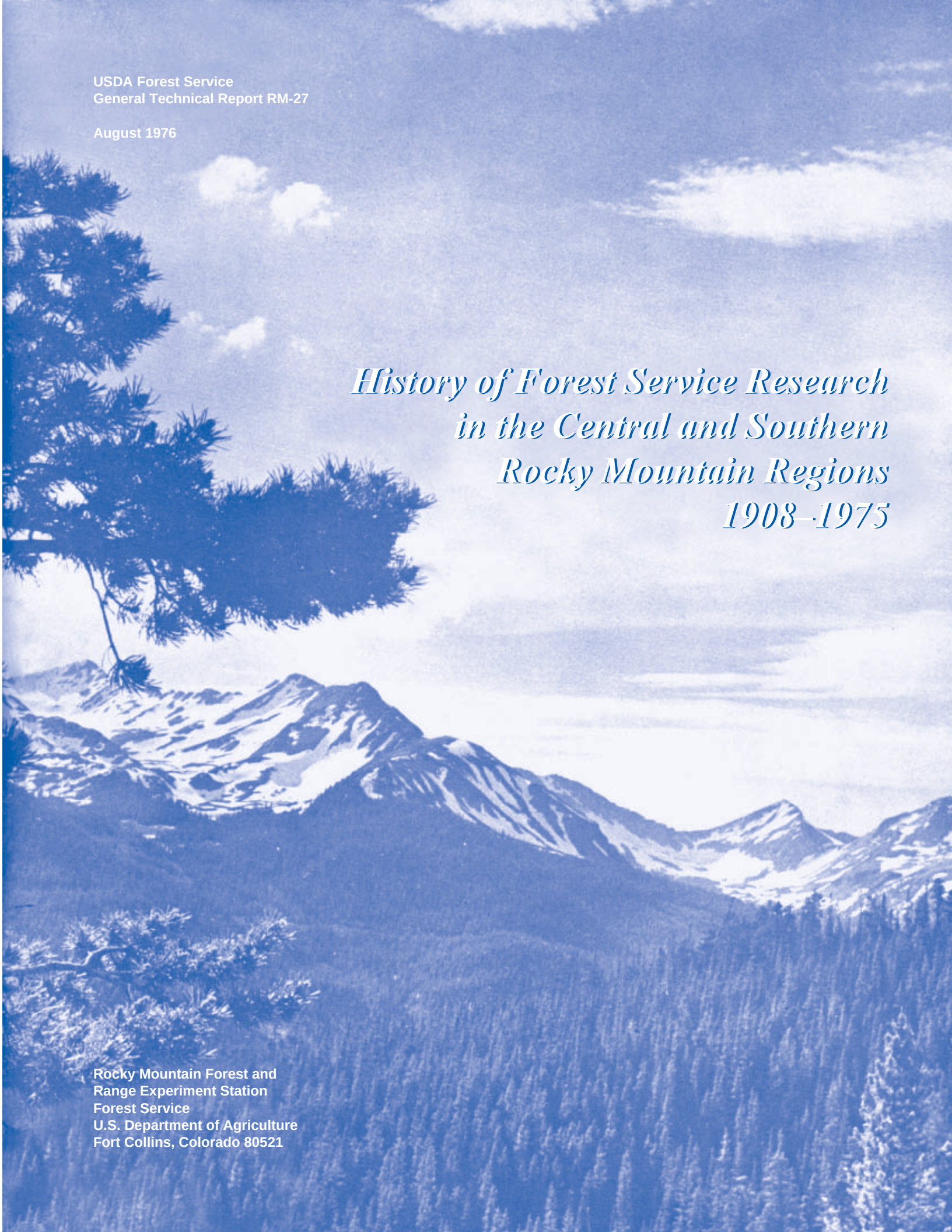
USDA Forest Service
General Technical Report RM-27

August 1976



History of Forest Service Research in the Central and Southern Rocky Mountain Regions 1908–1975

Rocky Mountain Forest and
Range Experiment Station
Forest Service
U.S. Department of Agriculture
Fort Collins, Colorado 80521

Abstract

Price, Raymond.
1976. History of Forest Service Research in the Central and Southern Rocky Mountain Regions, 1908-1975. USDA For. Serv. Gen. Tech. Rep. RM-27, 100 p. Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colo. 80521.

The first forest research area established by the Forest Service was in 1908–the Fort Valley Experimental Forest near Flagstaff, Arizona. In 1909, the Fremont Experiment Station near Colorado Springs was begun, as well as the Wagon Wheel Gap watershed experiment in the central Rockies. The Santa Rita Range Reserve, begun in 1903, was transferred to the Forest Service in 1915. Two forest and range experiment stations were officially designated–Southwestern Station, in 1930, at Tucson, Arizona, and Rocky Mountain Station, in 1935, at Fort Collins, Colorado. The two Stations were combined in 1953, with central headquarters at Fort Collins, to serve a 10-State territory.

Keywords: USDA Forest Service, forestry research, history.

USDA Forest Service
General Technical Report, RM-27 **August 1976**

History of Forest Service Research in the Central and Southern Rocky Mountain Regions 1908-1975

Raymond Price[1]

[1]*Raymond Price, retired, was Director of the Southwestern Forest and Range Experiment Station with headquarters at Tuscon, Arizona, from 1942 to 1953. In 1953, the Southwestern and Rocky Mountain Stations were consolidated, with headquarters at Fort Collins, Colorado, where Price served as Director from 1953 to 1971. The Rocky Mountain Forest and Range Experiment Station maintains central headquarters at Fort Collins, in cooperation with Colorado State University.*

Foreword

The Nation's Bicentennial—1976—also marks the Centennial for federal forestry in the United States. Forestry research became an integral part of the Nation's earliest efforts to base forestry and other land management practices on sound scientific footing.

Forests and their related resources provided our forebears with much of the raw material they needed to build our country. These resources are even more important to our national welfare now than they were in 1876 or 1776.

Today, resource managers possess tools for doing their jobs that were only dreamed of by Gifford Pinchot and other forestry pioneers at the beginning of the 20th Century. The modern manager knows how to plan forestry practices that will get much more from timber, range, wildlife, water, and recreation resources than was possible in earlier years—and he can do it while retaining, or even improving, scenic beauty and other environmental values.

Research made these resource management advances possible. We believe this history lends a perspective to the role of the Rocky Mountain Forest and Range Experiment Station, and its predecessors, in the efforts of the Forest Service in the West. Some of the earliest organized research in the Forest Service began here: timber management research at Fort Valley in Arizona, watershed management research at Wagon Wheel Gap in Colorado, and range management research at Santa Rita and Jornada in Arizona and New Mexico.

In the field of timber management research, scientists have sought answers to long-term challenges associated with forest regeneration, improving growth and yield, and protecting forests from insects, diseases, and fires. Means of handling several problems in these areas have been worked out, and foresters have applied the results.

Guidelines for managing rangelands in the central Rockies and Southwest were nonexistent at the turn of the century. Our researchers have cooperated with managers to devise grazing systems that prevent range abuse, methods for controlling poisonous plants, and techniques for restoring depleted ranges to productivity.

Watershed management research has been one of our significant pioneering efforts. We have developed information on erosion potential for forest and rangelands, and have devised ways to control soil loss and avoid decline in water quality. We have also developed techniques for managing vegetation, and snow accumulation, as means for altering the volume and timing of streamflows from mountain watersheds.

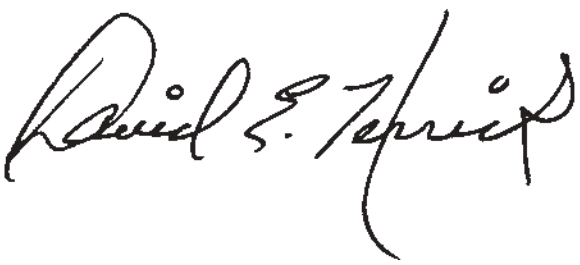
In recent years rapid population growth in many areas of the West, including expanding recreation and community developments in the mountains, has boosted demands for all resources. Our research is responding to these shifts by developing practical tools to help land managers devise better ways to meet diverse public needs while preserving environmental beauty and productivity.

We're proud of our forestry research history. But even more, we're proud of the people who made that history. This document records the efforts of a number of those people, although time and space would not permit everyone to be mentioned, or the detail given to their work that we might like. Men and women together have shared in our mistakes and our accomplishments. Their efforts have built the foundation for future research—research that we hope will be increasingly effective in helping to solve major forest and range resource challenges in the Great Plains, the Central and Southern Rockies, and the Southwest.

As we considered assembling the Station's history, we asked ourselves who could best organize and describe nearly 7 decades of research spread over a 10-State territory. Ray Price was our immediate choice. No other individual has personally known and dealt with so many facets of the Station's work over so many years.

Ray accepted the challenge and tackled the task with the same vigor he exhibited during his years as Station Director. He dug into old reports and contacted retirees and others to ferret out significant events—and some stories on the lighter side—that would illustrate why various research programs were organized and the significance of their results. We are indebted to Ray for completing this difficult job.

For the constructive criticisms made of this history, we gratefully acknowledge the help of former Station Directors R. E. McArdle, C. A. Connaughton, W. G. McGinnies, and K. E. Wenger; former Chief of Range Research W. R. Chapline; former Assistant Directors and Branch Chiefs S. R. Andrews, G. L. Hayes, M. D. Hoover, B. R. Lexen, E. H. Reid, and N. D. Wygant; and various members of the current Station staff.



DAVID E. HERRICK
Director
Rocky Mountain Forest and Range Experiment Station
August 1976

ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

U.S. DEPARTMENT OF AGRICULTURE 6-76 FOREST SERVICE

Directors
Rocky Mountain Station
1935–53

R. E. McArdle

C. A. Connaughton

Directors
Combined Rocky Mountain Station
1953–75

R. Price

W. G. McGinnies

K. F. Wenger

D. E. Herrick

Directors
Southwestern Station
1930–53

G. A. Pearson

A. T. Upson

R. Price

LEGEND

- HEADQUARTERS
- ▲ Field Laboratories
- ◆ *Experimental Areas*
- Eisenhower Consortium Universities
- • Major communities in addition to laboratory locations

SCALE
50 0 100

Contents

Illustrations

All photographs with captions have permanent numbers; the negatives for them are stored in the Photo Library, Forest Service, U.S. Department of Agriculture, Washington, D. C. 20250.

Page	Negative
2	F19854A, F49165A, F230112.
5	F523699.
6	F523700.
7	(bottom) F329383.
9	(left) F523701; (right) F523702; (bottom) F36897A.
10	(left) F53431; (bottom) F76500.
11	(top) F49793A; (bottom) F193130.
12	F94321.
13	F94340.
14	F89863.
15	(left) F196626; (right) F16929A.
16	(left) F162847; (right) F216166.
17	F315275.
18	(top) F194274; (bottom) F329378.
21	Pearson F523703; Upson F523704; Price F523705.
23	(top) F329005, F329006; (bottom) F345402.
24	(A) F523706; (B) F523707; (C) F523708; (D) F523709; (bottom) F319003.
25	F321846.
26	(top) F321347; (bottom) F341490.
27	F523710.
28	(top) F402888; (bottom) F425038.
29	F523711.
31	F523712.
32	(left) F523713; (right) F523714.
33	F523715.
34	F523716.
35	McArdle F523717; Connaughton F523718; McGinnies F523719.
37	(left) F523720; (upper right) F523721; (center) F523722; (lower right) F523723.
38	(top) F396346, F396343, F396341; (bottom) F468429.
39	(top) F419059; (center) F435730; (right) F523724.
40	(top) F523725; (center) F523726; (bottom) F406360.
41	(left) F454274, F454281; (right) F410991, F472147.
42	F523727.
43	(top) F523728; (bottom) F523729.
45	(top, left) F523730, (right) F523731; (left, center) F465822, F465823; (bottom, left) F523732, (right) F523733, F523734.
46	(top) F523735, F523736, F523737; (bottom) F523738.
47	(top, right) F523739; (left) F523740; (bottom) F523741.
48	F386829, F485705.
49	F523742.
51	Price F523743; Wenger F523744; Herrick F523745.
52	(left) F523746; (right) F523747.
56	F523748.
57	(left) F523749; (right) F523750.
58	F523751.
59	(top) F523752; (bottom) F523753.
60	(A) F523754; (B) F523755; (C) F523756; (D) F523757.
61	(E) F523758; (F) F523759; (G) F523760; (H) F523761; (I) F523762; (J) F523763.
62	(upper right) F523764; (left) F523765; (lower left) F523766.
63	(upper left) F523767; (lower left) F523768; (upper right) F523769, F523770; (lower right) F523771.
64	(left, center) F523772, (bottom) F523773; (right, top) F523774, (center) F523775, (bottom) F523776, F523777.
65	(top, left) F523778, (right) F523779; (bottom) F523780.
66	F523781.
67	F523782.
69	(A) F523783; (B) F523784; (C) F523785; (D) F523786; (E) F523787; (F) F523788; (G) F523789.
70	F523790.
71	(A) F523791; (B) F523792; (C) F523793; (D) F523794; (E) F523795; (F) F463668; (G) F523796; (H) F523797.
72	F523798.
74	(A) F523799; (B) F523800; (C) F523801; (D) F523802; (E) F523803;
75	(F) F523804, F523805; (G) F523806; (H) F523807; (I) F523808; (J) F523809; (K) F523810; (L) F523811; (M) F523812.
76	F523813.
77	(top) F523814; (bottom, left) F523815, (center) F523816, (right) F523817.
78	(A) F523818; (B) F523819; (C) F523820; (D) F523821, F523822.
79	(E) F523823; (F) F523824; (G) F523825; (H) F523826; (I) F523827, F523828.
80	(left, top) F523829, (bottom) F523830; (right) F523831.
81	(left) F523832; (right) F523833.
83	F523834.
(Inside back cover)	F523835.

"Here We Shall Plant the Tree of Research"

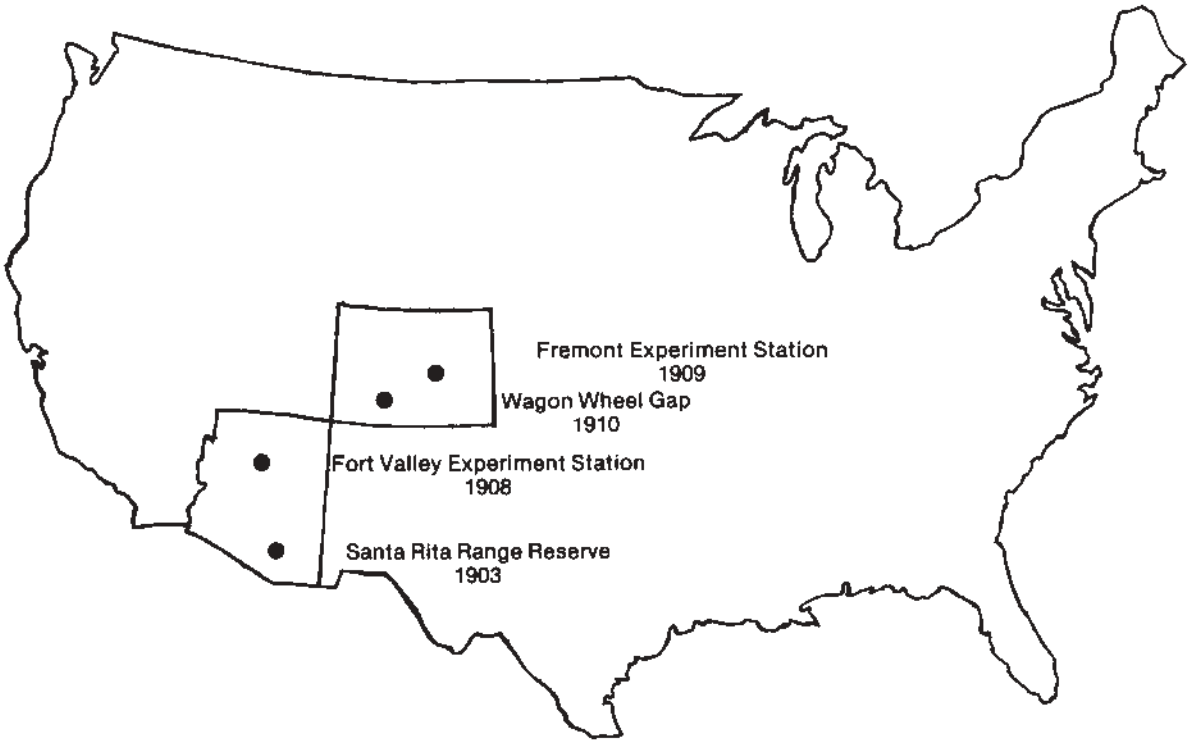
In August 1908, the U.S. Forest Service began its formal timber management research with the establishment of the Fort Valley Forest Experiment Station near Flagstaff, Arizona. This was the first scientific venture of its kind in America—now the oldest.

Following is a reflection about the establishment of the Fort Valley Forest Experiment Station by G. A. Pearson, pioneer Forest Service Silviculturist, the first director of the Station:

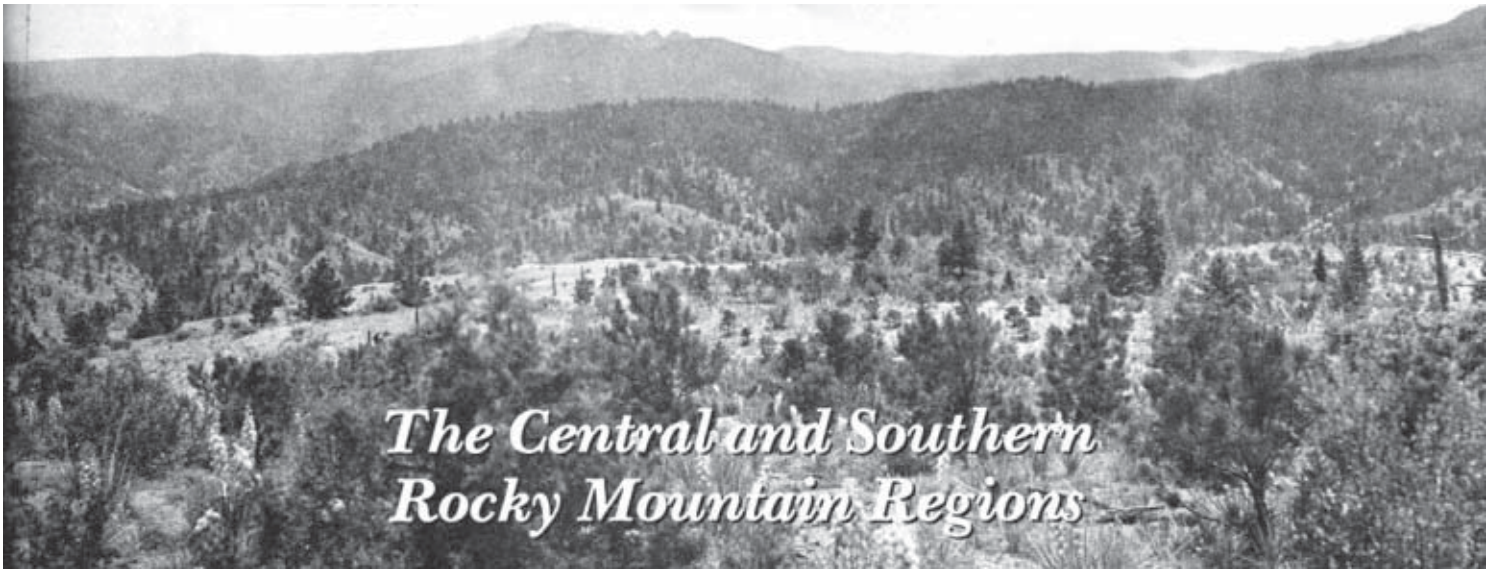
It was a sultry afternoon in August 1908. Raphael Zon, then chief of Silvics in the Forest Service, had come to Flagstaff to select a location for what was to be the first forest experiment station in the United States. Zon, Willard Drake, and I were urging our phlegmatic livery stable cayuses over the road to Fort Valley to examine a site that had been recommended by Frank Pooler, Supervisor of the Coconino National Forest. Two miles short of our destination a thunderstorm crashed down upon us in true Arizona style. The downpour was more violent than usual, so we took shelter in a large barn of the old A-1 Cattle Company. When we emerged an hour later, the normally dry Rio de Flag was running a hundred yards wide with a fluid whose color and consistency told plainly that the country was going to the dogs even in that early day. After crossing the 'river,' it was only half a mile to the area we had come to see—a beautiful stand of ponderosa pine. "Here," said Zon, "we shall plant the tree of research!"

The forest area selected was first called the "Coconino Experiment Station." In 1911 it was renamed the "Fort Valley Experiment Station." In the years following, a distinction developed between the "Experiment Station"—a group of scientists conducting research—and the "Experimental Forest"—the area on which the research was conducted. Later, the Fort Valley Experiment Station became one of several field laboratories of the Southwestern Forest and Range Experiment Station, now the Rocky Mountain Forest and Range Experiment Station.

The central and southern Rocky Mountain regions not only have the first experimental forest (Fort Valley) but also the first experimental range (the former Santa Rita Range Reserve near Tucson, Arizona, established in 1903), and the first experimental watersheds (the Wagon Wheel Gap watersheds on the Rio Grande National Forest in Colorado established in 1910). The experimental forest and experimental range are still in use, but the Wagon Wheel Gap watersheds have lain dormant since 1926.



Western yellow pine seedlings at Fort Valley were over 10 years old and taller than 6 inches when selected for a growth study. (Left to right) tree 44, in 1914, was 1.0 foot tall; in 1920, 2.7 feet; and in 1928, 5.2 feet tall.



The Central and Southern Rocky Mountain Regions

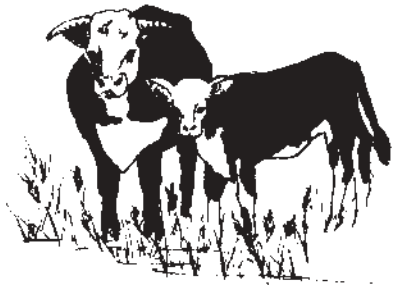
A Vast, Variable, and Valuable Empire

The central and southern Rocky Mountain regions—a 10-State area stretching from the Canadian border of North Dakota to Mexico—make a vast, variable, and valuable empire that comprises one-fourth of the land area of the conterminous 48 States.

Physiographically, the area is characterized by high mountains and true desert at the extremes, with high plateaus, rich mountain valleys, and high and low plains between. The natural vegetation reflects the accompanying climate.

Within this vast and variable empire are bounteous natural resources of water, timber, forage, wildlife, and recreational and scenic values that contribute much to the Nation's economy.

Unquestionably, water is the most important resource the area contributes to the western two-thirds of the Nation. Several major rivers of the West, including the Missouri, Platte, Arkansas, Canadian, Pecos, Rio Grande, Gila, and Colorado, have their origins in the Rockies. From these waters, irrigation and light and power are furnished for much of the West and Midwest. Cities and towns rely on mountain watersheds as their major source of water. And, mountain waters, held in multitudes of manmade lakes and reservoirs, provide prime outdoor recreation of a type that otherwise would not be available.



Some 80 percent of the lands is suitable, to some degree, for grazing of domestic livestock. Ranchers in the Rocky Mountain region derive over $1 billion annually from livestock, many of which are grazed under permit on Federal lands, chiefly National Forests. Some 11 million cattle and 9 million sheep graze a third of their forage from these ranges, which vary from semidesert grass-shrub ranges to alpine grasslands.

Wood products have always been a continuing segment of the economy of the central and southern Rockies.

Commercial forests cover roughly 30 million acres; another 50 million acres are covered with noncommercial forest, primarily pinyon-juniper woodlands. The commercial forests support more than 108 billion board feet of sawtimber—32 billion cubic feet of net growing stock. The wood products industry is now in a transition stage, switching toward more specific product orientation—emphasis on remanufactured products rather than plain boards.

Over 1.5 million big-game animals are the primary drawing card for hunters. Mule deer head the list in terms of numbers, while elk are the prized trophies. There is no sure way to put a dollar value on the wildlife resource itself, but as an example of the values at stake, Colorado alone estimated the value added to the State's economy by sportsmen expenditures (hunting and fishing) at nearly $329.4 million in 1973.[2]

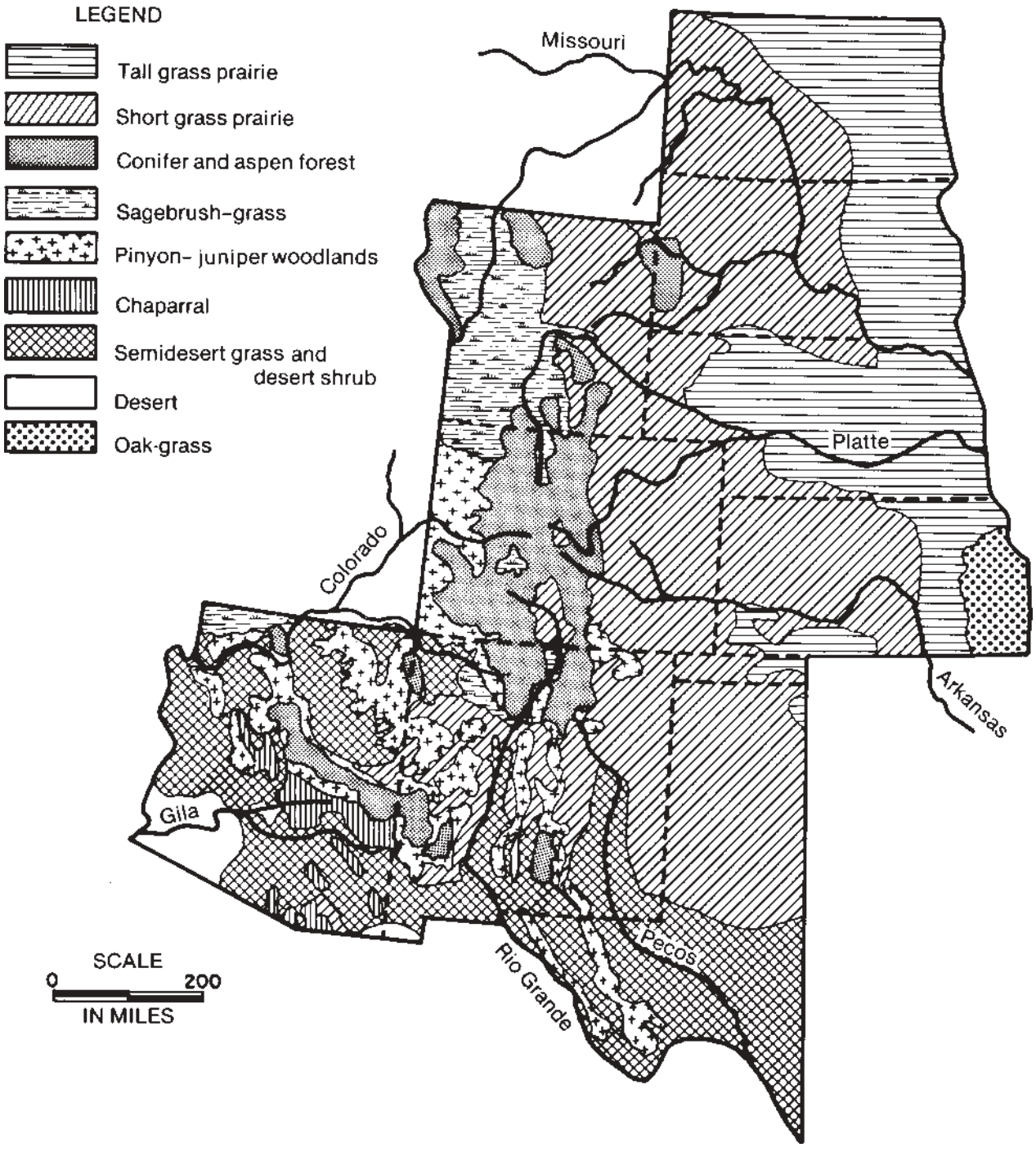
The esthetics of a diverse wildlife population broadly overlap into the field of recreation. The food value of the game the hunter brings home is but a small part of the total value he derives from being in the forest or field. The scenic grandeur of its mountains and deserts, however, gives

[2] *Nobe, K. C., D. M. Blood, and Lee Ann Ross. Survey of sportsmen expenditures for hunting and fishing in Colorado, 1973. (A contract report for the Div. Wildl., State of Colo., prepared by Dep. Econ., Colo. State Univ., Fort Collins.)*

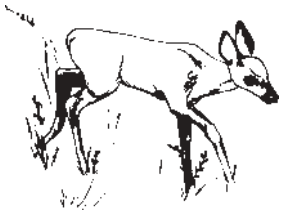
MAJOR RIVER DRAINAGES AND GENERAL VEGETATION TYPES

Rocky Mountain Forest and Range Experiment Station

March 1976



A growing youngster in a developing country.



the area great interest to recreationists. National Forests within the area accounted for 18 percent of the visits or days' use for all the National Forests across the country in 1974, yet the area supports only 7 percent of the country's population. Winter sports, especially, are gaining rapidly in popularity. Recreation takes many forms in the central and southern Rocky Mountains, and encompasses all seasons.

Regions Used Early

Although the 10 States that make up the central and southern Rocky Mountain regions are officially young—7 are among the last 14 admitted to the Union—their history of use by the white man is old. Spanish explorers and settlers spread northwestward from Mexico over much of the region before the Pilgrims landed in New England. Early records show that a Jesuit missionary promoted livestock raising in southern Arizona in 1540. The Spanish settlers spread mostly over the lowlands, following the river courses back into the interior.

Settlement of the rugged, mountainous areas, and the prairies to the east, progressed slowly until the late 1880's. Then several factors combined to cause boom growth: the construction of railroads to link East and West, the discovery of rich ores of gold and silver, and trail herds of cattle moving east from the Oregon Territory to Nebraska and Kansas railheads were a few.

Significantly, the lack of water—or perhaps more accurately, the erratic distribution of water—was a challenge even then to the development of communities and agriculture. Extensive irrigation systems were functioning as early as 1880.

Forests, especially those around developing communities, were logged off to provide necessary fuel, building lumber, fence and corral posts, mine timbers, and railroad ties. The tie hacks, especially, high-graded the forests in the railroaders' rush to connect the Coasts. Railroad construction also adversely affected the wildlife. Market hunters slaughtered great herds of game to provide meat for construction crews.

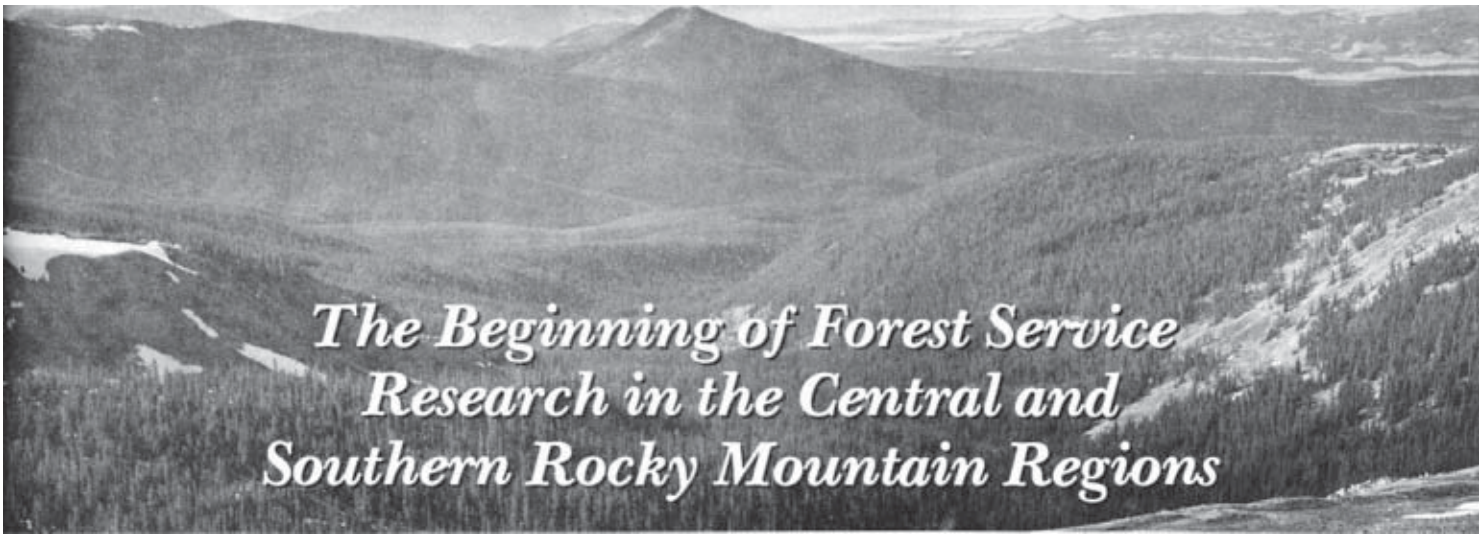
The range resource, too, was hit hard before the human population increased significantly. Livestock numbers soared to an early peak in 1885—over 5 million head of cattle, and nearly 10 million head of sheep. Overgrazing soon took its toll, and the herds suffered heavy losses during droughts and blizzards.

A Great Public Resource

Large segments of the forest and rangelands in the central and southern Rocky Mountain regions are in public ownership and—significantly —a public responsibility. Moreover, a close mountain-valley relationship exists. What happens on or to the mountains directly affects the values and activities in the adjacent valleys and cities. Here lies an immense piece of highly valuable real estate, its potential yields of renewable natural resources not yet fully known or appraised in terms of management guides.

The dominant value of the water resource requires that management and use of the other resources must often consider water yield as a limiting parameter. Thus, the economics of multiple-use relationships play an increasingly important role in the great Rocky Mountain empire.

A close mountain-valley relationship exists in the central and southern Rocky Mountain regions.



The Beginning of Forest Service Research in the Central and Southern Rocky Mountain Regions

Establishment of National Forests Made Forest Investigations Necessary

In 1891, when the Forest Reserves were created, little information or knowledge existed about the lands or the nature, value, and use of the resources. The boundaries had not even been defined on the ground, let alone any detailed information gained as to what was on them or how to properly use them.

The immediate task was to organize the Forest Reserves, later termed National Forests (1907), into some system for administration and inspection. A District plan, devised in 1907,[3] formed six Districts for the then existing National Forests, with headquarters at Missoula, Montana (District 1); Denver, Colorado (District 2); Albuquerque, New Mexico (District 3); Ogden, Utah (District 4); San Francisco, California (District 5); and Portland, Oregon (District 6). Later, four more Districts were added, one in the West (Juneau, Alaska), two in the East (now combined into one at Milwaukee, Wisconsin), and one in the South (Atlanta, Georgia). Also, the term District was changed to Region. This history concerns primarily Regions 2 and 3. Region 2 geographic area now includes Colorado, Kansas, Nebraska, South Dakota, and eastern Wyoming; Region 3 includes Arizona and New Mexico.

Soon after the organization of the National Forests was completed, an important and vital need was to learn about the several resources—their requirements and proper management and use. Management decisions had to be made without the benefit of assembled facts concerning the specific nature and capabilities of the resources. The challenge was how to go about getting the information and "know-how" as soon as possible.

Two closely related measures were adopted. The first was to encourage, assign, and approve Forest Officers in the field to observe, make notations, and conduct local administrative tests and studies. These were handled by heads of the Offices (later Divisions) of each Region handling each major resource, that is, Silvics (Timber Management), Grazing Management, and so forth. The other measure was to appoint and assign trained Forest Examiners (Silviculturists) and trained Grazing Examiners to each Region. These Forest and Range Examiners assigned by the Central Office of the Forest Service in Washington, D. C., were to give impetus to the local administrative studies made by Forest Officers, and to conduct more fundamental studies regarding the nature, requirements, and possible use of the resource.

An Office of Grazing Studies in the Washington Office was established in 1910 with James T. Jardine in charge. In 1911, Regional Offices of Grazing Studies were established in Districts 2 and 3. The offices had three main assignments, namely, range reconnaissance and management plan development for areas covered, technical range administration, and grazing studies.

[3] *U.S. Department of Agriculture. 1908. Report of the Forester for 1907.*

Jornada Range Reserve, New Mexico, 1913.

Chief Forester Henry S. Grave's Service Order 41, of January 2, 1912, set up a plan for Organization of Investigative Work. This Service Order created a Central Investigative Committee, and District Investigative Committees.[4] The original Central Investigative Committee consisted of Raphael Zon, Chairman, representing the Branch of Silviculture; James T. Jardine, representing the Branch of Grazing; and Howard Weiss, representing the Branch of Products. This Central Committee reviewed, approved, and correlated the investigations in the several Regions nationwide. This matter of forest investigations was not taken lightly, because information was so vital to the proper use and management of the National Forest resources.

The District (now Region) Committees consisted of the District (Regional) Forester as chairman; members were the Forest and Range Examiners, Heads or Chiefs of the several Resources Offices or Divisions, and selected Forest Supervisors. From time to time other Forest Officers and representatives of other Federal and State agencies were invited to sit in on Committee deliberations. The Committee met annually to hear the results of the studies and investigations conducted during the year, discuss their application and use, and consider and approve the proposed program and studies for the coming year. The report of the Committee, which consisted of the reports of the several studies and investigations, together with the Committee action, was sent to the Central Investigative Committee in Washington, D. C.

Region 2 Investigations

Region 2 personnel got deeply involved in forest investigations, including range studies.[5] They not only recognized the urgency to obtain resource information in guiding the use and management of the National Forests, but felt strongly that such investigative activities were good for the personnel involved. The Region held that local studies by Forest Officers were excellent training for forest personnel to develop their skills and knowledge of the resources, as well as their interest in use and management.

Observations and investigations were undertaken in many aspects of timber management, grazing management, and watershed management (chiefly erosion and streamflow). Investigations in timber management included growth studies, seeding habits, natural reproduction, seeding and planting, logging slash disposal, harvesting methods, logging practices, and forest fire. A network of permanent sample plots in the main timber types—ponderosa pine, lodgepole pine, and Engelmann spruce—was established, and remeasured periodically to obtain the above information under various site, harvesting, and natural conditions.[6]

Grazing management observations and investigations included plant identification, plant growth and development, poisonous plants, natural revegetation, reseeding, forage production and utilization, degree and seasons of use, handling of livestock, and wildlife observations.

In watershed management, such occurrences as erosion, floods, and time and amount of streamflow under various conditions were observed.

Fremont Experiment Station

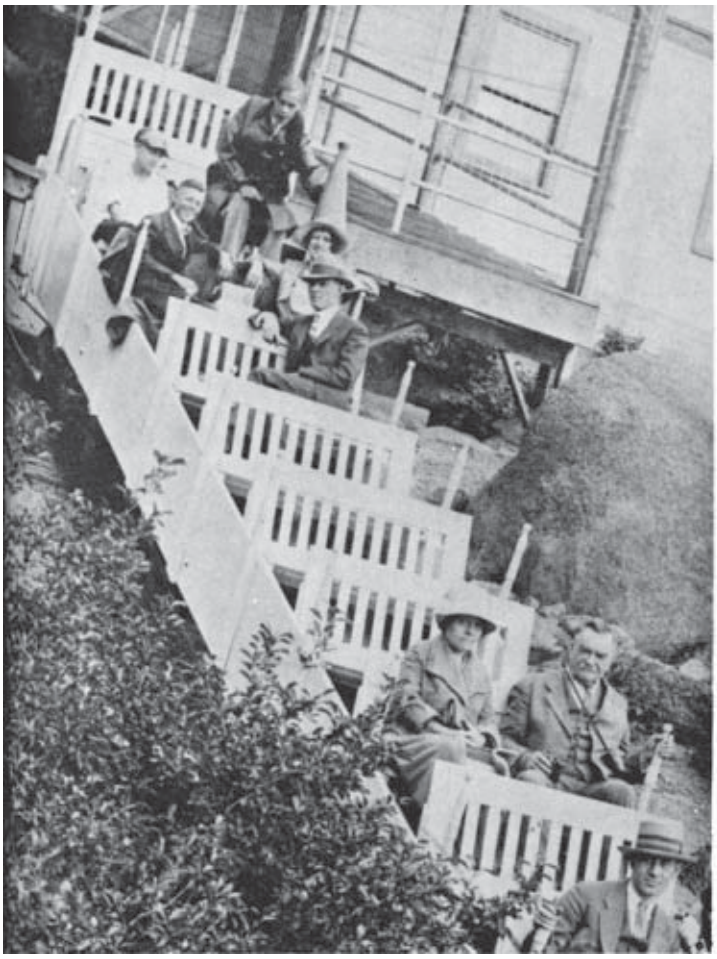
The principal field base and laboratory of the forest investigations in Region 2—the Fremont Experiment Station established September 3, 1909—was located near Manitou Springs, Colorado, in a pleasant mountain valley on the east slope of Pikes Peak, Pike National Forest. Here the principal forest types of the Region were represented, and the Station was so located "because it combined remoteness to insure a favorable atmosphere for carrying on various phases of research within the more important timber types (Engelmann spruce, ponderosa pine, Douglas-fir) indigenous to the Rocky Mountain Region."[7] In those days the automobile was a luxury and forest administrators were not thinking in terms of highway accessibility. Access to the Station was by tram, with horse and wagon between the upper terminals of the tram and the headquarters.

