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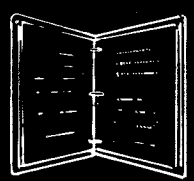

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Volume 9 Number 9

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Every reader is a potential author of an article for *Field Notes.* If you have a news item or short article you would like to share with Service engineers, we invite you to send it for publication in *Field Notes.*

Material submitted to the Washington Office for publication should be reviewed by the respective Regional Office to see that the information is current, timely, technically accurate, informative, and of interest to engineers Service-wide (FSM 7113). The length of material submitted may vary from several short sentences to several typewritten pages; however, short articles or news items are preferred. All material submitted to the Washington Office should be typed double-spaced; all illustrations should be original drawings or glossy black and white photos.

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Coordinators should direct questions concerning format, editing, publishing dates, and other problems to:

USDA Forest Service
Engineering Staff, Rm. 1108 RP-E
Attn: Gordon L. Rome or Rita E. Wright
P.O. Box 2417
Washington, D.C. 20013

Telephone: Area Code 703-235-8198

RESEARCH PUBLICATIONS

A.L. Colley
WO Technical Information Coordinator

We have reviewed *Forest Service Research Accomplishments 1975 & 1976* and would like to call your attention to some research publications which may be of value to you.

Please review the following abstracts and, if you find something of interest, order your copies directly from the Research Units indicated. For your convenience we are including abbreviations and addresses of the Research Units.

FOREST SERVICE RESEARCH UNITS

PNW

Director
Pacific Northwest Forest and Range Experiment Station
809 NE. 6th Avenue, P.O. Box 3141
Portland, Oregon 97208

PSW

Director
Pacific Southwest Forest and Range Experiment Station
1960 Addison Street, P.O. Box 245
Berkeley, California 94701

INT

Director
Intermountain Forest and Range Experiment Station
507 25th Street
Ogden, Utah 84401

RM

Director
Rocky Mountain Forest and Range Experiment Station
240 West Prospect Street
Fort Collins, Colorado 80521

NC

Director
North Central Forest Experiment Station
Folwell Avenue
St. Paul, Minnesota 55101

NE

Director
Northeastern Forest Experiment Station
6816 Market Street
Upper Darby, Pennsylvania 19082

SE

Director
Southeastern Forest Experiment Station
Post Office Building P.O. Box 2570
Asheville, North Carolina 28802

SO

Director
Southern Forest Experiment Station
T-10210 Federal Building
701 Loyola Avenue
New Orleans, Louisiana 70113

FPL

Director
Forest Products Laboratory
North Walnut Street
P.O. Box 5130
Madison, Wisconsin 53705

ITF

Director
Institute of Tropical Forestry
University of Puerto Rico
Agricultural Experiment Station Grounds
P.O. Box AQ
Rio Piedras, Puerto Rico 00928

WO

Deputy Chief for Research
Forest Service, P.O. Box 2417
U.S. Department of Agriculture
Washington, D.C. 20013

IMPROVING ENVIRONMENTAL QUALITY, PRODUCTIVITY, AND USEFULNESS

Reducing Pollution

Controlling Soil Erosion

Surface erosion from road construction, mining, and the like, may create serious impacts on fish habitats and other watershed values. A model for predicting surface erosion in the Idaho Batholith indicates that surface erosion is highest immediately after disturbance and decreases rapidly over time. Increased stoniness of the ground surface (erosion pavement) appears to be the dominant factor causing the trend. Mulching, netting, and transplanting can reduce soil losses during the period before seeded vegetation becomes established.--INT

Megahan W.F.
1974. Erosion over time on severely disturbed granitic soils: a model. USDA Forest Service Research Paper INT-156. 14 p.--(INT)

Ponderosa pine is well suited for stabilization of road fills in the Idaho Batholith. Ninety-seven percent of the trees planted survived. Growth was increased 95 percent by fertilization. Erosion was reduced 32 to 95 percent, depending on whether straw mulch and netting were used in combination with tree planting.--INT

Megahan, Walter F.
1974. Deep-rooted plants for erosion control on granitic road fills in the Idaho Batholith. USDA Forest Service Research paper INT-161. 18 p.--(INT)

Major highway construction is under stringent regulation in subarctic Alaska, but pioneer-type access roads have been neglected. These smaller roads are often erosion hazards and may contribute to fire and insect problems. Guidelines for development of roads in the subarctic have been designed for road builders with limited engineering and planning staffs. They are based on Federal and State environmental regulations for the conterminous United States modified by local experience in subarctic conditions.--PNW

Lotspeich, Frederick B., and Austin E. Helmers
1974. Environmental guidelines for development roads in the subarctic. EPA-660/3-74-009. Corvallis, OR, National Environmental Research Center, Office of Research and Development, U.S Environmental Protection Agency. 63 p.--(PNW)

One of the more visible and controversial environmental impacts associated with timber harvesting in subalpine coniferous forests is road building. A preliminary model has been developed for predicting an index of onsite erosion and downstream sediment yields. By describing the disturbed area in terms of watershed slope and engineering design, the land manager is provided some flexibility in evaluating the impacts of various road systems in the central Rocky Mountains.--RM

Leaf, Charles F.
1974. A model for predicting erosion and sediment yield from secondary forest road construction. USDA Forest Service Research Note RM-274. 4 p.--(RM)

Bare roadside slopes are especially vulnerable to erosion during the first few months after construction. Despite successful germination and early establishment, legumes are unable to compete with grasses and largely disappear from most roadside stands after 1 year. In western Oregon, grass-legume seed, fertilizer, and straw mulch applied to road backslopes, for the most part, successfully halted erosion. Infertile subsoils required refertilization. The mulch, fertilizer, and grass-legume mixtures identified in this study provide a good tool for stabilizing road cut and fill slopes.

