

**RESEARCH IN THE U.S.D.A. FOREST SERVICE:
A HISTORIAN'S VIEW**

by

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The first forestry efforts in North America began with a concern over timber supplies in the colonies. Plymouth Colony in 1626 restricted export and ten years later the unauthorized cutting from public lands. Acts to conserve timber increased in the colonies as nearby supplies were depleted. Later, the Federal government acted to protect stands of live oaks and red cedar to ensure naval construction needs. In fact, the U.S. Navy conducted the first forestry research in Florida in the 1830s on live oak plantings (Dana 1950: 317). This research was soon discontinued and it took nearly fifty years until the government resumed forestry research.

By the end of the 19th century the shifting timber frontier from its origin in the Northeast, then the Lake States, the South, and finally the Pacific Coast; led to a concern over future timber supplies. Dr. Franklin B. Hough presented a paper in 1873 at the annual meeting of the American Association for the Advancement of Science on "The Duty of Governments in the Preservation of Forests." A committee was formed to urge Congress and state legislators to act on forest protection and timber cultivation. Congress responded in 1876 and Dr. Hough was appointed within the Department of Agriculture as the first government forestry agent. The duties of this new post were:

To determine the annual amount of consumption, importation, and exportation of timber and other forest products, the probable supply for future wants, the means best adapted to their preservation and renewal, the influence of forests upon climates, and the measures that have been successfully applied in foreign countries, or that may be deemed applicable in this country, for the preservation and restoration or planting of forests; and to report upon the same to the Commissioner of Agriculture to be used by him in a separate report transmitted to congress...

From this work grew first a forestry division and later a Bureau of Forestry within the Department of Agriculture and, in 1905, the Forest Service. Thus, it may be said that the Forest Service started as a research agency. This is fitting because several of the early debates over the creation of forest reserves were scientific ones. I will return to this subject once I trace the evolution of the agency from Hough to Gifford Pinchot.

One of the first goals of many members of the early conservation movement was creation of Federal timber reserves out of public lands. The public domain was then administered by the General Land Office (GLO) in the Interior Department. Its primary function was to oversee the transfer of government lands to private ownership. Not until 1891 did the aim of government began to shift from land distribution to land retention with the creation of the first forest reserves. The 1897 Organic Act defined the two purposes of the reserves as timber conservation and watershed protection.

Meanwhile, the first Federal foresters were employed in the Department of Agriculture. Hough was replaced as chief of the division of forestry in 1883 by a political appointee. But when the division became a permanent part of the Department of Agriculture in 1886, Bernard E. Fernow was designated chief, the first professional forester in the position. Under Fernow, technical and original investigations were started since he believed "besides making propaganda (on merits of forestry), we should...establish the principles upon which the forestry we advocate is to be carried on (quoted in Storey 1975: 6)."

Unduly ignored by Pinchot for his role in creating the 1891 forest reserves, Fernow is recognized for his advocacy of research in the agency (Storey 1976: 7). Discouraged by the lack of funds for research, Fernow resigned in 1898 and Gifford Pinchot became chief. Pinchot was a politician and focused his efforts on the transfer of the reserves to the Department of Agriculture (which happened in 1905) and developing the administration of the Forest Service. These were years of growth with personnel going from 11 in 1898 to 821 in 1905; the number of professional foresters went from two to one hundred fifty-three.

While critical of Fernow for stressing theoretical, rather than practical, forestry Pinchot found it necessary in his first year to establish a Section of Special Investigations. By 1902, it was a division in the agency with 55 employees and accounted for one-third of the \$185,000 budget (Steen 1977: 132-133).

FORESTS AND FLOODS

The relation between forests and floods was a matter of debate in those years. As early as 1864, George Marsh argued in *Man and Nature* that forests both reduced the number and volume of floods. Hough discussed the role of forests in affecting climate in his official reports. One intent of the 1873 Timber Culture Act was to promote tree planting on homesteads and that this would increase the rainfall on the treeless plains on the assumption that forests brought rain (Steen 1976: 123).