[4] *Storey, H. C. History of Forest Service research: Development of a national program. (A working report, dated Apr. 24, 1975, on file at USDA For. Serv., Washington, D. C.)*

[5] *U.S. Forest Service, District 2 Investigations: Reports and Programs. (On file, Library, Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colo.)*

[6] *It is not the purpose of this publication to enumerate and describe all investigations or research undertaken. These are on file. Only fields of investigations and studies that show the direction and history are included. Moreover, not all forest officers and scientists are included; only those who had a part in initiating or directing the work are mentioned. A list of research personnel, taken from available records, is included in the appendix.*

[7] *Roeser, J., Jr. 1955. A brief chronological history of the Rocky Mountain Experiment Station. (Typewritten report, Apr. 18, 1955, on file, Library, Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colo.)*



Carlos G. Bates, one of the pioneer silviculturists of the Forest Service (Forest Examiner) who was assigned to Region 2, located and established the Fremont Station, which was named after General John C. Fremont, a noted explorer. Dr. Frederick E. Clements, pioneer ecologist, then director of the Alpine Laboratory of the Carnegie Institute (nearby on Ruxton Creek, Minnehaha Falls), accompanied Bates in establishing the Station.

(Right) Carlos G. Bates, Forester in Charge, Fremont Experiment Station, Colorado, 1909–27. (Left) Bates, in third seat from top, rides the Manitou Incline (courtesy of Verne C. Fuhlrodt).

Carlos G. Bates, with first load of supplies brought in on four wheels to the Fremont Experiment Station, Colorado, 1917.

Bates[8] was one of several University of Nebraska forestry graduates who played a prominent role in the early history of Forest Service research.[9] Following his graduation with a B.S. degree in 1907, Bates received an appointment as forest assistant in the Forest Service at a salary of $1,000 per annum. Bates was one of a group of young foresters who suggested to Chief Forester Pinchot the need for forest experiment stations. He was assigned the project of establishing a station within the Central Rocky Mountain District.

Bates was the principal investigator at the Fremont Station from 1909, the time of its establishment, until July 1927 when he transferred to the newly created Office of Biological Research at the Forest Products Laboratory. Within a year he transferred to the Lake States Forest Experiment Station. In 1934 he was assigned to provide technical guidance to the Great Plains Forestry Project (Shelterbelt Program).

Bates literally built the Fremont Station and its facilities. In addition to giving technical guidance to administrative studies by Region 2 forest officers, Bates completed many important investigations, several of which received national attention.

Bates started an arboretum and carried on a program of exotic tree introductions. Seeds were collected and tested in a study to determine the amount of periodicity of seed production of Rocky Mountain conifers in relation to climatic conditions, flowering, and cone production. Several plantations were established to determine the practical significance of geographic varieties and hereditary character of individual variation. Bates early recognized the significance of seed sources in forest planting. Another project of fundamental character, begun in 1910, was a study to determine the limiting climatic and edaphic factors affecting the distribution of forest types.

Prior to 1920, the office for the Fremont Station was in the Forest Service Regional Office

[8]*Roeser, Jacob, Jr. 1956. Carlos Glazier Bates: Pioneer silviculturist, 1885-1949. J. For. 54(4):272-273.*

[9]*Others include G. A. Pearson, R. R. Hill, A. W. Sampson, A. T. Upson, Paul Roberts, J. S. Boyce, E. W. Nelson, C. L. Forsling, and W. R. Chapline.*

In 1911, Bates evaluated windbreaks planted in the late 1800's. The mulberry hedge in Colorado's Arkansas Valley and the Lombardy poplars in Mesa County were used to protect orchards from wind and drifting sand.

Fremont Experiment Station, Colorado, 1920.

in Denver. From 1920 until the late summer of 1935 when the Station was closed,[10] offices were in quarters with the Pike National Forest in Colorado Springs.

The Fremont Station was renamed in 1925 to the "Rocky Mountain Experiment Station" which better characterized its work.

When Bates left the Station in 1927, Jacob Roeser, Jr., Bates' assistant, carried on the work of the Station. Roeser worked under the Chief of Timber Management of the Region, and continued the work started by Bates. When the Station closed in 1935, Roeser joined the newly established Rocky Mountain Forest and Range Experiment Station, with headquarters at Fort Collins, Colorado. Later, 1936, Roeser transferred to forest administrative work with Region 2.

In February 1953, during their annual meeting, the Central Rocky Mountain Section of the Society of American Foresters voted to commemorate the career and the pioneer contributions of Carlos G. Bates to forestry research by dedicating the plantations at the old Fremont Experiment Station, which he founded, to his name.

[10]*In 1945, all improvements, including the fence, were sold. Dismantling was completed in 1947.*

J. Roeser, Jr., observing ponderosa pine cones for drying. Fremont Experiment Station, Colorado, 1924.

Wagon Wheel Gap Experiment: A Milestone in Watershed Management Investigations

One of the purposes for establishing the National Forests was watershed protection and regulation of streamflow. With the several major rivers in the Central Rockies originating within the National Forests, the matter of streamflow and the effects of forest cover on runoff and erosion and watershed protection was of early concern. No specific information in this field existed in the United States. The one and only serious attempt to measure the influence of forests upon streamflow was the Emmenthal study in Switzerland.[11]

[11]*Engler, Arnold. 1919. [Experiments showing the effect of forests on the height of streams.] 626 p. Mitt. Schweiz. Centralanst. Forstl. Versuchswes. XII, Zurich. (As cited in Bates, Carlos G., and Alfred J. Henry. 1922. Streamflow experiment at Wagon Wheel Gap, Colorado. Mon. Weather Rev. Suppl. 17, 55 p.)*

Acting on the instructions from the Washington Office, a search was made for watersheds suitable for a study of the effects of forest cover on streamflow and erosion. The plan was "to select two contiguous watersheds, similar as to topography and forest cover; to observe carefully the meteorological conditions and the streamflow for a term of years under similar conditions of forest cover; then to denude one of the watersheds of its timber and to continue the measurements as before for an indefinite period, or until the effects of the forest destruction upon the time and amount of streamflow, the amount of erosion and quantity of silt carried by the streams had been determined."[12]

In 1910, Henry S. Graves, Chief Forester, stated "To determine exactly what effects the forest cover may have upon the disposition of rain and snow water, its runoff storage, and later

[12]*Bates, Carlos G., and Alfred J. Henry. 1922. Streamflow experiment at Wagon Wheel Gap, Colorado. Mon. Weather Rev. Suppl. 17, 55 p.*

Wagon Wheel Gap experimental watersheds, Colorado, 1911. Circles indicate weir locations.

Measuring snow conditions on watershed B, Wagon Wheel Gap, Colorado,

appearance in springs, and the possibility of erosion and silting up of streams, an experiment station has been started at Wagon Wheel Gap, on the Rio Grande National Forest. . ."[13]

"Since the plan of the experiment contemplated the use of considerable instrumental equipment and the services of men skilled in meteorological observations, the cooperation of the Weather Bureau was solicited, and on approval of the Secretary of Agriculture, the two services began the active work of getting material and equipment on the ground on June 1, 1910."[12]

Bates, Nile Hughel, surveyor, and C. R. Tillotson were on the site June 1, 1910, to represent the Forest Service. Forest Assistant P.T. Coolidge, Rio Grande National Forest, found the watersheds to be studied. Bates, with the occasional aid of several Forest Service men, completed the layout of the experimental watersheds and handled the Forest Service part of the work. The Wagon Wheel Gap study area was handled as a Branch of the Fremont Station.

Like many pioneer research efforts, the Wagon Wheel Gap Experiment raised more questions than it answered. This, as has been learned since, was largely because of the design of the experiment. It would have been interesting and no doubt fruitful if the treatment could have been reversed on the watersheds and run for another time period, which would have provided the replication so vital in experimental work. Nevertheless, the experience gained and the information and results obtained have been benchmarks for subsequent watershed research undertakings.

[13] *U.S. Forest Service. 1910 Annual Report.*

Grazing Investigations

Grazing studies began early. L. H. Douglas was assigned to Region 2 in 1911 as Grazing Examiner. Later Chester Lee and H. E. Schwan joined Douglas in conducting the administrative range studies. Some of the principal areas of observation and study included plant identification, natural revegetation, reseeding, and range utilization. Douglas also compared the open-herding and bedding-out system of sheep grazing to the sheep grazing system then prevalent.

Region 3 Investigations

Forest investigations in Region 3 (Arizona and New Mexico) followed much the same pattern as in Region 2, but pertained mostly to ponderosa pine, the principal timber species in the Southwest. One of the main reasons the Fort Valley Experiment Station was established and located in the Southwest was to study the reproduction of ponderosa pine and how to get more trees established.

On many areas of the Coconino National Forest, one could see through the ponderosa pine forests for great distances because of the limited and low growing pine reproduction. Uncontrolled forest fires in early years, drought, and browsing by livestock, mainly sheep, as the result of unregulated grazing, contributed to the scarcity and injury to the pine reproduction. Largely because of weather and growth conditions, reproduction of ponderosa pine occurs infrequently. In dry years much of the reproduction that did occur was damaged by browsing animals, especially in heavily grazed areas. But the favorable amount and timing of precipitation in 1919 plus a bumper seed crop that fell on a seedbed with reduced competing vegetation, resulted in much reproduction. About this same time sheep and cattle numbers were reduced. As a result, the ponderosa pine stands became thick with reproduction, much too thick in many places. This reproduction is now furnishing the growing stock for the forests.

Fort Valley Experiment Station

The Fort Valley Experiment Station was the main field station and laboratory for forest management investigations in Region 3. G. A. (Gus) Pearson, another pioneer silviculturist (Forest Examiner) assigned to Region 3 was the principal forest investigator at the Fort Valley Station and remained until his retirement in 1945.

Rare is the scientist that remains in the same field of investigation at the same location during his lifetime. Pearson was one of them. He spent his entire career studying ponderosa pine in the Southwest. After his retirement in 1945, Pearson continued as an unofficial collaborator working on and writing up his findings. At the time of his death, January 31, 1949, he was at his desk at

"Pink" mules used to haul freight and visitors to Fort Valley Experiment Station, Arizona, 1910.

G. A. "Gus' Pearson, Forester in Charge, Fort Valley Experiment Station, Arizona, 1908–30.

the Southwestern Forest and Range Experiment Station headquarters on Tumamoc Hill in Tucson, Arizona. His head rested on his manuscript which became his now-famous monograph, "Management of Ponderosa Pine in the Southwest" (Agric. Monogr. 6).

As with Bates, the Forest Service and the Government got their money's worth out of Pearson. Pearson not only pioneered and conducted the work at Fort Valley but he also was the stimulus to the early administrative forest studies in Region 3. He trained and worked with many associates who helped at one time or another to carry on the research program at Fort Valley. The list includes many who would be prominent in a "Who's Who" in American forestry. Some of those who worked at Fort Valley with Pearson, more or less in chronological order, include: J. S. Boyce, Max H. Foerster, Harold H. Greenamyre, Alexander J. Jaenicke, Norman W. Scherer, Enoch W. Nelson, Clarence F. Korstian, M. W. Talbot, R. D. Forbes, Herman Krauch, Harold S. Betts, Joseph C. Kircher, Emanuel Fritz, Ferdinand W. Haasis, Bert Lexen, E. M. Hornibrook, E. C. Crafts, Elbert H. Little, Jr., Frank W. Wadsworth, and George S. Meagher.

Pearson was enthusiastic about his work; it was always uppermost on his mind. Like Bates, Pearson was a keen observer. Each made extensive, close, and repeated observations which made up for the lack of formal replication in their studies. Pearson knew intimately each tree that grew at Fort Valley! On one occasion he stopped his trusty Ford coupe, got out, and rolled away a rock that was resting against a young ponderosa pine with the comment, "These cursed road builders have no regard for value or beauty!"

In 1950, the Southwestern Section of the Society of American Foresters, assembled at Flagstaff, Arizona, dedicated the 154-acre natural area of ponderosa pine at Fort Valley as the "G. A. Pearson Natural Area"—a living memorial to the man and his work.

Hermann Krauch, a long-time associate of Pearson, was paid by the Region but worked closely with Pearson in ponderosa pine investigations. Krauch completed several individual tree studies of ponderosa pine, and conducted investigations of Douglas-fir at the Cloudcroft Experimental Forest in southern New Mexico. He established the spruce plantings on the Santa Fe National Forest, which stand as a memorial to him.

Hermann Krauch, R. D. Forbes, and M. W. Talbot, ready for a day of plot mapping. Fort Valley Experiment Station, Arizona, 1913.

Grazing Investigations

Grazing investigations also began early in Region 3—soon after the establishment of the National Forests. They were administered by the Office of Grazing and were conducted throughout the Region. Some of the principal areas of observation and investigation included plant identification, natural revegetation, reseeding, range utilization, grazing damage to pine reproduction, use of water and salt, use of shrub ranges, and indicators of range use.

D. A. Shoemaker checks blue grama range near boundary of Manzano National Forest, New Mexico, 1921.

Those who played a prominent role in regional grazing investigations included R. R. Hill, Grazing Examiner, who was assigned to Region 3 in 1911 in charge of the Regional Office of Grazing Studies. An important contribution by Hill was information about grazing and pine reproduction. M. W. Talbot, also a member of the Regional Office of Grazing Studies (and in charge from 1920 when Hill took charge of the Santa Rita Range Reserve), published information regarding the use of salt and watering places in range management, and the classic handbook, "Indicators of Southwestern Range Conditions" (Farmer's Bull. 1782). Talbot established the first plots for studying grazing and erosion on the Tonto National Forest. C. K. Cooperrider, who also reported findings regarding grazing use and damage to pine reproduction, carried forward the erosion and watershed investigations chiefly centered in the Salt River Basin in Arizona.

Santa Rita and Jornada Range Reserves

In 1915, the Santa Rita and Jornada Range Reserves were transferred to the Forest Service from the former Bureau of Plant Industry, U.S. Department of Agriculture. With these transfers, responsibility for range (native pasture) research in the Department of Agriculture on public and private lands passed to the Forest Service. The Santa Rita and Jornada Range Reserves, later called Experimental Ranges, became the centers for the study of the vast semidesert ranges of the Southwest. General direction of the investigations on these areas was by the Office of Grazing Studies in Washington, D. C., headed by James T. Jardine until 1920 and then by W. Ridgely Chapline, who later became the first Chief of the Division of Range Research.

The **Santa Rita Range Reserve**, located in southern Arizona near Continental, was established in 1903 by the Bureau of Plant Industry. David Griffith, Assistant in Charge of Range Investigations Office of Grass and Forage Investigations, Bureau of Plant Industry, selected the area. Santa Rita, the oldest experimental range in the United States, was enlarged in 1907, and consists of about 51,000 acres typical of much of the semidesert grass and shrub rangelands in southern Arizona, southern New Mexico, and west Texas.

Headquarters, Santa Rita Experimental Range, Arizona, 1926.

When the Range Reserve was placed under the jurisdiction of the Forest Service in 1915, a range research program was begun with two major objectives: (1) to determine the best way to manage the lands in order to restore, improve, and maintain them at a sustained basis of productivity; and (2) to determine methods of handling cattle on the range to obtain the greatest returns over a period of time. Many and varied studies were conducted toward these objectives, and have greatly benefited the users and managers of these rangelands.

C. E. Fleming was responsible for both the Santa Rita and Jornada Range Reserves for the Forest Service. R. L. Hensel was the first Director of the Santa Rita. R. R. Hill followed Hensel in 1920. Hill was followed by Matt J. Culley in 1921. Culley worked closely with the range livestock producers, and is noted for his range and range livestock photography.

C. T. Vorhies, University of Arizona, and Walter P. Taylor, U.S. Biological Survey, made extensive studies of kangaroo rats and jackrabbits. Storage of mesquite seeds in mounds by the kangaroo rats was a factor in the spread of mesquite, and the jackrabbits competed with livestock for forage. During the early 1930's, cooperative studies with the University of Arizona by A. A. Nichol and others furnished deer feeding information; also water requirement information of important range plants was supplied by W. G. McGinnies and J. F. Arnold.

The Desert Grassland Station was established on the Santa Rita Experimental Range in cooperation with the University of Arizona. W. G. McGinnies and L. D. Love were in charge for the University. This activity on the part of the University was a reflection of the interest of the President, H. L. Shantz, who later was in charge of Wildlife Management for the Forest Service.

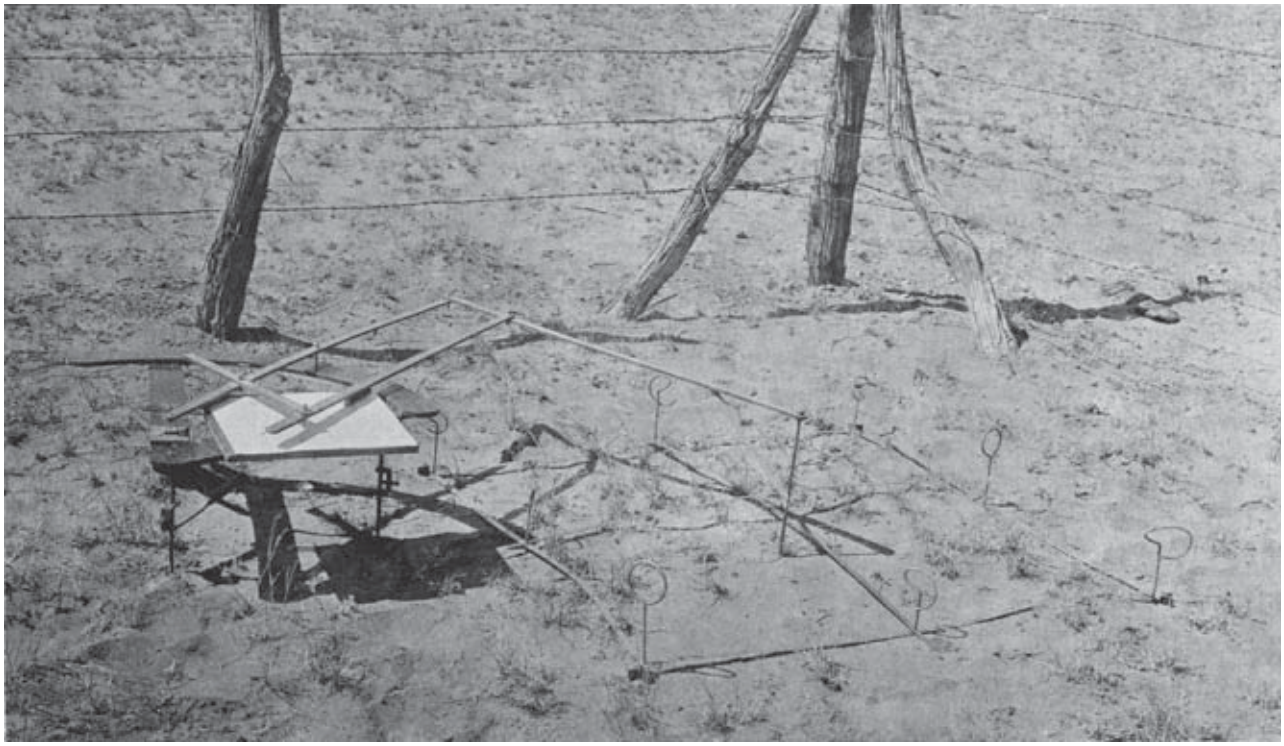
In the late 1940's, additional intensive studies were started on the Santa Rita. These included range reseeding, noxious plant control, and ecological investigations including, in 1970, the use of part of the area as a validation site for part of the Desert Biome of the International Biological Program. Those who took the lead in conducting and directing these activities, in chronological order, were G. E. Glendening, H. G. Reynolds, and S. C. Martin (1955 to present). Many other investigators in range management and range wildlife including range rodents, have worked on the Santa Rita; also many forestry and other students have visited and studied the area.

The Jornada Range Reserve was established by Executive Order in 1912 with E. O. Wooten, Bureau of Plant Industry, in charge. The Range covered 193,394 acres, most of it on the Jornada Del Muerto Plain in Dona Ana County, New Mexico. The east side, which extended into the San Andreas mountains, was later withdrawn for part of the White Sands bombing range. The Jornada is also classed as semidesert range, and includes black grama grasslands, tobosa flats, creosotebush-tarbush types, and mesquite sandhills, typical of extensive rangelands in southern New Mexico, west Texas, and southern Arizona.

The main objectives of the Jornada were similar to those of the Santa Rita—how to improve and maintain the range, and how to manage it for sustained use and production of range livestock. Drought and its effects are critical on this type of range.

Headquarters, Jornada Experimental Range, New Mexico, 1934.

C. E. Fleming was the first Director of the Jornada Experimental Range for the Forest Service in 1915. L. C. Hurtt directed the work in 1916. C. L. Forsling became Director in early 1917, and remained until late in 1920. E. W. Nelson took charge in 1920, and remained until 1924. Nelson was followed by J. D. Schoeller until 1927 at which time R. S. Campbell was assigned in charge. In 1931, F. N. Ares was assigned as Superintendent. Many range scientists, range administrators, and students have visited and studied at the Jornada Experimental Range. Also, Ranch Day, held annually for several years in cooperation with New Mexico State University to show and present the work at the Jornada and



R. R. Hill's pantograph, set up for measuring black grama quadrat. Jornada Experimental Range, New Mexico, 1924.

the adjacent "College" Ranch, was attended by many stockmen, extension specialists, range scientists, range administrators, students, and interested public. In accordance with the November 2, 1953 memorandum issued by Ezra Taft Benson, Secretary of the U.S. Department of Agriculture, the Jornada Experimental Range was transferred to the Agricultural Research Service, January 1, 1954.

The Santa Rita and Jornada Experimental Ranges, as developed by the Forest Service, are unique experimental areas. The lands and improvements are owned by the Federal Government. The cattle grazing the Ranges are owned and managed by operating stockmen under a plan of management outlined in a cooperative agreement with the Government. The stockmen graze their cattle throughout the year on the Range in designated pastures according to a management plan. Hence, the facts and information obtained about the range and the cattle grazed thereon, are directly applicable to range livestock operations with little or no extension or modification. In contrast, results obtained from plot or small fenced-pasture studies have to be extended or modified.

Yearling steers from Jornada Range Reserve, New Mexico, ready for sale at $27 per head at the railroad, 1913.

Complexity of Forest Land Management Called for Organized Research

Early forest investigations provided some needed guidance in use and management of the National Forests. Also, administrative studies contributed to some extent to local use and management. But, the complexity of forest land use and management soon dictated the need for more fundamental, continuous, and correlated research. Thus, in 1915, the Forest Service established the Branch of Research, headed by Earle H. Clapp, Assistant Chief. The research activities of the Forest Experiment Stations, the Forest Products Laboratory, and the Washington Offices of Products and Silviculture were placed under this new Branch of Research. Included in the Experiment Stations were those in the Central and Southern Rocky Mountain Regions, namely, Fort Valley at Flagstaff, Arizona, and Fremont and Wagon Wheel Gap in Colorado. The newly acquired Santa Rita and Jornada Range Reserves in southern Arizona and southern New Mexico continued under the supervision of the Washington Office of Grazing Studies in the Branch of Grazing until 1926 at which time they also became a part of the Branch of Research.

As the importance and use of forest land resources further increased, the Forest Service recommended the creation of a nationwide forest-research program[14] consisting of one forest experiment station for each of the 12 major timber regions of the United States. On May 22, 1928, the U.S. Congress passed the McSweeney-McNary Act which authorized the establishment of the 12 regional forest experiment stations.

Two years later, in 1930, Congress appropriated funds for the establishment of the Southwestern Forest and Range Experiment Station. In 1935, funds were appropriated for the establishment of the Rocky Mountain Forest and Range Experiment Station. As discussed later, these two Stations were combined in 1953.

[14] *U.S. Department of Agriculture. Forest Service. 1933. A national plan for American forestry. U.S. Sen. Doc. 12, 73d Congr., 1st Sess., 2 vols., Gov. Print. Off., Wash., D.C.*

The Southwestern Forest and Range Experiment Station, 1930-53

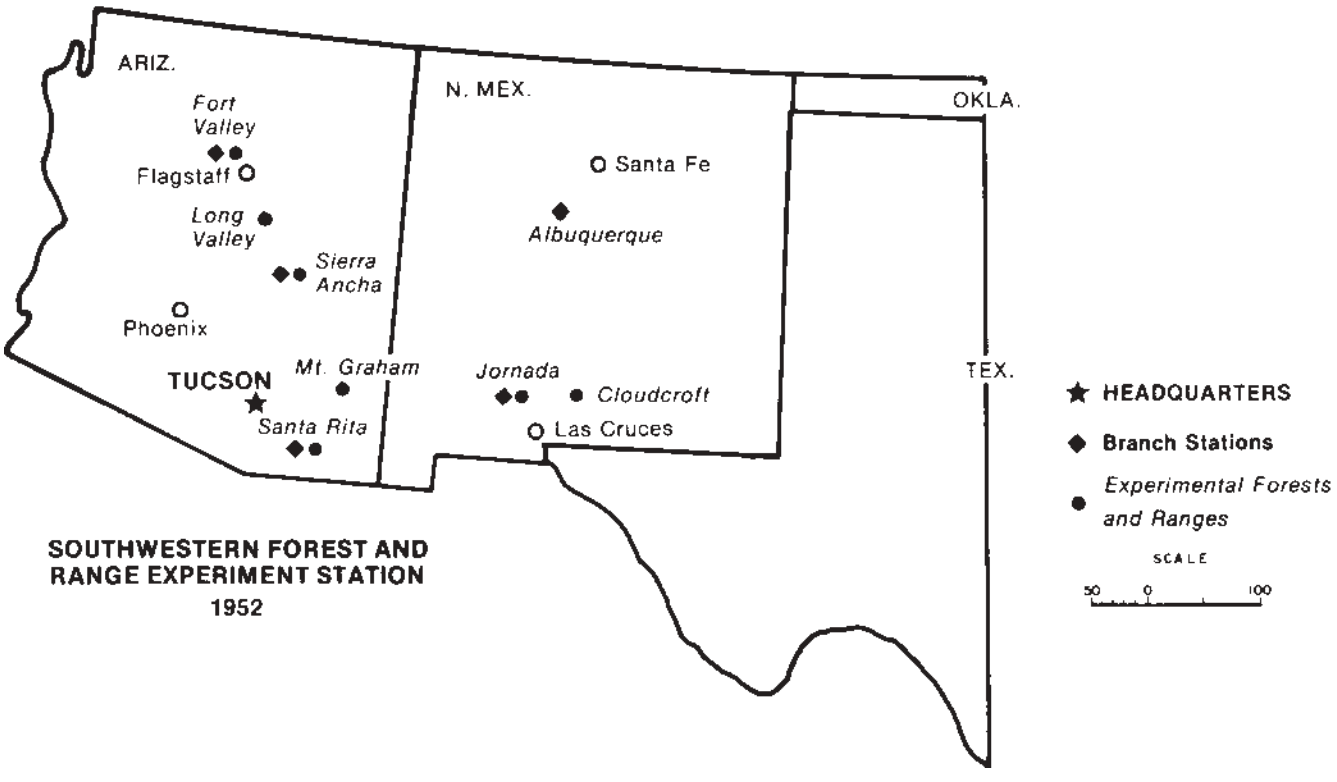
The Southwestern Forest and Range Experiment Station was established August 1, 1930, as a regional research unit of the Forest Service, U.S. Department of Agriculture. The general function of the forest and range experiment stations was to do the research that would aid in solving the forest and range problems of the nation. The specific research problems on which each station engaged varied according to the needs of the region that a particular station served. Many of the problems were common to more than one region, but by interchange of ideas and results among stations, solutions were obtained more rapidly than might be possible otherwise. Also, the Congressional Act creating the experiment stations did not restrict activities to National Forest problems, but required that the experiment stations work on nonagricultural forest and rangelands outside the National Forests. The forest experiment stations thus complemented the work of the State agricultural experiment stations which, at that time, worked primarily on farming lands.

The territory covered by the Southwestern Station comprised the States of Arizona, New Mexico, approximately the western half of Texas, and the Panhandle of Oklahoma.

The broad objective of the Station was twofold:

1. To add and improve upon existing knowledge of timber, range, and watershed management; and
2. To furnish answers to technical and practical problems arising in the administration of National Forests in Region 3; those confronting private owners of timber, range, and watershed lands in the Southwest, and to varying degrees, other Federal and State agencies.[15]

[15] *U.S. Department of Agriculture. Forest Service. 1936. Annual report on progress in research for calendar year 1935 and recommended program of research for fiscal year 1936-37. 105 p. Southwest. For. and Range Exp. Stn., Tucson, Ariz.*



Directors,
Southwestern Forest and Range
Experiment Station, 1930-53:

G. A. Pearson, 1930-35

Arthur T. Upson, 1935-42

Raymond Price, 1942-53

The Station's headquarters was located at Tucson, Arizona, and, under a cooperative agreement with the University of Arizona, was officed on the top floor of the Agriculture building on the University of Arizona campus.

The establishment of the Southwestern Forest and Range Experiment Station brought together in one organization the Fort Valley Forest Experiment Station, the timber management research at Cloudcroft, the range research on several National Forests, the erosion and watershed research on the Tonto National Forest (Parker Creek), and the Santa Rita and Jornada Range Reserves. These major units became field laboratories (Experimental Forests, Watersheds, and Ranges) under the new Southwestern Station.

The work of the Station was organized under three major lines of investigation, namely: Timber Management (Silvical), Forest and Range Influences (Watershed Management), and Range Management. G. A. (Gus) Pearson was named Director of the Station and in charge of Timber Management Research. C. K. Cooperrider was in charge of Watershed Management Research and Range Management Research. Matt J. Culley was in charge of the Santa Rita Experimental Range, and R. S. Campbell was in charge of the Jornada Experimental Range.

Organization of the Southwestern Forest and Range Experiment Station, 1930[16]

Director: G. A. Pearson
Timber Management
G. A. Pearson, in charge
Hermann Krauch
E. M. Hornibrook
Fort Valley Branch Station—
W. J. Osborn
Watershed Management:
C. K. Cooperrider, in charge
Range Management:
C. K. Cooperrider, in charge
B. A. Hendricks
H. O. Cassidy
E. S. Bliss
Santa Rita Experimental Range—
M. J. Culley, in charge
P. B. Lister
Jornada Experimental Range—
R. S. Campbell, in charge
R. H. Canfield

[16]*U.S. Department of Agriculture. Forest Service. 1931. Annual Report, Southwestern Forest and Range Experiment Station, 1930.*

Funds available in FY 1931 totaled $57,181.59, and were made up as follows:[16]

Timber Management		
Silvical Investigations	$ 9,900.00	
Management—National Forests	7,736.00	$17,636.00
Watershed Management		5,000.00
Range Management:		
Range Research on National Forests—Range Investigations	11,600.00	
Management—National Forests	2,600.00	14,200.00
Santa Rita Experimental Range—Range Investigations	11,600.00	
Coop Fund (Cooperating Stockmen)	571.80	12,171.80
Jornada Experimental Range—Range Investigations	7,000.00	
Coop Fund (Cooperating Stockmen)	1,173.79	8,173.79
Total budget, fiscal year 1931		$57,181.59

Fields of Research

Research in **Timber Management** was organized and conducted under the following major lines of work (listed in order of expenditure of funds): management—ponderosa pine; management—Douglas-fir; thinning—ponderosa pine; forestation and management—Engelmann spruce. **Watershed Management** research was centered on shrub associations in Arizona. **Range Investigations** included: management of bunchgrass in cutover pine forest; management of black grama and associated species (Jornada); management of semidesert mixed grasses (Santa Rita); handling livestock on the range; and management of browse range.

In 1931, **Forest Mensuration** research was begun by B. R. Lexen who also conducted other Timber Management research. A special project undertaken by Cooperrider with assistance of B. A. Hendricks was the Elephant Butte Watershed Survey of the Rio Grande in New Mexico. The upper part of the watershed in Colorado was handled by Forest Supervisor J. Higgins of Region 2.

Two additional field units were established in 1932, namely: The Parker Creek Erosion-Streamflow Station (later named Sierra Ancha Experimental Watersheds) above Roosevelt Dam on the Tonto National Forest in central Arizona,

Headquarters, Santa Rita Experimental Range, Arizona, 1936.

and the Mt. Graham Experimental Forest near Safford, Arizona. B. A. Hendricks was given charge of Parker Creek, and H. O. Cassidy was given charge of Range Research on the National Forests, under the supervision of Cooperrider.

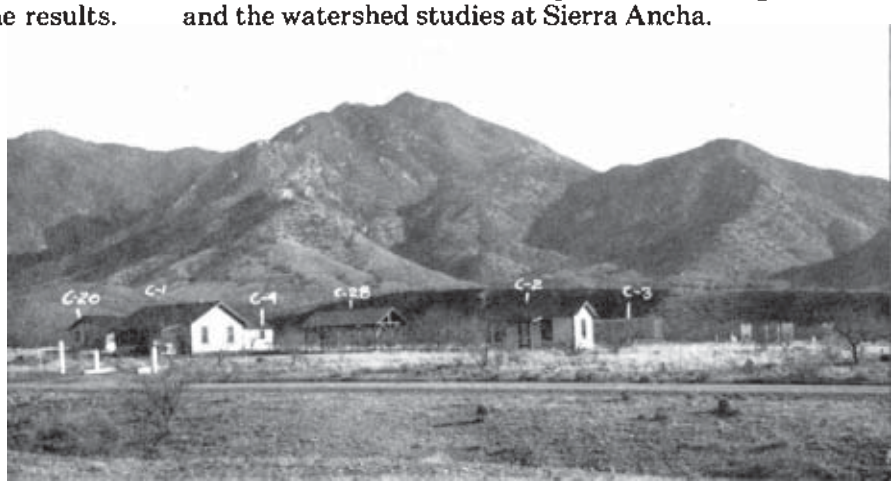
During the early 1930's, emergency funds became available in connection with the National Industrial Recovery Act (NIRA), Works Progress Administration (WPA), and the Civilian Conservation Corps (CCC). These emergency programs, made available to stimulate employment, were used by the Station to advance forestry research and made it possible to undertake research in following years which otherwise would not have been possible. Roads, telephone and power lines, and housing and physical research facilities were built. Also, various experimental land treatments such as reforestation, timber stand improvement, and soil erosion and range surveys were accomplished. Additional technical help, financed from these emergency funds, also made it possible to obtain, compile, analyze, and publish helpful information.

Considerable help was furnished by the CCC in conducting a study in the woodland type to determine methods of managing this extensive forest type. The study was in cooperation with the Forest Products Laboratory and the Division of Forest Pathology of the Bureau of Entomology and Plant Quarantine. B. R. Lexen designed the study, and G. L. Meagher and E. L. Little, Jr. conducted the research and reported the results.

Expanded Research Accompanying Aggressive Public Action Programs

With the stimulus of the increased funding from the various emergency programs which made possible the construction of research facilities, the Station was in a position to contribute technical know-how and assistance in several areas of forest and range land management. This was facilitated by reorganization and additions to the Station. Beginning in 1935, Director Pearson returned full time to management of ponderosa pine at Fort Valley. It became possible for him to complete studies for his ponderosa pine monograph.

Arthur T. Upson was appointed Director of the Station. Upson graduated in forestry from the University of Nebraska. He joined the Forest Service as a technical timber assistant, Arapaho National Forest in 1910, and filled various assignments in administration of the National Forests and at the Forest Products Laboratory. In 1924 he left the Forest Service and was employed by the National Lumber Manufacturing Association until returning in 1935 as Director of the Station. With his enthusiasm and managerial skills, Upson pulled the Station together into an overall productive unit. He intensified the research at the Jornada and Santa Rita Experimental Ranges and the watershed studies at Sierra Ancha.

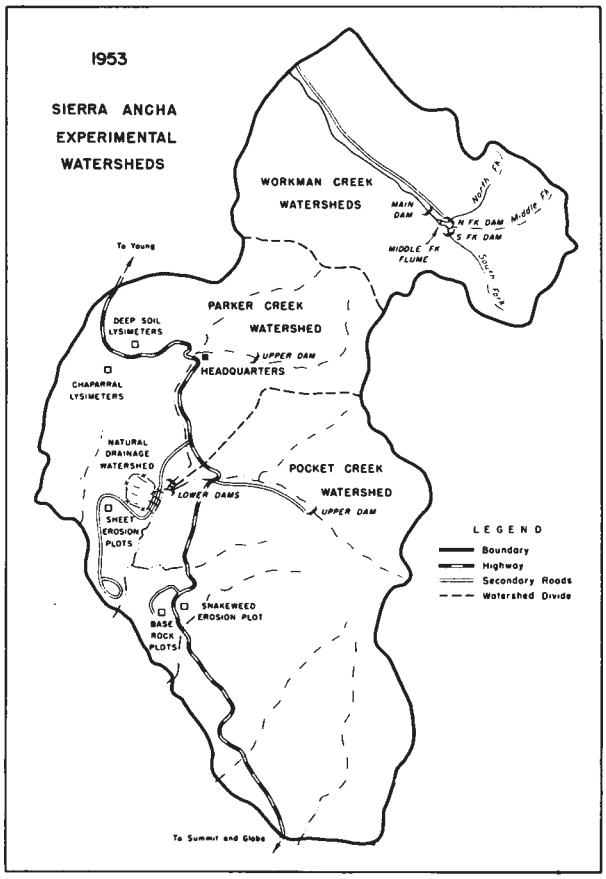


Desert Grasslands Station on Santa Rita Experimental Range, Arizona, Mid-1930's.

