in Station records from the start of the program through 2004 were Warren Clary, Boise; Jim Clayton, Boise; Jack King, Boise; Jack Lyon, Missoula; Geral McDonald, Moscow; Jack McIntyre, Boise; Jerry Rehfeldt, Moscow; Ray Shearer, Missoula; Al Stage, Moscow; and Bill Wykoff, Moscow.

The Ecosystem Approach Comes to Lick Creek

In 1993 the Forest Service was looking for places to start ecosystem management and research projects, and Lick Creek was a natural. Changes in the 3,500-acre area northwest of Darby, Montana, had been monitored since 1909. An experienced and talented multi-disciplinary team was available to develop and demonstrate management





Research Foresters Clint Carlson (left) and Steve Arno showed a group of journalists a cross section of a ponderosa pine from the Lick Creek area. The large fire scar at the base of the tree revealed a 300-year history of frequent, light surface fires that maintained a community of open, park-like timber with a grassy understory.

approaches that would consider a whole, natural system, how it functioned and how human activities would affect it and be influenced by its condition.

Just a year earlier, the team had won a "New Perspectives" award from the Chief of the Forest Service for noteworthy performance in land stewardship and collaboration among managers, researchers, and educators. The team included members from the Station, University of Montana, and the Bitterroot National Forest. Station personnel were from Bozeman, Missoula, and Moscow. (*INTercom* May/93). "New Perspectives" was a fuzzily defined Forest Service initiative. Although it seemed to imply significant change, the concept was never fully understood inside or outside the Service, and most of the activities consisted of meetings and attempts at planning that failed to result in concrete action (Lyon, personal communication). The initiative faded away and died about 2 years after it was launched.

At the Station, however, "new perspectives" activities did serve to set the stage for a successful move into the broad concept of ecosystem management and research. Wildlife research unit Project Leader Jack Lyon and Research Forester Clint Carlson wrote an "ecosystem management" proposal featuring the Lick Creek area. The plan went to the national office for consideration in a competitive grants program. It was rated the best of many proposals, and resulted in funding to support the cooperative management-research program in the Bitterroot National Forest that was to continue through the balance of Station history (Lyon, personal communication).

In addition to Lyon and Carlson, key Station participants in the planning and early conduct of the program included Steve Arno and Mick Harrington of the fire effects unit, Wyman Schmidt of the subalpine silviculture unit, Russ Graham of the silviculture and genetics unit, and retiree Bob Benson. Others joined the team later.

The researchers had a lot of background information to work with. The first timber sale was made at Lick Creek in 1906. It was the first large ponderosa pine sale in Region 1, and is said to have been given personal direction by Forest Service Chief Gifford Pinchot. Photos were taken in 1909 at 13 points in and near the sale area. The photopoints were located and permanently marked in the 1920s and photos were taken thereafter during each decade. Results of 88 years of change were displayed and analyzed in a Station publication (Smith and Arno 1999).

The publication was an update of an earlier report (Gruell and others 1982) in which the authors concluded that trends in Lick Creek vegetation were increasing the chances of severe wildfires, changing the composition of the forest from ponderosa pine to Douglas-fir, and causing declines in wildlife habitat. To reverse these trends, the authors recommended periodic prescribed fires of low intensity in conjunction with partial cutting and thinning. To evaluate the recommendations, Station and National Forest personnel made a series of carefully designed studies of various cutting and underburning methods applied at different times of the year and under different moisture conditions.

The goal was to determine how best to return the tree stands to structures that were sustainable and consistent with historical fire occurrence in the Lick Creek area. Results were expected to define cutting methods combined with prescribed burning that would maintain healthy multi-aged stands of ponderosa pine and set an example for management of millions of acres of similar forests elsewhere in the western U.S.

The task was not easy. Arno said at the time the studies started, "Fuels have accumulated, trees may be experiencing growth stagnation related

Research Forester Mick Harrington collected samples of duff, twigs, and vegetation at Lick Creek to monitor moisture contents at various stages before, during, and after burning the area. The information helped determine the effects of fire on the vegetation.

to overstocking and lack of sufficient nutrient cycling, and fine roots may be growing close to the soil surface and thus be vulnerable to fire damage. Invasive non-native plants are established and likely to increase with any disturbance."

Despite the problems, the ecosystem-based management methods applied at Lick Creek produced an array of mostly positive changes. Some of the negatives, such as declines in esthetic quality and some bird species shortly after the treatments, were thought to be temporary (Fletcher 1999b).

All the evidence indicated that before the 1900s forests in the Lick Creek area consisted of open park-like ponderosa pine with a grassy understory containing scattered shrubs and occasional thickets of Douglas-fir. The forests were maintained by low-intensity, slow-burning wildfires—either caused by lightning or ignited by Indians who wanted healthy habitat for the game they hunted. The fires killed most new, small trees but caused little damage to the old-growth ponderosa pine. The absence of fire created stands of dense, stagnant trees susceptible to insects, disease, and large, intense destructive fires. The research-management goal at Lick Creek was to return the area to conditions that reflected presettlement times (*INTercom* August/1993).

The studies were so successful in developing information to help understand the consequences of management strategies that the original 5-year charter of the Ecosystem Management/Research Demonstration Area project was extended several times and expanded into new areas of the Bitterroot Forest. Arno said he believed small-scale, ecosystem-based projects conducted over several years fit Forest Service capabilities well and would be acceptable to the public.

"However," Arno said, "the scale of treatment needs to be greatly expanded to restore and maintain any substantial part of the ponderosa pine forest…. There is a real need for large-scale restoration treatments, including prescribed burning." He cautioned that, because of excessive stocking of mid-sized trees in ecosystems like Lick Creek, simply returning fire without preparatory tree cutting would either be ineffective or too destructive (Fletcher 1999b).

The ecosystem area actitivy expanded in 1995 when Station scientists launched an interdisciplinary and multi-functional cooperative effort with local partners to plan and develop ecosystem management in the 39,400-acre Stevensville West Central Analysis Area of the Bitterroot National Forest. New research was started there to determine area-wide habitat needs of fauna such as cavity nesting owls, small mammals, small carnivores, migratory birds, and aquatic organisms. Scientists from the Fire Lab started studies to probe deeper into understanding fire-dependent plant ecology (Intermountain and Rocky Mountain Stations 1995).

Roger Hungerford, research forester with the fire effects unit, placed a thermocouple near a bitterbrush plant at Lick Creek. Thermocouples monitored temperatures around and within the root crowns of plants during burning.

The Station also added economic analyses and computer modeling to the research mix. Studies by Station economists and colleagues at the University of Montana showed that the combination of thinning and prescribed fire would add considerably to the value of wood products in the future. The computer modeling produced a prototype showing managers what was likely to happen to vital streamside areas if improvement treatments were applied. The public communication part of the project was carried out through field trips, workshops, written reports, and information on an internet site (Solorzano and Kapler Smith 1998).

A summary of the concepts used in the Bitterroot Ecosystem Management Research Project, ecological changes that had taken place, and some of the initial findings was included in a 1996 Station publication, *The Use of Fire in Forest Restoration*. The document, edited by Colin Hardy and Arno, reported on a technical section of the annual meeting of the Society for Ecological Restoration. It quickly became one of the top five most-requested research publications in Station history (Rocky Mountain Research Station 2005).

Hardy became Project Leader of the Station's fire effects unit. Arno, a prolific writer on fire effects during his 30-year career at the Station, continued to carry the banner of "restoration forestry" after his retirement. He wrote two books. The first, *Flames in Our Forest* with Steven Allison-Bunnell, was a look at the historic role of wildfires in western forests. *Mimicking Nature's Fire*, with Carl Fiedler, a forestry professor at the University of Montana, discussed how "restoration forestry" could emulate natural forces to improve forest structures.

The Leopold Wilderness Institute

"The richest values of wilderness lie not in the days of Daniel Boone, nor even in the present, but rather in the future," said Aldo Leopold, namesake of the organization established in Missoula in 1993 to develop and apply knowledge needed to improve management of wilderness and other natural areas for the benefit of future generations.

The Leopold Institute was formed from the Station's Wilderness Management Research Work Unit, which had provided national leadership in wilderness research since its formation in 1967. The Institute occupied the building used for many years by Station administrative people in Missoula, next door to the Forestry Sciences Lab where the predecessor wilderness unit had been housed.

The old wilderness unit had done a great deal of cooperative work with other agencies and organizations and was not limited to research in the local area, but the Institute took the concepts of cooperation and national mission to a higher and more formal level. A year after the Chief of the Forest Service signed the charter authorizing the Institute, an agreement was signed by the Forest Service, Bureau of Land Management, Fish and Wildlife Service, National Park Service, and National Biological Survey (later incorporated into the U.S. Geological Survey) to cooperate in "the development and implementation of the Institute." The five agencies also established a Wilderness Steering Committee to identify research needs, set priorities, pursue funding, and serve as a liaison group between the agencies.

At first, operation of the Institute was directed by the Washington Office of the Forest Service with the Station responsible for administrative support only. In 1996, the Forest Service transferred responsibility for all Institute operations to the Intermountain Station, and this responsibility passed to the new Rocky Mountain Research Station when the Intermountain and Rocky Mountain Stations merged the next year.

In 1999 the five Federal agencies established the Interagency Wilderness Policy Council, composed of senior managers from each agency, to improve coordination and management of the National Wilderness Preservation System. The Leopold Institute provided support to the council, including briefings and updates on research activities. Research representatives of the Forest Service and Geological Survey serve on the council.

The Leopold Institute went through a process of development and maturation to become a true interagency unit addressing the full breadth of social and natural science issues to provide the basis for wilderness stewardship across the 50 States. Director David Parsons said significant events in the process included stationing a Geological Survey scientist at the Institute and arranging annual transfers of funds from the Bureau of Land Management and Fish and Wildlife Service in 1996 (personal communication). Since then, the Institute added a fire ecologist to the staff and hired a Research Application Program Leader to focus on the delivery and application of new knowledge to management and policy makers.

Parsons' appointment reflected the interagency sponsorship of the Institute. He had been a research biologist for more than 20 years with the National Park Service. If there was any suspicion that the Institute would be dominated by the Forest Service, it was dispelled. Parsons had a broad background in wilderness science, including work on visitor impacts, fire ecology, forest ecology, and air pollution effects. He also had experience coordinating interdisciplinary teams of scientists and managers, which would prove useful in directing an interagency operation.

Aldo Leopold was a prime mover in the designation of the first Forest Service wilderness in 1924, and a champion of the national movement to preserve areas with important natural qualities regardless of ownership or agency management responsibility. He no doubt would have applauded the Leopold Institute's mission: "To provide scientific leadership in developing and using the knowledge needed to sustain wilderness ecosystems and values."

The Aldo Leopold Institute was dedicated in 1993 in true interagency fashion. Observing as Dorothy Bradley, Aldo Leopold's step-granddaughter, cut the ribbon in front of the building on the University of Montana campus were (left to right) Park Service Rocky Mountain Region Director Robert Baker, Forest Service Deputy Chief for Research Jerry Sesco, Forest Service Chief Dale Robertson, Bureau of Land Management Director of Recreation and Wilderness Frank Shnell, and Fish and Wildlife Service Assistant Director for Refuges and Wildlife David Olsen.

Consolidations and a New Station

Under the Reagan administration in the early 1980s, major changes occurred that had impacts on all of Forest Service research. Funding was being reduced, which caused unit closures, some scientists were transferred to units that did have funds, and morale was affected at many locations (Bay, personal communication).

At the same time USDA was being criticized by some members of Congress and the press for having too many offices performing the same or similar administrative tasks. Although aimed primarily at the agricultural agencies exclusively serving farmers and ranchers, the criticism spilled over to the Forest Service. As a result, Chief Max Peterson began looking at the various field units for opportunities to combine administrative offices. Station Director Bay and Regional Forester Stan Tixier were asked to prepare a proposal for combining administrative activities in Ogden.

Although both the Station Headquarters and the Regional Office were located in Ogden, they were in different buildings a few long blocks apart. The Station was housed in the Forest Service Building at 507 25th Street; the Regional staff was in the Federal Building at 324 25th Street. Bay and Tixier prepared a report with a range of combination alternatives (*INTercom* 1/20/83). The change approved by Chief Peterson combined the human resources (personnel management), administrative services, information systems, human rights and services (civil rights), and fiscal and public safety staffs. They became known as "common services" or "combined services" units. Employees of the human rights and services staff were on the Station rolls; the others were Region 4 employees. The budget staff remained strictly a Station function because of its crucial nature to Station management. The other administrative units in the two organizations, the information staffs, were not changed, and the Statistics Group remained as it was within the Station.

The arrangement worked fairly well, but required adjustments. In some instances, the Station and Region had different policies, so those differences had to be observed by the new combined services staffs. To meet the Station's needs, the common service staffs were required to initiate and take actions, because the research units at the labs had little administrative capability. This was a new experience for the staffs because their role in the Region was largely one of oversight and consultation for the administrative staffs of the various National Forests.

Elsewhere, the Pacific Northwest Station and Region 6 in Portland, the Rocky Mountain Station and the Arapaho-Roosevelt National Forest in Fort Collins, and the Pacific Southwest Station and California Region (Region 5) in Berkeley and San Francisco worked out their own approaches to combining administrative staffs. The arrangement in Ogden seemed to work as well or better than any of others. The Station people tried hard to make the staffs feel that they were an integral part of the Station as well as the Region. The Staff Directors reported to the Assistant Station Director for Administration in addition to the Deputy Regional Forester for Administration. Both prepared the annual performance appraisal for each common service unit director.

Beverly Holmes, Assistant Station Director for Administration at the time, made quite sure that the Staff Directors understood their obligations to serve both the Station and Region. To the credit of the staff personnel, most seemed to want to make the new arrangement work smoothly.

Bev Holmes—Ace Administrator

Beverly Holmes was just the person to make the transition to combined administrative services work well. She had experience working with or supervising all of the administrative units.

Holmes came to the Station in 1974 as a Personnel Management Specialist. She had worked for 6 years at the National Indian Training Center operated by the Bureau of Indian Affairs at Brigham City, Utah, where she served as Administrative Officer and Acting Center Director. She moved up the administrative ladder with the Forest Service at a fast pace, broadening her experience at every step. In 1975, Holmes was named Leader of the Station's Operations Group, a post in which she supervised and coordinated activities of Personnel, Budget and Finance, and Administrative Services units. She also took on an extra duty as a Career Counselor, which put her in touch with a variety of employees throughout the organization.

Two years later Holmes moved to the Washington Office as a staff assistant to the Deputy Chief for Research. Part of that assignment was coordinating administrative procedures between Research and the National Forest System. While in Washington, Holmes also chaired the Forest Service's Civil Rights Committee, a duty that continued when she returned to the Station as a Program Analyst in 1979.

Bev Holmes in 1983, the first woman to reach the Assistant Station Director level in the Forest Service.

The Program Analyst slot was a new position at the Station, reporting to Assistant Station Director for Planning and Applications Jerry Sesco. Holmes analyzed a variety of programs, provided advice to top management, and also served for a time as Acting Group Leader for Research Information.

In 1983 Holmes was named Assistant Station Director for Research Support Services. She was the first woman to reach this level in Forest Service Research. The job was to direct all Station fiscal, personnel, information, and administrative services activities. The job title was changed in 1987 throughout the Forest Service to Assistant Station Director for Administration.

The Forest Service faced a major problem in the 1980s after a class-action lawsuit filed by an employee at the Pacific Southwest Station was settled through agreement in a Federal Court to a consent decree. The lawsuit had charged sex discrimination in employment. The decree had many provisions designed to correct underrepresentation of women in job classifications traditionally filled by men. Complying with all the requirements was a daunting task for the Forest Service.

Holmes was called on to play a key role in resolving matters with an appointment as Special Assistant to the Forest Service's Deputy Chief for Administration. She reported to Washington, but was located in San Francisco because the consent decree applied to California operations where the Forest Service had several thousand personnel.

In 1991, with consent decree activity winding down, Holmes was named Deputy Regional Forester for Administration for the Pacific Southwest Region (Region 5). She was the first woman, and first ethnic minority, to reach this level in the history of the Forest Service. When the Deputy appointment was made, Holmes also was appointed to the Senior Executive Service. She was the first Deputy for Administration in the Forest Service to qualify for Senior Executive status.

Before Holmes retired, all consent decree actions were completed. Compliance had taken nearly 20 years, millions of dollars, many personnel changes, and for Holmes, a lot of stress. She said the award she received for her work, signed by the President, was nice and had a healthy check attached, which "almost paid for the headaches, ulcer, and medications" that came with the job (Holmes, personal communication).

A native of Oklahoma, Holmes was a member of the Cherokee Indian Tribe. She was a strong advocate of civil rights throughout her career. During much of her time at the Intermountain Station she performed extra duties dressed in traditional tribal clothing giving orientations on Indian culture and expectations for Forest Service employees.

Bev Holmes in tribal clothing for a Station orientation program.

This work and her professional administrative activities earned many awards for Holmes throughout her career. She was named Federal Woman of the Year for the Bureau of Indian Affairs in 1973, received a Career Excellence Award from the Western Women's Career Forum in 1983, and was the Utah YWCA's Woman of the Year in 1986.

Co-locations

Shortly after the common services units began operating in 1983, Roger Bay moved to Berkeley as Pacific Southwest Station Director. Bay was replaced by Larry Lassen who was Southern Station Director in New Orleans. After several months of operating with a majority of the administrative staff located in a building two blocks away, Lassen decided to move Station Headquarters to the Federal Building and to complete the co-location process in 1984.

The move wasn't quite as simple as it might seem. It required the Ogden Ranger District, which had been located in the Federal Building for years, to "trade places" with part of the Station staff by relocating to the Forest Service Building. The Regional Office had to vacate the remainder of the second floor in the Federal Building to accommodate the Station people, and the entire area had to be remodeled.

USDA's Office of the General Counsel, whose lawyers worked mainly with the regional people and seldom had business with the Station, stayed where it was, two blocks away from the Regional Office. Forest Survey stayed in the Forest Service Building, which became a Forestry Sciences Laboratory, but expanded into space vacated by the headquarters personnel. The Station's mountain pine beetle research unit stayed where it was in the old building.

A common reaction of bureaucracies—perhaps most large organizations—is to attempt to solve problems by reorganizing. Combining administrative units in the same or a

The Region 4 staff moved to the Ogden Federal Building when it was completed in 1975. Station Headquarters, the mountain pine beetle and forest survey research units, and USDA's legal staff then were sole occupants of the Forest Service Building. Station Headquarters personnel moved to the Federal Building in 1984.

nearby city was a typical approach to the perceived problem of high administrative costs. No detailed analyses were attempted to show if cost savings would be made. Back-of-the-envelope estimates, however, showed little if any monetary savings. Victory was claimed, nonetheless, by demonstrating to the successively higher layers within the bureaucracy that "cost-saving actions" had been taken.

A small committee of Station and Region 4 people had been appointed to study the situation and make recommendations shortly before the final decision to move Station Headquarters supposedly was made. As chairman, I reported to Lassen and Regional Forester Stan Tixier that the committee had been unable to define any cost savings that would result from the co-location. In fact, I had been told that the move was expected to cost about $90,000 (the funds came in a special allocation from the Washington Office), and it was likely that costs would exceed any financial benefits. Lassen and Tixier thanked the committee for its work, went to another room to confer, and reappeared in a few minutes. They announced their decision to make the move and said there were important factors other than costs to be considered.

Another co-location action took place at Logan in 1986. The lease on the building housing the Logan Ranger District of the Wasatch-Cache National Forest had expired in 1985. The Station's lab on the Utah State University campus was less than full after the demise of the aspen research unit in 1984. During the peak years from 1965 to 1969, there were 15 scientists at the Lab; by 1989 there were only five.

