

**ENGINEERING
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FIELD NOTES • TECHNICAL REPORTS • TEXTS
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Field Notes

Volume 5 Number 7 July 1973

The New Color of Engineering Field Notes

Legal Responsibilities of the Forest Service

(From an Engineering Standpoint)

Associated with Special Uses Involving Winter Sports

WO Division of Engineering News



FOREST SERVICE • U.S. DEPARTMENT OF AGRICULTURE

ENGINEERING FIELD NOTES

This publication is a monthly newsletter published to exchange engineering information and ideas of a technical or administrative nature among Forest Service personnel. The text in this publication represents the personal opinions of the respective author and must not be construed as recommended or approved procedures, mandatory instructions, or policy, except by FSM references.

This publication is not intended to be exclusively for engineers. However, because of the type of material in the publication, all engineers and engineering technicians should read each issue.

This publication is distributed from the Washington Office directly to all Regional, Station, and Area Headquarters. If you are not now receiving a copy and would like one, ask your Office Manager or the Regional Information Coordinator to increase the number of copies sent to your office. Use Form 7100-60 for this purpose. Copies of back issues are also available from the Washington Office and can be ordered on Form 7100-60.

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 sentences to several typewritten pages. However, short articles or news items are preferred. The Washington Office will edit for grammar only. All material submitted to the Washington Office should be typed double-spaced, and all illustrations should be original drawings or glossy black and white photos.

Each Region has an Information Coordinator to whom field personnel should submit both questions and material for publication. The Coordinators are:

R-1 Bob Hinshaw	R-6 Kjell Bakke
R-2 Allen Groven	R-8 Ernest Quinn
R-3 Dan Roper	R-9 Ron Pokrandt
R-4 Fleet Stanton	R-10 Gerald Coghlan
R-5 Jim McCoy	WO Al Colley

Coordinators should direct questions concerning format, editing, publishing dates, etc., to Fran Owsley, Editor, Division of Engineering, Forest Service, USDA, Washington, D. C. 20250.

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F I E L D N O T E S

THE NEW COLOR OF ENGINEERING FIELD NOTES

By A. L. Colley

Information Coordinator, Washington Office

The official reason for the new color of our Engineering Field Notes (EFN) is to signal a basic change in the nature of the Notes themselves. The purpose of this article is to share with you some of the reasons behind the changes and the related details.

For some time, we have been having difficulty in obtaining suitable articles for EFN, and even more difficulty in getting them published. Somehow, during the past year, we have departed from the original concept of newsy-informative articles for the Field Notes and have been receiving quasi-technical reports. These reports were too long for EFN and too short to do technical justice to the subject matter. It is now apparent that these submissions were not meeting the basic objective of providing a means for sharing technical and administrative information among our engineers on a timely basis. Consequently, technical reviewers rejected most articles because they did not meet technical nor informative standards.

We are redirecting our efforts to establish an in-house newsletter type of publication by returning to a monthly issue and adding a section of short news items for the Washington Office. We hope that each Region and Station will join in the effort by submitting news items for a Regional section. These submissions should reach the WO by the first of each month for publication in the following month's issue.

The Field Notes offer an opportunity to provide Service-wide information on your projects, studies, successes, failures, and problem areas. By sharing this information we can avoid duplicated efforts and keep people with common problems in touch with each other. EFN should also be used to keep in touch with our people by publishing personnel changes as well as anything of an administrative nature affecting the engineering environment.

We will continue to publish articles, but our approach to these will be informal. The WO will do only minor grammatical editing and, in general, the articles will be published in the language and style of the author. Each article will reflect the author's personal opinions only, as opposed to representing approved procedures; therefore, when you read future articles we hope that you will not hesitate to take issue, through EFN, with anything you think to be "off-base."

In order to meet the monthly publishing schedule, all materials submitted for EFN must be typed double-spaced and where illustrations are involved, they must be suitable for reproduction. Original line-drawings and/or glossy black and white pictures are preferred.

Starting with this issue, distribution will be through Regional, Station, and Area Headquarters to Forest Service personnel only. The cost of sustaining an individual mailing is prohibitive, and outside distribution requires Departmental approval of all material prior to publication.

This publication can be as meaningful as you care to make it. If you as an individual and your Regional Information Coordinator seek out informative articles and share them with others via EFN, we can create a tool that provides unlimited benefits.

FSM 7113 is being revised to reflect the above.



