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REPORT TO THE CONGRESS

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The Forest Service Needs
To Ensure That The Best
Possible Use Is Made Of Its
Research Program Findings B-125053

Department of Agriculture

BY THE COMPTROLLER GENERAL
OF THE UNITED STATES

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JAN. 6, 1972



COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-125053

To the President of the Senate and the
Speaker of the House of Representatives

This is our report on the need for the Forest Service to ensure that the best possible use is made of its research program findings.

Our review was made pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53), and the Accounting and Auditing Act of 1950 (31 U.S.C. 67).

Copies of this report are being sent to the Director, Office of Management and Budget; the Secretary of Agriculture; the Secretary of the Interior; and the Secretary of Defense.

A handwritten signature in cursive script that reads "James B. Stewart".

Comptroller General
of the United States

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D I G E S T

WHY THE REVIEW WAS MADE

The Forest Service carries out a forestry research program to determine, demonstrate, and make known the best methods for managing, protecting, and using Federal, State, and private forest lands and resources.

The program is conducted at about 80 locations. Since fiscal year 1966 expenditures have been in excess of \$29 million annually, and in fiscal year 1970 the expenditures amounted to about \$43.4 million. Funds appropriated for the program for fiscal years 1971 and 1972 totaled \$48.9 million and \$54.3 million, respectively.

The General Accounting Office (GAO) made this review to find out whether Forest Service management practices ensured that benefits from this research program were being realized to the fullest extent possible in the management of forest lands and resources.

FINDINGS AND CONCLUSIONS

Hundreds of field managers in Forest Service regions and national forests individually determine whether research findings can be applied to improve their operations. These managers are not required to advise top management of their decisions or of problems encountered in attempting to use research findings. (See p. 9.)

Existing Forest Service procedures do not provide adequate means for (1) ensuring that the best possible use is made of research program results and (2) furnishing research officials with feedback of information which could be useful in planning and directing future work. Thus the Forest Service does not have adequate assurance that optimum benefits are obtained.

GAO reviewed 10 forestry research findings which research officials said could be used by field managers. These 10 findings had been cited by Forest Service research stations as achievements, and five of them had been cited as research program accomplishments in data submitted to the Congress in support of Forest Service budget requests. These findings had not been evaluated by top management, however, to determine the extent to which they could and should have been used by field managers. (See p. 10.)

In visits to various field locations of the Forest Service and other Federal and State and private agencies, GAO found that some managers were using some of the 10 findings. No one finding was being used at all the locations, and

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two of the findings were not being used at any of the locations. Field managers told GAO that unresolved problems limited the use that had been made of the findings. Even so they normally did not communicate these problems to top management for resolution or to research officials for use in planning and directing future research efforts. (See p. 10.)

The following examples are typical.

- Liquid-concentrate fire-retardant solutions tested by research in 1961 were being used by some field managers who had reported that the solutions were effective and more economical than alternative types of fire retardants. Others had not applied this research finding because they believed that there were unresolved questions pertaining to the solutions' safety, effectiveness, and availability. (See p. 11.)
- A number of research findings have been published on techniques for using fuelbreaks (e.g., areas cleared of trees and brush) for fire control. Some field managers had applied this research finding and planned extensive future applications in their areas of operation. Others had not used, or had limited the use of, fuelbreaks because they believed that there were unresolved questions concerning aesthetics and economic feasibility. (See p. 15.)
- Cost-benefit guides were developed by research to enable field managers in the Pacific Northwest to select projects with the greatest expected returns from a backlog of timber-stand improvement and disease control work. Field managers whom GAO contacted had not used these guides in selecting work priorities because they believed that there were unresolved questions pertaining to their practicality and to the feasibility of the disease control work covered by the guides. (See p. 18.)
- Tables for estimating the quantity of logging slash--debris left on the ground from logging operations--were developed by research to assist field managers in deciding on the need for treatment to reduce the fire hazard associated with the slash. Field managers contacted by GAO were not using these tables because of questions regarding the applicability of the tables to their areas of operation, the need for such precise data for decisions on slash treatment, and the relative importance of slash weight in deciding on the type of slash treatment. Some managers were not aware of the tables. (See p. 20.)

Varying conditions among Forest Service regions can affect the potential use of forestry research findings. Such differences, however, increase the need for improved procedures to provide a basis for top management to decide on the extent to which research findings can and should be used or whether further research is needed to make them useful. (See p. 23.)

The need for improved procedures may apply also to the Forest Service's equipment development and testing program. (See p. 25.)