The national emphasis on combining units appeared to present a welcome opportunity. After a period of disruption for remodeling, the eight-person Ranger District staff moved into the Lab, which housed the Station's mined-land rehabilitation research unit. It proved to be somewhat less than an ideal situation.

Remodeling at the Logan Lab over a 2-month period was extensive in preparation for locating the Logan Ranger District in the building, a change that didn't work out very well.

The co-location caused concern by the university that the Forest Service was closing out its research activity on campus and substituting a National Forest Ranger District in its place. That fear had to be put to rest. A negative for the District was that the location was away from U.S. Highway 89, the main public access to the National Forest via Logan Canyon. Negatives for the Station were the disruption and noise associated with public visitors requesting permits or travel information, or engaging in other activities not related to research. The co-location did provide the Washington Office with another "score" in reporting cost-cutting success to USDA. Whether the public was better served or money saved was never rigorously analyzed.

The event that paved the way for the politically motivated co-location, termination of the aspen research unit, itself had a political twist. After the staff was told that the unit would be abolished several individuals approached members of the Utah Congressional delegation about keeping the project alive. The legislators investigated, and were told "we knew everything we needed to know" about aspen. The Senators and Congressmen thus did not support continuation of the unit.

Staff members, most of whom had been transferred to Logan when older range or watershed research units were abolished or reorganized, again had their work and lives disrupted. Walt Mueggler and Norb DeByle fared best; they were allowed to stay in Logan until they retired. Roy Harniss retired immediately. Bob Campbell was transferred to the wildlife research project in Missoula. Dale Bartos was moved to the mountain pine beetle unit in Ogden, only to be moved back to Logan in 1997. He had resumed working on aspen studies in 1993, and was officially reassigned from the mountain pine beetle project to the reclamation project on Jan. 1, 1998. (Bartos, personal communication).

Funds for construction of a new Ranger Station building at the mouth of Logan Canyon were made available in 1993. By this time, co-location pressures had subsided, and the Station used the space vacated by the District to house

the mountain pine beetle research unit, which was moved from the Forest Service Building in Ogden. It was a fortuitous situation for all concerned, and gave the entomological unit staff the opportunity to interact with university faculty and students.

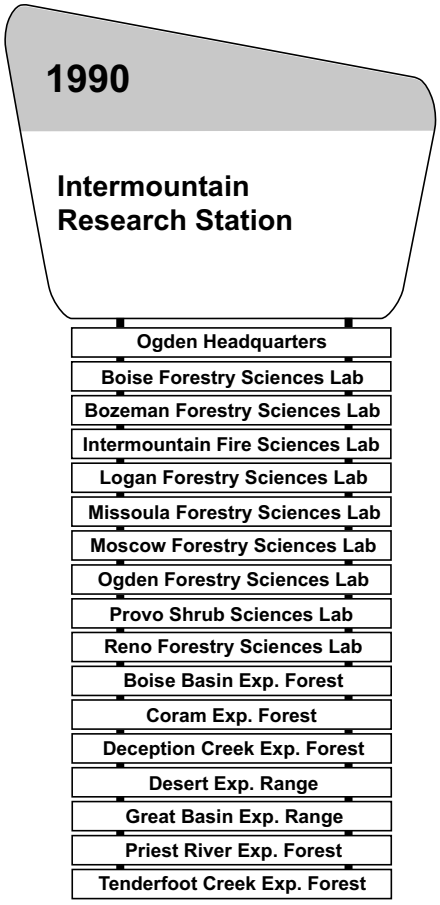
No, It's Not the IRS

While some Station units adapted to new configurations, the organization also was getting used to new names. Late in 1984, Director Lassen and his staff reviewed unit names. One change was made quickly. The official name of the Northern Forest Fire Laboratory was changed to Intermountain Fire Sciences Laboratory. The announcement said research advances had made the old name inappropriate:

"Over the years, research there has expanded to include behavior, effects, and control of fire in rangelands as well as forests. There have been substantial advancements in the fundamental sciences of chemistry, meteorology, and ecology as well as increased sophistication in the concepts, development, and application of models in behavior, effects, and control. Also, research on wilderness fire management critical to implementing wilderness fire policy is beginning at the lab" (*INTercom* 1/24/85).

With no fanfare, and no official approval by Washington, the entire organization started using the name "Intermountain Research Station" in 1985. It began to appear on publications in April. Considerable time passed before the Chief's office endorsed the change.

On August 15, 1990, more than 5 years after the Station started using the new name, Lassen issued a letter (1200 files) to all employees that said: "For some time we have been seeking approval to change the Station name. I am pleased to announce this change has been approved by the Chief's office. Effective immediately the Station's name is officially 'Intermountain Research Station'."



Approval may have taken a long time, but imitation was swift. The largest western Station announced it was shortening its name from "Pacific Northwest Forest and Range Experiment Station" to "Pacific Northwest Research Station." The announcement said, "The name change follows by several months a similar change at the Intermountain Research Station" (*INTercom* 8/22/85). Over the next several years every Station but one made the change. The Rocky Mountain Forest and Range Experiment Station did not change until 1997 when it and the Intermountain Research Station merged.

At least one reaction to the appearance of the more concise Intermountain Station name was negative. Shortly after the first newsletter carrying the new name went out, a Missoula employee called Research Information in Ogden. After a few comments about the general intelligence level of people in the headquarters, the complainer said something like, "Don't you people realize the acronym for Intermountain Research Station is IRS?" The caller was not completely satisfied when told the official short form had not changed. It remained INT.

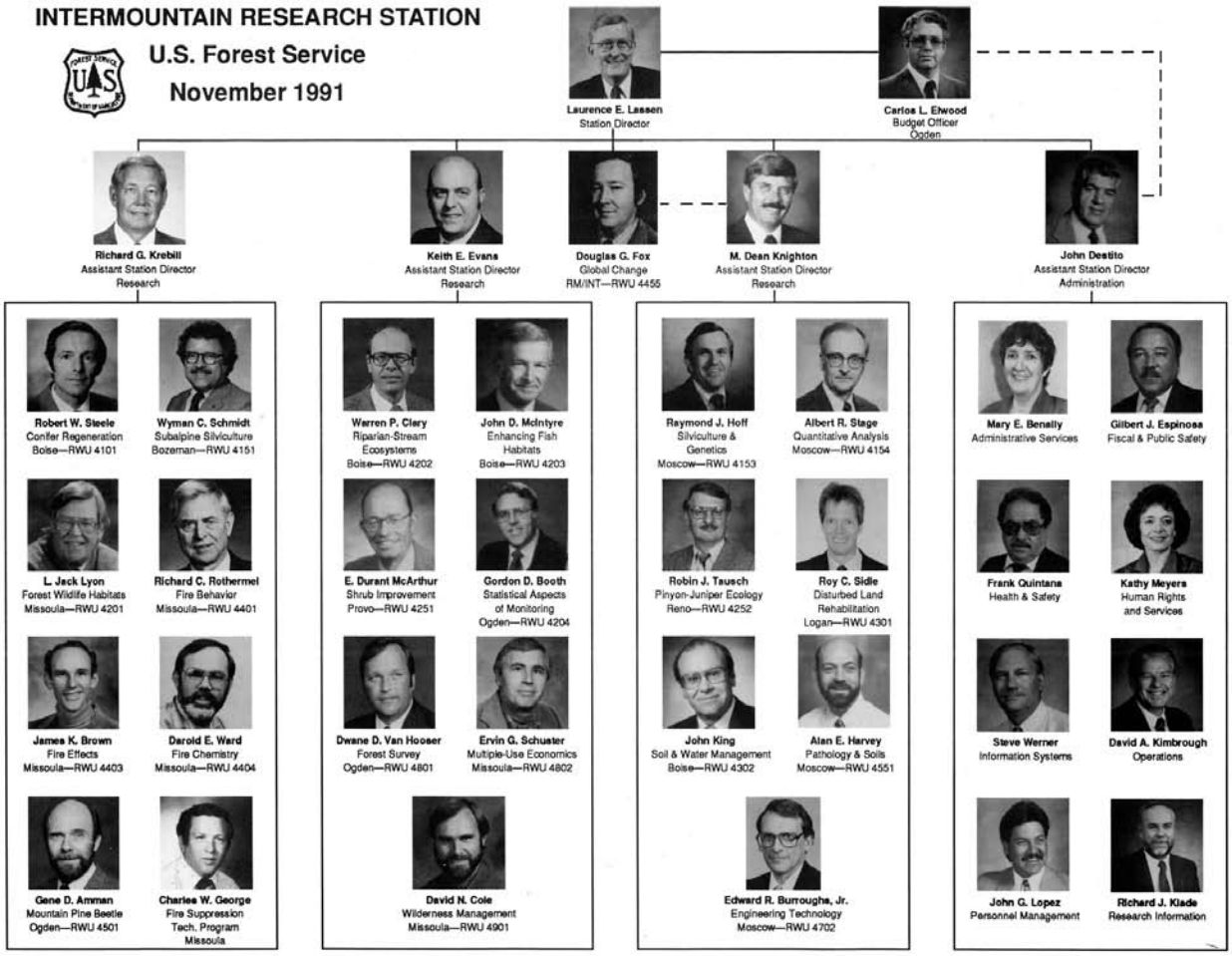
In 1990, Lassen included comments about the name change in a talk to new employees about Station history: "The problem was the Intermountain Forest and Range Experiment Station was just too big a mouthful for most people outside—and quite a few inside—the Forest Service to get right. I believe the final straw was a letter addressed to me at the Intermountain Forest Ranger Experiment Station. And, I can tell you there are absolutely no rangers available to experiment on or with."

The Director concluded the talk with an observation about the short version: "If this is more than you want to remember about the Intermountain Research Station, please do remember that our short-hand abbreviation is INT not IRS. That is one bit of name confusion we can do without."

The official Station name change announcement included a notice that four administrative units—Budget and Research Agreements, Human Rights and Services, Operations, and Research Information—were changed from "Branch" designations to "Staff." Their heads had been Group Leaders, but now would be titled Staff Directors.

This change was made because the combined services administrative units, except for Human Rights and Services, were headed by Staff Directors, usually with several Group Leaders reporting to

Intertwined peaks representing "Intermountain" came into use as a Station symbol in 1988. A variation of it was adopted by the Rocky Mountain Research Station after the 1997 merger.



them. With the other four administrative units headed by Group Leaders, the "pecking order" wasn't in good order, and the title changes were made to help the units interact smoothly. When Denver Burns became Acting Director of the Intermountain Station several years later, he promptly changed the titles back to Group Leader (Kingsbury interview, 2004).

The Last Picture Show

In the late 1980s it became customary for the Station to issue pictorial organization charts showing the Director and Assistant Directors and the heads of research and administrative units. The charts were used in new employee orientation packages and available to all Station and Region 1 and 4 employees who wanted a copy for reference. The charts usually were revised annually, but the frequency varied somewhat depending on how many changes had taken place since the previous issue.

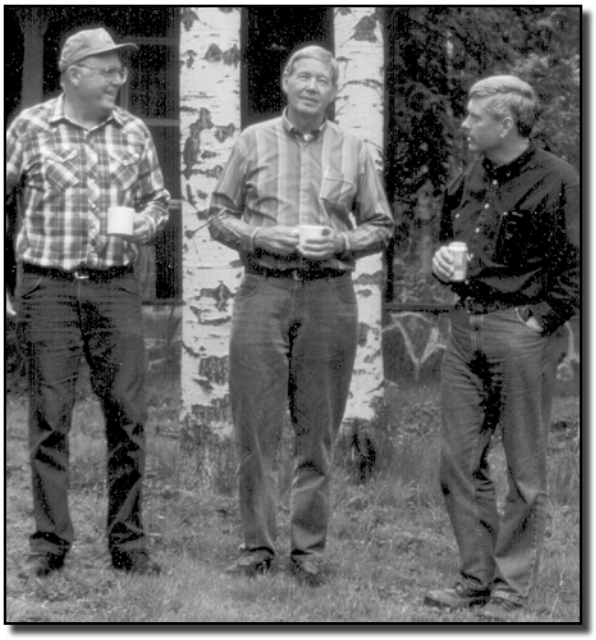
The November 1991 chart was the last one produced. In the summer of 1992 the Forest Service announced the impending merger of the Intermountain and Rocky Mountain Stations, creating a temporary acting Station Director situation at Intermountain. Later in 1992, the Clinton administration embarked on a "Reinventing Government" program led by Vice President Al Gore, which caused considerable apprehension among employees about the future. Responding in 1994 to pressure to reduce costs, the Forest Service announced opportunities for early retirements and offered cash incentives.

Throughout the Forest Service the number of employees taking advantage of the early retirement program exceeded any official estimates. The Intermountain Station was no exception. Quite a few of the Station retirements were unit heads who tended to have many years of service, allowing them to leave without significant financial hardship. Several unit realignments and consolidations also were pending.

By October 1994, nine of the leadership positions shown on the 1991 chart were filled by individuals "acting" as the unit head and two were vacant (*INTercom* Oct./84). *INTercom* published a chart with names and no photos, and stated, "Faces have changed from the 1991 organization chart, but it's impossible to fill in with permanent new ones, at this point!"

The Final Merger

In 1992, USDA agencies were under some pressure to reduce Senior Executive Service (SES) positions. Because Intermountain Station Director Lassen and Southern Station Director



Assistant Station Directors (left to right) Keith Evans, Dick Krebill, and Dean Knighton rotated assignments as Acting Station Director for 18 months after Larry Lassen retired.

Tom Ellis had announced impending retirements, an opportunity to eliminate two SES positions by merging Stations was present. Forest Service Chief Dale Robertson decided to propose merging the Intermountain and Rocky Mountain and Southern and Southeastern Stations. His proposal was announced in August.

Before Lassen's retirement, he had arranged for an interim rotating acting director system with the three research program assistant directors sharing the job. After 18 months, Rocky Mountain Station Director Denver Burns was named to take on the additional assignment of acting director for the Intermountain Station. The merger was not finalized until 1997, so the Intermountain Station was to be led by an acting director for a total of 5 years. This time lag put headquarters personnel in limbo. To their credit, although a few did object to the merger through their congressional representatives, the Intermountain Station Headquarters personnel, who had the most concerns, generally went ahead with their work as best they could.

The impediments to the merger were many. Bill Clinton won the 1992 presidential election and replaced Secretary Madigan with Mike Espy, a former Democratic Congressman from Mississippi. With this change, the decision to combine the Stations was put on hold. In 1993, Chief Robertson was fired and replaced by Jack Ward Thomas, a Forest Service wildlife scientist stationed at the Pacific Northwest Station's Le Grande, Oregon, lab. Evans said he urged Thomas, a wildlife research colleague, to either cancel the merger or push it through because of the ill effects of the uncertainty that prevailed (personal communication). Neither action was taken, probably because the Forest Service soon was totally involved in a "reinvention" analysis that included possible realignments of Regions and Stations.

After 18 months of study, the Secretary of Agriculture approved a "Reinvention Plan" for the Forest Service. The plan redrew Station and Region boundaries, and reduced Stations by one and Regions by two. Each new administrative unit had a research unit with the same boundaries. The "Intermountain Region," with headquarters in Ogden, was to include all of Idaho, Nevada, and Utah and eastern Washington and Oregon. The "Northern Plains Region," with headquarters in Denver, incorporated all of Montana, Wyoming, Colorado, Kansas, Nebraska, and North and South Dakota. Basically, the philosophy underlying this plan was opposite the thinking behind the Intermountan-Rocky Mountain merger proposal. It aligned administration and research completely, rather than creating the situation that eventually came about in which a single Station spanned four Regions.

Plans to change the Forest Service structure through realignments and consolidations were nothing new. A plan containing many elements of the "reinvention" proposal was announced in 1973. It was killed by Congressional opposition. The strongest opposition that time was said to have been from Montana Senator Mike Mansfield.

The reinvention plan was announced in detail in a Burns' letter to all Intermountain and Rocky Mountain Station employees on December 7, 1994 (reproduced in *INTercom* Dec./94). Burns said implementation plans were to be developed by September 30, 1995, and at that time his job would revert to leading a single Station. He also pointed out that members of Congress were being briefed and many questions could be expected. He was correct. Members of Congress prevented the plan from being carried out. Apparently, its demise put the Intermountain-Rocky Mountain merger back on the table. Several developments once again delayed it.

As the months of interim acting directors in Ogden stretched into years, the uncertainty created a difficult time for many employees, especially for those at Intermountain Station Headquarters. The headquarters employees were not involved in any "what if" planning, which might have given them a feeling that they shared ownership in plans to make the merger work smoothly when it finally came about.

In 1993, the Forest Service had attempted to relieve some of the employee anxiety, and probably also to soothe the Utah Congressional delegation, by taking an action perhaps unique in the history of unit consolidations within the Service up to that time. Every administrative employee in the Ogden Headquarters received a letter signed by Chief Robertson assuring them that they would not be forced to move or suffer loss of grade or pay as a result of the proposed consolidation (*INTercom* Apr./93). The letter did say that job reassignments, with appropriate training, might be necessary if employees chose to remain in the Ogden area. When Denver Burns was named Acting Director of the Intermountain Station later in the year, he stated that the Chief's letter to the Ogden employees remained valid (*INTercom* Nov./Dec./93).

The Forest Service kept its word for a long time. Eight employees who received Robertson's letter in 1993 were still stationed in Ogden at the close of 2004. There were 52 employees in the Ogden headquarters in 1992 when Robertson announced his consolidation plan.

The 1996 Federal Government fiscal year began without a passed appropriations bill as the Republican Congress and Democratic President battled over the budget. Continuing budget resolutions ran out twice, closing down the entire Federal Government on both occasions. Finally, an appropriations bill was passed in May, 1996. The budget uncertainties played a part in stalling the merger of the Rocky Mountain and Intermountain Stations.

Another impediment to the merger was concern by the Utah Congressional delegation and other groups over the loss of Intermountain Station Headquarters in Ogden. The Congressional delegation was particularly sensitive to any threat of Federal job loss in Utah because Defense Depot Ogden had been picked for closure and Hill Air Force Base was threatened with closure. Research user groups feared that a merger would diminish the responsiveness of a merged Station to their needs. As the 1997 fiscal year appropriations bill wound its way through Congress, Senator Bob Bennett of Utah, who served on the appropriations committee, put a hold on the bill while it was still in committee. The Station merger, however, was a minor matter in the context of the entire bill and the holding action was withdrawn to allow the appropriations bill to go forward.

With the way apparently cleared for the merger, yet one more impediment stalled the change. Chief Thomas retired late in 1996 and was replaced by Mike Dombeck, a one-time Forest Service fisheries biologist who had gone on to become the acting chief of the Bureau of Land Management. Some of Dombeck's first actions as Chief were to replace the Deputy Chiefs with people of his own choosing. While these personnel changes were being made, the merger again was put on hold.

In May 1997, Burns announced that the merger had been finalized and the two Stations began taking the steps needed to become one. The merged organization was named the Rocky Mountain Research Station. Headquarters were in Fort Collins. The large Forest Inventory and Analysis unit and a small service center, including a library, publishing services, and several administrators, remained in Ogden.

When Assistant Director for Administration John Destito retired 2 years after the original merger announcement, he had both favorable and unfavorable comments about the idea (*INTercom* Summer/94). "I know people have seen the consolidation as major impacts, particularly for the individual and families," he said. "But frankly for the agency it's a healthy way to create a better organization. In the Forest Service as a whole, we have too many field offices, buildings, and administrative processes that dilute too much money away from research and management of natural resources."

"The initial decision on consolidation was poorly handled," Destito said. "The first mistake was that INT was not allowed input. Second is that the decision as I see it was political to show Congress and the Department that we were making some attempt to downsize. The lesson is that as we move forward on change, we need to make decisions on the basis of meeting the mission of the Forest Service and then keep all parties informed of their roles in the transition."