**LEGAL RESPONSIBILITIES OF THE FOREST SERVICE
(FROM AN ENGINEERING STANDPOINT) ASSOCIATED
WITH SPECIAL USES INVOLVING WINTER SPORTS**

By Charles F. Dwyer, Cableways Staff Engineer
Washington Office (located in Denver, Colo.)

The legal considerations and principles of law presented here are the work of others, particularly Mr. Dean A. Gardner, Attorney in Charge, Office of the General Counsel, Ogden, Utah. This article directs applicable portions of prior presentations to the more limited subject under discussion. The contents of this article represent the author's opinion only and do not establish policy nor responsibility for the Forest Service or for Forest officers.

SUBJECT DEFINITION

Legal Responsibilities. We are discussing here the procedures and rules that apply to the duties or responsibilities of the Forest Service and its employees, both individually and collectively, in their administration and other involvement with special uses, particularly winter sports.

In law a legal responsibility or duty is created by agreeing to do something for the benefit of someone else. This responsibility or duty is incurred by a written agreement, as were our permits, standards, and safety requirements, or it may be incurred by a particular course of conduct, even though never written, if the user is aware of the responsibility or duty and relies on it. It also may be imposed by law to cover certain relationships, such as the duty and degree of care expected of the operator of a common carrier.

Liability is that condition of being responsible for a loss, an expense, an injury, an evil or a burden. Liability is incurred when there is a neglect of a legal duty or responsibility.

From an Engineering Standpoint. The term “from an engineering standpoint” connotes that the subject under discussion involves rights and responsibilities of the Forest Service employees relating to activities with structures, plants, equipment, conveyances and related items to the extent they require the application by engineering personnel of engineering principles in their design, construction, application, inspection, operation and maintenance.

Special Uses Involving Winter Sports. The term “special uses involving winter sports” is defined here to be those engineered items used in our ski areas and winter recreation sites which are dependent upon engineering support services for satisfactory function. The principal items are:

- ***Mechanical Transport Facilities*** — Aerial passenger tramways, aerial and surface ski lifts, tows, personal rapid transit (PRT) systems, and similar conveyances.
- ***Engineered Services*** — Water supply and sewage treatment plants, power supply and distribution, and heating and cooling systems.
- ***Others*** — Roads, bridges, dams and parking facilities associated with the development of winter sports areas; avalanche retainage and control structures.

To clarify this paper it seems expedient to use one aspect of the engineering effort associated with special uses involving winter sports and assume the others are closely related. Since mechanical transport facilities typify winter sport special uses, that subject will be used when a special activity is described.

RESPONSIBILITIES AND THE ESTABLISHING FACTORS

As an owner of land, the Government is entitled to most of the rights and privileges of a private landowner. And, since 1946 when the Federal Torts Claims Act was enacted, the Government has assumed the legal obligations and responsibilities of a private landowner except in cases of sovereign immunity in discretionary functions, and in the exceptions listed in 28 USC 2680, such as libel and slander. The following explains some of the situations where the Forest Service has legal responsibilities to be met or for which it may be held accountable.

Standard of Care. We establish by direction and action a standard of care or behavior for the various activities of the Forest Service. Among these are our activities associated with special uses involving winter sports. Failure to meet these standards may be considered negligence. Negligent conduct is conduct which falls below the standard of behavior established by law for the protection of others against unreasonable harm and risk. We incur a liability when an injury has been caused by an act of negligence and the injured party has not contributed thereto (e.g., through contributory negligence or by assumption of the risk).

There may be reasons not based on any principle of negligence that would prevent a negligent person from becoming liable. The statute of limitations may prevent an action. The Federal Tort Claims Act requires that a person file a damage claim with the agency responsible for the alleged negligence prior to commencing a lawsuit in court.

There are various degrees of misconduct involved in negligence actions, such as reckless, wanton and willful negligence. There is also a type of conduct that produces liability without negligence; this is called absolute liability or liability without fault. Recently the U.S. Supreme Court decided, in the case of *Laird vs Nelms*, that claims based on the principle of absolute liability may not be prosecuted successfully against the United States because the Federal Tort Claims Act only waived sovereign immunity for injury to persons or property caused by negligent or wrongful acts or omissions.

The directive system of the Forest Service, including manuals, handbooks, and regional supplements is a reference to determine the standard of care for an employee. There is no clear-cut law setting forth the Forest Service responsibility in special uses involving winter sports; in part, it is derived from the various interpretations of the Organic and Multiple Use Acts, although many other laws and decisions are also involved. To the extent that these interpretations vary, the nature and level of performance should vary. Each engineer should know the rules specific to his job.