The role of forests in moderating streamflow was unclear but gained credence enough to be integral to the creation of forest reserves. Noted in the 1897 Organic Act was "securing favorable conditions of water flows" or watershed protection as a primary function of reserve forests.

The importance of forests in flood protection was recognized by foresters but not by engineers. The latter advocated flood control by use of dams and levees (Sartz 1977: 34). The dispute was not just a scientific one since Pinchot felt the Corps of Engineers position harmed the conservation cause by undermining one of the key arguments for creating forest reserves (Steen 1976: 126).

The issue was important because of the need to gain political support for purchase of national forests in the East. The constitutionality of Federal purchase of forest land was at stake. The House Judiciary Committee decided that the commerce clause permitted the purchase of watersheds of navigable streams, if it could be proved that forests prevented floods (Sartz 1977: 35).

The task fell to the Forest Service Office of Silvics to counter the view that forests were unimportant to flood control. Two early Forest Service research employees led the way. Hired in 1901, Raphael Zon became head of research in this period. To decentralize research, Zon proposed creation of forest experiment stations on the national forests. The first area experiment station was established in 1908 at Fort Valley on the Coconino National Forest in Arizona. These stations were Spartan local operations designed to serve the needs of the forest. One exception, however, was the Wagon Wheel Gap Watershed Study in Colorado, a cooperative project with the Weather Bureau to study the effect of timber removal on water yields. The study began in 1910 and its results helped ensure the passage of the Weeks Act in 1911 which allowed Federal purchase of additional national forests.

The second pioneer, Carlos Bates, had chosen the remote site near the Rio Grande National Forest (Colorado) in 1909 for the first controlled experiments on forest-streamflow relations in the nation (Sartz 1977: 35). Little was known of the hydrology of mountain watersheds until Bates' innovative research on how water moves through soil to sustain streams in rainless periods (Sartz 1977: 35). Over the 16-year period of the study, Bates continually sought to extend its scope but money was lacking. Once in his constant struggle for funds, Bates cabled Assistant Chief Earle H. Clapp: "Why Can We Not Get the Dinero?" Forest Service research was shifting from empirical observation to experimental testing of hypotheses, but agency funding did not keep pace with research needs. This shortage of funding would continue to be a constant theme throughout the history of research in the agency.

FOREST PRODUCTS LABORATORY

Fernow started work in 1887 on timber physics (wood utilization) but had to stop in 1896 when the Secretary of Agriculture deemed it not germane to the work of the Division of Forestry. Under Pinchot, the work resumed through contracts with forestry schools but it was decided a centralized permanent testing facility was required. Through a cooperative agreement with the University of Wisconsin, a forest products laboratory was opened in 1910 at Madison. The impetus was the desire to conserve wood through better utilization at a period when much of it was wasted in the process of harvest and manufacture.

In his study of the first fifty years of the Forest Products Laboratory (FPL) from 1910 to 1964, Charles Nelson (1963: 168-169) identified four main recurring challenges:

1. Inadequate budgets
2. Loss of personnel to private industry
3. Lack of publication funds.

4. Difficulty of getting private industry to apply FPL innovations.

1915-THE TURNING POINT

It may be said that the growth of forestry is linked directly with research results. The importance of research to forest management was formalized in 1915 with the creation of a Branch of Research in the Forester's (Washington) Office, with Earle Clapp in charge. Research was to be based out of a central office to ensure project planning on a national scale. The move made research co-equal to the administrative side of the agency.

The original function of Forest Service research was to gather dendrological or other data required to manage the national forests (Harper 1955: 106). When research expanded to private forest lands and became "pure" as well as applied oriented, forest administrators and scientists found themselves in conflict.

Samuel Trask Dana who worked for Zon in the Office of Silvics from 1907 to 1921, recalled the early schism between the two staffs in an interview (Mauder and Fry 1966: 4):

the common attitude toward research...[was that] it was regarded as harmless, but the real job was practical work in the woods. Only the nuts got involved in establishing sample plots. I think the general attitude was that research was a good field in which to put somebody who couldn't do anything else.

