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FIELD NOTES ● TECHNICAL REPORTS ● TEXTS
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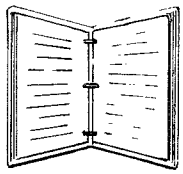
# Field  Notes

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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:

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|---|---|---|---|
| R-1 | Kenneth Yeager | R-6 | Don Loff |
| R-2 | Marshall Fox | R-8 | Ernest Quinn |
| R-3 | Dan Roper | R-9 | Clifford Hill |
| R-4 | Fleet Stanton | R-10 | Loren Adkins |
| R-5 | Chuck Paletti | WO | Norman Sears |

# F I E L D  N O T E S

## BOAT DOCK AT ATHERTON CREEK CAMPGROUND

by Thomas G. Grant, Forest Engineer, Teton National Forest

Atherton Creek Campground on the Teton National Forest needed a boat dock on Lower Slide Lake. Two years ago the dock was successfully planned, designed and installed to accommodate the following special features.

1. The dock had to be built in sections that could be handled by inexperienced people when it was placed into or removed from the lake without the use of heavy equipment.

2. It had to be of such design that it could be removed from the water before the winter months to avoid severe ice action during spring thaws.

3. It had to be flexible enough to be raised or lowered according to the water level in the lake, and to match the shoreline.

Seven separate floats were constructed by following the design in a Dow Chemical bulletin discussing the use of styrofoam billets as a flotation agent. The bulletin contains simplified calculations concerning the amount of material needed to provide a predetermined freeboard for flotation of each float. The use of different types of styrofoam used for different situations, such as installations where oil and gasoline from marine engines is prevalent, is also, discussed. The floats were designed in 6 x 12 foot sections, each one using 3 full styrofoam billets placed longitudinally and one 1/3 billet placed crosswise at the end of each section. This provides adequate stability, flotation, and approximately 12 inches of freeboard.

The design in the Dow Chemical bulletin was followed and construction of each float section was relatively simple. We did, however, change the method of attaching the floats to each another. We found that wave action and people walking across the sections placed sufficient pressure on the Dow specified rod and eye bolt connection to tear the eye bolt loose from the end-facing board, even though the bolt was backed by a plate of sheet metal which acted as an oversized

washer. We removed this connection and placed 1/4 inch steel plates along the outside edges, and at the end of each of the floats. These plates were drilled to accept a 1/2 inch x 1 inch bolt which fastens the floats together. This method of connecting the sections provided a much stronger connection and it also eliminated the noise that was present with the rod and eye bolt system.

The dock was installed so that a cable wound around a windlass would pull the entire assembly either toward the lake or toward the shore as needed to position the dock to match the waterline. This was done as follows:

1. The shoreward end of the float nearest the bank was equipped with 4-inch diameter rollers placed underneath the float section.

2. A concrete ramp 6 feet wide and 6 inches thick was constructed between high and low water levels in alignment with the dock. Two steel channel irons were installed in the concrete partly above the finished surface of the ramp to act as rails or tracks for the rollers attached to the end of the shoreward float.

3. An anchor was fabricated of concrete blocks, each weighing approximately 100 pounds, and cast with a hole in the center of each block. The size was kept at 100 pounds to facilitate handling and hauling these sections by boat to the desired location in the lake. A cable was threaded through the hole and secured to the first block. The other blocks were threaded and slipped down along the cable until ten of the blocks were in place on the lake bottom. The surface end of the cable was attached to a ring which was part of a buoy made from a 55-gallon drum.

4. A 1/2-inch diameter steel rod was thrust through a 55-gallon drum and the extending rod ends heated and bent to form rings into which attachments could be secured. The drum was filled with expanding-type styrofoam to assure that it would remain afloat if the drum was damaged. A commercially purchased buoy could serve the same purpose, but the drum is as serviceable, and by far the least expensive of the two.

5. The anchors were attached to the ring on one side of the buoy and a 15-inch sheave was attached to the other ring. This provided a floating anchorage which could remain in the water when the dock was removed for winter storage.