Type of Use. Outdoor recreation involves both native and improved lands. Special uses involving winter sports are of increasing importance among developed and natural outlets for outdoor recreation. Public safety is an important consideration in recreational areas developed by the Forest Service or constructed under special use permits.

Supervision and Control. For permitted operations, Forest Service policy is to encourage permittee expertise with the objective of reducing supervision and control over the operations of its permittees to a minimum.

Engineering Responsibilities. The Forest Service has directed that the design of structures and mechanical equipment be certified for adequacy by a qualified engineer, preferably from outside the Service, and has placed similar requirements for construction and operation (FSM 7320). The Forest Service expects the same standard of care from its engineers that is demanded of a professional person in any other field. The forest engineer is assigned work in a wide variety of activities and he is accountable for his actions in any particular field or specialty.

The Federal Tort Claims Act has imposed the negative and defensive duty of an ordinary landowner on the employees of the Government to conduct their operations free from negligence or suffer the potential of suit for damages resulting therefrom. A negligent Government employee who injures or damages someone is vulnerable to personal liability for his acts unless he is acting as a public officer performing a discretionary function.

Federal-State Jurisdiction. Virtually all instances of special use involving winter sports fall in some measure under the Joint Jurisdiction of the Federal and a State Government. It is well established that Federal agencies are not subject to regulation by the States. When both Federal and States laws are dealing with the same subject, the Federal law is supreme. However, the Federal Tort Claims Act sets the standard of care at that required by State law regarding liability. Where a State has relevant laws and regulations pertaining to those activities associated with our special uses, the Federal procedures must be such that State requirements can be met. Primarily, the protection of life and property and the maintenance of law and order within the territorial

jurisdiction of any State are responsibilities of State and local authorities. Local laws and ordinances may establish duties which the Federal Government, as a landowner, owes to the public.

The Nature of Use. In analyzing the legal rights of persons and the legal responsibilities of landowners, the purpose for the presence of an individual on the land is most important. Traditionally, the purpose of a visit is classified as that of a: (1) trespasser, (2) licensee, (3) invitee and (4) paying passengers. Almost without exception, persons using National Forest land under special use for winter sports are invitees on the land or are paying passengers, and the Forest Service as landowner is legally responsible to require licensees serving the public to provide reasonable care for their safety. When their presence further involves the use of aerial passenger tramways or related facilities sometimes classified as common carriers, we are responsible for requiring permittees to provide the same degree of care.

Usually, a landowner has no duty or responsibility for persons on leased premises. But the Forest Service as landowner in the instance of a special use involving winter sports, has the responsibility for the public or invitee on the land. The following condition arises from these circumstances:

- Our special use permits create a legal relationship between the Government and its permittees.
- In the instance of a concession involving an extra-hazardous operation for public use, the landowner retains a non-delegable duty and responsibility to those invited on the land.

Recent Legislation. Recent environmental legislation has introduced new legal responsibilities for the Forest Service in its administration of public lands. The Clean Air Act of 1963, as amended, requires that the Forest Service comply with State requirements respecting control and abatement of air pollution (Section 118, Clean Air Amendments of 1970). We are required to comply with the applicable Federal, State, Interstate, and local requirements respecting control and abatement of air pollution to the same extent that any person is subject to such requirements. Similar responsibilities are incurred under provisions of the Water Pollution Control Act of 1970 – an Act intended to enhance the quality and value of our water resources and to exercise the prevention, control and abatement of water pollution. Related responsibilities were developed under provisions of the National Environmental Policy Act of 1969. This Act encourages a productive and enjoyable harmony between man and his environment; promotes efforts to prevent or eliminate damage to the environment, and to stimulate the health and welfare of man. These recently enacted laws must be studied along with provisions of the Organic Act and the Multiple Use Act to establish Forest Service responsibilities peculiar to a specific special use and, most particularly, those involving winter sports. Our employees incurred additional legal responsibilities for cooperation with others in implementing the provisions of the Occupational Safety and Health Act of 1970.

MINIMIZING LIABILITY IN THE PERFORMANCE OF ENGINEERING DUTIES AND IN MEETING LEGAL RESPONSIBILITIES ASSOCIATED WITH SPECIAL USES INVOLVING WINTER SPORTS

The preceding material attempts to interpret, from an engineering standpoint, the legal responsibilities associated with special uses involving winter sports. The purpose of the interpretation is to facilitate standard compliance with the many Acts establishing these responsibilities. An awareness of the consequences of failing to correctly perform the duties assigned and a suggestion for procedures which might tend to decrease the liability inherent in the activities associated with meeting these responsibilities in the field is necessary.

