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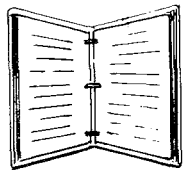
Field  Notes

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FOREST SERVICE ● U.S. DEPARTMENT OF AGRICULTURE

ENGINEERING FIELD NOTES

This publication is a monthly newsletter published to exchange Engineering information and ideas among Forest Service personnel.

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

The publication is distributed from the Washington Office directly to all Forest, Regional, Center, Station, Area, Laboratory, and Research Offices. Adequate copies are printed to provide all who wish a personal copy. If you are not now receiving a personal 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.

It is intended that the material in the Field Notes be primarily written and used by Forest Service Field Engineers; however, material from other publications may be used.

Field Note material should always be informative and cannot contain mandatory instructions or policy. The length of an article may vary from several sentences to several typewritten pages. Material need not be typed (neatly written or printed is acceptable), or edited before being submitted to the Washington Office. This will be done in the Washington Office to accommodate our format and allowable space.

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

R-1	Kenneth Yeager	R-6	Don Loff
R-2	Marshall Fox	R-8	Rollie Bailey
R-3	Dan Roper	R-9	David Jones
R-4	Fleet Stanton	R-10	Loren Adkins
R-5	Chuck Paletti	WO	Norman Sears

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ENGINEERING IN WILDERNESSES

by J. J. Byrne, Director
Division of Engineering, WO

I am taking a liberty with the purpose of Field Notes to cover a subject which is not technical, but which apparently is not well understood by engineers at all levels. This is the Wilderness resource. The Manual (FSM 2320) contains directives which cover the administration of National Forest Wildernesses. However, there is much which can be read between the lines. This article is being written to give my interpretation of this Act for your benefit.

First of all, why do we have this kind of resource designation? Many of you have limited experience with the many pressures brought to bear on the administration of all Government lands. These pressures may be simply classified as: (1) Exploitation; (2) preservation; and (3) wise use. Wise use is our policy in the Forest Service. Multiple-use and sustained yield are components of wise use. The establishment of Wildernesses, and Wild and Primitive Areas by the Forest Service in the twenties was in recognition of a demand by some people for opportunities to enjoy unspoiled areas. The Forest Service was the only agency in Government at that time to recognize this need. Even National Parks were mostly outdoor museums where masses of people spoiled the area for nature lovers. And as a matter of fact, no National Park units have been included in the National Wilderness System. Congress recognized this need by establishing wilderness as a resource in the Wilderness Act of 1964, which established the Wilderness System. In this Act, the most basic determination was that we, the American people, could afford the luxury of wilderness. If we accept this determination, and we must, then we can better understand that economy, efficiency, or convenience is secondary to preserving wilderness values. This does not mean that we should overlook economy, but all actions should be consistent with the Act.

I suggest that you all read the Act, which is included in Sec. 1021 of the Manual (page 219). You will recognize that it includes several compromises. As a result, in some respects it is a patchwork document.

One item which is often misinterpreted is the use of motorized equipment. Sec. 3c, page 224 speaks of this subject. It states that "...except as necessary to meet the minimum requirements for the administration of the area for the purposes of the Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure of installation within the area." I call your attention to "...except as necessary to meet the minimum requirements for the administration of the area for the purpose of the Act." Nothing is said about economy, efficiency, or convenience. The thrust is toward achieving the purposes of the Act.

To administer the Wilderness Act properly, there is always a need to consider alternatives and choose the one which will best meet the objectives of the Act. Some examples follow:

1. A flood occurred in the Bob Marshall Wilderness. The trail system was destroyed over a large area. Analysis indicated that it would take from 2 to 3 years to reestablish these trails without mechanizing the work. If the work could be mechanized, it could be finished in one work season. It was decided to permit mechanization of the job and the use of helicopters in order to finish the job in one season.

2. The U.S. Geological Survey applied for permission to use helicopters to set controls for mapping. It was determined that many of the control points could be reached on foot or by horse without unduly delaying the job. However, a few were too inaccessible to reach in the deadline for meeting an objective. A helicopter was permitted for establishing control at these few points.

3. The Wilderness Act itself required that reports be made on the mineralization in certain Primitive Areas which were under consideration for inclusion in Wilderness. The time allowed was short and the qualified mineral surveyors were also in short supply. Helicopters were used by these surveyors in some instances.

In all the foregoing cases, economy did not enter into the decision, even though it may have been furthered.

I urge you to feel the challenge of the Wilderness Act of 1964. What options left to you can be used to meet the purpose of the Act? Ingenuity can solve many problems and give great personal satisfaction.

