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Dire Straits

Because of a lack of articles, we will not be publishing a September-October 1989 issue of *Engineering Field Notes*. Under our normal schedule, articles for the September-October issue should have been in this office by June 1. This allows us time to get the articles approved, edited, formatted, printed, and distributed by early September. As of June 23, we had received just one article for the September-October issue.

We need your help! Just as the title suggests, *Engineering Field Notes* is supposed to consist of information from the field. This information could be about *anything* that you feel is important or interesting and that could be informative or helpful to others in the Forest Service. The articles do not need to be of a highly technical nature, do not need to be 10 or more pages, and do not have to be success stories. They can be short blurbs giving the whos, whats, and wheres of projects, with a person to contact for more detailed information. They can be stories of methods tried and failed—anything to let others know what is happening in your Region, District, Forest, or wherever you are working.

During a time of doing more things with less money and fewer people, I am sure there are many innovative ideas being tried in the field—some old, some new, some successes, and some failures. It seems to make sense to share these experiences so we all are not trying to "re-invent the wheel." Please help us by taking a little time to jot down what you have been doing recently. What are the projects on which you have been working, and what have you learned during the process? What problems have faced you for which you have been unable to find a solution? Maybe one of our readers has faced the same problem and will have some suggestions.

Please send in your articles for the November-December issue by August 15. If you need an extension to that date, simply call us, and we can work something out.

Engineering Field Notes needs your help if it is to meet its mission of providing a means for the exchange of engineering-related information and ideas on activities, problems encountered, and solutions developed that may be of value to Engineers throughout the Forest Service.

—Mary Jane Baggett
Editor, *Engineering Field Notes*

Increasing Productivity by Preparing Road Plans With CADD

Tom Strassmaier
Civil Engineer
National Forests in Mississippi

Jeff Orr
Civil Engineer
National Forests in Mississippi

Introduction

The seven-member Preconstruction Staff of the National Forests in Mississippi prepares plans for over 125 miles of roads annually. Most of the mileage is done in line diagram form because of the need to show such details as drainage features, special erosion control measures, subgrade reinforcement, spot surfacing, and so on. There also are projects and segments of projects requiring earthwork design with plan and profile drawings that are incorporated into the road plan packages.

Previous Method

In the past, the staff drafted plans on D size film intermediates, with mirrored prototype images of those elements common to all plans (title sheet locator maps, general notes, line diagram grids, typical details, and so forth) printed on the reverse side. The drafter added detail to the front and erased from the reverse side. Lettering was added using the Merlin Express tape appliqué. Final plans were reduced commercially and copied. This was an efficient method.

Present Method

A year ago, the staff began converting these prototype drawings to CADD using many of the available CADD customization features. CADD has been used to merge Lumberjack plan and profile graphics with the road plan graphics. See figures 1 through 4 for samples.

Symbols, Details, Settings

The staff created a symbols library in each drawing type for quick recall and insertion of various drainage, erosion control, and other symbols, as well as construction details, text strings for pay items, and so on. Each drawing has been preset with standardized scale factors, such as sheet size, text styles, and hatch patterns.

Custom Menus

The staff also created custom menus for each drawing type. An example is in figure 5. Digitizer-mouse buttons were reprogrammed. The pulldown menus in the Advanced User Interface of Autocad Rel 9/10 were customized to display lists of symbols and details that can be inserted into the drawings with a single "pick." Some menu items initiate a sequence of several operations

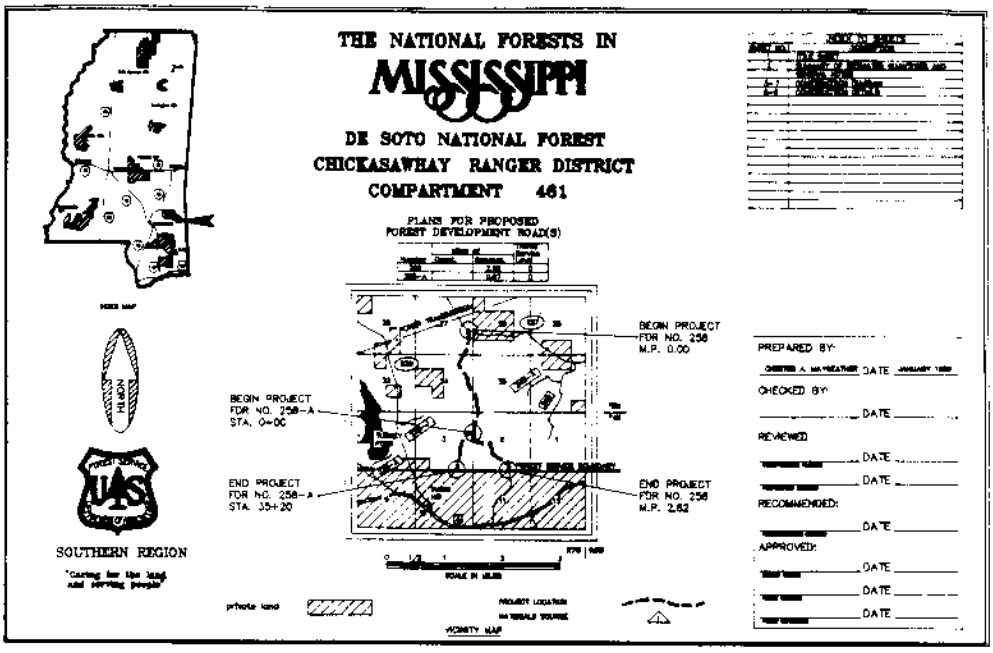


Figure 1.—Title sheet. Blank title sheet is stored on hard disk. Vicinity map is input with a digitizer. Text is entered in preset styles (as in all drawings) to match the existing text.