Performance of Engineering Assignments. Each engineering assignment should be performed as that of a professional person accepting such assignment. It should be performed by following the instructions and procedures established by the Forest Service for the performance of the assignment. It should be performed in a manner to best accomplish or fulfill the mission and objectives of the Forest Service.

Many of our engineering-related legal responsibilities arise from our established work rules. Most of these rules are clearly established and readily available in our manuals, handbooks, codes and standards. Others exist, but are less available, in State and Federal laws. Still others exist in the intangible form of parallels established by pleading procedures and court actions. We are obligated in the performance of our work to be knowledgeable of, and to adhere strictly to, the established rules available to us. We should seek legal assistance in clarifying these responsibilities arising from less definitive rules or precedents.

Elimination of Negligence. An engineering service must be performed without negligence. Negligence can be based on either active or passive conduct — a failure to act, or an action. Under the Federal Tort Claims Act, negligence is a negligent performance of a Federal Government employee engaged in an activity on the operational level that subjects the Government to liability. (The exception is the Government's being exempt from liability for the negligence of its employees when they are performing a discretionary function. A discretionary function, in turn, being one in which an engineer exercises a power or right to act officially in the policy making field.)

Avoiding Grievances. Assignments to our administrative and engineering personnel in exercising control over special uses involving winter sports are many and varied. These assignments involve contact with individuals, firms, and others exercising their rights while we perform our tasks and fulfill our responsibilities. Often this interplay does not have the benefit of implementation by definition or other inclusion in either the standard or special clauses of the special use permit. However, the assignments are generally accomplished amiably, and problems or differences that arise are resolved without incident. Occasionally an individual is injured, damaged or aggrieved. Most often his claim is based upon:

- Torts committed by our employees (negligence).
- Agreements and contracts which we have failed to perform or fulfill.

- Violations against the public interest.

In performing their duties, Forest Service personnel are expected to cooperate and to maintain the highest level of amicable relations with permittees. They must be mindful, however, of the possible consequences of their actions in activities beyond those assigned. They can function in the capacity of a consultant from time to time but must be careful not to place the Government in competition with private enterprise.

Program Enforcement. The principal means of controlling safety practices and thus assuring fulfillment of Forest Service legal responsibilities for areas under a winter sports special use permit are for the Forest Service to (1) enforce controls which are written into the permit, and (2) inspect the permittee's actions. When police action is required, it will be taken largely by and in accord with local and State law.

The Forest Service Manual is explicit in requiring certain inspections of facilities in a winter sports area. The rule of law is that when inspections are required they must be performed. Failure to make required inspections is evidence of negligence.

When an engineer has negligently failed to perform an inspection, or performed an inspection negligently, his personal liability judgment will be based on his performing a discretionary function or duty unless his act was outside of his authority or was performed willfully, corruptly or with malice.

CONCLUSION

The legal responsibilities of the Forest Service associated with special uses are vast, and are not easily established or clearly defined. While the field is narrowed when approached from an engineering standpoint and limited to special uses involving winter sports, it remains broad and subject to variation from many factors. Location, State or local laws and ordinances, nature of the particular use, and other factors affect our responsibilities.

Without an exhaustive study of the legal ramifications of laws governing our activities, it seems reasonable to accept those responsibilities in our subject fields which are established by current Forest Service Manual or related direction and by the precedence of our activities in the past.

The Forest Service engineer is also expected to comply with the standard of reasonable prudence determined by legislative enactment, administrative regulations, prior court decisions, or a court jury decision by:

- Exercising his skill and knowledge in a manner normally possessed by a professional engineer in good standing.
- Conducting himself as a reasonable, prudent engineer.

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WO DIVISION OF ENGINEERING NEWS

CONSULTATION AND STANDARDS

Charles R. Weller
Assistant Director

Cadastral Engineering. Over the years much information has become available on field utilization of various north seeking gyro theodolite equipment. The applications of this equipment to Forest Service land surveying has been assigned to Mr. Victor Hedman, Regional Cadastral Engineer, Milwaukee. Several gyro reports have been written, some have been published, and just recently two more reports were transmitted to all Regions (FSM 7150, April 25, 1973).

