United States
Department of
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Forest Service

Engineering Staff

Washington, DC

Engineering Field Notes

Engineering Technical Information System

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Awards for the 1988 *Engineering Field Notes* Articles

" . . . I usually find something of interest/help to the job in each issue." "Very good articles." " . . . most informative . . . applicable to . . . projects throughout the country." " . . . potential to save the Forest Service $$!"

These are just some of the positive comments we received along with your rating sheets for the top three articles of 1988. *All* of the authors should be proud! Your votes have been tallied, and now we are pleased to announce the winners:

Article	*Author*
Four Years of Using GPS	Vic Hedman, Region 9 Regional Office, Engineering Staff
Forest Service Implementation of Federal Guidelines for Dam Safety—1987 Progress Report	Skip Coghlan, Washington Office, Engineering Staff
Radon Gas—An Invisible Safety Hazard	Jerry Greer, Washington Office, Engineering Staff, Nationwide Forestry Applications Program

Congratulations to you all! Our thanks go out to all of you who took the time to write and submit articles for publication in *Engineering Field Notes.* Judging by the postmarks and the comments appearing on the rating sheets, your ideas are getting out to the field and being put to good use. Estimated cost savings resulting from others applying your ideas and experiences range from $1,000 to $21,000, not to mention the time and effort saved.

Thanks also to those who took time to fill out a rating sheet and to send it in. We appreciate all the nice comments about *Engineering Field Notes* as a whole and hope to continue meeting our goal of helping field personnel share their ideas and experiences with one another. We need your help to do this, however. Every employee is a potential author of an *Engineering Field Notes* article. So get those articles in here, and maybe next year you will have the pleasure of knowing that your idea helped someone do his or her job better.

Forest Service Engineer of the Year

National Society of Professional Engineers
No. 13

NSPE NEWS

1420 King Street
Alexandria, Virginia 22314
(703) 684-2800

FOR IMMEDIATE RELEASE

Media Contact:
Kelly Cunningham
703/684-2855

DR. DAVID W. GREEN NAMED ENGINEER OF THE YEAR

ALEXANDRIA, VIRGINIA, February 9, 1989--Dr. David W. Green has been named "Engineer of the Year" of the Forest Service. Dr. Green, a resident of New Glarus, Wisconsin works for the agency at the Forest Products Laboratory in Madison, Wisconsin. Dr. Green is one of 34 federal agency winners nationwide competing for the title of Federal Engineer of the Year. Dr. Green will receive his agency award on February 15 at a special recognition banquet in Crystal City, Virginia, just outside Washington, D.C. The National Federal Engineer of the Year will be announced at that time.

As Research General Engineer, Green's research has resulted in improved methods for estimating the effects of moisture content and temperature on lumber.

The Federal Engineer of the Year Awards (FEYA) program is sponsored by the National Society of Professional Engineers (NSPE)

-more-

NOTE: Founded in 1934, the National Society of Professional Engineers (NSPE) is a three-level organization serving over 75,000 members throughout more than 500 local chapters in 54 states and territories.

and leads into National Engineers Week, February 19-25. NSPE initiated FEYA to provide recognition for engineers employed in the federal government.

Judges for this year's prestigious awards were: Congressman Don Ritter (R-PA); Tracy N. Peters, Jr., P.E., Chairman, Professional Engineers in Government, NSPE; and Dr. John White, P.E., Assistant Director of Engineering, National Science Foundation.

The National Society of Professional Engineers, headquartered in Alexandria, Virginia, represents more than 75,000 engineers in all technical branches of the profession.

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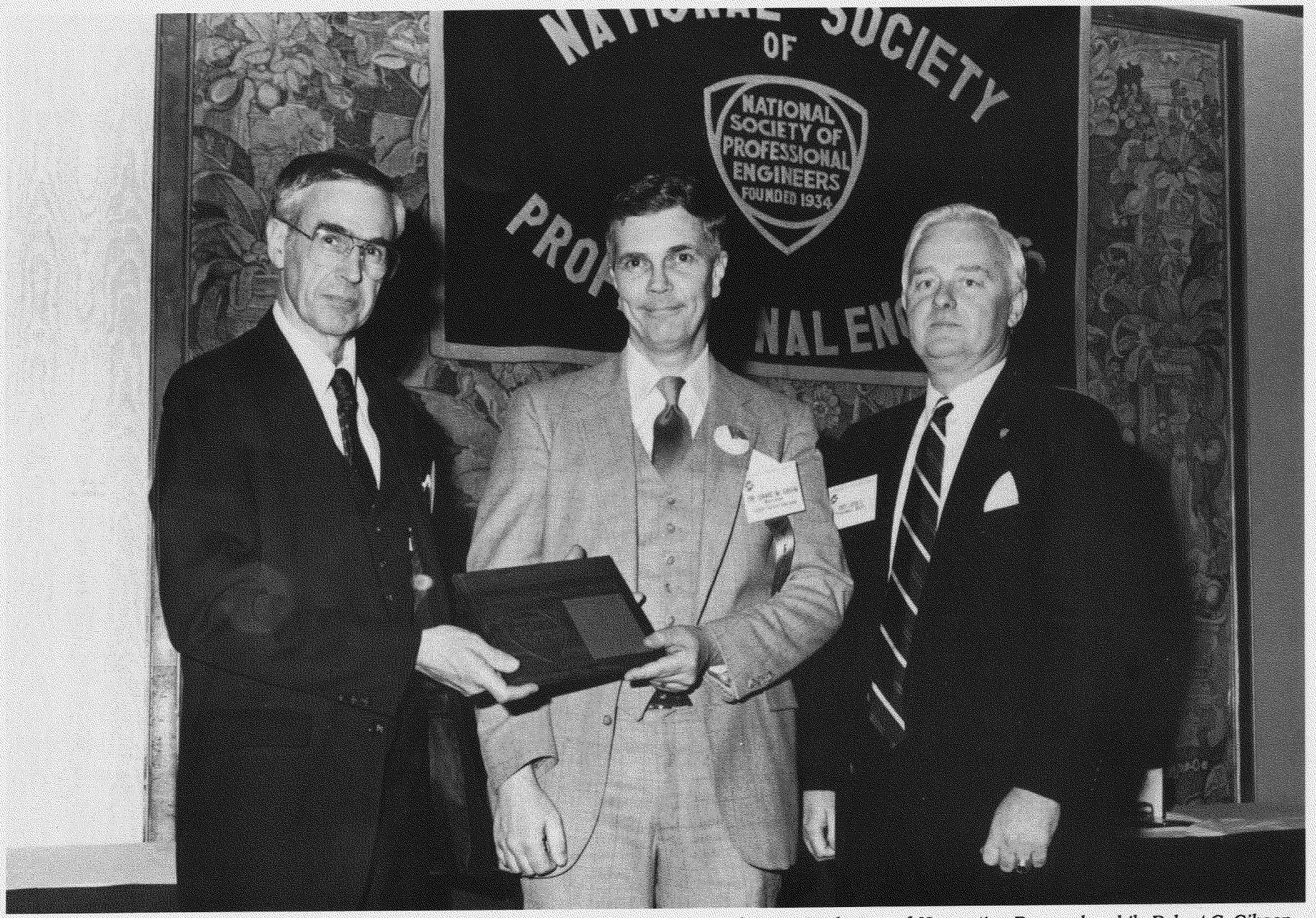

Figure 1.—Dr. Green receives award from Stanley O. Bean, Jr., Forest Service Director of Forest Products and Harvesting Research, while Robert C. Gibson, President of NSPE, looks on.

Road Program Costs: Continuing Efforts Addressing the Issue

Sam Morigeau
Civil Engineer
Washington Office

The 99th Congress directed each Region of the Forest Service to reduce the average unit cost of timber road construction in 1987 to 5 percent below 1985 levels. In response, we instituted cost-saving measures that resulted in cost reductions of 9 percent. Efforts to reduce road construction costs continued through 1988. The average unit cost as compared to 1985 continued to show a reduction, amounting to 4 percent. However, compared to 1987, our 1988 unit costs increased by 6 percent. This increase was partially because of low unit-cost restoration reconstruction projects being done through road maintenance. In 1988, Congress transferred $10 million from the Forest Road Program to road maintenance for this purpose. From 1987 to 1988, a 5-percent increase of the Forest Road Program funds was used to construct and reconstruct recreation and general purpose roads. These roads normally require higher construction costs for a safer and more comfortable facility.