Dana credited Earle Clapp with increasing the prestige and autonomy of research in the agency (Mauder and Fry 1966: 4):

Clapp and the rest of us researchers felt that control had to be under the immediate direction of the Chief of the Forest Service, independent of the administration, on the ground that the regional foresters would be certain to divert research into solving problems of immediate interest instead of into basic research.

The reason the Regional Foresters stressed practical work was because it was left to them to apply the findings of research to local problems. To cope with the problem of separation of research from administration from 1915 onward, the agency developed a line, staff, and research organization. Independence from administrative duties allowed scientists more time to dedicate to research projects, but made it necessary to develop a staff of specialists to transfer the flow of technical information into field applications (Steen 1976: 139).

USDA AND FOREST SERVICE RESEARCH

As already noted, forestry research was largely the monopoly of the Forest Service in this period (Harper 1955: 110). Influenced by his knowledge of European experiment stations, Zon advocated the establishment of regional stations on the national forests. Dana, who recommended the first (1908) site at Fort Valley, addressed the question of why forestry research was not made part of the agricultural experiment stations which already existed in the nation:

The answer to that was two-fold: they had their hands full already with agricultural problems, and they were neither interested nor competent to handle forest research.....Also if the work were organized under the agricultural experiment stations, every state would think it had to undertake experimental work in forestry--and that wasn't necessary (Mauder and Fry 1966: 5).

In fact, he regarded the Department of Agriculture in general as indifferent to the Forest Service, a status which gave the agency considerable freedom to operate independently (Mauder and Fry 1966: 5).

The separation of research from administration made the application of results to forestry practices problematic. But it did give the agency recognition for its research function. In his history of the Forest Service, Steen (1976: 138) cited research as helping keep the agency from being transferred to the Department of the Interior, since otherwise the Forest Service would merely be "an administrative organization."

FIELD WORK

Although research concerns were subordinate within the Forest Service to the chore of managing the reserves following their 1905 transfer, research was required by the new agency to cope with the immediate problem of range use. The issue of stock grazing was critical in those years since grazing, and not timber, was the primary concern of forest managers. Western stockmen were some of the strongest opponents of the creation of the forest reserves (national forests) based on their fear that grazing would be prohibited, which it was until 1898. After that year, the GLO and later Forest Service opted not to ban grazing but did attempt to regulate it, leading to years of conflict with the industry.

Range research began in the USDA Department of Botany (1868-1901) and later the Division of Agrostology. The Division of Forestry became interested in the subject and in the summer of 1897 Frederick Coville carried out the first range investigation in the Cascades of Oregon on the impact of grazing (Storey 1975: 18). This important study, published in 1898, was known as the Coville Report (Division of Forestry Bulletin No. 15) and because of it the forest reserves in Oregon were reopened for grazing (Pinchot 1947; Steen 1976).

James Jardine and Arthur Sampson conducted studies in 1907 to determine the grazing capacity of the Willowa National Forest in Oregon. The early research by Sampson provided the grounds for deferred and rotation grazing, which was the issue of carrying capacity and numbers of stock that could be grazed in an area. This controversial issue continued to be argued both inside and outside the agency and required years of study before the dispute was resolved on scientific grounds (Rowley 1985). Historian Thomas Alexander (1987) uses the case to demonstrate the shift from rule of thumb to scientific range management in the Forest Service.

The bulk of research on range management took place in the Intermountain Region at the Great Basin Experiment Station. The station was established in 1912 on the Manti National Forest in Utah. Although in 1915 Chief Forester Graves separated research from administration, he expected close cooperation between the two. In Region Four, field research was closely tied to the needs of the regional foresters (Alexander 1987: 413).

These research and administration managers held divergent views, with one faction concerned about the economics of the grazing industry and another group focused on the condition of the land. Over time it was the latter who determined policy based on the findings of the researchers on carrying capacity. In the end, the numbers of animals on the national forests were reduced, except during the war years. Professional range management emerged in the agency as the result of the work of its research staff.