The Division of Engineering is presently considering three areas for Engineering Technical Reports (FSM 7113.1) concerning Forest Service land surveying applications. They are as follows:

- Electronic Distance Measuring (EDM) and gyro equipment
- Calculators and the State Plane (S.P.) Coordinate System
- Deed requirements by map, mosaic, orthophotoplat and terrain digitizing.

Since much work is yet to be done, the progress of equipment tests presently being conducted, the technique revision evaluations, and the new or modified systems are being distributed directly to each Regional Cadastral Engineer. For those of you who are interested in reviewing what has been done or in helping by contributing information, please contact your Regional Cadastral Engineer.

Transportation System Planning

Project Analysis: The Transportation System Planning Project (TSPP) has completed the development of the several transportation analysis models described in ETR-7700-4c. User guides and handbooks are being written and will be distributed by mid-summer. The traffic surveillance design handbook is also in final draft and will be distributed soon to all Forests. Field units desiring more information about these transportation analysis models or assistance in technical application to resource transportation development problems are encouraged to contact Mr. DeKalb, TSPP Leader, Berkeley. No additional development of new transportation network analysis models are planned at this time.

A major TSPP effort will be made this summer and fall on selected Forests in several Regions to move ahead with implementation where network analysis techniques can be effectively utilized to solve current timber resource transportation problems.

Planning: Revised drafts of FSM 7700 Zero Code and Chapters 7710, 7720, and 7770 are being forwarded to Regions for review. This material is the outgrowth of a field planning and management task force that was assigned the responsibility for developing more detailed guidelines and policy for operation of the transportation system. These chapters have been extensively rewritten and restructured to embrace the three principal areas of transportation engineering — *Planning, Development and Operation*.

Water and Sanitation

Operator Certification: A certification reciprocity program is a necessity to enable our water and waste water systems operators to comply with various Federal and State legislation, and to assure quality control in plant operations. The Association of Boards of Certification (ABC), formed jointly by AWWA and WPCF, recognizes this, but the situation does not lend itself to a fast solution. In the interim, EPA and the Neosho, Missouri Water and Wastewater Technical School, where many of our wastewater system operators have recently completed training, will pursue the matter at some length. The school has been actively engaged in obtaining reciprocity agreements for the Texas State Test, which they offer, in many States in which our trained operators now reside. The enthusiasm and interest of these operators is displayed in the phenomenally high percentage (over 80 percent) who have passed the Texas Test.

Drinking Water Legislation: There are two bills before Congress which have acceptable and debatable sections that draw mixed emotions from the various entities who might be involved. A perusal of the various professional and trade publications will acquaint those interested with the issues. Any one of the bills, if passed, would assist the Forest Service in advancing our safe, sanitary drinking water supply programs. A citizens' committee developed a revised set of proposed drinking water standards to be applied under any of the bills. An EPA working committee is now studying those standards. Indications are they will be published before the end of the calendar year, with or without an associated bill, to replace the 1962 Drinking Water Standards under which we now operate.



TECHNOLOGICAL IMPROVEMENTS

Heyward T. Taylor
Assistant Director

Timber Crib Retaining Walls. Road construction in mountainous terrain frequently requires retaining structures to prevent scarring of hillsides, minimize stream encroachment and stabilize cut and fill slopes. In forested areas, it is particularly desirable that these structures be made from wood — if such structures are economically competitive with conventional structures made from

concrete, steel or other materials. Under the terms of a cooperative agreement with the Forest Service, the University of Idaho has recently completed a study and analysis of timber crib retaining walls. Design criteria for timber cribs were evaluated, including (1) the structural quality of timber members and their connecting devices, (2) the suitability of various soils as crib fill and backfill, and (3) the effect of settlement and differential wall movements on stresses in timber members and connecting devices. Seven different standard designs, including three Forest Service designs, were analyzed in detail. A computer program was developed which checks soil bearing pressure, wall movement, and various stress points within the structure.

The study findings, as well as the computer program, have been incorporated into a final report. Plans are under way in the WO to install this computer program on Forest Service computers. We believe the final report, which is currently being distributed Service-wide, will prove to be a highly useful reference for structural designers, materials engineers, and others concerned with timber crib retaining walls.

Computer Terminals. During the past 1½ years, efforts have been under way to make the computer more accessible to field units. Vital ingredients in this accessibility are computer terminals. During May 1973, Service-wide contracts were awarded for the purchase or rental of two types of computer terminals by Forest Service units.