RECOMMENDATIONS OR SUGGESTIONS

To identify and exploit fully the opportunities for improved resource management through the best possible use of the results of its research program, the Forest Service should establish procedures to require that:

- Evaluations be made of research findings to determine the extent to which they can and should be used.
- Forest Service field managers use the findings determined to be usable or explain why their use is not feasible or desirable.
- Comments be obtained from managers of other Federal and State and private lands on the applicability of research findings.
- Evaluations be made of the information obtained from Forest Service and other field managers to identify opportunities for more widespread use of research findings or the need for additional research.

These procedures should be applied through an official or officials designated by the Chief, Forest Service, to be responsible for coordinating the use of research findings and for deciding on the extent to which they are to be applied throughout the Forest Service.

To aid in planning and directing future forestry research efforts, the Forest Service should develop procedures for advising research officials of the results of the evaluation of research findings. (See p. 24.)

AGENCY ACTIONS AND UNRESOLVED ISSUES

The Forest Service agreed in principle with GAO's findings and conclusions and agreed in general with GAO's recommendations. The Forest Service also stated that it would explore a number of alternatives for carrying out GAO's recommendations. (See p. 24.)

MATTERS FOR CONSIDERATION BY THE CONGRESS

Members of Congress have expressed concern for the need for increased research to keep pace with the growing public demand for use of forest lands and resources. Information contained in this report may be applicable or useful to other Government agencies engaged in research and development activities.

CHAPTER 1

INTRODUCTION AND SCOPE

The Forest Service, Department of Agriculture, is responsible for promoting the conservation and wise use of forest resources on Federal, State, and private forest and related watershed lands, which constitute about one third of the total land area of the Nation. Forest resources include timber, range, recreation, watersheds, fish, and wildlife. Under the authority of the McSweeney-McNary Forestry Research Act of 1928, as amended (16 U.S.C. 581), the Forest Service carries out a forestry research program to help Federal agencies, States, and private landowners solve problems in managing forest lands and resources.

Federal agencies, other than the Forest Service, which have forest management responsibilities include the Bureau of Land Management, the Bureau of Indian Affairs, and the National Park Service--all constituent agencies of the Department of the Interior--and the Department of Defense.

The act provides that the Forest Service conduct such experiments as deemed necessary to determine, demonstrate, and promulgate the best methods for:

- Reforestation and growing, managing, and utilizing timber, forage, and other forest products.
- Maintaining favorable conditions for water flow and for preventing erosion.
- Protecting timber and other forest growth from fire, insects, disease, or other harmful agents.
- Obtaining the fullest and most effective use of forest lands.

The act also authorizes investigations to determine and make known the economic considerations which should underlie the establishment of sound policies for managing forest lands and utilizing forest products.

To achieve its forestry research program objectives, the Forest Service has established policies which provide, in part, that it will

- carry on a national forestry research program under which carefully planned and coordinated lines of research are identified and set forth to solve major problems of high priority;
- conduct research directly with its own scientists and indirectly by providing university and other scientists with financial support;
- cooperate with other agencies, both public and private, in the interests of a coordinated and effective national forestry research program; and
- promptly publish research findings and disseminate the findings in a manner that will encourage their acceptance and use and assist user agencies and individuals in applying research results.

Forest Service forestry research findings are published and distributed widely to land managers, scientists, and interested organizations. Workshops, field demonstrations, seminars, and consultations are used to promote the use of the research findings.

The Forest Service's forestry research program is under the overall planning, direction, and coordination of its Deputy Chief, Research. The research work is organized, for the most part, under the management of directors at the Forest Products Laboratory, Madison, Wisconsin; the Institute of Tropical Forestry, Rio Piedras, Puerto Rico; and the following eight regional experiment stations.

<u>Experiment station</u>	<u>Location</u>
Northeastern	Upper Darby, Pennsylvania
Southeastern	Asheville, North Carolina
Southern	New Orleans, Louisiana
North Central	St. Paul, Minnesota
Rocky Mountain	Fort Collins, Colorado
Intermountain	Ogden, Utah
Pacific Southwest	Berkeley, California
Pacific Northwest	Portland, Oregon

The research work is performed by Forest Service employees at about 80 Forest Service locations.

In a report on Forest Service activities dated March 26, 1971, the Chief of the Forest Service stated that (1) there were a number of problems on which additional knowledge from research was needed to do the best job of timber management on the national forests in a quality environment and (2) a greatly strengthened research program should be undertaken. Also there is congressional concern over the need for more research to keep pace with the growing public demand for use of forest lands and resources. For example, during recent appropriation hearings the Subcommittee on the Department of the Interior and Related Agencies of the House Committee on Appropriations stressed the need for more forestry research.

Expenditures for the forestry research program increased from about \$29.3 million in fiscal year 1966 to about \$43.4 million in fiscal year 1970. During fiscal year 1970 the Forest Service issued 1,253 research publications at an average expenditure of \$35,000 each. Appropriations for the program for fiscal years 1971 and 1972 totaled \$48.9 million and \$54.3 million, respectively.