Jerry Sesco, former Intermountain Station Planning & Applications Assistant Director who was Deputy Chief for Research when the merger was proposed, said "the merger of the Stations was inevitable." (personal communication). "The decline in Forest Service Research budgets in real terms is as evident today as it was when the INT/RM and SE/SO mergers took place," he said. "Facilities and equipment continue to need maintenance or replacement. The mergers of SE/SO and INT/RM seemed to be the most feasible due mainly to the compatibility and similarity of research programs. Forest Service Research labors under the handicap of being a small program in a very large organization whose primary mission is not research, but management of the National Forest System."

Sesco said that early in the merger planning process "it was obvious that if we were going to be successful we had to minimize the impacts on employees…thus, we prepared the Robertson letter. Every employee would have a job and we would handle the merger through voluntary transfers and attrition. The meetings I held with SO and INT employees advising them of the proposed changes were two of the most difficult meetings of my tenure as Deputy Chief."

Regardless of how one views the advantages and disadvantages of the merger, a major step in the evolution of Forest Service research was taken. The new Rocky Mountain Station territory covered the western United States from the Great Plains to the Sierra Nevada and from Canada to Mexico. It encompassed four National Forest System Regions—Regions 1, 2, 3, and 4—which include about half of the total National Forest acreage in the United States.

Not In The Line Of Duty

Throughout the history of the Intermountain Station and its predecessor organizations employees often worked long hours, donated their skills and sometimes personal funds to perform extra duties, and served as volunteers, benefitting the research program and their communities. Of course, not everyone served with unusual dedication, but many individuals did. All in all, it was a hard-working outfit.

Despite the emphasis on productivity, the Station at times was a fun-loving organization. Two major awards—The Most Constructive Turk and the Numbskull—were unique. Personnel enjoyed getting, giving, and discussing them. Party and farewell event agendas usually were about 5 percent serious business and 95 percent fun. The ratio was reversed in the organization's newsletter. Almost all of it was serious, but a joke was slipped in now and then. Typical workdays were like that, too.

The Most Constructive Turk

Although sometimes "The Most Constructive Turk Award" involved an element of humor, it had a serious purpose. At annual Project Leader Meetings (formally, Management Team or Leadership Team Meetings) all past recipients of the award would pay attention to who said what. If anyone had made a true statement that was somewhat courageous, but perhaps ill-advised or "politically incorrect," the "Turks" could vote to designate the speaker who uttered the audacious comment as a new member of the group.

New Turks received two plaques they could display until the next Turk was selected. The first featured a well-worn stirrup and the inscription: "The Man Who Tells the Truth Should Have One Foot in the Stirrup—Old Turkish Proverb." The second plaque displayed the names of all award winners and the date and meeting site where the honor was earned. And it was an honor; Turks usually displayed the plaques prominently in their offices and were quite proud to have been recognized as a "Young Turk," the designation often used for brevity.

The original Young Turks were members of a Turkish nationalist reform party whose leaders led a revolt against the autocratic sultan Abdul Hamid II. They succeeded in deposing Hamid and drove him into exile in 1909. The reform movement began in the 1890s with formation of secret societies of progressive university students and military cadets. They operated secretly of necessity; the sultan and his police dealt harshly with anyone who openly criticized the regime. In about 1908, "Young Turk" began to be used as a nickname for any brash young usurper. It subsequently passed into general usage throughout much of the world. This bit of history probably inspired the Station award, which suggested that those who speak the truth in the wrong place or at the wrong time should be ready to get out of town fast.

The Station's award was retired in 1995 at the direction of Station management. The plaques are on display at the Moscow Forestry Sciences Laboratory. They were on a wall outside the office used by Emeritus Scientist Al Stage, the first Constructive Turk. Discontinuance of the award, which was an incentive for personnel to present and debate divergent viewpoints, was viewed by many as signaling a major negative change in Station culture (Stage interview, 2005).

The reasons Turks were selected were not recorded in any formal way, thus some are lost to us. Those that follow were derived largely from newsletter accounts or recollections by Turks who could be contacted.

The Turks, with the meeting place and date of each award, were:

Al Stage	Ogden, Utah	1967
Jim Lotan	Burley, Idaho	1969
Garry Routledge	Ogden, Utah	1980
Dick Klade	Missoula, Montana	1983
Mike Prouty	Ogden, Utah	1985
Erv Schuster	Reno, Nevada	1986
Larry Lassen	Park City, Utah	1989
Roy Sidle	Sun Valley, Idaho	1990
L. Jack Lyon	Jackson, Wyoming	1991
Dwane D. Van Hooser	Ogden, Utah	1993
Sally Hejl	Albuquerque, New Mexico	1994

Al Stage—The Moscow Project Leader's recollection was that he received the initial award because of his questioning attitude during a "how to do it" mock employee development interview that was part of an annual meeting. Watershed Scientist Ned Bethlamy was acting as the "supervisor," and taking the whole exercise quite seriously. Stage was the "employee" being interviewed. Stage made several caustic observations about the whole process being "much ado about the wrong problem," thus earning the Station's first honor for forthright statements.

Dick Klade—My recollection is the honor was bestowed after I said there was no reason whatever that the Assistant Station Director for Research Support Services (my supervisor) should review my performance because the ASD had no understanding of my work as Research Information Group Leader. This could have been dangerous as well as ill-advised. The ASD, who was present, was Dave Blackner, who played tackle on the Brigham Young University football team in college. Blackner was a big man in more ways than one; he never mentioned the comment or seemed to hold it against me.

Mike Prouty—According to an *INTercom* article (4/30/85) written by Public Affairs Specialist Prouty, and therefore somewhat suspect, he earned the honor "for having the audacity to use better slides than the Station Director" and "telling it like it is, and with enthusiasm." Those comments were attributed to Al Stage; the article implies that Jim Lotan also made comments, but said, "The text of Lotan's remarks has been lost." Prouty's report claims Dick Klade, last holder of the award, was barred from voting for the new winner by Stage and Lotan on grounds he was not objective.

Erv Schuster—Schuster, Project Leader of the Economics Research Unit, became a Turk for making irreverent remarks about how research administrators could improve their performance when he was supposed to be describing the work of his unit. The vote was unanimous among the Turks present (Stage, Lotan, and Klade), according to an *INTercom* (5/1/86) account. Schuster said in 2003 he didn't recall too much about the specifics, but thought his statements had to do with budgets and Station overhead, or hiring quotas.

Jack Lyon—According to *INTercom* (Apr./91), Wildlife Habitat Project Leader Jack Lyon "proudly displayed his most Constructive Turk Award given to him for his comments about the latest (Forest Service) national initiative." The implication was that the comments were not complimentary, a fact probably not lost on Associate Deputy Chief Tom Hamilton, who was in the audience.

Dwane Van Hooser—Van Hooser was the Forest Survey Project Leader in 1993 when he chose to declare in the midst of a discussion of obstacles to hiring more women for scientific leadership positions that "every time we have a good opening, some unqualified veteran is blocking the roster (the official list of those deemed qualified for the job by Civil Service authorities)." He overlooked the fact that perhaps as many as three-fourths of the people in the audience were veterans and many of them probably had been selected from rosters for their first jobs with the Forest Service. Three of the four Turks present were veterans; the decision to honor Van Hooser was not difficult.

Dwane Van Hooser (right) looked a little apprehensive after I presented the Turk plaques to him in 1993.

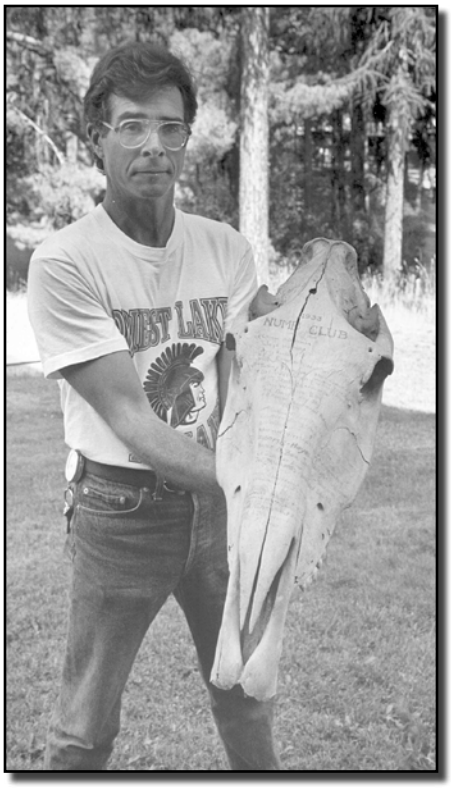
Numbskull!

One of the legendary awards at the Station began at Priest River in the midst of the Great Depression and was conferred regularly on sometimes unsuspecting individuals for 60 years.

In 1931, Morris Huberman drove a Priest River car up Benton Creek to the end of the road to recover some tree seed that had been placed in the duff nearby to determine how long the seed would remain viable. In turning around, he worked the car crosswise of the road with the rear against the cut bank and the front wheels at the very edge of the steep fill slope. Not an inch was left in which to maneuver. On the 3-mile walk back to headquarters for help Huberman found an old bleached animal skull to which he tied a string. He hung the skull from his neck as he stood before Superintendent J. B. Thompson and explained why the car needed to be rescued. So was born the Numbskull Club of America, Parent Chapter No. 0.0001 (Wellner 1976).

Before the Numbskull Club was discontinued in the 1990s by Station management because it was said to be "put-down humor that was out of fashion," (Van Hooser, personal communication) the original chapter inspired creation of at least three other chapters, and 65 people had their names inscribed on four different skulls. Of the rapid expansion of the club Wellner (1976) said, "Soon exploits that ordinarily were deeply hidden or denied were offered (usually by 'friends') as proof of eligibility for membership in the Numbskull Club. A horse's skull was needed to accommodate names of the growing membership. Although standards for eligibility were raised, there never was a dearth of eligible people."

Two new chapters were formed in the mid-1930s. One was "Chapter No. o.oo1" established at Deception Creek Experimental Forest near Coeur d'Alene in 1935. The first chapter president, Kenneth Davis, performed in



In 1992 Bob Denner was Superintendent of the Priest River Experimental Forest and also had the honor of being custodian of the first Numbskull Club skull.

the finest tradition of the club to earn an award.

Davis was outfitting the newly established Deception Creek facility, and the U.S. Army was ridding itself of old World War I gear. The Army issued long lists of property that could be had by other Federal agencies for the mere payment of shipping charges. To dollar-poor Forest Service researchers, the lists were like free candy to a child. Our hero elatedly spotted and checked a paper cutter on a list from an Army base in New Jersey. Weeks later he received a frantic call from the Station's administrative assistant in Missoula informing him that she was trying to stop a railroad flatcar loaded only with a 4,000-pound, power paper cutter to save on the freight bill. She was unable to stop the shipment in Missoula, and the car rattled on to Spokane. The paper cutter, a monstrous piece of equipment, was unloaded at the Forest Service warehouse (Wellner 1976). It was definitely not the desk-top paper cutter Davis had envisioned.

Davis rounded up some buddies, drove to Spokane, and with pipes as rollers unloaded the flat car and deposited the cutter on the Forest Service warehouse dock. There it sat for some time. Later, the warehouse sent the Northern Rocky Mountain Station a bill for storage. When Davis asked the Director what to do about the bill, the reply was, "Just like in a hotel, you don't pay the bill, they keep your luggage!" (Stage, personal communication). Thus, the warehouse acquired a giant paper cutter.

Davis' name was carefully inscribed on the whitened skull of a horse. A charter for a new Numbskull chapter was prepared, rolled, and placed in the skull, which was tenderly wound with several rolls of toilet tissue, boxed, and mailed collect from Priest River to Deception Creek. In response, Davis wrote, "I am deeply insensible to the honor of receiving Charter No. o.oo1…It is indeed incomprehensible that my wholly insignificant and puny efforts should merit the recognition of such masters in the great field of Numbery."

A small skull got its first inscription of a deserving member name in 1935. This skull honors the members of Chapter 0.0002, Missoula. A fourth skull, complete with horns, is inscribed with names of 19 people whose exploits gained membership in Chapter 0.00001, Ogden.

Following its involuntary retirement, the skull of the original club was put on display in the office-laboratory building at Priest River. It is accompanied by a framed document listing the members (nine inscriptions were illegible). The Forest Inventory and Analysis unit in Ogden, which as Forest Survey traditionally presented awards for the two clubs, safeguarded the Missoula and Ogden chapter skulls. The status of the Deception Creek skull and any others that may have been created is unknown.

Club officers were good at composing fanciful certificates awarded to new members, but they weren't big on keeping records. A sampling follows of exploits gleaned from old files or provided in 2004 by retirees or Rocky Mountain Station employees with long memories.

An early "Numbskull" at Priest River, said to have been George Jemison, complained bitterly about how hard it was to row a boat nearly all the way across Chase Lake after sudden thunder, lightning, and rain motivated a quick departure from the water. When the other occupants pulled the boat on shore, they noticed that the anchor had been out throughout the journey.

One researcher, probably Lyle Watts, was working with a crew on the west side of the Priest River. On the way, they had to go through a gate. Returning home, Watts stopped at the gate and the crew members jumped out of the back of the pick-up to open it. Watts drove through and forgot to stop on the other side. He didn't miss the crew until they arrived back at the office some time later. In a similar

Ken Davis ordered a 4,000 pound paper cutter by mistake in 1935 to become the first president of the Numbskull of America chapter at Deception Creek. The note on the photo reads: "Chief numb of all the skullers; supreme o'er all the rest; a monument of steel his deed—the very best."

incident, an absent-minded Northern Rocky Mountain Station Director (seven Directors were honored for "numb" acts over the years) promised to take a researcher from Priest River back to headquarters in Missoula. He blithely drove away alone, stranding the scientist at Priest River, 210 miles from home.

Forest Survey personnel needed to be schooled in first-aid techniques in case of accidental injury on trips to backcountry sampling sites. Research Forester Bill McClain scheduled a training class at Red Cross headquarters in Ogden in 1982. He then gave the wrong date to Survey crewmembers. About 30 showed up for the class. Not a single Red Cross instructor appeared.

Fire Lab Project Leaders Darold Ward, Jim Brown, Dick Rothermel, and Chuck George shared an award in 1989 for "excellence in decision making by committee." The quartet was operating as a group led by the Project Leader who was serving as the Station Director's representative at the time. The committee was empowered to approve modifications in lab space.

Ward decided he needed an elevator alongside the combustion tower flume hood so he could install air sampling equipment. An elevator was bought and installed. Then it was discovered that a set of steps had to be constructed to get to the elevator. Because the steps were awkward and unsafe, a hole was cut in the floor of the combustion room so the elevator could descend farther, thus eliminating the need for the steps. Brown said, "It was a huge mess. We blamed Darold for the bulk of it."

The Survey unit put Scott Travis in charge of the logistics of getting the crews, trucks, trailers, and equipment to northern Idaho to start the statewide inventory. After all the crews, trucks, and trailers arrived, Travis realized he had failed to include the equipment needed to take measurements. Survey had to hire a charter plane to fly the equipment from Ogden to Idaho.

One early Station administrator was known to be a "dapper" dresser, always wearing a long-sleeve shirt and coat and tie. He insisted that all the researchers in his unit dress similarly when working in the laboratory. He earned entry into the annals of numbskullery by sending a memo to the safety officer that said, "Get the word out to researchers who are out in the woods using a chain saw to be sure to either tuck their necktie under their shirt, or to use a strong tie clip, so as to not engage the necktie in the chain." For the rest of his career, the administrator was said to have received comments from throughout the Station asking how many researchers he had seen lately working in the woods wearing a tie.

Alan Green (Forest Survey) returned to Ogden from Missoula immediately after a major snowstorm blanketed the parking lot at the Salt Lake City airport. The Government vehicle he had taken to the airport was not to be found, so Green phoned his wife who picked him up and brought him back to Ogden. Green filed an official report stating that the Government car was missing—probably stolen. A day or so later the snow melted and the car was found sitting in the airport parking lot right where Green had left it.

Roger Bay merited a skull inscription and certificate from the Ogden chapter for being "numb enough" to accept an appointment as Station Director at the Pacific Southwest Station. The presenters implied that being Director at PSW just was not quite as "grand and glorious" a position as being the Director of the Intermountain Station.

The Numbskull Club provided an opportunity to poke fun at supervisors without much fear of retaliation, and in some cases the members may have exaggerated the circumstances of situations to justify conferring the honor. That appears to have happened in 1980 when Assistant Station Director Jim Blaisdell was initiated into the Ogden chapter with this certificate:

For being such an inspiration to other researchers, administrators, supervisors, and supervisees in dedication to his work, excellence at time management, and efficient use of scarce research dollars, to wit:

a) Frequently driving to the Salt Lake City International Airport to attend meetings and returning without catching the plane (that left the airport the same time he left the office);

b) Having slept through all but 10 minutes of the last 49 staff meetings and two GMR's (general management reviews);

c) Scheduling Friday-Monday semi-monthly meetings in Reno, Nevada, even when his work unit staff there were all on vacation.

Accompanying the certificate was a photo of Blaisdell wearing waders and taking a nap on the hood of a Forest Service vehicle. No information accompanied the photo to describe where the administrator was at the time or what he was doing there.

Survey provided an expert plant identification service to field crews. If crewmembers found a plant they couldn't identify, they sent it to Ogden where botanists would make a determination. Frank Angele sent in a mysterious plant in 1987. It was poison ivy.

Lest anyone think Numbskull winners were really losers, the cast of characters who were "numinated" over the years included some very talented people. Angele, for example, earned a cash performance award from the Station Director the same year he failed to recognize poison ivy for "exceptional performance as the camp supervisor for the New Mexico forest survey." One of the most honored scientists in Forest Service history, Harry Gisborne, shared a "numb" award with two others. Gisborne was said to delight in discovering "goofs" by visitors to Priest River that merited club membership, and sometimes changing the facts a bit to make an award plausible (Hardy 1977).

George Jemison, one of the researchers who shared the award with Gisborne, later became Deputy Chief for Research. Jemison earned not one, but two, Numbskull awards. Lyle Watts became an early member of the Priest River chapter. He recovered from the honor to become Chief of the Forest Service. Ken Davis, the first Numbskull winner at Deception Creek, became Dean of the Forestry School at the University of Montana, and later served as Dean at the University of Michigan and Yale University (Stage, personal communication). The awards were coeducational; seven women were listed as winners.

At the Intermountain and Northern Rocky Mountain Stations, the lessons to be learned from the "numbskulls" were that even the best performers err now and then, and it was important not to take oneself too seriously. Ken Davis kept a constant reminder. He still had the 1930s photo of the 4,000-pound paper cutter he ordered by mistake on his office wall in 1952, when Al Stage was his research assistant at the University of Michigan (Stage, interview).

When Station Headquarters employees and retirees attended a Christmas luncheon, such as this one at Ogden's Mansion House in the early 1970s, they dressed for the occasion. Here, Assistant Station Director George Gruschow (left) chatted with Carolyn Keck. Carolyn's husband, Wendell (next to her) was retired and in the process of writing a history of the Great Basin Station as a volunteer.