Sometimes, actions taken to reduce costs may be accomplished by deferring or transferring costs. For example, we can defer costs by requiring less surfacing materials now and more frequent reconstruction later. We can transfer costs by constructing lower standard roads (for example, steeper grades or rough running surfaces) that raise user costs. Care is taken to ensure that roads are designed to serve the projected traffic requirements at the lowest total transportation costs (which include construction, maintenance, and user costs), while paying attention to environmental and safety considerations.

Figure 1 is a display of the unit costs for road construction and reconstruction. The data are collected and compiled using the ROad Analysis and Display System (ROADS). These graphs are useful to managers in displaying trends and identifying areas of high unit costs.

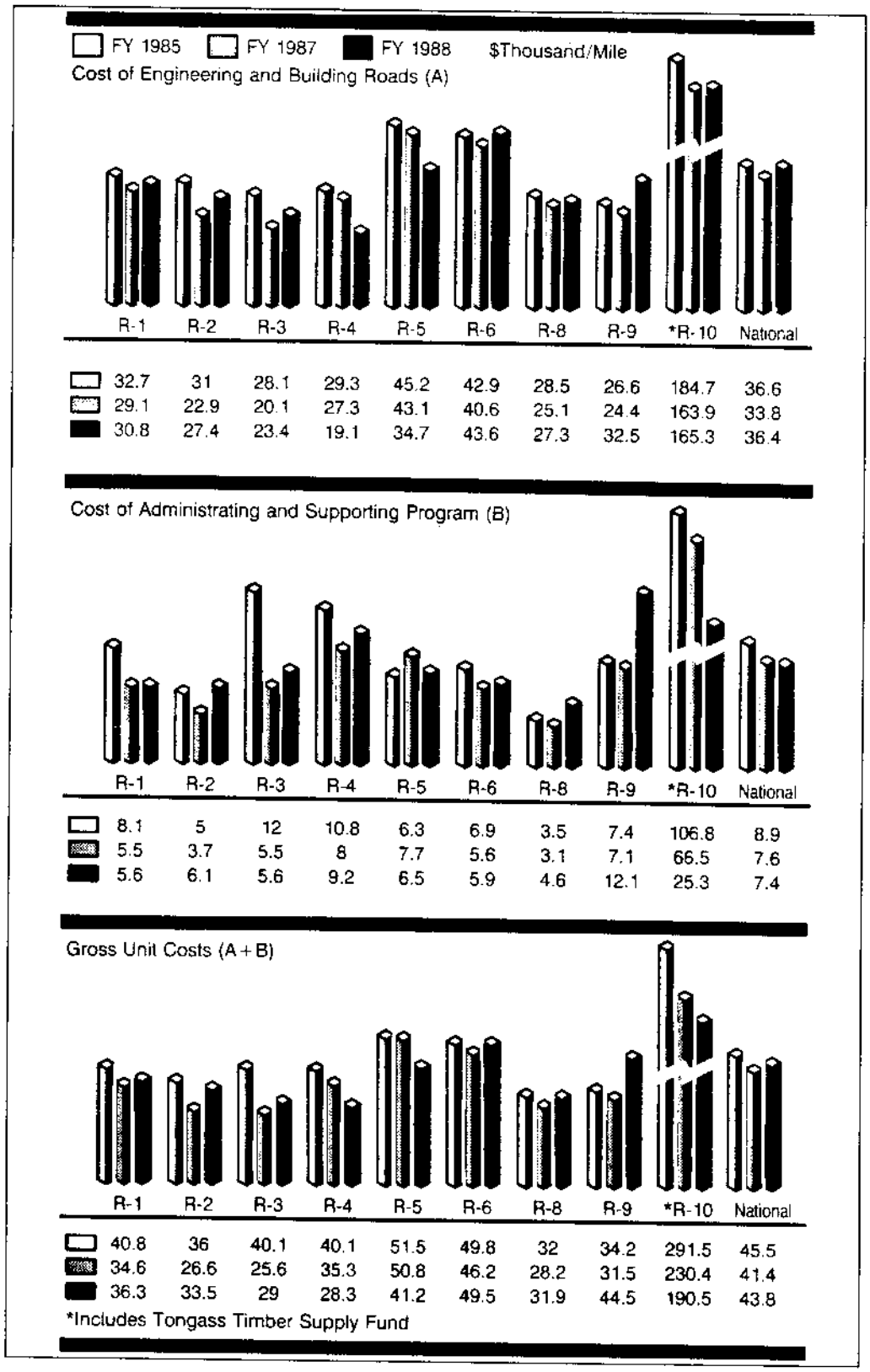

Figure 1.—Summary of unit costs for road construction and reconstruction.

San Dimas Technology & Development Center Project Receives First Chief's Award for Technology Transfer

The Technology Transfer Act of 1986 (Public Law 99-502) directs the head of each Federal agency to develop and implement a cash award program to reward personnel for exemplary activities that promote the transfer of Federal technologies. On October 24, 1988, Chief and Staff approved the establishment of a Chief's Award for Technology Transfer. Up to three awards are to be given annually in each of two Technology Transfer categories:

(1) To individuals or groups in the Forest Service who have introduced a new technology or knowledge into the organization.

(2) To individuals or groups in the Forest Service who have transferred knowledge or technology from the Forest Service to industry, business, or State or local government.

The Chief's Award for Technology Transfer is given specifically for actions in transferring knowledge or technology and not for research or development efforts.

Each award comes with a plaque and $10,000. This award was presented for the first time at the Forest Service's award ceremony on

Figure 1.—Briar Cook (right) receiving award from Chief Dale Robertson.

January 25, 1989, in Washington, DC. Chief F. Dale Robertson presided over a program that saw many national awards presented. Toward the end of the ceremony, the following personnel together received one of three Chief's awards:

(1) Briar Cook, Program Leader—Resources, San Dimas Technology & Development Center (SDTDC).

(2) Bob Simonson, Civil Engineer, SDTDC.

(3) Don Studier, Program Director, Advanced Technical Training—Logging Engineering and Resource Transportation Planning, Corvallis, OR.

(4) Ron Copstead, Mechanical Engineer, Pacific Northwest Forestry Sciences Laboratory, Seattle, WA.

The award was for the SDTDC-based Substitute Earth Anchor System (SEAS) project. The four individuals were recognized for their uncommon creativity and initiative in using multiple methods to transfer the SEAS technology to those in the timber area of the Forest Service and to the private sector. The technology opened approximately 15 percent of the timber area in the Pacific Northwest that previously could not be logged by conventional means. It also opened vast areas to safe and efficient timber harvesting because location of stumps no longer restricts the location of yarding equipment.

Many approaches were used to transfer technology. Presentations and/or field demonstrations kept the Federal Occupational Safety and Health Administration (OSHA), four State OSHA's, Forest Service personnel, and private loggers informed about evolving technology. A steering committee provided input and received feedback from the Regions. Later, presentations were given to and/or booths were manned at logging conferences; university classes; meetings of the Council of Forest Engineers, the American Pulpwood Association, the Society of American Foresters, the American Society of Agricultural Engineers, and two international groups; gatherings of Regional and national timber management staff; and Regional Engineers. Four field demonstrations on active logging sales were conducted in Oregon, Washington, Idaho, and Virginia. News media invitations to the field demonstrations resulted in several newspaper and trade journal articles. An "Anchor Guide" was used in a final training session conducted last November for 20 Forest Service and 5 private industry trainers. These efforts affected approximately 6,000 people.

Information Sharing in Region 5 (Technology Transfer Revisited)

Rich Farrington
Engineering Management Analysis Staff Engineer
Region 5

Introduction

In 1985, under the leadership of Dick Deleissegues, Regional Engineer, Bob Harris, Assistant Regional Engineer, and Larry Gruver, Engineering Management Analysis Staff Engineer, Region 5 decided to invigorate its Technology Transfer Program by finding out whether something could be done to involve more Forest and District personnel. Considerable effort had been invested in Technology Transfer in the past, as described in *Engineering Field Notes* by Jim Mandigo (June-August 1984) and Dale Petersen (January-February 1985). However, most people believed that participating in Technology Transfer meant they had to develop new technology and write about it for publication in a technical journal. This is not true. I remember hearing many times about good ideas and simple methods that "weren't good enough to share." The problem was how to change the image of Technology Transfer and get people to participate.