The Forest Service's Engineering Division conducts a separate program for developing and testing equipment and materials. Most development and testing work is done at the equipment development centers in Missoula, Montana, and San Dimas, California, and at an electronics center in Beltsville, Maryland. In fiscal year 1971, \$1.5 million was provided for equipment and materials development and testing projects.

Our review was directed primarily toward determining whether the Forest Service had adequate management procedures to ensure that benefits from the research program were being realized to the fullest extent possible in the management of forest lands and resources. Also we obtained information on procedures followed in the equipment development and testing program.

We reviewed the laws authorizing the research program and the policies, procedures, and practices relating to the

implementation of research results; we did not review the overall program operations at any of the locations we visited.

We also discussed the procedures and practices followed in implementing selected forestry research findings with officials at the Forest Service headquarters office in Washington, D.C., and at several field locations of the Forest Service, Bureau of Land Management, Bureau of Indian Affairs, and National Park Service and with State and private forest resource managers. The Forest Service field locations included the experiment stations at Asheville, Ogden, Fort Collins, Berkeley, and Portland; the equipment development center at Missoula; and several research locations.

CHAPTER 2

NEED FOR EVALUATIONS AND DECISIONS CONCERNING USEFULNESS OF FORESTRY RESEARCH FINDINGS

The Forest Service needs to improve its procedures to require high-level management evaluations and decisions on whether forestry research findings, such as new products or practices, can and should be put to actual use in the management of Forest Service lands and resources. Evaluations of the research findings and decisions on whether they should be used are left to the many individual field managers of Forest Service lands and resources.¹ The individual field managers are not required to advise top management of their evaluations and decisions or of the problems they might encounter in using the research findings.

Also the Forest Service needs to improve its procedures to provide for obtaining and evaluating comments from managers of other Federal and State and private lands on the usefulness of Forest Service research findings in their operations.

Existing Forest Service procedures do not provide adequate means for (1) ensuring that the best possible use is made of research program results and (2) furnishing research officials with feedback of information which could be useful in planning and directing future work under the program. Thus the Forest Service does not have adequate assurance that optimum benefits are obtained from the program, for which \$54.3 million was appropriated for fiscal year 1972.

¹ Many individual field managers receive information on forestry research findings and consider their application. For example, the Forest Service has about 130 national forest supervisors and 760 district rangers who have the responsibility for making decisions on the use of research findings.

Although Forest Service research officials publish information on over 1,000 forestry research findings annually, the Forest Service does not identify which findings are ready for use by field managers.

To determine what use, if any, was being made of forestry research findings which had been reported as important research program achievements, we selected 10 findings for detailed review. Research officials told us that these 10 findings could be used by field managers. The 10 findings had been cited by Forest Service research stations in reports to the headquarters office as achievements, and five of them had been cited as research program accomplishments in data submitted to the Congress in support of Forest Service budget requests. No top-level decisions had been made, however, on whether and where the findings could or should be used.

In our visits to several field locations of the Forest Service and other Federal and State and private agencies, we found that some field managers were using some of the 10 findings. No one finding was being used at all the locations, and two of the findings were not being used at any of the locations.

Field managers told us that, in their opinions, unresolved problems, some of which are discussed below, had limited the use that they had made of the 10 research findings. The field managers normally did not communicate these problems to (1) top management for evaluations and decisions on the use to be made of the research findings or (2) research officials for use in planning and directing future research efforts.

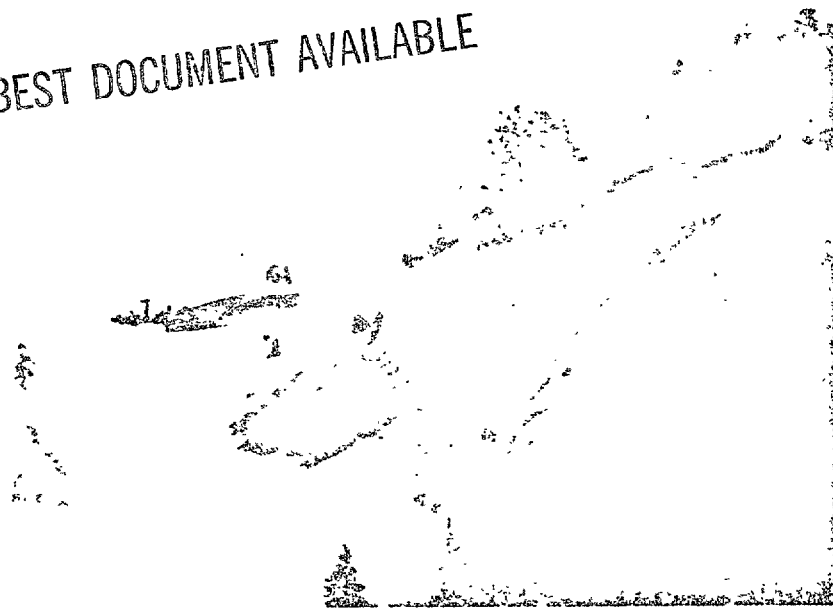
We recognize that varying conditions among Forest Service regions can affect the potential use of forestry research findings. Such differences, however, increase the need for improved procedures to provide a basis for top management to decide on the extent to which findings developed under the research program can and should be used, giving consideration to whether there are problems limiting use that may require further research.