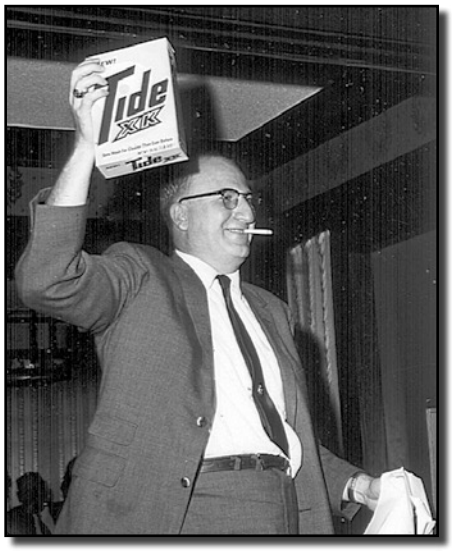
Fairies and Farewells

Holiday and retirement parties were premiere social events through most of the Station's history. Christmas parties staged by Headquarters personnel were coat-and-tie and party-dress affairs, usually formal dinners or luncheons. They lasted several hours and featured carol singing and sometimes ingenious programs of variable quality. Retirement parties, minus the carols of course, also were well-organized and attended. Employees at labs arranged similar events. Both types of parties sometimes were held as joint affairs with other units. In 1975, *INTercom* (11/28) carried this report titled "Holiday Parties Ahead:"

> Plans are being made for annual Christmas parties throughout the Station. Employees at the Missoula FSL will gather Dec. 6 for dinner and dancing at the Longhorn. Missoula Fire Lab personnel have set Dec. 19 as the date for their party, with details to be worked out. The SEAM group (Billings) has been invited to join the Custer National Forest party on Dec. 6 at the Rod and Gun Club. The Station's Boise people are planning a luncheon; the Bozeman FSL reports things "still in the early planning stage." Our source in Moscow announces that they plan to join Palouse Ranger District personnel for dinner and dancing at the Elks Club on Dec. 6. Ogden, Provo, Logan, and Ephraim employees and local retirees will meet Dec. 18 at the Elks Lodge, Ogden.

Over the years the nature of the parties changed. New forms of entertainment appeared, single-parent families or families with both parents in the workforce became more common, and people generally complained of not having enough time to get things done. In the new environment, potlucks and informal lunches or presentations at scheduled "break times" became more common.

In 1979, personnel at the Fire Lab made a complete change when they started a "Christmas Family" project rather than holding a holiday party (*INTercom* 1/11/79). Pat Andrews, chairman of the Lab's Welfare Committee, reported that groceries, gifts, and cash were delivered to the home of Mrs. Ann Perkins in Missoula a few days before Christmas to bring holiday cheer to her and her five children. Cash donations and profits from candy and soft drink machines at the Lab provided funds for this and other welfare activities.



Christmas party programs could feature all sorts of hijinks. Ed Cnare, Branch Chief for Publications and Information Services, may have been discussing something about cleaning up manuscripts.

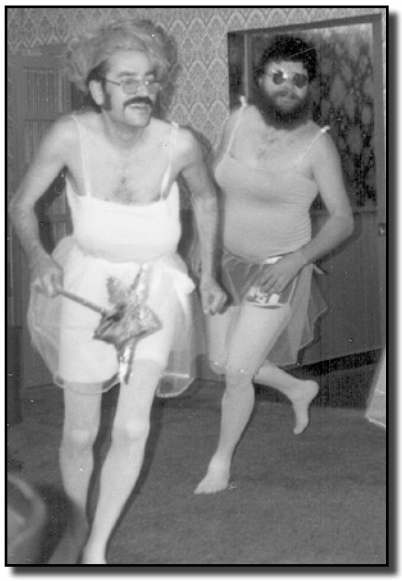
"Sugar Plum Fairies" (left to right) Ron Tymcio, Curt Peterson, Mike Prouty, Bob Fischer, Greg Bernu, Bill Dunning, Dave Chojnacky, and Tom Pawley. Peterson was the Station's Civil Rights Director, Prouty was the Public Information Specialist, and the other lovely fairies worked in the Forest Survey unit in Ogden.

Change on the party front probably was inevitable. But some of those old-time parties sure were fun! Anyone who saw Ira Menacker as a "Sugar Plum Fairy" leap into the arms of Bob Fischer never forgot the experience.

The fairies gave two performances. The first was at a rather novel Christmas Party held in 1979 in the basement of the Forest Service Building. Each unit stationed there presented a skit. Forest Survey brought down the house when the fairies performed. Their costumes and choreography were provided by Survey staff member Melissa Van Meeteren, who drilled the fairies in the appropriate dance steps. In true Broadway style, the fairies presented their director with roses after the successful "opening night" performance.

Several years later Mike Prouty was appointed chairman of the Christmas party committee. The story goes that he approached Survey people about staging "The Return of the Sugar Plum Fairies." They wouldn't agree unless he participated. He did, and also talked his friend Curt Peterson into donning the pink tights of a "fairy."

According to Peterson, practices were frequent and intense (personal communication). "It was overkill," Peterson said. We practiced all the time in the basement of the building. We even had a dress rehearsal right before the program." Peterson said there was at least one justification for practice sessions, however, "Menacker was pretty nervous about the whole thing."



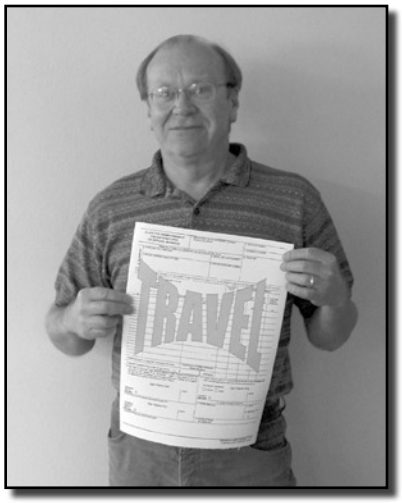
Ira Menacker (with wand) and Bob Fischer cavorted to the music of the Nutcracker Suite as they warmed up for the highlight of a Sugar Plum Fairy performance—when Menacker leaped through the air into Fischer's arms. The wand had a pin as its tip that Menacker used to pop the balloons that were an important part of the fairies' costumes.

The "Return of the Sugar Plum Fairies" was staged at the Mansion House restaurant in Ogden for an appreciative luncheon audience of employees, retirees, and their families. It was a great success, although there is no indication that the fairies ever performed again.

During a program to say farewell just before Station Headquarters was moved from the Forest Service Building to the Federal Building in Ogden, Research Information personnel unveiled some startling statistics. It took 11 months to move two blocks, some 7 months longer than it took early settlers to walk from Missouri to Utah pulling handcarts filled with all their possessions. The assumption was that the possessions included the pioneers' office equipment. Had the move been to Hooper, a small community southwest of Ogden, it would have taken 22 years, an entire career for a typical moving coordinator. Knowing of my fondness for the old building, Larry Lassen displayed a photo showing my reaction to news of the move—a portrait of an enraged gorilla.

When a hearty laugh rang out across a crowded room, Station people knew Wyman Schmidt had appeared to spread good cheer. Schmidt devoted much of his spare time to song—with "The Chord Rustlers," a Bozeman men's group, and to a barbership quartet that sang at local functions. A lead tenor, Schmidt started singing in barbershop groups as a teenager. While serving in the U.S. Air Force during the Korean War, he frequently was assigned to Special Services to provide entertainment at military bases throughout the United States (*INTercom* 5/6/76). When Station people held meetings in Bozeman or Missoula, Schmidt often arranged a performance by barbershop singers as an after-hours activity. The tables were turned when he retired in 1994. A barbershop quartet serenaded him at the party.

Public Information Specialist Delpha Noble was visibly upset when she heard that a news release she had written had caused the Region 1 Director of Timber Management to "bounce off his office walls like a ping pong ball" (see "Family Fights Erupt," chapter 11). Nobel calmed down after being assured by her supervisors that she had done a good job and the offensive words were not hers. Years later at her retirement luncheon, one of the "gifts" bestowed on Noble was a shoebox filled with ping pong balls.



Project Leader Jack King displayed one of several posters specially made for a novel "holiday party" to honor the end of a fiscal year at the Boise Lab.

Some people will go to almost any lengths to find a reason for a little party, but personnel at the Boise Lab may have taken the prize. They sponsored an informal "New Years" observance at the end of a *fiscal* year. Among the highlights were displays of posters representing various paperwork hassles known to try the patience of Federal employees.

When Alan Green (Forest Survey) retired after more than 40 years of service, long-time associate Ted Setzer said Green "wasn't old enough for tributes," but stories were all right. Setzer related that during one of Green's early years in the Forest Service he chartered a plane to drop heavy rolls of barbed wire to be used to fence study plots, because he "wanted to avoid carrying all that weight all that distance on his back." According to Setzer, Green's talent for "bombing" study plots was recognized in Washington, DC, causing him to be transferred there to work on a project funded by the CIA. Asked to comment on the Setzer story, Green said, "It's mostly all lies" (*INTercom* Mar./91).

Some retirement party humor was used so often it nearly became a requirement. A retiring entomologist usually was labeled an "old bugger" sometime during the proceedings. A standard gift recognizing the greatest scientific contribution of the new retiree was two blocks of wood, which of course could be used to annihilate even the most fearsome insect pest.

When long-time Technical Publications Editor Martin Onishuk retired in 1991 Erv Schuster presented him with the "Iowa State Prediction Wheel." The economics unit Project Leader claimed the wheel proved that Onishuk's predictions during breaks at the Missoula Forestry Sciences Lab had invariably been wrong (Klade 1991). And when the Station newsletter published an account of the party, the editor skipped the traditional photo approach and published a cartoon on a certificate recognizing Onishuk for "relentless efforts to eradicate arcane obfuscation."

Martin Onishuk was recognized with a cartoon for 18 years at the Station during which he edited more than 46,000 manuscript pages.

Give Us a Break

Once upon a time Station personnel were required to appear for duty at 8 a.m. and stay on the job until 5 p.m., five days a week. Anybody who wanted to could take a 15-minute break at 10 a.m., another at 3 p.m., and an hour for lunch at noon. The researchers, however, were notorious for working all sorts of strange hours, often many more than required, and ignoring most of the rigid attendance requirements. But almost everybody who was not working in the field showed up for the breaks.

Not all in Station history liked the idea of breaks. Pioneer fire researcher Harry Gisborne reacted adversely when the idea of having a morning and afternoon break on official time was put to Northern Rocky Mountain Station employees on March 3, 1949. Gisborne, known to be extremely dedicated to his work and demanding of his subordinates, said, "I would like to suggest that our Division of Fire Research avoid the practice of ganging up for a coffee period. That leads to excessive noise and confusion which definitely interferes with work by all those in adjacent offices and which does cause unfavorable public comment" (Hardy 1977).

According to Project Leader Dennis Ferguson of the Moscow Lab (personal communication), "Coffee breaks at the Lab used to be real interesting. Often we'd get into discussions about science that led to some good cooperation and insightful comments. Nowadays people only attend coffee breaks when something special is going on, or on Friday mornings, because we have donuts on Fridays."

Ferguson's comments could be applied to all Labs and Station Headquarters once flexible work schedules became the norm, and even "work at home" arrangements were possible. Set break times became a thing of the past. That was too bad in a way, because the breaks gave people a chance to get to know fellow employees on all levels in an informal atmosphere, many exchanges related to work occurred, and often some humor was injected into otherwise tedious days on the job.

AD for Administration John Destito (right) seemed serious, but no one else did, during this break outside the Station Director's office that coincided with a Halloween costume day. The revelers were (left to right) Lynda Aoki, Nancy Murray, Ava Antonich, Irene Voit, and Larry Lassen.

A Quick Trip Through the Last Two Decades

This sampling of events great and small is intended to provide insights into changes in programs and key personnel at the Intermountain Station during the last years before its merger with the Rocky Mountain Station. The items also include achievements by Station people not mentioned elsewhere, and how they were recognized by others. Examples of special activities at work and in community and international service also are presented. Almost all 1975-1995 items are from the *INTercom* newsletter; a few are from news clippings. The last entries are from "Director's Notes," issued electronically by the Station Director's office.

***Jan.* '75** —Plant Ecologist Steve Arno (Missoula FSL) received the Director's Award for Publications Excellence from the National Park Service for his book, *Discovering Sierra Trees*.

Station employees topped their goals for giving to the Combined Federal campaign with 80 percent participation and 167 percent of the dollar goal.

Perry Plummer (Ephraim), Bob Pfister (Missoula FSL) and Marv Foiles and Glenn Deitschman (Moscow) were among 100 scientists who contributed to *Seeds of Woody Plants in the United States*, published by the Department of Agriculture.

Glenn Deitschman was senior author of five sections in "Seeds of Woody Plants in the United States," a handbook produced by USDA in 1975 that was translated into several languages and reprinted many times. Deitschman joined the Station at the Inland Empire Research Center in Spokane in 1963 as leader of a new project on silviculture of western white pine and associated species. He continued to lead the unit after it was moved to the Moscow Lab until he retired in 1976.

***Feb.* '75**—Economist Denny Schweitzer (Missoula FSL) developed a slide show titled *Forest Service Research in Montana*. It was available for others to duplicate and use.

***Mar.* '75**—Range scientist Joe Basile was appointed to the Library Board by the Mayor of Bozeman.

***Apr.* '75**—Bob Mutch (Fire Lab) was reelected to the board of trustees of the Target Range School District.

***May* '75**—Wood Utilization Specialist Dave Lowery (Missoula FSL) returned from a 2-year Peace Corps assignment during which he developed a graduate program for the University of Chile.

Local newspapers reported community service by three Station people. Dean Rogers (Logan) was recognized for 6 years of promoting a conservation education program in schools, Steve Monsen (Boise) assisted in a program to plant big game forage near Emmett, Idaho, and Phil Barker (Logan) was named chairman of a Cache Valley committee whose goal was to plant 20,000 trees during the year.

***June* '75**—Employees at the Missoula Forestry Sciences Lab began a trial of "Flexitime" work schedules, the first in the Station.

Ed Wicker (Moscow) was named Project Leader for research on biology and management of diseases in Northern Rocky Mountain forests.

***July* '75**—Food and Agricultural Organization Fellows from Nicaragua and Thailand toured the Fire Lab with Alan Taylor as part of a fire management study sponsored by the United Nations.

Aug.* '*75—Chuck George was named Project Leader for fire control technology research at the Fire Lab.

Oct.* '*75—John Deeming was named Project Leader for research on the National Fire Danger Rating System at the Fire Lab.

Nov.* '*75—About 350 people attended the dedication ceremony and open house to mark the opening of the Shrub Sciences Laboratory in Provo.

Ted Setzer's mother and several other relatives were featured in a *National Geographic* article about Iowa's Amana Colonies (a photo of Mrs. Setzer was the cover scene). Ted (Forest Survey) was Director of the Amana Department of Forestry, whose operations included a sawmill and 8,000 acres of hardwood forest, after he graduated from Iowa State University in 1958.

Dec.* '*75—Director Roger Bay hosted Congressman Max Baucus (D-Montana) on a tour of Station research facilities in Missoula. Dick Rothermel, John Deeming, Hal Anderson, and Jim Lotan gave briefings.

Roy Brown, an African-American student at Weber State College, joined the Station in Ogden as a business management trainee. Program enrollees could become eligible for regular employment if they successfully completed work assignments.

Jan.* '*76—Perry Plummer (Provo) returned from a 3-week trip to the Soviet Union where he worked with Agricultural Research Service personnel laying the groundwork for an exchange of information about native plants between the Soviets and the U.S.

Feb.* '*76—Don Fuquay (Fire Lab) was awarded a Ph.D. by Colorado State University. Bob Murray (Reno) received a Ph.D. from Washington State University.

Mar.* '*76—Forest Service Chief John McGuire presented a cash award to fisheries biologist Bill Platts (Boise) for outstanding work on the national Resources Planning Act project.

Bob Mutch (Fire Lab) returned from Hawaii where he was a member of a team developing a fire management plan for Volcanoes National Park.

Apr.* '*76—Project Leader Jack Lyon (Missoula FSL) was featured on the TV program "Helena Outdoors" discussing elk behavior related to logging in forest areas.

May* '*76—Dave Fellin (Missoula FSL) finished first in the 45 to 54 age group in a 7-mile race from Milltown to downtown Missoula. Bob Benson and Dick Schmitz also competed.

June* '*76—The Priest River Youth Conservation Corps camp opened for 10 boys and 10 girls, ages 15 through 18, who lived, worked, and studied at the camp Monday through Friday for 8 weeks. It was the first YCC camp in the Nation to be established at a Forest Service research site.

July* '*76—Dave Lowery (Missoula FSL) was named chairman of the Inland Empire Section of the Forest Products Research Society.

James Hanover, a forestry professor at Michigan State who had been a scientists at Moscow (1956-1965), developed a new tree in honor of the bicentennial, the *New York Times* reported. The "American Spruce" was created by cross-breeding red, white, and blue spruces.

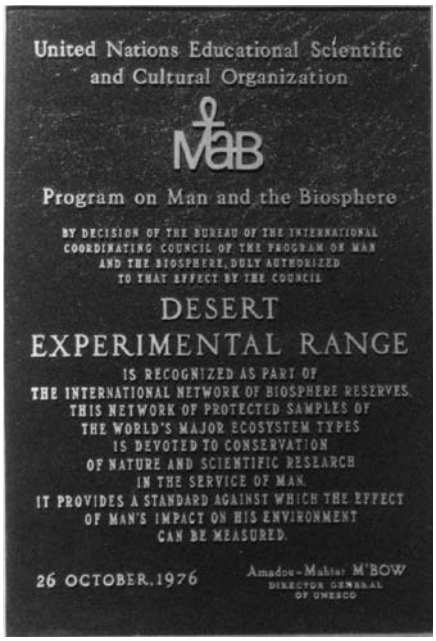
Aug.* '*76—Director Roger Bay planted a Douglas-fir seedling in a ceremony at University Center Mall at the University of Montana. The seedling was grown from a seed that was taken to the moon in 1971 on the Apollo 14 mission.

More than 200 people, including four former Directors, attended 3 days of events celebrating the 65th anniversary of the founding of the Priest River Experiment Station.

Sept.* '*76—Dick Barney (Fire Lab) was awarded a Ph.D. by the Department of Forestry, Michigan State University.

John Host (Missoula FSL) was named to the newly formed Missoula County Board of Adjustment for a 2-year term.

Oct.* '*76—The Coram Experimental Forest and Desert Experimental Range were among the first biosphere reserves to be recognized by the United Nations Educational, Scientific, and Cultural Organization (UNESCO). Biosphere reserves are protected as samples of the world's major ecosystem types through UNESCO's "Program on Man and the Biosphere."



Bronze plaques were installed to permanently record selection of the Coram and Desert Range experimental areas as biosphere reserves.

Lenore Rios (Ogden) was named Coordinator of the Station's Spanish-Speaking Program, a part of the total Equal Employment Opportunity program.

Brigham Young University leased 27 acres of land at the foot of "Y Mountain" to be used for plant studies by Station scientists at Provo.

Nov.* '*76—Frank Albini (Fire Lab) returned from a 3-week visit to the Leningrad Forestry Institute, Russia, where he consulted with scientists involved in systems analysis approaches to fire operations.

The Christian Science Monitor carried a feature story, "Sagebrush—old villain now a friend," that described work at the Shrub Lab and quoted plant geneticist Durant McArthur.

Feb.* '*77—Bill Fischer (Fire Lab) was named chairman of the Northern Rocky Mountain Section of the Society of American Foresters.

Apr.* '*77—AD Jim Blaisdell and Jack Ward Thomas of the Pacific Northwest Station presented a prospectus for research at the first national forum on "The Wild Horse and the Western Public Land" at Reno.

Region 1 issued a *User's Guide to Debris Prediction and Hazard Appraisal*, written by John Puckett and five Fire Lab scientists—Frank Albini, Jim Brown, Dave Bunnell, Bill Fischer, and Ken Snell. The Regional Director of Fire and Aviation Management said if techniques in the guide are properly used, management of forest residues in the Northern Rocky Mountains would be improved significantly.