This article identifies the most successful aspects of the Region 5 Information Sharing Program over the last few years. It does not describe all aspects of the program.

Information Sharing

We know from research on human behavior that the best way to transfer information is to demonstrate and communicate at the same time. Field trips are a good way of doing this. Many Forests are doing "neat things" but are not sharing them because they are not considered new technology.

One of the first changes was to rename the program "Information Sharing" to convey the message that sharing all information, not just new technology, is encouraged. Sharing work methods and good ideas is what the program is about.

Meetings were held and experiments conducted to encourage field personnel to share their ideas. Each Forest was asked to appoint an Information Sharing Coordinator to be a "missionary." We held two successful Regional workshops with the Forest Coordinators to help plan and implement the program. They included training and discussions on communication, how to motivate people to "make a difference," and how to acknowledge successful participants in the program.

After many trial and error attempts at promoting information sharing, two methods seem to have "caught on."

Network Using the Data General

The first method is a Data General network operated by Jim Mandigo (J.MANDIGO:R05D) in the Regional Office from which anyone can get an answer to a problem. One can send a question or information to Jim, and he will distribute it to all Region 5 Forest Information Sharing Coordinators, representatives in each of the other Regions, contacts in the Washington Office, and various other interested people around the country.

We have received approximately 300 to 400 questions (and a few information items) each year over the last 2 years. Typically, the originator receives anywhere from 3 or 4 to over 20 responses to each question. The most responses ever received to a question was 50. Responses usually provide a variety of solutions to solving a problem.

This network seems to attract people because they can easily access information to solve their particular problems. People who receive Data General questions are generally willing to respond if they know the answer, or they will forward the message to people who might. The Data General makes this easy. The questions include the Data General address of the originator. The benefits are decreases in time, money, and headaches by learning from others' successes and failures so as not to "reinvent the wheel."

Show & Tell

The other successful information-sharing activity is time allotted for information sharing at each Regional workshop. This amounts to a "show and tell" period, something everyone learned in school. The key is to tell participants they must present something, keeping it simple and short (5 to 10 minutes maximum). A handout should accompany the presentation, which does not have to be formal.

The November Region 5 Forest Engineers' meeting took this concept one step further. Each Forest Engineer was asked to prepare a 35-millimeter slide show of something current and representative of his or her Forest. Some of us expected a considerable overlap of topics and pictures. To our surprise, the projects, programs, and work methods shown in each 20-minute presentation were considerably different. Some showed a variety of projects and work methods, and others focused on one or two topics. All the topics presented were beneficial.

I learned more about what Engineers are doing in this Region in 1 day than I learned during the past 14 years. In addition to learning about projects and work methods, I now know who is working on what; I can call them for more information.

Anyone interested in promoting the sharing of methods and ideas among Engineers should try a similar approach. Do not limit the program to Forest Engineer meetings; include time for information sharing at all workshops or meetings—at District, Forest, Regional, or national levels.

Share your successes through similar efforts to promote information sharing with all of Engineering. We need to help each other find simple ways to work better.

OGC Analysis of the Federal Employees Liability Reform and Tort Compensation Act of 1988

In the March-April issue of *Engineering Field Notes*, we published a copy of the Federal Employees Liability Reform and Tort Compensation Act of 1988 as signed by then President Reagan. At that time, we did not yet have the Office of the General Counsel's (OGC) interpretation but promised to publish it once it was developed. We are including it here for your information. The last paragraph references a Department of Justice opinion that we have not included in this publication because we feel it does not add anything not covered in the body of the OGC letter.

United States Department of Agriculture
Office of the General Counsel
Washington, D.C. 20250-1400

F 35751

DEC 7 1988

TO: John J. Franke, Jr.
Assistant Secretary for Administration

FROM: James Michael Kelly
Associate General Counsel

SUBJECT: Federal Employees Liability Reform and Tort Compensation Act of 1988

This is in response to your request for an analysis of the Federal Employees Liability Reform and Tort Compensation Act of 1988 (the Act). The Act, Pub. L. No. 100-694, was signed by the President on November 18, 1988. The purpose of the Act is to immunize Federal employees from personal liability for common law torts by making the Federal Tort Claims Act the exclusive remedy for injury to, or loss of, property, death, or personal injury caused by the negligent or wrongful act or omission of a Federal employee acting within the scope of his office or employment. The Act, however, does not provide immunity for Federal employees from personal liability as a result of a civil action brought for a violation of the Constitution of the United States, or which is otherwise authorized by any statute of the United States.

The Act authorizes the Attorney General to certify that an employee of the United States, named as a defendant in a civil action in a state or Federal court, was acting within the scope of his office or employment. Upon such certification, the United States shall be substituted as the defendant in place of such employee, and such proceeding shall be removed to a Federal court, if originally filed in state court.

In the event that the Attorney General refuses to so certify, an employee may petition the court to so find and certify. Upon such certification by the court, the action shall be deemed to be against the United States. In defending such actions, the United States is authorized to assert any defenses based upon judicial or legislative immunity that otherwise would have been available to be asserted by the employee, as well as any defenses to which the United States is entitled.

The Supreme Court, in Harlow v. Fitzgerald, 457 U.S. 800 (1982), held that government officials performing discretionary functions are entitled to qualified immunity from liability for violations of constitutional rights if they can establish that they did not violate clearly established statutory or constitutional rights of which a reasonable person should have known. Thus, any Federal employee acting within the scope of his office or employment is now immune from personal liability as long as his actions did not violate any clearly established constitutional or statutory rights of which a reasonable person should have known, or his actions do not subject him to liability under any Federal statute providing for personal liability.

Your memorandum also requests our opinion as to the effect the passage of this Act would have on the Department of Justice opinion attached thereto. The memorandum in question reviews the liability of Federal employees for violations of constitutional and common law rights as the law existed prior to the Supreme Court's decision in Westfall v. Erwin and the passage of the the Act. While the Act, of course, supercedes any discussion of common law liability in the memorandum, nothing in the Act invalidates the discussion contained in the memorandum discussing the liability of Federal employees for violations of constitutional rights.

Geogrid Used in Steep Fill Slide Repair

Ron McNemar
Supervisory Civil Engineer
Daniel Boone National Forest, Region 8

Washington Office Note

This article represents a risk judgment in the scope of investigation and repair alternatives. The use of Geogrid allowed a steeper, and thus lighter, backfill on the head of the slide. Based on local experience and assessment of the consequences of further sliding, this repair was determined by the author to be the most cost effective. Because of the nature of the Forest Service road system, expedient decisions are frequently required. It is critical that line officers are involved in such decisions and that they understand the risks involved. A difficult part of this process is determining the amount of geotechnical investigation to ensure that all resource values and consequences are properly weighed against different alternatives (for example, providing drainage behind the slump block, lowering the grade, and so on).

Situation

A slide occurred in the fill side of an asphalt paved road that is more than 30 years old. The pavement is located approximately 15 feet above summer-pool elevation of a U.S. Army Corps of Engineers reservoir, and the road is subject to inundation from time to time. A contributing factor to the slide could have been the prolonged drought of 1988, followed by some heavy rain, which caused a rapid rise, then a rapid draw down, of the reservoir.

The failure was approximately 45 feet long with an 8-foot vertical drop from the shoulder (figure 1). Its downhill bulge was partially above water and partially below water. At summer-pool elevation, the depth of water in this location is about 7 feet.

Objective of Repairs

The objective is to install a structure on incompetent base material that would support the fill and remaining shoulder. Because the base was considered incompetent, the repair structure had to be lightweight (small) to reduce surcharge, well drained, and somewhat flexible. (Excavation to a competent base would have involved lowering the reservoir to below normal operating levels or below water-surface excavation. Realignment of the road would have required rock excavation.) A simple and inexpensive repair that involved a moderate degree of risk seemed appropriate.

Nature of the Repair

Because it was not practical for equipment to access the top of the slide bulb, #2 stone was dumped from the roadway up to a point from which it

could be leveled by a backhoe sitting in the roadway. This point was about 10 feet above the roadway. This stone also served as a bottom drain that would help relieve water pressure behind the repair. Filter fabric was installed over the stone to help keep it clean.

