



UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

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DWR

COMMUNITY AND ECONOMIC
DEVELOPMENT DIVISION

February 26, 1982

Mr. R. Max Peterson
Chief, U.S. Forest Service
U.S. Department of Agriculture
Washington, D.C. 20250



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Dear Mr. Peterson:

SUBJECT: Further Efforts Needed to Ensure
Best Use of Research Findings

We have made a limited review of the results of actions taken by the Forest Service to obtain the best use of research findings. Since our 1972 report to the Congress on this subject 1/, the Forest Service has made a number of organizational and procedural changes to increase the use of research findings in the management of lands and resources. While much progress has been made, our work showed a need for the Forest Service to take further steps to ensure the best use of research findings.

As discussed in detail in the enclosure, we found that a more systematic approach, with accountability, is needed in obtaining information on the use and utility of research findings. The annual reports of research results prepared by research project leaders and other management levels do not always specifically identify the benefits that land managers have obtained and can expect to obtain from use of research findings. The regional foresters and area directors do not systematically provide meaningful information to station directors on the extent of use of the research findings by Federal and other land managers, or whether there are problems which may be limiting or impairing the use of the research results. As a result, project leaders, station directors, and other levels of Forest Service management do not have all of the information needed to adequately identify and expand all possible opportunities for obtaining better use of research findings or, where the need is indicated, to refocus ongoing research to maximize benefits to land managers.

1/ Report to the Congress, The Forest Service Needs to Ensure that The Best Possible Use Is Made Of Its Research Program Findings, B-125053, January 6, 1972

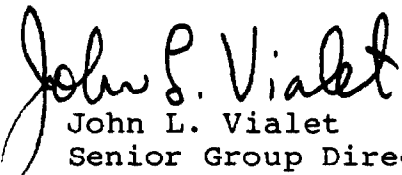
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These matters were discussed with Forest Service Headquarters officials. In response to our concerns, they agreed to modify a directive that was being prepared on technology transfer responsibilities. The modifications will make clear that regional foresters and area directors will be responsible for providing detailed input to research project leaders and station directors on the use made of research findings by Federal and other land managers or explain any problems that may be limiting or impairing use. If this information is obtained and used in a systematic manner the Service will be able to improve the use and utility of research findings and provide better information in its reports to the Congress. Our conclusions and the actions being taken by the Forest Service are discussed in more detail on pages 8 and 9 of the enclosure.

In view of the proposed directive modifications, we are not making any recommendations in this report. We would appreciate your informing us of your final action on this matter.

Sincerely yours,


John L. Vialet
Senior Group Director

Enclosure

cc: Inspector General

FURTHER EFFORTS NEEDED TO ENSURE BEST
USE OF FOREST SERVICE RESEARCH FINDINGS

The Forest Service has a large forest and rangeland research program to develop scientific information and new technology for use by Federal, State, and other public and private land managers. The research work is directed through a network of eight regional forest and range experiment stations and a forest products laboratory. This work involves some 2,500 active research studies performed by about 1,000 scientists assigned to 270 research work units at about 80 research laboratories. For fiscal years 1977 through 1981, annual appropriations for the Forest Service research program have exceeded \$100 million and for fiscal year 1981 it was about \$128 million. An average of about 1,500 research publications containing research findings have been issued annually by the Forest Service during the past 5 years.

PRIOR GENERAL ACCOUNTING OFFICE REPORT

On January 6, 1972, we reported to the Congress that the Forest Service needed to ensure that the best possible use is made of its research program findings and made recommendations to help achieve this objective. The Forest Service agreed with the report's findings and conclusions and promised to take corrective actions. Our recent review was performed to determine whether actions taken by the Forest Service are adequate to assure the best use of research findings.

SCOPE AND METHODOLOGY

We examined legislation, policies, and procedures applicable to Forest Service research findings and discussed these with (1) officials at Forest Service Headquarters involved in technology transfer activities (2) officials at Forest Service research stations in Berkely, California; Fort Collins; Colorado; and Portland, Oregon. We also reviewed the procedures followed by project leaders in gathering and reporting information on research progress, accomplishments, and use.

We selected for review one research finding from four of the eight project leaders of the Pacific Northwest Forest and Range Experiment Station who had significant findings reported to the Congress by the Forest Service in its 1982 budget justification and its 1980 annual report on significant research findings. In these documents the Forest Service cited 51 significant research findings and said that 6 were being used, 15 could be used, and 13 would be helpful to land managers. For the other 17 findings cited, the Forest Service either did not include any

comments on the use or utility of the research or indicated that the findings were not ready for use.