May* '*77—Project Leader Mal Furniss (Moscow) returned from Mexico where he presented a paper on the Douglas-fir beetle at a meeting of the Entomological Society of Mexico and participated in fieldwork in the mountains of Chihuahua.

June* '*77—Hedri Hadri of the Soil Conservation Office, Ariana, Tunisia, visited Ogden, Logan, and Provo to discuss range, soil, and water conservation practices with Station scientists.

July* '*77—Deputy Director Con Schallau announced he was leaving the Station to become Project Leader for regional economic research at the Pacific Northwest Station lab in Corvallis.

Aug* '*77—Fisheries Biologist Bill Platts (Boise) and AD Jim Blaisdell attended the first meeting of the Western Anadromous Fish Habitat Research Program in Juneau, Alaska.

Sept.* '*77—A report showed that young people from Youth Conservation Corps camps in southern Idaho contributed hundreds of hours over the summer to Station fish habitat studies on the South Fork of the Salmon River.

Carter Gibbs was named Deputy Director, moving from an AD position at the North Central Station. Gibbs previously served at the Southern Station and in the Washington Office, where he was responsible for leadership of nationwide research programs concerned with ecology, silviculture, and management of hardwood forests.

Oct.* '*77—John Host (Missoula FSL) was in charge of arrangements for Montana Logging Association workshops that focused on cost control for independent loggers.

Nov.* '*77—Station units began hiring enrollees in the new Young Adult Conservation Corps program; 38 young people were expected to be assigned to research activities.

Entomologist Chuck Tiernan (Provo) worked with residents of Springville, Utah, to transplant native shrubs and trees to the city's Heritage Park arboretum.

Jan.* '*78—George Stankey (Missoula FSL) was chairman of a special task force developing a rating system for evaluating wilderness quality in a major phase of the Forest Service's national Roadless Areas Review and Evaluation (RARE II).

Feb.* '*78—Botanist Steve Monsen (Provo) supervised trial seeding and planting of shrubs selected for a major revegetation program on the Snake River Plains in southern Idaho. A cooperative program of the Station, Bureau of Land Management, and Idaho Department of Fish and Game, the work was designed to produce a tenfold increase in the number of ring-necked pheasants in the area within a few years.

Mar.* '*78—A half-hour telecast from Idaho Falls featured Project Leader Walt Cole (Ogden) discussing research aimed at reducing losses of lodgepole pine to mountain pine beetles.

June* '*78—Ecologist Steve Arno (Missoula FSL) nominated or co-nominated three of the trees—Arizona alder, subalpine fir, and subalpine larch—listed in the American Forestry Association's 1978 National Register of Big Trees.

The *Idaho Statesman* featured Soil Scientist Jim Clayton (Boise) in a column titled "Portrait of a Distinguished Citizen."

July* '*78—Dick Schmitz (Ogden) was awarded a Ph.D. by the Department of Entomology, University of Idaho.

Aug.* '*78—The Idaho Department of Fish and Game recognized Wildlife Biologist Dean Medin (Boise) for his work in helping to evaluate and develop a big game population computer simulation program.

Dwane Van Hooser of the Forest Resources Economics Research Staff in Washington, DC, was named Project Leader of Forest Survey.

Seventy land managers, educators, and industry representatives met for 2 days at Coeur d'Alene to learn of progress made since 1974 when the Station and the University of Idaho accelerated their cooperative program of research on intensive timber culture.

Oct.* '*78—Walt Cole (Ogden) was coordinator of a program to help Laotian refugees adjust to life in the U.S. Phoukkanh Salenthone, who had been interred in a refugee camp for nearly 2 years in Cambodia, was living with the Cole family while he worked and learned English.

Project Leader Walt Megahan (Boise) taught a course in forest hydrology at the Forest Ecology Institute, San Vito, Italy, during a technology exchange trip to four European countries.

Nov.* '*78—Monsour Mohammadi and seven associates from Iran visited the Fire Lab as part of a 5-month tour to learn about American forestry, especially fire management.

Lyle Cooper (Moscow) and his family lost all personal belongings in a fire in their rented home. Plant Pathologist Neil Martin provided a house for the Coopers and donations of furniture, clothing, food, and $800 cash, including $300 from the Fire Lab, poured in from Station people.

Jan.* '*79—John Deeming, former Project Leader for National Fire Danger Rating System research at the Fire Lab, received the "Outstanding Service in Fire Management Award," the highest honor available to wildfire managers, for his work at the Station.

Feb.* '*79—The magazine of the J. R. Simplot Company, *Simplot World*, said, "With the valuable assistance of (Paul) Packer and his colleagues (Bland Richardson and Bryan Williams) we're having increasingly better success in reclamation work." The article

The J. R. Simplot Company's first success in revegetating a phosphate mine waste dump, at the Maybe Canyon Mine in southeastern Idaho, was based on research by the Logan reclamation unit in the 1970s.

recognized "outstanding work" by the Logan researchers at phosphate mines in southeastern Idaho.

Mar.* '*79—Electronics Engineer John Warren (Boise) received an award for work with Bureau of Land Management personnel at the Boise Interagency Fire Center in developing and testing use of remote automatic weather stations.

Apr.* '*79—Bruce Welch (Provo), chairman of the Civil Rights Committee, reported that the Station was successful in meeting most of its minority and women employment targets for fiscal year 1978, although the targets were modest.

May* '*79—Art Tiedemann, scientist with the Pacific Northwest Station at Wenatchee, was appointed Project Leader for shrub improvement work at Provo.

June* '*79—Ed Archuleta (Ogden) received a Presidential Citation during Vietnam Veterans Week for his "continued service to community, State, and Nation."

July* '*79—Liz Close (Ogden) was elected secretary of the Forestry/Forest Products Section of the Special Libraries Association.

Oct.* '*79—Idaho forest managers began using a new tool, a manual titled *Photo Series for Appraising Thinning Slash in North Idaho*, coauthored by Wayne Koski of the State's Department of Public Lands and Bill Fischer (Fire Lab).

Nov.* '*79—Roger Bay established the "Director's First Annual Physical Fitness Award" by announcing he would provide free coffee break treats for the Lab whose people had the lowest average blood pressure during a Station-wide fitness check.

Employees at Station Headquarters pledged 141 percent of their goal for the Northern Utah Combined Federal Campaign and 61 of 69 employees made contributions.

Jan.* '*80—Chuck Hepner as Woodsy Owl and Paige Ballard as Smokey Bear charmed youngsters at the Latah County Fair in Moscow.

Mick Gonsior (Missoula) was named Project Leader for research on wood utilization in the Intermountain West.

The quarterly issue of Recent Reports listed 55 new Station publications, the most ever. In the first month the list was out, the Research Information Group received 3,596 requests for 31,169 publication copies; after that the distribution clerks stopped counting.

Feb.* '*80—Al Harvey (Moscow) was named Project Leader for research on forest diseases in the central and northern Rocky Mountains.

Thadd Harrington of the Southern Station was named AD for Research-North, to be located in Missoula. He succeeded Ralph Klawitter, who retired.

Barney Coster, Program Manager of SEAM since 1978, was named Supervisor of the Shasta-Trinity National Forest in California.

Mar.* '*80—Deputy Director Carter Gibbs, R-4 Regional Forester Vern Hamre, and Forest Service Chief Max Peterson held a news conference in Salt Lake City in conjunction with Peterson's visit to the national workshop on Management of Western Forests and Grasslands for Nongame Birds.

Ray Shearer, Ward McCaughey, Chuck Tiernan, and Clint Carlson (Missoula), and Wyman Schmidt and Dennis Cole (Bozeman) gave a seminar for 100 Bureau of Indian Affairs foresters at Polson, Montana, on factors affecting management of subalpine forests.

Project Leader Art Tiedemann (Provo) accepted a 3-year appointment to the editorial advisory board of *Forest*

Senior Enrollee Porfirio "Sandy" Padilla filled an order for publications at Station Headquarters in 1980, a banner year for document announcements and requests.

Science, technical journal of the Society of American Foresters.

Meteorologist Arnold Finklin (Fire Lab) received a Special Service Award from the National Weather Service for many years of keeping daily records at a weather station located in his home.

Apr. '80—Four Station scientists—Russ Ryker, Bob Steele, Norb DeByle, and George Schier—were selected as "best qualified experts in their fields" to be instructors for Region 4's program for certification of silviculturists at Utah State University.

May '80—Biological Technician John Woo (Moscow) and his wife Helen created a surprise highlight for a delegation from the People's Republic of China when they provided special delicacies and used a traditional serving set at a "tea break" they hosted for the visitors.

Range Conservationist Sherel Goodrich (Provo) discovered a new plant species during field studies on the Toiyabe Range in Lander County, Nevada. The curators of Brigham Young University's herbarium named the plant for Goodrich—*Cymopterus goodrichii*.

Fred Shafizadeh, a cooperator in several Station studies, received the University of Montana's first Distinguished Research Award for his work in wood chemistry.

June '80—Kathy Seyedbagheri, a participant in the cooperative education program at the Station, received the "Outstanding Senior" award from the Department of Watershed Science, Utah State University.

July '80—Four German Air Force specialists visited the Fire Lab to learn how U.S. fire fighters use fixed-wing aircraft and helicopters in control work.

Hydrologist Gene Farmer (Logan) was appointed to a committee of the National Academy of Sciences that was charged with reviewing practices needed to ensure safe and environmentally sound disposal of spoils from mining operations.

Aug. '80—Gene Amman (Ogden) presented a paper on mountain pine beetle-lodgepole pine interactions at the International Congress of Entomology in Kyoto, Japan, which was attended by 2,200 entomologists from throughout the world.

Director Bay and Regional Foresters Tom Coston (Region 1) and Jeff Sirmon (Region 4) hosted 30 leading natural resource educators from eight States on a tour focused on "Fire Management in the 1980s." Jim Lotan (Missoula) was chairman of the planning committee, and 14 Station scientists and administrators participated.

Sept. '80—The Fire Lab celebrated its 20th anniversary and the 75th birthday of the Forest Service with an open house and special program coordinated with similar activities at the Aerial Fire Depot in Missoula.

Oct. '80—While John Woo (Moscow) was training Rodolfo Campos, entomologist with the University of Chapingo, Mexico, in uses of the electron microscope, the two discovered an anatomical feature that helped identify a species of bark beetle of major concern to Mexican foresters.

Rodolfo Campos (left) and John Woo worked at the scanning electron microscope at Moscow.

Group Leader Tom Baugh and 14 members of the Research Information staff received awards for record production of publications and technical information services.

Nov. '80—George Stankey (Missoula FSL) was named a Senior Lecturer of the Natural Resources Group at Canberra (Australia) College and was to leave soon for the 2-year assignment for which he would draw on his experiences with the Station's wilderness research unit.

The College of Forestry at Colorado State University reprinted and used as a textbook a Station publication, *Environmental Consequences of Timber Harvesting in Rocky Mountain Coniferous Forests*.

Feb. '81—Gene Farmer (Logan) was named Project Leader of the mined-land reclamation research unit.

O'Hara Creek, 7,000 acres in the Nez Perce National Forest, was the first large, relatively undisturbed stream area in Idaho designated as a Research Natural Area. The area featured beaver colonies, wet meadows, and notable cascades and waterfalls.

Mar. '81—An article in the *Toronto Star* told Canadian readers of the place of sagebrush in western ecology; it included several quotes by Plant Geneticist Durant McArthur who was

Library Technician Ruth Hyland (second from left) took Station library services into the field in 1980 as she acted as interpreter between Region 1 foresters and visitors from Chile. Hyland was fluent in Spanish and Portugese. During World War II, she used her skills to break codes and translate documents as a cryptographic specialist with the Office of the Chief Signal Officer in Washington, DC.

contacted by the newspaper at the Provo Shrub Lab.

Apr.* '*81—Mathematician Pat Andrews (Fire Lab) served as a member of the steering committee for the HOST program, an effort to improve all aspects of client and visitor contact at the Station.

Scientists Frank Albini and Don Latham (Fire Lab) were awarded a U.S. patent for their invention of an improved housing for data storage disks.

An IBM Displaywriter, one of the most sophisticated word-processing systems available, was delivered to Station Headquarters. All field locations were to get similar units by mid-September.

June* '*81—Station scientists at Bozeman hosted Adamma Okwu, who was studying at Yale University with support by the Nigerian Federal Department of Forestry.

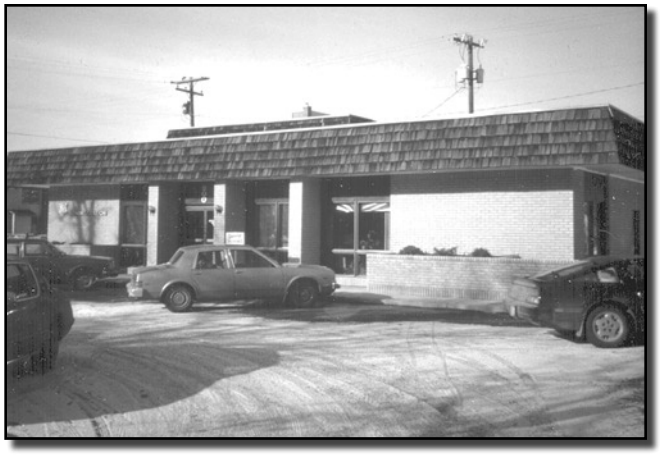
Sept.* '*81—The National Academy of Sciences appointed Walt Megahan (Boise) to a 3-year term on the hydrology committee of its Transportation Research Board.

Oct.* '*81—The Station sponsored workshops in northwest Wyoming for managers from three Forest Service Regions and State forestry personnel from Idaho, Colorado, and Wyoming to discuss research results applicable to high-elevation lodgepole pine forests.

The Station and Uinta National Forest sponsored a tour for managers featuring discussions of research on Gambel oak and the forest's management policies for the species.

Project Leader Gene Farmer (Provo) participated in a National Research Council study of regulations for reclaiming surface-mined coal lands.

Nov.* '*81—Fisheries Biologist Bill Platts (Boise) was elected Second Vice President of the American Fisheries Society, the first Forest Service employee to hold the position. Platts automatically became president of the society in 1984.



The Station acquired the Missoula Administration Building in 1982. Personnel initially assigned there were AD Thadd Harrington; Dorothy Dryden and Janet Johnson, AD's office; Martin Onishuk and Bryan Owen, research information; Gayle Yamasaki, statistician; Steve Cooper, Bryan Steel, and Mike Sweet, silviculture research unit; and Dallas Summerfield, Dorothy Walker, Erma Jorgenson, Pat Boyer, Pat Courchene, Eileen Neill, Darlene Betz, Marilyn Harris, and Gail Hallesy, research support services. The building later housed the Aldo Leopold Wilderness Research Institute.

The Wasatch Audubon Society (Ogden) announced election of AD Keith Evans to the board of directors and Assistant Resource Analyst Dennis Collins (Forest Survey) as vice president.

Dec.* '*81—Physical Science Technician Bob Schuette (Fire Lab) was named Air Crewman of the Year by the Montana Army National Guard for his work as a helicopter crew chief.

Jan.* '*82—Faced with a bleak budget year, Director Bay advised employees that to conserve funds Station management would give full consideration to requests for voluntary leave without pay or voluntary changes to lesser hours of duty.

Feb.* '*82—Mechanical Engineer Frank Albini (Fire Lab) gave a paper at a Navy Department conference attended by 400 people interested in ways to improve fire prevention and control systems on ships.

Mar.* '*82—Plant Physiologist Bruce Welch (Provo) accepted a 3-year appointment as an associate editor of the *Journal of Range Management*.

Photos by Mal Furniss (Moscow) took first and second places in the outdoor recreation category and a second in the scenic group in a contest sponsored by *Idaho Wildlife*, official magazine of the Idaho Department of Fish and Game.

Apr.* '*82—Eighteen employees moved into the Missoula Administration Building, formerly the Missoula Federal Credit Union Building, just west of the Forestry Sciences Laboratory. The change was made to relieve overcrowding at the Fire Lab and consolidate administrative people in one place.

AD Keith Evans was appointed an associate editor of the *Journal of Wildlife Management*.

May* '*82—Project Leader Dwane Van Hooser (Forest Survey) was one of a group of eight to receive a USDA Superior Service Award for preparing a comprehensive report on timber supplies

Silviculturist Mike Cole pointed out the effectiveness of stand culture in young lodgepole pine forests to Adamma Okwu, a visiting student from Yale University.

in the U.S. as a special assignment to meet requirements of the Resources Planning Act.

John Emerson, Supervisor of the Flathead National Forest, wrote, "As a result of Bob Lucas' help with trail traffic counters and cameras, and subsequent analysis of the data, the Lewis and Clark, Lolo, and Flathead managers now have the best traffic data we have ever had for the Bob Marshall Wilderness."

Brian van Wilgen, research officer in the South African Department of Forestry, began a 5-month working visit to the Fire Lab.

June '82—Dick Krebill, AD at the Rocky Mountain Station in Tempe, Arizona, agreed to become AD-North, located in Missoula, in mid-August. He replaced Thadd Harrington, who retired.

Bill Fischer, Ron Prichard, and Steve Arno (Fire Lab) authored articles in a special issue of the *Missoulian* describing wildland fire history, costs, and ways homeowners could protect themselves and their property. More than 100,000 people received copies of the issue.

Project Leader Walt Megahan, Jim Clayton, and Gary Ketcheson (Boise) conducted a tour of the Silver creek watershed research area for hydrologists from the National Council of the Paper Industry, Potlatch Corporation, and Georgia-Pacific.

July '82—Members of the Station's Fire Control Technology unit (Fire Lab) participated in field tests of a new retardant delivery system for a helicopter owned by the Los Angeles County Fire Department.

Oct. '82—The national Research Accomplishments Report included five Station contributions: (1) Alternative designs reduce impact of forest roads; (2) managing ecological impacts at wilderness campsites; (3) reducing cattle grazing and fish habitat conflicts; (4) small trees play a big role in the Great Basin; and (5) fire as a management tool.

Nov. '82—An article on the front page of *USDA*, the Department of Agriculture's employee newsletter, described the life-saving assistance Ray Brown (Logan) and other Station people gave at the scene of a serious auto accident in Montana in August.

Walt Megahan (pointing) and associates at the Boise Lab gave many briefings at the Silver Creek study area in the Boise National Forest for managers and researchers concerned with sound management practices in areas having highly erodible granitic soils.

Dec. '82—Wood Scientist Peter Koch and retiree Mike Hardy, former Project Leader for fire control research at the Fire Lab, were elected Fellows of the Society of American Foresters for "outstanding service to forestry."

Feb. '83—Bev Holmes was named Assistant Director for Research Support Services, replacing Dave Blackner, who transferred to Region 4 as Director of Personnel Management.

Region 4 gave Liz Close (Ogden) a cash award for "outstanding service implementing the WESTFORNET technical information system in the Intermountain Region."

Mar. '83—Project Leader Russ Ryker (Boise) was honored as Forester of the Year by the Intermountain Section of the Society of American Foresters "for his efforts in applying research findings to practical forest management."

Apr. '83—Geneticist Durant McArthur (Provo) said "Rincon" fourwing saltbush, a superior strain of a shrub native to the Intermountain West, soon would be available for use in soil stabilization and rangeland seeding programs, climaxing 24 years of cooperative research by State and Federal personnel.

Research Forester Steve Arno (Fire Lab) was elected chairman of the Northwest Scientific Association.

June '83—The spring issue of *Women in Forestry*, a magazine published by the University of Idaho college of Forestry, Wildlife, and Range Sciences, had an article by Forester Jonalea Tonn (Moscow) describing her research activities, including an evaluation of commercial thinning in a western white pine plantation.

Aug. '83—Deans and professors from major western colleges and universities and National Forest System officials examined elk habitat-logging and other issues during an Educators Seminar jointly sponsored by Regions 1 and 4 and the Station.