From this point, Tensar Geogrid SRI (UX1100) was installed between each 1-foot lift of borrow material (clay, silt, sand, and rock). See figure 2. The slope of the earthen repair was approximately 1.25 H:1.0 V. The earthen repair was not compacted; consequently, some consolidation was anticipated. At this slope, it was not necessary to face the repair with Geogrid. Establishment of vegetation on the repaired slope should not present a problem.

The cost of the Geogrid in this repair was about $700. The remaining cost was in backhoe rental, dump truck rental, stone, seed, mulch, and net. The project was completed in 1 day.

This project was *not* designed and constructed in compliance with *CONTECH Construction and Guidelines* technical bulletin. CONTECH recommends a

Figure 1.—Slide before repair.

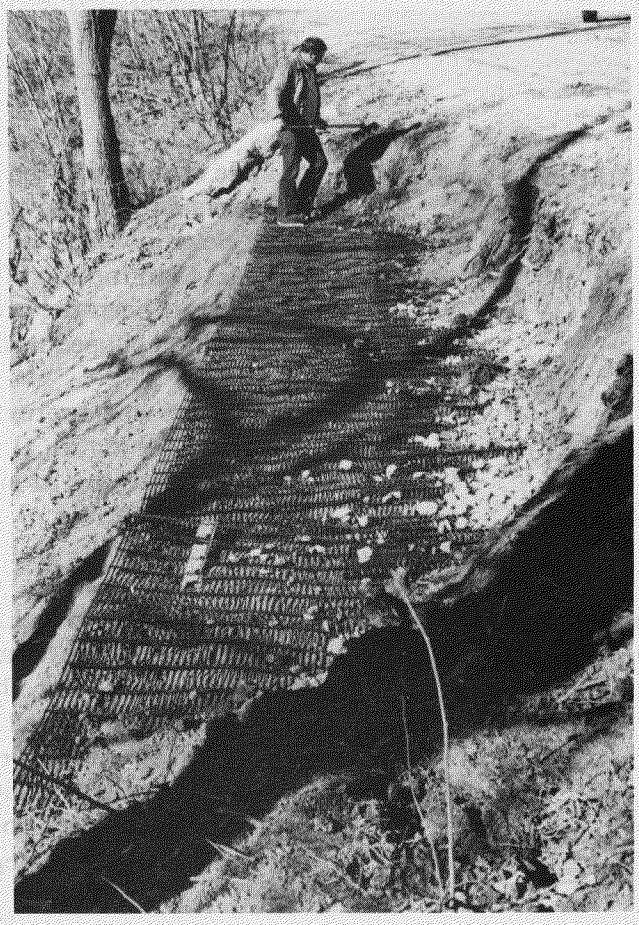

Figure 2.—Tensar Geogrid installed horizontally at 1-foot vertical increments.

competent base for the structure and compaction of the fill material. However, it seems that Geogrid placed at these intervals for small repairs should reinforce the slope and interfere with the development of shear planes to the point of stabilization. Some consolidation can be tolerated over time and should result only in a top dressing repair. If this method works, it would be beneficial in the repair of small slides.

GEOWEB Boat Ramps

Mary Miller
Civil Engineer
Inyo National Forest, Region 5

In 1988, the Inyo National Forest constructed two light-duty boat ramps using the GEOWEB Grid Confinement System. The advantages in using GEOWEB for boat ramps are its low cost, its ease and speed of installation, and the ease of transporting the requisite construction materials. See the diagram in figure 1 for details.

Ramp construction began by building a reinforcing steel bar frame to stretch open the honeycomb cells of the web. The framing was attached to the web with wire ties. The web and frame then were placed on a filter cloth, slid into the water, and positioned over a prepared grade (figure 2). The mass of the frame gradually submerged the web and cloth. Round aggregate was placed in the grid honeycombs and compacted (figure 3). The framing was removed, and the ramp structure was complete (figure 4).

GEOWEB costs approximately $2 per square foot. As part of a larger contract, ramp building required 6 person-days for a 20-foot by 40-foot ramp. A 20-foot by 45-foot ramp project took 20 person-days, including building a temporary plastic fabric perimeter fence to minimize lake siltation, grading out the site, importing fill material, constructing the ramp, and cleaning up. The maximum depth of water during construction was 3 to 4 feet at both ramps.

Both ramps are functioning well. A review showed that rounded aggregate should not have been used to fill the web cells. The Forest intends to cap the ramps with crushed angular material and specify the same for future ramps.

SPECIFICATIONS GEOWEB Structural Properties

1. Expanded Dimension	8 ft. x 20 ft. x 8 in. or 4 in.
2. Collapsed Dimension	11 ft. x 5 in. x 8 in. or 4 in.
3. Panel Thickness (Nominal)	0.045 ± .002 in.
4. Weight	103 or 51.5 lbs.
5. Cell Area	41 $in.^2$
6. Cell Seam Node Pitch	13 in.
7. Welds/Seam	7 or 3, for 8 in. or 4 in.
8. Seams Tensile Peel Strength	450 lbs. or 225 lbs.
9. Installation Temperature Range	-16°F to +110°F
10. Polymer Material	High Density Polyethylene
11. Color	Black
12. Carbon Black Content	2%
13. Chemical Resistance	Superior

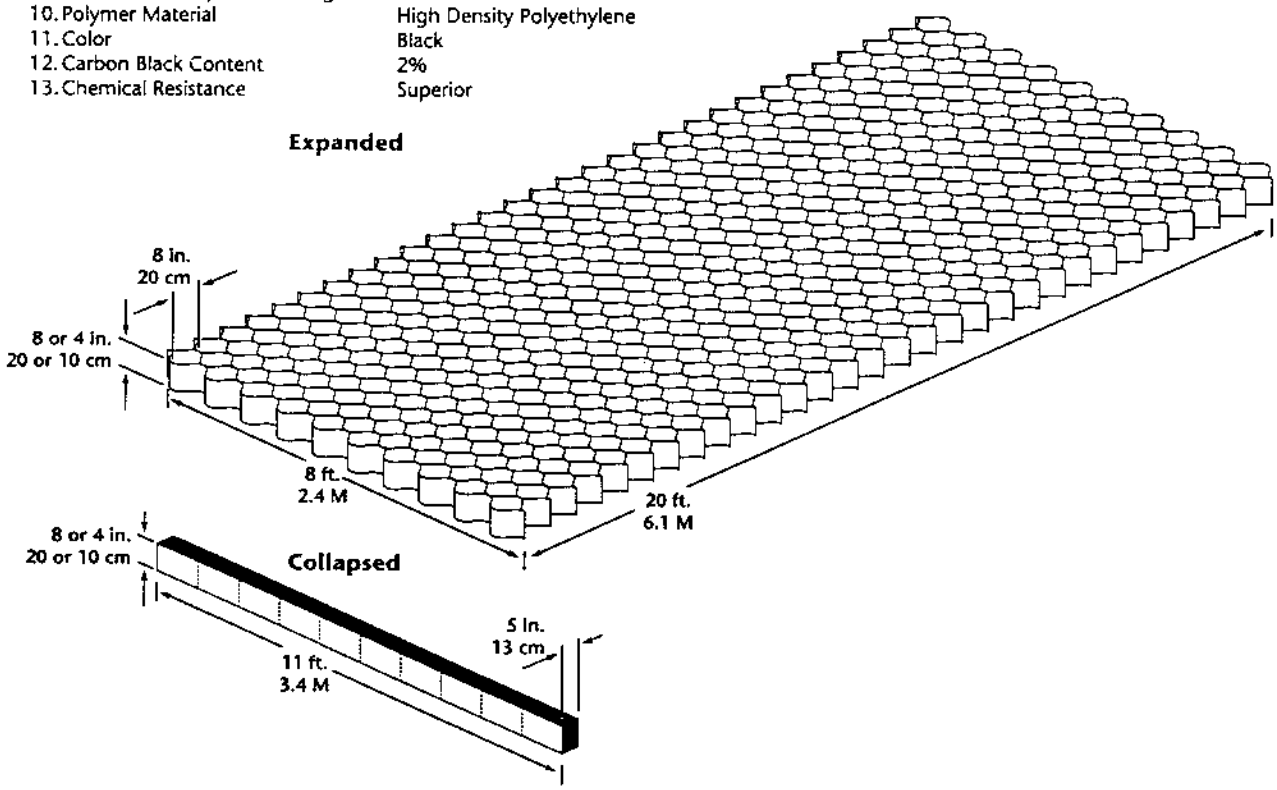

Figure 1.—GEOWEB specifications diagram. (Diagram courtesy of Presto Products, Inc., Appleton, WI)