McSWEENEY-McNARY RESEARCH ACT OF 1928

In the transition from timber mining to timber growing, the Forest Service Chiefs' annual reports noted the need for research to solve technical problems. By the 1920s, there were twelve regional stations with branch field (experimental) stations in the agency. What was missing was "unifying legislation and congressional support (Steen 1976: 140)." In response, in 1924 the Society of American Foresters set up a special committee on forest research with Clapp as chairman. The forest industry supported the final report which was called an organic act for forest research. In his report, Clapp (1926) argued that the agency was concerned with fire protection, timber growing, and wood utilization but lacked interest in research on those subjects. If forest industry was to follow the advice of the agency, it must be provided with information based on research. With this justification Congress passed the McSweeney-McNary Research Act on May 22, 1928.

The act legitimized the experiment stations, authorized forest research on a broad scale, and provided appropriations. Finally, it brought attention to the subject of forest research and endorsed the program (Storey 1975: 43-44). The Great Depression years retarded Forest Service research funding somewhat, but from \$970,000 in 1929, it went to \$1,160,000 in 1930, although declining in 1935 to \$1,036,000 (Storey 1975: 46).

FIRE RESEARCH

In 1922, Earle Clapp wrote that those who entered fire research were destined to "become the leaders of the most important forest research activities in the country" (quoted in Hardy 1983: 2). The relation between fire and forestry was as important to the Forest Service in the early years as floods and grazing.

One impetus for forestry research in the United States was the limits of European models for U.S. forest management. Early foresters such as Fernow and Pinchot had been trained in Europe but recognized the need for an indigenous forestry. This was especially apparent in dealing with the threat to forests posed by fire. For European forests simply did not have the fire dangers experienced in America.

This was recognized by Earle Clapp in his call for fire research, as he noted in 1933 "forest fire research apparently originated in the United States, undoubtedly as the direct result of a forest-fire situation which is more serious than in almost any other country" (Pyne 1981: 65-66). In fact, in making the movie *Bambi*, the Disney studios changed the original setting from Austria, where poachers were the main threat to wildlife, to America and inserted a great fire.

Foresters everywhere regarded fire protection to be a fundamental mission of their profession. When the USDA Forest Service was created in 1905, fire protection became a national program. The mission was used to justify the agency, and its success or failure in fire control became a public test (Pyne 1981: 68).

In addition to fire control, there was a related problem to deal with in the area of fire policy. "Light" (understory brush) burning was a common practice in northern California by timber owners to reduce fire danger. In 1910, it became a political issue as foresters considered it a threat to their views on fire protection (Olmstead 1911). Clearly there was a need for fire research.

The agency began a program, with Chief Greeley writing that "firefighting is a matter of scientific management just as much as silviculture or range improvement (Pyne 1981: 69)." The lead was taken by California with District Forester Coert DuBois directing tests of light burning and fire planning . In 1914, he published his classic/*Systematic Fire Protection in California*/__

Fire control was expensive and the 1908 Forest Fire Emergency Act allowed deficit spending in years of bad fires. The first test was in 1910 when the agency spent a million dollars fighting the disastrous fires in Idaho and Montana, then faced bankruptcy (Pyne 1981: 70). The expense alone made fire research important.

By 1921, the Forest Service dedicated the Missoula, Montana, headquarters of the Priest River Forest Experiment Station to fire research. Clapp personally arranged for Harry Gisborne to be assigned to the station. From then until his death during a fire inspection trip in 1949, Gisborne worked on fire research. The many achievements of the man are detailed in the/*Gisborne Era of Forest Fire Research: Legacy of a Pioneer*/(1983) by Mike Hardy. One significant contribution that Gisborne made was a rating index for projecting fire danger.

Fire research in the period of the 1920s was subordinate to administration, with research focused on fire control rather than fire itself. Under this pragmatic approach fire researchers were expected to leave their field plots and statistical compilations for the fireline. The southern U.S. was an exception since light burning was still an industrial practice. Thus, research on fire and wildlife management and long leaf pine silviculture was carried on in the Southern Region. When the Forest Service created a separate division of fire research in 1948 one objective was a national research agenda supervised by forester-engineers and forester-economists (Pyne 1981: 72).