You are all busy people; however, I think you will get a feel for our legal boundaries and obligations if you thumb through the entire Zero Code 1020 - LAWS, REGULATIONS, AND ORDERS in the Manual. The more you become familiar with these documents, the more opportunity you will have to advance to high administrative positions in the Forest Service.

TRAIL MACHINE CATTLEGUARD

by Harold L. Greer, Civil Engineer
Sawtooth National Forest

The Williams Creek Trail on the Sawtooth National Forest crosses private land near Obsidian. The trail carries a substantial amount of trail machines and the private land crossed by the trail is used for grazing cattle. Where the trail leaves private land and enters public land, a cattleguard was needed to enclose cattle and allow safe passage of trail machines.

Crossing a standard wood or steel cattleguard with a two-wheel vehicle is dangerous and often disasterous. The rails, especially when wet, are slippery and dangerous to cross. To stop livestock, rails on a cattleguard must be widely spaced--wide enough for the wheels of most trail machines, if turned parallel to the rails, to drop between them.

Some solution to the problem had to be found that would provide for the safety of machine riders. Harry Ames, Forest Engineer on the Caribou National Forest, had a similar problem. After detailed dicussions, Mr. Ames suggested a design for cattleguards using suspended hoses.

I designed a trail machine cattleguard--using suspended hoses--and Wallace Wilson, Sawtooth Valley District Engineering Technician, fabricated and installed it. It worked! It was tested by riding different types of trail machines, at varying rates of speed, across it. No problems were encountered.

The depth illusion and slight motion of the hoses keep the cattle completely away from the cattleguard. Although the plans call for light-colored gravel, it has not been placed under this unit yet, but the unit appears to be effective without it. An unidentified horseman apparently tried to force his horse across this unit but was unsuccessful. In his attempt, cross-bars were pulled loose. They were easily replaced by putting new springs and cords through the hoses. Replacement of cross-bars, in case of accidental or deliberate damage, is simple and cheap. The initial cost of this installed unit is approximately $150.00.

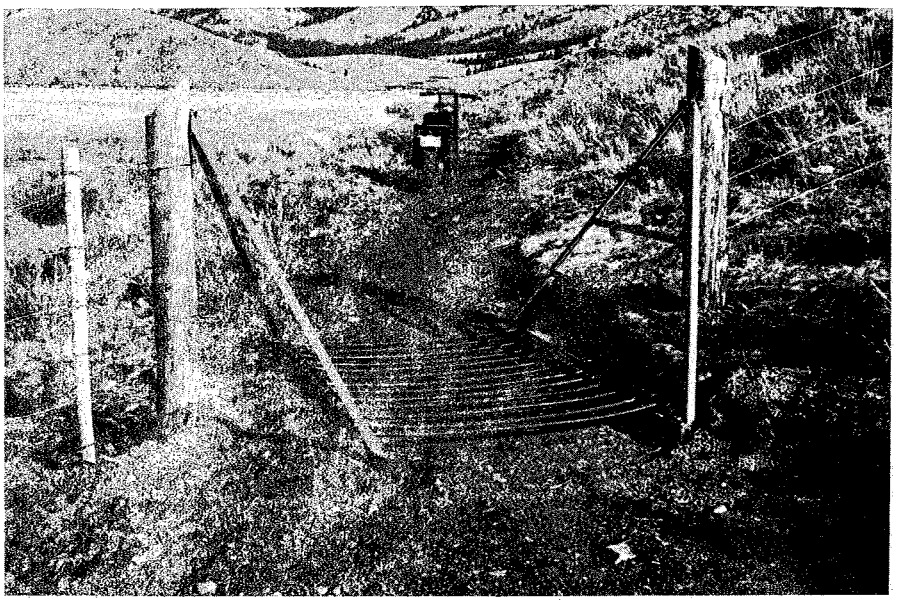
It is recommended that a gate be installed by the side of the cattleguard to allow easy passage of pack strings. The guard itself is relatively easy to open, but some pack strings might be shy about going through the open cattleguard.