Key buildings at Fort Valley Experimental Forest, Arizona, 1915:

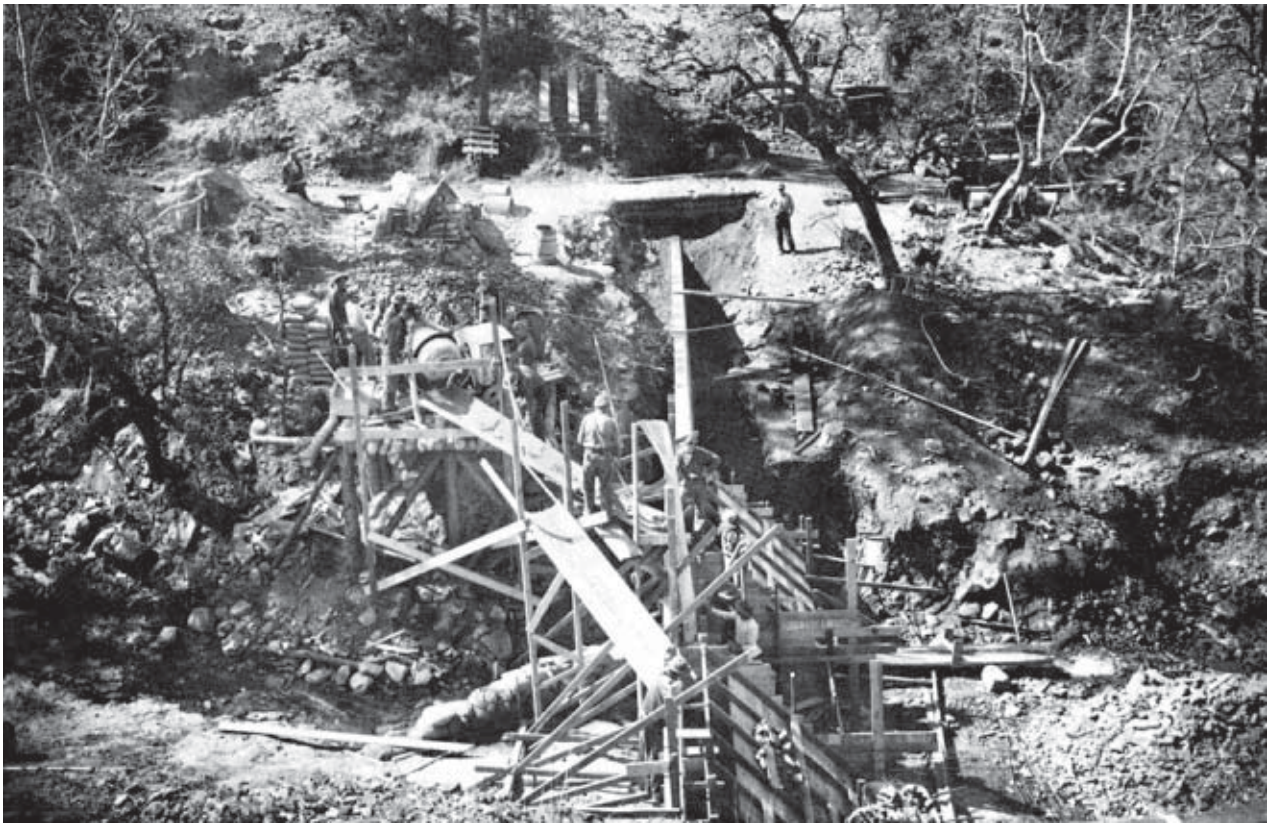
A, ***Laboratory and office.***
B, ***Caretaker's house.***
C, ***Con-drying shed.***
D, ***Pearson's residence, built in 1909.***

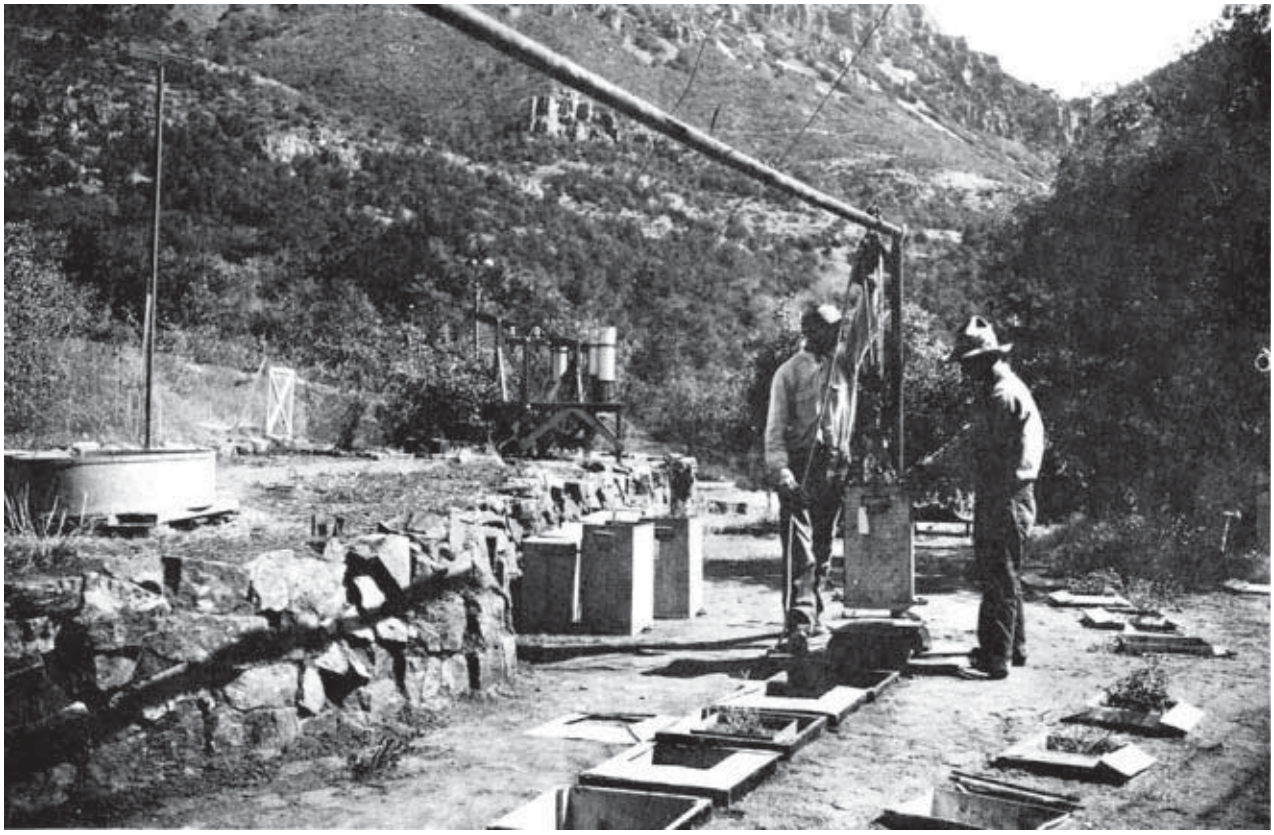
E. C. Crafts measures ponderosa pine growth on experimental plot. Fort Valley Experimental Forest, Arizona, 1935.



Additional key personnel were added, several of whom later filled more responsible positions in the Forest Service. Among these were E. C. Crafts, K. W. Parker, G. E. Glendening, W. G. McGinnies, G. S. Meagher, Frank Wadsworth, and E. L. Little, Jr. Crafts later became Associate Chief of the Forest Service and was the first Director of the new Bureau of Outdoor Recreation, U.S. Department of the Interior. Parker became Division Chief of Range Research at the Station and subsequently Chief, Division of Range Research for the Forest Service in Washington, D. C. Glendening headed up several research projects and was a Project Leader at the Station at the time of his untimely death. McGinnies was in charge of Range Research at the Station and then went on to become Director of the Rocky Mountain Station and Director of the Central States Station. Meagher became Chief, Division of Forest Management Research at the Station and then filled the same position at the Pacific Northwest Station. Wadsworth is Director of the Institute of Tropical Forestry, Puerto Rico. He is the recognized authority in Tropical Forestry. Little became the Dendrologist for the Forest Service.

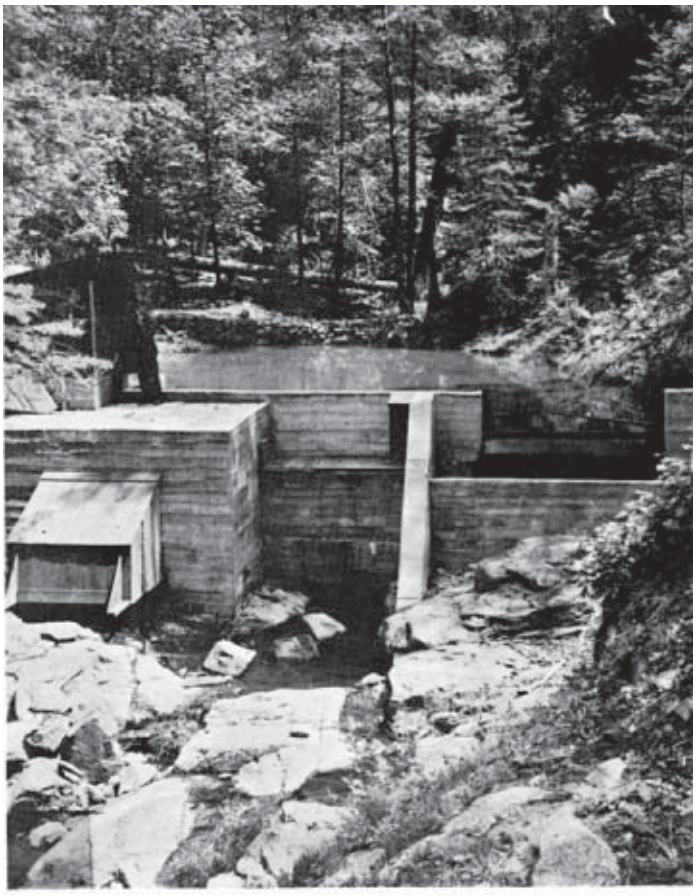
Headquarters, Parker Creek Erosion-Streamflow Station, Arizona, 1935. (Later called Sierra Ancha Experimental Watersheds.)





⇦ *Civilian Conservation Corps constructs dam and weir for watershed research on Upper Pocket Creek. Sierra Ancha, Arizona, 1936.*

⇦ *Weighing transpiration can during evapotranspiration experiment at Sierra Ancha, 1937.*

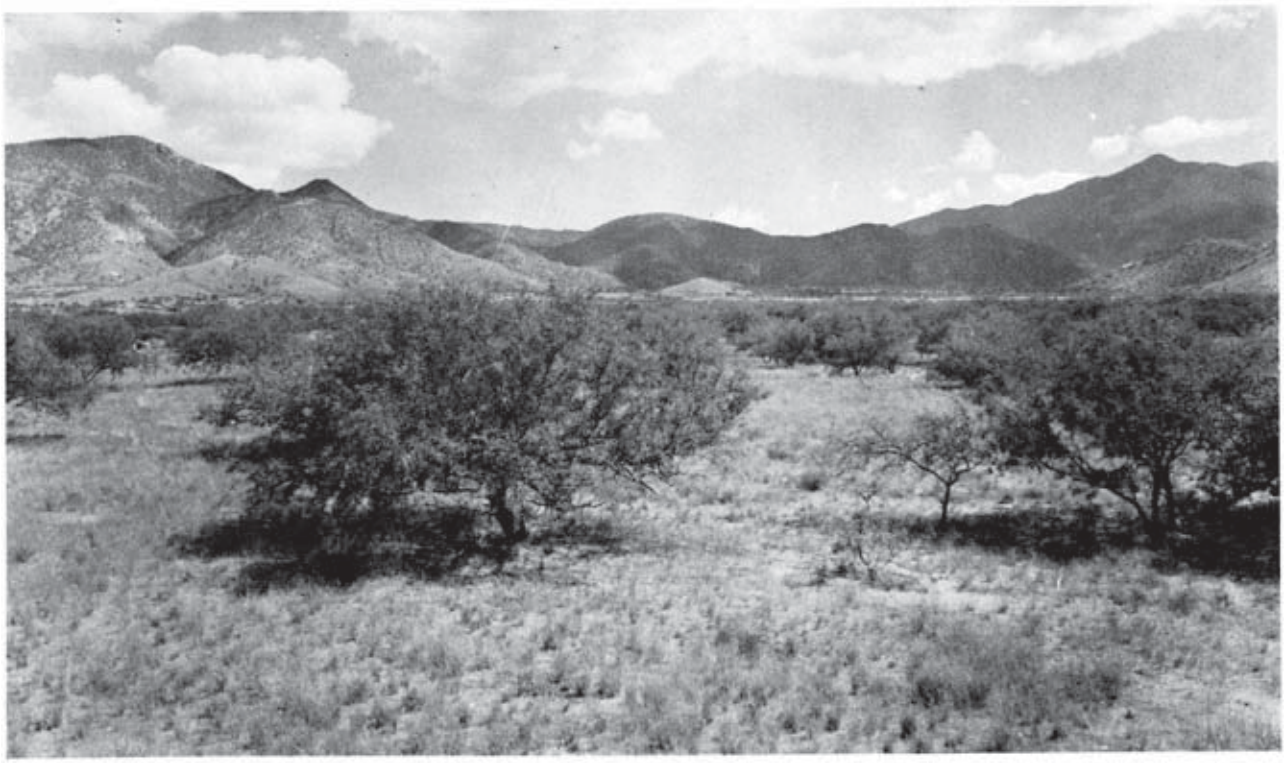


Compound weir on Workman Creek, for measuring streamflow changes after timber harvest. Sierra Ancha Experimental Forest, early 1940's. ð

Several significant lines of research were begun and land use measures accomplished during the late thirties. In 1937 the cooperative Range Utilization Standards studies were begun. R. S. Campbell directed the work Servicewide. E. C. Crafts, G. E. Glendening, and B. A. Hendricks actively participated. Formal Shrub Invasion Control research was begun by K. W. Parker. The Station was an active participant in Flood Control Surveys under the Omnibus Flood Control Act of June 22, 1936, cooperating with the Soil Conservation Service, Bureau of Agriculture Economics, and Corps of Engineers of the U.S. Army. Cooperrider was in charge of the work assisted by W. W. Wier, E. S. Bliss, H. O. Cassidy, B. Nelson, and G. G. Sykes. This work continued into 1941. The Station also participated in the Western Range Survey in cooperation with the Agriculture Adjustment Administration under the Agriculture Adjustment Act. The work was handled by G. D. Merrick, E. S. Bliss, E. W. Bomberger, and K. W. Parker. The work was completed in August 1938.

The Long Valley Experimental Forest was formally established in 1937. This area was a virgin stand of high-site ponderosa pine. Except for growth data, the area was never fully used experimentally because of lack of funds; also, mining activities destroyed most of one section.

In 1940, the Station, under agreement with Region 3, gave impetus to the collection of essential range resource data on the Range Study Plots located throughout the Region. The goal was the establishment of a minimum of one study plot within each major vegetation type on each Ranger District. The effort did not fall much short of the goal! The original records included writeups of the vegetation, photographs, and detailed sampling of a 100- by 100-foot plot within each fenced enclosure and of a similar sized plot on comparable adjacent grazed areas. These data have not only furnished helpful information on range recovery, range utilization, and range condition and trend, but—if the areas are safeguarded and the records are maintained—valuable benchmarks of range conditions and use can be obtained for time to come.



Invasion of mesquite as the result of drought, planting of seeds by kangaroo rats, and heavy grazing. Santa Rita Experimental Range (upper) 1903; (lower) 1941.

Headquarters

With the growth of the Station and the expansion of the University of Arizona, it became necessary for the Station to move its headquarters off campus. The Station rented an apartment house in the 700 block on Third Avenue just a block from the west entrance to the University. About a year later, because of lack of funds, the Desert Laboratory of the Carnegie Institution, located on Tumamoc Hill 3 miles west of the city of Tucson, closed its doors. A plan was developed for several universities, including the University of Arizona, to band together and use the laboratory for a graduate study facility in biological sciences. But, lack of finances prevented this arrangement. Hence, by default, the U.S. Government obtained the laboratory by payment of $1; the facilities were transferred to the Forest Service, and became the headquarters for the Station.

The laboratory consisted of a main building of native basalt rock construction, 20 by 122 feet. In it was an equipped laboratory with attached greenhouse, an excellent biological library, and five office or workrooms. There was another rock building 28 by 46 feet that was partially burned. These buildings rested on a bench below the top of Tumamoc Hill among the cacti, creosotebush, and other desert plants and animals including javelina, desert mule deer, and desert foxes. There are several stories concerning the origin of "Tumamoc." One favored is that it is the Papago word meaning "horned toad."

The office for the laboratory was at the bottom of the hill. The only access to the laboratory on the hill was a one-way horse and buggy trail. It was "modernized" for automobile travel by concreting two wheel strips through the rocky section. The water supply was pumped up from the bottom of the hill. The plumbing was modern, but the sewage was piped over the west rock face of the hill.

This was home, and like all homes it was to have and to hold. It took some fixing up! With emergency funds the partially burned building was rebuilt and another rock building about 40 by 40 feet was added. For the next several years "allotment balances" were used to make the facility attractive and comfortable, including the addition of "desert" coolers. Also, a widened automobile access road was added to the Forest Service road system!

During World War II, by agreement, permission was given to Griffith H. Riddle, president of Research Foundation, Inc., a private concern from New York City, to erect some metal buildings on the site for use in conducting radiation studies.

Headquarters, Southwestern Forest and Range Experiment Station, Tumamoc Hill, Tucson, Arizona.

Wartime Casualties

No sooner had the Station become established on Tumamoc Hill than the effects of the war began to be felt and continued well into 1945. The younger scientists entered the military services. Some of the older specialists were assigned to other more direct wartime activities.

Director Upson went to the National War Board to handle national lumber requirements. Cooperrider was sent to search the desert lands in Mexico for rubber-producing plants. McGinnies went to the Emergency Rubber Project in charge of establishing sites for growing and harvesting the guayule plant for rubber production. The few remaining scientists had to do double duty to maintain essential records of continuing research.

Bombs Away!

On top of the wartime casualties at the Station, the civilian real estate arm of the War Department recommended taking over the Santa Rita Experimental Range for a bombing range! U.S. airfields dotted the Southwestern landscape. Practice bombing ranges were needed. Since the Santa Rita was adjacent to three air bases, taking over the Santa Rita seemed a quick and easy way to get a bombing range. After all, it was Government property!

Since the Director and key people at the Station had "gone to war," C. L. Forsling, then Assistant Chief in charge of Forest Research, sent Raymond Price, Assistant Chief, Range Research, to Tucson to save the Santa Rita. Price and K. W. Parker, the remaining principal Range Scientist at the Station, prepared maps, developed their case, and went out to see the Commanding Officer at Davis-Monthan Air Base. The Commander was courteous but a bit fidgety. After listening to their story for about 45 minutes in which Price pointed out the great value and unique features of the Santa Rita—that the values had been built up in the land by reason of its longtime protection and experimental use, and could never be replaced—the Commanding Officer sat back and said, "A very interesting story, but gentlemen, I have a war to win!" Price quickly replied, "But Colonel, we're making it possible for you to win the next war!" That did the trick, especially with a nudge from his superior officer in San Francisco who was called by phone. The miles of open desert land surrounding the air bases were used for bombing ranges. The Santa Rita was saved and it remains today, the oldest experimental range in existence. And, each year adds more value to this unique area.

In 1942, Price was sent back to Tucson as Acting Director of the Station. The next year he was made Director. Price was a University of Utah graduate. He got deeply involved in athletics at the university so he did not attend a forestry school. In lieu thereof he took forestry-related courses and majored in botany. Later he completed graduate work at Yale University, taking forestry courses and majoring in ecology. He began his career in forestry research at the Intermountain Station in 1931. He was in charge of the Great Basin Branch Station until 1937 when he became Assistant to the Chief, Range Research, Washington, D. C.

Upson and McGinnies did not return to the Station. Upson was appointed in charge of the National Forest and Tropical Station work at Puerto Rico. McGinnies became Director of the Rocky Mountain Station. Cooperrider returned to the Station for a short time, but an infection he acquired while searching for superior guayule plants in Mexico proved fatal. He died at age 55 at the Marine Hospital, Baltimore, Maryland, July 13, 1944. "Coop," as he was known to a host of friends, accomplished much. His greatest achievement was his work in the field of watershed management. A group of Forest Service scientists meeting in a special westernwide range management conference stated "...we missed Coop's friendly smile, able counsel, sage advice, interesting anecdotes, and his technical contributions..."

Accomplishments During War Years

Despite the reduced wartime staff, much was accomplished during the war years. In addition to maintaining essential records for continuing research, some of the accomplishments included the development of the Line Intercept Method of measuring range vegetation by R. H. Canfield; publication of Southwestern Range Ecology by McGinnies, Parker, and Glendening; the development of a Range Condition Score Card for judging

rangelands by Parker; and Guides for the Revegetation of Military Areas in Arid Regions by Parker and staff. Some special wartime jobs included test plantings of cork oak by Krauch for possible cork production; measuring temperature and moisture in wooden aircraft wings in cooperation with the Forest Products Laboratory; moisture determination of wooden propellers with the AAF Materiels Command; and participation in agriculture production goals and in postwar planning.

The final year of the war, 1945, was a stress year. Funds and personnel were at a low ebb. But it was also a turning point: later in the year, funds were received to employ the returning veterans. With Cooperrider's death and B. A. Hendrick's retirement, it was necessary to obtain a whole new Watershed Management Research staff. W. P. Martin, a soil specialist, was transferred from the U.S. Soil Salinity Laboratory at Riverside, California, to head up the work. L. C. Rich, hydrologist, transferred from the Soil Conservation Service as Martin's associate. R. K. Hudson, a Junior Forester from Michigan, completed the technical staff.

A bright spot of 1945 was the receipt of new funds to begin formal research in range reseeding. Millions of acres of rangelands were not producing suitable forage, and soil erosion was evident. Range reseeding appeared to be the answer, if suitable species and methods could be developed. In this research effort, special mention must be made of J. O. Bridges, who began the work in New Mexico. Bridges was experienced in sheep and cattle raising before going to New Mexico A&M College (now New Mexico State University) to teach range management. When the new funds became available for reseeding research, Bridges transferred to the Station to begin the work in New Mexico. He put his gear and grass seeds in his pickup and took off like a "mining prospector" to find out how to reseed the range. He camped out wherever he was when night fell. He was gone before sunup. Hours and accommodations meant little to him. Through his efforts, field nurseries and planting sites were established in the major vegetation types in New Mexico and, contrary to opinions at that time, grass seedings were established! Two years later Bridges went back to cattle raising and cotton growing. H. W. Springfield continued the research in New Mexico. In Arizona, D. M. Thompson, Fred Lavin, G. E. Glendening, and H. G. Reynolds conducted the research.

With Pearson's retirement in 1945, G. S. Meagher returned to the Station in 1946 from the Pacific Northwest Station to head up Timber Management research. It fell Meagher's lot to complete Pearson's ponderosa pine monograph for publication. Meagher could best do it because he assisted in some of the field studies and was well versed in ponderosa pine silviculture.

Director Price, M. W. Talbot, and W. G. Koogler (left to right) examine a rodent exclosure established in 1923 on Tonto National Forest, Arizona. 1946.

High Costs Hamper Research Efforts

Increasing costs of materials and operations reduced the value of the research dollar and made it difficult to do in-depth research. The answer seemed to be to obtain new funds for pressing problems. One of these problems was the wholesale encroachment of shrubby vegetation on rangelands which reduced forage production and contributed to surface soil erosion. Thus it was in 1947 that funds were obtained from the Hope-Flanagan Research and Marketing Act to undertake fundamental research in the physiology and ecology of noxious plants. G. E. Glendening headed the work, and he, H. A. Paulsen, Jr., and S. C. Martin handled the ecological and plant control studies. B. O. Blair started the physiology studies, which centered mainly on mesquite. Later, H. M. Hull and M. E. Roach continued the research until 1954 when they and the research were transferred to the Agricultural Research Service.

In 1948, W. E. Martin left the Station to teach soils at the University of Minnesota where he now heads up the Soils Department. H. C. Fletcher came to the Station from the Soil Conservation Service to replace Martin in charge of Watershed Research. K. W. Parker left the Station for Washington, D. C. to finish developing the Three-Step Method of Range Inventory for National Forest ranges, and later became Chief of the Division of Range Research. C. K. Pearse, who was Assistant Chief of the Division of Range Research in Washington, D. C., replaced Parker at the Station. Pearse was skilled in range reseeding and range management research, so he kept the work going at a strong pace.

Responding to the developing interest in the Southwest for diversity in forest utilization and lumber production and marketing, Senator Carl Hayden of Arizona in 1950 requested that Congress make funds available to bring the Forest Utilization Service to the Southwest. The request was successful. L. A. Mueller came from the Northern Rocky Mountain Station to head up the work. E. S. Kotok transferred from the Pacific Northwest Station to work with Mueller. They made a good team, and their efforts resulted in much improvement in the forest industry field in the Southwest. Included in their accomplishments were improved milling, seasoning, wood preservation practices, use of paints and finishes, production of veneer and plywood, and improved utilization of wood wastes including the use of woodland and desert shrub species.

The First Research Center

In the interest of curtailing erosion from watershed lands above Elephant Butte Dam, and thereby reducing the silt load in the Rio Grande

Experimental mesquite control by (left) cabling, and (right) spraying. Santa Rita Experimental Range, Arizona, late 1940's.

and prolonging the life of the dam, Congress, in 1951, at the request of Senator Dennis Chavez of New Mexico, appropriated funds to establish a Forest Research Center in northern New Mexico as a part of the Southwestern Station.

With the approval of the University of New Mexico, an amendment was added to the Station's Cooperative Agreement with New Mexico A&M College at Las Cruces (the land grant authority in New Mexico) to locate the Research Center with the University of New Mexico at Albuquerque. This location placed the scientists closer to the problem; also, some library and laboratory facilities were available.

E. J. Dortignac transferred from the Rocky Mountain Station and was placed in charge of the Research Center and undertook watershed research. H. W. Springfield moved from Tucson to Albuquerque to pursue range reseeding research. Grazing trials on watersheds and reseeded areas were undertaken. Those on the lower elevation watersheds outside the National Forests were conducted in cooperation with the Bureau of Land Management, which also helped finance the research. The research results stimulated much reseeding by Federal and State agencies and private individuals. Grazing practices were also improved, resulting in better range conditions.

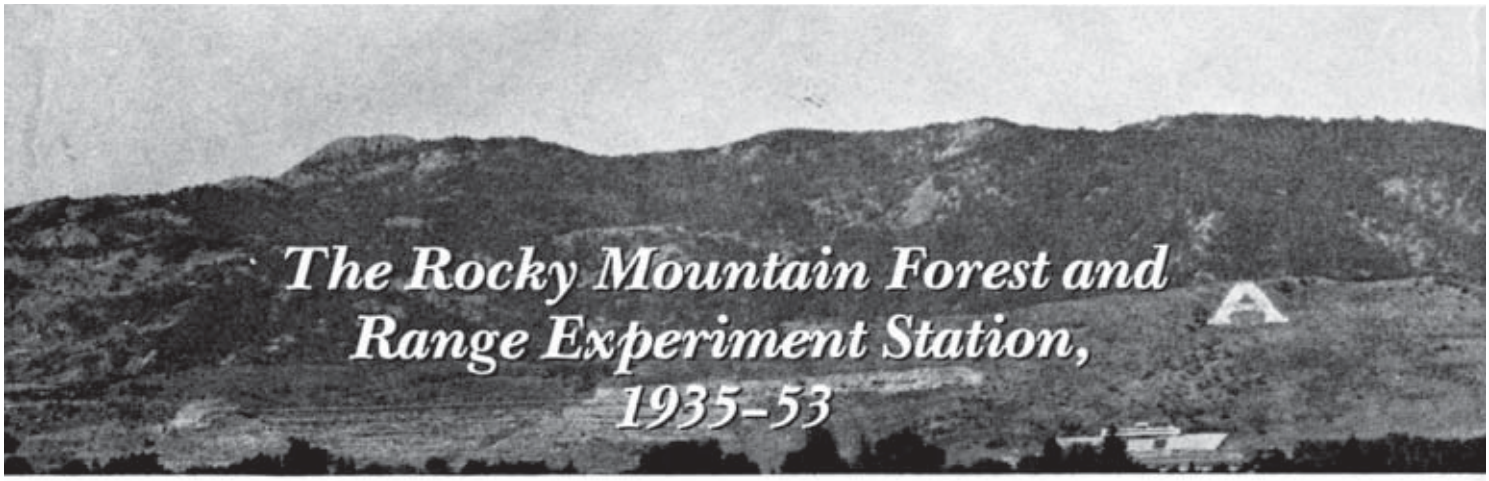
This same year (1951) Meagher returned to the Pacific Northwest Station in charge of Timber Management Research. E. M. Gaines transferred from the Southern Station to replace Meagher. Gaines also became leader of the Flagstaff Research Center, which included Range Research on forested ranges conducted by J. F. Arnold. Other Research Centers established were the Jornada at Las Cruces, New Mexico, with H. A. Paulsen, Jr. in charge, and the Santa Rita at Tucson, Arizona, with G. E. Glendening in charge.

The Beginning of the Arizona Watershed Program

The informal relationship with the Salt River Water Users Association at Phoenix, Arizona, was formalized during 1953. The Association entered into a Cooperative Agreement with the Station concerning the harvesting of timber on the Workman Creek watershed at the Sierra Ancha Experimental Forest. The objective of the research was to determine the effects of different levels of timber removal on water yield and soil erosion. The research was planned to continue until 1980. The project marked the beginning of the unique Arizona Watershed Program, which will be discussed later.

SOUTHWESTERN FOREST AND RANGE EXPERIMENT STATION
Tumamoc Hill, Tucson, Arizona
Program Conference—1951

(Left to right)
First row: F. N. Ares, R. H. Canfield, N. Cobb, Geraldine Peterson, Dorothy Smith, Helen Hunt, Alice Martin, Georgia Savage, Florence Martin, E. C. Martin, E. J. Dortignac, L. R. Rich.
Second row: D. N. Anderson (SCS), G. E. Glendening, H. W. Springfield, Director Price, Pablo Lucero, J. W. Bohning, J. F. Arnold, C. K. Pearse, L. A. Mueller.
Third row: E. M. Gaines, K. W. Parker, F. R. Herman, H. A. Paulsen, Jr., H. G. Reynolds, F. R. Lavin, E. S. Kotok, H. C. Fletcher.

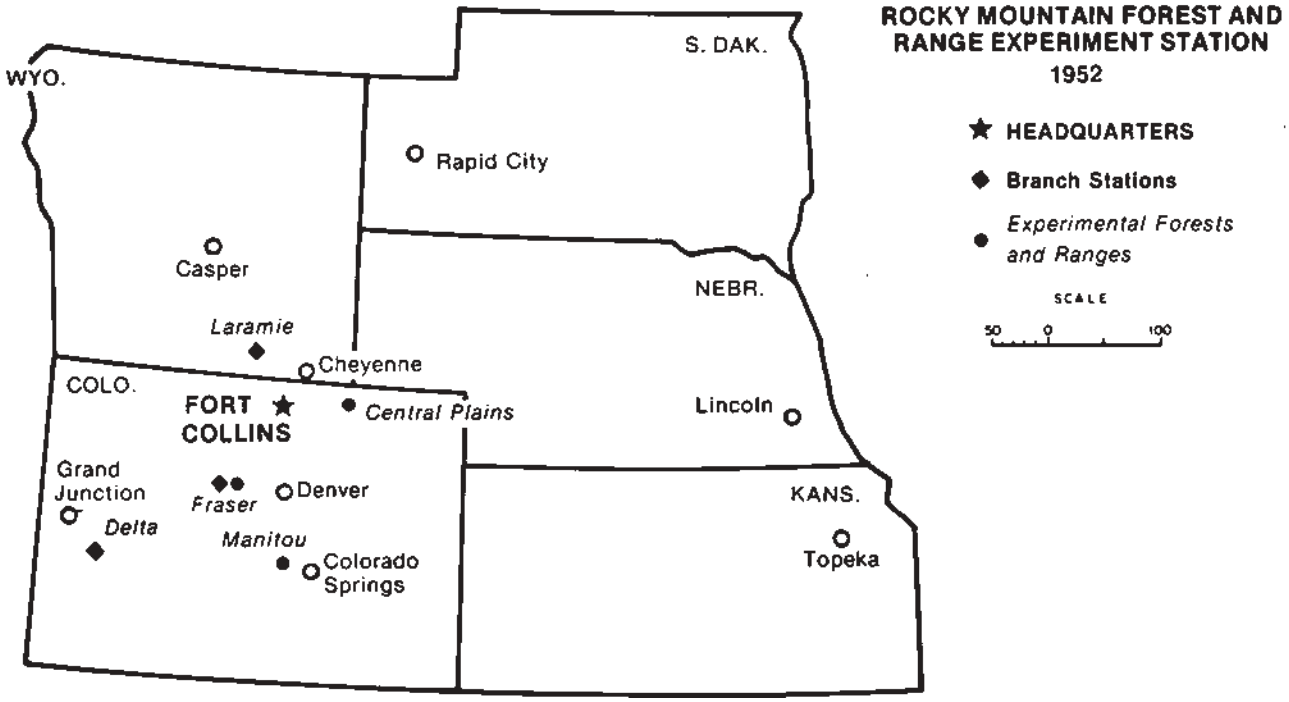


The Rocky Mountain Forest and Range Experiment Station, 1935-53

The Rocky Mountain Forest and Range Experiment Station, the last of the 12 regional forest experiment stations funded under the McSweeney-McNary Act of 1928, was established July 1, 1935.

The Rocky Mountain Station area included the States of Colorado, Wyoming (east of the Continental Divide), western South Dakota, Nebraska, and Kansas. Under cooperative agreement, the Station was headquartered with Colorado College of Agriculture and Mechanic Arts

Headquarters, Rocky Mountain Forest and Range Experiment Station, second floor of forestry building, built in 1937 on Colorado A & M campus.



Directors,
Rocky Mountain Forest and Range
Experiment Station, 1935-53:

Richard E. McArdle, 1935-38

Charles A. Connaughton, 1938-44

William G. McGinnies, 1944-53

(now Colorado State University) at Fort Collins. For the first year, offices were on the top floor of the Administration building. During the following year the Station moved to the new Forestry building constructed by the College.

All research work previously handled by the Forest Service in the central Rocky Mountain region, including the 500-acre Fremont station at Manitou, was absorbed by the new regional Rocky Mountain Station.

R. E. McArdle, who later became Chief of the Forest Service, was the first Director of the Station. McArdle earned his B.S., M.S. and Ph.D. degrees from the University of Michigan. He was Dean of the School of Forestry at the University of Idaho at the time of his selection. Prior to this, McArdle was engaged in forest research at the Pacific Northwest Station. McArdle's choice as Director was a good one. With his unusual ability to meet and work with people, he quickly established the Station as a productive cooperative unit.

"Hat in the Ring"

The story is told that early in the history of the Station McArdle was at the Regional Forester's office in Denver. The Regional Forester was meeting with some of his top staff. Little attention was being paid to McArdle—he was not being included in the discussion. So, in his characteristic unusual manner, McArdle stepped back and threw his hat into the center of the room and said, "Gentlemen, there is another hat in the ring now!" That broke the ice. Regional Forester Peck traveled with McArdle around the Region during the next several months. This established Research as an integral part of the Forest Service in Region 2.

Another incident characteristic of McArdle happened when he was in Washington helping to write the Range Report.[17] Earl H. Clapp, Associate Chief, was "cracking the whip" on the report. Clapp announced that nobody could leave until the report was finished—at least one would have to have an excuse that he had not heard before he would consider their leaving. Meantime, the new Forestry building at Fort Collins was nearing completion. Interestingly, McArdle received a wire from the President of Colorado A&M College asking him to be present for the cornerstone laying! McArdle took the wire in to Clapp. After reading the wire, Clapp threw up his hands and with a chuckle said, "Mac, you've done it again; go on home!"

Initial Organization

By April of 1936 a staff was assembled and on the job at the new Station. The initial appropriation was $75,000. This was broken down to $25,000 each for Timber Management, Range Management, and Watershed Management Research.

Organization of the Rocky Mountain Forest and Range Experiment Station, 1935[18]

Director: R. E. McArdle
Timber Management:
R. F. Taylor, in charge
Mensuration—E. W. Hornibrook
Regeneration—Jacob Roeser, Jr.
Range Management:
L. J. Palmer, in charge
Range Forage—D. F. Costello
Range Management—L. J. Palmer
Watershed Management:
C. A. Connaughton, in charge
Erosion—C. A. Connaughton
Watersheds—W. M. Johnson
Experimental Forests and Ranges:
Fremont—Colorado Springs, Colo.

R. F. Taylor came to the Station from the Washington, D. C. office. E. W. Hornibrook transferred from the Southwestern Station. J. Roeser was already on the job at Fremont. L. J. Palmer transferred from the Fish and Wildlife Service, Department of the Interior. He was working in Alaska on reindeer range work. C. A. Connaughton, D. F. Costello, and W. M. Johnson all transferred from the Intermountain Station.

[17] *U.S. Department of Agriculture. Forest Service. 1936. The western range. U.S. Sen. Doc. 199, 74th Congr., 2d Sess., 620 p. Gov. Print. Off., Wash., D.C.*

[18] *U.S. Department of Agriculture. Forest Service. 1936. Report for 1935 and research program for 1936, Rocky Mountain Forest and Range Experiment Station. 11 p. Fort Collins, Colo.*

Regional Research Councils and Program Formulation

To assure that research at the Station did not duplicate the work by other research agencies, that these other agencies would know the work of the Station, and that the Station would be kept informed of problems and current developments, a Regional Research Council, as used by other Stations, was formed. Membership was drawn from other research agencies, industry representatives, and Federal and State forest and range land-management agencies. At first the Council was organized into three committees, one for each of the major fields of research, with plans for regular meetings. In later years, the Council became more informal and met as the occasion demanded.

As a result of the committee meetings, a research program in each of the three fields of research was formulated. Attention was given to (1) the most important problems, (2) solutions that would be beneficial to the land users, (3) the necessity of concentrating longtime research on experimental forests and ranges, and (4) acquainting members of the Station with the region as quickly as possible.[18]

The initial studies in **Timber Management Research** were growth and yield studies, volume studies, regeneration studies, and silvicultural studies. Those in **Range Management** included a host of management problems requiring many years to solve. However, immediate attention was devoted to a survey of range forage conditions, and plant development in relation to grazing periods. In **Watershed Management Research,** a host of water problems were also recognized to be solved over the years. But, again first effort was centered on a survey of the extent and character of soil erosion on the National Forests, the influence of vegetative cover on runoff and erosion, and use of water by vegetation.

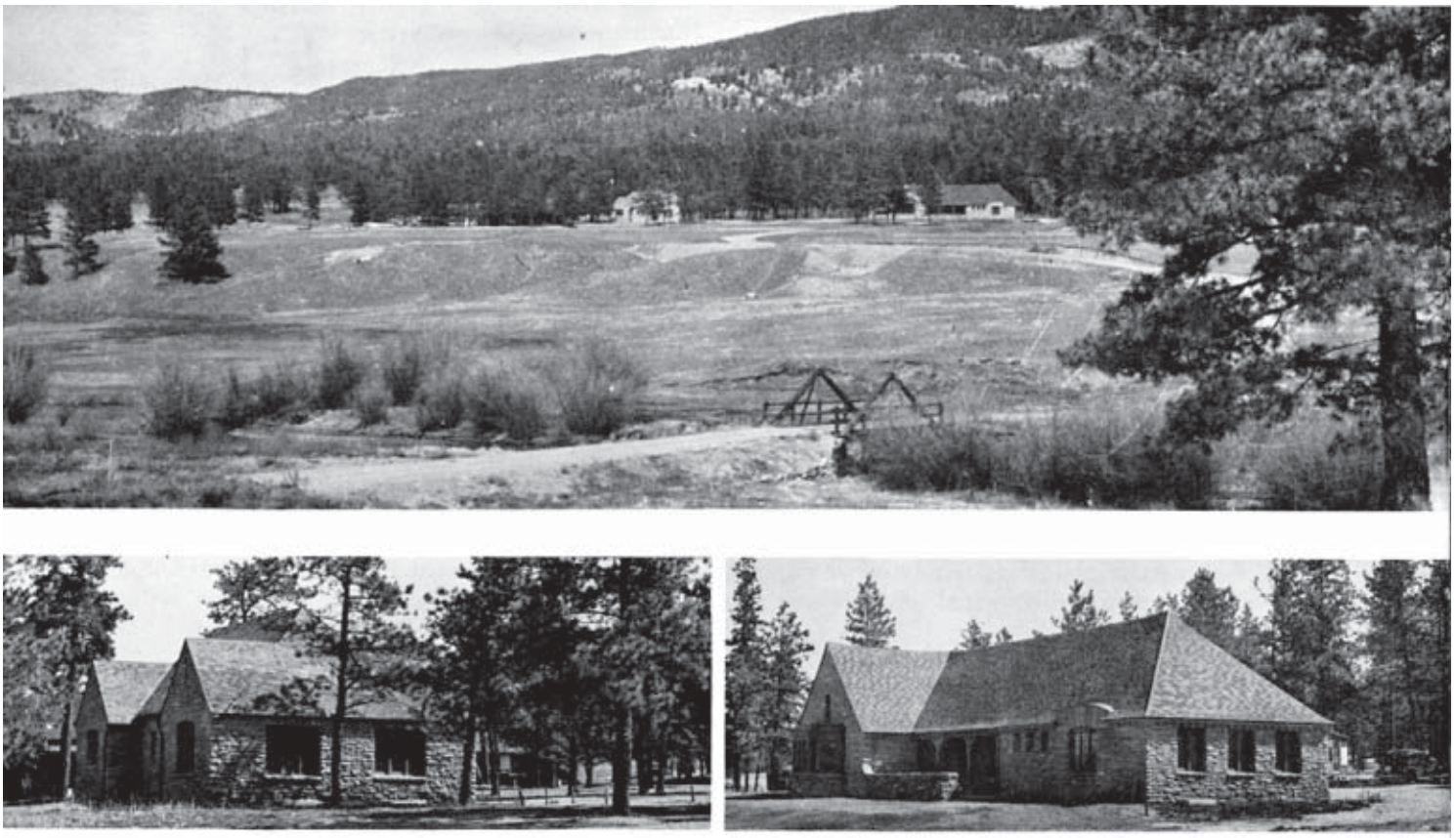
During the next 2 years, 1936 and 1937, work progressed rapidly. Growth and yield tables for ponderosa pine in the Black Hills were completed; preliminary data were gathered for lodgepole pine. The survey of erosion on National Forests was completed. Effort on the Western Range Survey was completed and Flood Control Surveys began.