The mass fire bombings of World War II (all overseas) and post-war climate changed fire research in the agency. The agency cooperated with the Office of Civil Defense on national fire defense. Surplus military equipment went to the agency and 40-man suppression crews and smokejumpers operated to contain brush fires with a rapid attack. The dangers of urban fires in southern California reinforced this orientation. Three

forest fire labs were established, with one in Macon (Georgia), one in Riverside (California) and one in Missoula (Montana). By the mid-1960s most fire research was conducted in these three centers.

Large fires in Washington and California in 1970, which burned more national forest acreage than in any year since 1910, helped introduce new research aims. In addition, the Wilderness Act (1964) and environmental movement influenced fire policy. The agency ceased its close ties with Civil Defense and the military. Fire ecology emerged as an important research subject and the agency altered its 10 a.m. containment policy in 1971 and allowed fire by prescription (Pyne 1981 and 1982). Fire sometimes became a friend of the forester in forest management but as the 1988 Yellowstone fires illustrate fire is still a political issue.

RESEARCH OVERVIEW: DEPRESSION, WAR, AND GROWTH--1930-70

While funding for research declined in the 1930s, the Great Depression era was a period of facilities expansion. Programs such as the Civilian Conservation Corps (CCC) and Works Progress Administration (WPA) provided labor and materials for construction. By 1935, forty-eight experimental forests and ranges existed, and their physical plants were being further developed.

The scope of research was also widened during this period with forest and range influences added to the program of several stations. Research on forest genetics received a boost in 1935 when the Eddy Tree Breeding Station was deeded to the government. Inspired by the work of Luther Burbank, lumberman James G. Eddy founded the station in 1925. By now it is part of the Forest Service's Pacific Southwest Forest and Range Experiment Station (Stone 1968).

The McSweeney-McNary Act sponsored research in forest-related fields in other branches of the USDA. The Bureau of Plant Industry, Soils, and Agricultural Engineering investigated forest diseases such as blister rust. Forest insect research was assigned to the Bureau of Entomology. Research in this area was urgent since bark beetles in conifer stands were destroying more merchantable timber in some regions than logging or fires combined (Storey 1975: 51-2). The Forest Service had been involved in this research since the 1902 creation of the Office of Forest Insect Investigation within the USDA Division of Entomology. Dr. A. D. Hopkins, the "father of forest entomology," was the first Chief of the division. When Hopkins retired in 1923, Dr. Frank Craighead served as Chief for the next 27 years.

The first wildlife work was assigned to the USDA Biological Survey (in 1939 it became the core of the new USDI Fish and Wildlife Service). Under the McSweeney-McNary Act, the researchers were to investigate "the life histories and habits of forest animals, birds, and wildlife, whether injurious to forest growth or of value as a supplemental resources, and in developing the best and most effective methods for their management and control." A history of the Forest Service wildlife management and research is covered in an essay by Dennis Roth (1988).

The advent of World War II produced a shift in research aims; many programs were shelved while forest products research expanded. The situation was not much better after the war, there were 62 centers, but appropriations in 1954 were almost at the level of 1947. The need for increased funding was evident in that many centers were staffed by only one or two people. When Verne L. Harper assumed the duty of Assistant Chief in charge of research in 1951, his mission was clear.

Appropriations began to increase by 1955 and climbed upward into the 1970s. From \$6 million in FY 1954 they increased to about \$14 million in 1960, and reached \$42 million by 1970. The program became somewhat more balanced, with forest products research making up only 18 percent of the 1970 budget. Past programs were expanded and new ones started, including forest recreation in 1957 and forest engineering in 1962.

Harper also sought to improve the level of professionalism by the research staff. In the area of salary, the problem was that in the development of the Federal Civil Service system, pay grades were oriented toward administrators not researchers. The higher grades were based on the number of people supervised and the program budget. Thus to get promotions, scientists had to accept administrative responsibilities and do less

research. The opportunity to conduct highly paid research elsewhere led many to resign, while those who stayed often became frustrated managers.