The following four examples are typical of our review findings.

LIQUID-CONCENTRATE FIRE RETARDANT

Several different types of flame-inhibiting chemical retardants are available to field managers for fire fighting. The retardants usually are dropped on fires from aircraft. The retardants can be categorized into two groups, depending on the type of handling required. One group requires mixing tanks to prepare liquid solutions from dry chemicals and pumps for recirculating and transferring the solutions from the mixing tanks to the aircraft. In the other group-- liquid-concentrate fire-retardant solutions--the chemicals already are in a liquid form and do not require mixing tanks. During 1970 the Forest Service dropped about 10.7 million gallons of both types of retardants on fires.

BEST DOCUMENT AVAILABLE



AIRCRAFT DROPPING FIRE
RETARDANT ON A FOREST FIRE IN THE PACIFIC NORTHWEST

(Photographs furnished by the Forest Service)

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AIRCRAFT DROPPING FIRE
RETARDANT ON A FOREST FIRE IN THE PACIFIC NORTHWEST

(Photographs furnished by the Forest Service)

A research official of the Southeastern Experimentation Station told us that liquid-concentrate solutions first were tested by that station in 1961. The Forest Service's Western Region started using liquid-concentrate solutions in operations on a trial basis during 1962 in the southern Appalachian Mountains and on a regionwide basis during the following year. Subsequently the State forestry departments in Georgia and Florida began using liquid-concentrate solutions in their fire control programs.

In 1965, the Southeastern Experiment Station published and disseminated the results of its research work on liquid-concentrate solutions and, in a report to the headquarters office, stated that the solutions were a significant step in developing new and improved fire control methods.

In areas outside the South, virtually no use was made of the liquid-concentrate solutions until 1969 when the Forest Service's Pacific Northwest Region, at the suggestion of an employee who had transferred from the Southeastern Region, conducted trial tests with the solutions. After the tests were completed, Pacific Northwest regional officials concluded that liquid-concentrate solutions were superior to the retardant prepared from dry chemicals that they

had been using. The officials therefore decided to phase out the dry-chemical retardant and adopt the liquid-concentrate solutions.

In hearings on its fiscal year 1971 budget request before the Subcommittee on Interior and Related Agencies of the Senate Committee on Appropriations, the Forest Service reported that the use of liquid-concentrate fire-retardant solutions in the Pacific Northwest had been effective on fires and had reduced manpower needed for handling retardants by as much as 75 percent. The Forest Service also cited the use of liquid-concentrate solutions as an achievement in fire control and fire research in data used to support its 1972 budget request.

Although the Southern and the Pacific Northwest Regions were using liquid-concentrate solutions, managers from other Forest Service regions, the Bureau of Land Management, and a State forestry department whom we contacted during our fieldwork still were using retardants prepared from dry chemicals. Fire control officials of Forest Service regions in the western United States, other than the Pacific Northwest Region, told us that they were not using liquid-concentrate solutions for such reasons as the

- questionable effectiveness of liquid-concentrate solutions on the types of fires in their regions,
- lack of visibility of the solutions after application,
- unresolved questions concerning the tendency of the solutions to spread out too much after dropping, and
- lack of a supply source.

Officials of the California State Forestry Department told us that they would not approve the use of liquid-concentrate solutions in their operations because:

- The solutions had not been fully evaluated in accordance with the Forest Service's standard retardant-testing procedures. (This fact was confirmed by the Forest Service in a letter to us dated June 15, 1970.)

--The solutions had not been tested to determine whether their metal corrosion properties posed a hazard to safe operation of aircraft or whether the solutions had toxic properties. (Tests by the Forest Service's Equipment Development Center in San Dimas in 1969 and subsequent tests by researchers at the Northern Forest Fire Laboratory showed that corrosion caused by liquid-concentrate solutions exceeded the corrosion standards established by the Forest Service.)

The State of California accounts for most chemical fire retardants used by State forestry departments in the United States.

The differences of opinion as to the desirability of using liquid-concentrate solutions in lieu of solutions prepared from dry chemicals have not been resolved, although 10 years have elapsed since the liquid-concentrate solutions first were tested and used. Forest Service top management has not required that the differences of opinion among field managers be communicated to top management for resolution, nor has it determined the extent to which this forestry research finding can and should be applied in the Forest Service.