Pike National Forest, Colorado, April 1939:

(Left) R. Stahelin, weighing snow.

Ponderosa pine grading experiment:

(Upper right) Planting camp, with heeling-in beds in foreground; planting furrows behind tents; and packing tent at right. (Center) Planting trees. Stakes of a watershed experiment plot in background. (Lower right) Faller uses old inner tube fastened to stake to help pull saw back through cut. Black Hills, South Dakota.



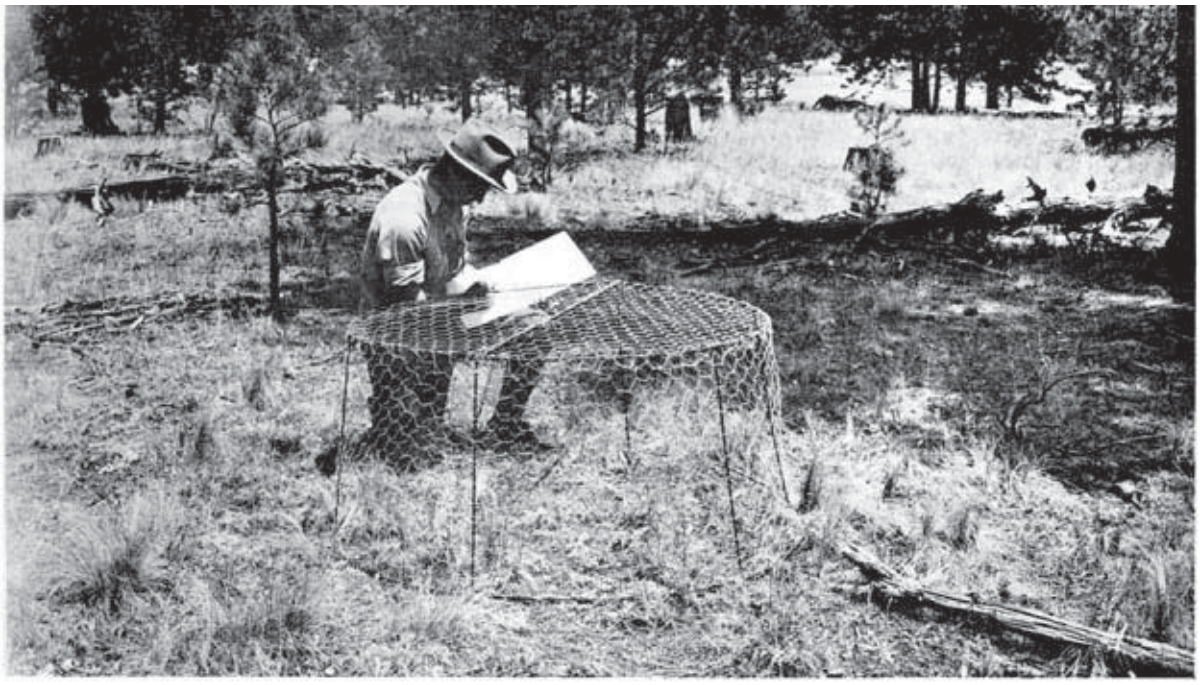
Headquarters, Manitou Experimental Forest, Colorado, 1940.
(Left) Office *(Right) Lodge.*

Manitou Experimental Forest

The Manitou Experimental Forest,[19] established in 1936 near Woodland Park, lies 28 miles northwest of Colorado Springs, and covers 25 square miles in the ponderosa pine lands of the Colorado Front Range. Colorado College at Colorado Springs cooperated for a short time in the early research work. The initial cooperation with a Federal agency was with the Farm Security Administration, U.S. Department of Agriculture, who had built the attractive stone buildings that became the Manitou headquarters. Just before the Station was to take over the property, the large stone building (lodge) completely burned. The agency, and a work camp of the Works Progress Administration (WPA), rebuilt the building.

The Experimental Forest was established primarily for watershed management research purposes—to determine principles and methods of management of the critical ponderosa pine Front Range area for watershed protection and to curtail floods and erosion. Some of the lower open lands had been farmed; also, much of the area was being grazed by cattle. Hence, intensive tests of species and methods of reseeding were conducted as a range rehabilitation measure. Also, pasture tests of the intensity, seasons, and systems of cattle grazing were conducted to develop guides for range cattle management for the ponderosa pine Front Range area. The results obtained have been of far-reaching benefit. Many stockmen, water users, range extension specialists, scientists, students, and general public have visited and studied the results of the research. W. M. Johnson played a major role in the development and conduct of the work at Manitou. L. D. Love directed some of the early work and participated in the watershed studies. P. O. Currie has been in charge in later years.

[19] *Love, L. D. 1958. The Manitou Experimental Forest—its work and aims. U.S. Dep. Agric., For. Serv., Rocky Mt. For. and Range Exp. Stn., Stn. Pap. 7, 21 p. (Rev.). Fort Collins, Colo.*



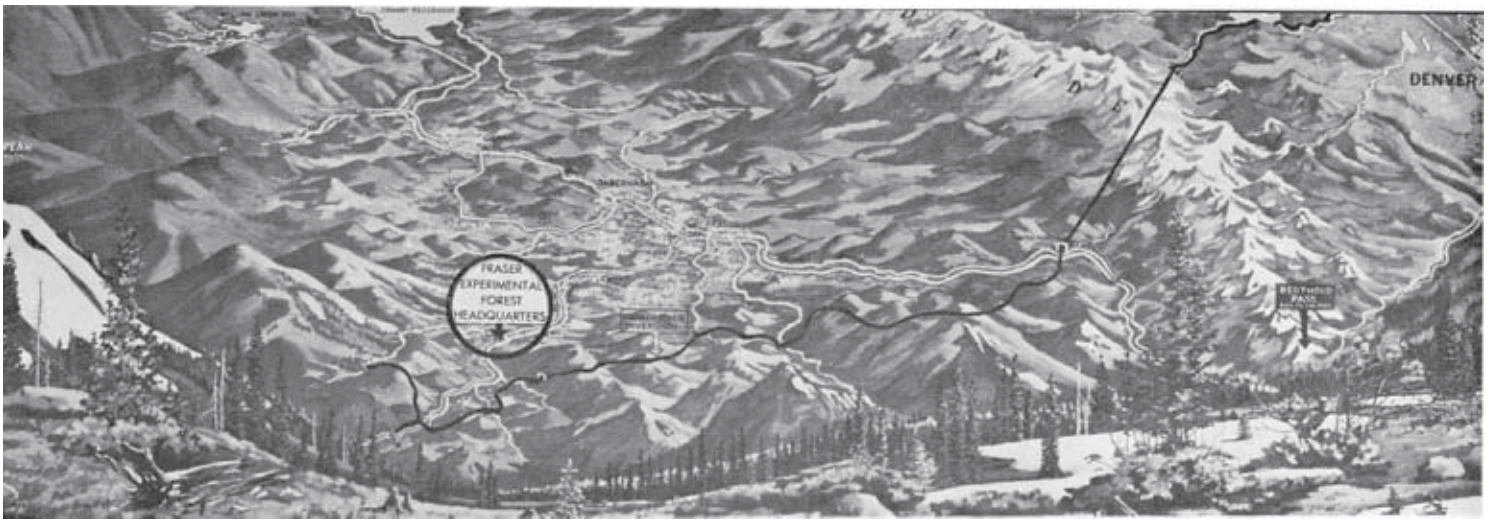
Manitou Experimental Forest, Colorado.

⇦ *(Left) Grazing in intermediate wheatgrass planted on abandoned field, 1951.*

(Top) Measuring density of protected plants in cattle range, 1941.

(Center) Abandoned field reclaimed, through reseeding, 1944.

(Right) Grass nursery adaptability trials, 1950.



Headquarters, Fraser Experimental Forest, Colorado.

Fraser Experimental Forest

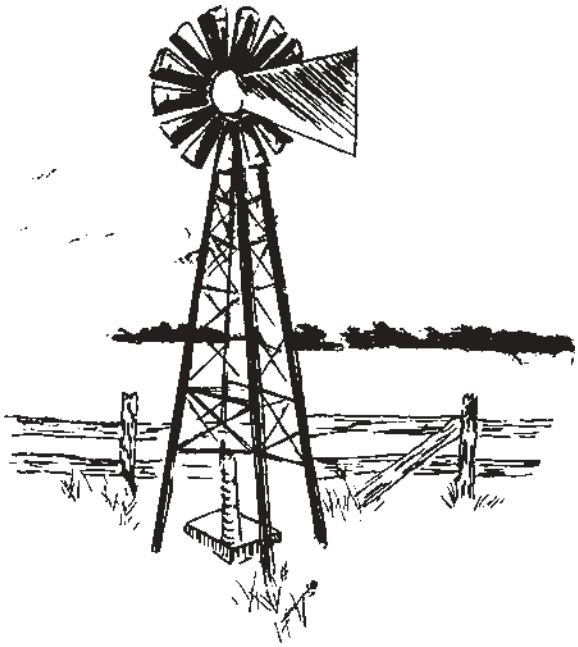
The Fraser Experimental Forest was established in 1937.[20] It is situated in the heart of the Central Rocky Mountains near the Continental Divide 65 miles north and west of Denver near Fraser, Colorado. The dominant tree species are lodgepole pine, Engelmann spruce, and subalpine fir. Aspen grows in the openings left by fire and logging. Higher in the alpine areas are barren rocks intermixed with meadows containing grasses, sedges, forbs, and dwarf willows. This 36-square-mile outdoor research laboratory was selected to study pressing problems related to water yield from high-elevation forests and alpine areas. Water from much of the area is diverted to the City of Denver, and a prime purpose of the Experimental Forest was to find out how to get more water from snowmelt.

Various methods and arrangements of timber harvests were made, and the snow storages measured and translated to water yield; also measured were the growth and mortality of the tree species. Streamflow and siltation from the harvested watershed were compared to that from the unharvested check watershed. The results have been of great importance to water users and forest land managers nationwide. The timber on the original harvest cutting plots was cut and skidded by Public Works crews. The timber harvest was directed by the Arapaho National Forest.

Many people, including foreign delegations, have visited the Experimental Forest. It has also been used for training schools and field meetings by various institutions and associations. Many scientists and students have worked at Fraser. Those who were chiefly responsible included C. A. Connaughton, H. G. Wilm, B. R. Lexen, B. C. Goodell, R. R. Alexander, and M. D. Hoover.

[20] *Love, L. D. 1960. The Fraser Experimental Forest—its work and aims. U.S. Dep. Agric., For. Serv., Rocky Mt. For. and Range Exp. Stn., Stn. Pap. 8, 16 p. (Rev.). Fort Collins, Colo.*

Headquarters, Central Plains Experimental Range, Colorado. G. E. Klipple records the vegetation density in an experimental pasture, 1942.



Central Plains Experimental Range

The development of the Central Plains Experimental Range was begun in 1939 in cooperation with the U.S. Soil Conservation Service. Located 12 miles northeast of Nunn, Colorado, and 25 miles southeast of Cheyenne, Wyoming, the 12,800-acre experimental range is in the western part of the Central Great Plains region. Blue grama and buffalograss are the dominant forage grasses.[21] To furnish guides to proper management of the extensive range type, yearling heifers were grazed in pastures under three grazing intensities to determine the effects on the range and on the cattle. The Experimental Range was transferred to the Agriculture Research Service in 1954 in the reorganization of the Department of Agriculture. D. F. Costello and G. E. Klipple developed the Experimental Range, and gave direction to the research.

[21] *Klipple, G. E., and David F. Costello. 1960. Vegetation and cattle responses to different intensities of grazing on short-grass ranges on the central Great Plains. U.S. Dep. Agric., Tech. Bull. 1216, 82 p.*

David F. Costello (upper) weighs cattle used in experimental grazing systems, and (lower) reports a light-use pasture in high-fair condition. 1942.

Key Personnel Changes

The years 1938 and 1939 were marked by changes in key personnel. C. A. Connaughton took over the Directorship of the Station in 1938. McArdle went to Asheville, North Carolina, as Director of the Appalachian Station. H. G. Wilm, from the California Station, replaced Connaughton as Chief of Watershed Management Research. L. J. Palmer returned to Alaska. D. F. Costello became Chief, Range Management Research, and J. T. Cassady joined the range staff. Rudolph Stahelin was added to the Timber Management Research staff.

In 1939, B. R. Lexen transferred from the Southwestern Station, and replaced Taylor as Chief of Timber Management Research. G. T. Turner and Clyde Doran joined the Range staff, and M. H. Collet and C. H. Niederhof were added to the Watershed Management staff. Wilm was also in charge of Flood Control Surveys with L. K. Hill, W. M. Johnson, H. D. Burke, and E. G. Dunford.

Connaughton, a University of Idaho forester, completed his M.F. at Yale. He was an organization and action man. Things moved under his friendly but objective leadership. Under his direction, an in-depth analysis was made of the wildland management problems of the Region. In **Timber Management**, the problems were segregated by major forest types; that is, Engelmann spruce, lodgepole pine, ponderosa pine, and other minor forest types, chief of which was Douglas-fir. In **Range Management**, problems were arranged in three broad categories or areas, each characterized by certain vegetative types, climate, physiography, and economics. They were the Great Plains, the sagebrush-grass and semidesert areas, and the mountain area. In **Watershed Management**, the problems were arranged into four broad areas or zones, namely the Great Plains, the Foothills, the Front Range, and the Main Rocky Mountain Range.

Much useful information was made available: reforestation procedures, tree classification of lodgepole pine, growth and yield of selectively cut lodgepole pine, growth after thinning in ponderosa pine; also, the influence of vegetation on surface runoff and erosion, the most desirable reforestation sites, and information on snow storage and rate of melting. Other accomplishments included reports on initial stocking rates

ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION
Fort Collins, Colorado
Staff—1943

(Left to right)
First row: D. F. Costello, P. L. Ginter, H. G. Wilm, Maria Garwood, N. D. Wygant (Cooperator, Division of Forest Insect Investigations, BE&PQ), E. G. Dunford, B. R. Lexen.
Second row: Director C. A. Connaughton, C. W. Maxey, E. M. Hornibrook, W. M. Johnson, G. E. Klipple.

Grazing experiments with heavy, moderate, and light grazing on experimental pastures at Manitou Experimental Forest, Colorado, 1940's.

for cattle for the Manitou pastures; effect of grazing by cattle on the Central Plains Experimental Range; research in the control of orange sneezeweed (*Helenium hoopesii*); and a study course in Range Ecology. A milestone was the marking of lodgepole pine for various degrees of harvesting in the timber-water yield study at the Fraser Experimental Forest.

In 1940, the forest and range problems of the Region were reappraised. Several important problems were recognized in each of the broad areas or zones: the Great Plains, the Foothills, the Front Range, the Main Rocky Mountain Range, and the Colorado Plateau. However, within the funds and facilities available, research was directed chiefly on a few critical areas including: **Range Management,** ponderosa pine and short-grass ranges and poisonous plant control, principally orange sneezeweed; **Timber Management,** management of the Engelmann spruce type and artificial regeneration; **Watershed Management,** Front Range and the Main Range. W. M. Johnson was given charge of the Manitou Experimental Forest.

G. T. Turner evaluates the mima mounds attributable to pocket gophers on Black Mesa, Colorado, 1947.

Streamlined Program During War Years

During the war years, 1941 to 1945, the main emphasis of the Station program shifted to problems directly associated with World War II and immediate postwar effort. Less urgent work was placed on a maintenance basis, because funds and personnel were reduced to a minimum. The younger scientists entered the military services. Those remaining continued the essentials of the more important established research, and also handled special related wartime activities. Some of these included a study of supply and requirements of forest products for the Rocky Mountain region, the development of shortcut labor-saving methods of handling timber sales, U.S. Department of Agriculture War Board assignments, Food for Freedom Program, a study of native rubber-bearing plants, and plant collections for special wartime insecticide programs. B. R. Lexen was transferred to the Guayule project for research and survey purposes. P. L. Ginter joined the Station and, in cooperation with Region 2, handled the Timber Products War Projects.

Despite the wartime restrictions, the Engelmann spruce area at Fraser was prepared for the key experimental water-timber cuttings. In Range Management Research, a study of the effects of pocket gophers on range condition and grazing capacity on summer ranges of the Plateau area on the Grand Mesa National Forest were begun; also, the ponderosa pine range-watershed study was started at Manitou. Three degrees of grazing were imposed on the pastures.

In 1944, Connaughton transferred to the Directorship of the Southern Forest Experiment Station. W. G. McGinnies of the Emergency Rubber Project was appointed Director. McGinnies was a 1922 University of Arizona graduate with a B.S.A. in biology; he obtained his Ph.D. in ecology (1932) at the University of Chicago. Subsequently, he was Range Ecologist and Professor of Botany at the University of Arizona (1927–35) and then with the U.S. Soil Conservation Service, before joining the Southwestern Station.

Post-War Rebuilding Program

In mid-1945 as the war ended, some new funds became available to revitalize the research program. Formal research in range reseeding was begun by C. L. Terrell. B. C. Goodell joined the Watershed Management staff. J. L. Retzer, Soil Scientist, also joined the staff. Retzer's soil skills added another dimension to the Station's program. His first effort, working with Region 2, was evaluating soils in range surveys and special soils investigations. Retzer classified wildland soils of the Region preparatory to the conduct of intensive forest and range research. Later, Retzer transferred to Washington, D. C., to organize and head up nationwide soil surveys on the National Forests.

Reorganization of Research Into Research Centers

Funds were made available in July 1946 for conducting forest and range research in western Colorado. In accordance with "Hearings on the U.S. Department of Agriculture Appropriation Bill for 1947," this new research was established and organized as the Western Slope Research Center. Following this same pattern, the research at the Station was also organized into the Front Range and Continental Divide Research Centers. These Research Centers operated as Branch Stations under the general supervision of the central staff.

The Central Plains Experimental Range was administered by the Division of Range Management Research with G. E. Klipple as Superintendent. The Fraser Experimental Forest was the principal work center for the Continental Divide Research Center; B. R. Lexen was acting Research Center Leader, with E. M. Hornibrook and B. C. Goodell. Front Range Research Center work was concentrated at the Manitou Experimental Forest; W. M. Johnson was Research Center Leader with E. J. Dortignac and C. L. Terrell. G. T. Turner was Acting Research Center Leader of the Western Slope Research Center, with C. W. Doran. Leaders for all three Research Centers maintained headquarters at Fort Collins. The central staff at Fort Collins included B. R. Lexen, in charge Timber Management Research; H. G. Wilm, in charge Watershed Management Research; D. F. Costello, in charge Range Management Research, and J. L. Retzer, Special Soils Investigations.

In 1947, the personnel assigned to the Western Slope Research Center moved to Delta, Colorado. They operated out of the Supervisor's Office of the Uncompahgre National Forest. Streamgaging stations were established on three timbered watersheds of Red Sandstone Creek, White River National Forest. The Research Center moved to Grand Junction in 1955; in 1960, the personnel moved back to Fort Collins.

Sneezeweed control, range reseeding, and cooperative pocket gopher research were included in the program of the Western Slope Research Center. E. J. Dortignac was transferred from the Front Range Research Center to the Western Slope staff. Other personnel changes included the addition of E. G. Dunford, Soil Scientist, to the Front Range staff. C. L. Terrell joined the Colorado State Cooperative Extension Service as Extension Conservationist. Later he handled State and Extension Forestry, and in 1959 was appointed Secretary to the State Board of Agriculture. W. M. Johnson and E. G. Dunford moved to the Manitou Experimental Forest residences.

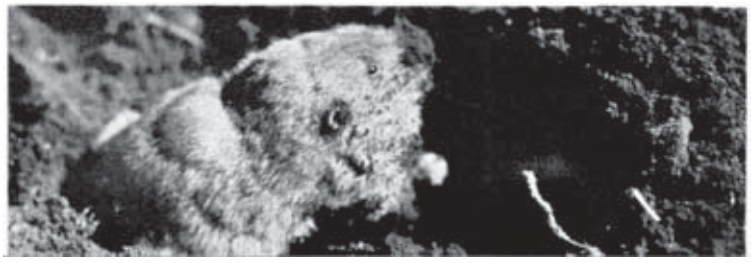
In 1948, special attention was given by the Timber Management staff to reproduction and stand condition in the beetle-killed spruce stands of the Colorado Plateau area. Range reseeding tests and research in sagebrush control were begun in Wyoming in cooperation with the Bureau of Land Management and Wyoming Agricultural Experiment Station. Attention was centered on adaptable species and seedbed preparation. L. D. Love transferred to the Station from the U.S. Soil Conservation Service to replace Wilm as head of Watershed Management Research. Wilm transferred to the Southern Station. A. C. Hull transferred to the Range Management staff from the Intermountain Station, to conduct range reseeding research.

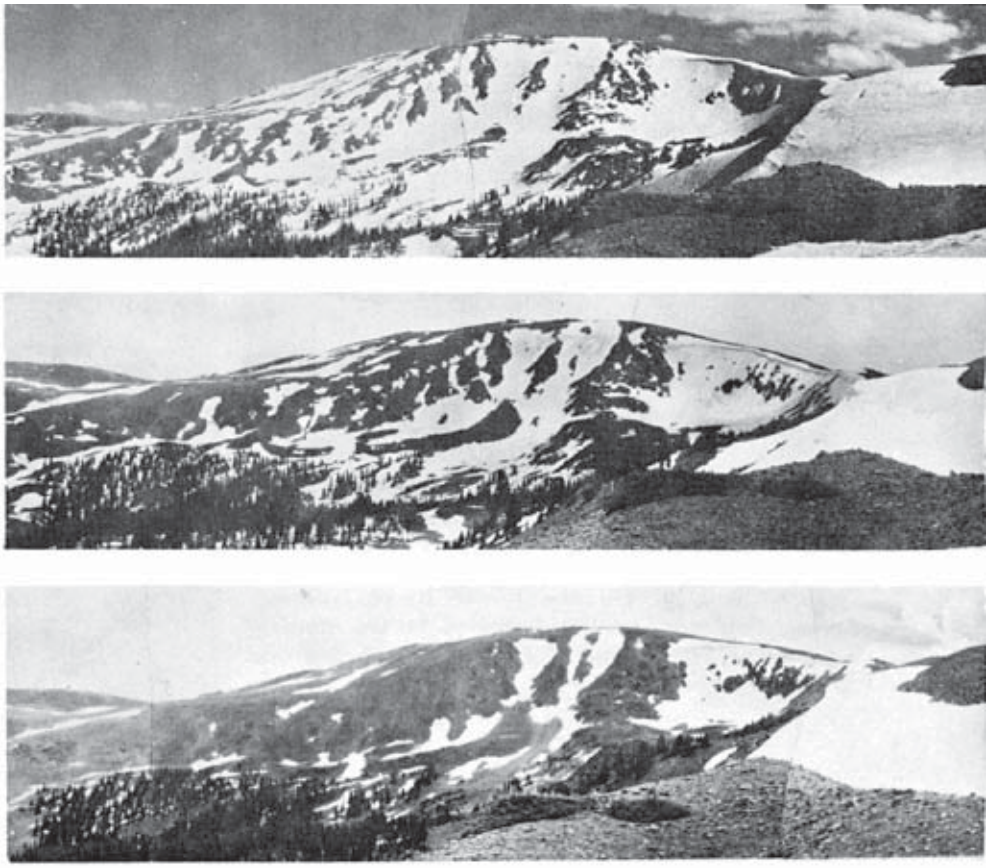
In 1949, the research program at the Station was reviewed in relation to watershed management and river basin planning and development, which was then receiving nationwide attention. This was apropos, as the central Rocky Mountain Region is the fountainhead of four major rivers. In cooperation with D. V. Harris of the

Devastation of Engelmann spruce by the spruce beetle, 1939 to 1953, did much to get insect control research rolling. On the White River National Forest, Colorado, beetles destroyed entire stands—3.8 billion board feet of Engelmann spruce and 500 million board feet of lodgepole pine.

Both airplane and tractor-mounted spraying equipment were used for sagebrush-control experiments in Wyoming in the 1940's.

Building a gopher exclosure study area on Black Mesa in western Colorado.





East St. Louis watershed, Fraser Experimental Forest, Colorado, 1950, where relation of streamflow to extent of snow cover was recorded. Before April 1, entire watershed was snow covered; most snow had disappeared by July 3.

Upper, June 2;

Center, June 19;

Lower, July 3.

Geology Department of Colorado A&M College (later named Colorado State University), studies were begun to evaluate the geologic factors in erosion. Also in 1949, a group of Forest Service watershed and timber management scientists from various parts of the United States met at the Fraser Experimental Forest to consider experimental evidence and plans for the classic Fool Creek timber-watershed study. This "Fool Creek Jury" agreed that the area was ready for experimental treatment as follows:

1. Construct logging roads prior to harvesting and evaluate effects on streamflow.
2. Remove some 3 million board feet of timber by alternate-strip cutting, and evaluate effects on streamflow.
3. About 1960 remove remaining timber, and evaluate effects on streamflow.

FOOL CREEK JURY, FRASER EXPERIMENTAL FOREST, 1949.
(Left to right)
Front row: M. B. Huckeby, M. D. Hoover, L. Lassen, T. Krueger.
Second row: Director W. G. McGinnies, R. K. LeBarron, R. W. Bailey, J. J. Byrne.
Third row: B. C. Goodell, E. N. Munns, E. J. Dortignac, E. G. Dunford, P. A. Ingebo, B. R. Lexen.
Fourth row: L. D. Love, J. G. Osborne, A. R. Croft, A. G. Lindh, C. M. Hendee, J. L. Retzer.

Timber harvest patterns designed for evaluting effects of water yield and forest regeneration. Fool Creek watershed, Fraser Experimental Forest, Colorado. Access roads were built in 1950-51; timber harvesting was done in 1954-56.

A sediment basin of 1/4 acre-foot capacity was constructed in 1951 immediately below the stream-gaging station. Annual sediment yield from the watershed following logging averaged only 1.5 cubic feet per acre, net volume.

Other Programs in the Early Fifties

Despite the decreasing purchasing power of the dollar, other progress was achieved during the early fifties. In 1951, the Fool Creek program began. Previous work with small sample plots at the Fraser Experimental Forest furnished background information and suggested possible treatments. Work in Wyoming in cooperation with the University of Wyoming was extended to the Bighorn area, where intensity-of-grazing studies were begun. Plans for an Experimental Range on Black Mesa, Gunnison National Forest, Colorado, were developed and cooperative grazing studies with the Black Mesa Cattlemen's Association were begun in 1952. Intensity of grazing was put to the test at Manitou in the drought years then existing, and recommendations made available.

The National Forest Advisory Council raised questions about livestock grazing on important watersheds of the Front Range of Colorado. To answer these questions, in 1950, E. H. Reid, Division of Range Research, Washington, D. C. Office, headed up a team of resource scientists and made a study of the Elk Ridge and Lower Elk Ridge cattle allotments on the Roosevelt National Forest, Colorado.[22] Recommendations from the Roosevelt study emphasized the need to consider all resource values such as soil productivity, erosion, streamflow, wildlife habitat, timber production, and recreation aspects along with range condition and trend, in establishing range livestock grazing policies for National Forest ranges.

The following personnel changes occurred in 1951: (1) J. H. Buell replaced Lexen in charge of Timber Management Research. Lexen was transferred to Washington, D. C., in Timber Management Research. Later he transferred to the Department of Agriculture in charge of foreign forestry, P.L. 480. Buell transferred from the Washington Office of Timber Management Research. (2) E. G. Dunford was made Research Center Leader of the Continental Divide Research Center. (3) A. C. Hull, Jr. was transferred to the Washington office in Range Research. (4) R. M. Hurd came from the Washington office to be Research Center Leader of the Big Horn Research Center. He was assisted by N. A. Kissinger. (5) R. R. Alexander joined the Timber Management staff, and H. E. Brown the Watershed Management staff.

In 1952 arrangements were made for beginning the appraisals of shelterbelts in Nebraska, Kansas, and South Dakota. Cooperation was worked out with the Nebraska Agricultural Experiment Station for the assignment of R. A. Read at Lincoln, Nebraska, to begin the work. During the year, Dortignac was transferred to the Southwestern Station to head up the work in northern New Mexico. H. E. Brown was transferred to the Western Slope Research Center to replace Dortignac.

[22] *Reid, Elbert H., and L. D. Love. 1951. Range-watershed conditions and recommendations for management, Elk Ridge and Lower Elk Ridge cattle allotments, Roosevelt National Forest, Colorado. 123 p. U.S. Dep. Agric., For. Serv., Wash., D.C.*

This shelterbelt, planted in 1938 (upper), was evaluated in 1954 (lower).

A sign "Ike Ate Here" hangs over the entrance to the dining room of the "lodge" at the Fraser Experimental Forest. President Dwight D. Eisenhower was a guest at the Byers Peak Ranch at Fraser, Colorado, for part of the summers of 1953, 1954, and 1955. The Experimental Forest joins the west boundary of the Ranch.

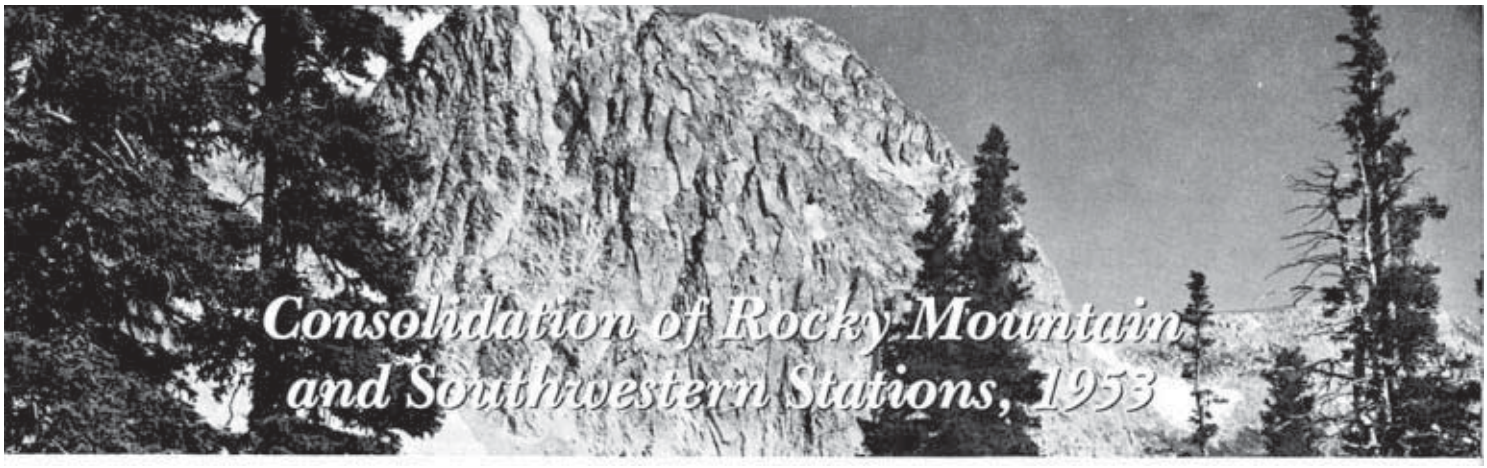
During the summer of 1953, arrangements were made with Sherman Adams, Special Assistant to President Eisenhower (formerly a lumberman), for the President to visit and have lunch at the Experimental Forest. As the President entered the cook house, he smelled the soup being prepared by Andrew J. O'Mailia, the summer cook at the Experimental Forest. The President tasted the soup, and this started a friendly conversation between him and "Andy" about recipes. Occasionally "Andy" took a pie to the Ranch for the President. During a visit to the Ranch in the summer of 1954, "Andy" mentioned to the President that he read where he—the President—was going to Missoula, Montana, to dedicate a new Forest Service smoke-jumpers headquarters. "Andy" asked the President to say hello to his boss Richard E. McArdle, Chief of the Forest Service. Following is a quote from the President's remarks at the ceremony:

> I am not at all surprised that it [the Forest Service] is such a good outfit . . . two nights ago in Fraser, Colorado, I was visited by a cook, a cook in the Forest Service. He said, "I read in the paper you are going to Missoula. There you will see my boss, Mr. McArdle. Give him my greetings and best wishes."
>
> I was long with the Army, I have seen some of the finest battle units that have ever been produced, and whenever you find one where the cook and the private in the ranks want to be remembered to the General, when someone sees him, then you know it is a good outfit.

"Andy" and his cooking did much to facilitate the research at the Fraser Experimental Forest.

ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION
Fort Collins, Colorado
Staff—1951

(Left to right)
First row: Director W. G. McGinnies, R. R. Alexander, D. F. Costello, E. G. Dunford, L. D. Love, C. M. Doran, J. L. Retzer.
Second row: Joye E. Smith, Maria D. Garwood, Mona F. Nickerson, Marie H. Gurwell, Annalea C. Busch.
Third row: G. T. Turner, C. L. Newman, G. E. Klipple, W. M. Johnson, R. D. Hurd, N. A. Kissinger, J. H. Buell.



Consolidation of Rocky Mountain and Southwestern Stations, 1953

The steady decline in quantity and value of the research dollar in the early fifties was causing a gradually declining research program at the several regional forest experiment stations, especially at the smaller western stations. This situation made it difficult to operate, and to entice and hold good scientists.

The Forest Service, constantly studying ways and means to meet changing needs and pròblems, and after a thorough 2-year study, deemed it advisable to consolidate the smaller western stations. Hence, in 1952 the Northern Rocky Mountain (Missoula, Montana) and the Intermountain Stations were consolidated as a new Intermountain Station with headquarters at Ogden, Utah. A year later, September 1953, the Rocky Mountain and Southwestern Stations were consolidated as a new Rocky Mountain Station with headquarters in Fort Collins, Colorado, in cooperation with Colorado A&M College (later called Colorado State University). Fort Collins was a more central location with available library and research facilities. Improved transportation helped make the consolidations possible.

Several advantages resulted from consolidating the two stations. The elimination of one Director's office made funds available to continue and generally strengthen going research, and made possible an enlarged, more comprehensive, and more closely correlated program. Formerly, only partial programs in a few fields were possible at the two stations. After consolidation, more skills and services became available to the people and interests in the central and southern Rocky Mountain Regions. Consolidation, of course, has its limits, but in this case it proved beneficial. The area served has many problems in common, so that basic facts obtained have wide application.

Organizations Meshed and Decentralized

Raymond Price moved to Fort Collins as Director of the combined Stations. McGinnies moved to Columbus, Ohio, as Director of the Central States Station. Other personnel of the two Stations were meshed together into a productive organization.

In the Director's office, J. H. Buell continued as Division Chief of Timber Management Research. M. D. Hoover transferred from the Southeastern Station to head up Watershed Management Research; and E. H. Reid came from the Washington office to head up Range Management Research. Previously, C. K. Pearse had taken a foreign assignment, and D. F. Costello had transferred to the Pacific Northwest Station. L. D. Love became Leader of the Front Range Research Center, and H. C. Fletcher became Leader of the Sierra Ancha Research Center. Hoover and Reid, with their rich experience in Watershed Management and Range Research, gave impetus to the station program and helped develop the younger scientists in these fields. L. A. Mueller and E. S. Kotok moved from Tucson to Fort Collins to work Stationwide in forest utilization.

To effectively administer the broader and mòre comprehensive program of the new Station within the enlarged area to be served, the research was organized and conducted on a research center basis. This organization was not new. It had been followed by the Forest Service in the East and South for several years and on a partial basis by the former two Stations. Now, except for special services, the entire Station program was so organized and managed.

Most of the technical personnel were located at nine research centers. These included the Santa Rita, Sierra Ancha, and Fort Valley Research Centers in Arizona; the Upper Rio Grande in New Mexico; the Upper Colorado (Western Slope), Continental Divide, and Front Range in Colorado; the Big Horn in Wyoming; and the Prairie Research Project in Nebraska. Other research areas were recognized, such as the Black Hills of

Directors,
Combined Rocky Mountain Forest and
Range Experiment Station, 1953-75:

Raymond Price, 1953-71

Karl F. Wenger, 1971-75

David E. Herrick, 1975-Present

South Dakota and Wyoming, and the Trans Pecos in west Texas and New Mexico. These areas were not then activated, however, since appropriated funds were lacking.

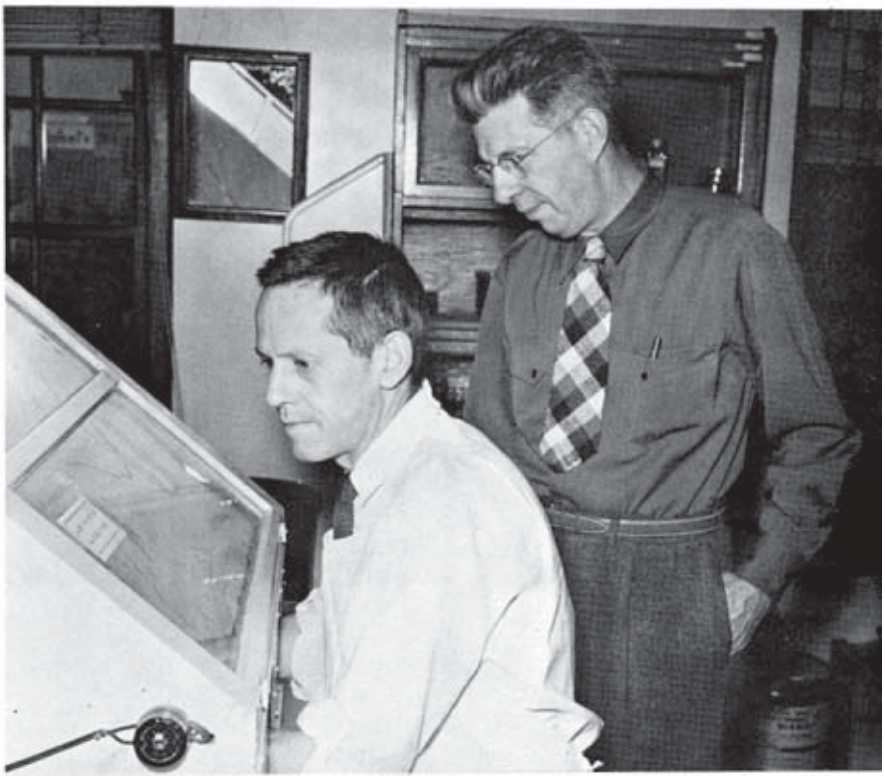
The Research Center organization proved to be effective for the times and had several marked advantages: (1) because scientists resided within the areas, they became more intimately acquainted with the people and the problems needing attention; and (2) the people within the areas had a greater opportunity to take part in the programs. As a result, the research was more directly oriented to local problems, and the findings more easily put into practice.