Dyrness, C.T.
1975. Grass-legume mixtures for erosion control along forest roads in western Oregon. Journal of Soil and Water Conservation 30(4): p. 169-173. (PNW)

Chemicals in the Forest Environment

Salt (NaCl), used to deice highways, has injured roadside trees in the Lake Tahoe Basin of California. In 1 year, an estimated 3,000 trees were damaged or killed on 321 sites. Symptoms and concentration of salt in the needles of exposed trees were determined and described. Results will help the State Division of Highways develop environmental impact statements and indicate the need for additional studies in the area.--PSW

Scharpf, R.F., and M. Srago
1974. Conifer damage and death associated with the use of highway deicing salt in the Lake Tahoe Basin of California and Nevada. Forest Pest Control Technical Report 1. San Francisco, CA. USDA Forest Service, California Region. 16 p.--(PSW)

Recycling Wastes--Sewage Effluent, Sludge, and Residues

Forests are potential sites for treatment and disposal of sewage wastes, but overirrigation with sewage effluent could result in excess moisture and nutrients. After effluent irrigation, a 20-year-old stand of red pine and young deciduous and conifer seedlings on a sandy site in southern Michigan showed improved growth and survival of most species. Boron toxicity symptoms were indicated in the red pine needles. One to 2-inch (2.54 to 5.08 cm) irrigation treatments at this site appear to be environmentally acceptable.--NC

Sutherland, Jeffrey C., John H. Cooley, Daniel G. Neary, and Dean H. Urie
1974. Irrigation of trees and crops with sewage stabilization pond effluent in southern Michigan. *In* Wastewater use in the production of food and fiber-proceedings, Oklahoma City, OK, 5-7 March 1974. Environmental Protection Technology Series EPA-660/2-74-041. Washington, DC, U.S. Environmental Protection Agency, Office of Research & Development. p. 295-313.--(NC)

Treatment and disposal of sewage wastes from Forest campgrounds has been a difficult problem for land managers. Wastes from sewage vaults were injected into a sandy soil site on the Hiawatha National Forest in upper Michigan. Tests for bacteria and chemicals indicate on-site soil treatment protected the surrounding soil and water resources. With proper site selection, soil incorporation provides cheap, effective, and safe treatment of sewage from remote campgrounds.--NC

Cunningham, Robert, Louis Tluczek, and Dean H. Urie
1974. Soil incorporation shows promise for low cost treatment of sanitary vault wastes. USDA Forest Service Research Note NC-181. 3 p.--(NC)

Sewage effluents and sludges from municipal and industrial sources provide potential water and nutrient sources for intensive culture of forest crops. Pulp and paper mills may soon be required to use land renovation to meet effluent discharge standards. Intensive-culture forestry offers the only wideland management alternative that gives adequate nutrient uptake to provide long term renovation of wastewater. Nitrogen enrichment of groundwater may be the controlling factor in such practices.--NC

Urie, Dean H.
1975. Nutrient and water control in intensive silviculture on sewage renovation area. Iowa State Journal of Research 49(3, pt. 2): p. 313-317.--(NC)

Management of forest residues may impact soil microbes important in the maintenance of soil fertility. Interactions between soil microbes and forest residues are controlled by six environmental factors which are drastically affected by burning. Microbial decomposition of forest residues recycles nitrogen and can improve soil physical properties. Microbial activity can be enhanced by reducing particle size of residues, by providing good contact between residue fragments and soil, and by adding nitrogen to the site.--PNW

Bollen, Walter B.
1974. Soil microbes. *In* Environmental effects of forest residues management in the Pacific Northwest: a state-of-knowledge compendium. USDA Forest Service General Technical Report PNW-24 p. B1-B41.--(PNW)

There is an increasing need for environmentally safe methods of sewage sludge disposal. Energy development is increasing the areas of strip-mined lands needing reclamation. Use of sludge on strip-mined lands offers a solution to both problems. Studies in southern Illinois show that highly acid spoils can be revegetated and leaching of acids and heavy metals reduced by sludge treatments, Heavy sludge applications may cause excess nitrate nitrogen leaching. However, the studies have provided guidelines for a pilot project on the Shawnee National Forest.

Cunningham, Robert S., Craig K. Losche, and R. Kenneth Holtje
1975. Water quality implications of strip-mine reclamation by wastewater sludge. *In* Water Reuse, water's interface with energy, air, and solids, 2nd national conference, Chicago, IL, 4-8 May 1975. 20 p. (NC)

Water irrigation of forests with sewage effluent would aid municipalities but requires adequate soil infiltration. Tests on sand soil plots forested with jack pine and scrub oak showed that effluent did infiltrate in most plots throughout the winter, and effluent distribution on the surface and within the soil mass was limited. However, nitrogen renovation was low compared to the growing season. It can be concluded that winter irrigation of forest soils should be limited to areas where maintaining ground water quality is not critical.

Harris, Alfred Ray
1976. Sewage effluent infiltrates frozen forest soil. USDA Forest Service Research Note NC-197. 2 p. (NC)

Cities are turning to forest irrigation systems to dispose of sewage effluent, often without a thorough knowledge of environmental effects. Studies of soil chemistry after 9 years of effluent irrigation showed only nominal changes in potassium, sodium, manganese, exchangeable hydrogen, ozone, and phosphorus. No detrimental effects on the soil could be determined. The results can be used in planning effluent disposal facilities and forest irrigation.