FUELBREAKS

Fuelbreak techniques, such as clearing areas of brush and trees, were developed under the research program to help (1) confine disaster fires to smaller areas and (2) prevent brush fires from spreading into high-value areas, such as residential and commercial areas and important watersheds.



A FUELBREAK IN A TIMBERED
AREA OF NORTHERN CALIFORNIA

(Photograph furnished by the Forest Service)

Fuelbreak techniques were developed by the Pacific Southwest Experiment Station through a cooperative effort with the State of California, the Los Angeles County Fire Department, the California Region of the Forest Service, and other organizations. They were tested in the brushlands of southern California and later were adapted to timbered areas.

Fuelbreak research still was going on at the time of our review, and the results of the research have been published periodically since 1959 when they were reported as accomplishments by the Pacific Southwest Experiment Station. That station reported, in its 1966 annual report to the Deputy Chief for Research, that fuelbreak studies up to that time had cost about \$200,000 annually. Information on the cost of fuelbreak research after 1966 was not readily available.

In data supporting its fiscal year 1967 budget request, the Forest Service reported that fuelbreak techniques developed by research were being used in large areas that were highly susceptible to fire because of heavy concentrations of such material as trees, brush, grass, and slash. In its fiscal year 1972 budget request, the Forest Service reported that fuelbreaks had been successful in helping to control fires and ultimately would result in fewer acres burned by wildfires, less resource damage, and lower fire-fighting costs.

By 1971 about 2,600 miles of fuelbreaks had been constructed in California--about 1,400 miles on Forest Service lands and the remainder on State and private lands. About 600 miles of those fuelbreaks were of marginal use and may become ineffective because funds have not been available for control of brush regrowth. The California Region has reported to the Chief, Forest Service, that 6,320 additional miles of fuelbreaks need to be constructed in that region during the next 10 years.

An official of the Southwestern Region told us that about 350 miles of fuelbreaks had been constructed on lands in that region in conjunction with timber sales and that more fuelbreaks were planned. The Northern and Intermountain Regions also had constructed several fuelbreaks on a trial basis. The Rocky Mountain and Pacific Northwest Regions,

however, had not constructed any fuelbreaks. Officials of the Rocky Mountain Region told us that they did not believe that the fire hazard in the region was great enough to justify constructing fuelbreaks.

Officials of the Pacific Northwest Region told us that they believed that the drawbacks of fuelbreaks were the high cost of construction, the damage to aesthetics, and the withdrawal of timber land from production. These officials also stated that they believed that greater fire protection benefits were obtained from using funds for physical treatment of debris remaining after logging and thinning rather than for constructing fuelbreaks. They stated, however, that fuelbreaks were to be constructed in four forests in their region, in conjunction with such other programs as timber sales and thinning operations, as part of a 1971 Pacific Northwest Experiment Station research study.

Field managers of the Bureau of Land Management, the Bureau of Indian Affairs, and other agencies whom we contacted raised similar objections to the construction of fuelbreaks.

Although some of these managers told us that they believed that there were unresolved questions concerning whether the benefits from fuelbreaks were worth the costs, Pacific Southwest Experiment Station officials told us that Forest Service researchers had not made any analysis of the costs and benefits associated with fuelbreaks because other phases of fuelbreak research had been considered more important. They said, however, that the station planned to prepare a summary publication on fuelbreaks that would include cost-benefit considerations.

Although considerable forestry research had been done on fuelbreaks and more was planned, the questions raised and the problems cited by the field managers concerning fuelbreaks had not been communicated to Forest Service top management for resolution and no top-management decision had been made defining the conditions under which construction of fuelbreaks would be justified.

COST-BENEFIT GUIDES

Dwarf mistletoe, a parasitic plant that attacks and damages certain tree species, causes an annual loss of an estimated 29 million cubic feet of ponderosa pine timber in the Pacific Northwest Region. Dwarf mistletoe usually is controlled by cutting down the infected trees. This work generally is done in conjunction with precommercial thinning¹ because one operation complements the other.

The Pacific Northwest Region each year precommercially thins about 50,000 acres of ponderosa pine. A regional official told us that the region had a backlog of about 430,000 acres of ponderosa pine that was ready for precommercial thinning. He told us also that this backlog existed because sufficient funds and manpower had not been available to do the work. Because of the significant backlog and limited funds, field managers in the region must decide on work priorities.

To assist field managers in assigning priorities, cost-benefit guides for both dwarf mistletoe control and precommercial thinning of ponderosa pine were developed by the Pacific Northwest Experiment Station from time and cost studies. The guides provide (1) a basis for estimating costs of the work and (2) rate-of-return data for assigning work priorities to those stands of trees where the greatest returns can be expected. The guides were published and widely disseminated to field managers and others by the station in 1966. In its budget request for fiscal year 1968, the Forest Service cited the cost-benefit guides developed through research as a major accomplishment.