For each of the four research findings, we reviewed the information reported on them to station directors and the Deputy Chief of Research. We also interviewed the research project leaders and/or lead scientists, and reviewed any documentation researchers had accumulated on the use being made or problems being experienced by land managers in attempting to use the research findings. We also discussed the general procedures used for identifying and reporting the use made of major research accomplishments with the director and his staff at the Pacific Northwest Forest and Range Experiment Station.

CONGRESSIONAL CONCERNS

In the last 10 years, various legislation has been enacted emphasizing the importance of making effective use of research findings developed in Federal research programs. The National Forest Management Act of 1976 (16 U.S.C. 1600) requires the Secretary of Agriculture to submit an annual report to the Congress describing major Forest Service research programs, significant findings, and how these findings will be used in National Forest System management. In 1978 the basic authority for the Forest Service research program was changed with enactment of the Forest and Rangeland Renewable Resources Research Act (16 U.S.C. 1641) which emphasized that "scientific discoveries and technological advances must be made and applied to support the protection, management, and utilization of the Nation's renewable resources." Further general concern for making use of research findings from federally funded research was expressed with enactment of the Technology Innovation Act of 1980 (15 U.S.C. 3701). This act requires the Forest Service, as well as other Federal agencies operating large research programs, to commit at least one full-time person to promote use of technology developed through federally funded research and to use research funds to support transfer of new technology to users.

ACTIONS TAKEN BY THE FOREST SERVICE

Since 1972, the Forest Service has taken steps to make its field officials responsible for obtaining the best use of research findings. Each of the regional foresters, research station directors, and area directors for State and private forestry offices located in the Northeast and the Southeast have been made jointly responsible for determining (a) the degree of use being made of research findings by National Forest System units; other Federal, State, and local governments; and private land managers; and (b) how to increase the number and diversity of users and uses.

Other actions taken by the Service include

- appointing regional research coordinators in each Forest Service regional office and State and private forestry area office and establishing a position of assistant director for planning and application at each research station;
- developing various technical data bases to provide improved access to information on published research findings as well as ongoing research;
- incorporating use of research findings into research scientist position descriptions and using application of research findings as part of merit pay criteria for scientists;
- establishing a technology transfer group at the headquarters office to establish policy and foster transfer of new technology at all Service levels; and
- developing and implementing a national technology transfer plan to strengthen Forest Service efforts in the use of research findings.

Progress has been made to bring researchers and potential users together to exchange views and facilitate the transfer of technology. This is done through such activities as pilot testing research findings with users; providing technical assistance, training, and seminars; and obtaining user input in planning sessions. Contacts made through these activities help improve the use and utility of research findings.

Project leaders for each of the Forest Service research work units are responsible for gathering and reporting on research progress, accomplishments, and use. Station directors and their staff are responsible for reviewing these reports, and for selecting and reporting the more significant matters to the Deputy Chief for Research for use in (1) supporting Forest Service research budget requests, and (2) preparing the annual research report to the Congress as required by the National Forest Management Act of 1976. The users of the research are not required to systematically provide feedback to project leaders and station directors on the benefits or problems of using research findings.

INFORMATION ON USE NEEDED TO MAXIMIZE BENEFITS OF RESEARCH FINDINGS

Our review of the four research findings showed that the annual reports of research results prepared by project leaders and other management levels do not always specifically identify the benefits that land managers have obtained and can expect to obtain from their use of research findings. The regional foresters and area directors do not systematically provide

meaningful information to project leaders and station directors on the extent of use of the research findings by Federal and other land managers or whether there are problems which may be limiting or impairing use of the research results. As a result, project leaders, station directors, and other levels of Forest Service management do not have all the information needed to adequately identify and expand all possible opportunities for obtaining the best use of research findings or, when the need is indicated, to refocus ongoing research to maximize benefits to land managers.

Our findings with respect to each of the four research findings follow.

Large organic debris
benefits streams

According to information reported within the Service and to the Congress in 1980 annual reports on research, large organic debris plays a beneficial role in stream eco-systems. The debris is reported to provide an effective sediment trap, often forming a series of steps or falls which (1) lessens the erosive power of the water, (2) provides cover and protection for fish, and (3) contributes to the food supply for stream insects. The project leader and the Forest Service reported that land managers were using the initial findings from this research in planning for management of streams and streamside zones.