Richenderfer, James L., William E. Sopper, and Louis T. Kardos
1975. Spray-irrigation of treated municipal sewage effluent and its effect on chemical properties of forest soils. USDA Forest Service General Technical Report NE-17. 24 p. (NE)

Improving Social and Amenity Values

Environmental Amenities--Landscapes and Open Space

Traffic noise is the most widespread form of audio pollution and attempts to reduce it at the source have been only partly successful. Tests in Nebraska show that wide belts of tall, dense trees can reduce sound levels up to a half and combinations of tall, dense trees, shrubs, and landforms 10-12 feet (3.05 to 3.66 m) high can reduce it as much as two-thirds. Sound barriers close to the sound source were more effective. Effectiveness of tree-covered landforms is now qualified and is being used by landscape architects, highway engineers, foresters, and others to reduce noisy traffic situations to more acceptable levels.

Environmental Tree Culture

Cook, David I., and D.F. Van Haverbeke
1974. Noise control. *In* Yearbook of science and technology. McGraw-Hill. p. 282-284. (RM)

Wood has been in a poor competitive position in the guardrail support market, owing to a lack of knowledge of how its impact strength characteristics compared with steel posts. Using the Southwest Research Institute's pendulum facility and high-speed movies, it was found that smaller sizes of lower grades of wood are equal or superior to standard steel posts. These results, in combination with earlier work on machine driving (NE-81 and NE-212), are the basis for an industry-Forest Service effort to change State guardrail post specifications. Success in this effort will provide an expanded market for the over-abundant lower grades of wood.--NE

Gatchell, Charles J., and Jarvis D. Michie
1974. Pendulum impact tests of wooden and steel highway guardrail posts. USDA Forest Service Research Paper NE-311. 20 p.--(NE)

Condensation problems in houses are a major cause of excessive maintenance and heating costs. Research has shown that proper location of vapor barriers and insulation, coupled with improved construction techniques, will minimize condensation problems. Adoption of the research findings can improve house durability and reduce heating energy requirements.--FPL(1298).

Anderson, L.O., and G.E. Sherwood
1974 Condensation problems in your house: prevention and solution. Agriculture Information Bulletin No. 373. Washington, DC, U.S. Department of Agriculture, Forest Service. 39. p.--(FPL)

In addition to softwood plywood, the homeowner has several choices of panel products for new construction or remodeling jobs. Many of these products are made partly or entirely of wood-based material--hardwood plywood, insulation board, hardboard, laminated paperboard, particleboard, and gypsum board. Each product will serve well if used as intended. Information presented will help the homeowner select the materials that best fit his need and pocketbook.--FPL

Werren, Fred
1974. Panel products to choose from. *In* 1974 Yearbook of Agriculture. Washington, DC, U.S. Department of Agriculture. p. 112-115.--(FPL)

Noise is a form of pollution which especially effects residential privacy. Single-row-of-wood stud walls are an important alternative for airborne sound insulation for party walls in multifamily dwellings, since they use less material than, for example, a double-row-of-stud construction. Four different types of design were evaluated under laboratory and field conditions. Two of the designs showed good potential for party wall applications. Results are important to building code groups, builders, and building inspectors, because the advantages and limitations of this type of structure are shown.--FPL

Jones, Robert E.
1975. Sound insulation evaluations of several single-row-of-wood stud party walls under laboratory and field conditions. USDA Forest Service Research Paper FPL-241. 29 p.--(FPL)

Single and multifamily wood-frame dwellings which are outmoded or in a deteriorating condition exist in communities throughout the country. Many of these homes could be rehabilitated at a lower cost than new construction and with much less material than a new home. To promote the twofold advantage of lower cost houses and conservation of our natural resources, a guide was developed for appraising the suitability of woodframe dwellings and to serve as a guide for rehabilitation. It includes information on

examining a house to determine its suitability for rehabilitation, the consideration of esthetic values, planning for improvements to be made, and details for accomplishing the rehabilitation. It should be useful to homeowners, lending institutions, and contractors.

Sherwood, Gerald E.
1976. Renovate an old house? USDA Forest Service Home and Garden Bulletin No. 212. 21 p. (FPL)

Sherwood, Gerald E.
1975. New life for old dwellings: appraisal and rehabilitation. USDA Forest Service Agriculture Handbook No. 481. 99 p. (FPL)

The end of heavy timber beams exposed to the weather are subjected to large changes in moisture content that cause checking, degradation of finishes, and the danger of decay. Finishes, flashings, and other protective covers may be used to minimize weathering effects, and recommendations based upon observations of past designs and current exposure experiments are offered. These recommendations are of value to architects and builders.

Oviatt, A.E.
1975. Protecting exposed ends of timber beams in the Puget Sound area. USDA Forest Service Research Note PNW-263. 15 p. (PNW)

Prevention and Control of Wood-Destroying Organisms

Fungi and insects cause considerable damage to wood throughout the country. This damage is especially important when it involves high-value or critical items such as posts, poles, or supporting components of buildings. Techniques have been developed for recognizing and preventing or minimizing this damage. Pest control operators, architects, builders, and others will be able to contribute toward reducing wood loss by implementing these techniques.--SO

Amburgey, Terry L.
1974. Wood-inhabiting fungi. Pest Control 42(6): p.22-25.--(SO)

Amburgey, Terry L., Lonnie H. Williams, and Raymond H. Beal
1974. Annotated guide to training aids in wood products protection. USDA Forest Service General Technical Report SO-5. 16 p.--(SO)

Many houses are constructed with built-in errors that will predispose them to damage by wood-decay fungi, termites, or other wood-destroying insects. Fifteen percent of all owners of houses built after 1969 in one county bordering the Gulf Coast reported wood damage in their homes due to these agents. Most of this damage could easily have been prevented. A method

of inspection that focuses attention on quality control within samples of houses, rather than an inspection program that requires a superficial examination of all houses under construction, is proposed for consideration by members of the Southern Building Code Congress.