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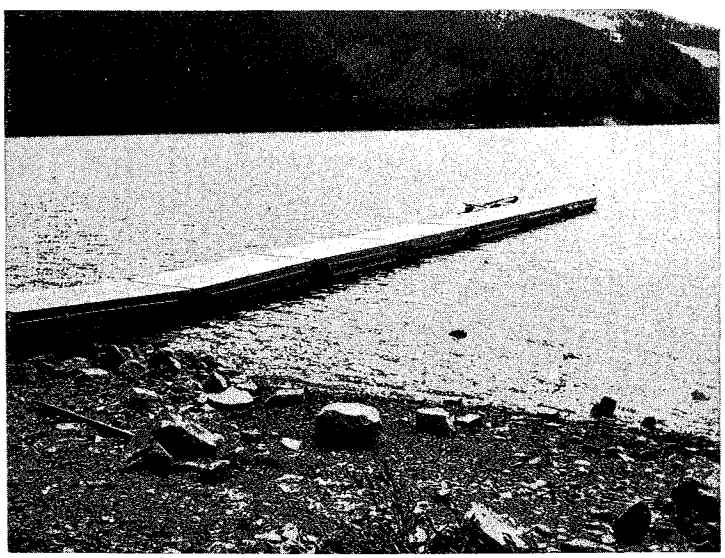
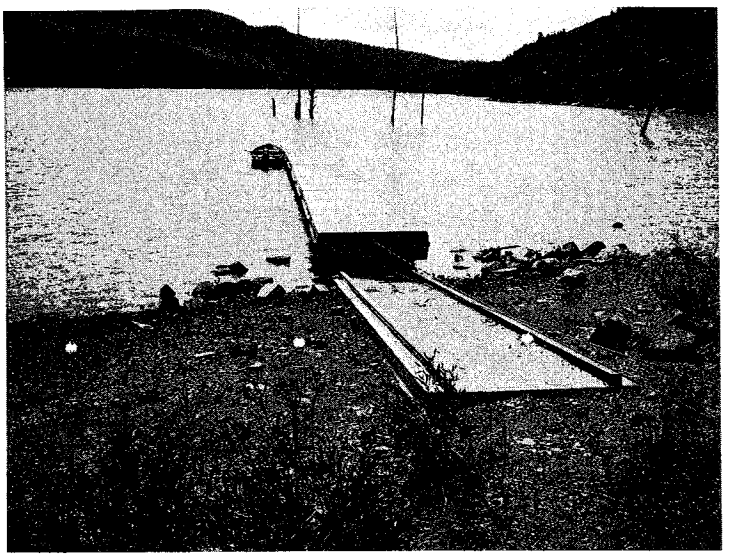
EDITOR'S NOTE:

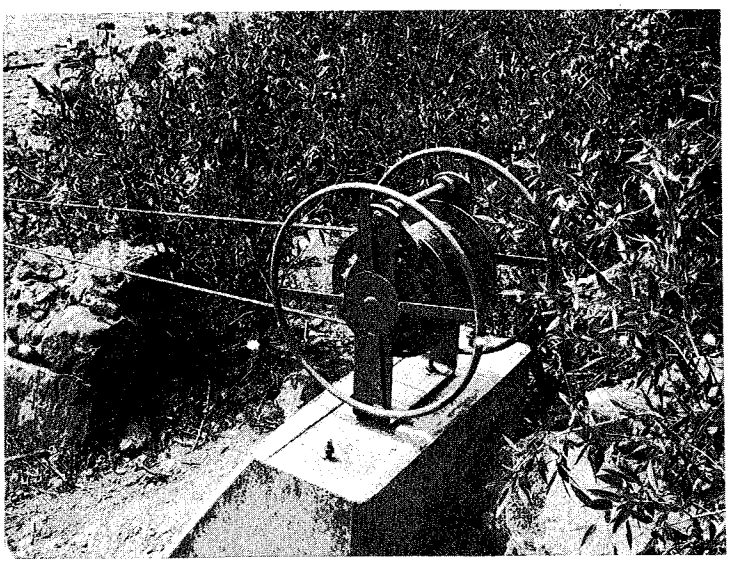
Further information concerning the design of this boat dock may be obtained from the author. Phone 307-733-2752 or write Forest Engineer, Teton National Forest, Jackson, Wyoming 83001.



View of boat dock on Lower Slide Lake
in Atherton Creek Campground



Concrete ramp with two steel channel iron rails



Cable and windlass assembly used for moving boat dock

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# STABILIZATION OF ROADSIDE BANKS WITH ANNUAL GRASSES (FIELD HAY)

by Ernest K. Ellersick, Umpqua National Forest, R-6

The Umpqua National Forest recently completed a 475-acre contract to stabilize cutbanks and fill slopes. The use of local field hay[1/] consisting of early-germinating annual grasses is basically responsible for success of the operation.