Typagraf, Inc. was awarded a contract to supply semi-portable terminals. These terminals are similar to teletypes. They will print 132 characters per line, transmit and receive data at rates up to 30 characters per second, and will have magnetic tape cassettes for storing data. They will also be equipped with acoustical couplers which will accept the headpiece from a regular telephone for sending or receiving data. The initial order is for 49 terminals – 25 for Regional and project offices, and 24 for National Forests. The purchase price is \$4,400 per terminal.

Computer Transceiver Systems, Inc. was awarded a contract to supply portable terminals – the model name is EXECUPORT. The terminals are suitcase-size, will print 80 characters per line, and are also equipped with magnetic tape cassettes and acoustical couplers. The initial order is for 18 terminals for Regional and project offices. The purchase price is also \$4,400 per terminal.

Delivery of both terminal types should begin by July 1, 1973.

Recent Publications

- Annual ED&T Plans and Progress Report, Washington Office, 1972 and 1973.
- A Minimum Water Toilet Fixture – The Duner 509, EQUIP TIPS, March 1973.
- Gloves for Forest Workers, EQUIP TIPS, March 1973.
- Improved Emergency Ration, EQUIP TIPS, June 1973.
- Specification for Downdrains, Flexible Coated Fabric – Forest Service Specification 7100-001b.
- Information Retrieval Systems and Services in the Geotechnical Field – An Annotated Listing, ASTM Standardization News, March 1973.

- A Study and Analysis of Timber Crib Retaining Walls, Civil Engineering Report 73-1, University of Idaho, April 1973.



OPERATIONS

Harold L. Strickland
Assistant Director

Dale O. (Jack) Frost will be reporting to the Washington Office about the first of July where he will assume duties in the Engineering Management section. Jack's responsibilities will include forest road and trail and pollution abatement program coordination.

Frank Hammond, staff engineer, Engineering Management, has been a member of the National Forest System team that is analyzing, coordinating, and preparing budget proposals. The team's work is based on field data submitted in the Environmental Program for the Future and the program budget for FY 1975 alternative data from the field. Additional information on the budget process will be forthcoming in subsequent issues of Field Notes.

Instructions for implementing a Forest Service Potable Water and Sanitation program were transmitted to Regional Foresters, Station Directors, and Area Directors by Mr. T. C. Nelson's 7410/1310 letter of 6/14/73. The material contains specifics on the use of P.L. 92-500 funds in FY 1974, criteria for project selection, and related reporting procedures.

Retiring from the Forest Service after many years of government service are Jim Onishick (34 years) and Marion Shoquist (31 years). Jim has been working in our Geometronics section, and Marion has worked as an illustrator in drafting.

Engineering Services Study. During the March 1973 Regional Engineers' meeting, the Regional Engineers recommended that the engineering organization be studied for better ways of providing engineering services.

Since then, the WO Engineering Operations group has been making a study of the engineering job Service-wide, and analyzing various alternative ways of organizing to best accomplish the engineering job in support of National Forest goals. This study ties in with the Service-wide organization study, the realignment of Regional boundaries, the Chief's Financial Planning Advice, and the program direction for fiscal year 1974 and the foreseeable future. This study, with its recommendations, will become input to the total organization study.

The recommendations coming out of the study being conducted by the Operations group take into account supporting National Forest goals, quality engineering, economy of providing engineering services, career opportunities in specialized areas, and preserving our best talents during severe

budget restrictions. The study should help to provide each Region with a strengthened engineering force regardless of the outcome of the Regional reorganization.

All Regions have been involved in supplying input to the study, and have responded promptly and accurately despite heavy Regional work loads and pressures. This kind of teamwork is appreciated.

Geometronics. Our multifunctional planning efforts of the past few years have caused us to rethink how we collect, manipulate, and display data to support decision making:

- We need more data in some areas — can get by with less in others.
- The data must be non-biased if it is to be converted to a digital form and used in computer-assisted planning.
- The spatially oriented data must be related to a common reference system — tied together in space. Just knowing there is a good stand of Sugar Pine on the north side of Bear Mountain is not sufficient reference for today's investigation of resource opportunities.

Most of our resource information has been compiled by the appropriate functional specialists. It consequently has been displayed on a wide variety of maps and graphics. Putting this data together is a frustrating and time-consuming task — one we cannot afford to continue.