DeGroot, R.C., T.W. Popham, and H.E. Dickerhoof
1976. Minimizing wood deterioration. Southern Building (Feb-Mar): p. 8-9. (SO)

IMPROVING UTILIZATION AND EXTENDING WOOD SUPPLIES

Intensive Culture Methods

Management Planning

No available information compares yields from plantations of northern conifers with those from naturally regenerated aspen. Yields at age 40 compared in central Minnesota showed volumes were highest for red pine (408 cubic meters and 147 tonnes per hectare), progressively less for aspen, jack pine, and white spruce, and lowest for black spruce (183 cubic meters and 70 tonnes per hectare). Land managers may anticipate similar variation in yields attributable to species when reforesting similar sites.

Schlaegel, Bryce E.
1975. Yields of four 40-year-old conifers and aspen in adjacent stands. Canadian Journal of Forest Research 5(2): p. 278-180. (SO)

Improving Uses and Protection of Wood

Utilization Potential and Processing of Wood

Wooden houses should be repainted only after previous paint has weathered thin because paint failures tend to occur if the paint film is too thick. A simple test is described for determining whether an old paint surface will form a satisfactory bond with latex paint. Simplified instructions for repainting a house, including preparations of surface and application of paint, are included. This information is of broad interest to owners of homes and other wood structures.

Mraz, Edward A.
1976. How to refinish wood siding with latex paints. USDA Forest Service Research Note FPL-232. 2 p. (FPL)

Performance of finishes on wood exposed outdoors can be vastly improved by treatment of wood surfaces with various inorganic compounds. Simple brush applications of aqueous solutions of the chemicals to wood surfaces can: 1) retard degradation of the surfaces by ultraviolet radiation; 2) enhance effective use of polymer coatings transparent to ultraviolet light; 3) reduce the swelling of wood by water; 4) impart a degree of fungal resistance to the surface and surface coatings; 5) serve to fix the extractives in redwood and red cedar; and 6) lengthen the life of oil base and latex stains and coatings. Use of the treatment will improve wood as a substrate for finishing.--FPL

Black, John M., and Edward A. Mraz
1974. Inorganic surface treatments for weather-resistant natural finishes. USDA Forest Service Research Paper FPL-232. 40 p.--(FPL)

Wood Engineering

In the design of wood structures, design parameters are established on the basis of the analysis of component units (rafters, walls) rather than on a total integrated structure. By racking a complete wood-frame structure, the strength of the total structure was determined. Conventional wood framing provides excellent strength. Under severe stresses, floor-to-wall connections failed first. Other tests show that moisture gradients in roof joists can cause bowing and subsequent separation of interior ceiling from walls. Such weaknesses can easily be rectified with minor design changes.

Tuomi, Roger L., and William J. McCutcheon
1975. A conventional house challenges simulated forces of nature. Forest Products Journal 25(6): p. 13-20. (FPL)

Tuomi, Roger L., and Darrel M. Temple
1975. Bowing in roof joists induced by moisture gradients and slope of grain. USDA Forest Service Research Paper FPL-262. 12 p. (FPL)

Timber bridges are widely used in rural areas and on Forest Service roads. They are durable, economically attractive, and can be erected with a minimum of skilled labor and equipment. The newly developed glued-laminated bridge deck provides excellent structural performance, and promises to extend the service life for the bridge by protecting the superstructure. An efficient construction procedure is presented, and suggestions made to avoid common pitfalls.

Tuomi, Roger L.
1976. Erection procedure for glued-laminated timber bridge decks with dowel connectors. USDA Forest Service Research Paper FPL-263. 15 p. (FPL)

Architects and builders know little about changes in moisture that occur behind brick siding or conventional wood siding in exterior insulated wood-frame walls. A study of moisture gradients in these two wall types was made during winter in a mild climate in Athens, Ga. The results show that the wood frames behind brick siding will remain dry during winter even if the interior vapor barrier is broken or omitted because of the air space normally provided between the brick and wall sheathing. The wood-sided wall must contain an interior vapor barrier to stay dry. Properly constructed wood-frame wall systems, using either brick or wood siding, can be expected to remain structurally sound without costly deterioration from dimensional instability, paint peeling, and wood decay, caused by high moisture levels.

Duff, John E.
1974. Comparative effects of brick and wood siding on the moisture conditions in wood walls. USDA Forest Service Research Paper SE-113. 16 p.-(SE)

FOREST PRODUCTS AND ENGINEERING RESEARCH

Forest Engineering Research

Improving Engineering Systems

Burke, Doyle
1974. The mass diagram in timber access road analysis. USDA Forest Service Research Note PNW-234. 10 p.--(PNW)

Burke, Doyle
1974. Automated analysis of timber access road alternatives. USDA Forest Service General Technical Report PNW-27. 40 p.--(PNW)

Burke, Doyle
1974. Skyline logging profiles from a digital terrain model. *In* Skyline logging symposium, proceedings, Seattle, WA, 23-24 Jan 1974. Seattle, WA, University of Washington. p. 52-55.--(PNW)

Egging, Louis T, and David F. Gibson
1974. Helicopter logging: a model for locating landings. USDA Forest Service Research Paper INT-155. 27 p.--(INT)

Gibson, David F., and Louis T. Egging
1974. A model for determining the optimal number and location of log decks for rubber-tired skidders. Transactions of the ASAE 17(6): p. 1112-1116.--(INT)

SLOPE INCLINOMETER DATA REDUCTION

Robert E. Kaufman
Materials Engineer
Region 2

A slope inclinometer is an instrument developed to aid engineers in evaluating the performance of embankments and foundations, and in monitoring earth movements in natural slopes.