The contract specifications called for the application of 4,000 lbs. of grass hay, 15 lbs. of grass seed, and 200 lbs. of fertilizer per acre. The mixture was applied with a mulch spreader system, using an engine-powered blower with sufficient force to blow the mixture 80 feet.

It was specified that the hay consist of not less than 50 percent annual grasses, with not more than 5 percent noxious plant material, and that 75 percent of the hay should have a minimum of 10 viable seeds per head. The added seed mix was Alta fescue, 4 lbs.; perennial rye grass, 6 lbs.; Potomac orchard grass, 2 lbs.; and New Zealand white clover (inoculated), 3 lbs. The fertilizer was 16-20-0.

The complete mixture--hay, supplemental seed, and fertilizer--was applied in one operation. Seed and fertilizer were premixed and sacked in 80-pound, waterproof sacks, by a local co-op.

The actual application was monitored closely for even distribution of hay, seed, and fertilizer. Subsequent plant growth has proved coverage satisfactory.

Local farmers estimated that each bale of hay contained from 2 to 3 pounds of seed. The average number of bales used per acre was 60. This abundance of seed is very evident from the resulting dense growth.

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1/ Native or introduced grasses that occur naturally at low elevation in the Umpqua Valley. Mixture is variable but usually contains several species of annual grasses; bromes, rye, and fescues are common.

The results cannot be better described than by the following excerpt from a memorandum by Frederick C. Hall, Range Conservationist, R-6, Portland, Oregon.

> During our return to Roseburg, we briefly evaluated annual grass hay mulching on road cut and fills. The stop was on a road constructed this past summer [1969] and mulched in September with annual grass hay plus fertilizer and standard forest erosion mix. Frankly, I was astounded at the immediate results: both annual grasses and domestic perennial grasses and legumes had germinated, the mulch had not washed off under heavy rains of two days previous, and every mulched cut and fill was thoroughly occupied and protected by grass and mulch. This was so effective that road ditches were still covered with mulch and germinating grass, and showed little to no evidence of soil rills or accumulation of material washed off the slopes. I would strongly recommend other Forests, particularly in the southwestern west side, be made aware of this procedure for further tests.

The field hay will adhere to cut slopes of 1/4:1 on a rough surface. No asphalt adhesive is needed. To obtain better clinging qualities, a "wrap around" of 2 feet at the top of the cut slope was specified. This tends to hold the hay because it binds with natural ground cover. Good growth at the top of the cut or fill will ensure better reproduction on the slope.

Rounded cuts are more effective in retaining the cover because they eliminate the raveling of soils from the top of the slopes.

Annual grasses are also proving very successful on older cut slopes that were barren of vegetation. Several miles of road as old as 14 years were mulched. The mulch seemed to soften the hard crust and give the seed a chance to establish.

The contract application started September 15 and ended December 15, 1969; however, an earlier starting date is preferred, to have material on the ground before the fall rains. Complete records have been kept on all applications, and it is expected a more complete evaluation will be available in the future.

The Forest also had a 25-acre hydromulching and seeding contract in 1969. The specifications required 1,200 pounds of wood fiber, 29 pounds of seed, and 320 pounds of fertilizer per acre. The contract was awarded for $217 per acre; the contract price of seeding and mulching with field hay was $151.50.

On a road adjoining the Forest, the Bureau of Land Management started a hydromulching and seeding contract the same day the Umpqua National Forest started the field-hay contract--same areas, same conditions. This gave an excellent opportunity for comparison.

After his review of both projects, Dallas R. Hughes, Watershed Specialist on the Umpqua National Forest, wrote, in a Memorandum to the Record, October 10, 1969:

> We also examined results of hydromulching and seeding on the Francis Creek road. A few blades of grass were showing. It appears that this treatment will have a negligible effect on reducing erosion this winter. The wood fiber mulch acts only as a carrier and provides virtually no protection against erosion, in contrast to the hay. It looks to me as if this hydromulching and seeding will leave much to be desired. The hydromulching and seeding was done September 15 and 16, at the same time road No. 2682B was treated with hay, seed, and fertilizer. There is no question that the mulch is far superior to the wood fiber and is much cheaper than the wood fiber. I think anyone that is involved in this program should look at this comparison.

A rough observation in comparing the two types of application, was that there were more live stems per square inch from the field-hay process than from a square foot of the hydromulching process. The hay also tends to break the impact of raindrops on raw slopes.

At one time, straw was used but its use had been discouraged because of its slippery qualities, and because it could not be controlled.