The solution was implemented in the Department of Agriculture with the "Man in Job Concept" where a researcher could be graded on research accomplishments based on peer review. Once accepted by the Civil Service Commission, there were two ways for advancement in the Research Branch of the Forest Service: The ladder of research administration or as research scientist.

Harper in the late 1950s changed the research structure from one of centers to one of projects. Under the new system a senior scientist led the project and supervised the staff. This led to improved research administration and better research. To further improve research quality, Harper encouraged continuing education for personnel. The Government Employees Training Act (1958) provided the incentive. In 1957, nearly ten percent of agency scientists were enrolled in graduate training. The number reached 20 percent in 1967 but fell to five percent in 1974 since nearly 75 percent of the professional research employees had advanced degrees (Storey 1975: 73-74).

One other research area that Harper influenced was international forestry. After World War II, the agency had developed ties with the Forestry Division of the Food and Agriculture Organization (FAO) of the United Nations. In the early 1950s research was assigned all aspects of international forestry by the Forest Service. The Forest Service also resumed its membership in the International Union of Forestry Research Organizations (IUFRO), and Harper was an active member until he retired in 1966.

Cooperative forestry research overseas stems from Public Law 480 (1954, amended 1958) which allowed the USDA to dispose of surplus agricultural commodities in return for host country credit. The money was then used in part to fund research by the host country in cooperation with the Forest Service.

RECREATION RESEARCH--SOCIAL SCIENTISTS

Chief Edward Cliff participated in the 53rd Western Forestry Conference in Seattle (Washington) on 12 December 1962. The title of his presentation was "Forestry and Forestry Research in the U.S. Department of Agriculture." The speech began with a summary of current USDA programs that affected forested lands. One of the most recent was the Rural Areas Development Program. Aimed at rehabilitating distressed rural communities, part of the plan called for new or expanded forest products industries. To ensure soil or watershed stabilization, the plan called for reforestation of some areas, and where profitable, recreational ventures.

In regard to Forest Service research on forest recreation, Cliff noted that the agency was only beginning to explore this new field. In his words, "...a rapid expansion of the relatively new and unexplored field of research...will provide a better basis upon which to handle the problems of policy and management of forest recreation...it is long overdue (Cliff 1962: 6)."

Why was forest recreation research ignored for so long? Harry W. Camp wrote in his essay "An Historical Sketch of Recreation Research in the USDA Forest Service" (1983), that recreation "started as the stepchild of other forest disciplines (Camp 1983: 4)." In 1940s when Dr. Verne L. Harper was director of the Northeast Forest Experiment Station, he had advocated a recreation research program. Outside of the wildlife and sportsman's associations, few were interested since many regarded it as a land management problem.

However, through the efforts of Samuel T. Dana, Dean Emeritus of the School of Natural Resources at the University of Michigan, the Forestry Research Advisory Committee recommended in 1954 that research was needed relating to forest recreation. Harper was now an Assistant Chief and funded Dana to work on a forest recreation research program. Finally, in 1960, recreation research was made a line item in the Federal budget. Public interest in the environment and wilderness in the 1960s helped ensure continued research in recreation.

At first, the recreation research program operated within the Division of Forest Economics; it was then shifted to the Division of Range Management Research. In 1959, Harry W. Camp was appointed to be the

first head of Forest Service recreation research. Camp and other felt that social aspects of recreation were important, but lack of trained researchers and support by field administrators restricted most investigations to biological and physical concerns. A 1964 Forest Service report "A National Forestry Research Program", for example, lists nine proposed projects under forest recreation research; several of which such as number eight "devising ways to measure recreation use and future requirements" required social science skills.

Recreation research was concerned first with gaining credibility through recreation natural resource studies. Work was conducted on mitigating deterioration of soils and vegetation in campgrounds, for example. A lack of support for even this type of research by field managers was part of a legacy of opposition by "old-line" managers to the influx of specialists experienced by the agency in the 1960s and 1970s. The employment of non-traditional specialists challenged the authority of the old-line managers, accordingly it took time for new programs to be accepted. Sociological studies, although advocated by Dr. George E. Jemison, who later became Chief of Research, were postponed until the recreation research program was better established and funded (Camp 1983). In this period, forest recreation research was conducted regionally by the experiment stations.