The initial step is installation of a vertical well casing in a soil mass. A profile of the casing is determined by lowering a slope inclinometer instrument into the casing and recording the measurement at regular depth intervals. Location, magnitude, direction, and rate of movement of the casing can be identified and detected by repeating measurements at given time intervals.

The Fort Collins Computer Center has on line an available program, (R2PROG.SLPIND), specifically designed to reduce and plot slope inclinometer data. This program was obtained from the Colorado State Highway Commission; some corrections were made, and Region 2 has used it for the past several months.

PROGRAM DESCRIPTION

Field data for the program is primarily horizontal displacement in inches. Readings are taken at predetermined depths in the inclinometer tube; all subsequent readings must be repeated at the same depths. Four readings are collected at each depth (two in the north-south axis, and two in the east-west axis). A measured or an assumed azimuth is assigned to one axis.

The program has two parts. The first is the classical reduction of data for two separate axes, one 90° to the other. The second part of the program calculates a resultant movement vector for each depth increment measured.

In the first part, the program reduces data and accumulates deflection from either an assumed fixed bottom or the top of the inclinometer tube. The data are directly affected by an "instrument constant" which is multiplied by the *change* in field data to yield apparent deflection. The *offset* (measured movement of the top of the tube) is computed to reflect the new relative positions.

In the second part of the calculations, the movement vector is the resultant of deflection in the two axes as calculated in the first part of the program. Direction of the resultant vector is calculated from the azimuth assigned to one of the axes. Magnitude and direction of the movement vector are listed and plotted.

In summary, the program:

1. Calculates and plots the *difference* between an initial and subsequent set of data.

2. Calculates and plots an accumulative deflection from an assumed fixed point, which may be either the top or bottom of the inclinometer tube.

3. Calculates and plots the magnitude and direction of the resultant horizontal deflection of each depth increment.

PROGRAM USE

The program output is designed for either a remote or high-speed terminal with 132-column printout capability. It offers both an abbreviated and complete output of data. The abbreviated output is the input data, the listing and plot of magnitude, and direction of the resultant movement vector for each depth increment. The complete output is:

1. Input data,

2. Listing of data change and accumulated deflection,

3. Plots of both north-south and east-west axis data changes,

4. Plots of both north-south and east-west deflections,

5. Listing and plot of the resultant movement vector for each depth increment.

To be considered complete, the program needs additional enhancements. Such desired items are: plotting water levels; labeling outputs in feet (if, in fact they are); and calculating the resultant movement vector for all types of input. Regardless of these shortcomings, the program is a vast improvement over manual calculations.

Those interested may obtain a user's guide by contacting:

Robert Kaufman
Rocky Mountain Region
11177 West 8th Avenue
Lakewood, Colorado 80225
(FTS 234-4405)

The guide includes: program details; runstream; sample data sheets; coding forms and instructions; and a sample problem.

A HISTORY OF EXPLOSIVES USE BY THE FOREST SERVICE ROCKY MOUNTAIN REGION[1]

Ray Adolphson; P.E. & L.S.
Regional Blaster Examiner

Use of explosives by the Forest Service in the Rocky Mountain Region has come a long way from the early days, when black powder was used by Forest Service crews.

Very little blaster training was provided for Forest Service construction and maintenance crews prior to the establishment of the Civilian Conservation Corps (CCC), April 1933.

Many of our people used explosives, including our District Rangers. Construction and maintenance laborers on force account work were hired in many instances with the assumption that they had explosives experience. Often these employees had a wide variety of expertise, but many who did explosives work had little or no training in their use.

Black powder and dynamite, detonated by safety fuse and caps, were the standard explosive products of the day.

Storage, transportation, and use standards for explosives were meager, and the few standards that existed were rarely followed. The Dupont Company had, for its day, an excellent Blaster's Handbook, but few explosive users had copies of it. Those who did quite often ignored the safety guidelines. The Dupont Blaster's Handbook is still the "Bible" guideline for safe use of explosives in the United States.

When the Civilian Conservation Corps (CCC) was established in April 1933, the Forest Service saw the need for an adequate safety program. Comprehensive safety regulations in handling, transportation, and storage of explosives were developed for thousands of CCC enrollees. The first CCC training program in explosives began in the Black Hills in 1933.

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[1]*From the Western Engineer, Volume 61, No. 6, June 1977. Reprinted by permission.*

In 1934, use of safety fuse and caps was generally discontinued. Electric blasting machines, electric blasting caps, lead wires, connecting wires, and a gadget called a "Blasting Galvanometer" used to check the electric caps and circuits at blasting sites, replaced safety fuse and caps. Training, during CCC days, included mandatory night sessions for those who elected to work with explosives.

The four-step method of on-the-job instruction was started early in 1934 by Rocky Mountain Regional Forester, Col. Allen Peck. This early on-the-job instruction was introduced by two members of the Dunwoody Industrial Institute, Minneapolis, Minnesota, and by Forest Service CCC supervisors and foremen.