By themselves, seeding and fertilizing left much to be desired because of the uneven catch, and most of the seed ended up in the ditches rather than on the slopes.

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EDITOR'S NOTE:

In all roadside grasses activities, extreme care must be taken to comply with State and local laws concerning transporting noxious plants.

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# LINED CAVITY SHAPED CHARGES

by James Lott, Equipment Development Center at Missoula, Montana

There seems to be some misconception about the theory and application of shaped charges. A pile of dynamite over an inverted paper cup does not constitute a lined cavity shaped charge. Much of this could be due to the lack of published information on the subject. The military uses lined cavity shaped charges, extensively, but much of their work is classified.

A lined cavity shaped charge consists of a charge container, liner, explosive, and detonator and booster. The container should be cardboard or other material that will not give shrapnel hazards. The liner can be metal or ceramic, but must be accurately machined or formed. The explosive must have high velocity and high brisance. Common commercial explosives such as stumping or ditching powder are not suitable. Military explosives, such as C-3 are best, and 100 percent blasting gelatin will yield usable jets.

There is some disagreement about the exact mechanism of target penetration, but basically the liner is formed into a high velocity jet or slug that penetrates the target.

Lined cavity shaped charges can give useful penetration in rock, earth material, and wood. It is not feasible to replace drilling methods with lined cavity shaped charges, but they may have some application in hazardous or inaccessible locations where a few shallow holes are needed.

Lined cavity shaped charges do have some definite limitations such as cost, availability, inherent danger of explosives, and the fact that the backblast is a good fire starter. They are suited for punching holes in a target, but not for breaking it.

An excellent publication on this subject is:

> Bulletin 69, "Lined-Cavity Shaped Charges and Their Use in Rock and Earth Materials"
> By Carl F. Austin
> State Bureau of Mines and Mineral Resources
> New Mexico Institute of Mining and Technology
> Campus Station
> Socorro, N.M.
> $1.25

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# PUBLIC SUPPORT THROUGH MULTIPLE USE COORDINATION OF ENGINEERING PROJECTS

## A FABLE AND A FANTASY

by Don C. Turner, Assistant Director, Division of Engineering
(Speech given at Forest Supervisors' meeting February 3, 1970 in Region 9 while Don Turner was Regional Engineer there.)

### The Fable

The F. Y. 1971 Program of Work for the Tamarack National Forest included the construction of Timber Access Road #1706. On April 1st, 1969, Forest Engineer Gary Inept assigned the Location, Survey and Design to Johnny Tenderfoot, their new Junior Engineer, GS-7. Johnny asked how he should go at this, and Gary told him to go and look at the transportation plan and then talk to someone on the Ranger District. Johnny got out the plan maps and went to the District Office, but when he got there, District Ranger Larry Sincere was in the field with his assistants, so Johnny talked to Jake Treemaker, the Forest Technician, who told him the map location looked pretty good to him.

The next day Johnny and one of the engineering aids went to the project area and started to locate the road on the ground with flagging. Shortly after they started, they noticed they were in a grove of trees which looked entirely different from anything they had seen anywhere else on the forest. They remarked on this but didn't record their observation in the field notes. Another quarter of a mile, or so, they traversed an area of flat terrain about 100 feet from the shoreline of Cliff Lake. Then they went through an area with very steep slopes which had a large number of gullies transecting it and they also noticed that a lot of the trees were leaning downslope at an odd angle. Next, they noticed quite a few small brown birds with bright yellow markings on their wings and remarkable emerald colored topknots. They had never seen birds like these before and they were fascinated by the antics of pairs of these little birds building nests and performing some sort of ritual dance. When they got all of the road located they remarked that they hadn't seen very much of what they would consider good looking timber.

In June, Forest Engineer Inept called Ranger Sincere and told him they were ready to look at the road location on the ground, but Ranger Sincere was pretty busy trying to get his compartment examination work caught up so he asked Inept if he was happy with the location. Inept said it looked pretty good on paper so they agreed that Engineering should go ahead with the design.

In April of 1970, the Forest sent the contract documents to the R. O., where they were processed, advertised and the construction Contract Awarded on July 10th. The contractor commenced clearing and grubbing operations on August 6th.

On August 8th, Dr. Barry Brandt of Brown Bay filed a petition in Federal Court asking that we be enjoined from constructing Road #1706. He was joined in this action by the Society for the Protection of Emerald Crested Warblers, the Soil Conservation League, the Rare Tree Species Watchdog Committee and 23 other citizen groups. On August 12th, Federal Judge Fairly Perceptive issued the injunction, but facetiously noted he was tempted to turn it down because the whole sequence of events had started on April Fool's Day of 1969.