The need for specialists in forest recreation led the Forest Service between 1962 and 1965, to appoint employees to cooperative units at five schools of forestry. By 1971, T.F. McClintock, Director of Forest Environmental Research, summarized the results: "Today the demand-supply picture has been reversed. At least 50 universities have now instituted curricula in parks and recreation and/or forest recreation and have attracted several hundred students (Camp 1983: 10)." There was no longer a need for the cooperative program (although the National Park Service continues to have such a program).

Between 1963 and 1983 Forest Service recreation research "became more clearly defined, gained in popularity and scientific significance among the government agencies, and took on international significance (Camp 1983: 10)." One measure of success is the degree to which program concepts, theories, and research techniques are incorporated into management practices. For example, based on studies of river floater's activities on over 60 rivers from Florida to Alaska, the Forest Service, Bureau of Land Management, National Park Service, and others are better able to manage river recreational use. Other examples include: Regulation of visitors to wilderness areas, relocating campsites, and mitigating vandalism (Bey and Dwyer 1987). Progress in (outdoor)recreation in the use of social science methodology and concepts improved to the point that Scott (1986: 7) stated it was "one of the most practical applications of social science to date--anywhere."

Current and future research directions are already being acted on with programs in urban recreation, creation of parks and nature reserves in Third World nations, and providing increased recreational opportunities for the elderly and handicapped.

To end with my personal observation: There is still much improvement needed in the area of employment of skilled social researchers in recreation research and elsewhere in the agency (Wenner 1989; Karr 1983: 164). I find that too often social research is assigned to experiment station staff as an additional duty or contracted out. The results are often of limited value. Social research is increasing critical given the renewed agenda in the USDA on rural revitalization. Also, the social and economic importance of forest recreation in timber-dependent communities of the northwest is especially important given the reduced timber harvests expected there in the future.

It is especially critical that agency social analysis go beyond past narrow case studies of recreation potential in timber dependent communities, we need to study the transaction costs in the transitional phase from logging to a diversified economy.

FINAL VIEWS

In 1939, a conference on forest products research was held at the Forest Products Laboratory. It was one of those useful gatherings of colleagues where views could be aired, and, as such the final report was deemed "not for publication." Discovery of such reports are the joy of the historian, since the remarks they contain

are honest opinions. I will cite one of those since it relates to the topic of where research fits into the Forest Service:

We have often heard the laboratory spoken of as not being part of the Forest Service. It has been said that each unit of the Service goes its own way and thinks it should not be disturbed...We need to think about integrating the work of the Laboratory with Stations and Regions. We want to avoid thinking in terms of individuals and of individuals agencies having a field of their own (C. Forsling quoted in FPL 1939: 47).

In my study of the National Grasslands, grassland rangers/staff echoed the same complaint (West 1989). State and Private Forestry, Research, and the National Forest System form the triumvirate that comprise the USDA Forest Service. The alliance is sometimes problematic since there is a tendency toward fragmentation. Isolation of research from the other two is perhaps the most critical area of concern for the future of the agency. I will touch on this and two other points in the remainder of the paper.

Three issues have emerged from my study of the history of research in the Forest Service. These issues speak to the question of how history affected the current role of research.

The first issue concerns the relation between basic research and forest management. My review found that the basic mission of Forest Service research is to provide the knowledge on which forestry management and protection is based. To garner this knowledge, a national research program was created with regional and branch offices. The creation of a separate branch of research in the Forest Service raised the problem of technology transfer. The administrative solution was an organization of line, staff, and research personnel, with staff to advise line managers on application of research findings to local problems. Since many early resource concerns were also political issues, such as floods, grazing, and fire, research personnel tended to concentrate on applied work. For example, the work of the FPL on bleached sulfate pulping was result of World War I paper shortages. (By 1931, the lab laid the basis for the transformation of the southern timber industry with use of southern pines and hardwoods for Kraft pulp.) Overall, however, tight funding for FS research limited the number of staff and the program activities. Not until the post-war World War II economic boom and cold war generated funding increases did research really expand. Employment of professional scientists in large numbers allowed projects in pure research areas, such as forest genetics and fire spread. Research became more complicated and at times isolated from local needs. A trend reinforced by the tendency of Forest Service researchers to forge closer ties with their academic colleagues than with National Forest managers.