COMMENTS OF THE USERS

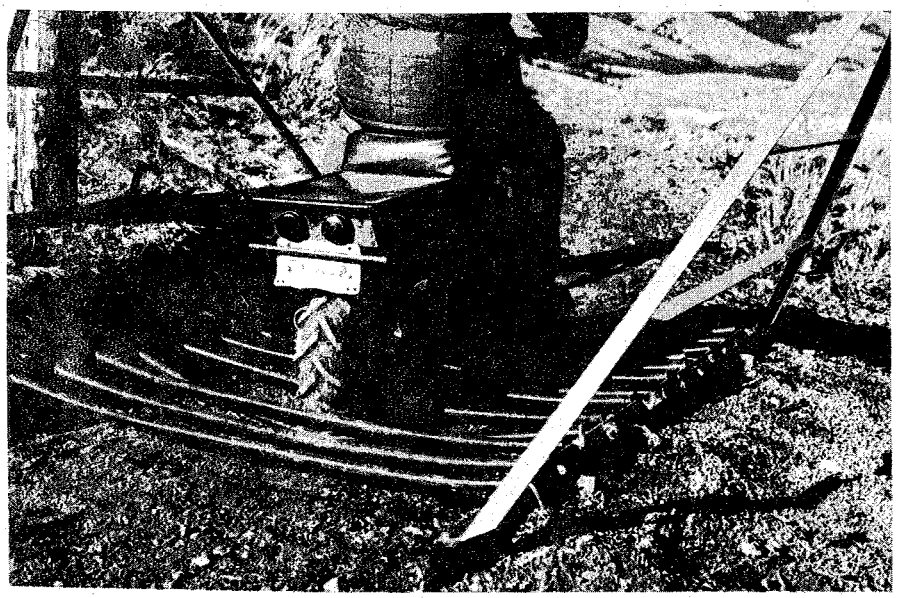
Mr. Wilson has received many favorable comments from machine riders using the trail and cattleguard. It appears they are a bit leery during their first crossing, but after finding no problems in crossing, they readily praise the unit.

EDITOR'S NOTE: A copy of the plans for the cattleguard could not be included in the Field Notes. If you desire a copy of the plans, we suggest you contact the author.

Pictures follow.



Machine Trail Cattleguard



Machine Crossing the Cattleguard

Opening the Cattleguard

ROADWAY STRUCTURAL SECTION DESIGN USING ELASTIC THEORY

by David L. Jones, Materials Engineer, R-9

The ready supply of good road building material is rapidly depleting. At the same time, costs are rising. We are thus faced with the need for better utilization of in situ construction materials. Various methods of stabilizing native or in-place materials have been developed. Incorporation of these stabilized materials into the structural section of the roadway has often been based on past experience of the design engineer. A more systematic approach involves using empirical design concepts. In recent years, design concepts have evolved which relate basic engineering characteristics of materials to their performance in a structural section of a roadway. The application of these concepts to design has been made possible through systems analysis and the use of the modern computer.

One such computer program has been developed by Chevron Asphalt Corporation. The purpose of this program was design and analysis of flexible pavements. The program will accept information data for up to 15 layers of materials having different engineering characteristics. Most of the work that has been done with this and other programs has thus far been related to high standard roads. However, the theory appears to be valid even for the low standard, low use roads frequently encountered by the Forest Service. In an effort to check the practicality of this system's approach to design, Region 9 has entered into a contract with the University of Minnesota. Under this contract, the University will study and design a number of pavement sections for an actual project using the Chevron 15 layer program.

Uniformly graded beach sands are in great abundance in the area of the Great Lakes. Meaningful laboratory test results for a strength design with these sands are difficult to obtain. Therefore, an actual project was selected for design where beach sands were the major in situ material. The project is located on the Hiawatha National Forest in Upper Michigan. Samples of sand from the project were furnished to the University for testing.

The purpose of the testing program is threefold:

1. To determine the standard test values and classify the natural occurring material.

2. To determine the stress-strain properties of the soil and different asphalt mixtures.

3. To determine an indication of fatigue resistance of this stabilized soil.

Designs will be based on the laboratory tests and on traffic data furnished by the Forest Service. Structural designs will be established for 2-, 5-, and 10-year lives.

The primary objective of this project is to determine the applicability of the elastic theory to the design of Forest Service roads. Preliminary results of the present study appear favorable. We hope to construct a project as soon as funds are available. Field installation

should include permanently installed instrumentation. The instrumentation will provide feedback for comparison of assumed design parameters with those actually measured in the field. If the elastic theory approach to design is determined to be practical, then a whole new field of structural section design appears to open for us.

NEWS ITEM

Submitted by Arthur F. Anderson, R-1

We have recently learned of a new book prepared by and available through the International Conference of Building Officials, 50 South Los Robles, Pasadena, California 91101. Its title is "A Training Manual in Field Inspection of Buildings and Structures." It is a paperback, 171 pages, and costs $8.60. The book was designed as an aid to city building inspectors, but it also contains data that will be of value to all other inspectors. There are numerous photographs and a liberal amount of drawings and sketches throughout the book. At the end of each chapter is an evaluation checklist and several test questions. It will make a fine addition to your Forest's engineering library.

Titles of a few of the chapters are:

"How to Inspect the Excavation, Soils, Footings, Foundations, and Retaining Walls"

"How to Inspect the Wood Framing and Structure"

"How to Inspect the Masonry Framing and Structure"

"How to Inspect the Steel Framing and Structure" (Includes welding)

"How to Inspect the Mechanical Features" (Plumbing, heating, electrical, etc.)