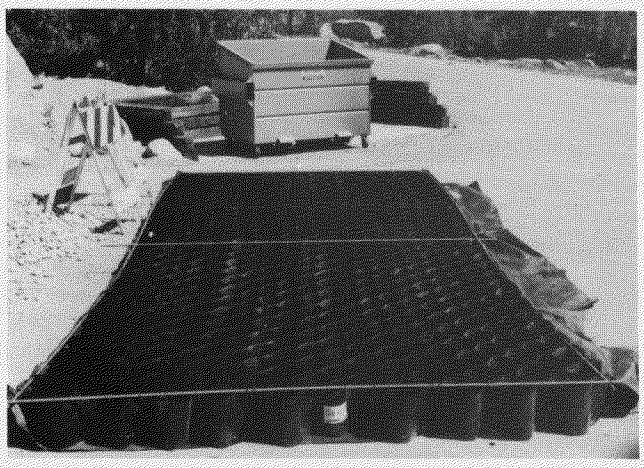

Figure 2.—GEOWEB with rebar frame on top and filter cloth beneath (ready for placement).

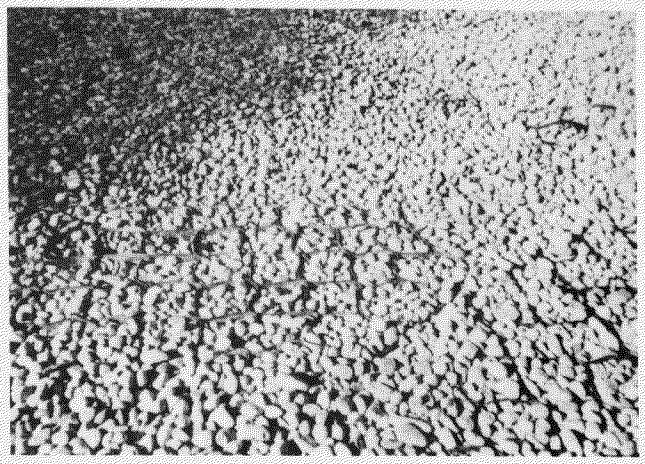

Figure 3.—GEOWEB in place, filled with aggregate.

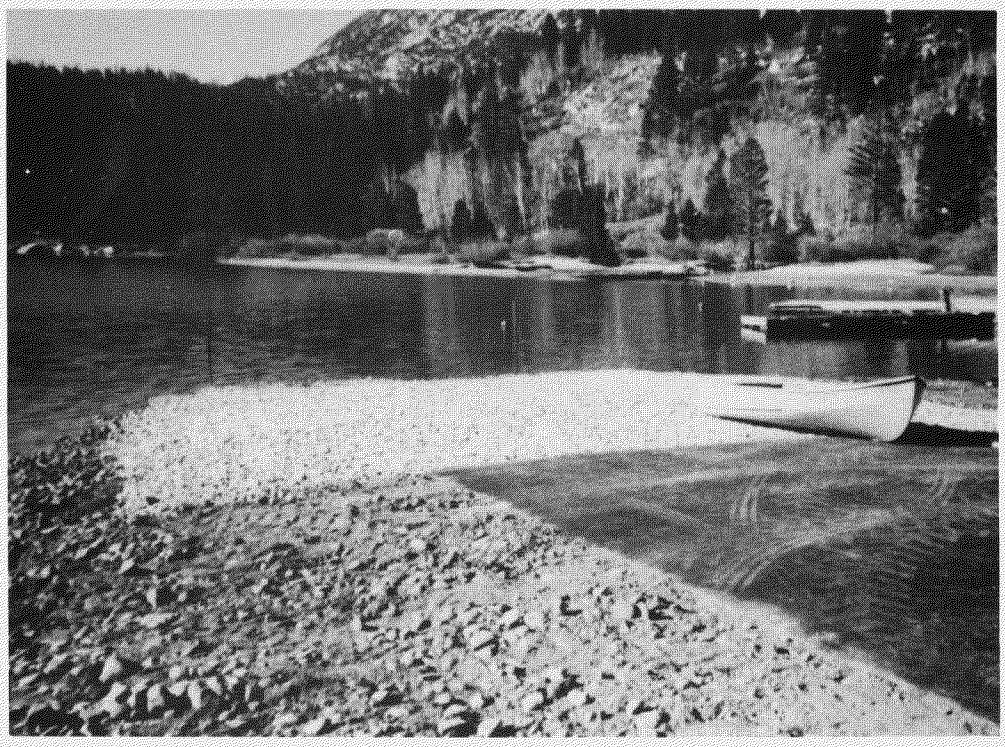

Figure 4.—Completed boat ramp in use.

Liaison & Technical Support in the Nationwide Forestry Applications Program: A Project Review

Jerry D. Greer
Project Leader
Nationwide Forestry Applications Program

The Nationwide Forestry Applications Program (NFAP) is charged with monitoring developments in remote sensing technology. Appropriate techniques using remote sensing in forest and range management are evaluated and, where possible, transferred to working managers on National Forests or in research. To accomplish this complex objective, NFAP is divided into two projects: (1) Training and Technology Transfer and (2) Liaison and Technical Support (L&TS). See the organizational chart in figure 1.

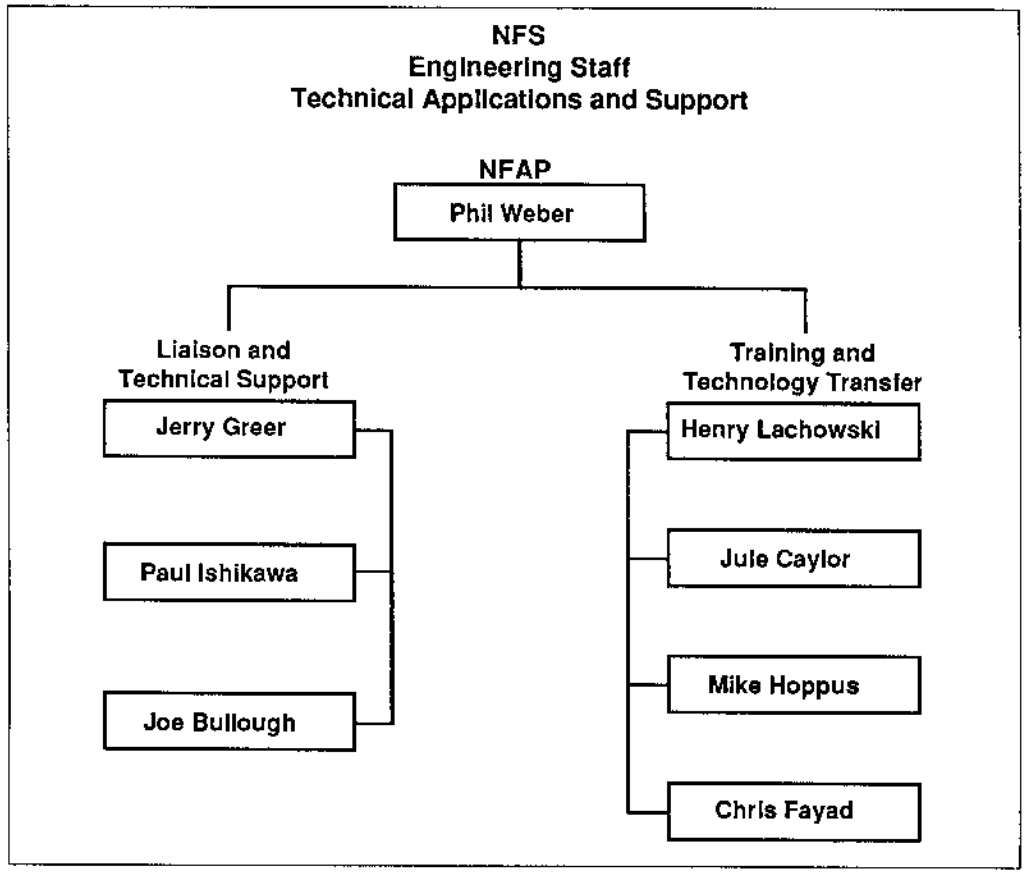

Figure 1.—NFAP organizational chart.