By the 1970s, politics intervened to shift research back into the applied arena to meet the needs of forest managers. First, in 1974, came the Forest and Rangeland Renewable Resources Planning Act (RPA), amended in 1976 by the National Forest Management Act (NFMA). The charter for research was revised by the Forest and Rangeland Renewable Resources Research Act of 1978, which supplanted McSweeney-McNary. Dennis Roth, former Forest Service Chief Historian, called the NFMA "the most significant law effecting the management of the national forests since the Organic Act" of 1897 (Roth 1989)."

The era of forest plans introduced new demands by national forest planners on research staff. For example, the 1987 Record of Decision for the Sawtooth (Idaho) National Forest (Land and Resource Management Plan) in section G, Research Needs required under part 219.7(e) of the NFMA regulations lists 24 proposed areas of investigation. The lack of data on these subjects led forest planners to request them from the regional research staff.

The second issue is related to the role of research in resolving forest multiple resources management problems. For a long time, the Forest Service enjoyed almost a monopoly on research on forestry, which allowed the agency to believe that its expertise was sufficient to manage and protect forest resources in a professional manner. For example, Catherine Caufield wrote: "In 1952, a Forest Service silviculturalist called the great forests of the Pacific Northwest 'biological deserts' (Caufield 1990: 48)." She went on to note that the first major ecological study of PNW forests did not happen until 1981. This state of Forest Service expertise is now challenged by outside scholars. The growth of forestry schools that followed World War II, fueled by Federal funds, increased university research on forestry and related natural resources. In his critical study *Timber and the Forest Service* (1986) David Clary cited several challenges to perceived

agency wisdom by independent scholars. In regard to timber management practices, it began with a 1970 study of clearcutting on the Bitterroot (Montana) NF, by Dean Arnold W. Bolle of the University of Montana school of forestry. But now debate extends to wildlife (northern spotted owl) and old growth-biodiversity. The pressure on Forest Service research personnel to develop baseline studies to guide management of resources stems then from two sources: RPA requirements and outside challenges.

The third theme is the eternal one of funding. The USDA Forest Service in the decade of the 1980s faced the consequences of reduced Federal spending resulting from the national recession and steps to reduce the Federal deficit. In his Reduction-in-Force Report of 3 April 1989, Forest Service Chief Dale Robertson noted that from 1982 to 1989 the agency went from 35,017 to 30,824 permanent employees. (Some research reductions are: FPL from 363 to 305, INT from 266 to 217, and NE from 402 to 327). Overall, in research there was a staff reduction of 25 percent from 964 in FY 1980 to 720 in FY 1990. Most of the reduction resulted from attrition when retiring workers were not replaced. In regard to funding of research, it has remained constant since 1980.

The response by research is to better allocate funds to research priorities. In their essay "Research Planning and Evaluation in the U.S. Forest Service" (1988) Bengston and Kaiser suggested ways to improve research planning and evaluation.

Deputy Chief Jerry Sesco, in his remarks to House subcommittees on 20 September 1989, discussed the future of Forest Service research in terms of a "Priority Research Program," which concerns global climate changes, as well as threatened, endangered, and sensitive (commonly referred to as T&E) plant and animal species (Sesco 1989: 6-7). However if this program is implemented, in these times of reduced funding, some current areas of research will be cut back or eliminated.

The conclusion is obvious: Research in the Forest Service is shaped by the larger political-economic context. Right now it is the greenhouse effect and the northern spotted owl and old-growth biodiversity. The challenge to research is to regain its pioneering past by being ahead of trends rather than being forced into them by outsiders. The danger for research is that they will be expected to resolve problems which appear "scientific" but are really political.

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