Soon after World War II, the Chief of the Forest Service and the Rocky Mountain Director of Engineering decided that a blaster's certification system was essential. This need became evident soon after the Timber Access Road Program started in July 1946. Many Forest Service force account crews and contractors worked in isolated areas. Since getting injured construction and maintenance personnel out of the rough back country was always a problem, most explosives accidents were fatal. Hence, good safety practices on the job became increasingly important. Increased use of explosives on roads, trails, bridge sites, telephone and fence post holes, bridge abutments, pier excavations, and lookout tower foundations indicated the need for a blaster's training system. Additional emphasis on avalanche control in ski areas and use of explosives in seismic work also reinforced the need for an organized blaster's training workshop program.

The first examination and field test in the Rocky Mountain Region was administered at Kremmling, Colorado, on August 23, 1948. The field test was given on the Routt Divide Road located between Gore and Rabbit Ears Pass. In the summer of 1949, I initiated the first Forest Blaster's Workshop at the Medicine Bow National Forest headquartered at Laramie, Wyoming. The workshop was a 2-day session in the classroom and in the field.

It was apparent that the Forest's training programs needed to be coordinated to insure continuity in instruction and test standards. This required the Engineer's office guidance. The Region was divided into two zones, and training was conducted on this basis.

I handled the Regional training on the Routt National Forest, Steamboat Springs, Colorado, from May 1958 until 1961. From 1961 to 1969, training was conducted by Don Fibe, Regional Blaster Examiner, on a 3-day basis--2 day in the classroom and 1 day in the field.

Since World War II, there has occurred a near revolutionary development by industry of new, safer explosives. It has been matched by a flood of new State and Federal explosive regulations since 1970. In fact, there have been more new State and federal explosives regulations and controls during the last 7 years than had existed in the previous 50 years.

Consequently, the blending of new explosives, new operating equipment, and techniques, coupled with the numerous explosive regulations and controls initiated during the past decade, created the need to upgrade the Forest Service explosives training workshops.

The post-World War II introduction of ammonium nitrate in its current "prilled ANFO" forms, water jells, slurries, and the component types ("blasting agents") of explosives, has required new handling techniques. The use of dynamite products is rapidly being phased out because of the development of safer explosives. The Forests in the Rocky Mountain Region no longer employ dynamite (nitroglycerine products) except for the occasional use of ditching powder. Still another impact has been found. When safety fuse and caps are used, extraneous electricity provides a greater hazard in surface explosives operations (long identified in underground mining operations) than has generally been recognized.

As a result of this impact in 1972, the Forest Service expanded its blaster's workshops in the Rocky Mountain Region to 5, rather than 3 days (fig. 1). In addition, the Forest Service has conducted separate blaster's workshops for the U.S. Bureau of Mines, U.S. Bureau of Reclamation, the National Park Service, the Colorado Division of Highways, and the local ski patrols. Also, public agency participation in Forest Service blaster's workshops has substantially increased.

The Regional blaster's workshops are the fundamental base for training Forest Service personnel in the use of explosives. Supplemental training is incorporated in the workshop for seismic personnel. At other Forest Service workshops avalanche control personnel also receive additional training pointed toward their special ski area needs. The Rocky Mountain Station provides basic data and guidance for the avalanche control throughout the Forest Service.

During the past 6 years, the Forest Service has given considerable attention to the dangerous static electricity potentials which may exist at the blasting site. Recently developed electric bridge wire (EBW) blasting machines, electric bridge wire detonators, and shunted cap safety fuses have contributed materially to safer explosives detonation. *Nonel*, an explosive tool product developed by Nitro Nobel of Sweden is another major improvement of an explosives detonating device. Nonel currently is being used by contractors on the Eisenhower Tunnel's eastbound bore on I-70, under contract supervision of the Colorado Division of Highways.

Figure 1. Blaster's training workshop, and blaster's training workshop Field Demonstrations: View shows one of the crews preparing an underground charge.

Other explosives manufacturers have provided updated technical reference literature and technical speakers for our blaster workshops. In addition, several State and federal agencies have assisted us in our training program.

The Forest Service, in the Rocky Mountain Region, initiated a safety and instructions program for explosive blasters many years before State and Federal regulations made training programs mandatory. The Agency's continued commitment to explosives safety is reflected by its programs, workshops, and trained personnel (fig. 2).

Figure 2. A Kinepak charge being explained to members of the training workshop.

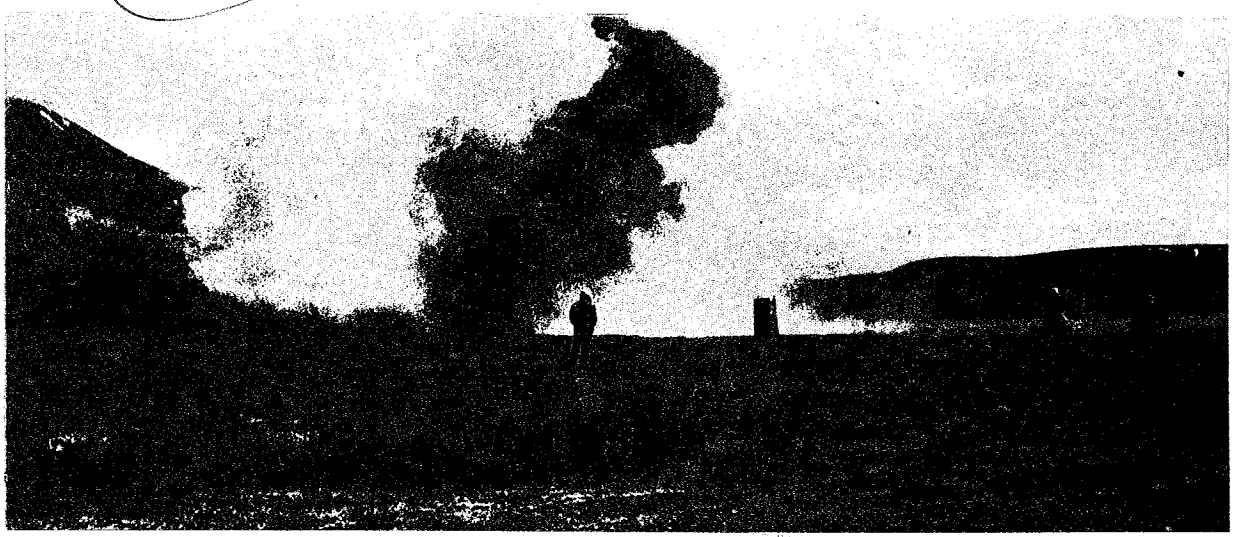
Current explosive blaster personnel in the Rocky Mountain Region are competent, stable, and receptive to the many technical changes which frequently occur. In the surface blasting area such as roads, trails, avalanche control, and other general construction, we have approximately 20 outstanding forest blasters and instructors on the Region's Forests (fig. 3).