The objective of the L&TS project is to give Forest Supervisors, District Rangers, and Research Scientists more effective and efficient ways to inventory and manage resources and to solve problems through remote sensing. This objective is accomplished in three distinct steps: (1) discovery of information, (2) conceiving of applications, and (3) transferral of information.

Discovery of Information

The first step is not basic research. It is a process that primarily means the active monitoring of developments in the highly technical field of remote sensing.

The basic technology of remote sensing, whether using visible light, sound, mechanical sniffers, personnel detectors, or heat sensors, is developed in many areas. For example, other civilian government agencies, such as the National Park Service, Fish and Wildlife Service, Bureau of Land Management, and especially the National Aeronautics and Space Administration (NASA), have developed (as has the Forest Service) some basic remote sensing techniques. Centers of excellence (located normally in association with a major university) have the specific purpose of performing basic research and development in remote sensing. ERIM in Michigan is a good example of such a center. National laboratories, such as Sandia, Los Alamos, and the Jet Propulsion Laboratory, also contribute to the development of new remote sensing technologies. The Agricultural Research Service within the U.S. Department of Agriculture has made some significant contributions to improving remote sensing.

Many valuable techniques to make the obscure more clear come from the civilian intelligence agencies, such as the Central Intelligence Agency and the Federal Bureau of Investigation. These groups are especially interested in the identity and movement of people, and many techniques are of interest to natural resource managers faced with increased people-related problems.

The military shares interests in these "people" areas but is concerned with the real-time detection, identification, and classification of events in battlefield management. The Department of Defense (either internally or through contracts) sponsors significant research into new remote sensing techniques. Today, these real-time systems are taking on more importance in the tools used by resource managers.

Basic research and discovery of remote sensing technology certainly does not reside in the United States alone. Significant developments are being made in the European Space Agency, the Soviet Union, Japan, France, and China. Much of this information is available to managers in the United States; it is the responsibility of NFAP to keep up with developments in these widely different and scattered areas.

In L&TS, one can discover information by reading professional journals, abstracts, magazines, letters, or reports and by telephoning experts in the area, talking, and listening. One also can discover information of value to Forest Service workers by attending meetings and symposiums.

Conceiving of Applications

The second step is very important. Once remote sensing techniques are developed, it is important that the appropriate techniques be applied to real problems in research or forest and range management. There are three basic ways to carry out this step.

The first way is routine or operational—a simple task of observing how a current application of remote sensing may be moved from one successful unit to another where the technique can save time and improve management. For example, the Australians develop a simple way to use aerial photography in tree plantation monitoring. We simply adapt it. The use of color infrared photography for vegetative assessment work also represents opportunities in this area. The techniques are operational; they work. Often, it is simply a matter of showing new users the photographs and teaching them the new interpretative techniques required.

The second way is to find new procedures for old tasks, based on staff experiences in law enforcement, fire control, range conservation, watershed management, and all the other functional areas of natural resource management. This provides more opportunities for creativity. An example is the use of the Global Positioning System (GPS) to locate points of interest critical in either mapping, resource protection, or land management planning. Another example is the use of digital data gathered by satellite to inventory and monitor changes in vegetative resources.

The third way to conceive of applications is to find problems for answers. This is where observations of phenomena in basic research are identified and used in innovative ways to solve problems or to provide information to resource managers. A good example is how the Thermal Imaging Multispectral Scanner (TIMS) is being used to locate buried gravel deposits in Region 8. Researchers designed this airborne instrument to detect differences in heat on the surface of the Earth. It took a creative mind to figure that underground gravel deposits also would hold large quantities of water and that this water changes temperature slowly. At night, there would be a relatively warm spot on the cooler Earth surface directly over a large gravel deposit. With this sequence of thinking, a problem (locating gravel) was found for an answer (a heat-sensing device).

Transferral of Information

The third step in accomplishing the objective is the most critical; it is where the information is transferred from the thinkers to the doers. This step is near the heart of successful technology transfer and demands *real* communications. Being successful in this step is the only way that NFAP can be successful in meeting its broad goals.

Liaison and Technical Support uses the following five basic methods for transferring information into the hands of field users:

(1) Sending existing information.

(2) Giving presentations and talks to Forest Service units.

(3) Writing creatively.

(4) Sponsoring workshops and meetings.

(5) Conducting field projects.

Sending Existing Information

The process steps from the most simple method to the most complicated. Sending existing information is the easiest. A field person requests documents, reports, or references on a particular problem. Liaison and Technical Support finds the material, if possible, and ships it to the requestor. Many of these requests are simply handled by telephone. Depending on the situation and project, follow-up calls may be made to determine the need for further help.

Giving Presentations & Talks to Units

Giving presentations and talks to Forest Service units is complicated by the common need to travel to any unit requesting more detailed information. Some information about the general aspects of remote sensing are presented to Forest Supervisors and their staff in awareness sessions. These presentations may last 2 to 4 hours and address questions or problems raised by the unit. Similar presentations have been made at meetings of Range Scientists and Forest Inventory Specialists.

Writing Creatively

Writing creatively, based on either literature searches or on active remote sensing work, provides an excellent way to send information to a wide audience. Systems and data may be studied in depth, and a report or article is prepared. Papers may be prepared for a single person. For example, NFAP conducted a search of the NASA data base listing every one of the thousands of photographs of the Earth taken from the space shuttle. All available images over Sudan (Africa) were listed for reference by a team of Forest Service Engineers working for the United Nations.

Other papers or booklets prepared by NFAP (L&TS) have reviewed the large format camera experiment on the space shuttle, the GPS, side-looking radar, and the handheld earth photography program of NASA. These reports appear in *Engineering Field Notes*, *Journal of Forestry*, and such international journals as *GEOCARTO*. Liaison and Technical Support also is presenting professional papers. Foremost among these is a continuing series of papers dealing with natural resource management, presented to the airborne reconnaissance group of the Society of Photo-Optical Instrumentation Engineers. While this group is composed almost exclusively of military intelligence people, each year the members invite NFAP to present a paper about airborne reconnaissance in the Forest Service. NFAP has presented papers on forestry and range applications of high-altitude photography, the use of space shuttle large format camera photography in natural resource management, and the application of real-time military intelligence acquisition methods to problems in natural resource management. NFAP has made similar presentations to the Society of Wetland Managers.

Papers are occasionally prepared for use in international forestry. NFAP has completed articles that review the extent and quality of space shuttle large format camera coverage of China, Africa, and Canada.

Liaison and Technical Support also seeks to find new and better ways to release information to potential users. One result has been the creation of the Occasional Electronic Paper (OEP) series that is "published" in the Data General CEO system. The OEP series permits the almost instantaneous distribution of information. It has proven an excellent way to get comments about papers in final draft that are being prepared for publication in other articles.

Sponsoring Workshops & Meetings

To date, two major conferences have been sponsored. The first (in 1986) was co-sponsored by NASA at the Ames Research Center near San Francisco. The second was co-sponsored by NASA, the Institute for Technology Development, and the Society of American Forestry at the National Space Technology Laboratories in Mississippi. A third, scheduled for April 1990, is in planning. This series of highly informative and educational meetings is drawing both national and international attention. Representatives of Canada and Morocco attended the first and a contingent of four Canadians attended the second.

Conducting Field Projects

Finally, the most visible and perhaps the most effective way information and technology are transferred to resource managers is through conducting field projects. Projects usually start for a number of reasons.

First, projects might be in response to emergencies. The side looking airborne radar images of Mt. St. Helen's after the eruption were acquired under a special short-term L&TS project. The quick assessment of timber volumes in tornado blowdowns in the Southeast is another example of this kind of project.

Second, projects arise when field people ask: "How can I ... ?" They have a task to accomplish and need help. A good example is the use of color infrared photography in riparian area mapping in the Southwest. Managers wanted a more accurate and efficient way to map riparian vegetation. Liaison and Technical Support projects were planned and techniques demonstrated to Forest Supervisors before work began.