Department of Agriculture Reorganization

Secretary Benson's memorandum of November 2, 1953, pertaining to the reorganization of the Department of Agriculture, transferred Forest Insect Investigations, of the Bureau of Entomology and Plant Quarantine, and Forest Pathology, of the Bureau of Plant Industry, Soils, and Agricultural Engineering, to the Forest Service and added them to the programs of the forest and range experiment stations. Hence, the Forest Insect Investigation Unit at Fort Collins, headed by N. D. Wygant, and the Forest Pathology Unit at Albuquerque, New Mexico, headed by L. S. Gill, were added to the newly formed Rocky Mountain Station. Wygant became Chief of Forest Insect Research at the Station, and L. S. Gill came to Fort Collins as Chief of Forest Disease Research. The other personnel of these units were organized into two Forest Insect and Disease Laboratories. One was headquartered in Albuquerque, New Mexico, to serve the States of Arizona and New Mexico, and the other at Fort Collins to serve the remainder of the Station area.

As a part of the reorganization of the Department of Agriculture, certain phases of range research of the Forest Service were transferred to the Agricultural Research Service. All range research in the Great Plains, including the Central Plains Experimental Range and the Jornada Experimental Range, were transferred to the Agricultural Research Service. Also transferred from the Forest Service to Agricultural Research Service was research in range reseeding, except for reseeding for wildlife and management of reseeded ranges. Research projects on methods to control undesirable range plants were also transferred, except for control by grazing management or fire and ecology studies. The scientists transferred to the Agricultural Research Service remained in place at the Station's Research Centers for several years and worked on a cooperative basis. These included G. E. Klipple at Fort Collins, F. Lavin at Tempe, H. M. Hull and M. E. Roach at Tucson, and F. N. Ares at Las Cruces.

N. D. Wygant (left) checks an insect attack near Cameron Pass, Colorado. L. S. Gill watches as S. R. Andrews transfers fungus cultures at the Forest Diseases Laboratory, Albuquerque, New Mexico.



Organization of the Rocky Mountain Forest and Range Experiment Station, after Consolidation, 1954

DIRECTOR'S OFFICE

Director: Raymond Price
Divisions of Research:
Timber Management—
J. H. Buell, Chief
Forest Diseases—
L. S. Gill, Chief
Forest Insects—
N. D. Wygant, Chief
Forest Utilization—
L. A. Mueller, Chief
E. S. Kotok
Range Management—
E. H. Reid, Chief
Watershed Management—
M. D. Hoover, Chief
Soils Investigations:
J. L. Retzer

RESEARCH CENTERS

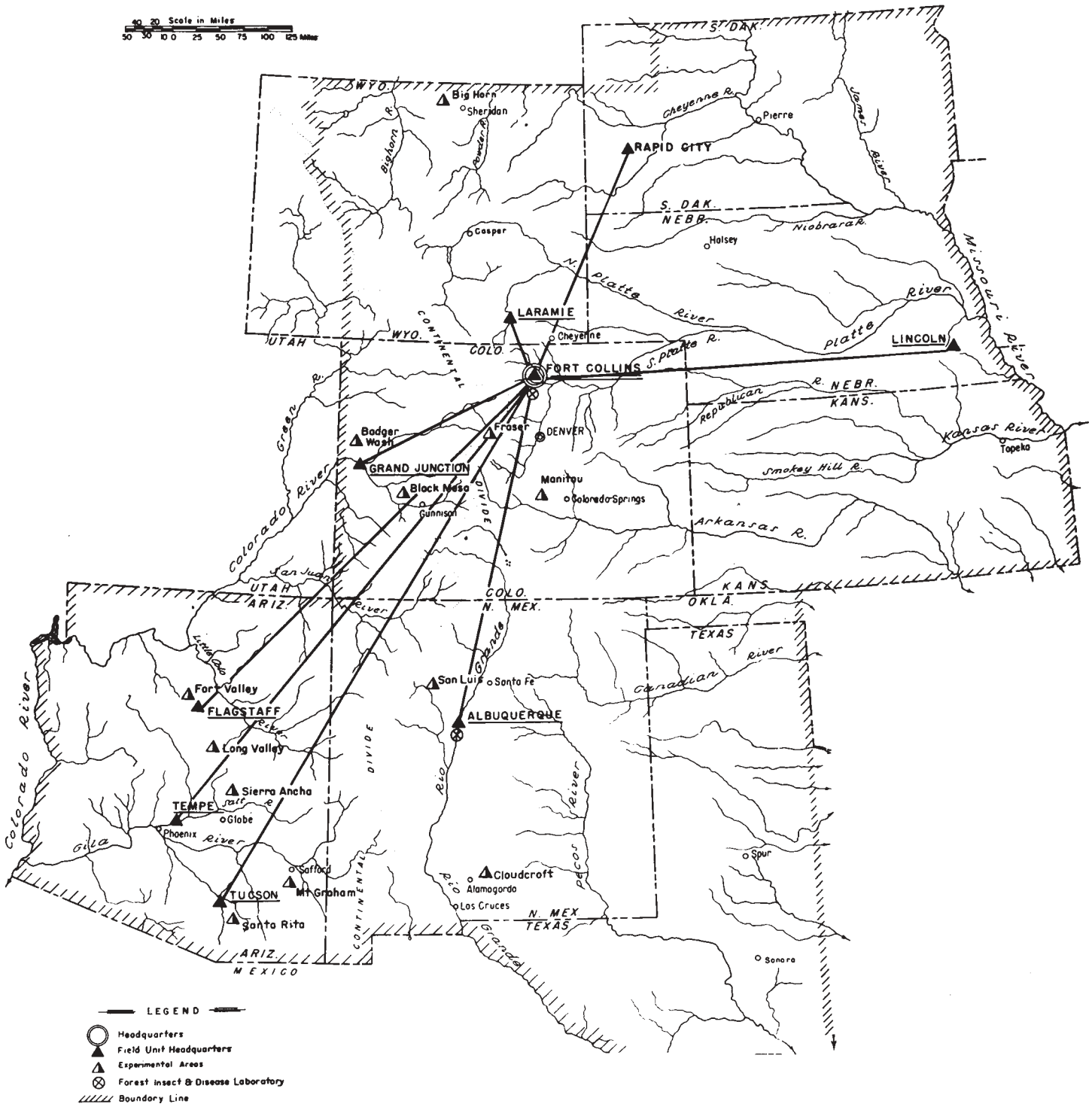
Arizona:
Fort Valley, Flagstaff
E. M. Gaines, Leader
Timber Management—
E. M. Gaines
F. R. Herman
E. C. Martin
Range Management—
J. F. Arnold
Santa Rita, Tucson
H. G. Reynolds, Leader
Range Management—
H. G. Reynolds
J. W. Bohning
Cooperating ARS—
H. M. Hull
M. E. Roach
Sierra Ancha, Tempe
H. C. Fletcher, Leader
Watershed Management—
H. C. Fletcher
L. R. Rich
D. R. Cable
Cooperating ARS—
F. Lavin
Colorado:
Continental Divide, Fort Collins
B. C. Goodell, Leader
Timber Management—
R. R. Alexander
Watershed Management—
B. C. Goodell
Front Range, Fort Collins
L. D. Love, Leader
Range Management—
W. M. Johnson
Cooperating ARS—
G. E. Klipple
Watershed Management—
L. D. Love
Upper Colorado, Delta
G. T. Turner, Leader
Range Management—
G. T. Turner
Watershed Management—
H. E. Brown
Nebraska:
Prairie Research Project, Lincoln
R. A. Read, Leader
Timber Management—
R. A. Read
New Mexico:
Upper Rio Grande, Albuquerque
E. J. Dortignac, Leader
Fire—
A. W. Lindenmuth, Jr.
Range Management—
H. A. Paulsen, Jr.
Watershed Management—
E. J. Dortignac
E. H. Palpant
Wyoming:
Big Horn, Laramie
R. M. Hurd, Leader
Range Management—
R. M. Hurd
F. W. Pond

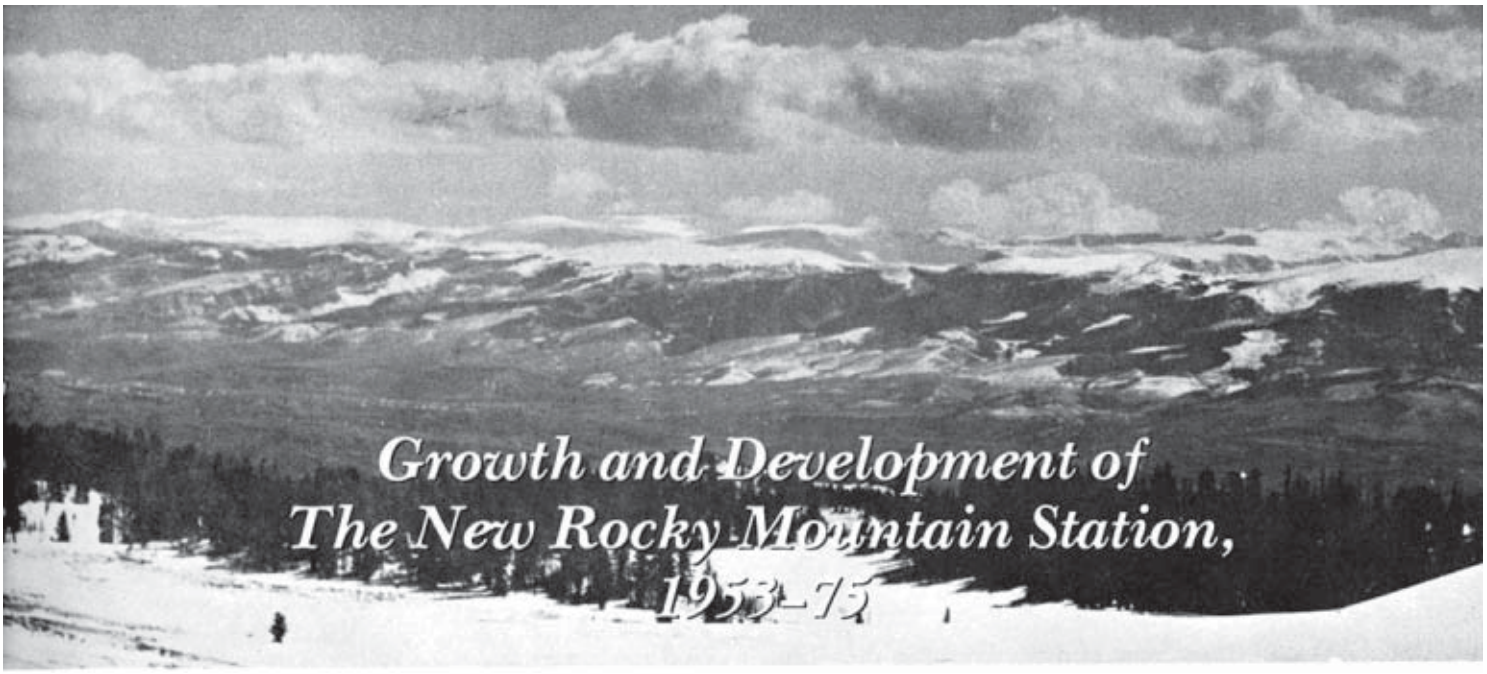
FOREST INSECT AND DISEASE LABORATORIES

Albuquerque, New Mexico
J. W. Bongberg, in charge
Forest Diseases—
S. R. Andrews
F. G. Hawksworth
T. E. Hinds
Forest Insects—
J. W. Bongberg
R. K. Bennett
Fort Collins, Colorado
B. H. Wilford, in charge
Forest Diseases—
R. W. Davidson
Forest Insects—
B. H. Wilford
C. L. Massey
W. F. Bailey
A. E. Landgraf
R. H. Nagel
F. B. Knight
F. M. Yasinski

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION





Growth and Development of The New Rocky Mountain Station, 1953–75

From Canada to Mexico, the Rocky Mountain Empire straddles the Continental Divide—the backbone of the country. Much of the area is too steep, too cold, or too arid for cultivation; yet, water for half of the Nation flows from it. A large portion of this empire falls within the jurisdiction of the consolidated Rocky Mountain Station. As demands for water, timber, forage, wildlife, and outdoor recreation increased, the need for forestry research became more urgent. To provide the know-how for continued wise use of the invaluable renewable resources in the heart of the Nation's last wildland frontier was the challenge. With the functioning of its several research centers located

throughout the enlarged area, the new Rocky Mountain Station became recognized as a major wildland resource institution in the Rocky Mountain Empire.

An Expanding Research Program

In response to the increasing needs and challenge, the new Station, with additional appropriated funds, broadened its research program during the remainder of the 1950's, and began some new studies.

Arizona Watershed Program

A significant new activity was the development of the Arizona Watershed Program, including the Beaver Creek Multiple Use Evaluation Project. The results of the watershed studies at the Fraser Experimental Forest in Colorado and the Sierra Ancha Experimental Watersheds in Arizona sparked an interest in water users in Arizona as to how to obtain more water from natural rainfall on the watersheds. The University of Arizona was requested to study the problem as it pertained to the Salt River watershed in central Arizona. Dr. George Barr, head of the Agricultural Economics Department, was given the assignment. He invited several watershed experts to come to Arizona to inspect the watershed. Most of these watershed experts were or had been employed by the Forest Service, since the Forest Service pioneered watershed research and watershed management. Each visiting expert was flown over and driven through the watershed, after which he filed a report of his findings and recommendations. Dr. Barr and his staff reviewed and summarized the reports and prepared a two-part publication entitled "Recovering Rainfall," known as "The Barr Report."

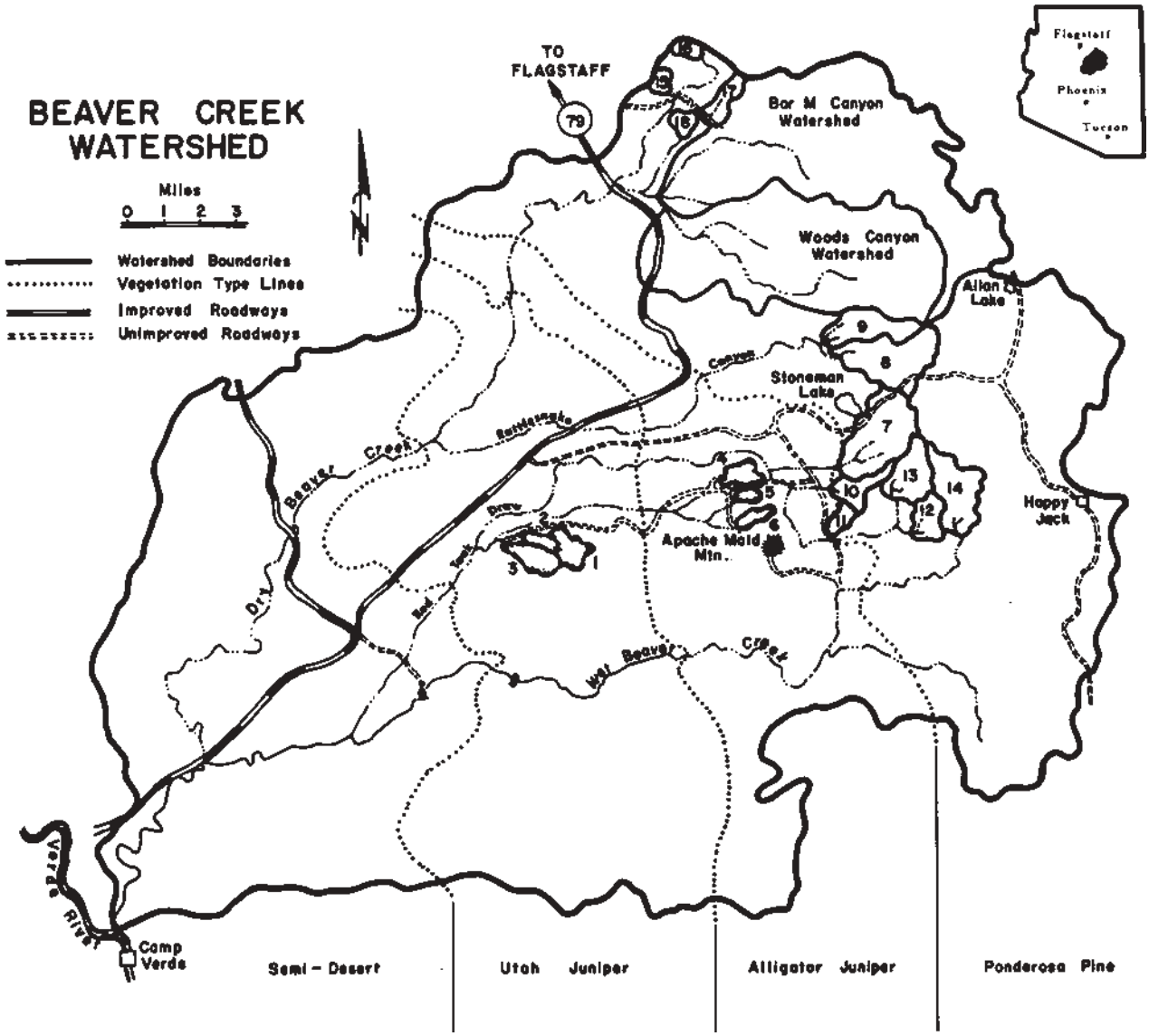
In essence, the "Barr Report" stated that a significant amount of rainfall, in the form of streamflow, could be recovered from the watersheds by various treatments of the vegetation, such as heavier timber harvesting, eradication of pinyon-juniper, and burning brush and other vegetation.

The publication was announced and presented at a special dinner at the Westward Ho Hotel in Phoenix in December 1956. Following the meeting, a Citizen's Committee was appointed, and all was set to begin large-scale watershed treatments. But, land managers raised questions and conservationists objected. They feared that unplanned harsh treatment of the vegetation on the watersheds would wreak havoc and result in irreparable damage. Both the Committee and land managers appealed to the Arizona Congressional Delegation, chiefly Senator Carl Hayden, the dean of the U.S. Senate and Chairman of the Appropriations Committee. Senator Hayden called R. E. McArdle, Chief of the Forest Service, and asked if it would be possible to apply the proposed watershed treatments on a selected watershed on a trial basis to see what would happen before launching a widespread program. McArdle said yes. From then on, the Forest Service, and more particularly the Rocky Mountain Station, were committed. Funds were authorized, the telephone from Washington rang, and the ball began to roll!

The first step was to find a suitable test watershed. The Beaver Creek watershed on the Coconino National Forest, an upstream tributary of the Verde River—a part of the Salt River System—had been recommended as a segment of a Soil Conservation District program. This large watershed covers some 275,000 acres, and includes ponderosa pine, Utah juniper, and semidesert types—all characteristic of most southwestern watersheds. It was decided to examine it as a possible test area.

Aerial view of the 275,000-acre Beaver Creek experimental area selected for the Multiple Use Evaluation Project.

Aerial view of Beaver Creek watershed 9 (left) with regular strip cutting and no thinning, and of watershed 14 (right) with irregular strip cutting and thinning.

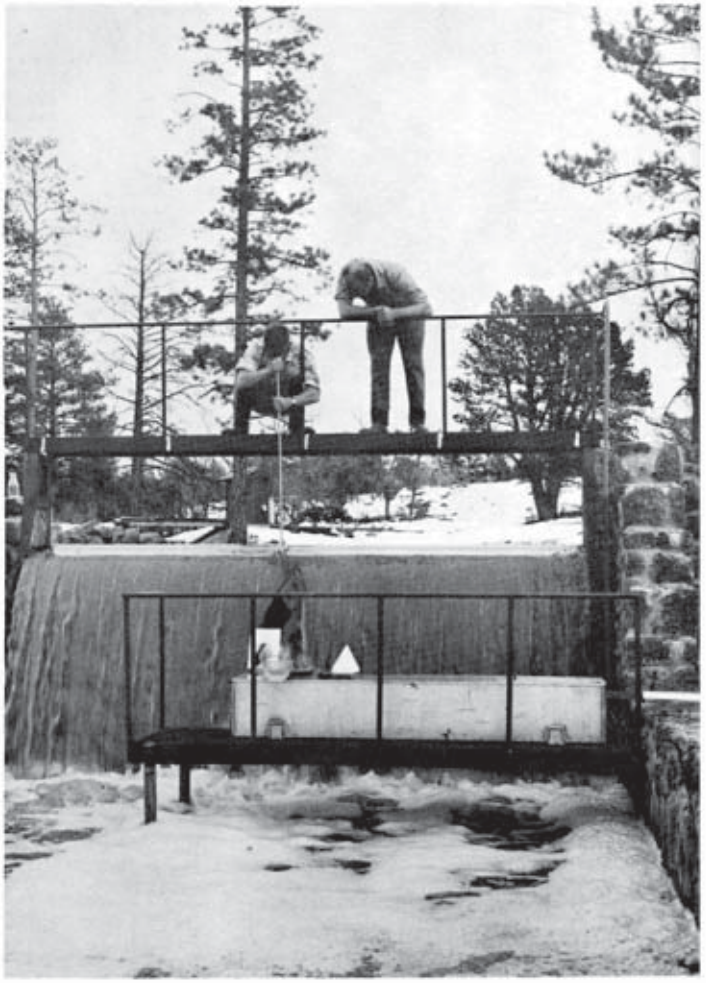


M. D. Hoover, who had recently transferred to the Station in charge of watershed management research, was assigned to represent the Station and look over the Beaver Creek watershed. He met Region 3 people at Flagstaff and spent 2 to 3 days hiking over the watershed since there were no roads.

The inspection party recommended the Beaver Creek watershed as a test area. It had two main drainages—Wet and Dry Beaver Creeks—and some 15 to 20 small subwatersheds, several in each vegetation type. So, as far as the Region was concerned, everything was ready to go. Regional Forester F. R. Kennedy was about to call McArdle and say all was ready to start treatment. Their plan was to treat the whole area and see what would happen. But, the Station said, "It isn't that simple!" After a lengthy telephone conversation, it was agreed that representatives of the Station and the Region should meet and iron out the differences.

The Cory Hotel Match.—Regional Forester Kennedy and W. L. Hanson, Chief Watershed Management, Region 3, and Director Price and Hoover met early one morning at the Cory Hotel, Denver, Colorado, prior to Kennedy's leaving for Washington. Needless to say, when two Irishmen got together to debate a problem, the going was hard and heavy! By midafternoon the air cleared. All present agreed that simply treating the whole area was not the plan to follow—that the area had to be stratified, and that the effects of the proposed treatments in the different vegetation types might vary considerably. Moreover, replication of treatments was essential to furnish sound information; also that the proposed treatments (various patterns of timber harvest, pinyon-juniper control, and reseeding) should be applied to one of the two main drainages, leaving the other drainage for a later large operational program. Hence, the Beaver Creek Multiple Use Evaluation Project was launched and has been carried forward essentially as ironed out at the Cory Hotel.

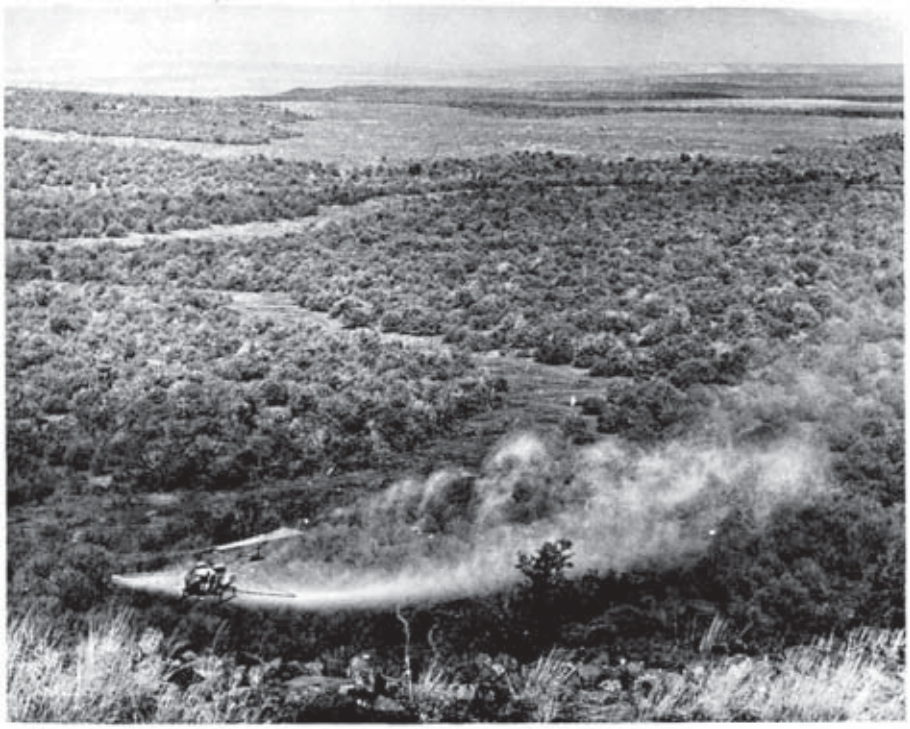
The Beaver Creek story is a long one—too long to record here. Moreover, it will not end soon because additional results will continue to become available as other treatments are applied and the years go by. It is a unique project—first and only one of its kind anywhere. It has received worldwide attention. The Forest Service, Region 3, the Rocky Mountain Station, and supporters may well be proud of this most significant contribution to forest land management.



Some of the Men Involved.—Many people have and will be involved in the Beaver Creek Project. Names have and will appear on reports and publications of the findings. It is beyond this history to mention them all, but a few are listed here in order to name some of those who shared the initial responsibility. For Region 3 were Regional Forester F. R. Kennedy and his successor W. B. Hurst; W. L. Hanson and his successors L. B. Woods and G. R. Proctor; and Supervisors R. W. Crawford, J. H. Cravens, R. M. Housley, and D. D. Seaman of the Coconino National Forest. For the Station, in addition to Director Price and M. D. Hoover, in chronological order, were E. F. Aldon, D. P. Worley, H. E. Brown, R. D. Lloyd, D. E. Herrick, and D. R. Carder. Those in charge of associated projects in the Arizona Watershed Program were L. R. Rich and J. R. Thompson, pine-fir forest watersheds; G. E. Glendening and A. R. Hibbert, chaparral and woodland watersheds; J. S. Horton, riparian and phreatophyte areas; and P. F. O'Connell, evaluation of watershed programs.

Beaver Creek watersheds, Coconino National Forest, Arizona:

(Left) Measuring water yield and silt content. (Upper right) Killing pinyon and juniper to determine the effect on water yield, livestock forage, and wildlife habitat. (Below) Testing strip cutting to determine changes in water yield.



Other Accomplishments

Going research was intensified on all fronts. A few examples include (1) radioactive tagging of Engelmann spruce beetles in Colorado to provide basic information on dispersion and flight habits of this destructive insect (R. H. Nagel); (2) the use of nematodes to reduce egg production of Engelmann spruce beetles (C. L. Massey); (3) ballistics studies of dwarf mistletoe seeds (F. G. Hawksworth and T. E. Hinds); (4) work on native stem rusts of pines (R. S. Peterson); (5) the establishment of a groundwood pulpmill in Arizona and the construction of a charcoal kiln in Colorado to study kiln schedules and designs suited to local species (L. A. Mueller and E. S. Kotok); (6) spruce management and artificial regeneration in beetle-killed spruce stands (R. R. Alexander and F. Ronco); and (7) levels of grazing and the effects of pocket gophers on vegetation and soils on Thurber fescue range (G. T. Turner).

A, *W. M. Johnson, and*

B, *Raymond Price, conducting training sessions at Manitou Experimental Forest, Colorado.*

C, *R. A. Read, examining (left) nursery seedlings, and (right) an experimental shelterbelt planting. Tree in foreground, and those in background, are same species and age, but come from different seed sources, Horning Farm, Nebraska.*

D, *R. M. Nagel, selecting beetles to be equipped with aluminum foil harnesses for study of flight habits.*

E, *C. A. Myers, developing computerized techniques to speed timber management planning, and to reduce costs. Fort Collins, Colorado.*

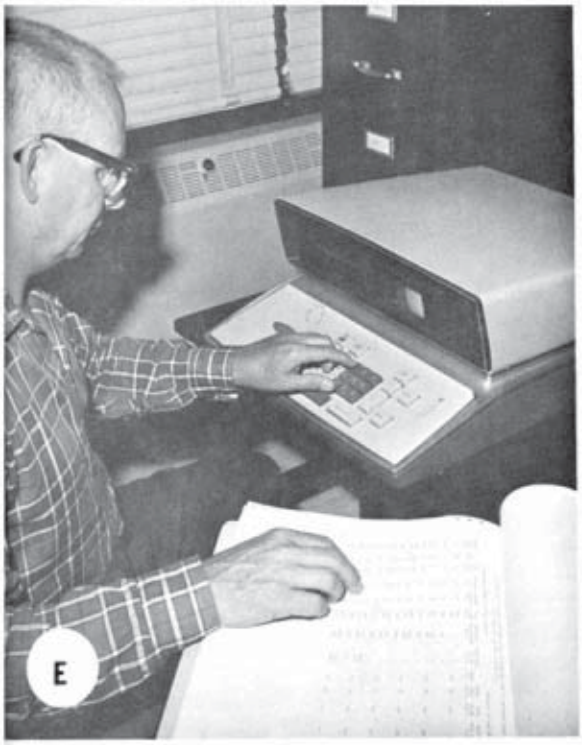
F, *R. R. Alexander, checking the growth response of Engelmann spruce within a timber measurement plot. Roosevelt National Forest, Colorado.*

G, *W. F. McCambridge, studying life habits of mountain pine beetles. Fort Collins, Colorado.*

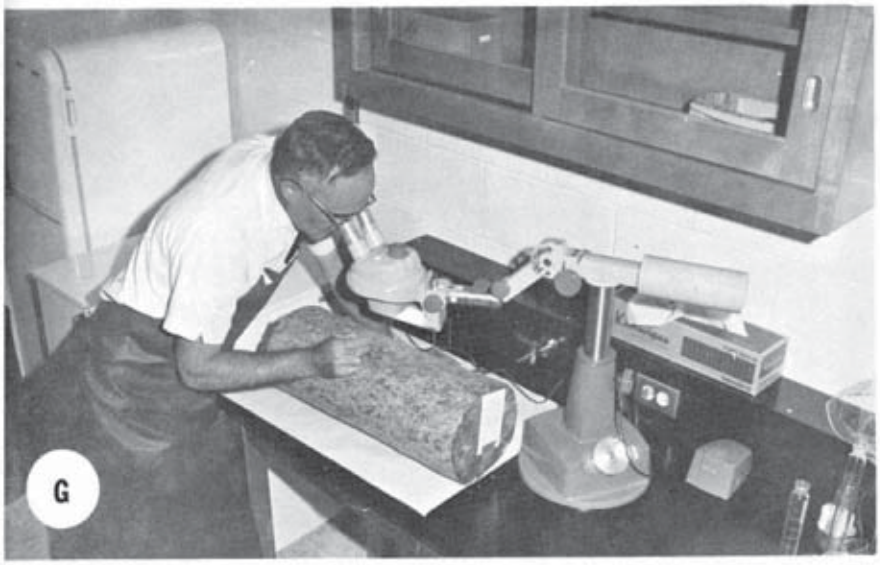
H, *F. G. Hawksworth, observing dwarf mistletoe infection. Roosevelt National Forest, Colorado.*

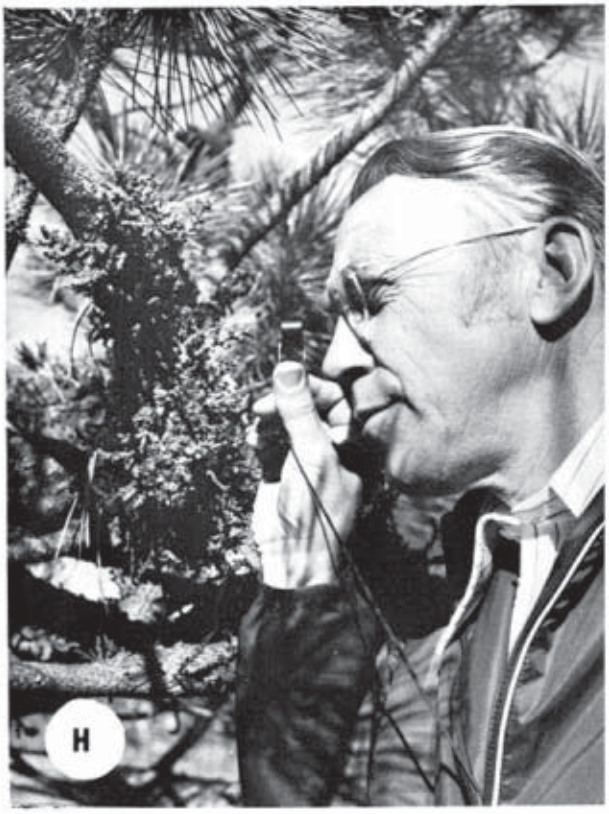
I, *F. Ronco, determining physiological response of Engelmann spruce seedlings. Fort Collins, Colorado.*

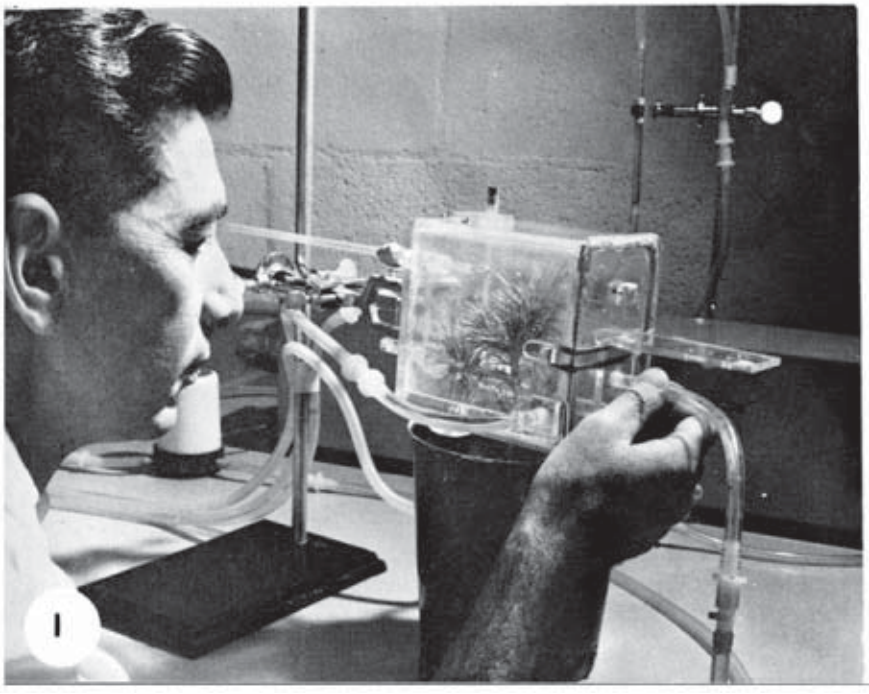
J, *M. D. Hoover, measuring changes in sap flow to determine peak periods of moisture use. Fraser Experimental Forest, Colorado.*


E


F


G


H


I

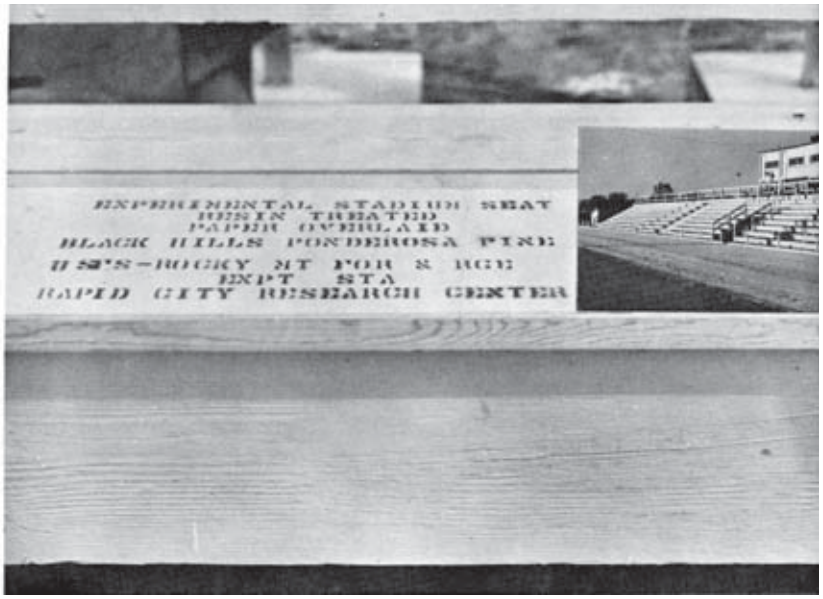

J

Black Hills Research Center.—Another major achievement was the establishment of the Black Hills Research Center in 1955. For years the lumber industry in the Black Hills was largely on a saw-log basis. The trees were cut and sawed into boards and shipped out of the area. Little or no remanufacturing was done. Moreover, the smaller stems and other material were left unused in the woods. With the interest of the Governor of South Dakota and a Forest Utilization Committee established in Rapid City, supported by Senator Karl E. Mundt, the Congress appropriated funds to establish a Forest Research Center in the Black Hills. Emphasis was to center on ways and means of developing new wood-using industries. However, funds were sufficient to begin supporting studies in timber growth and production, watershed improvement, and improved range-wildlife habitat. The decision was made to locate the research unit in Rapid City in cooperation with the South Dakota School of Mines and Technology where some library and research interests were present. Offices were made available in the old Prep Building on the campus.

R. M. Hurd was transferred from Laramie to head up the Research Center. Other scientists and the fields of research undertaken were:

Organization of the Black Hills Research Center, Rapid City, South Dakota, 1955

R. M. Hurd, Leader
Research Projects:
- Timber Management—
  - C. A. Myers
- Forest Utilization—
  - E. F. Landt
  - R. O. Woodfin
- Range Management—
  - C. P. Pase
- Watershed Management—
  - H. K. Orr



(Upper right) Stadium seats were overlaid with resin-treated paper for service testing. South Dakota School of Mines and Technology, Rapid City.

(Left) Chemicals were used in peelability tests on Black Hills ponderosa pine, South Dakota.

(Lower left) Black Hills ponderosa pine fenceposts, treated by nine different methods.

Other new studies begun during the 1950's included the following:

Forest Fire Research.—When A. W. Lindenmuth, Jr. completed his assignment in Albuquerque, developing an improved fire-danger system for the Southwest, he was transferred to Fort Collins in 1955 to begin fire-danger studies Stationwide.

Skyline Crane Logging.—In furthering the proper utilization of steepslope timberlands, Mueller and Kotok, assisted by F. R. Herman, completed arrangements for the purchase of an overhead cable system (Wyssen) in 1955. They also arranged for Mr. Wyssen, the Swiss designer and maker of the system, to install the equipment for testing at the Fraser Experimental Forest. Harvesting these idle forest stands would not only permit the utilization of timber which otherwise would be lost, but also foster management of the steep watersheds by opening up the stands for increased snowpack. Moreover, such a method of logging would reduce erosion and eliminate costly access roads.

(Upper right) A. W. Lindenmuth, Jr., determining rate of spread of prescribed fires, Arizona.

(Upper left) C. P. Pase, measuring streamflow changes that result from vegetation changes on chaparral watersheds. Tonto National Forest, Arizona.

(Lower left) L. A. Mueller, testing moisture content in structural wooden beams. Fort Collins, Colorado.

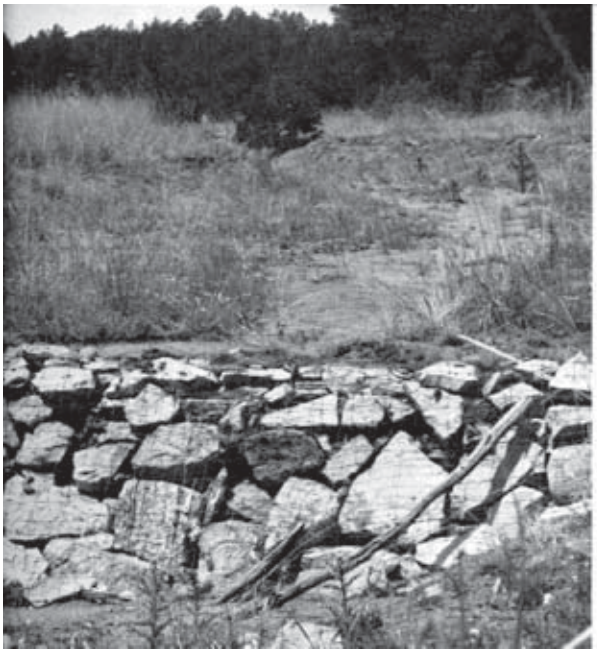
(Lower right) Testing use of skyline crane logging in the Rocky Mountains. Fraser Experimental Forest, Colorado.