The Region's goal continues toward a safer, more efficient explosives blasting operation.

"There are BOLD Blasters, there are OLD Blasters, - but no OLD, BOLD Blasters."

Figure 3. Blasting's not limited to the men. This young lady has been on the Copper Mountain Ski Patrol for 3½ seasons and the trail crew for one season. She has been involved in avalanche and trail blasting for the past year and a half.

Blaster's training workshop: General view showing personnel attending the blaster's training workshop held at the National Guard Armory in Montrose, Colorado.



Blaster's training workshop, blaster's training workshop Field Demonstrations: The final blast of the day is shown as all the leftover explosives are detonated.

WASHINGTON OFFICE NEWS

OPERATIONS

Harold L. Strickland
Assistant Director

GEOMETRONICS APPLICATION OF DIGITIZING TECHNIQUES

In response to the many inquiries concerning digitizing and general digital concepts, the WO Geometronics Group is preparing a publication to identify and describe the concepts and Forest Service applications of digitizing techniques. These inquiries are valid, and represent broad potential for further applications of the concepts. All indications point to the acceptance of digital methods, and one responsibility of the Geometronics Group is to develop the understanding and the technology transfer of methods and procedures now in use.

Digitizing may be described as "converting lines, images, and other conventional displays of information to a numerical format which can be understood and enhanced by a computer." Many agencies employing digital techniques find them to be more cost-effective than conventional methods. It is recognized that the initial investments are high, careful planning is required, and there is a short training cycle necessary to redirect our patterns of thinking and established methods. But the advantages outweigh those factors:

1. Information can be handled more efficiently by a computer than by a man

2. Error rates are reduced significantly

3. Greater quantities of information can be stored in digital form than any other known at present

4. More variables can be introduced.

Thus, costs are reduced, output capabilities and evaluations are improved, and results are enhanced.

Much of the early interest in digital data resulted from the use of data sources such as *LANDSAT* and the *DMA* tapes; but these sources were considered too coarse for most FS activities, and it was necessary to establish

digitizing procedures that would meet specific FS project needs. The result is a variety of digitizing techniques to accommodate both 2- and 3-axis data.

The 2-axis data have been used primarily to obtain statistical information for a given area, and to provide plotted output of a specific nature (generally for land and resource use). Land attributes are located with respect to some coordinate system by an x- and y- axis only. The 3-axis data are used to record information with respect to x- and y- coordinate values, and a z- value or elevation. This third dimension allows data to be manipulated--with programs such as TOPAS--to create perspectives, contours, profiles, and many other useful products. One program being developed in Geometronics incorporates the ability to correlate information that has been digitized in a 2-axis mode with 3-axis data (digital terrain model).

The publication that the Geometronics Development Group is preparing for distribution in the fall will describe the background, concepts, applications, and trends of the digitizing effort to meet FS needs. It will make distinctions between 2-axis and 3-axis digitizing--from the type of source data used, to the products generated by each method.

To the extent that documentation is available, several of the programs that are presently used in the Field will be outlined, both as to intent and the products generated. Although the digitizing technique is the most important consideration, other data sources (such as *LANDSAT* and *DMA* tapes) will be addressed in the publication.

Specific equipment characteristics will not be included, since the Geometronics Development Group recently distributed copies of four sections of a DATAPRO publication concerning data collection equipment; it is available from your Regional Geometronics Leader.

DATAPRO, a private concern that markets this type of information, permitted the FS to reproduce the material. The company performs an annual survey of various equipment items, and tabulates that information according to manufacturer, the equipment attributes, and prices; generally, there is a short description of the technology involved.

Because of the increased emphasis on obtaining more information in less time, it is imperative that the FS understand and use digital data. We can no longer ignore the fact that most organizations have investigated the use of digital systems, and may have initiated programs to exploit its advantages. The amount of information available in digital form is rapidly increasing; equipment costs are decreasing; the integrity of the data is improving; and the next request received may say, "Please send me your digits on project.....".

TECHNOLOGICAL IMPROVEMENTS

Heyward T. Taylor
Assistant Director

NOISE POLLUTION PREDICTION METHOD

The Forest Service has entered into an interagency agreement with the U.S. Environmental Protection Agency (EPA) to better quantify and control outdoor noise, especially in recreation areas. Major responsibility for work accomplishment has been assigned to the San Dimas Equipment Development Center, with Forest Engineering Research personnel providing assistance.