Sept. '83—A field demonstration by Forest Survey personnel of what they do and why was a highlight of an orientation in the Jackson, Wyoming, area for Station Headquarters employees.

Durant McArthur (Provo) was named Project Leader for research on shrub improvement and use in revegetation.

Russ Graham (center) and Bill Wykoff (right) of the Moscow Lab explained silvicultural studies in progress and development and uses of the Prognosis Model for Ray Housley, Deputy Chief, National Forest System, during an Educators Seminar stop at Deception Creek Experimental Forest.

Oct.* '*83—The first experimental burn in Glacier National Park took place under the watchful eyes of Project Leader Bruce Kilgore (Fire Lab) and cooperator Ron Wakimoto of the University of Montana's School of Forestry.

Nov.* '*83—Fire protection agencies adopted a wildland fire hazard classification for the Sierra Front in Nevada, much of it based on the BEHAVE system developed at the Fire Lab. The classification was the first step in an interagency plan to reduce the risk of fire damage following serious wildfires in 1981.

Jan.* '*84—Chuck Hepner, research technician at the Moscow Lab, was appointed Superintendent of the Priest River Experimental Forest, replacing Cal Carpenter who retired.

Feb.* '*84—Seven Station scientists co-authored chapters in a revised national publication, *Silvicultural Systems for the Major Forest Types of the United States*, a highly regarded reference book.

May* '*84—During a 2-day visit to Ogden, Forest Service Chief Max Peterson praised the Station's half-century-old Davis County Watershed project and Entomologist Walt Cole's work with control of the mountain pine beetle.

The National Science Foundation awarded a grant to the Station and Brigham Young University to assess possibilities of using rubber rabbbitbrush, a common western shrub, as a commercial source of rubber and industrial chemicals.

Acting on a nomination by Gallatin National Forest Supervisor Dave Garber, Associate Chief Dave Unger presented the 1984 National Minerals Management Award to Plant Physiologist Ray Brown (Logan) for his frequent efforts and successes in technology transfer.

June* '*84—A self-described "Forest Service brat," Ann Baker joined the Station as Administrative Officer for the Missoula units. Ann's father worked on a Ranger District and her husband had worked in three Forest Service Regions.

Director Lassen told Ogden Headquarters employees that a decision had been made to move to the Federal Building in Ogden if funding became available to make the change.

Project Leader Rich Everett (Reno) was awarded a Ph.D. in range ecology and soils by Oregon State University.

July* '*84—With 2 months remaining in the fiscal year, authors had sent a record number of manuscripts (267) to Research Information for editing and processing.

Nov.* '*84—Research Forester Steve Arno (Fire Lab) was named Small Woodlot Tree Farmer of the Year by the Montana Tree Farm Committee for being "out in front, practicing his profession on his own land, and setting an example for Montana's small woodlot owners."

An agreement with the Nevada Division of Forestry allowed Project Leader Rich Everett (Reno) and University of Nevada cooperators to use inmates of the State prison to thin tree stands and test several ways to dispose of logging slash in a study near Carson City.

Dec.* '*84—The Intermountain and Pacific Northwest Stations combined their insect collections at LaGrande, Oregon, forming probably the largest sample of insects in the West. The enlarged collection promised to be an important information and identification resource for students and scientists.

Feb.* '*85—Jim Clayton (Boise) was awarded a Ph.D. in soil science by Oregon State University.

Six crews from Forest Survey began gathering data for the first comprehensive statewide analysis of Arizona's wood resources.

Mar.* '*85—Commercial quantities of seed for two improved grass species—Ephraim Crested Wheatgrass and Paiute Orchardgrass, which originated with research at Great Basin—were available for the 1985 planting season thanks to development work led by the Soil Conservation Service.

Apr.* '*85—Project Leader Bruce Kilgore (Fire Lab) left the Station for a position with the National Park Service as Chief of the Division of Natural Resources and Research in the western regional office in San Francisco.

May* '*85—AD Duane Lloyd received a National Public Service Award from The Nature Conservancy for "helping create a model system for public and private cooperative efforts to inventory and designate Research Natural Areas."

Bill Platts (Boise) began a 3-month assignment to help Alaska Fish and Game Department biologists identify critical king salmon rearing areas on the Kenai River.

AD Keith Evans was one of 26 Federal executives selected as Congressional Fellows in a national competition for the 1985-86 program.

Sylvan Christensen (Great Basin), who was enrolled longer than any other person in the Green Thumb Program in the Intermountain area, was honored at a ceremony conducted by Utah Governor Norm Bangerter observing Older American Month. The Green Thumb Program was sponsored by the National Farmers Union and funded by local, State, and national agencies.

June* '*85—Chris Risbrudt, Director of Policy Analysis for the Forest Service,

Ray Brown checked climate data at the McLaren Mine reclamation research and demonstration site. He earned a national award in 1984 for his achievements in transferring his research results to others.

said *Below-Cost Timber Sales: Analysis of a Forest Policy Issue*, by economists Erv Schuster and Greg Jones (Missoula FSL) was widely distributed and quoted before and during Congressional hearings on below-cost sales.

Project Leader Wyman Schmidt (Bozeman) presented a seminar to the Salish-Kootenai Tribal Council on silvics of major trees on the Flathead Indian Reservation. The Council directed activities of Bureau of Indian Affairs foresters who conducted an aggressive timber harvesting program for the tribe.

July* '*85—Research Forester Clint Carlson (Missoula FSL) was elected president of the Montana Academy of Sciences.

Research Engineer Mick Gonsior (Bozeman) received a national Inventor Incentive Award for his work leading to a Department of Commerce patent license for a traction-driven logging system.

Aug.* '*85—The Station led all other Forest Service Stations and all but one Region with a 9.4 percent increase in the number of new Savings Bond subscribers signed up during the 1985 campaign.

The New York Times ("Computer Helps Battle Forest Fires") and the Massachusetts Institute of Technology's *Technology Review* ("Fighting Fires With…Computers") featured research at the Fire Lab via interviews with Project Leader Dick Rothermel, Mathematician Pat Andrews, and Meteorologist/ Physicist Don Latham. The MIT article hailed the BEHAVE system developed at the Lab as a "breakthrough."

Oct.* '*85—A delegation of Chinese scientists and administrators, guided by "Wagonmaster" Mike Prouty, spent 2 weeks touring facilities throughout the Station territory. Prouty said the dedication of the visitors was remarkable, citing an occasion when they stood, oblivious to the conditions, in mud and a driving rain while they peppered Geral McDonald and Ray Hoff with questions about genetics research.

WESTFORNET personnel said response time for literature searches had been cut from 10 days to same-day service for clients who had access to Data General computers.

Budget Officer Carlos Elwood (Ogden) received an award for developing an automated information system that became a model for other Stations and Regions in the Forest Service.

Research Forester Ray Shearer (Missoula FSL) was awarded a Ph.D. in forest ecology by the University of Montana.

Research Forester Dave Chojnacky (Forest Survey, Ogden) was awarded a Ph.D. in forest biometry by Colorado State University.

Nov.* '*85—Entomologist Dave Fellin completed a 2-year task force assignment by providing documentation for half the team's management recommendations to control outbreaks of spruce budworm in the Southwest Region.

Jan.* '*86—The Station-Region 4 Forest Service Women's Association in Ogden raised $600 in donations to help flood victims employed in West Virginia by the Monongahela National Forest and Northeastern Station.

Grant Mortensen, chairman of the Station's Automated Data Processing Committee, said, "Electronic communication may eventually involve time and attendance reports, requisitions and purchase orders, travel authorizations, and numerous standard requests and reports."

Budget Officer Carlos Elwood said a national compilation of data showed the Station had the lowest State Worker's Compensation costs of any Region or Station, which he attributed to "both good management and good luck."

Feb.* '*86—Rita Kennedy (Ogden) was named Hispanic Employment Program Manager of the Year by the Utah program council.

Mar.* '*86—Ecologist Rosemary Pendleton (Provo) was awarded a Ph.D. by Wayne State University.

Research Forester Kevin Ryan (Fire Lab) was awarded a George E. Bright Memorial Fellowship in Forestry by the University of Montana, where he was enrolled in a Ph.D. program.

May* '*86—The Station, in cooperation with Region 4, installed an exhibit in Ogden's Union Station Museum that described links between Forest Service and railroad history and the missions of the Station and Region. The museum was getting about 20,000 visitors annually.

Shirley Hanson, Director of the Union Station Museum in Ogden, admired the Station-Region 4 exhibit showing Forest Service-railroad connections.

Liz Close (left) briefed (left to right) Idaho State Forester Stan Hamilton, Region 4 Director of State and Private Forestry Dave Graham, Toiyabe National Forest District Ranger Mike King, and Region 4 Office Management Assistant Nancy Wright on WESTFORNET technical information services during a tour of Station Headquarters that was part of a State Foresters/Forest Service coordination meeting in 1986.

June '86—The School of Forestry at the University of Montana made a text, *Weather and Climate of the Selway-Bitterroot Wilderness*, by Arnold Finklin (Fire Lab) required reading for students in the Advanced Fire Weather course.

WESTFORNET-Ogden reported filling orders for 12,176 technical information items during June, the most ever in one month.

Aug. '86—A large group of Station people, their families, and distinguished guests assembled at Priest River to celebrate the 75th anniversary of the unit as a major center for research in the Northern Rocky Mountains.

Sept. '86—An article in *Forest Industries* magazine described engineering research work at Moscow to find ways to improve forest road construction that were cost-effective yet limited adverse environmental effects.

Station and Region 4 personnel staged a "Freedom Fest" for 125 patients at Ogden's Stewart Rehabilitation Center that allowed the guests to enjoy a day outdoors in an Ogden Ranger District Campground.

Oct. '86—Project Leader Jim Brown (Fire Lab) and Forester Dennis Simmerman explained that a new publication, *Appraising Fuels and Flammability in Western Aspen: A Prescribed Fire Guide,* gave managers information needed to use controlled fire to maintain aspen stands.

Nov. '86—The National Wildfire Coordinating Group, which had a warehouse and order-taking operation at the Boise Interagency Fire Center, approved a fourth publication by Station scientists for printing as a training aid, making the material available to the international fire management community while conserving Station funds by eliminating the need to reprint popular items.

Jan. '87—In the first of a series of seminars for employees at Station Headquarters, Research Forester Ray Shearer (Missoula) described how 20 years of research at Miller Creek and Newman Ridge in Montana helped make prescribed fire acceptable as a professional tool in forest management.

A sprinkler system slightly larger than the one in many backyards was used by Station scientists to simulate rainfall as part of studies to accurately describe erosion processes on forest roads.

Research Forester Jack Schmidt was named "Sailor of the Quarter" for the Naval Reserve Facility in Missoula for his work as a command career counselor.

Mar. '87—Project Leader Ed Burroughs (Moscow) told Station Headquarters and Region 4 personnel of work by his unit as part of the Water Erosion Prediction Project, which included scientists with the Agricultural Research Service and Soil Conservation Service.

AD Dick Krebill and Soil Scientist Jim Clayton (Boise) helped prepare a long-term research program proposal on the effects of global climate change in the United States.

Apr. '87—George Roether, Region 4 Director of Timber Management, wrote, "The cooperation, expert assistance, and general helpfulness of Jerry Rehfeldt, Pat Wells, and Ray Hoff to the Regional Geneticist in the development of a tree improvement program is greatly appreciated."

Director Lassen kicked off the Station Leadership Team Meeting in Moscow by stating, "We are a results-oriented organization, and I make no apology for that. Our product is new knowledge… We're not just another government bureau processing paperwork."

Project Leader Chuck George (Fire Lab) agreed to provide technical advice over a 2-year period to British designers developing a state-of-the-art fire retardant delivery system.

French scientist Jean Levieux (right) inspected a pheromone attraction trap for mountain pine beetles with Entomologist Dick Schmitz during a technology exchange visit in 1987.

July '87—Range Scientist Jeanne Chambers (Logan) was awarded a Ph.D. by the Utah State University Department of Biology-Ecology.

Aug. '87—Vinh N. Lu, a Vietnamese refugee employed at the Bozeman Lab in the work-study program while he studied electrical engineering at Montana State University, became a citizen of the United States at a ceremony in Butte.

Oct. '87—More than 450 people from 27 States and two foreign countries attended a Missoula symposium conceived and organized by Bill Fischer and Steve Arno titled "Protecting People and Homes from Wildfire in the Interior West."

Nov. '87—Ralph Nelson (Fire Lab) was honored with the Southeastern Station's Research Award for 1987 for work he completed there on movement of water through wood as it relates to fire. The award went to one individual each year judged by peers to be doing particularly high-quality scientific research.

Gene Farmer (Logan) transferred to the Region 4 Minerals Area Management Staff where he was to assist personnel in four Forest Service Regions with special problems in mined-land reclamation.

Dec. '87—At a Station family meeting in Ogden, Deputy Chief for Research John Ohman said, "We aren't being encouraged to consolidate offices as

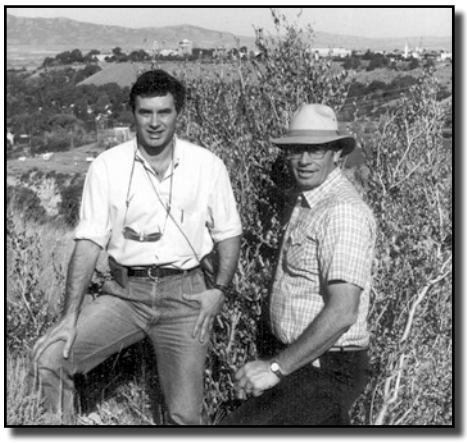
we were a few years ago. We will still look for possibilities that promise real savings, but in most cases reducing the number of units isn't worth the political battle of trying to get it done."

Feb.* '*88—Project Leaders Wyman Schmidt (Bozeman) and Gene Amman (Ogden) gave a seminar at Forest Service national headquarters titled "Silvicultural Prevention of Insect Outbreaks;" the topic was one of 10 selected from 120 nominations by field units.

Apr.* '*88—Researchers at the Shrub Lab in Provo donated 1,000 surplus plant specimens to the Ogden Nature Center and local Boy Scouts took on the job of planting them throughout the center's 127-acre grounds.

June* '*88—Ray Brown, Jeanne Chambers and retiree Bland Richardson (Logan) were part of a team cited by Region 4 for developing the *Intermountain Region Reclamation Field Guide*, a booklet "that will be of continuing benefit in the review of reclamation plans."

Aug.* '*88—Argentinean sheep ranch manager Alejandro Paz Braun, who read about Shrub Lab work on improved plants in *Rangelands* magazine, spent a week with Provo scientists supported by an Eisenhower Exchange Fellowship, a program that worked to forge international linkages through people.



Alejandro Paz Braun (left) and Durant McArthur examined vegetation on a field trip near Logan. Braun took home 10 improved plants for a revegetation trial at his sheep ranch in Patagonia, Argentina.

Under a new experimental program, Station employees could contribute vacation days to coworkers with medical or family emergencies who lacked leave time to deal with the problems.

Sept.* '*88—Technical Information Officer Carol Ayer said that, although much work needed to be done, the FS INFO bibliographic database could now be accessed directly by employees through Data General.

Project Leader Bob Lucas (Missoula FSL) presented nine pages of testimony before the Congressional Subcommittee on National Parks and Public Lands, which was conducting hearings on National Forest Wilderness management.

A vacationer wrote to Forest Survey expressing thanks for actions by crew member Mark Konop when their family vehicle ran out of gas, stranding them 10 miles east of Billings, Montana. Konop refused compensation after, on his own time, obtaining a can of gas and following the family into Billings to be sure they were all right.

Project Leader Jim Brown (Fire Lab) discussed how fire ecology and fire control affect forests on a Public Broadcasting System television program, *Forest Health: the State of the Nation's Forests*.

Research Engineer Rod Prellwitz (Missoula FSL) was selected as the first Forest Service representative to serve on the steering committee for the Northwest Geotechnical Workshop, an annual event sponsored by the Federal Highway Administration to update geologists and engineers on new road-building techniques.

Oct.* '*88—Employees at the Bozeman Lab and 75 guests celebrated the 25th anniversary of the Lab with an open house, tree planting ceremony, and banquet speeches.

John Destito, Group Leader in Region 4 Personnel Management, was named Assistant Station Director for Administration, replacing Bev Holmes who moved to national headquarters as Forest Service Consent Decree Coordinator.

Nov.* '*88—Project Leader Warren Clary (Boise) started work with a Sawtooth National Forest staff officer to develop "best management practices" for grazing in riparian areas in Region 4.

Dec.* '*88—Deputy Director Carter Gibbs was designated to coordinate Forest Service research activities in the Greater Yellowstone Area in cooperation with the National Park Service, a program given impetus by the severe wildfires in the area throughout the summer.

Jan.* '*89—An open house celebrating the 25th anniversary of the Moscow Lab featured four major accomplishments: (1) Development of blister-rust resistant western white pine; (2) creation of the Prognosis Stand Development Model; (3) contributions to improved knowledge of pathology and silviculure for many Northern Rocky Mountain tree species; and (4) finding new methods for controlling the Douglas-fir beetle.

Feb.* '*89—Project Leaders Jim Brown and Dick Rothermel (Fire Lab) fielded questions at a press conference in San Francisco before presenting papers at a symposium on "Fires and Fire Management in Yellowstone National Park."

Mar.* '*89—Technical Information Officer Carol Ayer said all Intermountain and Northern Rocky Mountain Station serial publications were being added to the FS INFO database; the next step would be adding all journal and other publications by Station scientists.

Hydrologist Jack King (Boise) and Rhey Solomon, Washington Office Water Resources Program Manager, became known as "King Solomon" after helping select conservation and rehabilitation measures for slopes above Tiberias on the shore of the Sea of Galilee in Israel in a program sponsored by the United Jewish Fund.

May* '*89—A Station proposal for monitoring recovery processes after natural areas are disturbed was one of only 16 selected by the Forest Service for funding under the new Research Challenge Cost Share Program. The Nature Conservancy matched the Federal funds.

June '89—Approval of two new Research Natural Areas in the Kaniksu National Forest of northern Idaho brought to 69 the number of RNAs designated following Station proposals. The Forest Service had 201 RNAs nationally; the Station was by far the leader in numbers.

July '89—Soil Scientist Jim Clayton (Boise) raised $450 for the American Cancer Society, more than enough to get him out of a cell during a fund raiser known as "Jail and Bail."

Aug. '89—Ecologist Steve Arno (Fire Lab) and Steve Barrett, a cooperator, received a $37,000 grant to develop a detailed fire history of the upper Lamar River drainage in Yellowstone National Park.

Sept. '89—Station scientists Walt Megahan and Bob Steele (Boise) and Jim Brown (Fire Lab) were on a team planning a $1 million rehabilitation project following large fires over the summer in the Boise National Forest.

Nov. '89—Station researchers hosted field tours at Priest River, Coram, and Deception Creek Experimental Forests in Idaho and Montana following the Society of American Foresters national meeting in Spokane.

Professor Fan Weicheng visited the Fire Lab and said he planned to use it as a model for establishment of a National Fire Science Laboratory in the People's Republic of China.

A large group of employees, retirees, and special guests marked the 25th anniversary of the Logan Lab with a rededication ceremony featuring Paul Packer and Norb DeByle describing research activities over the years and recalling the cast of characters who participated.

Jan. '90—Con Schallau, former Station Deputy Director, left the Forest Service to join the American Forest Resources Alliance as chief economist.

Botanist Steve Monsen (Provo) was named Range Manager of the Year at a joint meeting of the Utah and Idaho chapters of the Society for Range Management for "his unusual commitment to helping range managers put scientific knowledge to practical use."