Alpine Snowfields.—In further recognition of the great value of the water resources of the Rocky Mountain Empire, studies on the influence of alpine snowfields—upstream reservoirs—on streamflow were begun. M. Martinelli, then a graduate student at New York State University, working with B. C. Goodell at Fraser, made a survey of alpine areas of the Front Range in 1954 and studied the "Hydrology of Alpine Snowfields" for his Ph.D. thesis. This began what developed into a major field of research for the Forest Service.

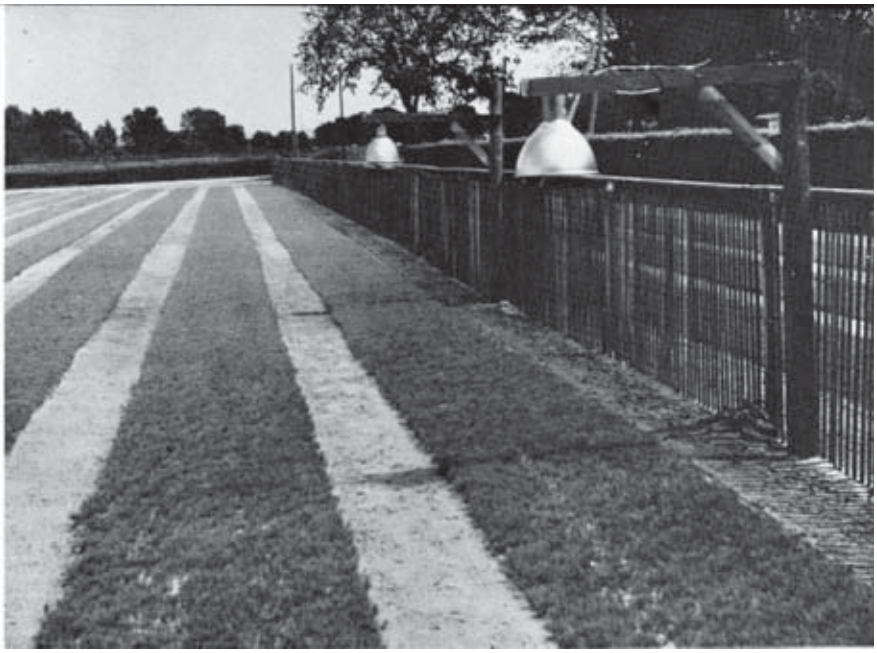
(Upper left) M. Martinelli, Jr., testing snow strength with a torque wrench and vane; (below) Elnora Martinelli, obtaining snow sample to determine water equivalent.

(Upper right) Building snowfence near Loveland Pass, Colorado, to help keep blowing snow out of an avalanche path; (below) R. W. Hanson and R. E. Stillman, determining snow accumulation on each side of a snow fence.

(Lower right) F. M. Yasinski (in field) and M. E. McKnight (in mobile laboratory), checking for spruce budworm infestation.



(Left) Check dams of loose rock, reinforced by woven wire were used to control erosion. Manitou Experimental Forest, Colorado.



(Right) Conifer seedlings in the nursery grew faster when provided with supplemental light at night. Lincoln, Nebraska, 1957–58.

Effects of Pocket Gophers on Rangelands.—A cooperative research program was begun in 1955 with the Colorado Agricultural Experiment Station, the U.S. Fish and Wildlife Service, and the Colorado Cattlemen's Association to study the effects of pocket gophers on range vegetation and watershed values and to develop methods of control under field conditions. G. T. Turner represented the Station.

Forest Survey and Forest Economics.—The National Forest Survey was begun in Colorado and Wyoming in 1955. The work was in cooperation with the Forest Survey Unit at the Intermountain Station. Forest Survey in the Black Hills and in Nebraska and Kansas was handled by the Lake States Experiment Station. In 1956, M. E. Becker was assigned to the Station to begin economic studies focusing on finding new markets to expand use of overmature lodgepole pine. Becker was replaced by C. R. Hathaway in 1958. J. M. Hughes replaced Hathaway in 1959.

San Luis Cooperative Range-Watershed Study.—In 1955, E. J. Dortignac completed arrangements with the U.S. Bureau of Land Management and the U.S. Geological Survey to begin a cattle grazing-watershed study near the community of San Luis, New Mexico. Grazing was conducted during a 6-month winter season, and forage production, siltation, and water yield were measured.

Increasing Skills to Assist the Expanding Program

It soon became evident that supporting skills were necessary to assist in the expanding research program of the new Station. Hence, in 1955, E. W. Shaw, a forester at the Pacific Northwest Station with an interest in writing, transferred to the Station as Editor. Shaw, with his background and training in forestry, was of material assistance to the scientists in writing up their findings. He also conducted training programs

Experimental harvests, 1958–66, in Arizona's mixed conifer forests to determine effects on water yield. Workman Creek, Sierra Ancha Experimental Forest.

for the scientists less experienced in writing. Shaw left the Station in 1962. R. H. Hamre, a chemistry and journalism major from the University of Wisconsin, then transferred to the Station from the Forest Products Laboratory. Hamre broadened the scope and, with the introduction of new equipment and the expansion of printing and photographic facilities at Colorado State University, improved the format and readability of the Station publications and releases.

In 1956, J. L. Kovner, a forest soils major with special abilities in statistics, transferred from the Southeastern Station as Station biometrician. Kovner was tremendously helpful to the other scientists in the design of experiments, computing techniques, and analyses of data. As the work progressed and the program of the Station grew in scope and complexity, others were added to the biometrics group including G. Peterson, G. L. Godsey, C. D. Adair, B. J. Erickson, and G. E. Brink.

To assist in the administration of the expanding program, D. M. Ilch was transferred to the Station in 1958 as Chief of Station Management. Ilch came from the Internal Audit Unit headquartered in the Washington Office. Ilch was assisted by D. E. Bradfield until 1961 when Bradfield retired.

With the increase in personnel, D. H. Morton was transferred from the Regional Office in Denver in 1962 to handle personnel services and

ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION
Stationwide Research Program Conference
Globe, Arizona—February 26-27, 1957

(Left to right)
First row: E. F. Landt, F. Ronco, B. C. Goodell, H. K. Orr, D. S. Nordwall (R-2), L. A. Mueller, M. M. Larson, E. C. Martin, D. A. Jameson, A. W. Lindenmuth, Jr., J. L. Kovner, E. J. Dortignac, L. D. Love, G. L. Hayes, D. E. Bergstrom, R. H. Nagel, E. H. Reid.
Second row: J. L. Retzer, H. Camp (INT), M. E. Becker, R. O. Woodfin, Jr., B. Reed (R-2), B. H. Wilford, A. E. Landgraf, E. W. Shaw, C. P. Pase, E. F. Aldon, E. H. Palpant, W. C. Hickey, Jr., L. S. Gill, R. R. Alexander, C. A. Myers, S. R. Andrews, L. R. Rich, D. R. Cable.
Back rows: H. G. Reynolds, D. A. Pierce, Director Raymond Price, J. W. Bohning, R. W. Davidson, R. M. Hurd, G. T. Turner, F. R. Herman, F. W. Pond, E. M. Gaines, J. P. Daniels, J. A. Wagar, W. M. Johnson, R. E. Johnson, D. E. Bradfield, J. S. Horton, F. B. Knight, W. M. Curtis, H. W. Berndt, J. O. Keith, R. M. Hanson, H. E. Ostmark, H. E. Brown, R. A. Read, J. P. Decker, F. M. Yasinski, C. L. Massey, H. L. Gary, V. H. Reid (Cooperator, U.S. Fish & Wildlife Service), M. Martinelli, Jr., S. C. Martin, M. D. Hoover, H. A. Paulsen, Jr.
(Absent were E. M. Conway, D. K. Smith, H. W. Springfield, and N. D. Wygant.)

budgetary matters formerly handled by Bradfield. As the personnel workload grew, T. T. Hahn was added to the staff in 1968 as full-time personnel officer. In 1972, Hahn transferred to Washington, D. C., and L. L. Manley transferred from the National Finance Office to assume the personnel duties.

In addition to the special skills added to the Station, Director Price, using in part the authority of the Government Employees Training Act, PL 85-507, inaugurated a program of graduate study and self-betterment of Station personnel. The Rocky Mountain Station led out in these fields. Up to 20 scientists per year were engaged in graduate study under the training program. About 75 percent of the technical staff obtained advanced degrees, one-fourth of whom completed their doctorates. Of the 86 scientists on the Station staff in 1975, 76 (86 percent) have advanced degrees; 40 (47 percent) of these are Ph.D.'s. Having the research centers located with colleges and universities facilitated the training and self-betterment program.

Facilities to Sustain the Research Program

The growth of the new Station soon outgrew the available research facilities. Office space became critical for Station personnel as the growth of the colleges and universities overtaxed their facilities.

As part of a nationwide program, the Station began a building campaign. In total, seven new research facilities, complete with modern offices, laboratories, greenhouses, and libraries, were constructed during the sixties and early seventies. This included a headquarters building at Fort Collins. D. M. Ilch, Division Chief of Station Management, spearheaded the building program.

The first of these facilities was the Forest Research Laboratory at Rapid City, South Dakota, dedicated May 21, 1960. How this facility was obtained is interesting. When the Black Hills Research Center was established, President F. L. Partlo, South Dakota School of Mines and Technology, said, "We just don't have any space available. We are a small institution, and our facilities budget is nonexistent. The only possible quarters available is the top floor of the old Prep Building which has been condemned!" It was a small, three-story structure. Part of the first floor was being used by the U.S. Geological Survey for recording instruments. The band practiced on the second floor. A narrow, rickety stairway led to the third floor, which was totally abandoned.

After looking over the building, and with an eye to the future, the Station said, "We'll take it!" After a month or so with carpenters and painters, the quarters, once one got to them, were tolerable but there were no laboratory facilities.

The next summer Senator Karl Mundt of South Dakota was making rounds with his constituents. President Partlo was prevailed upon to invite the senator to the campus to see the new Forest Research Center. The day was hot and muggy. By the time the senator climbed the narrow rickety stairs to the third floor, he was out of breath and perspiring. He sat down on the first available chair, wiped his brow, and asked, "Is this the best you've got?"

In the next session of Congress, $100,000 was earmarked for a Forest Research Laboratory at Rapid City, South Dakota. Time for the customary legislative procedures was not sufficient. So the senator, being a member of the Senate Appropriations Committee, earmarked $100,000 of a million-dollar appropriation item for a forest fire laboratory for Missoula, Montana, for a laboratory at Rapid City. Needless to say, Chief L. F. Watts and the fire researchers at Missoula were not too happy. But, the Station got a laboratory—an attractive addition to the college campus. A special invitation to the dedication was sent to the Missoula fire researchers!

The obtaining of funds and the construction of the remaining six forestry laboratories within the Station area, including the headquarters office-laboratory at Fort Collins, were equally interesting and stimulating. Several members of

Forest Research Laboratory, Rapid City, South Dakota, dedicated May 21, 1960.

the Appropriations Committee of the U.S. Senate hailed from the Station area, and were acquainted with forestry resources and needs. These included Karl E. Mundt of South Dakota, Carl T. Curtis of Nebraska, Gale W. McGee of Wyoming, Gordon L. Allott of Colorado, Dennis Chavez and Clinton P. Anderson of New Mexico, and Carl Hayden of Arizona. Senator Hayden served as chairman of the committee for several years. He had firsthand knowledge of the Nation's natural resources, especially of the West, and championed their development and management, including the necessary supporting research and facilities.

All of the office-laboratories were located on college or university campuses where library and related research facilities and interests were available. This was done under formal Cooperative Agreements whereby the State institutions provided the lands and the Federal Government constructed the facilities—a mutually beneficial arrangement.

The Forestry Sciences Laboratory at Flagstaff was located on the campus of Arizona State College, now Northern Arizona University. It was dedicated May 21, 1963. Prior to that time, Station personnel were first officed in temporary wartime barracks on the campus and then on the second floor of the Journalism Building.

The Forest, Range, and Watershed Laboratory at Laramie, on the University of Wyoming campus, was also dedicated in 1963, on May 23. Previously, Station personnel were officed in the Agriculture building. For a short time, one of the scientists from the Big Horn Research Center was officed at Northern Wyoming Community College at Sheridan.

The Forest Hydrology Laboratory (Tempe) was dedicated December 16, 1965. Under a three-way Memorandum of Understanding among the University of Arizona (the Land Grant authority in Arizona), Arizona State University, and the Station, the new laboratory was located on the Arizona State University campus at Tempe. Prior to the completion of the laboratory, Station personnel were officed in two different buildings on the Arizona State campus in cooperation with the University's Agriculture Department. The Station built a small office-laboratory near the Agriculture building for its use. When the new laboratory was completed, this structure was razed to make room for campus improvements.

The Headquarters office-laboratory at Fort Collins, on the Colorado State University campus, was dedicated July 28, 1967. Except for the first year, 1935, when Station personnel were temporarily located on the top floor of the Administration building, the Station had occupied part of the second floor of the College's then-new Forestry building. As the new Station grew, additional space was occupied in two other College buildings, Student Services, and South Hall, a wartime temporary structure now removed. Also, office space was rented in D. C. Royer building in downtown Fort Collins. At the time of the dedication of the Headquarters office-laboratory, President William E. Morgan, Colorado State University, referring to the long-time and increasing space requirements of the Station, quipped, "It was like the man who was invited to dinner—he came with his family and stayed!"

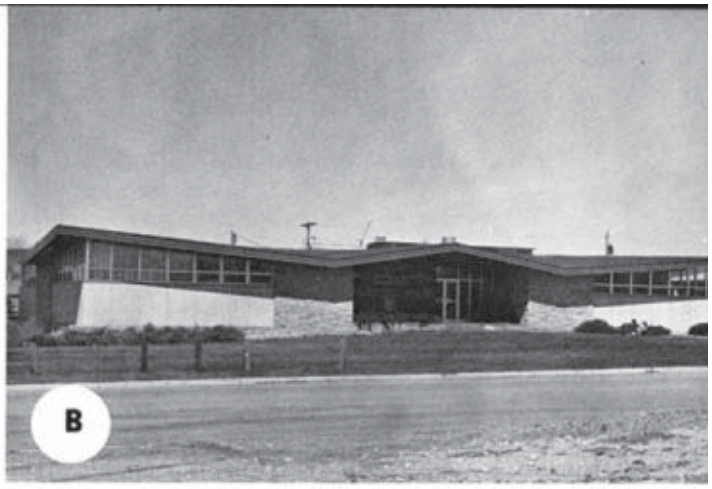
It took several years to get the Forestry Sciences Laboratory at Lincoln. Plans and drawings were completed in 1968, but the building was not constructed and dedicated until October 19, 1973. It is located on the East Campus of the University of Nebraska.

Under a three-way Memorandum of Understanding among New Mexico State College (now New Mexico State University) at Las Cruces (Land Grant authority for New Mexico), the University of New Mexico at Albuquerque, and the Station, building space was made available to the Station for an office-laboratory at the Research Park of the University of New Mexico in Albuquerque. Funds were appropriated for planning the facility. The plans were completed, but to date funds have not been appropriated for the construction of the building. Station personnel were officed on the university campus in a wartime temporary structure, and then in Marron Hall. Space became critical on the campus so when the new Federal Office Building in downtown Albuquerque was constructed, space was made available in the building for the Station. The Station added a small greenhouse on the roof of the building.

At the time the University of Arizona acquired the Tumamoc Hill property in Tucson from the Federal Government by exchange and purchase (1960), they agreed to continue to furnish suitable office and laboratory space for Station personnel in Tucson. Hence, the Station people remain on Tumamoc Hill in part of the buildings formerly occupied by the Southwestern Station.

The Shelterbelt Laboratory at Bottineau, North Dakota, on the campus of the North Dakota School of Forestry, was built in 1963 as part of the nationwide building program. It was a facility of the Lake States Experiment Station, but in 1966 became a part of the Rocky Mountain Station.

Thus, the building program inaugurated in the late fifties essentially was completed. All field units and central headquarters of the Station were provided and equipped with office and laboratory facilities.



Laboratory location	*Dedication date*
A, Flagstaff, Arizona	*May 21, 1963*
B, Laramie, Wyoming	*May 23, 1963*
C, Tempe, Arizona	*December 16, 1965*
D, Fort Collins, Colorado	*July 28, 1967*
E, Lincoln, Nebraska	*October 19, 1973*
F, Tucson, Arizona	*(Exchange) 1960*
G, Bottineau, North Dakota	*(Transfer) 1966*

Project Orientation and In-Depth Research

With the planning and completion of adequate research facilities, the total program of the Station was reappraised in the early 1960's as part of a Servicewide reorganization of research.

The term "research center leader" at field units was abandoned. Field locations were maintained, but the research was organized on a project or subject-matter basis. Where a project was undertaken was determined on three criteria: (1) where the problem could best be attacked, (2) where suitable library and research facilities were available, and (3) where cooperation was assured. Hence, subject-matter research became dominant rather than location.

The research was organized into projects led by "Project Leaders," who were subject-matter specialists. One project leader at each field location was designated to handle overall administrative and cooperative matters, in consultation with the other project leaders. As occasion warranted, this administrative responsibility was rotated to other project leaders.

New projects added to the Station program in the 1960's included:

Range Biometry.—M. J. Morris, Project Leader. This westernwide project was designed to develop improved methods and techniques in range research. Morris transferred to Fort Collins from the Intermountain Station.

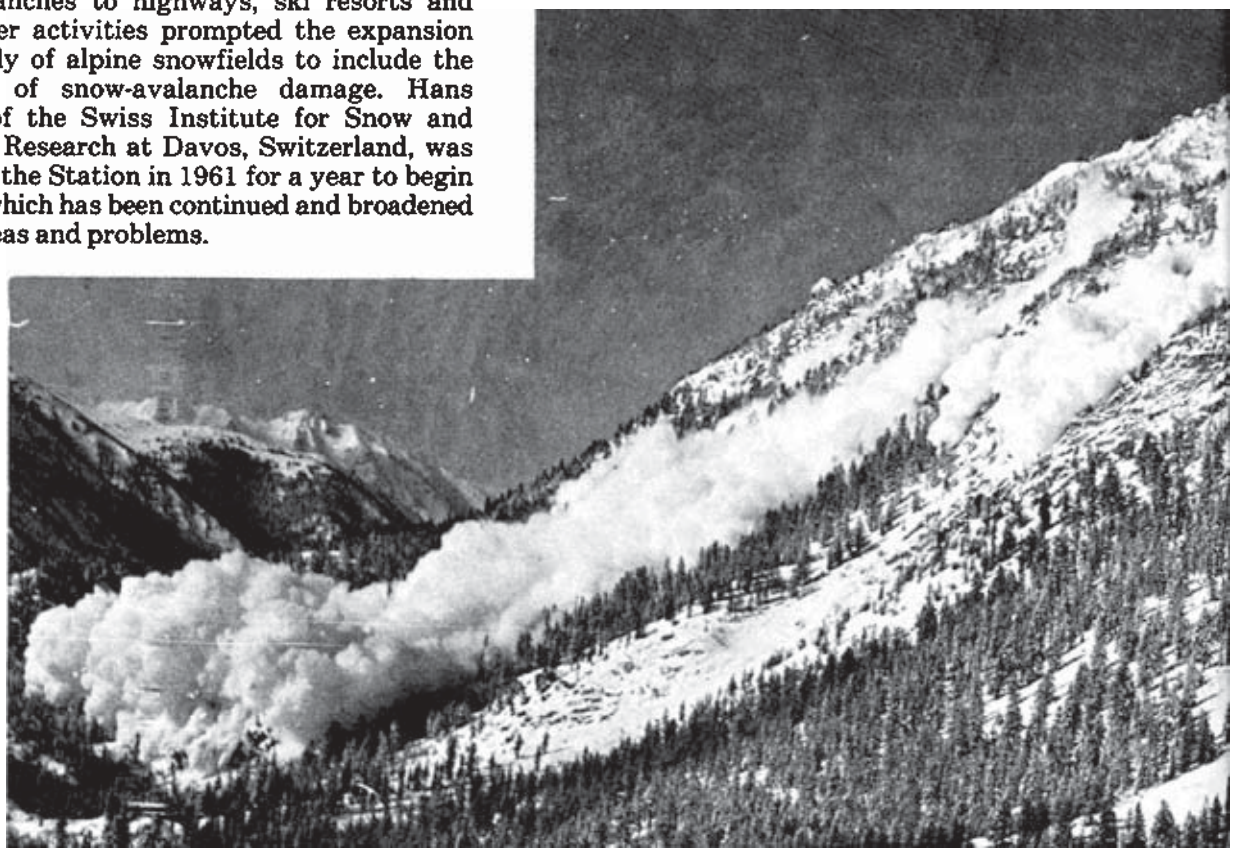
Snow Avalanche Research.—M. Martinelli, Jr., Project Leader. The increasing problem of snow avalanches to highways, ski resorts and other winter activities prompted the expansion of the study of alpine snowfields to include the alleviation of snow-avalanche damage. Hans Frutiger, of the Swiss Institute for Snow and Avalanche Research at Davos, Switzerland, was brought to the Station in 1961 for a year to begin the study which has been continued and broadened to other areas and problems.

Forest Recreation.—L. D. Love, Project Leader. With the great increase in outdoor recreation, the various kinds, location, and concentration of recreational sites and use of the National Forests were evaluated in the central and southern Rocky Mountain region. Love, who had devoted most of his career to watershed management research, began and pursued this new project until his retirement in 1964. H. D. Burke with the assistance of W. D. Beardsley, carried the project until 1966 when the research was transferred to Logan, Utah, under direction of the Intermountain Station.

Mensuration.—C. A. Myers, Project Leader. To quicken and improve the management and use of the timber resources, a special study in computerized management of ponderosa pine in the Black Hills where records were available was begun. Later, Myers directed his special skills and interest to other timber types and problems.

Prairie Grouse Habitat.—D. R. Dietz, Project Leader. K. E. Evans, working under Dietz's leadership, began studies of prairie grouse habitat in the Great Plains to give needed direction and guidance to management and use of this range-wildlife resource.

Many avalanches in the Rocky Mountains start when wind-toughened snow layers, called wind slabs, fracture and slide down the mountains. Twin Lakes, Colorado.



A, *E. H. Reid, checking the herbage meter on the Front Range, Colorado.*

B, *(Left to right) J. R. Thompson, J. B. Ryan, Jr., a summer assistant, and D. M. Ilch, measuring water use by phreatophytes in central Arizona.*

C, *G. W. Peterson, using sterilizer equipment in studies to control diseases of conifers in nurseries, Lincoln, Nebraska.*

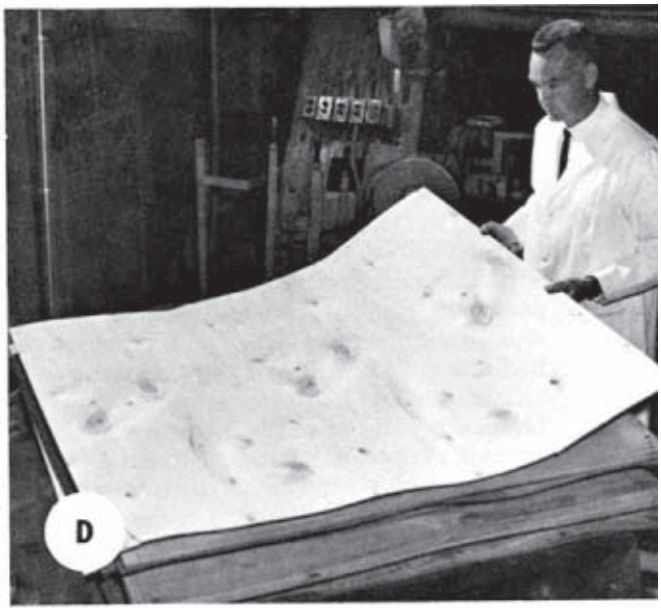
D, *R. L. Barger, evaluating veneer cut from grade 5 ponderosa pine saw logs, Flagstaff, Arizona.*

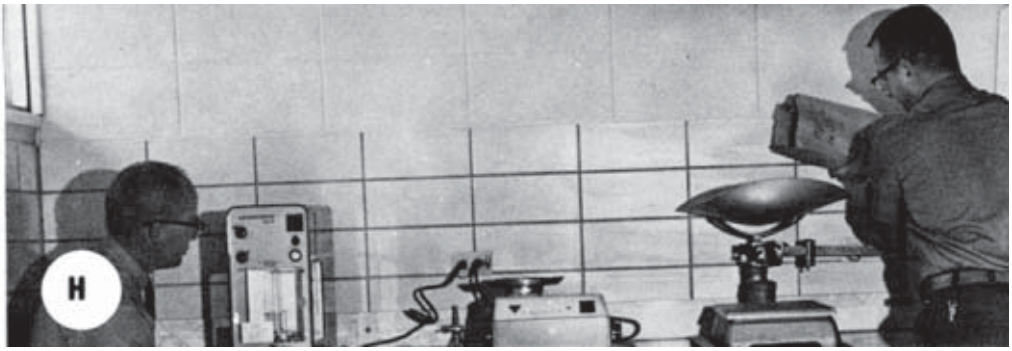
E, *J. L. Van Deusen, examining ponderosa pine stand in experimental thinning plots of the Black Hills Experimental Forest, South Dakota.*

F, *H. W. Springfield, obtaining samples for perennial grass density study, New Mexico.*

G, *D. R. Dietz, determining nutritional status of forage and browse species, Rapid City, South Dakota.*

H, *Dixie R. Smith and R. D. Tabler, using laboratory equipment in Forest, Range, and Watershed Laboratory at Laramie, Wyoming.*





Cooperative Watershed Management Unit.—B. C. Goodell, Project Leader. With the growing importance of watershed management, more personnel trained in watershed science were needed. To help meet this need, the Forest Service established a Watershed Management Unit with the College of Forestry and Natural Resources at Colorado State University. B. C. Goodell was assigned in charge of the Unit which he carried until his retirement in 1968. Goodell conducted special research and directed studies of graduate students in the watershed management field.

Use of Fire in Chaparral.—A. W. Lindenmuth, Jr., Project Leader. As part of the Arizona watershed improvement program, Lindenmuth was transferred to Flagstaff in 1962 to begin intensive study of the effects and use of different types and degree of fire on reduction and control of chaparral.

Other Changes.—G. L. Hayes came to the Station in October 1956 as Chief of Timber Management Research to replace Buell who retired. With his rich background in forest management research, Hayes spearheaded the organization and development of the several research projects, including the training of younger scientists.

Improved laboratory and other research facilities made possible more in-depth research. A team of specially trained scientists was able to focus attention on a particular problem. For example, G. W. Peterson, a trained Plant Pathologist, was added in 1958 to the Shelterbelt Project at Lincoln, Nebraska, to obtain information and give guidance to the disease aspects of this project. The Whitten Amendment to the Granger-Thye Act (64 Stat. 82, as amended April 16, 1956) fostered and stimulated participation from State and other public and private agencies in forestry research. During this same period, in 1961, the Forest Insect Survey—previously a part of Forest Insect Research—was transferred to the Regions. B. H. Wilford, W. F. Bailey, and A. E. Landgraf were transferred to Region 2 (Denver), and F. M. Yasinski and A. M. Rivas to Region 3 (Albuquerque).

G. L. Hayes (left), describing silviculture characteristics of a forest stand to D. L. Noble. Roosevelt National Forest, Colorado.

Projects, Project Leaders, Scientists, and Locations, 1962

ARIZONA

Flagstaff:

Evaluation of Watershed Programs—
D. P. Worley, Project Leader
H. E. Brown
W. P. Clary
A. R. Tiedemann
P. F. Ffolliott

Fire Use—
A. W. Lindenmuth, Jr., Project Leader
J. R. Davis

Management—Woodland and Forest Ranges—
D. A. Jameson, Project Leader
H. A. Pearson

Silviculture—Ponderosa Pine—
G. N. Schubert, Project Leader
M. M. Larson
L. J. Heidmann
E. C. Martin

Tempe:

Management—Chaparral Ranges—
F. W. Pond, Project Leader
H. D. Chadwick (attached to Albuquerque)

Management—Riparian and Wet Sites—
J. S. Horton, Project Leader
J. P. Decker
C. J. Campbell

Water Yield Improvement—Chaparral—
G. E. Glendening, Project Leader
P. A. Ingebo
C. P. Pase
C. M. Skau

Water Yield Improvement—Pine-Fir—
L. R. Rich, Project Leader
P. T. Koshi

Wildlife Habitat—
H. G. Reynolds, Project Leader

Tucson:

Management—Semidesert Ranges—
S. C. Martin, Project Leader
D. R. Cable

COLORADO

Fort Collins: (* indicates acted as Project Leader in addition to Division Chief responsibilities)

Forest Diseases—
Diseases—Montane and Subalpine Species—
F. G. Hawksworth, Project Leader
J. M. Staley
T. E. Hinds

Forest Economics—
Forest Survey—
R. L. Miller
Market Development Opportunities—
J. M. Hughes, Project Leader
Forest Recreation—
L. D. Love, Project Leader

Forest Insects—
Biology, Ecology, and Control of Bark Beetles and Defoliators in the Central Rocky Mountains—
N. D. Wygant, Project Leader*
W. F. McCambridge
R. H. Nagel
M. E. McKnight

Timber Management—
Mensuration—
C. A. Myers, Project Leader
Silviculture—Spruce-Fir and Lodgepole Pine—
R. R. Alexander, Project Leader
F. Ronco
Silviculture—Mixed Conifers and Aspen—
G. L. Hayes, Project Leader*
J. R. Jones

Range Management and Wildlife Habitat—
Forest Biometry—
M. J. Morris, Project Leader
Forest Game and Fish Habitat—
Dwight R. Smith, Project Leader
Management—Mountain Ranges
H. A. Paulsen, Jr., Project Leader
P. O. Currie
G. L. Spain

Watershed Management—
Alpine Snow and Avalanches—
M. Martinelli, Jr., Project Leader
A. Judson
Water Yield Improvement; Runoff and Erosion—
M. D. Hoover, Project Leader*
R. H. Swanson
J. D. Bergen
B. H. Heede
E. C. Frank
Cooperative Watershed Management Research Unit—
B. C. Goodell, Project Leader

NEBRASKA

Lincoln:

Diseases—Shelterbelts and Nurseries—
G. W. Peterson, Project Leader

Silviculture—Windbreaks—
R. A. Read, Project Leader
D. H. Sander
D. F. Van Haverbeke

NEW MEXICO

Albuquerque:

Diseases—Ponderosa Pine and Associated Species—
P. C. Lightle, Project Leader
J. W. Riffle

Insects—Biology, Ecology, and Control of Bark Beetles and Defoliators in the Southwest—
C. L. Massey, Project Leader
M. J. Stelzer
J. F. Chansler

Range Improvement and Management of Seeded Ranges—
H. W. Springfield, Project Leader

Watershed Rehabilitation—
E. F. Aldon, Project Leader
W. C. Hickey

Water Yield Improvement—
H. L. Gary, Project Leader

SOUTH DAKOTA

Rapid City:

Forest Utilization (Black Hills)—
E. F. Landt, Project Leader
V. P. Yerkes

Silviculture—Ponderosa Pine (Black Hills)—
C. E. Boldt, Project Leader
J. L. Van Deusen

Water Yield Improvement (Black Hills)—
H. K. Orr, Project Leader
M. L. Geiger

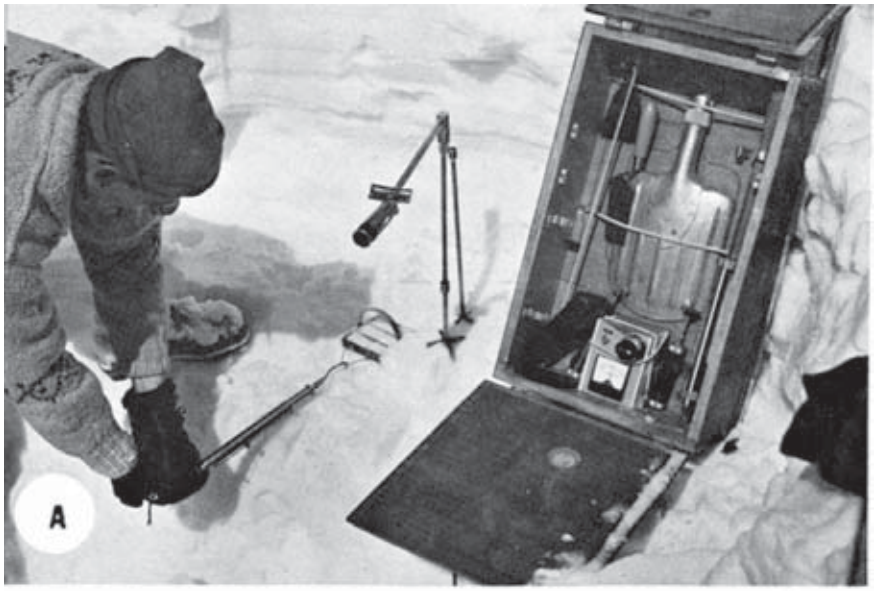
Wildlife Habitat (Black Hills)—
D. R. Dietz, Project Leader

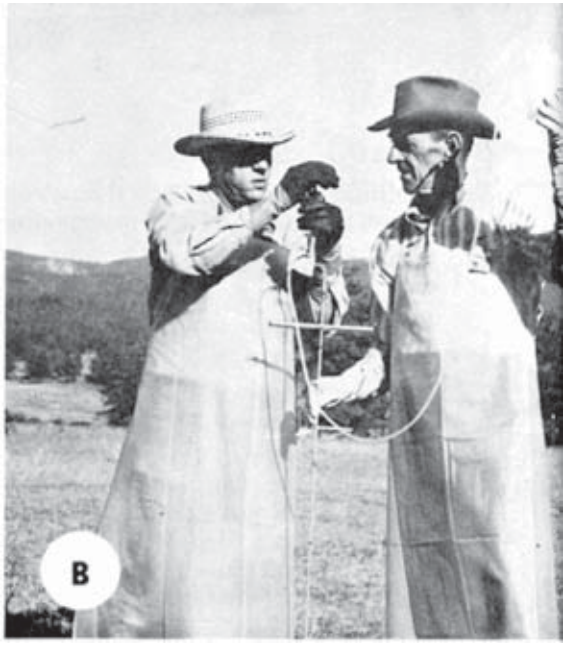
WYOMING

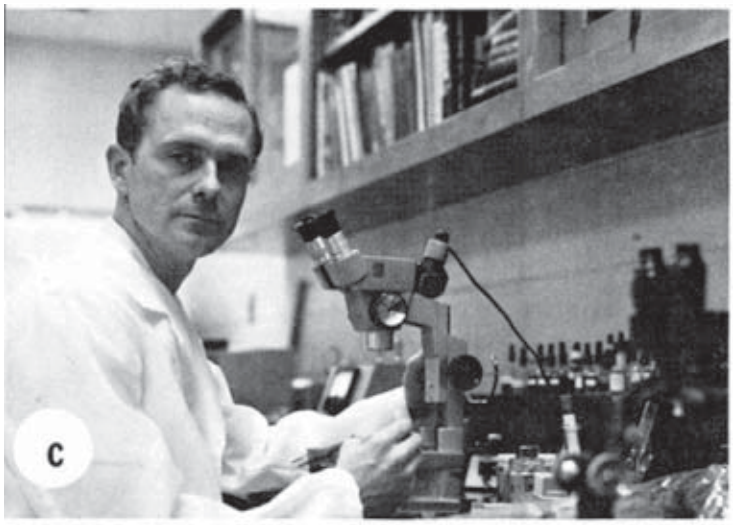
Laramie:

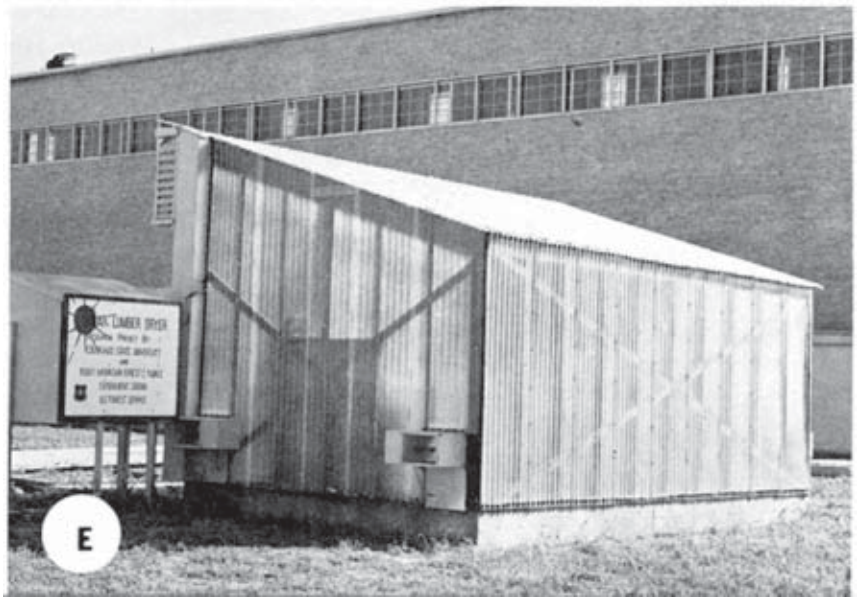
Management—Alpine and Subalpine Ranges—
W. M. Johnson, Project Leader
Dixie R. Smith

Water Yield Improvement—Sagebrush Lands—
H. W. Berndt, Project Leader
R. D. Tabler
B. A. Hutchison









A, *A. Judson, measuring shear strength of snow, Berthoud Pass, Colorado, 1963.*

B, *P. O. Currie and F. L. Hammer, injecting radioactive phosphorus into soil to measure lateral spread and depth of roots of native plants, Manitou Experimental Forest, Colorado.*

C, *J. M. Staley, examining needle cast fungus of conifers.*

D, *D. C. Markstrom, checking a test panel of laminated decking fabricated from Black Hills ponderosa pine.*

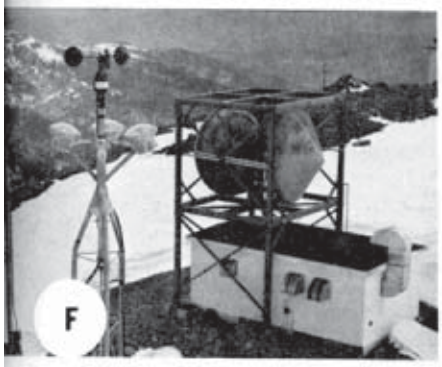
E, *An experimental solar-heated lumber dryer used in tests at Colorado State University.*

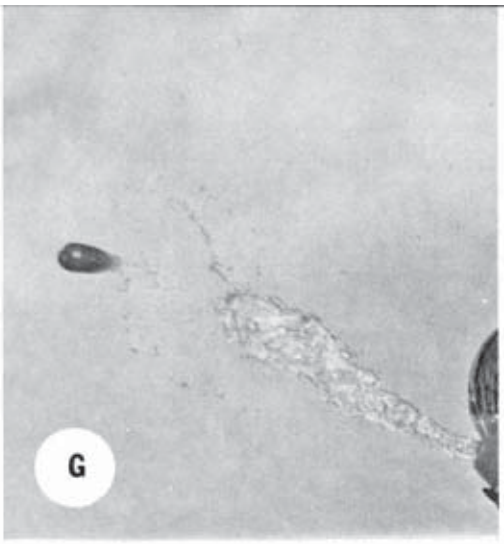
F, *Soft rime accumulated on three-cup anemometers until electric infrared de-icers were installed on 12,493-foot summit of Mines Peak, Colorado.*

G, *High-speed photography helped in study of the spread of dwarf mistletoe. Velocity of seed expulsion averaged 72 to 85 feet per second.*

H, *Charcoal kiln constructed of native adobe, southern Arizona.*

I, *Mechanical injuries on aspen trees are prime entrance points for canker diseases. The cankers eventually girdle the tree and cause its death.*



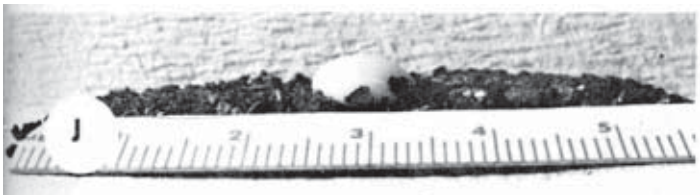


J, *Soil and litter wettability influences hydrology on many sites. A drop of water (with tracer added) shows the resistance of Utah juniper litter to wetting, central Arizona.*

K, *A controlled hot surface fire like this consumes 75 percent of the litter—optimum for increasing water yield.*

L, *Chemicals in juniper foliage inhibited grass growth beneath the tree.*

M, *Engelmann spruce and lodgepole pine seedlings, planted at high altitudes, survived better when shaded and mulched. White River Plateau, Colorado, 1957.*



Assistant Director Organization to Further Strengthen Research

To further strengthen the emphasis on basic in-depth research needed to guide the increasing use of forest land resources, key research personnel were relieved of administrative duties and returned to project research. M. D. Hoover assumed leadership of the major water-yield improvement and channel stabilization project at Fort Collins and Albuquerque. N. D. Wygant assumed leadership of special forest insect and S. R. Andrews of forest disease research projects at Fort Collins. L. A. Mueller assumed active project work in forest products utilization at Fort Collins.