Field managers of the Forest Service, Bureau of Land Management, Bureau of Indian Affairs, and State and private agencies in the Pacific Northwest whom we contacted told us that they were limiting their dwarf mistletoe control and precommercial thinning to stands of trees that were

¹To improve the growth of timber in areas with dense young trees, the Forest Service cuts down a considerable number of the trees to allow selected ones to grow more rapidly. This work is called precommercial thinning.

accessible, overstocked, and/or lightly infected and that they were not using the cost-benefit guides to establish work priorities within these parameters.

Some managers told us that:

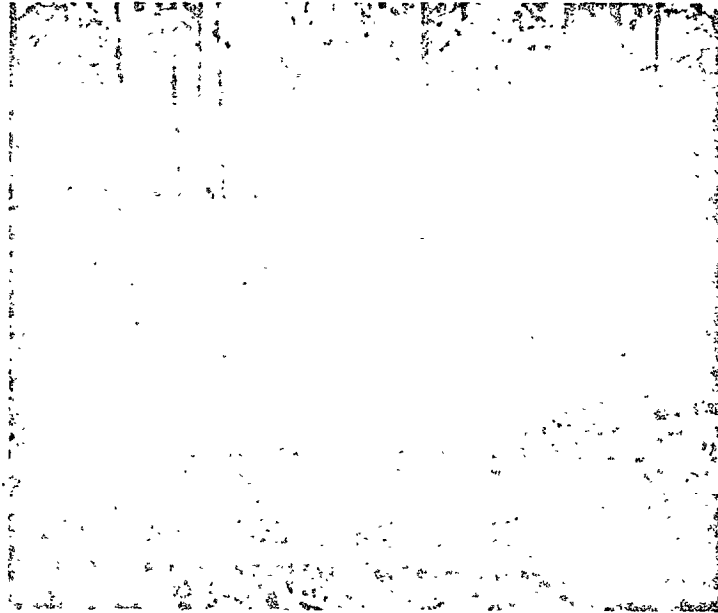
- The guides were not practicable for use in making decisions because of the time involved in collecting all the information needed to make a sound decision on the basis of cost-benefit factors.
- Dwarf mistletoe control work had not been done or had been discontinued because it had not proved to be an effective means of controlling the problem.
- The guides did not take into consideration all factors necessary for establishing priorities; e.g., the susceptibility of an unthinned stand of trees to insect damage and the cost of disposing of slash created by thinning operations.

Forest Service top management had not required that these problems be communicated to them for resolution.

Although the Forest Service has cited the development of the cost-benefit guides for dwarf mistletoe control and precommercial thinning as a major accomplishment, a top-management decision has not been made to resolve differences of opinions among the research staff and the field managers on the practicality of applying the cost-benefit guides.

SLASH-WEIGHT TABLES

When logging and thinning operations are performed, large volumes of slash are left on the ground.



FRESH, GREEN SLASH CREATED FROM THE PRECOMMERCIAL THINNING OF A STAND OF YOUNG PONDEROSA PINE IN THE PACIFIC NORTHWEST REGION



1-YEAR-OLD DOUGLAS-FIR, CEDAR, AND HEMLOCK SLASH OF MEDIUM WEIGHT CREATED FROM A LOGGING OPERATION IN THE PACIFIC NORTHWEST REGION

(Photographs furnished by the Forest Service)

Slash is a fire hazard and may be treated by burning or by such mechanical means as crushing and chipping, to reduce the hazard. The field manager has to decide on the method of treatment to use.

In 1960 the Pacific Southwest Experiment Station published and disseminated tables--referred to as slash-weight tables--for estimating the quantity of slash that would be left on the ground from logging and thinning operations. Additional research by the Pacific Northwest Experiment Station resulted in the development of slash-weight tables for slash created by precommercial thinning of ponderosa pine.

In his annual report to the Secretary of Agriculture for 1968, the Chief, Forest Service, stated that tables and techniques for predicting the quantity of slash would facilitate special fire control planning to minimize the likelihood of fire and that this research could have an impact on the economics of timber management throughout the West.

Forest Service Headquarters research officials told us that the tables, which they considered to be a major fire research accomplishment, could be used by forest managers throughout the United States and that the tables should be incorporated in the Forest Service's field office manuals.

The slash-weight tables had not been incorporated in the field manuals at the Forest Service regional offices included in our review. Further, the field managers whom we contacted in five Forest Service regions and in several field locations of other Federal and State and private agencies were not using these tables to determine the need for slash treatment and the method to be used.