Mar. '90—A crew of five "heavy haulers" from Forest Survey supervised by foreman Bill McLain salvaged thousands of dollars worth of publications after a broken pipe flooded basement storage areas in the Ogden Federal Building with 3 feet of water. Despite the good work, publication losses amounted to $15,000.

June '90—Station scientists Anne Bradley and Bob Campbell provided technical assistance to a group that produced a poster illustrating the role of fire in nature and a book of education activities for teachers to use in instructing junior high school students.

July '90—Technical Information Officer Carol Ayer and the staff of FS INFO (Ogden) received an award from Director Lassen for "maintaining and expanding the unit's position as the number one provider of technical information among the 10 centers in the Forest Service."

Aug. '90—The Boise Interagency Fire Center offered two new publications by Fire Lab scientists for sale: *The Fireline Blaster's Guidebook*, by Dick Barney and cooperator Bud Clarke, and the *Weather Station Handbook—an Interagency Guide for Wildland Managers*, by Arnold Finklin and Bill Fischer.

Nov. '90—Computer Systems Analyst Wally Deschene (Missoula) received a national award for converting complex mathematical software to the Data General system and training more than 300 Forest Service employees in its use.

Dec. '90—Research Forester Bob Monserud (Moscow) returned from Austria after completing an assignment with the Biosphere Dynamics Team, an international group creating a computer model to show what would happen to the earth's vegetation if the amount of carbon dioxide in the atmosphere doubled.

Mar. '91—Project Leader Roy Sidle (Logan) was named Associate Editor of the *Journal of Environmental Quality* shortly before leaving for a 9-month assignment to work on a hydrological research project with Japanese scientists.

The Society for Range Management gave Botanist Steve Monsen (Provo) its Outstanding Achievement Award at the annual convention in Washington, DC, for "developing and promoting sound range management practices."

May '91—John Daigle, outdoor recreation planner in the wilderness research unit (Missoula), coordinated the Station's first Native American Education Program, a cooperative venture with Salish Kootenai College, Region 1, and the University of Montana.

Sept. '91—Dean Knighton, Watershed Research Group Leader with the national Forest Environment Research Staff, was named an Assistant Station Director for Research.

The Society of American Foresters at its annual convention in San Francisco gave Wildlife Biologist Bret Tobalske (Bozeman) its top award for his poster presentation on bird populations in logged and unlogged forest areas.

Station employees donated more than 350 hours of their vacation time (one donated 70) to Virginia Veals of Research Information, who missed nearly 4 months of work because of serious illness.

Electronics Engineer Ron Babbitt explained to students how the Fire Lab's combustion chamber is used to study fire chemistry during part of the Native American Education Program in 1991.

Angela Evenden, manager of the most successful Research Natural Area designation program in the Forest Service, studied flora in the Aquarius RNA in the Clearwater National Forest in 1991.

***Oct.* '91**—Crews finished an addition to the Moscow Lab that expanded office space by 50 percent, allowing scientists and engineers who had been housed in surplus Job Corps trailers for 20 years to join the rest of the staff in modern facilities.

***Nov.* '91**—Natural Areas Program Manager Angela Evenden (Missoula), whose position was jointly funded by the Station and Region 1, was elected to the Board of Directors of the Natural Areas Association.

***Dec.* '91**—The Station and the Navajo Nation signed a cooperative agreement that resulted in 12 forestry aids and technicians from the Navajo Reservation being employed by Forest Survey during the 1992 field season.

***Jan.* '92**—Project Leader Al Stage (Moscow) was a co-recipient of the 1991 Award for Research Excellence from the national Forest Insect and Disease Research staff for his role in producing a model of behavior, effects, and impacts of root diseases in western coniferous forests.

***Feb.* '92**—Station Headquarters personnel celebrated Native American Awareness Week with speeches and music, concluding the program by watching traditional Indian dancing, and then joining in for a friendship dance.

***April* '92**—The Station donated a dozen historic weather measurement instruments to the National Forest Service Museum. Ed Heilman, secretary-treasurer of the museum, said it was "the first significant donation from the research side of the Forest Service."

***May* '92—**Ray Brown (Logan) was named Project Leader of the disturbed land rehabilitation unit, and was given a "Numbskull" award for accepting the job.

***June* '92**—Led by Ava Antonich, Budget and Research Agreements, Ogden employees conducted a weekend "Take Pride in America" project, removing debris from the Ogden River and its banks.

Leading the Parade

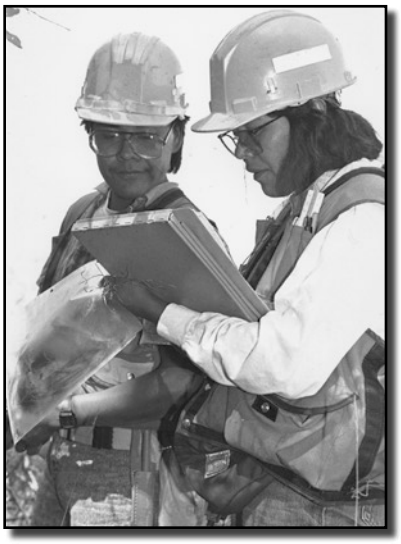
Forest Survey Program Manager Dwane Van Hooser and his wife Susie received a "Points of Light" award from USDA in 1992 for their 10 years of community service as parade masters for Ogden's Pioneer Days Parade. The parade was the focal point for the city's biggest annual civic celebration. The 1991 parade included 170 entries (*INTercom* May 1992).

Dwane Van Hooser led the way for years in Ogden's biggest civic celebration to earn a "Points of Light" award, a community service honor instituted by President George H. W. Bush.

An editorial in the *Ogden Standard-Examiner* said, "When there was a slight faltering in the sponsorship of the parade…it was Van Hooser who stood tall and agreed to be the chairman. Far too often, we fail to laud those who are responsible for successes that have enormous community benefit and are only possible because of the dedication of individuals to civic duty."

Dwane and Susie worked with a cadre of other volunteers from Elks Lodge No. 719 to make the parade happen. As Pioneer Day approached each year, the team worked lengthy shifts to prepare for the event. Several Forest Survey people played key roles in the parade's success over the years. Al Green wrote the script and served on the committee for 7 years. Deloris Holly was committee secretary for 2 years, and then the job was taken over by Karen Charlton.

Van Hooser went on to serve on the central committee for 4 years, including terms as vice-chairman in 1993 and chairman (1993-94). He then was appointed by the Governor of Utah to serve on the Statewide Sesquicentennial Celebration Coordinating Committee.



Technicians Kevin Yazzie and Rosita Denetso worked for Forest Survey in 1991 under a cooperative agreement between the Navajo Nation and the Station designed to add diversity to the Station's workforce and help Navajo youth gain experience and education in natural resource fields.

Ogden personnel (seated, left to right) Dave Kimbrough, Operations Group Leader; Eddie Morris, Human Resources Combined Services Unit; and Bert Lindler, Research Information, compared notes during the 1992 new employee orientation at Priest River as Project Leader Al Stage looked on. Stage was superintendent of the experimental forest, 1954-56, in his first full-time assignment at the Station.

July '92—Ogden employees celebrated Asian/Pacific American week with a "luau and learn" lunch in the park and several other activities.

Aug. '92—Norman Maclean's novel, *Young Men and Fire*, much of which was based on information from Fire Lab scientists Dick Rothermel, Frank Albini, and Bob Burgan, made the best seller list of the *New York Times*.

Oct. '92—More than 40 Station people participated in a "Research Rendevous" at Priest River, an event designed to provide intensive orientation to research and administrative activities for new employees.

Nov. '92—A special issue of *INTercom* highlighted research accomplishments for the year in a 16-page edition with sections titled Ecosystem Management, Global Climate Change, Forest Health, Wilderness Management, Fisheries, Wildlife, Watershed Management, Fire Management, Forest Products and Harvesting, and Forest Inventory.

Dec. '92—Project Leader Jack King (Boise) participated in a national watershed teleconference sponsored by the University of Maine, and broadcast simultaneously from Orono and Corvallis, Orgeon.

The *INTercom* editor noted that Station full-time employees included 110 women (42 percent of the workforce). Thirteen were research scientists and 17 were in other professional positions.

Apr. '93—On a tour financed by the World Bank, five Chinese fire control managers visited the Fire Lab to review the research program.

May '93—Research Forester Russ Graham (Moscow) shared a national award for his contributions to a report titled "Management Recommendations for the Northern Goshawk in the Southwestern United States," which was published by the Rocky Mountain Station.

June '93—Research Foresters Bob Burgan and Roberta Hartford (Fire Lab) produced a Station publication with a self-study computer disk to show resource managers how to monitor the condition of vegetation using space satellite imagery.

July '93—The Station, *American Forests* magazine, University of Idaho, Boise Cascade Corporation, the Society of American Foresters, and the Boise National Forest sponsored a Forest Health Symposium in Boise to review information relevant to forest health and ecological issues.

Dec. '93—The Forest Service Women's Association (Ogden), which included Station and Region 4 personnel, raised $5,000 for Primary Children's Hospital with a "Christmas fantasy" creation at a Festival of Trees event held in Salt Lake City.

A Tree with a Different Twist

Forestry Technician Pat Wells wanted "to see if I could learn something." He did, and the result was a patent awarded in 1993 for a new genetic variation of Douglas-fir, the 'Torquis' variety. The tree looked nothing like the stately Douglas-firs that grace many acres of western forests. It was a low, twisted ornamental with a personality all its own.

Wells spotted the "mother tree" for his new variety in a test planting while pursuing his regular duties with the Moscow-based silviculture and genetics research unit. He invested a lot of personal time in developing the variety, but the patent acknowledging Wells as the inventor of the ornamental belonged to the public. That was just fine with Wells. He said, "I didn't do it to make a million." The only reward Wells said he wanted was to see the value of the tree recognized, and for commercial producers to be licensed to produce the ornamental for people to enjoy.

Pat Wells usually worked with trees that grow straight and tall, but the Patent and Trademark Office recognized him for "inventing" a twisted dwarf Douglas-fir variety. Here he inspected a 'Torquis' Douglas-fir growing at the Priest River Experimental Forest nursery.

***Jan.* '94**—With security provided by the Venezuelan National Guard, Project Leader Ray Brown (Logan) led a team of scientists that recommended ways to restore lands devastated by unregulated mining.

***May* '94**—Twenty Station employees accepted a "Voluntary Separation Incentive" and retired, part of a large contingent that made 1994 one of the years of greatest change in Forest Service history.

***Aug.* '94**—With the retirement of Project Leaders Bob Steele (conifer ecology and regeneration) and Jack McIntyre (aquatic ecology), Warren Clary was appointed acting Project Leader for all four research units at Boise, which included studies of fisheries, riparian areas, watersheds, and forest ecology.

***Sept.* '94**—Resource managers called for help throughout the summer when more than 60,000 wildfires burned nationwide and many Station employees responded by volunteering for special assignments ranging from administrative jobs to smoke monitoring and rehabilitation planning.

The Station and Utah State University's College of Natural Resources established a new Center on Disturbance Ecology to coordinate activities between Logan Lab scientists and counterparts at the university.

***May* '95**—The Forest Service adopted the Timber Sale Planning and Analysis System developed by the Station's economics research unit in Missoula for use nationally in economic analyses of timber sales.

***June* '95**—Research Forester Melinda Moeur was named Project Leader of the Quantitative Analysis research unit at Moscow, replacing Al Stage who retired after 44 years of Federal service.

In cooperation with Regions 1 and 4, the Station sponsored camps for youth designed to encourage careers in math and science; the camps were located on the Flathead Indian Reservation and in the Fishlake National Forest.

***Sept.* '95**—Almost the entire staff of the Shrub Lab helped host the 5th International Rangeland Congress held at Salt Lake City in which more than 600 scientists and range managers from 70 countries participated.

Melinda Moeur, a member of the Quantitative Analysis unit at Moscow for 15 years, became Project Leader in 1995.

***Nov.* '95**—After learning of needs at Soviet hospitals while working there to build an international vegetation model, Mensurationist Bob Monserud (Moscow) and his wife, Leslie Morehead, arranged to ship 14 tons of medical supplies from the U.S. to the Soviet Union.

***Mar.* '96**—The Rocky Mountain and Intermountain Stations held a joint leadership team meeting in Fort Collins.

***May* '96—**Jim Haskell, a former Region 4-Intermountain Station Director of Information Systems was named Assistant Director for Administration of the Rocky Mountain Station.

Assistant Director Dean Knighton traveled to Washington, DC, with Acting Station Director Denver Burns for a series of visits with Congressional representatives.

***June* '96**—Forest Service Chief Jack Ward Thomas said at a joint meeting with Station and Region 4 employees in Ogden that a Congressman told him, "We demand predictable outputs." Thomas replied, "The Forest Service could do that if the weather remained stable, there were no insect and disease problems, budgets were stable, models work, no appeals, no lawsuits, no new species listed, and no elections."

***July* '96**—Acting Station Director Denver Burns predicted the Intermountain and Rocky Mountain Stations would be consolidated by Sept. 30, "in keeping with my record of only being wrong once a year on this topic."

Station Scientist Bob Monserud (in hat), helped unload medical supplies at a hospital in the Soviet Union. Monserud learned of the scarcity of supplies from Bioclimatologist Nadja Tchebakova (gesturing, far right).

***Sept.* '*96*—**The Intermountain and Rocky Mountain Stations issued 1995 research highlights as a combined publication.

***Oct.* '*96*—**The Station began receiving comments on services, publications, and the research program via "customer service cards" distributed to all who visited or received information through the mail.

***Jan.* '*97*—**Don Latham was appointed Project Leader of the fire behavior unit at the Fire Lab, replacing Pat Andrews who decided to devote full time to her personal research.

***Mar.* '*97*—**The President's budget for fiscal year 1998 contained a $102,000 reduction for the Station.

"Director's Notes" said that since October 1992, the number of research employees in the Forest Service had dropped from 2,628 to 1,989.

***Apr.* '*97*—**Ecologist Jeanne Chambers (Reno) provided testimony to the Nevada State Engineer regarding stream flow levels necessary to sustain essential streamside vegetation in Monitor Valley in the Toiyabe National Forest.

***May* '*97*—**The Intermountain Research Station-Rocky Mountain Forest and Range Experiment Station merger was formally announced on May 7. The new organization would be known as the Rocky Mountain Research Station, with headquarters in Fort Collins, Colorado.

Interviews

Interviews were not recorded. In most cases, text based on interviews was sent to the person who provided the information for review and correction before it was finalized.

Conducted by Larry Lassen:

Bingham, Richard T., retired Intermountain Station Project Leader, Moscow, ID, 1993.
Boyd, Raymond J., retired Intermountain Station scientist, Moscow, ID, 1993.
Carpenter, Cal, retired Superintendent, Priest River Experimental Forest, Intermountain Station, Moscow, ID 1993.
Clary, Warren P., retired Intermountain Station Project Leader, Boise, ID, 1993.
George, Charles W., retired Intermountain Station Project Leader, Missoula, MT, 1993.
Graham, Russell T., Research Forester, Rocky Mountain Station, Moscow, ID, 1993.
Harvey, Alan E., retired Intermountain Station Project Leader, Moscow, ID, 1993.
Hoff, Raymond J., retired Intermountain Station Project Leader, Moscow, ID, 1993.
Pechanec, Joseph F. retired Intermountain Station Director, Boise, ID, 1993.
Stage, Albert R., retired Intermountain Station Project Leader, Moscow, ID, 1993.
Wellner, Charles A., retired Intermountain Station Assistant Director, Moscow, ID, 1993.

Conducted by Dick Klade:

Bay, Roger R., retired Intermountain Station Director, Bozeman, MT, 2004.
Born, J. David, retired Research Forester, Forest Survey, Intermountain Station, Ogden, UT, 2005.
Cook, Wayne, Technology Transfer Specialist, Rocky Mountain Research Station, Missoula, MT, 2005.
Evans, Keith E. retired Intermountain Station Assistant Director, 2005.
Ferguson, Bryan, Regional Silviculturist, Intermountain Region, Ogden, UT, 2005.
Ferguson, Robert, retired Intermountain Station Range Scientist, Boise, ID, 2005.
Jensen, Chester E., retired Intermountain Station Statistician, Ogden, UT, 2005.
Kingsbury, D. Louise, retired Group Leader, Publishing Services, Rocky Mountain Station, Ogden, UT, 2004
Lassen, Laurence E., retired Intermountain Station Director, Ogden, UT, 2004 and 2005.
Meeuwig, Richard O., retired Intermountain Station Project Leader, Reno, NV, 2005.
Mueggler, Walter F., retired Intermountain Station Plant Ecologist, Logan, UT, 2005.
Parry, Ross, retired Computer Specialist, Intermountain Station and Intermountain Region, Ogden, UT, 2004.
Peterson, Curt, Director of Civil Rights, Intermountain Region, Ogden, UT, 2004.
Prevedel, David. Information Systems Specialist, Intermountain Region, Ogden, UT, 2005.
Stage, Al, retired Intermountain Station Project Leader, Moscow, ID, 2005.
Tippets, David, Public Affairs Specialist, Rocky Mountain Station, Ogden, UT, 2004 and 2005.
Van Hooser, Dwane D., retired Program Manager, Forest Survey, Intermountain Station, Ogden, UT, 2004.
Waters, Shirley, Computer Programmer, Forest Inventory and Analysis, Rocky Mountain Station, Ogden, UT, 2004.

Conducted by Dave Tippets:

Evanko, Tony, retired Intermountain Station Range Scientist, 2005.
Lindsey, Virgil, retired Ennis District Ranger, 2005.
Ryan, Mike, Archeologist, Beaverhead National Forest, 2005.
Thomas, Jack Ward, retired Chief, U.S. Forest Service, 2005.

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Full citations for all Station publications mentioned in the text can be easily found through links at the Rocky Mountain Research Station web page (www.fs.fed.us/rm). The page also provides links to research unit information. Most of the units include lists of additional publications by scientists who worked in the area of interest. For brevity, this reference list is largely limited to entries showing the sources of statements included in the text of this history and publications that contain additional background information for those who want to more fully explore the history of a particular topic.

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Appendix A.

Pechanec Remembers His Early Days in Research

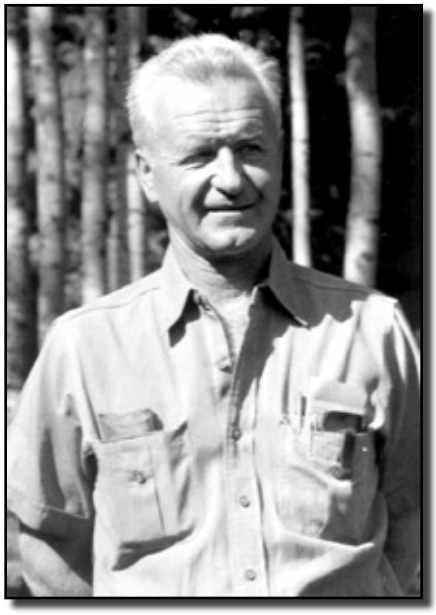
By Joseph F. Pechanec

The Depression was on, Federal budgets had been cut, and the Federal Junior Range Examiner exam was not to be given in 1932 as my graduation from the University of Idaho neared. Job prospects were horrible! Even so, a few months before graduation exercises I was offered a temporary job as field assistant in range research with the Intermountain Forest and Range Experiment Station, Ogden, Utah, if I could report early in May. Forestry School Dean F. G. Miller understood and with his blessing and assurance that my diploma would be mailed, I headed for Ogden. It's odd; I've never missed those graduation exercises!