While some discussion of the general benefits of large organic debris in streams was provided, the annual report did not specifically describe (1) the cited research publications and findings that were ready for use by land managers, (2) the improvements that could be or were obtained through use of the findings, (3) the Federal or other land managers who had used the findings, and (4) whether any problems were impairing use of the findings by land managers. As a result, the station director and other levels of Forest Service management did not have all the information needed to assess the potential for greater use of the research finding or the need for additional research if such need were indicated.

According to the project leader and lead scientist, guidelines for managing natural debris in streams were needed and were to be developed within the next year or two.

In exploring the availability of further information on the application of the debris research, we asked the lead scientist how the findings could be used. He told us that the general premise developed through the research was that large organic debris is beneficial to fish, reduces erosion, and should not always be removed by land managers in their timber harvesting activities. Project researchers told us that the annual report comments on use of the research findings were essentially

a general reference to use of all of the research findings developed in their studies on the effects of timber harvesting on surface erosion and mass soil movement.

The researchers were unable to provide specific examples of cases where their findings were being used by land managers. They said that the reported information on use of the findings was based on personal observations and informal contacts with land managers during field trips, meetings, seminars, and conferences. Such contacts were not documented and the researchers could not specifically identify the users of the findings or whether or not there were any problems which might be limiting or impairing use of the findings by land managers. They told us that they were not required to obtain information from the regional forester on the extent of use of the research findings by Federal and other land managers in the Pacific Northwest or comments on why such use was not feasible or desirable.

The lead scientist told us that he thought the research findings had been included in a recent Pacific Northwest regional supplement to the Forest Service manual. A regional official confirmed that the manual change was based in part on this research but that he had not obtained formal feedback from national forest and ranger district personnel on the extent to which they were applying the provisions of this manual supplement in their timber sales activities, whether anticipated benefits were being obtained, or whether problems were being experienced which were limiting or impairing use of the research findings pertaining to large organic debris.

If meaningful comments had been obtained from actual and potential users of these research findings, and their comments on the benefits realized or the problems impairing their use had been obtained, the station director, project leader, and other levels of Service management would have a better basis for determining whether present plans for proceeding further in this area are on target or whether they should be adjusted.

How to manage ponderosa pine

The annual research reports cited a research publication entitled "Silviculture of Ponderosa Pine in the Pacific Northwest: The State of our Knowledge" and reported that this publication summarized over 100 previous research findings and observations dealing with the management of ponderosa pine. According to these reports, this research would be helpful to practicing foresters in managing 6.7 million acres of Pacific Northwest ponderosa pine forests. However, they did not provide specific information on (1) the use being made of the research findings, (2) the benefits obtained from their use by land managers, or (3) any problems that forest land managers were having in using the findings. Such information would better enable the station director to

adequately assess the potential for more use of the findings or the need for additional research.

The project leader and lead scientist told us that this research publication could serve as a useful management guide to help practicing foresters and that it was being used. This statement of use was based on information that a local community college instructor was using the publication as a textbook and that a Forest Service field manager had used the growth and yield tables in the publication to assist him in preparing a forest management plan. According to the researchers, this limited information was not available when the annual report was prepared.

They also said that no information was obtained from the regional forester on the extent to which the findings were being used by Federal and other land managers in the Pacific Northwest or if any problems were limiting or impairing their use. Such information would have better enabled the project leader and station director to meaningfully assess the actual and potential usefulness of the research findings.

Visual quality and the cost of growing trees

In describing this major research accomplishment to the Congress, the Forest Service reported that while its research did not provide an estimate of what a more attractive forest landscape is worth, it did measure the increase in costs that must be incurred to achieve a more attractive landscape primarily through a more thorough cleanup after timber harvesting. The Forest Service reported that the cost of an attractive landscape would amount to a \$2 a year per acre for the life of the forest where the study was done--representing an increase of about 14 percent in the direct cost of growing and harvesting timber.

The project leader's annual report listed the research publication but did not state whether it contained findings ready for use by land managers, whether there were any benefits that land managers have obtained from use of the findings, or whether land managers had experienced problems limiting or impairing their use. Without such information, the station director does not have an adequate basis for identifying and expanding opportunities for more widespread use of research findings, and evaluating whether additional research or research changes are needed to obtain more usable results.