Some of the Forest Service field managers told us that they were not aware of the slash-weight tables developed through research. Others told us that they did not, or could not, use the tables to make slash-treatment decisions for such reasons as:

--The tables were based on information collected from another part of the country.

- Such precise slash-weight information was not needed to make slash-treatment decisions.
- Slash weight is only a minor consideration in determining the need for slash treatment and the method to be used.

Field managers we talked to from other Federal and State and private agencies raised similar objections to the use of the slash-weight tables.

Although the field managers whom we contacted were not using the slash-weight tables that had been developed, the Rocky Mountain Experiment Station was developing slash-weight tables during 1971 in a cooperative study with Forest Service field managers in the Black Hills National Forest in South Dakota.

Forest Service top management has not required the differences of opinion among the research staff and the field managers as to the usefulness of slash-weight tables to be communicated to them for resolution, nor has it determined the extent to which slash-weight tables can and should be used by the Forest Service.

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In a November 1969 letter, we requested the Forest Service to comment on the advisability of establishing a formal system for implementing forestry research results, including the assignment of responsibility for such implementation to an organizational unit in the headquarters office. The Forest Service advised us by letter dated December 29, 1969, that at one time it had considered such a system in connection with fire research results but that national centralization had lost some of its appeal and was not adopted because of (1) the wide diversity of problems from one region to another and (2) the wide diversity and capability of the agencies served.

CONCLUSIONS

To ensure that optimum benefits are obtained from its forestry research program, the Forest Service needs to establish procedures requiring (1) top management to identify and exploit fully opportunities for improved resource management through optimum use of research findings and (2) research officials to be provided with feedback of information on the use and applicability of research findings to aid in planning and directing future forestry research.

We recognize that varying conditions among Forest Service regions can affect the potential use of forestry research findings. Such differences, however, increase the need for improved procedures that will provide a basis for top management to decide on the extent to which the findings developed under the research program--for which \$54.3 million was appropriated for fiscal year 1972--can and should be used, giving consideration to whether there are problems limiting use that may require further research.

Such procedures would help the Forest Service define the differences that exist among the various regions of the country and thus would enable the Forest Service to plan its forestry research program to give consideration to these differences.

RECOMMENDATIONS TO SECRETARY OF AGRICULTURE

We recommend that the Forest Service, to identify and exploit fully the opportunities for improved resource management through the best possible use of forestry research findings, establish procedures to require that:

- Evaluations be made of research findings to determine the extent to which they can and should be used.
- Forest Service field managers use the findings determined to be usable or explain why their use is not feasible or desirable.
- Comments be obtained from managers of other Federal and State and private lands on the applicability of research findings.

--Evaluations be made of the information obtained from Forest Service and other field managers to identify opportunities for more widespread use of research findings or the need for additional research.

These procedures should be applied through an official or officials designated by the Chief, Forest Service, to be responsible for coordinating the use of research findings and for deciding the extent to which they are to be applied throughout the Forest Service.

We recommend also that the Forest Service, to aid in planning and directing future forestry research, develop procedures for advising research officials of the results of the evaluation of research findings.

AGENCY COMMENTS

The Forest Service advised us by letter dated October 22, 1971 (see app. I), that it agreed in principle with our findings and conclusions and in general with our recommendations. The Forest Service stated:

--That present procedures included periodic field inspections by high-level management and other mechanisms for evaluating, implementing, and obtaining comments on research findings but that it recognized that they were not fully successful or satisfactory.

--That opportunities for more widespread use of research findings and for additional research must be identified more precisely.

The Forest Service stated that there were a number of alternatives for carrying out our recommendations and for improving controls over the program and that the Forest Service would explore such alternatives. The Forest Service stated also that it would consider our suggestion that the recommended procedures be carried out by an official or officials designated by the Chief of the Forest Service to be responsible for coordinating the use of research findings and for deciding on the extent to which they are to be applied throughout the Forest Service.

CHAPTER 3

FOREST SERVICE EQUIPMENT DEVELOPMENT

AND TESTING PROGRAM

Under the Forest Service's equipment development and testing program, the Engineering Division carries out projects to

- design, construct, and test new equipment and materials;
- test, and, if necessary, modify, existing equipment and materials; and
- formulate standards and specifications to be used as guides for purchasing equipment and materials.

The results of the projects--under which such items as scooters, powered load carriers, excavating machines, explosives, rockcrushers, and rock drills have been developed and tested--are published and disseminated to Forest Service field managers and to other Federal and State and private forest managers. Also the Forest Service holds special demonstrations to encourage acceptance and use of the project results.

In its October 22, 1971, letter, the Forest Service pointed out that its procedures for this program required reviews by regional and high-level headquarters advisory boards before a proposed development or testing project could be undertaken. The Forest Service also stated that follow-up actions, including feedback and comments from equipment users, were a formal part of all significant equipment developments.