In response to this need, we have developed a new, broader mapping system for the Forest Service. This system will be reflected in the soon-to-be published revision of FSM 7140. Figure 1 illustrates the overall concept of the system. The objective will be to ultimately incorporate all of our functional mapping efforts into a coordinated system, tied to a common base. These layers will provide systematic input to INFORM's data banks and a format for displaying the output. Figure 2 illustrates the source material for the system and some of its products.

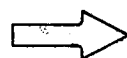
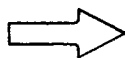
It is important to note our reliance on the U.S. Geological Survey for the basic data. Our efforts can no longer be in the preparation and maintenance of base maps — some of which have duplicated the efforts of other Federal agencies. We must concentrate on supplementing base maps — prepared by the USGS — with the unique information we need to support planning.

The base materials are already available for the most part:

- Primary series — nearly 60 percent
- Secondary series — over 80 percent
- Regional series — 100 percent

Bringing the materials up to date and incorporating orthophotos and our functional layers will still be a sizable job, however. Under present manpower and funding constraints, we envision a 10-year period for full implementation.

Individual Layers



Work Maps

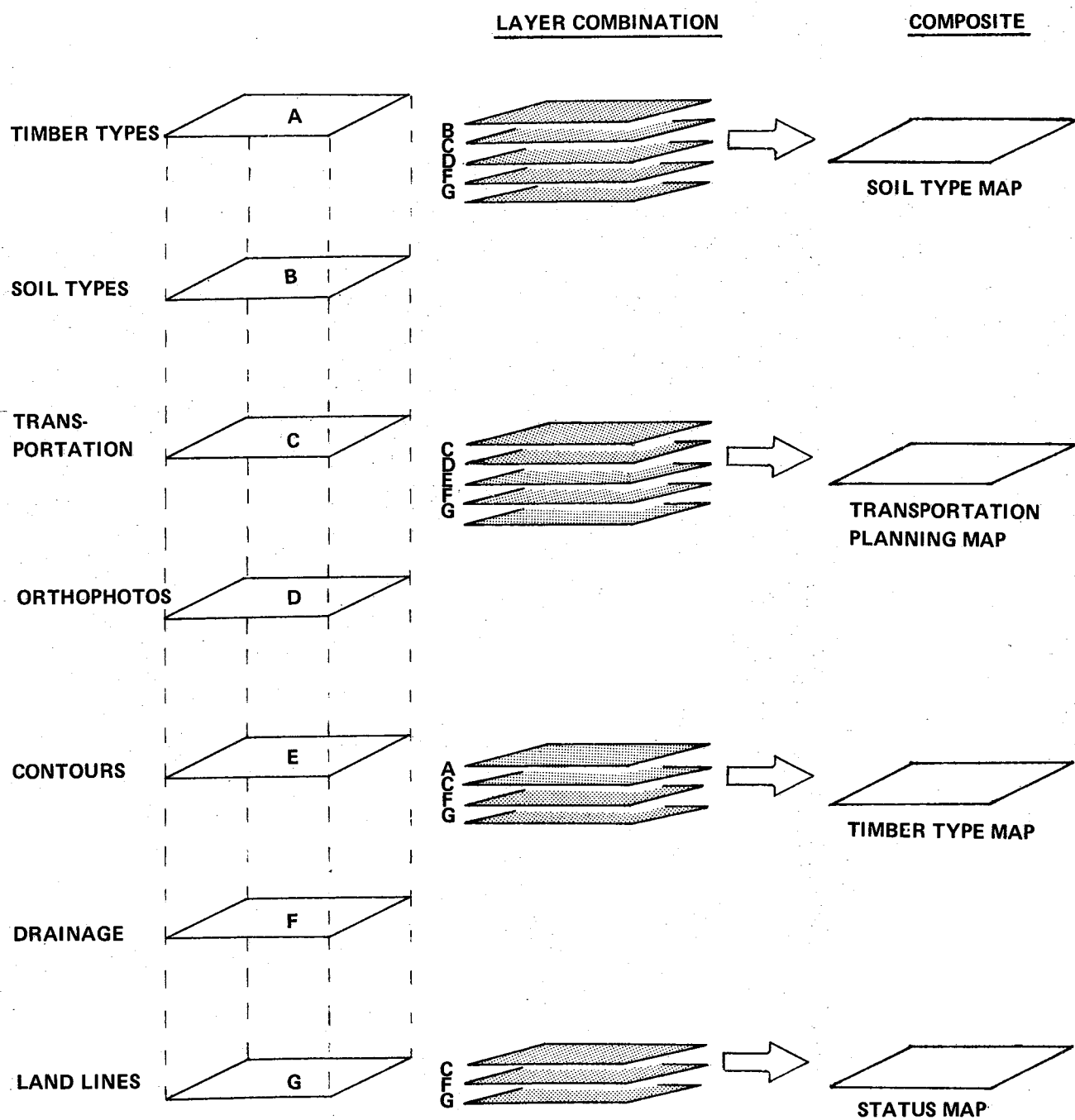


Figure 1.— Multi-Layer System for Providing Work Maps

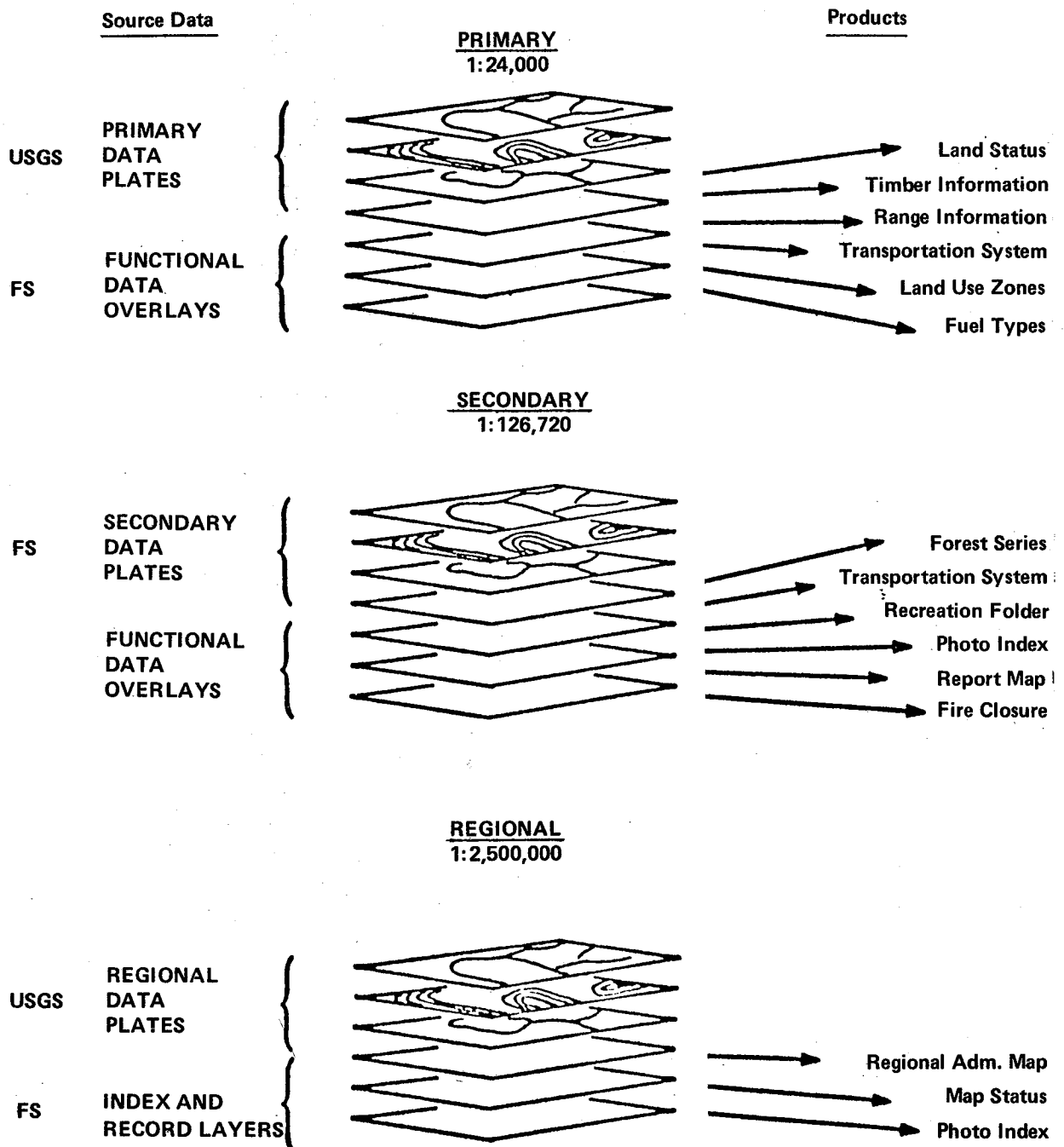


Figure 2.— Forest Service Base Series Map Products