To determine what information was available to fill the voids in the reported data for this research finding, we contacted the project leader who told us that the publication contained an equation he had developed for calculating the additional costs that would be incurred to achieve a more attractive landscape. While no formal evaluation was made to determine whether and to

what extent this research finding could and should be used to improve forest management, the project leader told us that in his opinion the equation was ready for use. He said it could be used by all managers of forest land with multiple use objectives to help them decide whether a more attractive landscape was worth the additional cost. The project leader told us that he had not requested or obtained comments from the regional forester or any one else on the use being made of this research finding in the Pacific Northwest or whether land managers had identified problems that inhibited use of the finding.

Optimizing millwork and
moulding product yields

The annual research reports stated that researchers at the Pacific Northwest Forest and Range Experiment Station and the Forest Products Laboratory (located in Madison, Wisconsin) had developed a method to determine the yields of millwork and moulding products that could be expected from mixed and lower quality lumber.

The reports stated that about 1.3 billion board feet of lumber is needed each year for millwork and moulding products, including cabinets, doors, window frames, and other finish woodwork, and that lumber suitable for these products is always in short supply. However, the reports did not (1) cite the research publication in which the finding was made available to potential users, (2) provide specific information on the extent the research findings were being used by the wood products industry, or (3) provide information on any problems which might have been limiting or impairing use. As a result, the station directors did not have all the information needed to assess the potential for greater use of the research finding or the need for additional research.

The project leader at the research station told us no publication had been issued in 1980 on this research but that one ("5/4 Ponderosa Pine Shop Grade Cutting Yields") had been issued by the Forest Products Laboratory in June 1981. He said this publication was the first of several publications planned as a result of this research. He also explained that this was a cooperative research effort and that the Pacific Northwest Station participated in the data gathering phase and provided input for the publication. He did not know the extent of use being made of the research findings or whether any problems had been encountered in their use. He suggested that we contact the research scientist at the Forest Products Laboratory since the station's active involvement and knowledge of the research ended in mid-1980.

The lead scientist at the Forest Product Laboratory told us that he knew the name of one wood products firm that had requested

information on the research findings and was actually using them. This firm had participated in the data-gathering stage of the research. He said he had received telephone calls from other firms who had tried to apply this research finding but were having difficulty obtaining the higher levels of the expected yields. He told us that these firms did not have computerized facilities and that the higher yields could not be obtained without such facilities and an appropriate computer program.

The lead scientist told us that work on a computer program (OPTYLD) is scheduled for completion by May 1982 and that, at that time, all the information will be turned over to State and private forestry representatives in the Forest Service's Pacific Northwest and Pacific Southwest regions for presentations to potential users. He said the problems experienced in the use of the research would be clarified in seminars which had been requested by users and potential users of the research findings.

The 1981 annual report of Forest Products Laboratory research results cited the June 1981 publication but did not discuss the problems experienced by users without computerized facilities. If this information had been reported, a better basis would have been available for evaluating the extent to which the research finding can or should be used and any need for adjustments to ongoing research to obtain the best possible use.

CONCLUSIONS AND ACTIONS BEING TAKEN

There are inconsistencies in the extent to which research project leaders and station directors have identified the benefits that land managers have obtained or can expect to obtain from use of research findings. In addition, the actions taken to obtain information on any problems which may be limiting or impairing their use have been sporadic. A more systematic approach is needed to help ensure that the best use is made of research findings and that ongoing research is directed so as to maximize benefits to land managers. We discussed these matters with Headquarters officials who, in response to our concerns, agreed to modify a directive that was being prepared on technology transfer responsibilities. The modifications will make clear that regional foresters and area directors will be responsible for providing detailed input to research project leaders and station directors on the use made of research findings by Federal and other land managers or explain any problems that may be limiting or impairing use. If this information is obtained in a systematic manner, the station directors and Deputy Chief of Research will have a better basis to (1) identify opportunities for and take the actions necessary to obtain the best possible use of research findings, (2) refocus, where appropriate, ongoing research to maximize benefits to land managers, and (3) include better information, in the Service's annual reports to the Congress, on the use made of significant research findings by Federal and

other land managers. In view of the actions being taken by the Forest Service, we are not making any recommendations in this report.