Decisions on whether to use the project results, however, are left to the many individual Forest Service field managers. A program official told us that problems had been encountered in obtaining wide acceptance and use of the project results.

Also program officials had received feedback of information from some field managers who had used or evaluated specific project results, but the Forest Service's procedures do not call for top-level management to obtain and evaluate this information for all equipment and materials successfully developed or tested under the program.

We believe that management procedures, along the lines recommended on page 23 for the forestry research program, may be needed to provide the Forest Service with greater assurance that optimum benefits are obtained from the equipment development and testing program.

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
WASHINGTON, D.C. 20250

IN REPLY REFER TO

1420

October 22, 1971

Mr. Max Hirschhorn
Associate Director
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Hirschhorn:

We have reviewed the draft of the General Accounting Office (GAO) Report to Congress, "Need for Better Assurance That Optimum Benefits are Obtained from Forest Service Research Programs."

We agree in principle with the "Findings and Conclusions" set forth. The Forest Service recognizes the need to improve procedures for evaluating research findings and obtaining comments from forest land managers.

Some procedures are available. Periodic inspections by high-level management of the research programs and relationships to field managers and other research organizations are required. These inspections include General Integrating Inspections, General Research Inspections, and General Functional Inspections. During the inspections contacts are made with Forest Service and other Federal, State, and private land managers and cooperators. Less formal assistance visits also are made. In addition, local advisory committees review Station research programs and recommend shifts in emphasis. Other mechanisms for implementing and evaluating research and for obtaining comments from land managers could be cited. The Forest Service recognizes that present procedures are not fully successful or satisfactory. We need to do better and we are making plans to do so.

Regarding the "Recommendations or Suggestions" to the Secretary of Agriculture, we are in general agreement. Procedures for evaluating research findings, getting them into practice, and obtaining feedback from forest managers are available but do



APPENDIX I

need improvement. New ones also must be developed. Opportunities for more widespread use of research findings and for additional research must be identified more precisely. The suggestion that the Chief, Forest Service, designate an official or officials to coordinate use of research findings and to decide the extent to which they are applied will be considered.

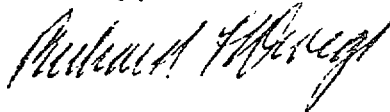
The Chief does have formal review procedures, prescribed in the Forest Service Manual, for the equipment development program. Regional equipment advisory boards make recommendations to an Equipment Advisory Board chaired by an Associate Deputy Chief at the Washington Office level. This Board has representatives from National Forest System, State and Private Forestry, and Research. Only projects approved by this Board are assigned to a Center.

Follow-up actions, including feedback and comment from equipment users, are a formal part of all significant equipment developments. We recognize that certain developments do not result in optimum solutions for field application and follow-up is not necessary. These cases are exceptions as can be shown by records.

There are a number of alternatives for carrying out the recommendations in the GAO report and for improving controls over programs. We will explore such alternatives. To meet rapidly changing public needs and fulfill multiple use and sustained yield objectives, the Forest Service must continue to maintain organizational flexibility.

The opportunity to review the draft is greatly appreciated.

Sincerely,



RICHARD F. DROEGGE
Acting Chief

PRINCIPAL OFFICIALS
OF THE DEPARTMENT OF AGRICULTURE
RESPONSIBLE FOR THE ADMINISTRATION OF
ACTIVITIES DISCUSSED IN THIS REPORT

	<u>Tenure of office</u>	
	<u>From</u>	<u>To</u>
SECRETARY OF AGRICULTURE:		
Earl L. Butz	Dec. 1971	Present
Clifford M. Hardin	Jan. 1969	Nov. 1971
Orville L. Freeman	Jan. 1961	Jan. 1969
ASSISTANT SECRETARY, RURAL DEVELOPMENT AND CONSERVATION:		
Thomas K. Cowden	May 1969	Present
John A. Baker	Aug. 1962	Jan. 1969
CHIEF, FOREST SERVICE:		
Edward P. Cliff	Mar. 1962	Present
DEPUTY CHIEF, RESEARCH:		
R. Keith Arnold	May 1969	Present
George I. Jamison	Jan. 1966	Jan. 1969
DEPUTY CHIEF, NATIONAL FOREST SYSTEM (note a):		
Edward W. Schultz	June 1971	Present
M. M. Nelson	May 1962	May 1971
DEPUTY CHIEF, STATE AND PRIVATE FORESTRY:		
E. M. Bacon	Oct. 1966	Present

^aTitle changed from Deputy Chief for National Forest Protection and Development, effective March 21, 1966.

Copies of this report are available from the U. S. General Accounting Office, Room 6417, 441 G Street, N W., Washington, D.C., 20548.

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