Third, projects come from ideas of L&TS staff. The demonstration of the value of GPS technology in Arizona is such a project. Other projects are planned and implemented because they build on the strong interests and experiences of individuals in the L&TS group.

Fourth, projects occur in response to a need for special skills or equipment in the L&TS group. Current work in improving the detection of marijuana plantations is a good example, as is the photo interpretation work in support of spruce dieback evaluation, oak wilt assessments, and sugarmaple dieback.

Also, there are three basic types of projects, and they tie directly to the three ways L&TS conceives of technological applications. Most projects are unique and may not be placed easily into a category, however.

Operational Projects. Project objectives are to accomplish a job or task as quickly as possible. Either current or advanced technology may be used.

Normally, some special ability or equipment is needed. The L&TS group performs the task and little (if any) technology transfer occurs.

Demonstration Projects. The transfer of technology is an objective here, and an effort is made to introduce field people to new technology. New procedures and tools are introduced to users, and support is given until the new ways are accepted. These projects are based on current technology.

New Applications Projects. Based on new or advanced technology, these projects are designed to evaluate new ways to gather information. A project is successful whether the technology proves feasible or not (that is, finding whether something will not work is important, too). Current work in finding photographic and statistical ways to map the occurrence of Port Orford cedar is representative of this type of project.

Projects carried out by the L&TS group in NFAP cover nearly every functional area; the variety of these projects best illustrates the magnitude of the work over the last several years. The partial list in Figure 2 displays many project activities and illustrates that variety.

Summary

The key to *moving ahead* is knowing where you are stepping. The NFAP L&TS group helps managers place their feet so that they end up with goals, targets, and assignments accomplished.

The key to *staying ahead* is using the most efficient and effective methods available. The job of people in technology transfer is to find new ways to do more work at less cost and then to show or tell others how they can do the same thing. The L&TS project is designed to do this. Through a system of monitoring developments in remote sensing, promising technologies are evaluated and, if usable, are passed on to managers. Current techniques are introduced to users as opportunities arise. The focus is always on improving the conservation of our natural resources.

Remote sensing is only one tool on the list of resource management aids. In many ways, we have been very successful in making the obscure obvious, but we still cannot make the invisible visible. Remote sensing can help but it will never replace the need for field work.

Law Enforcement	• Use of electronic sensors to detect the movement of vandals in archeology sites • Use of advanced remote sensing to locate marijuana gardens • Data base development and use in predictive modeling for wildland crime analysis • Endangered species site intrusion monitoring
Research and Forest Inventory and Assessment	• Use of GPS to locate CFI sample plots • Use of satellite digital imagery to assess vegetation
International Forestry	• Sudan (African) photography search and report • Evaluation of space shuttle photography of China, Africa, and Canada
Forest Pest Management	• Hardwood decline • Spruce decline (acid rain or deposition) • Southern pine beetle infestations in Texas • Gypsy moth spread • Oak decline in Texas • Tussock moth defoliation in northern Idaho
Fire Management	• Selway-Bitterroot fire history • Mapping of fire fuels and vegetative productivity • Real-time monitoring of fire starts
Timber Management	• Typing and classification of timber with high-altitude, color infrared photography • Typing and classification of timber with digital data • Plantation stocking and survival • Single-species tree inventory
Range and Watershed	• Mapping and classification of riparian areas with high-altitude, color infrared photography • Use of SPOT satellite data to map riparian areas • Use of Landsat data to locate and map impounded water • Soil mapping with a variety of sensors
Wildlife and Fisheries	• Use of very large-scale photographs to evaluate fisheries habitat • Use of digital data and photographs to predict elk calving areas • Large species movement monitoring with GPS
Engineering	• Road and trail mapping

Figure 2.—A list of representative NFAP field projects.

"Super Good Cents" Makes Good Sense

Louis F. Janke
Facilities Engineer
Colville National Forest, Region 6

Background

The Colville National Forest recently used the "Super Good Cents" program, which is sponsored by the Bonneville Power Administration (BPA), in the construction of a new bunkhouse at the Republic Ranger Station. This program promotes energy efficiency in new single or multifamily electrically heated residences in Washington, Oregon, Idaho, and Montana. (An energy analysis should be made to determine whether electric heat is economical in a particular area before using this program.)

The construction contract allowed the contractor to enroll the building in the program and receive a rebate (estimated at $4,800) from the power company. We believe these savings were included in the bid and passed on to the Government. A contractor who had previous experience with the program made the lowest bid at $50,000. The next lowest bid was $55,000, and that bidder, whose previous experience with the program is unknown, did not choose the program.

The objectives of the program are lower energy costs, increased comfort, healthy living environment, proper installation of energy features, and higher building value. The program has many notable features, which are discussed below.

Advanced Framing Techniques

Advanced framing eliminates nonstructural lumber and reduces thermal bridging. With an R-value of 1 per inch, wood is a relatively poor insulator because it acts as a thermal bridge for heat loss from the inside wall to the outside wall. Advanced framing allows insulation installation in more of the building shell, decreasing heat loss. Using advanced framing can reduce labor and material costs. Advanced framing techniques incorporate the following:

(1) Two-inch by 6-inch studs 24 inches on center, thereby eliminating unnecessary lumber at intersections between exterior walls and partitions.

(2) Insulated headers.

(3) Two-stud and special three-stud corners that eliminate uninsulated corner cavities.

(4) Ceilings constructed to allow insulation at full depth to extend over the top plates.

Advanced Drywall Approach

The advanced drywall approach provides a "continuous" air barrier to control air leakage by linking the drywall to other components of the building's envelope. This barrier can easily be treated to double as a vapor barrier. The keys to the advanced drywall approach are to:

(1) Caulk or gasket where walls intersect ceilings, floors, and other walls.

(2) Caulk or gasket between framing members that join ceilings to walls and walls to floors (for example, between the bottom plate and the subfloor).

(3) Mud and tape drywall face to seal other drywall joints and seams.

(4) Seal utility, wiring, and all other penetrations with caulk.

(5) Use continuous drywall sheets to minimize joints that need to be sealed, whenever possible.

(6) Paint with vapor barrier paint and use faced insulation batts or unsealed sheets of polyethylene to provide a vapor barrier.

The first two steps prevent air leakage around drywall edges into stud or joist cavities.

More Effective Insulation in Ceilings, Walls, & Floors

Increased insulation in ceilings, walls, and floors is important in energy-efficient homes. Wall and ceiling designs in Super Good Cents homes provide added room for insulation, use of rigid insulation, and installation details that reduce compressions and improve performance. Common features include the following:

(1) R-38 or R-49 ceiling insulation.

(2) Exterior or interior rigid foam board applied to R-19 walls to achieve high R-value walls.

(3) R-30 underfloor insulation.

High-Quality Windows & Doors

The program provides access to information on product performance. The program endorses:

(1) Triple- or double-glazed windows with heat-reflective coating.

(2) Windows rated at U-40.

(3) Thermally broken door and window frames.

(4) Insulated foam core doors with weather stripping.

Efficient Electric Heating Systems

Electric heating systems are designed to be safe, clean, and energy efficient. The following are some of the types of electric heating systems:

(1) Zonal heating systems that allow individual-room temperature control.

(2) Heat pump water heaters that also relieve air conditioning, heating, and kitchen and toilet area ventilation.

(3) Air-to-air heat exchangers.

Cost Effectiveness

The 30-year life-cycle cost difference (the calculated savings) is $500. Although this is not enough to be significant, if energy costs escalate substantially over the life of the building, the program would continue to be supported. Energy usage is expected to be 30 percent of normal usage and will produce a reduction in operating costs to the Government of $50 to $70 per month.

Other Features

BPA designs heating, ventilation, and air conditioning systems using computer analysis and provides sizing, specifications, and installation information. Local field representatives provide technical assistance. The buildings are tested for air tightness and program compliance prior to rebate. Building and utility costs are monitored to gauge program efficiency.

Washington Office Note

We are pleased with yet another innovative way to cut investment and operating costs in our facilities. The BPA's Super Good Cents program has a dimension that facility staffs in other areas can use. While the rebate described in the article is available only in the BPA market area, BPA has funded an extensive audiovisual effort, led by the Oregon State University (OSU) Extension Services's Energy Program, to expand use of the alternative building technologies mentioned in this article.