Different recreational activities are associated with different acoustical environments. For example, many visitors to public lands expect to enjoy a pristine environment where they can pursue quiet activities such as hiking, camping, or exploring wilderness areas; while others come to engage in noise-producing activities such as riding off-road vehicles, using power boats, or operating chainsaws. Commercial enterprises and transportation systems can also create significant noise impacts.

Since land managers are expected to furnish compatible environments for these different activities on lands open for public use, they need methods to assist them in planning and controlling conflicting noise-generating and noise-sensitive fields of action.

To provide some methods, the interagency project has four overall tasks:

1. Develop a noise pollution prediction method to determine the pattern of noise environments in a given Forest from sources within the immediate vicinity of the Forest.

2. Develop a set of criteria to identify Forest activities compatible with various noise environments.

3. Identify land management and operational control techniques and principles that can be applied to reduce noise impact in the Forest. Develop a system that permits the user to choose the most appropriate techniques for noise-abatement purposes.

4. Test, evaluate, and demonstrate the utility of the system on one or more selected Forests.

Development of a computerized "noise prediction" method is well underway, and the target date for the actual demonstration is in late FY 1978.

Cooperation with EPA in setting up this project to meet our own needs in recreation management has put the Forest Service in contact with many Federal Agency officials, who are involved in noise abatement and control. An interagency luncheon was hosted by the Forest Service this summer in the South Agriculture Building to discuss our concerns about noise in recreation areas, our development work in measurement standards, hearing protectors, operational policies, and current research in noise areas.

Accomplishment of the tasks outlined in the join EPA project and intimate participation with other Federal Agencies in reviewing their noise programs all promise to improve our noise management tools. With better tools, our land managers will be able to improve recreational environments for the public.

CONSULTATION & STANDARDS

Walter E. Furen
Assistant Director

THE FR&T STUDY ON TRANSPORTATION INVESTMENT DECISION POLICIES AND ANALYSIS

In mid-July, the Chief's office sent a copy of the *FR&T Study on Transportation Investment Decision Policies and Analysis* to all Region and National Forests through Regional offices.

From March through May, a group of Forest Officers interviewed more than 130 field personnel and reviewed written comments from other Units in and outside the Forest Service. The Forest officers then developed a report to the Chief concerning actions needed to increase capabilities of the Forest Service in evaluating and justifying Forest roads and trails.

The following highlights were presented to the Chief:

> A paramount concern of each Regional Forester and many others was the inability to operate and maintain roads, trails, and other improvements at a satisfactory level. The need for a means to carry out custodial management or finance "base" activities was an up-front issue. This report uses the term, "stewardship," or "asset management," to encompass these management activities.
>
> For many FR&T issues the consensus was that existing policy is satisfactory, although some new, revised, or clarified policy is needed.
>
> Relationship between policies and program direction is a concern, and consistent management direction is needed. Links between RPA, written policy, program budget procedures, and fund distribution are not always clear.
>
> An understandable and uniform accountability system is needed.
>
> The present program budget system is too complex, and many minor investment decisions are being made by the Washington Office.
>
> The Forest Service needs a better system of approving and carrying out long-term investments.

National Forest trails have not received sufficient attention.

Concerns were expressed that new or revised economic analysis policies would result in greater funding inequities than presently exist between Regions.

Transportation planning is not adequately included as part of the land management planning process.

In September, the Chief approved an Action plan by the Washington Office Staff Directors responsible for developing the policy and procedures required.

During the coming months, proposed concepts and policies will be developed concerning asset management. Several National Forests will be selected to participate in pilot studies to establish practical application procedures for these proposals.

As recently discussed in *Field Notes*, actions will soon begin on the items listed in the "Road & Bridge Preconstruction Activity Review." In general, the *FR&T Study* and the *Activity Review* complement each other. The *FR&T Study* addresses changing the method for investment analysis, while the *Activity Review* states that Engineering economic analysis and evaluation of road-resource relationships need better application in preconstruction. A few recommendations overlap; however, completion of overlapping actions on the *Activity Review* will be regarded as accomplishments for the *FR&T Study*.

Most of the actions will be completed within 2 years.

ASSISTANT DIRECTOR FUREN

In this issue, we thought you'd like to hear about the background of Walter E. Furen, new Assistant Director of Engineering for Consultation and Standards.

Walt was raised in Wyoming and attended the University of Utah. He spent 8 years in Region 6 with time on the Fremont and Willamette and in 1962 became Forest Engineer of the Umpqua National Forest.

In 1966 he became the first Engineering Training and Development Officer in the Washington Office. During this time he initiated Forest Engineering Technical Training Programs that provided for University training of Forest Service Engineers. Some of these programs are still used to increase Engineering technical skills in meeting the continuing change in technology and analysis activity.

In 1969 Walt became Assistant Regional Engineer in Region 5. He started in the Construction and Maintenance position and later moved to Programming and Technical Services.

Early in 1975 he became Regional Engineer of Region 3 and now is Assistant Director of Engineering for Consultation and Standards.

Consultation and Standards is involved in helping Regions and Forests perform the day-to-day technical engineering work to support Forest Service Operations. As the name implies, this group of nationally recognized specialists provides consultation support to Forest Service Officers in all phases of Engineering. It also develops the National Standards necessary to assure that engineering practices in the Forest Service are technically adequate. The Consultation and Standards Staff consists of specialists in Structures, Water Supply, Dam Design, Materials, Sanitation, Electric Power, Surveying, and Transportation System specialists in Planning, Design, Construction, Maintenance, Operations, and Safety.

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