My assignment was to the spring-fall (sagebrush) range project. G. D. "Pick" Pickford, a graduate of Iowa State, was the excellent project leader. The challenge faced by this project was staggering. Knowledge was minimal about sagebrush ranges, how to manage grazing on them, and methods for improving them. Range conditions were deplorable. Most of these ranges were in public domain with no management.

Very little research was under way. Much of it was in the Intermountain Station's program begun in 1923 at the U.S. Sheep Experiment Station in cooperation with the Bureau of Animal Industry. The program included research on season and systems of grazing, range readiness, and ecology of the sagebrush type. But staffing was only one researcher part time, yearly, for the first 8 years.

In 1930 Pickford began research in Utah with a study along the Wasatch Front of effects of the prevailing heavy grazing and promiscuous burning. He found serious damage. In 1932, after I joined the project, we continued



Joe Pechanec served as Intermountain Station Director, 1962-71.

collecting information in Utah. We established a series of 10-acre exclosures and open-grazed plots and took initial records on them. The objective was to determine the floristic composition of these samples of the sagebrush type and then follow rate of recovery. Then funds ran out in midsummer.

The summer range research at the Great Basin Station near Ephraim had some slack. I went there to work for Raymond Price, Leader. Kenneth W. Parker and Irwin "Hap" Johnson were two other field assistants. We mapped quadrants and browse plots and estimated plant density on major plots. By the last of September funds here, too, ran out.

Luckily the spring-fall project employed me for a month to help in establishing an exciting new study on sagebrush burning. Pickford, Selar Hutchings, leader of the winter range project, and I laid out exclosures, plots, and quadrants called for by the study plan and took initial records on them in the early fall of 1932.

The Station, State Forester of Idaho, and the Fremont County Woolgrowers' Association had jointly agreed to a major cooperative, several-year study. The Woolgrowers' spring-fall range on public domain and leased State lands north of St. Anthony, Idaho was covered by extremely dense sagebrush. They knew that on occasion fire had resulted in at least temporary relief. They were excellent cooperators, did the burning and deferred the area from grazing for 1 year after burning.

By that time several emergency programs had begun. Some contributed substantially to the conduct of research as well as to jobs. During the next year I was involved in three examples. In mid-summer 1933 I was assigned to a new CCC camp west of Milford, Utah. CCC's were constructing fences, buildings, and other facilities needed on the newly established Desert Experimental Range. My assignment as foreman, with a crew of North Carolina and Utah boys, was to establish a 23-mile belt transect, 4 chains wide, from the northeast side of Pine Valley to the top of Indian Peak. Along this transect we mapped vegetation types, inventoried vegetation, dug and mapped soil pits, and mapped shrub root systems. This provided the basis for analysis of biotic and edaphic factors associated with different salt desert shrub vegetation types.

This was really exciting and also a challenge to get the best from the CCC enrollees. They were great even in the

heat of August and on those days when camp cooks sent out bread and mustard sandwiches for lunch! But the job also was stimulating because it provided the opportunity to make the acquaintance of range men at the CCC camp. Perhaps best of all was the opportunity to meet Dr. Walter Cottam, University of Utah plant ecologist, who was conducting ecological studies and assisting in plant identification on the Experimental Range. His attire on many summer days was only shorts and boots with a jacket nearby to hold pencils, hand lens, etc. It was a revelation to see what would be ordinarily thought of as a sedate professor striding across the desert in shorts. By October, after we had finished 18 miles of the transect, I was sent to the Great Basin Station.

At the Great Basin Station, with a crew of CCC boys, I was to dig, clean, and bottle in alcohol roots from geranium, slender wheatgrass, mountain brome, and some other species that had been clipped to different intensities and at different dates during spring and summer. This was a major study being conducted by Dr. E. C. McCarty from Riverside, California, in cooperation with the Forest Service. The objective was to determine food storage regimens in range plants and factors affecting them including defoliation. Dr. McCarty pioneered food storage research. His findings did much to aid understanding range plant reactions to grazing.

By November the Station had received funds to establish a 20-person Civilian Works Administration crew in Ogden to compile all scientific data that had accumulated in range, watershed, and silviculture projects for years. Some of the records were taken by Sampson and Forsling during their early days at the Great Basin. We had some extremely good people but they were completely unskilled in the subject matter, the type of work, or the sophisticated Monroe and Marchant calculators we had. We made good headway and for once in the Station's history it could be said that the routine compilations had been completed and data were ready for analysis. This also may have been the last time!

Early in 1934 funds for this emergency project ran out. The Junior Range Exam had been given early the previous fall and I had an appointment with the spring-fall project together with a cut in salary mandated by the Roosevelt Administration for all Federal employees. In April I happily headed back to the Sheep Station with a crew of four field assistants to complete scheduled data collection on management and climate and plant growth studies, and to make the first remeasurements of Fremont County burning project plots.

Fremont County areas burned in 1932 were a startling revelation! Waving seas of grass without brush obstructions showed why most sheepmen wanted to burn. It made us wonder why bureaucratic reluctance to approve burning was so stiff. There were spots of bad wind erosion but it was not general. Fire just had to be bad! There must be a joker somewhere.

During 1935 we began to see problems. We were able to study some other areas burned in 1932 in Fremont and Clark Counties that did not result in waving seas of grass. They also had a tremendous number of sagebrush seedlings and some bad erosion.

A CCC spike camp at Great Basin, 1936.

Promiscuous grazing and trailing seemed to be responsible. We needed to know whether we could repeat the success of the 1932 burn. It was decided to burn another large area having somewhat different vegetation and soil conditions and where we would have better control of grazing. A 640-acre area of big sagebrush on the Sheep Station range was selected and burned in August 1936.

The start of a major set of range reseeding experiments at and near the Sheep Station was an urgently needed addition. This was part of the Station-wide range reseeding project begun in 1935. Substantial emphasis was to be placed on depleted sagebrush ranges.

While we were engaged in seeking knowledge about sagebrush ranges from 1932 to 1936 some very significant national events took place that would have far reaching effects on management and improvement of ranges generally and the future of sagebrush-grass ranges in particular. These would also affect our research program, our cooperation, and our clientele.

Establishment of the Soil Conservation Service brought strong technical assistance and the benefits of a strong nursery and range reseeding division to private rangeland owners in Soil Conservation Districts. Establishment of the Grazing Service (Bureau of Land Management) was a major forward step toward placing public domain rangelands under management and improving range conditions. Creation of the Agricultural Adjustment Administration with its range program provided incentive payments and technical assistance to private rangeland owners. The Forest Service and Indian Service expanded their range programs materially. All of these Federal agencies began recruiting range-trained men and the universities responded quickly both in training and research.

These were extremely interesting years. Whatever we had in research was eagerly sought by men anxious for knowledge. And we learned from them. I'm glad I was there! (Pechanec, unpublished paper).

Appendix B.

A Few Days with Ralph at the Desert Range

By Richard J. Klade

Before I first worked in a research organization in 1968 my perception of scientists probably mirrored the general public view. Scientists were deadly serious people who wore white coats and spent endless hours studying mysterious phenomena. They were important people, but humorless and sort of dull. The "mad scientist" or "absent-minded professor" types were entertaining, but most people thought they existed only in the movies or as characters in comic books; they didn't represent reality.

So far, I've yet to meet a mad scientist. But I have encountered a number of researchers who might be considered real characters, unusual people who were perhaps a bit eccentric. Most of them were delightful. Not the least of these characters was Ralph Holmgren.

Ralph worked for many years at the Desert Experimental Range, a remote outpost some 300 miles southwest of Ogden. The range is 48 miles west of the nearest community, Milford, Utah. Research there focused on the effects of grazing on dry-land vegetation, which covers millions of acres in the Interior West. Before my opportunity to visit him at his desert home in 1976, Holmgren was known to me largely by reputation.

Coworkers said Ralph liked the Desert Range so much that he disliked leaving the place and even spent his vacation time there when he took annual leave. He often was referred to as "the old sheepherder." One rumor was that Ralph had a pet antelope at the range. He was said to be a genial man, somewhat shy, whose habits were a bit unusual. The unusual part was confirmed on one occasion when I encountered him checking into the Ramada Inn in Ogden before attending a meeting at Station Headquarters. Ralph's luggage consisted of two shopping bags. The man carrying his belongings in bags was of average size, deeply tanned from hours under the desert sun, and had a twinkle in his eye.

Dispatched to the Desert— Any formal records of my visit to the Desert Range are long gone, and trying to recall events that happened nearly 30 years ago is a chancy business. However, one thing is certain. I never was sure why I was sent there. Either Station Director Roger Bay or Assistant Director Jim Blaisdell told me to go. The mission was something vague about "helping Holmgren get some writing done," and also "working with him" on a visit by Bureau of Land Management (BLM) range managers. "Work with him" is an assignment often made by Forest Service managers when they are keeping a commitment to send help, but really don't know what the problem is. Like a good soldier, I went.

My visit was in late June of 1976; the weather was dry and it was hot. The trip began very early in the morning to allow for a brief lunch stop in Milford and get me to the destination early enough in the afternoon to help Ralph that day with whatever I was supposed to help him with. As I progressed down State highways on the 6-hour drive from Ogden the temperatures got hotter, signs of human habitation were fewer, and vegetation became more and more sparse.

People who are not impressed with the beauties of desert shrubbery and an empty landscape might call the area encompassing the Desert Range "desolate." I won't go that far, but must admit the surroundings are somewhat less than lush. The entry road passed between two stone pillars. A buzzard was perched atop one of the pillars when I went through. That turned out to be of no significance, much to my relief.

The stone pillars at the Desert Range entry were impressive, with or without a roosting buzzard.

Incidentally, I learned later that the pillars were made of Warm Point Quartzite, a rock found near the Desert Range. They were built by CCC men during the 1930s, as were the buildings, fences, and roads.

Working With Ralph—A young man who was a student at Brigham Young University (BYU) employed for the summer directed me to the building where Holmgren was to be found. He was seated at a desk in a second-floor loft, with pencil in hand, ruefully contemplating a stack of papers that looked like a publication manuscript. Aha, we were going to work on the first part of my assistance assignment.

Ralph's answers to a few discrete (I hoped) questions about problems he might be having with the writing didn't pinpoint much of anything. If he had a problem, it probably was the one faced by most authors at one time or another—reluctance to apply one end of the anatomy to a chair and start the other end concentrating on the job at hand. We chatted for a while about writing in general, and I pointed out several times that I was willing to help with anything he wanted.

"Well," said Ralph, "we'll have 25 BLM guys coming in tomorrow. A few are from the Nevada State Office, but most are from Districts in Utah and Nevada. We'll spend the whole next day on a tour of our study plots. Some of the Districts are pretty far away; so a few are staying over two nights. We need to get things ready."

My first (and actually only) assistance task was moving mattresses. Ralph, the BYU student, Range Technician John Kinney, and I carried them from a pile on the second floor of a storage building to various other buildings in the Desert Range complex. There were only 24. When concern was expressed about how 25 BLM guests, plus me, were going to sleep on 24 narrow mattresses, Ralph just shrugged and said, "Oh, things like that always work out."

He then announced, "We need to get some provisions. Come on, we'll take a ride over to the store."

Although several government vehicles were parked in the complex, we got into Holmgren's personal car. My recollection is it was a brand-new, white, Chevrolet sedan. With all the windows rolled down, we took off toward the west at a pretty fast clip. It was mid-afternoon, and no doubt the temperature was in the 100s. We drove for quite a while, finally stopping at a dilapidated general store. A rough looking guy attired in worn out jeans and a dirty underwear shirt was the only clerk. He was a big fellow, and I envisioned talking him into hauling the boxes of food we were about to buy out to the car. By then, I was almost as sweaty as he looked, and there was no way I wanted to do anything physical.

We walked around in the store for a while. Ralph bought two-dozen cookies and a six-pack of beer. We left.

The Journey Back—At what seemed like about the midpoint in the drive back to the Desert Range, Ralph asked if I was interested in historic sites. When I said I certainly was, he said, "Good, there's a ranch just ahead that has a family graveyard that dates back to early settlement days around here. We'll drop in on them and I'll show it to you."

We veered off the highway to the right onto a dirt road, drove about a half mile, and pulled up in front of a large ranch house. No one was home. "That's OK," Ralph said. "They won't mind if we just go ahead and look at the headstones."

Well, they apparently did mind if people tramped through their graveyard. A "chicken wire" fence about nine feet high surrounded the plot. A formidable padlock secured the gate. It's a guess, but Holmgren was probably about 55 years old. I was in my 30s and in reasonably good shape, I thought. He went up and over that fence in a flash. I struggled up, and with Ralph tugging at me from a perch on the inside, more or less fell into the graveyard. The several dozen tombstones were, indeed, interesting. Getting out was easier than getting in. The fence had some 2-by-4 cross braces on the inside that made the climb up easy.

We finished the return trip to the Desert Range without incident. Passing through the area where vehicles were parked, I expressed surprise that Ralph would take his new personal car (now thoroughly coated with dust) instead of a government rig. "None of them have been running for a while," Ralph said. "Our guys are taking parts out of two of them to see if they can get that one over there going."

I then asked if air conditioning wasn't available when Ralph bought his Chevy. Gesturing toward a small pile of hoses, tubes, and miscellaneous metal parts near one of the disabled government vehicles, he said, "Oh, it came with it. I've never liked it in my cars—took it out right away."

The next question concerned the pet antelope. "She should be around about this time," Ralph said, "We'll run out and see her." We drove a short distance past the buildings and parked in an area facing a gentle hill. "There she is," Ralph said. Sure enough, a young pronghorn stood part way up the rise.

Ralph called out, "Annie, come here." The antelope didn't move. He cupped his hands and yelled, "Come here, Annie." Nothing happened. He jumped up on the hood of the Chevy and yelled louder, "Annnneeeee." There

Desert Range Superintendent John Kinney showing a small visitor how Annie responded to a sugar cookie treat. The little girl was a member of a family driving by on the nearby highway. They spotted the antelope and Kinney, stopped, and the daughter got a first-hand introduction to wildlife.

was no movement on the hillside. Ralph turned to me and said, "Heck, that's not Annie."

For the benefit of doubters, and I was one, there really was a pet antelope named Annie at the Desert Range. John Kinney, who served at the range for nine years, had a picture of Annie on the wall of his office in Boise in 2004. He says she was quite tame and liked to nibble on sugar cookies provided by the staff.

It was starting to get dark and we headed for the kitchen. The BYU student, Kinney, and a fourth resident, Don Beale, a Utah Division of Wildlife Resources researcher, were there. Beale was doing a study of antelope. He also was the cook.

After dinner, Ralph took me to another room in the dwelling and showed me a bed he said I was welcome to use during my stay. He then went off somewhere, and wasn't seen again until the next morning. I went back to help the kitchen crew clean up and see if they would comment on a few of the day's minor mysteries. They enlightened me.

Kinney and the student said it was really good luck that Beale was there to cook. They said Ralph hated to cook, and if nobody was around to do that chore he lived mainly on oatmeal cookies. The BLM guests were bringing their own grub, so the "provisions" we had gone to get were just Ralph's personal supplies.

Ralph had given me his bed. That gift concerned me in view of the impending mattress shortage. Where was he going to sleep? The crew said it was no problem at all. "He'll probably just stay up all night reading. He does that a lot."

The Guests Arrive—Breakfast was just after sunup. Beale laid out a good spread and the five of us consumed it all with gusto. As we ate, the "regulars" had a lively discussion of whether or not it was going to rain that day. That was interesting, because average annual precipitation at the Desert Range compound is about six inches, and half of that is snow in winter months. Rainy summer days probably are causes for great celebration. When the weather topic was exhausted, I asked Ralph if he had worked in other places. "I worked up in Idaho for a while," he said, "but the trees made me nervous."

The BLM managers arrived at intervals throughout the day. Ralph greeted them and the student and Kinney showed them to their mattresses. The guests took over the kitchen and made lunch. We did the neighborly thing and helped them eat it. They were good cooks and we no longer had a kitchen, so we also helped them consume the dinner they made that night. At least some of us did; Ralph wasn't seen at lunch or dinner.

Ralph Holmgren explained how to apply findings from research at the Desert Range to BLM range managers during the field day, June 22, 1976.

In mid-afternoon, one of the Utah District guests hurried up to Ralph and said he was terribly sorry but he just got a radio message about a bad accident back in his unit. He had to leave right away to take care of the crisis, and couldn't possibly return for the field day. After he left, Ralph glanced at me and said, "Well, I guess that makes twenty-four."

A Day on the Range—The next day we temporarily reoccupied the kitchen for another breakfast at daybreak. Once again, the discussion topic was the chance of rain interfering with the day's activities. The BLM men started appearing, we left, and they made breakfast and cleaned up the kitchen. That took a while, but it was still pretty early when all the guests were assembled outside waiting for business to get under way.

The field day got off to a somewhat rocky start. Ralph ambled out to face the group. He was wearing wrinkled work pants, well-worn hunting boots, a floppy bucket hat, and a patterned shirt. The shirttail was hanging out. He launched into a rambling, somewhat disjointed welcome and orientation talk. The BLM managers fidgeted around a little and seemed unimpressed. One near me was overheard to mutter, "This is our expert?"

The Desert Range is divided into some three dozen study pastures that have been grazed in various controlled ways, most by sheep, a few by cattle. Within the pastures are fenced exclosures. Inside them the vegetation has been allowed to grow with no disturbance by large animals. So researchers have been able to compare the effects on plants of various grazing systems, or no grazing, and also study plant succession over many years.

As our group started walking toward the first pasture on the agenda, a young manager pointed to a shrub, and said something like, "Oh, there's _____, _____" (He spouted a Latin scientific name). Ralph stopped the group. He said, "No, that's _____, _____, _____, _____." (He identified the plant by the correct scientific and common names). Holmgren then reeled off about a dozen scientific and common names of plants that grow at the Desert Range, pointing out several that were in our immediate vicinity. For each, he added information on plant associations, forage values, and growth characteristics. Anyone who had been unimpressed with our field day leader was converted right then and there.

Respect turned to awe throughout a very long day as Ralph expounded on the meaning of what we were seeing at exclosure after exclosure. He gave the results of studies on seasons of use, rotation systems, watering techniques, and herding and handling animals, sprinkling in management recommendations. The

managers hung on his every word. There obviously was very little Holmgren didn't know about the results of 40 years of research at the Desert Range. And he described things in terms the BLM men obviously understood.

Number, please—Most of the guests drove off for home after dinner that night. After the stragglers left in the morning, our little group settled in for a relatively late, and leisurely, breakfast. Of course, an argument soon erupted about the chances for rain that day. Well, enough was enough. I finally interrupted and said something like, "You guys are just pulling my leg. There's about as much chance of rain today as there is it will snow."

Soon thereafter it rained for two or three minutes. Ralph just smiled, touched my arm, and pointed at the raindrops on the kitchen window.

Ralph went off somewhere and while we were doing the dishes the conversation turned to the telephone on the kitchen wall. It was the type now found only in museums. I learned it was on a party line, and anybody could listen in on conversations. The Forest Service built and maintained the line, so among the duties of John Kinney was acting as manager of the local phone company. It wasn't a very big company; it served the Desert Range and one other customer, a ranch. The line ran 48 miles to a school in Milford. Signals were rings like "two shorts and a long."

During my visits to the kitchen, whenever one signal rang no one answered. My guess was the calls were to the ranch house where we had inspected the family graveyard. But it seemed strange that everyone would be gone for several days from a working ranch that looked like a big operation. That wasn't it, the breakfast crew said. "That's our ring. Ralph hardly ever answers it. He says it's usually just somebody in Provo or Ogden wanting some fool thing or other."

Spending a few days at the Desert Range was not one of the major events in my life, but it comes to mind fairly often. Whenever I have occasion to munch on an oatmeal cookie it reminds me of Ralph Holmgren—competent scientist, good host, gentleman…and a real character.

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