## The Fantasy

On April 10th, 1979, Forest Engineer Jim Competent assigned the Location, Survey and Design for Road Project #1706 to Assistant Forest Engineer Steve Qualified. Steve retrieved the Orthophotomap, scale 1" = 1000', for the area from the files. He then dialed computer central and requested TRAN PLAN program. Later that day, the computer terminal in the office drafted overlay #1 which showed the proposed Transportation Plan location for Road #1706. Steve immediately noted the proposed location seemed pretty close to Cliff Lake, so he asked the Watershed Management Specialist about this. The Watershed man said he'd better try the WAT QUAL program. Steve also noticed that the road went through a very steep area so he asked the Forest Soil Scientist what he thought about that. The Soil Scientist advised him to call for the SOIL STAB program. The next day Steve dialed computer central again and called for WAT QUAL and SOIL STAB. Later that day, the computer terminal drafted the waterfront zone overlay with the water quality data symbols on it, as well as the overlay showing the soil series for the area with the steep, unstable area outlined and cross-hatched in red.

Meanwhile, Steve had contacted the Timber Staff Man who told him the COMP EXAM program would give him the timber overlay data, the Recreation Staff who recommended the REC SITE program and the Wildlife Staff who suggested the HABITAT program. By April 20th, Steve was able to advise Forest Engineer Competent that they were ready for a Multiple Use Coordination meeting with the staff and Ranger Sincere. The meeting was held on May 10th. The recordomat printout from this meeting indicated that the group agreed that the road could not traverse the grove of rare trees at coordinate position 103, 000N, 68,000 E., that it must be kept at least 1000 feet from the edge of Recreation Site 76, and no closer than 500 feet from the unstable soil area. The group also noted that this would avoid the Emerald Crested Warbler breeding grounds by 1/2 mile which they considered a safe distance. They did note that the road would be about 1/4 mile longer than originally planned, but Forest Engineer Competent pointed out that it probably would not cost more than the plan location because it would avoid the steep slope and unstable soils which would have entailed costly structural measures to stabilize. The group gave their tentative agreement to the location pending a report on the on-the-ground findings. The printout on this meeting was filed under "Preliminary Multiple Use Coordination Reports."

After the road was located on the ground and reviewed with the Ranger, Steve ran the SEEN AR program for an overlay showing all areas which would be seen from the road and the PERSPEC program which printed out the perspective views of the road as it would be perceived by a forest visitor. He reviewed these with the Landscape Architect and together they were able to make some minor changes which improved the scenic quality of the road. While Steve was doing this, the other staff had reviewed their data in more detail and the wildlife man recommended moving the road another 1/4 mile away from the warble grounds. By August 10th, the staff was able to again meet with Ranger Sincerely and review the final road design. The recordomat printout from this meeting became the "Intermediate Multiple Use Coordination Report," which concluded with a statement by Forest Supervisor Confidently Able that they now appeared to be ready for a public briefing on the project and the timber sale program.

The recordomat printout of the public briefing indicated that 43 conservation society representatives attended and questioned the decision making quite thoroughly, but ended with several expressions

of confidence in the plans. This printout became the "Final Multiple Use Coordination Report."

At the Rotary Club luncheon on December 6th, Judge Fairly Perceptive remarked to Supervisor Able that he sure was pleased that there hadn't been any of those injunction proceedings in his court for a long time.

Postscript: Time has prevented exploring the potential of the implications in these fantasies to the depth I would like. There are many resource items which I have left out. I hope I have whetted your appetites and stimulated your imagination. I would also ask a question. Have I imagined anything that couldn't be done now, without the benefit of data retrieval systems from a computer?

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EDITOR'S NOTE:

The name "Field Notes" originiated from a great need for a channel for communication between all Engineering personnel. A review of the past issues of the Field Notes revealed that the Washington Office has been doing most of the talking. Some Regional and Forest personnel have not spoken at all. To correct this situation, we need more articles and/or news items from you in the Field. The channel is open--use your Field Notes.

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CORRECTION:

Field Notes, Vol. 2, No. 5, May, 1970 contained an article, "Culvert Length Computations," by Harwell Adams. The last sentence of the Editor's Note stated "Earthwork volumes will be affected by the skewed section, but the effect ....". This sentence should have been: "Earthwork volumes and pipe length will be affected, but the effect is generally negligible up to skews of 10 degrees."