To make these changes possible, the research of the Station was organized and administered by five assistant directors. R. D. Lloyd transferred to the Station from the Bureau of Land Management, Washington, D. C. He headed up and gave dynamic leadership to Forest Economics, Utilization, and Recreation Research, including the Beaver Creek Evaluation Project. At this same time, the fiscal and accounting, business management, personnel, library, biometry, and publication and information services were placed under the supervision of D.M. Ilch as Assistant Director. H. C. Fletcher returned to the Station from the Washington, D. C. headquarters of the Agricultural Research Service, to become the Assistant Director of Watershed Management Research.

Assistant Director Organization, 1965

Director: Raymond Price
Assistant Directors:
Forest Economics, Utilization, and Recreation Research—R. D. Lloyd
Range Management and Wildlife Habitat Research—E. H. Reid
Timber Management and Forest Protection Research—G. L. Hayes
Watershed Management Research—H. C. Fletcher
Station Management—D. M. Ilch

With this new organization, several new research activities were added to the Station program, some westernwide and some national in scope. These included Westernwide Range Inventory Analysis in 1965 under R. S. Driscoll; National Fire Danger Rating in 1966 under M. E. Schroeder and J. W. Lancaster; Westernwide Avalanche Hazard Rating in 1969 under A. Judson; and the National Range Plant Project and Herbarium in 1970 under F. J. Hermann and C. Feddema.

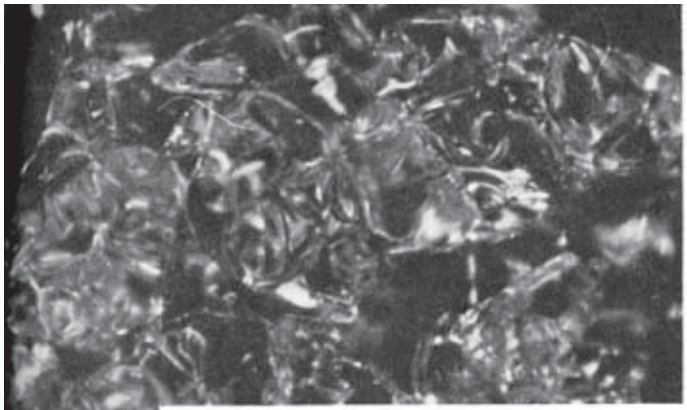
Study of visitor use of campgrounds showed family units closer together than 100 feet receive least use.

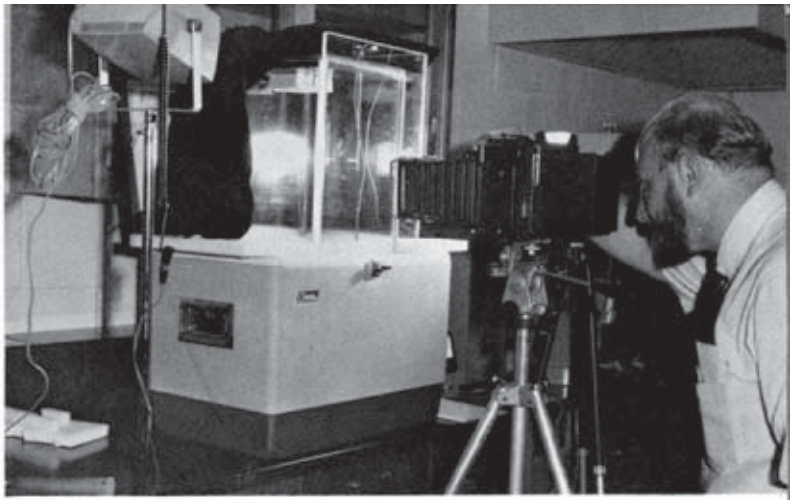
In 1966 the Central States Forest Experiment Station was abolished, and, in the realinement of the research in the Midwest, the shelterbelt research in the northern Plains at Bottineau, North Dakota, formerly under the Lake States Station, was added to the Rocky Mountain Station. This move consolidated all shelterbelt research by the Forest Service at the Rocky Mountain Station. P. E. Slabaugh was the Project Leader at Bottineau and remained so until his retirement in 1973, when R. W. Tinus assumed these responsibilities. R. A. Read continued as Project Leader at Lincoln, Nebraska.

With the increasing pressure for more big-game, the range-wildlife research at Laramie was enlarged to include elk range management in 1967 under A. L. Ward. Forest Insect Research was also broadened in 1967 to include studies of insects of shelterbelts and forest nurseries at Bottineau by M. E. McKnight.

Several key personnel changes were made during this same period as the result of retirements. D. E. Morton replaced D. M. Ilch, as Assistant Director of Station Management in 1967. R. E. Stevens replaced N. D. Wygant as Project Leader of Forest Insect Research in 1968. Stevens came to the Station from the Division of Forest Insect Research, Washington Office. C. M. Berntsen replaced G. L. Hayes as Assistant Director of Timber Management Research in 1969. Berntsen came from the Washington Office Division of Timber Management Research. H. A. Paulsen, Jr. replaced E. H. Reid as Assistant Director of Range and Wildlife Research. Paulsen came from the Washington Office Division of Range and Wildlife Habitat Research.

Other additions to the Station Staff included a full-time Librarian, Mrs. Frances J. Barney (1967) and an Information Officer, R. W. Leonard (1969). Under Mrs. Barney's direction, a working reference library was established at the Fort Collins headquarters, and branch libraries established at each field location. P. B. Johnson, a Utah State forestry graduate, transferred from Region 4, in 1972, to replace Leonard. Johnson has aided materially in increasing the image of the Station and its work.

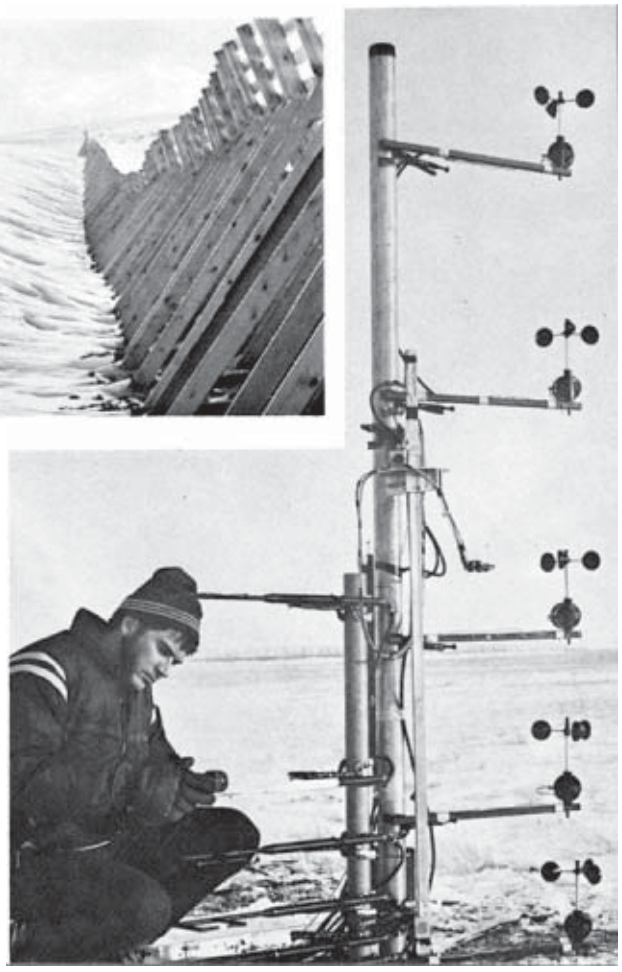




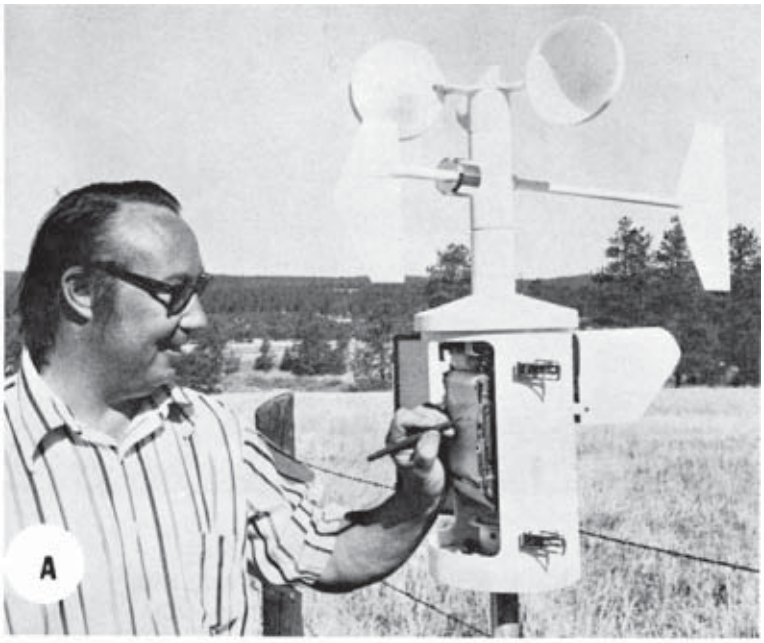
R. A. Sommerfeld, photographing snow crystals being grown in a cold chamber, Fort Collins, Colorado.

Computerized Management

With the development of electronics and computers and the increasing skills in these fields at the Station, marked advancements were made beginning in the late 1960's in design of experiments, computation and analyses of data, and the extension of research data to management and use. Some examples of this development include: models of sublimation of blowing snow for designing snow fence systems (R. A. Schmidt, Jr., and R. D. Tabler); computerized management of ponderosa pine in the Black Hills and, more recently (1975), new guidelines for management and use of ponderosa pine forests of the Colorado Front Range (C. A. Myers); models for evaluating multiple resource data from Beaver Creek (R. D. Lloyd and H. E. Brown); economic models for evaluating alternative chaparral management practices (P. F. O'Connell); model of air flows in fire danger rating (M. A. Fosberg); models for determining airflow in lodgepole pine stands (J. D. Bergen); model for revising streamflow forecasts (C. F. Leaf and G. E. Brink); prediction of softwood cutting yields by computer (D. C. Markstrom and B. J. Erickson); and the National Fire Danger Rating System (J. E. Deeming, J. W. Lancaster, M. A. Fosberg, R. W. Furman, and M. J. Schroeder). These improvements and advancements have extended research information and its application to forestry resource problems.



R. A. Schmidt, Jr., and R. D. Tabler, developing models of sublimation for blowing snow control. Schmidt (right), calibrating a snow particle counter; Tabler (above), observing snow depth behind an experimental snow fence, near Laramie, Wyoming.



A, *M. A. Fosberg, checking recorded data in study of climatic influence on the environment (Colorado Springs Gazette-Telegraph photo by S. Payne; courtesy of Pikes Peak Regional Library).*

B, *W. J. Greentree, scanning satellite photography with automatic microdensitometer to map wildland resources. Fort Collins, Colorado.*

C, *O. C. Wallmo, working with trained deer used in forage studies in Colorado.*

D, *A. L. Ward, releasing telemetered cow elk for habitat study in Wyoming.*

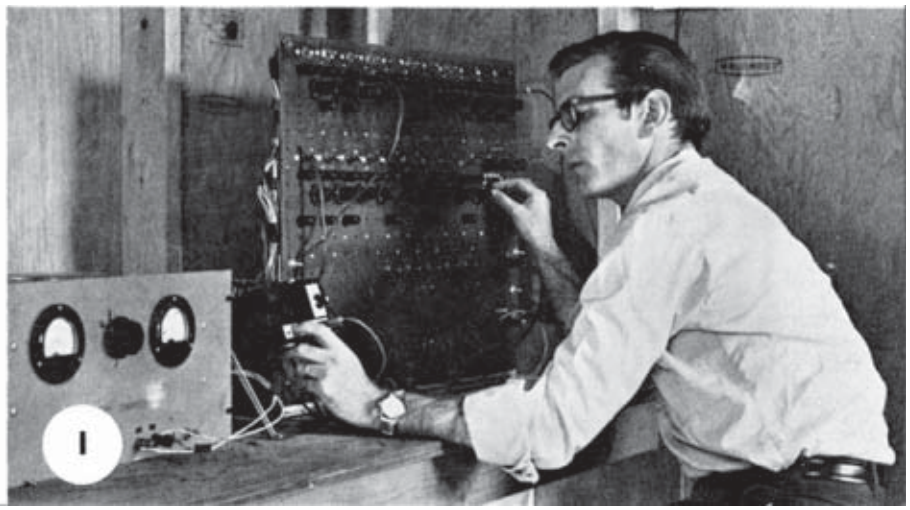
E, *J. W. Riffle, examining culture of diseases affecting shelterbelt trees in the Great Plains. Lincoln, Nebraska.*

F, *R. W. Tinus, examining 6-month-old Siberian larch seedlings grown in controlled environment greenhouse. Bottineau, North Dakota.*

G, *R. S. Driscoll, inspecting low-light television camera prior to resource inventory flight. Fort Collins, Colorado.*

H, *D. R. Patton, checking Abert squirrel trapped as part of wildlife habitat study in Arizona.*

I, *J. D. Bergen, checking equipment used in studies of air movement in a forest clearing as indicated by smoke drift. Fort Collins, Colorado.*



Adapting Research to Environment

With the approach of the seventies, problems of the environment became a national issue. The long-used term "ecology," a byword in professional forestry circles, was "discovered" by the public. Aspiring political leaders became champions of the environment.

It was apparent that wildland resource scientists were guilty of "hiding their light." They had not publicized or glamorized their ecological know-how.

Awakening to this public surge in environmental interest, it seemed in order for Station scientists to describe ongoing research in more readily understandable terms, and to begin more direct environmental research.

One of the first more direct environmental studies in 1970 was determining the effects of properly located barriers of trees and shrubs to reduce highway noise. This research, conducted near Lincoln, Nebraska, was a cooperative study by Professor D. I. Cook, University of Nebraska, College of Engineering, and D. F. Van Haverbeke of the Station.

Groundwork was also begun in 1970 toward the development of a proposed western environmental research institute. In 1971, G. D. Lewis of the Division of Economics, Washington Office, was transferred to the Station to begin environmental economic research. His assignment was to determine what economic information is most important to land use planning, and to evaluate the economic consequences of rapidly growing recreation communities in the forest environment.

After nearly 41 years in forestry research, 30 of which were devoted to directing research in the Southern and Central Rocky Mountain Regions, Raymond Price retired May 28, 1971. Karl F. Wenger, Chief of Conifer Ecology and Management Research in the Washington Office, became the new Director. Wenger was a forestry graduate of the University of Maine. He received his M.F. and Ph.D. at Duke University. His previous assignments had been at the Southern and Southeastern Stations.

The Eisenhower Consortium for Western Environmental Forestry Research

With the tremendous population growth, in and adjacent to the Rocky Mountains during the 1960's and 1970's, came ever increasing demands for wildland resources and for occupancy of the land itself either on a permanent or temporary basis. Forest Service researchers alone could not possibly uncover all the information needed by land planners and managers to cope with these new impacts. The Eisenhower Consortium for Western Environmental Forestry Research was established September 9, 1971, to pool the talents of Rocky Mountain Station scientists with those of researchers in nine western universities (University of Wyoming, Colorado State University, University of Colorado, Northern Arizona University, Arizona State University, University of Arizona, University of New Mexico, New Mexico State University, and Texas Tech University).

The goals of the Consortium are to (1) increase understanding of the interactions between people and the environment; and (2) develop methods to provide for the needs and wants of increasing permanent and transient populations while maintaining, and enhancing where possible, the attractive features of the environment. Funding comes

D. I. Cook (Professor, University of Nebraska) and D. F. Van Haverbeke, recording effects of environmental plantings on noise abatement, near Lincoln, Nebraska.

from the Forest Service and other organizations. The intent of the Consortium is to provide commissions, planning boards, and agency administrators with facts to help them chart coordinated, environmentally sound open-space planning and development programs for public and private lands.

Through the first 4 years of its existence, Consortium members conducted 88 studies crossing five critical problem areas. Major results from some of these, and other related studies, were summarized at a Consortium-sponsored symposium in Vail, Colorado, in September of 1975. Title for the symposium was **Man, Leisure, and Wildlands: A Complex Interaction.** Land use planners as well as scientists attended the meeting.

To help the Consortium and other research organizations in the West set research priorities, a comprehensive problem analysis was initiated in 1973. Sponsored by the Consortium and the Institute of Ecology,[23] it was funded by the National Science Foundation, the Forest Service, and the Environmental Protection Agency. Some 300 specialists from all disciplines associated with natural resources in the West were mobilized to undertake the problem analysis. The specialists prepared committee reports on mineral and energy resources, recreation uses, water resource and second home uses, human needs and responses, institutional arrangements, and biological resources. This effort was guided by a three-man directorate headed by John M. Neuhold of Utah State University. Assisting were Duncan T. Patten of Arizona State University and David E. Herrick, who represented the Station. The final report, **Problems and Research Priorities in the Rocky Mountain Region,** was released for use in the summer of 1975.

[23] *The Institute of Ecology (TIE) is a consortium of universities and research institutes in the Western Hemisphere that synthesizes ecological concepts and relates them to public policy. (TIE, 955 L'Enfant Plaza, S.W., Suite 2600, Washington, D. C. 20024.)*

Eisenhower Consortium sponsored a symposium at Vail, Colorado, in September 1975, and took participants on a field trip to nearby Maroon Bells.

Additional Environmental Research

With the availability of funds from the Surface Environment and Mining (SEAM) Project—a research, development, and application program to help meet the Nation's energy crisis, and to produce needed minerals in harmony with a quality environment and other natural resource values—several projects were reorganized and new objectives pursued. In 1973 at Albuquerque, the watershed and erosion control and range improvement projects were combined, and research directed toward mine spoil reclamation in the Southwest with E. F. Aldon as leader. Also, at Rapid City the direction of range and wildlife management research was changed to include mine spoil rehabilitation. A. J. Bjugstad from the Division of Forest Environment Research in Washington, became the leader of the multifunctional project at Rapid City. Range research at Laramie was also redirected toward spoils residues.

The Federal Highway Administration made funds available in 1973 in Wyoming to determine the extent to which road construction and traffic affect game animal habitat, population, and movement. This made it possible for A. L. Ward to expand research on elk management and begin work on other big-game species.

Also in 1973, Recreation Research was reopened. B. L. Driver of the University of Michigan came to the Station. The mission of his project includes determining the benefits recreationists accrue from different experiences in different environments, and developing management guides for producing desired user benefits while protecting recreation and other resource values.

With publication of the National Fire Danger Rating System, emphasis in fire-danger-rating

research shifted to application and refinement of the System. W. Lancaster and J. Deeming moved to Boise, Idaho, to work at the Interagency Fire Center.

In 1974, Fire Research was reestablished and broadened. The research was headquartered at Tempe, Arizona. J. Dieterich transferred to the Station from Fire Research in Washington, D. C., and assumed the leadership of the project. The mission of the project is to develop guidelines and technology for protecting human life, property, and natural resources from wildfire, reducing wildfire hazard through improved fuel management, and using fire as a management tool in forest cover types of the Central and Southern Rocky Mountains.

Multifunctional Research Work Units

To further emphasize environmental research, several projects were combined into multifunctional work units.

Two such work units were established in Fort Collins. One, "Multiresource Management of the Central Rocky Mountain Subalpine Coniferous Forests," is led by R. R. Alexander. The mission of this work unit is to obtain further ecological information to help land managers predict the interactions of forest resources in Rocky Mountain subalpine forests. This unit combined the former research projects at Fort Collins in timber management by Alexander and Ronco, watershed management by C. F. Leaf, range management by G. T. Turner, and wildlife management by O. C. Wallmo. The other multifunctional project is "Multiple-Use Management in the Montane and Foothill Zones of the Rocky Mountains," with C. A. Myers as leader. Its project mission is to enable land use planners and managers to predict the interactions of people and natural resources in the Foothill and Montane zones and to incorporate this information into tools planners and managers can use to make management decisions for optimum benefit to people. This project includes the mensuration research by Myers, range management research by P. O. Currie, watershed management research by H. R. Gary, and range biometry research by M. J. Morris.

In Arizona, the research in pine-fir and chaparral was combined in a research project for Land Use Planning and Management with J. R. Thompson, leader. A recent offshoot of this project is the "Thomas Creek Resource Evaluation Study." This is another cooperative undertaking with Region 3. Its objective is to develop the basis for determining the best possible mix of products and services in alternative land management schemes for the mixed conifer forest type.

In 1974, the new project, Mountain Meteorology, was established in Fort Collins. D. G. Fox, Chief of the Model Development Branch of the Environmental Protection Agency's Meteorology Laboratory at Research Triangle Park, North Carolina, transferred to the Station as Project Leader. This project combines the research by M. A. Fosberg, R. W. Furman, and J. D. Bergen. The research goals are to learn how air currents, temperature, humidity, and precipitation behave in forested mountain regions, and to assess the effects of atmospheric conditions on forest management practices.

Further Reorganization of Director's Staff

In line with the consolidation and reorientation of field projects, the Department of Agriculture approved in 1973 an internal reorganization of the Forest Service experiment stations. In this new organization, D. E. Herrick became Deputy Director of the Station. Herrick came to the Station in 1970 as Assistant Director to replace R. D. Lloyd, who had moved to the Washington office. Other positions in the Director's staff included two Assistant Directors for Continuing Research, V. L. Duvall at Tempe, responsible for research in west Texas, New Mexico, and Arizona; and W. A. Laycock at Fort Collins, responsible for research in North Dakota, South Dakota, Nebraska, Kansas, Wyoming, and Colorado. Laycock transferred from the Intermountain Station and Duvall from the Southern Station. H. C. Fletcher retired. Also included was an Assistant Director for Planning and Application, H. A. Paulsen, Jr.; and an Assistant Director for Research Support Services, D. H. Morton. C. M. Berntsen transferred to the North Central Station as Deputy Director. Later, in 1974, D. H. Morton transferred to the Pacific Northwest Region as Deputy Regional Forester for Administration. D. R. Keefer of the Property Management Branch, Division of Administrative Services in Washington, D. C., replaced Morton as Assistant Director.

After about 4 years as Director of the Station, Wenger retired on April 11, 1975. D. E. Herrick, Deputy Director, was appointed Director. Herrick earned B.S. and M.F. degrees in forest management and utilization from Iowa State University where he also served on the faculty before joining the Forest Service.

Dixie R. Smith was appointed Deputy Director. Smith was in charge of the Wildlife Habitat and Range group of the Forest Environment Research staff, Washington, D. C. He received

his B.S. from Texas Technological College and Ph.D. from the University of Wyoming. He was formerly a project leader at the Station, headquartered at Laramie, Wyoming, 1962–69.

Just before Wenger retired, announcement was made of two new Research Work Units to be added to the Station in 1975. The largest of the Units, Resources Evaluation Techniques, a Research and Development Program, was established in response to the Forest and Rangeland Renewable Resources Planning Act of 1974. The act requires that the Forest Service, with other Federal agencies, provide Congress with a nationwide assessment of renewable resources in 1975, 1979, and every 10 years thereafter. The goal of the Unit is to devise the techniques whereby the Forest Service can achieve rapid, accurate, resource inventories and evaluations. R. S. Driscoll is program manager. This program includes the former projects for Westernwide Range Inventory Analysis (Rocky Mountain Station) and Remote Sensing (Pacific Southwest Station, Berkeley, California).

The second Unit is National Fuel Inventory and Appraisal. This unit will design ways to (1) inventory amounts and types of fire fuels in the forest; (2) predict the behavior of fire in different fuel types; (3) relate these to the National Fire Danger Rating System; and (4) combine onsite fuel information and current weather to predict fire intensity and spread. S. N. Hirsch has been selected to lead this project, and will transfer from the Pacific Southwest Forest and Range Experiment Station's Forest Fire Laboratory at Riverside, California.

As 1975 drew to a close, the theme of the Eisenhower Consortium sponsored symposium at Vail, Colorado in September: "**Man, Leisure, and Wildlands: A Complex Interaction,**" might well set the course of forestry research in the central and southern Rocky Mountain Regions in the years ahead.

ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION
Fort Collins, Colorado
Project Leaders' Meeting—March 25–27, 1975

(Left to right)
First row (seated on ground): D. R. Carder, F. G. Hawksworth, R. E. Stevens, G. D. Lewis, R. W. Tinus, D. R. Patton, J. W. Lancaster.
Second row (seated): D. R. Keefer, H. A. Paulsen, Jr., D. A. Lingwood (CRUSK), D. E. Herrick, W. C. Morris (CRUSK), M. B. Dickerman (WO), K. F. Wenger, W. J. Lucas (R-2), W. D. Hurst (R-3), R. Lindmark (INT), W. A. Laycock, V. L. Duvall.
Third row (standing): C. A. Myers, A. J. Bjugstad, A. L. Ward, C. Feddema, H. K. Orr, R. S. Boster, D. D. Elser, G. H. Schubert, H. E. Worth, E. F. Aldon, J. L. Kovner.
Fourth row (all remaining standing): G. W. Peterson, M. Martinelli, Jr., J. F. Thilenius, D. F. Van Haverbeke, S. C. Martin, R. S. Driscoll, D. G. Fox, W. P. Clary, S. S. Sackett, J. R. Thompson, B. L. Driver, J. H. Dieterich, R. R. Alexander, R. A. Read, R. H. Hamre, R. D. Tabler, L. L. Manley.
(Absent were P. F. O'Connell and P. B. Johnson. Meeting included all Project Leaders, Section Heads of Research Support Services, and guests and scientists who participated. Station's total full-time staff as of October 1, 1975 was 220 people; 90 were project leaders and scientists, 50 were technicians, 74 were Research Support Services and Clerical, and 6 were on the Director's immediate staff.)

The women of the Forest Service research organizations in the Central and Southern Rocky Mountain Regions have been outstanding. These include the wives of the scientists and the women employees.

The role of the wives of the scientists in a developing activity such as forestry research, was challenging and often trying. Transfers were frequent, and suitable housing usually was hard to find. In most instances field quarters were primitive and rugged. The men's duty hours had to match research requirements, which made family planning difficult. Moreover, travel schedules and requirements often left the wives at home with the sole responsibility for the families. Sometimes the wives helped their husbands in the field. Take Elinore Martinelli, for example. She was out on the alpine snowfields with Pete taking notes for him. When Lynn came Elinore was grounded, but not for long. Soon she took Lynn piggyback and again was off to the snowfields with Pete!

Thanks to the wives, the families kept close together and met the challenges. An activity that helped the wives at Station headquarters share their challenges and responsibilities was a monthly social which became known as "The Forestry Triangle." This group included the wives and women employees of the Forestry School (Education), of the Roosevelt National Forest and other local resource Administrative Agencies (Administration), and the Station (Research).

Dorothy McArdle, Myrtle Connaughton, and Rose McGinnies took the lead at the former Rocky Mountain Station. Beth Price took the lead at the Southwestern and the new Rocky Mountain Stations. These women played an important role in maintaining friendly associations within the Stations and among the forestry organizations.

The women employees since the beginning of the Stations have been efficient and dedicated, and have relieved the scientists of many chores. It is not possible to name them all here, but the history would not be complete without naming a few. At the Southwestern Station, Marjory P. Rickle deserves recognition for her efficient service. As Director's secretary, Mrs. Rickle kept an even keel at that Station. At the former Rocky Mountain Station, Eunice Skamser and Maria Garwood must be recognized. Miss Skamser, chief clerk in 1935, helped in several capacities. Mrs. Garwood, who also came in 1935, served as secretary to four Directors, including the Director of the new Rocky Mountain Station, until her retirement in 1968. She was a most efficient and dedicated employee, adding much to the Station's accomplishments.

In 1967, as part of the expansion program, a working reference library was added to the Station, with Frances J. Barney as librarian. Mrs. Barney holds B.S. and M.S. degrees in botany, and came to the Forest Service from the library at Colorado State University. She served as a research assistant in plant pathology at Connecticut Agricultural Experiment Station and as a librarian at Duke University. Her intimate knowledge of the natural resources and library science, as well as her devotion to her responsibilities make her a valuable asset to the Station's scientific efforts.

Two women who advanced from clerical to professional positions must be recognized—Geraldine Peterson and Mona F. Nickerson. Mrs. Peterson, who earned her B.S. in mathematics at the University of Arizona, and authored several publications, was a statistical clerk at the Southwestern Station. She transferred to the new Rocky Mountain Station when the Stations were combined, where she helped materially in computation of research data. She retired in 1965. Mrs. Nickerson earned her B.S. degree in economics and B.A. in technical journalism at Colorado State University. She served in stenographic and clerical duties with the former Rocky Mountain Station. Later, she became a technical publications editor, and is in the Publications Branch of the new Rocky Mountain Station. Mrs. Nickerson completed the editorial services for this history. Her interest and knowledge of the Station has been most helpful in searching for illustrations and records.

Cooperation With Other Agencies

Cooperation with other agencies has characterized the research of the Forest Service throughout its history. Many of the accomplishments obtained over the years at the Southwestern and Rocky Mountain Stations are, in part, the result of cooperative effort. This effort included counsel and advice; furnishing of quarters including office, laboratory, and library facilities; financial contributions; publication of findings; and participation in the conduct of research. The cooperators were many, including universities and colleges, associations, industry, State and other Federal agencies, and private individuals.

Universities and Colleges

The Station's longest cooperative relationship of record is that with the University of Arizona. This relationship began with the establishment of the Santa Rita Range Reserve in 1903. It has continued over the years and is still active.

Cooperation with New Mexico State University (then New Mexico A&M) began with the establishment of the Jornada Range Reserve in 1912. The Jornada was transferred to the Agricultural Research Service in 1953, but active cooperation continues with New Mexico State University and the University of New Mexico.

Another long and continuous cooperation is with Colorado State University (formerly Colorado A&M). This cooperation began formally when the former Rocky Mountain Station was established in 1935. It has waxed strong and enlarged over the years. The close working relations with the College of Forestry and Natural Resources has been and is especially helpful. Colorado A&M College and Colorado College (at Colorado Springs) also cooperated in some of the early work at the old Fremont Experiment Station near Manitou, Colorado.

Other universities and colleges that have been and are cooperators in various aspects of research, in more or less chronological order, include the following: University of Wyoming, University of Nebraska, Arizona State University, Northern Arizona University, South Dakota School of Mines and Technology, North Dakota School of Forestry (which entered into cooperation earlier with the former Lake States Experiment Station), University of Colorado, Western State College at Gunnison, Colorado, University of Utah, and Texas Technological University.

Association, Industry, and Private Cooperators

Formal cooperation with the Salt River Water Users Association began in 1953 with the logging of the Workman Creek Experimental Watersheds —the beginning of the Arizona Watershed Program. The cooperation is continuing.

Formal cooperation with other associations includes the Arizona Goat and Mohair Association, in a study of goat range in central Arizona; the Crow Valley Livestock Association in cattle grazing at the Central Plains Experimental Range; The Black Mesa Cattlegrowers in cattle grazing at the Black Mesa pastures; and the Colorado Cattlegrowers in pocket gopher studies. Koppers Company of Denver cooperated in the timber harvesting at Fraser. Duke City Lumber Company cooperated in the overlaid lumber manufacturing study at Albuquerque.

Formal cooperation with private individuals includes the operating stockmen at the Santa Rita, Jornada, Manitou, and Big Horn experimental areas.

State and Other Federal Agencies

State agencies that have cooperated in the research are many. Chief among these are the Fish and Game Departments of the States of Arizona, Colorado, New Mexico, South Dakota, and Wyoming. The State Engineer in New Mexico actively participated in streamflow measure-

ments. The State and Extension Foresters of the Rocky Mountain States, especially the States of Colorado, Wyoming, North and South Dakota, Kansas, Nebraska, and New Mexico gave strong support and participated in several surveys and studies. The Wyoming Highway Department sponsored research on design of fence systems to control blowing snow.

The Arizona Water Resources Committee, a State-sponsored citizens' group supporting the Arizona Watershed Program, has been and continues to be most helpful. The support of this committee made it possible to conduct the research on which the Arizona Watershed Program is based.

Of the Federal agencies, the cooperation—both formal and otherwise—of Region 2 and Region 3 of the Forest Service is immeasurable. Many research accomplishments would have been impossible without their support and encouragement.

Next to the two Forest Service Regions, the first and longest continuing cooperation was that of the former Forest Pathology Division of the Bureau of Plant Industry. In accordance with the agreement of March 21, 1910, between the Forest Service and this Bureau, W. H. Long, forest pathologist, assumed his duties in the Southwest in 1911 and established his headquarters in Albuquerque, New Mexico, in 1913. Dr. Long worked closely with G. A. Pearson, and was considered a member of the research team until his retirement in 1937. L. S. Gill followed Dr. Long, and he and his staff continued close cooperation with the Station. They became an integral part of the Station in 1953, and Gill became Chief of Forest Disease Research at the Station.

Although a forest pathologist was never assigned to Region 2 of the Forest Service under the original Facilitating Agreement, Long and other pathologists from Washington, D. C. were frequent visitors as consultants. From 1914 until his death in 1925, Ellsworth Bethel served as a forest pathologist with headquarters in Denver. As a specialist on western rusts, his main assignment was to study native rusts that might be confused with the introduced white pine blister rust. Beginning in 1951, R. W. Davidson was stationed in Fort Collins in cooperation with Colorado A&M College.

Forest entomology investigations, under the old Bureau of Entomology and Plant Quarantine, began with an outbreak of the mountain pine beetle in the Black Hills of South Dakota about 1900. From 1900 to 1909, A. D. Hopkins and associates studied several species of tree-killing beetles in the Rocky Mountains. Also, from 1910 to 1935, a limited amount of research on forest insects was done by entomologists visiting from the Forest Insect Laboratory at Berkeley, California. A Forest Insect Laboratory was established at Denver, Colorado, in January 1935 with J. A. Beal in charge. This new Forest Insect Laboratory moved to Fort Collins in September 1935 in cooperation with Colorado A&M. This move also marked the formal cooperation with the former Rocky Mountain Station which continued until 1954 when the laboratory became part of the new Rocky Mountain Station. N. D. Wygant, then Laboratory Leader, became Chief of Forest Insect Research at the Station.

The Fish and Wildlife Service (formerly Biological Survey), Department of the Interior, under the McSweeney-McNary Act, assigned a biologist to each western experiment station to advise and conduct research pertaining to wildlife. These assignments began soon after the passage of the Act, and have been continued since that time by several competent biologists.

The Bureau of Land Management, Bureau of Indian Affairs, Bureau of Reclamation, and National Park Service of the Department of the Interior cooperated in studies from time to time. The Bureau of Land Management supported the grazing studies in northern New Mexico and in Wyoming, and the Indian Service cooperated in surveys and studies in the use of fire in Arizona. The Bureau of Reclamation cooperated in watershed activities in Colorado. The Park Service cooperated in forest disease and forest insect research. All of these agencies were major clients of Forest Service research. Dr. Frederick V. Coville of the former Bureau of Plant Industry and his coworkers in the Smithsonian Institution aided in plant identification.

Some Research Highlights and Accomplishments

It is not possible to cover here the vast amount of research information obtained over the years by the Forest Service in the central and southern Rocky Mountain Regions. Most of this information has been presented in numerous publications, including scientific journals, U.S. Department of Agriculture publications, serial publications by the Station, trade journals, and other media. These publications contain references to related and supporting studies. Also, the Station recently made available a complete list of publications, alphabetically by author, for the period 1953-73.[24]

The Station has released a series of "Status of Knowledge" publications in timber, watershed, and range management. These reports are designed to provide land managers and administrators with concise overviews of specific resources in the Station territory, with summaries of major research results (extending back to the turn of the century in some cases), and ideas on how managers might apply the results to help solve problems. They also outline research needed to fill knowledge gaps in the respective fields. The report series include timber management for the five major timber types in the Station territory;[25] watershed management in five vegetation types in the Southwest,[26] and five in the Black Hills and central Rockies;[27] and range management for seven rangeland types in the central Rockies and Southwest.[28] These "Status of Knowledge" reports are proving very useful to managers and are in great demand. Hence, information about studies undertaken and results obtained over the years may be found in these papers and from the bibliographies contained therein.

[24] *USDA Forest Service General Technical Report RM-6, 96 p. 1974.*

[25] *USDA Forest Service Research Papers RM-120, 121, 122, 123, 124.*

[26] *USDA Forest Service Research Papers RM-117, 126, 127, 128, 129, 130.*

[27] *USDA Forest Service Research Papers RM-137, 138, 139, 140, 141, 142.*

[28] *USDA Forest Service Research Papers RM-154, 155, 156, 157, 158, 159, 160, 161.*

It is highly appropriate, however, to mention some of the pioneering efforts and significant contributions made to forestry research by Forest Service scientists who have worked in the central and southern Rocky Mountain Regions. For this purpose, these accomplishments are grouped into four broad areas of research:

1. Ecology and management of major timber species in the central and southern Rockies, including the biology and ecology of damaging forest insects and diseases, and forest fires.
2. Range ecology, range rehabilitation, and management, including range livestock production and wildlife habitat.
3. Watershed management, including erosion control and water-yield improvement.
4. Multiple use evaluation of forest land management.

Ecology and Management of Timber Species, Including Biology and Ecology of Insects and Diseases, and Forest Fires

As stated previously, little information existed concerning the timber species, their requirements, and proper use at the time the Forest Reserves were established. Hence, G. A. Pearson and Carlos G. Bates, the two pioneer silviculturists assigned to the central and southern Rocky Mountain Regions, began the timber management research and left several research reports as monuments to their work.

In the Southwest, Pearson's reports of natural reproduction of western yellow pine, forest types as determined by climate and soil, improvement selection cutting in ponderosa pine, and his culminating monograph—"Management of ponderosa pine in the Southwest," are major contributions. These have been of great value to forest land managers in the Southwest and neighboring regions.

Hermann Krauch, who also worked during the early period of timber management research in the Southwest, contributed several research papers on individual tree studies of ponderosa

pine. He also developed the management requirements of Douglas-fir timberland in the Southwest.

B. R. Lexen was associated with Pearson and Krauch during the early part of his Forest Service career. He introduced statistical computation and analyses to the research, and among his findings was the determination of the factors influencing the yield and mortality of ponderosa pine in the Southwest.

C. A. Myers extended Pearson's work, and made available information regarding converting virgin southwestern ponderosa pine to managed stands.

G. H. Schubert (1971) reported the growth response of even-aged ponderosa pine related to stand density levels. In 1974, Schubert completed an up-to-date review of the silviculture of ponderosa pine. J. R. Jones (1974) reviewed the silviculture of southwestern mixed conifers and aspen. These accomplishments have materially added to forest land management.