Several Regions and Stations purchased copies of 11 of the 14 Super Good Cents Builder Training Series videos in a Service-wide, consolidated order last fall. Two of the tapes have the same titles, "Advanced Drywall Approach" and "Advanced Framing Techniques," described in the article. Other videos discuss efficient windows, insulation practices, and so on. Super Good Cents videos and other Forest Service training videos can be borrowed from the purchasing units. Information regarding these videos is available in the Facilities Training System, a Data General Information Systems file, IC_FAC_TRAINING_LIBRARY. They are listed as "Builder Training Series."

Access instructions to the Library and other files in the Service-wide Facilities Training System are in the March-April 1988 issue of Engineering Field Notes. *One can copy loaner tapes free of charge or purchase University copies for $20 per tape. For more information regarding direct purchase of tapes and*

a catalog of other available titles, contact OSU Extension Service, Energy Program, 344 Batcheller Hall, Corvallis, OR, 97331-2401, (503) 754-3004.

Resource Training for the Engineer

Brenda Styer
Civil Engineer
Shasta-Trinity National Forest, Region 5

Introduction

What is the Forest Service all about? Have you ever wondered how all the little pieces that make up the big picture fit together? If each of us were asked what people in departments other than Engineering do, most of us only would have a vague idea.

A large percentage of people in Engineering have become specialized. They get locked into one profession, and most of the time their solutions provide a one-sided view. They look at things only from an Engineering viewpoint. That is where interdisciplinary teams are needed, but interdisciplinary teams can have two players who do not agree on anything just because they do not understand one another's professions. They simply do not communicate—not because of a personality conflict, but because of a professional barrier.

I am an Engineer by profession. I have worked with the Forest Service for approximately 5 years, primarily in the area of road design and construction inspection. As part of my career development plan, I recently went on a 6-month detail to the Weaverville Ranger District on the Shasta-Trinity National Forest. The purpose of the detail was cross-training in the different departments on the District.

My history with the Forest Service has included only Supervisor's Office experience. The biggest question I had before I went into this detail was: "What is the Forest Service all about?" There must be more to it than building roads. My schedule was as follows:

Timber Planning and Silviculture	4 weeks
Timber Preparation and Administration	4 weeks
Trails	4 weeks
Resources/Watershed and Archaeology	2 weeks
Wilderness Patrol	2 weeks
Recreation	2 weeks
Administration/Offices Services, Computers, Purchasing, Budget	2 weeks
Fire/Fuels, Fire Prevention, Lookouts and Fire Stations	4 weeks

This was a great overview of the organization.

From the Office to the District

Timber Planning & Silviculture

Going from a Supervisor's Office to a District is a big change in itself. I began in May in Silviculture, working on vexar tubing, fifth-year surveys, animal control, and release contracts. Until then, I had never really thought about what goes on in a plantation between the planting and harvesting stages. It is a struggle between animals feeding on the seedlings and vegetation competition. Release of plantations is done by hand, because of restrictions on the use of herbicides. This is very time consuming. Plantations have to be inspected to establish a priority list of plantations needing release and to determine whether the survival rate meets the qualification standards of a plantation. If a plantation does not meet the minimum requirements for trees per acre, then the silviculturist starts over again.

I found several plantations with research plots where we are studying the effects of the amount of rainfall, varying soil conditions, and weather changes on the seedlings. I previously thought that we left the research up to the research centers. It was good to see some research conducted on the District level.

Timber Preparation & Administration

I began with this department by cruising and marking timber with the crew, which consisted mainly of new and inexperienced people. The amount of instruction given to the newcomers was impressive. It was good to know that the Forest Service had done its best to ensure that the timber was marked correctly. This type of skill is very useful, and I would recommend at least some type of introductory course for all Engineers.

I think it would benefit all Engineers to understand more about the value of timber involved in the sale. In Timber Administration, I worked with the Sale Administrator on several sales around the District. Much of the experience could be compared to road inspection, where problems are found and dealt with on a daily basis.

Lastly, the entire department had the opportunity to tour the local mill. This was a very clever idea; it gave the crew the opportunity to see the rest of the story, and it showed us the importance of their being as accurate as possible in their cruising.

Trails

Trail work was a memorable experience. I have "camped" in the past, although always in established campgrounds and not too far from a vehicle. This was not true the day I went into the wilderness with the trail crew. We went on foot, our gear on our backs, and our tools on mules and horses. We went out for 8 days at a time and worked on improving existing trails, performing minor relocation work, and building causeways in several areas to help hikers across the mire. The most difficult part of the job, besides the physical labor, is that most of the labor goes unrecognized. Unless you get your hands dirty, you really have no idea as to the amount of work involved in our trail maintenance program.

Resources

In the area of Resources, I worked in Watershed and Archaeology. I visited several mining claims to inspect their operations, had a brief overview of all the rules and regulations that apply, and sat in on a meeting with the Shasta-Trinity Mining Association. There were Forest Service employees regularly in attendance to address the miners' concerns. I also visited a timber sale to look into the various alternatives for the environmental assessment process. The District was looking closely at private companies that are logging in the same area and type of terrain to learn from their mistakes when planning alternatives.

Recreation

A big part of Recreation and the Wilderness Patrol is public relations. I became familiar with the volunteer program and aware of the public's desires and needs, which I can use later in designing campground or recreation facilities. Some campgrounds on the District have amphitheaters. The campers enjoyed the evening programs put on by Forest Service employees; we should do more of them. Before I worked on the Wilderness Patrol, I did not know these programs existed. Their primary aim is public contact, along with cleanup and garbage detail.

As the number of users of the wilderness increases, the importance of wilderness ethics becomes more pronounced. The Wilderness Patrol plays a crucial role in educating the users about the protection of this resource.

Administration

When working in Administration, I had a brief overview of the various areas that make up this department: Office Services, Computers, Purchasing, and Budget. I got a better idea of how the organization runs as a whole. Administration is the "glue" that holds the entire structure together. The people who work in this department often have the first contact with the public. Therefore, they have to know a wealth of information about a wide range of topics. During this time, I also had the opportunity to get involved with several Consent Decree reports that involved working with every department.

Fire

In Fire, I worked in Fuels, Resource Protection, Fire Prevention, and Lookouts, and at a fire station. The Fuels department works closely with Silviculture and Resources to ensure that such resources as soil and water are protected and also that the type of burn needed is achieved.

I learned that the Forest Service had level-four law enforcement people working in areas other than marijuana control. These Resource Protection Officers are out patrolling with the sole purpose of enforcing forest regulations, equipped as police with a pistol on the side and a shot gun in the truck. I questioned the Sheriff's office to see how they felt about the Forest Service essentially doing their line of work. They said they could use the help and would like to see more of this in the future.

In the area of Fire Prevention, the District is closely involved with the schools. Fire Prevention employees give talks at the schools, have coloring contests, and even make suggestions, such as having the next homecoming theme centered around fire prevention.

Summary

These are just a few of the many highlights of my detail. I really enjoyed working on the Weaverville Ranger District and would like to thank them for the opportunity. They really are a special group of people. All in all, it was an exceptional learning experience, and I hope to see more of these details in the future. However, each detail should be molded to the individual's needs. The entire 6 months was beneficial to me, but it may not be possible or beneficial to others, depending on their background. Something on a smaller scale may be more feasible. However, you will not be able to cover such a wide range of topics in a shorter time period.

Everyone, not only the detailer, gains from the experience. The detailer provides a different perspective to the department when involved in its activities. I believe that this type of detail is an effective method of improving the Forest Service workforce. It can have numerous positive outcomes. For example, it could lead to being a manager in the future, such as a District Ranger or Forest Supervisor, who understands all of our jobs a little better and can perform better because of it. Or it could lead to a more productive employee who has more facts to consider before making decisions that effect others, such as the public or fellow employees. It makes for a more rounded employee, one who understands the organization better and who now has a broader working knowledge necessary to develop suggestions on possible changes that could improve the organization.

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Inquiries

Regional Information Coordinators should send material for publication and direct any questions, comments, or recommendations to the following address:

FOREST SERVICE--USDA
Engineering Staff--Washington Office
ATTN: Mary Jane Baggett, Editor
P.O. Box 96090
Washington, DC 20090-6090

Telephone: (703) 235-2346

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