In the central Rockies, Bates' work on growth requirements of conifers, seed production and seed source, reforestation, and forest type as determined by climate and soil, provided understanding and guidance to forest land managers generally. Bates encouraged the establishment of growth measurement plots throughout the National Forests of the central Rocky Mountains. The periodic measurements of these plots over the years have furnished much worthwhile information. R. R. Alexander has drawn on these and other forest stand measurements and added much useful information for forest land managers in the central Rockies, including the silvical characteristics of Engelmann spruce and subalpine fir. Alexander also reviewed the silviculture of central and southern Rocky Mountain forests. Alexander's publications on partial cutting of old-growth lodgepole pine and spruce-fir forests are especially helpful in the management and use of these forests.

F. Ronco's work on spruce seedling physiology and requirements for artificial regeneration has provided the basis for regeneration of the extensive insect-killed spruce stands in Colorado and neighboring regions.

C. E. Boldt and J. L. Van Deusen reviewed the silviculture of ponderosa pine in the Black Hills, making available up-to-date information for use in this highly developed area.

Drawing on the above research findings and other forest measurements, C. A. Myers completed an outstanding piece of research on simulating the management of even-aged timber stands (1973). In 1974, Myers extended his research to multipurpose silviculture in ponderosa pine stands of the Front Range in Colorado. Myers' accomplishments have provided forest land managers and others with the information and techniques for evaluating and appraising timber management practices in advance of operation, and thereby materially advanced forest land management planning.

In Plains forestry, R. A. Read completed an evaluation of the Great Plains Shelterbelts. On the basis of this evaluation, he established and has lead shelterbelt research in the Central Plains. Recently, Read, D. F. Van Haverbeke, and J. A. Sprackling completed provenance and genetic papers on several tree species for planting in the Central Plains. G. W. Peterson began forest disease research in the Central Plains and in a series of papers has made available information and guidance on diseases of forest nurseries and shelterbelts. R. W. Tinus, through his research of containerized seedlings at Bottineau, North Dakota, has provided private and public forestry organizations with useful information and techniques for more efficient and successful forest plantings for the northern Plains.

In Forest Diseases Research, L. S. Gill completed a taxonomic revision of the dwarf mistletoes. Gill also extended W. K. Long's work on both dwarf mistletoe and red rot. F. G. Hawksworth further extended dwarf mistletoe research throughout the central and southern Rocky Mountain Regions and into Mexico, and developed application of his findings to forest land management. Through his prodigious research, Hawksworth has become the recognized authority on dwarf mistletoes. S. R. Andrews concentrated on red rot of ponderosa pine, and summarized his and Long's research in a monographic treatment of this important decay. T. E. Hinds and R. W. Davidson made fundamental contributions in studies of blue stain fungi and canker diseases of aspen, while R. S. Peterson and J. M. Staley did much needed research in their respective fields of rusts and foliage diseases of conifers.

In Forest Fire Research, the work of J. E. Deeming, J. W. Lancaster, M. A. Fosberg, R. W. Furman, and M. J. Schroeder in developing the National Fire-Danger Rating System is important nationwide. This system is being used throughout the Forest Service and by other Federal and State agencies. A. W. Lindenmuth's research in fire-danger rating and burning characteristics of Arizona chaparral were helpful contributions.

Range Ecology and Range Rehabilitation and Management, Including Range Livestock Production

Management of range livestock grazing was a new experience when the Forest Reserves were established. There were no guidelines. Forest officers had to start from scratch. Damage to the forests from grazing was evident, so this problem drew first attention. Thus it was that R. R. Hill determined and characterized the effects of grazing on western yellow pine reproduction in the National Forests of Arizona and New Mexico. Pearson also noted this problem in his writings. C. K. Cooperrider described the recovery of ponderosa pine reproduction following injury to young annual growth.

Drought and its effects on livestock, especially in the Southwest, was another early problem. Hence, C. L. Forsling and J. T. Jardine outlined measures for range and cattle management during drought. Too many critters and continuous unrestricted grazing greatly accentuated the effects of drought. W. R. Chapline prepared management guides for goat range management on the National Forests. M. W. Talbot's "Indicators of Southwestern Range Conditions" have been widely used by private and public range and range-watershed managers.

Another early need was to determine the range forage constituents, their grazing value and growth habits, and how their presence or absence might indicate range conditions. Ecological findings and descriptions in the central Rockies, as documented by D. F. Costello and H. E. Schwan, are noteworthy. R. S. Campbell determined the plant succession and grazing capacity on clay soils in southern New Mexico. W. G. McGinnies, K. W. Parker, and G. E. Glendening described the ecology of southwestern ranges. Parker developed a scorecard of range conditions. He also developed the three-step method of measuring range condition and trend on National Forest rangelands, which was used nationwide in evaluating range conditions.

Noxious and poisonous plants were increasing problems on the range. On southwestern ranges, increase of mesquite was especially acute. Parker, S. C. Martin, Glendening, H. A. Paulsen, Jr., D. R. Cable, and H. G. Reynolds characterized this problem, and worked out measures for control and management. Parker also developed measures to control burroweed. On the Central Plains, Costello developed methods to control pricklypear, while C. W. Doran and J. T. Cassady developed methods of management for sheep on western Colorado rangelands infested with orange sneezeweed.

General depletion of rangelands called for concentrated efforts of Forest Service range ecologists to bring about range rehabilitation. Reseeding studies were intensified. In the Southwest, the research of J. T. Cassady, G. E. Glendening, F. Lavin, H. G. Reynolds, J. O. Bridges, and H. W. Springfield made information available for extensive successful range forage improvement. H. B. Pingrey and J. R. Gray of New Mexico State University with E. J. Dortignac and H. W. Springfield of the Station reported on cattle gains and the economics of lambing on range areas in northern New Mexico seeded to crested wheatgrass. In the central Rockies, W. M. Johnson, C. W. Doran, J. T. Cassady, and A. C. Hull developed range reseeding practices for successful range improvement.

As to range and range livestock management, much progress has been made. In the Southwest, E. W. Nelson (1934) and later H. A. Paulsen, Jr. and F. N. Ares (1962) outlined grazing values and management practices for black grama and tobosa grasslands and associated shrub ranges. M. J. Culley determined the economics of the cattle business on semidesert ranges. S. C. Martin and D. R. Cable worked out the grazing values, growth requirements, and use of mixed-grass ranges. J. F. Arnold, D. A. Jameson, and E. H. Reid described the pinyon-juniper type and outlined the effects of grazing, fire, and tree control in this range type.

In the central Rockies, D. F. Costello and G. T. Turner developed the basis for judging range condition and utilization, and G. E. Klipple and Costello reported the vegetation and cattle responses to intensities of grazing on Plains shortgrass ranges. W. M. Johnson reported the effects of grazing intensity upon vegetation and cattle gains on ponderosa pine-bunchgrass ranges. Johnson also participated in developing systems of grazing on mountain ranges in Wyoming.

In forest wildlife management, the work of H. G. Reynolds in the Southwest is outstanding. In a series of research papers, Reynolds determined wildlife habitat use and developed ways of habitat management and maintenance in forest wildlife management. O. C. Wallmo's research on deer winter ranges in Colorado and D. R. Dietz's research in deer habitat in the Black Hills are noteworthy.

Watershed Management, Including Erosion Control and Water-Yield Improvement

Watershed management also was a new undertaking at the time the Forest Reserves were created. Hence, the work of Bates and Henry at Wagon Wheel Gap, Colorado, is a benchmark in watershed management research. Here, runoff and water yields under forest practices were first measured; it was the beginning from which many other watershed studies developed. In the Southwest, C. K. Cooperrider developed erosion control methods and watershed management practices used in management of watersheds.

The timber-harvesting–water-production study at the Fraser Experimental Forest in Colorado is a classic in forest-watershed management research. The results have had widespread use on public watershed lands westernwide. Several scientists were involved in the study, including C. A. Connaughton, H. G. Wilm, B. R. Lexen, E. G. Dunford, B. C. Goodell, and L. D. Love. Love and W. M. Johnson also determined erosion and water yield information under various amounts of plant cover and intensities of grazing in the ponderosa pine zone, Manitou Experimental Forest, Colorado.

Much information came from the watershed investigations at the Sierra Ancha Experimental Watersheds in central Arizona. Here, water use by plants, erodability of soils, and plant-soil relationships have been used in developing land use practices on Southwestern watersheds. Those involved include Cooperrider, B. A. Hendricks, W. P. Martin, H. C. Fletcher, and L. R. Rich.

Development in watershed management research in later years was spearheaded by M. D. Hoover. Under Hoover's guidance, the research was directed toward determining and isolating the basic factors involved in water-yield and erosion-control processes. To do this, satellite experimental areas were established from the Fraser and Sierra Ancha experimental watersheds. To man these satellites, Hoover trained a number of younger scientists who have produced much helpful information. Among the contributing scientists in this enlarged program were B. C. Goodell, H. E. Brown, L. R. Rich, A. R. Hibbert, J. R. Thompson, P. A. Ingebo, R. D. Tabler, H. K. Orr, D. L. Sturges, J. P. Bergen, H. L. Gary, C. F. Leaf, R. W. Swanson, and B. H. Heede. J. S. Horton conducted studies pertaining to management of stream-bottom vegetation. His phreatophyte research, especially with tamarisk (saltcedar), has materially aided in the control of this water-using plant in the Southwest.

An important segment of the water-yield improvement research is that pertaining to alpine snowfields headed by M. Martinelli. This is the main snow research project by the Forest Service, and much useful information has been and is being developed that emphasizes the value of high-elevation snowfields and how to develop and manage them. Associated with Martinelli are R. A. Schmidt, R. A. Sommerfeld, and A. Judson. H. Frutiger, of the Swiss Federal Institute for Snow and Avalanche Research, was an early consultant in avalanche control. Frutiger described the avalanche starting zone, and prepared guidelines for the planning and design of permanent supporting structures. Judson is developing snow avalanche forecasting. Tabler has made outstanding application of the control of drifting snow to highway protection in Wyoming.

Multiple Use Evaluation of Forest Land Management

The marked accomplishments in timber, range, and watershed management research in the central and southern Rocky Mountain Regions set the stage and made it possible to apply and evaluate watershed management practices on an operational basis. This new approach had not been attempted elsewhere. It took courage, faith, and a good deal of money to do it. Thanks to the interest and support of the people in Arizona concerned with water-yield improvement, and the desire of the Forest Service to improve the use and management of the National Forests, the task was undertaken.

The main essentials of this unique forest land management evaluation project and the people involved have already been covered. This Beaver Creek Watershed Evaluation Project, headquartered at Flagstaff, Arizona, together with the other associated water-yield improvement and evaluation projects in Arizona, are major accomplishments. If properly pursued to an effective conclusion, the research should continue to contribute to the future of the forest land management in the Rocky Mountain empire.

The present research program of the Station, largely organized on an environmental basis, can best be evaluated in future years.

Following is a list of scientists, technicians, administrators, and support service leaders who have served at the Southwestern Station, the former Rocky Mountain Station, and the combined Rocky Mountain Station. Also listed are some early forest and range examiners who served in Regions 2 and 3. As personnel records are fragmented, some people may have been missed.

Many other employees, including secretaries and other supporting personnel, have contributed to the research program. Unfortunately, records are not complete, making it impossible to include these people.

Adair, Clarence D.*
Aldon, Earl F.*
Aldrich, Robert C.*
Alexander, Robert R.*
Allen, D. Neil*
Anderson, Patricia A.*
Andrews, Stuart R.,
Division Chief, combined RM Station
Ares, Fred N.
Arnold, Joseph F.
Asmussen, L. E.
Avery, C. C.
Bailey, Wilmer F.
Baker, Malchus B.*
Barger, R. L.
Barker, D. J.
Barney, Frances J.*
Barnhart, Michael R.*
Bates, Carlos G.,
Director, Fremont Station
Beagle, Lawrence D.*
Beardsley, Wendell G.
Becker, Maxwell E.
Benedict, Harris M.
Bennett, R. K.
Bergen, James D.*
Bergstrom, Duane E.
Berndt, Herbert W.
Berntsen, Carl M.,
Assistant Director, combined RM Station
Bird, Kenneth G.*
Bjugstad, Ardell J.*
Blackwell, G. A., Jr.
Blair, Byron O.
Bliss, E. Shirley
Bohning, John W.
Boldt, Charles E.*
Bomberger, E. H.
Bongberg, J. W.
Boster, Ronald S.*
Boyd, Raymond J.
Bradfield, Dewell E.
Bradley, John R.*
Bridges, Joseph O.
Brink, Glen E.*
Brinkman, Kenneth A.
Brown, Gary R.*
Brown, Harry E.
Brown, Thomas C.*
Buell, Jesse H.,
Division Chief, combined RM Station
Burke, Hubert D.
Cable, Dwight R.*
Campbell, C. J.
Campbell, R. S.,
Director, Jornada Range Reserve
Campbell, Ralph E.*
Canfield, Roy H.
Carder, D. Ross*
Carpenter, David C.*
Casner, Wilson B.*
Cassady, John T.
Cassidy, Hugh O.
Cavin, William C.
Chadwick, H. W.
Chamberlain, Valden*
Champagne, Norman E., Jr.*
Chansler, John F.
Chapline, W. R.,
Chief, Division of Range Research, Washington Office
Clary, Warren P.*
Collet, M. H.
Coltharp, G. B.
Connaughton, C. A.,
Division Chief and Director, former RM Station
Conway, Errett M.
Cooperrider, C. K.,
Division Chief, SW Station
Costello, David F.,
Division Chief, former RM Station
Crafts, Edward C.
Cribbs, William J.
Culley, Matt J.
Cunningham, Charles R., Sr.*
Cunningham, R. A.
Curnow, R. D.
Currie, Pat O.*
Curtis, Willie R.
Dalton, Adrian E.
Dana, Robert W.*
Daniels, John P.
Davidson, Ross W.
Davidson, Walter H.
Davis, Edwin A.*
Davis, James R.*
Dawson, David H.
Decker, John P.
Deeming, John E.
Dibbern, John C.
Diebold, C. H.
Dieterich, John H.*
Dietz, Donald R.
Dix, Mary E.*
Donnelly, Dennis M.*
Doran, Clyde W.
Dortignac, Edward J.
Douglas, L. H.,
Chief, Office of Grazing Studies, R-2
Driscoll, Richard S.*
Driver, Beverly L.*
Dunford, E. G.
Duvall, Vinson L.*
Assistant Director, combined RM Station
Edminster, Carlton B.*
Elser, Duane D.
Embry, R. S., Jr.
Erickson, Bernard J.*
Erickson, Robert B.
Erwin, Eldon V.*
Eslyn, Wallace E.
Evans, Keith E.
Fate, Dwight L.
Feddema, Charles*

*With the combined Station at the close of 1975.

Ffolliott, Peter F.
Fleming, C. E.,
Director,
Jornada and Santa Rita
Fletcher, Herbert C.,
Division Chief, SW Station;
Assistant Director,
combined RM Station
Forsling, C. L.,
Director, Jornada
Fosberg, Michael A.*
Fox, Douglas G.*
Francis, Richard E.*
Frank, Ernest C.*
Freeland, F. Dean, Jr.
Furman, R. William, II*
Gaines, Edward M.,
Division Chief, SW Station
Garcia, George*
Garrett, E. Chester*
Gary, Howard L.*
Geiger, M. L.
Germain, Charles J.
Gibbons, Robert D.
Gill, Lake S.,
Division Chief,
combined RM Station
Ginter, P. L.
Glendening, George E.
Godsey, Gary L.
Goodell, B. C.
Goodwin, Gregory A.*
Gottfried, Gerald J.*
Green, Win
Greentree, Wallace J.*
Haeffner, Arden D.
Hahn, Temple T.
Hammer, F. L.
Hamre, Robert H.*
Hansen, Edward A.
Hansen, T. W.
Hanson, Roy
Harris, R. W.
Hathaway, C. R.
Hawksworth, Frank G.*
Hayes, G. Lloyd,
Division Chief
and Assistant Director,
combined RM Station
Haynes, Richard A.*
Heede, Burchard H.*
Heidmann, Leroy J.*
Heidt, Jack D.
Hendricks, Barnard A.
Herman, Francis R.
Hermann, Fred J.
Hensel, R. L.,
Director, Santa Rita
Herrick, David E.,*
Assistant Director, Deputy
Director, and Director,
combined RM Station
Hiatt, Harvey A.*
Hibbert, Aldon R.*
Hickey, W. C., Jr.
Hill, L. K.
Hill, R. R.,
Chief, Office of Grazing
Studies, R-3
Hinds, T. E.*
Holbo, H. Richard
Holub, Ernest W.*
Hoover, Marvin D.,
Division Chief,
combined RM Station
Hornibrook, E. M.
Horton, J. S.
Hovland, Teddy L.*
Hudson, R. K.
Hughes, Jay M.
Hull, Alvin C., Jr.
Hull, Herbert M.
Hurd, R. M.
Hurtt, L. C.,
Director, Jornada
Hutchison, Boyd A.
Ilch, D. M.,
Assistant Director,
combined RM Station
Ingebo, P. A.
Jairell, Robert L.*
Jameson, Donald A.
Jennings, Daniel T.*
Johnson, Jerry
Johnson, Kendall L.
Johnson, Philip B.*
Johnson, Wallace M.
Jones, John R.*
Judson, Arthur*
Keefer, Donald R.,*
Assistant Director,
combined RM Station
Keith, James O.
Kerbs, Roger R.*
King, Rudy M.*
Kissinger, Neland A., Jr.
Klipple, Graydon E.
Knight, Fred B.
Knipe, Oren D.*
Knott, F. William*
Koshi, Paul
Kotok, Edward S.
Kovner, Jacob L.*
Krauch, Hermann
Krein, Benjamin J.*
Kruse, William H.*
Kuhl, Michael J.*
LaBau, Vernon J.*
Lancaster, James W.*
Landgraf, Amel E., Jr.
Landt, Eugene F.
Larson, Frederic R.*
Larson, Melvin L.
Lavin, Fred
Laycock, William A.,*
Assistant Director,
combined RM Station
Layman, Robert H.*
Lea, Alfred L.
Leaf, Charles F.
Lee, Chester,
Region 2
Lee, Richard
Leonard, Roger W.
Lewis, Gordon D.*
Lexen, Bert R.,
Division Chief,
former RM Station
Lightle, Paul C.
Lindenmuth, Anson W., Jr.
Little, Elbert L., Jr.
Lloyd, Grenville B., Jr.
Lloyd, R. Duane,
Assistant Director,
combined RM Station
Love, L. Dudley,
Division Chief,
former RM Station
Mace, Arnett C.
Manley, LeRoy L.*
Markstrom, Donald C.*
Martin, Edward C.
Martin, S. Clark*
Martin, William P.
Division Chief, SW Station
Martinelli, Mario, Jr.*
Martinez, Manuel H.*
Massey, Calvin L.
Mata, Stephen A.*
May, Morton
McArdle, Richard E.,
Director, former RM Station
McCambridge, William F.*
McElvain, William W.*
McEwen, Lowell C.
McGinnies, William G.,
Division Chief, SW Station;
Director, former RM Station
McKnight, Melvin E.

*With the combined Station at the close of 1975.

Meagher, George S.,
Division Chief, SW Station
Merrick, Gordon D.
Messner, Harold E.*
Miller, Robert L.
Mills, Thomas J.*
Miranda, Fernando Y.
Mitchell, James C.*
Moore, D. G.
Morris, Homer D.*
Morris, Meredith J.*
Morton, Edward P.
Morton, Donald H.,
Assistant Director, combined RM Station
Mueller, Lincoln A.,
Division Chief, SW Station and combined RM Station
Murphy, William G.
Myers, Clifford A., Jr.
Myhre, Richard J.*
Nagel, Roy H.
Nelson, Ben.
Nelson, Enoch W.,
Director, Jornada
Nickerson, Mona F.*
Niederhof, C. H.
Noble, Daniel L.*
North, William A.*
O'Connell, Paul F.
Orr, Howard K.*
Ostmark, N. Eugene
Ozment, Arnold D.*
Palmer, L. J.,
Division Chief, former RM Station
Palpant, Edgar H.
Parker, Kenneth W.,
Division Chief, SW Station
Parks, Townsend S., Jr.
Pase, Charles P.*
Patton, David R.*
Paulsen, Harold A., Jr.,*
Assistant Director, combined RM Station
Payne, G. F.
Pearse, C. Kenneth,
Division Chief, SW Station
Pearson, Gustaf A.,
Director, SW Station
Pearson, Henry A.
Perla, Ronald I.
Petersen, Louis G.*
Peterson, Geraldine
Peterson, Glenn W.*
Peterson, Roger S.
Pierce, Donald A.
Pond, Floyd W.
Pott, Alfred J., Jr.*
Price, Raymond
Director, SW Station; Director, combined RM Station
Read, Ralph A.*
Regelin, Wayne L.
Reichert, Donald W.*
Reid, Elbert H.,
Division Chief and Assistant Director, combined RM Station
Reppert, Jack N.
Retzer, John L.
Reynolds, Hudson G.
Rich, Lowell R.
Rietveld, Willis J.*
Riffle, Jerry W.*
Rivas, A. M.
Roach, Mack E.
Roberts, Edwin H.*
Roeser, J., Jr.
Ronco, Frank, Jr.*
Rowbury, J. G., Jr.
Ryan, Joseph B., Jr.*
Sackett, Stephen J.*
Sampson, George R.*
Sanchez, Henry C.*
Sander, Donald H.
Schoeler, J. D.,
Director, Jornada
Schmid, John M.*
Schmidt, Ralph A., Jr.*
Scholl, David G.*
Schroeder, Mark E.
Schubert, Gilbert H.*
Severson, Kieth E.*
Shaw, Elmer W.
Shepperd, Wayne D.*
Short, Henry L.*
Skau, Clarence M.
Slabaugh, P. E.
Smith, Ernest E.*
Smith, Dixie R.,*
Deputy Director, combined RM Station
Smith, Dwight R.
Smith, Joye E.
Smith, Ned A.
Sommerfeld, Richard A.*
Spain, Gene L.
Sprackling, John A.*
Springfield, H. Wayne
Stahelin, Rudolph
Staley, John M.*
Stein, John D., Jr.*
Stelzer, Milton J.
Stevens, Robert E.*
Stevenson, Orvil G.*
Sturges, David L.*
Swanson, Robert H.
Sykes, Glenton G.
Tabler, Ronald D.*
Tagestad, Arden D.*
Talbot, M. W.,
Chief, Office of Grazing Studies, R-3
Taussig, D. W.
Taylor, Raymond F.,
Division Chief, RM Station
Terrell, Charles L.
Thilenius, John F.*
Thompson, Darrow M.
Thompson, J. Robert*
Tiedemann, Arthur R.
Tinus, Richard W.*
Trujillo, David P.*
Turner, George T.
Turner, James M.
Upson, Arthur T.,
Director, SW Station
Urness, Phillip J.
Vahle, J. Robert*
Valentine, Kenneth A.
Valenzuela, Elias*
Van Deusen, James L.*
Van Haverbeke, David F.*
Wadsworth, Frank H.
Wagar, J. A., Jr.
Wallmo, Olof C.*
Ward, A. Lorin*
Ward, Donald E., Jr.
Watkins, Ross K.*
Weir, Wilbert W.
Wenger, Karl F.,
Director, combined RM Station
Wheatley, George W.*
White, P. Wayne*
Wiley, Ardath E.*
Wilford, Bill H.
Williams, Knox T.*
Wilm, Harold G.,
Division Chief, former RM Station
Winter, Charles J.*
Wolfe, Frank, Jr.*
Woodfin, Richard O.
Worley, David P.
Worth, Harold E.*
Wygant, Noel D.,
Division Chief, combined RM Station
Yamamoto, Teruo*
Yasinski, Frank M.
Yerkes, Vern P.

EXPERIMENTAL AREAS

Responding to the wise counsel and instruction of Earle H. Clapp (appointed in 1915 as Assistant Chief of the Forest Service in charge of Forest Research), many areas within the National Forests were set aside for possible use for research. Clapp asked that suitable areas be designated and set aside within each major forest type. These instructions were closely followed in the central and southern Rocky Mountain Regions, and many areas so designated. Some have and are being used for research purposes; some are still unused; and some have been abandoned. As the research required, other areas have been added. Some have received official research area designation (Experimental Forest, Range, or Watershed), while others have not.

The major experimental areas within the territory of the Rocky Mountain Forest and Range Experiment Station at the close of 1975 are listed in chronological order of establishment. An alphabetical list, with a characterization of each area, is also included.

Experimental Areas (in chronological order)

A. Areas designated as Experimental Forests or Ranges

1903—Santa Rita (Arizona)
1908—Fort Valley (Arizona)
1909—Fremont (Colorado)
1912—Jornada (New Mexico)
1925—Cloudcroft (New Mexico)
1931—Denbigh (North Dakota)
1932—Mount Graham (Arizona)
1932—Parker Creek (Arizona; see Sierra Ancha)
1936—Long Valley (Arizona)
1937—Central Plains (Colorado)
1937—Fraser (Colorado)
1938—Manitou (Colorado)
1938—Sierra Ancha (Arizona)
1954—Black Mesa (Colorado)
1961—Black Hills (South Dakota)
1968—Redfeather (Colorado)

B. Areas used for experimental purposes under cooperative agreement, or other arrangement

1909—Wagon Wheel Gap (Colorado)
1948—Crawford Nursery (Colorado)
1949—Beaver Rim (Wyoming)
1950—Cibolla Mesa (New Mexico)
1952—No Agua (New Mexico)
1952—San Luis (New Mexico)
1953—Badger Wash (Colorado)
1956—Castle Creek (Arizona)
1956—Three-Bar (Arizona)
1956—Tank Canyon (New Mexico)
1957—Beaver Creek (Arizona)
1958—Mingus Mountain (Arizona)
1958—White Spar (Arizona)
1958—Dubois (Wyoming)
1959—Horning State Farm (Nebraska)
1959—Burgess (Wyoming)
1960—Pole Mountain (Wyoming)
1961—Fort Bayard (New Mexico)
1961—Sturgis (South Dakota)
1961—Tonto Springs (Arizona)
1962—Wild Bill (Arizona)
1963—Halsey (Nebraska)
1963—Willow-Thomas Creeks (Arizona)
1963—Carter Mountain (Wyoming)
1964—Seven Springs (Arizona)
1967—Stratton (Wyoming)
1968—Hastings (Nebraska)
1968—Northwest Agriculture Laboratory (Nebraska)
1970—Mead University Field Laboratory (Nebraska)
1970—Interstate Highway 80 (Wyoming)

Experimental Areas (alphabetically by State)

	Location	Vegetation type	Primary research emphasis	Size (acres) and land ownership
A. Areas designated as Experimental Forests or Ranges				
ARIZONA				
FORT VALLEY 1908—Initiated experimental work. 1931—Established as an experimental forest, January 21 1975—Active	Coconino County, Coconino NF	Ponderosa pine	Timber management	Total—4,630 acres; all Federal
LONG VALLEY 1936—Established as an experimental forest, March 31 1975—Active	Coconino County, Coconino NF	Ponderosa pine	Timber management	Total—1,265 acres; Federal, 1,250; Private, 15
MOUNT GRAHAM 1932—Established as an experimental forest, March 23 1967—Disestablished	Graham County, Coronado NF	Mixed conifer	Timber and recreation management	Total—3,920 acres; all Federal
SANTA RITA 1903—Established as a range reserve by Bureau of Plant Industry 1915—Transferred to Forest Service 1975—Active	Pima County, Coronado NF	Semidesert grass-shrub	Range management	Total—53,159 acres; Federal, 51,795; Private, 1,364
SIERRA ANCHA 1932—Established as Parker Creek Erosion-Streamflow Station May 18 1938—Enlarged to Sierra Ancha Experimental Watersheds, April 6 1975—Active	Gila County, Tonto NF	Chaparral, ponderosa pine, mixed conifer	Watershed management	Total—13,255 acres; Federal, 13,213; State, 42
COLORADO				
BLACK MESA 1954—Initiated experimental work 1963—Established as an experimental forest, February 8 1975—Inactive	Gunnison County, Gunnison NF	Mountain grassland	Range, wildlife, and watershed management	Total—4,799 acres; Federal, 4,258; Private, 541
CENTRAL PLAINS 1937—Established as an experimental range, July 26 1954—Transferred to Agricultural Research Service 1975—Active under ARS	Weld County, Pawnee National Grasslands	Shortgrass Plains	Range management	Total—10,880 acres; Federal, 10,560; Private, 320

	Location	Vegetation type	Primary research emphasis	Size (acres) and land ownership
FRASER 1937—Established as an experimental forest, August 26 1975—Active	Grand County, Arapaho NF	Lodgepole pine, spruce-fir	Watershed, timber, and multiple use management	Total—23,000 acres; all Federal
FREMONT 1909—Initiated experimental work 1931—Established as an experimental forest, September 17 1975—Inactive	El Paso County, Pike NF	Mixed conifers	Timber management	Total—1931 to 1956, 500 acres; reduced to 260 acres April 12, 1956; all Federal
MANITOU 1938—Established as an experimental forest, March 25 1975—Active	Teller, Douglas, El Paso Counties, Pike NF	Ponderosa pine, bunchgrass	Range, watershed, and multiple use management	Total—16,560 acres; Federal, 14,500; Private, 2,060
REDFEATHER 1968—Established as an experimental forest, February 2 1975—Active	Larimer County, Roosevelt NF	Ponderosa pine, lodgepole pine, spruce-fir	Insect and disease biology, ecology, and control	Total—2,285 acres; all Federal
NEW MEXICO				
CLOUDCROFT 1925—Initiated experimental work 1935—Established as an experimental forest, November 30 1975—Inactive	Otero County, Lincoln NF	Douglas-fir	Timber management	Total—2,120 acres; all Federal
JORNADA 1912—Established as a range reserve by Bureau of Plant Industry 1915—Transferred to Forest Service 1954—Transferred to Agricultural Research Service 1975—Active under ARS	Dona Ana County	Semidesert grass-shrub	Range management	Total—193,394 acres; all Federal
NORTH DAKOTA				
DENBIGH 1931—Initiated experimental work 1961—Established as an experimental forest, June 20 1975—Active	McHenry County, USDA Forest Service	Northern Plains grassland	Shelterbelt management	Total—640 acres; all Federal
SOUTH DAKOTA				
BLACK HILLS 1961—Established as an experimental forest, October 6 1975—Active	Lawrence and Pennington Counties, Black Hills NF	Ponderosa pine	Timber and wildlife management	Total—3,438 acres; all Federal

	Location	Vegetation type	Primary research emphasis	Size (acres) and land ownership
B. Areas used for experimental purposes under cooperative agreement, or other arrangement				
ARIZONA				
BEAVER CREEK 1957—Initiated experimental work 1975—Active	Coconino and Yavapai Counties, Coconino NF	Desert shrub, pinyon-juniper, ponderosa pine	Watershed, and multiple use management	Total—275,000 acres; nearly all Federal
CASTLE CREEK 1956—Initiated experimental work 1975—Active	Greenlee County, Apache NF	Ponderosa pine	Watershed management	Total—2,063 acres; Federal, 1,953; State, 110
MINGUS MOUNTAIN 1958—Initiated experimental work 1975—Active	Yavapai County, Prescott NF	Chaparral	Watershed management	Total—205 acres; all Federal
SEVEN SPRINGS 1964—Initiated experimental work 1975—Active	Apache County, Apache NF	Mountain grassland	Watershed management	Total—1,200 acres; all Federal
THREE-BAR 1956—Initiated experimental work 1975—Active	Gila County, Tonto NF	Chaparral	Watershed management	Total—290 acres; all Federal
TONTO SPRINGS 1961—Initiated experimental work 1970—Research terminated; area returned to Prescott NF	Yavapai County, Prescott NF	Chaparral	Range management	Total—1,260 acres; all Federal
WILD BILL 1962—Initiated experimental work 1974—Research terminated; area returned to Coconino NF	Coconino County, Coconino NF	Ponderosa pine	Range management	Total—1,300 acres; all Federal
WHITE SPAR 1958—Initiated experimental work 1975—Active	Yavapai County, Prescott NF	Chaparral	Watershed management	Total—549 acres; all Federal
WILLOW-THOMAS CREEKS 1963—Initiated experimental work 1975—Active	Greenlee County, Apache NF	Mixed conifer	Watershed and multiple use management	Total—1,816 acres; all Federal

	Location	Vegetation type	Primary research emphasis	Size (acres) and land ownership
NEW MEXICO				
CIBOLLA MESA 1950—Initiated experimental work 1975—Inactive	Taos County	Sagebrush, pinyon, and juniper	Range reseeding, and cattle regrazing	Total—150 acres
FORT BAYARD 1961—Initiated experimental work 1975—Temporarily inactive	Grant County	Pinyon-juniper	Deer and elk range studies	Total—10,250 acres;
NO AGUA 1952—Initiated experimental work 1975—Inactive	Rio Arriba County	Open ponderosa pine	Range reseeding, and cattle grazing	Total—30 acres;
SAN LUIS 1952—Initiated experimental work 1972—Research terminated; area returned to to Bureau of Land Management	Sandoval County	Pinyon, juniper, semidesert	Watershed and range management	Total—1,364 acres; Federal, 1,204 Private, 160
TANK CANYON 1956—Initiated experimental work 1975—Inactive	Rio Arriba County	Sagebrush, pinyon-juniper	Range reseeding, and sheep grazing	Total—200 acres;
SOUTH DAKOTA				
STURGIS 1961—Initiated experimental work 1975—Active	Meade County, Black Hills NF	Ponderosa pine	Watershed management	Total—496 acres; all Federal
WYOMING				
BEAVER RIM 1949—Initiated experimental work 1975—Inactive	Fremont County	Sagebrush	Sagebrush controls	Total—363 acres;
BURGESS 1959—Initiated experimental work 1972—Research terminated; area returned to Bighorn NF	Sheridan County, Bighorn NF	Mountain grassland	Range management	Total—350 acres; all Federal
CARTER MOUNTAIN 1963—Initiated experimental work 1975—Active	Park County, Shoshone NF	Alpine tundra	Range management	Total—3,840 acres; all Federal

	Location	Vegetation type	Primary research emphasis	Size (acres) and land ownership
NEW MEXICO				
CIBOLLA MESA 1950—Initiated experimental work 1975—Inactive	Taos County	Sagebrush, pinyon, and juniper	Range reseeding, and cattle regrazing	Total—150 acres
FORT BAYARD 1961—Initiated experimental work 1975—Temporarily inactive	Grant County	Pinyon-juniper	Deer and elk range studies	Total—10,250 acres;
NO AGUA 1952—Initiated experimental work 1975—Inactive	Rio Arriba County	Open ponderosa pine	Range reseeding, and cattle grazing	Total—30 acres;
SAN LUIS 1952—Initiated experimental work 1972—Research terminated; area returned to to Bureau of Land Management	Sandoval County	Pinyon, juniper, semidesert	Watershed and range management	Total—1,364 acres; Federal, 1,204 Private, 160
TANK CANYON 1956—Initiated experimental work 1975—Inactive	Rio Arriba County	Sagebrush, pinyon-juniper	Range reseeding, and sheep grazing	Total—200 acres;
SOUTH DAKOTA				
STURGIS 1961—Initiated experimental work 1975—Active	Meade County, Black Hills NF	Ponderosa pine	Watershed management	Total—496 acres; all Federal
WYOMING				
BEAVER RIM 1949—Initiated experimental work 1975—Inactive	Fremont County	Sagebrush	Sagebrush controls	Total—363 acres;
BURGESS 1959—Initiated experimental work 1972—Research terminated; area returned to Bighorn NF	Sheridan County, Bighorn NF	Mountain grassland	Range management	Total—350 acres; all Federal
CARTER MOUNTAIN 1963—Initiated experimental work 1975—Active	Park County, Shoshone NF	Alpine tundra	Range management	Total—3,840 acres; all Federal

	Location	Vegetation type	Primary research emphasis	Size (acres) and land ownership
WYOMING (continued)				
DUBOIS 1958—Initiated experimental work 1972—Research terminated; area returned to Shoshone NF	Fremont County, Shoshone NF	Mountain sagebrush	Watershed management	Total—300 acres; all Federal
INTERSTATE HIGHWAY 80 1970—Initiated experimental work 1975—Active	Albany and Carbon Counties	Sagebrush shortgrass	Blowing snow control	Total—90,000 acres; of mixed ownerships
POLE MOUNTAIN 1960—Initiated experimental work 1973—Research discontinued 1975—Inactive	Albany County, Medicine Bow NF	Shortgrass	Watershed, and wildlife habitat	Total—300 acres; all Federal
STRATTON 1967—Initiated experimental work 1975—Active	Carbon County, Bureau of Land Management	Sagebrush	Watershed management	Total—7,160 acres; Federal, 6,300; State, 860

Price, Raymond.
1976. History of Forest Service Research in the Central and Southern Rocky Mountain Regions, 1908-1975. USDA For. Serv. Gen. Tech. Rep. RM-27, 100 p. Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colo. 80521.

The first forest research area established by the Forest Service was in 1908–the Fort Valley Experimental Forest near Flagstaff, Arizona. In 1909, the Fremont Experiment Station near Colorado Springs was begun, as well as the Wagon Wheel Gap watershed experiment in the central Rockies. The Santa Rita Range Reserve, begun in 1903, was transferred to the Forest Service in 1915. Two forest and range experiment stations were officially designated–Southwestern Station, in 1930, at Tucson, Arizona, and Rocky Mountain Station, in 1935, at Fort Collins, Colorado. The two Stations were combined in 1953, with central headquarters at Fort Collins, to serve a 10-State territory.

Keywords: USDA Forest Service, forestry research, history.

Price, Raymond.
1976. History of Forest Service Research in the Central and Southern Rocky Mountain Regions, 1908-1975. USDA For. Serv. Gen. Tech. Rep. RM-27, 100 p. Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colo. 80521.

The first forest research area established by the Forest Service was in 1908–the Fort Valley Experimental Forest near Flagstaff, Arizona. In 1909, the Fremont Experiment Station near Colorado Springs was begun, as well as the Wagon Wheel Gap watershed experiment in the central Rockies. The Santa Rita Range Reserve, begun in 1903, was transferred to the Forest Service in 1915. Two forest and range experiment stations were officially designated–Southwestern Station, in 1930, at Tucson, Arizona, and Rocky Mountain Station, in 1935, at Fort Collins, Colorado. The two Stations were combined in 1953, with central headquarters at Fort Collins, to serve a 10-State territory.

Keywords: USDA Forest Service, forestry research, history.

Price, Raymond.
1976. History of Forest Service Research in the Central and Southern Rocky Mountain Regions, 1908-1975. USDA For. Serv. Gen. Tech. Rep. RM-27, 100 p. Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colo. 80521.

The first forest research area established by the Forest Service was in 1908–the Fort Valley Experimental Forest near Flagstaff, Arizona. In 1909, the Fremont Experiment Station near Colorado Springs was begun, as well as the Wagon Wheel Gap watershed experiment in the central Rockies. The Santa Rita Range Reserve, begun in 1903, was transferred to the Forest Service in 1915. Two forest and range experiment stations were officially designated–Southwestern Station, in 1930, at Tucson, Arizona, and Rocky Mountain Station, in 1935, at Fort Collins, Colorado. The two Stations were combined in 1953, with central headquarters at Fort Collins, to serve a 10-State territory.

Keywords: USDA Forest Service, forestry research, history.

Price, Raymond.
1976. History of Forest Service Research in the Central and Southern Rocky Mountain Regions, 1908-1975. USDA For. Serv. Gen. Tech. Rep. RM-27, 100 p. Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colo. 80521.

The first forest research area established by the Forest Service was in 1908–the Fort Valley Experimental Forest near Flagstaff, Arizona. In 1909, the Fremont Experiment Station near Colorado Springs was begun, as well as the Wagon Wheel Gap watershed experiment in the central Rockies. The Santa Rita Range Reserve, begun in 1903, was transferred to the Forest Service in 1915. Two forest and range experiment stations were officially designated–Southwestern Station, in 1930, at Tucson, Arizona, and Rocky Mountain Station, in 1935, at Fort Collins, Colorado. The two Stations were combined in 1953, with central headquarters at Fort Collins, to serve a 10-State territory.

Keywords: USDA Forest Service, forestry research, history.

Headquarters Office–Laboratory, on Colorado State University campus, Fort Collins, dedicated July 28, 1967.


GROWING
FROM '76
U.S. FORESTRY
CENTENNIAL


AMERICAN REVOLUTION BICENTENNIAL
1776-1976