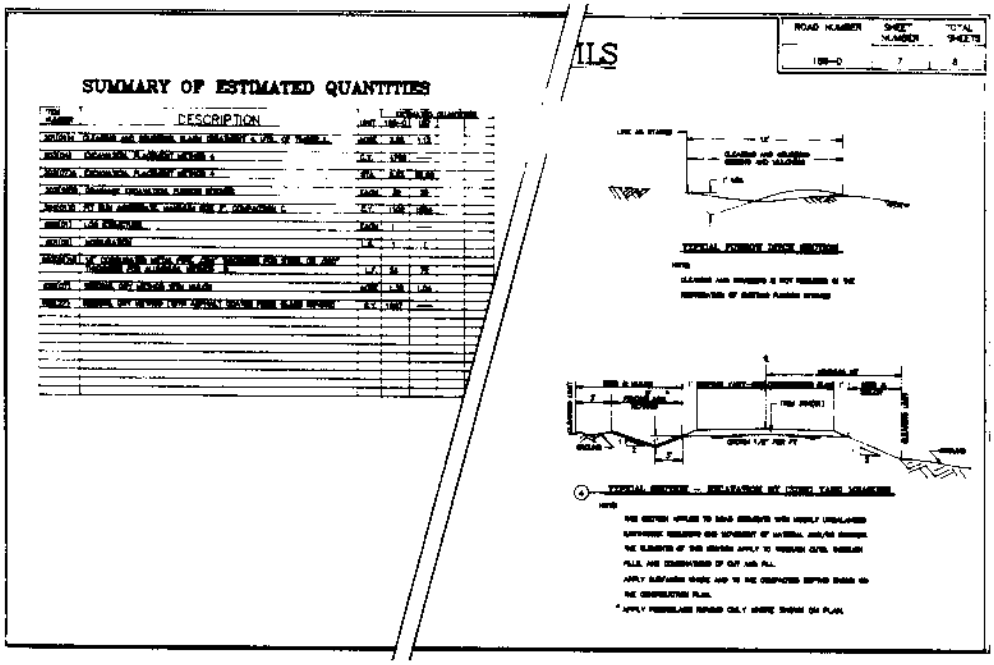


Figure 2.—Left is a summary of quantities and general notes sheet. Right is a construction details sheet. The pay items and the construction details are "picked" from the custom pulldown menus.

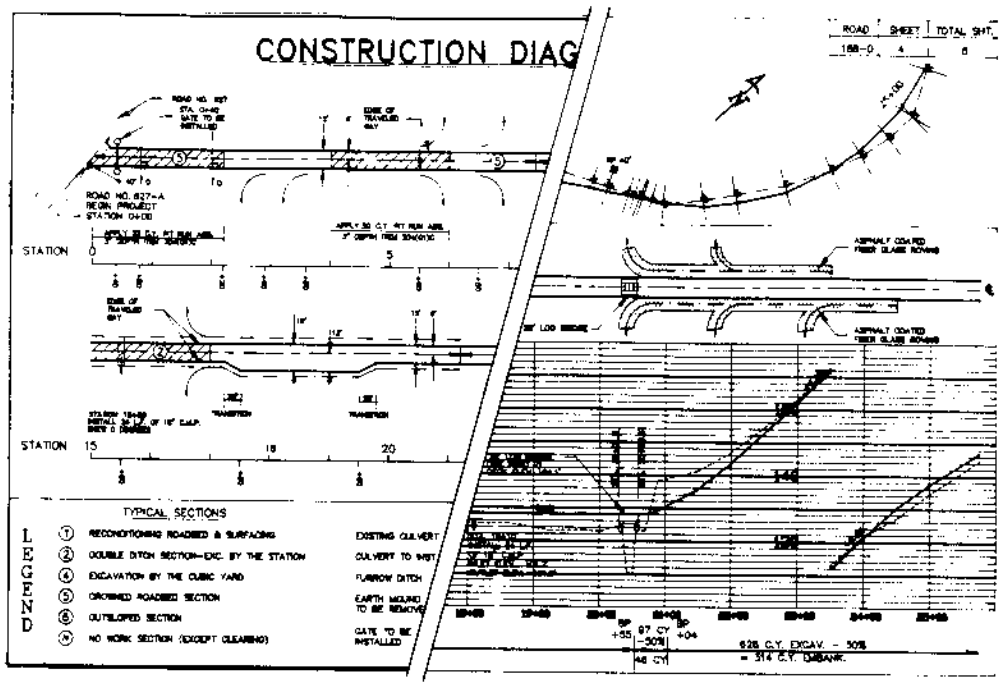


Figure 3.—Left is part of a line diagram sheet. Drawings are built up from custom menus. Legend appears on first sheet only. Right is a lumberjack plan and profile merged with our line diagram graphics.

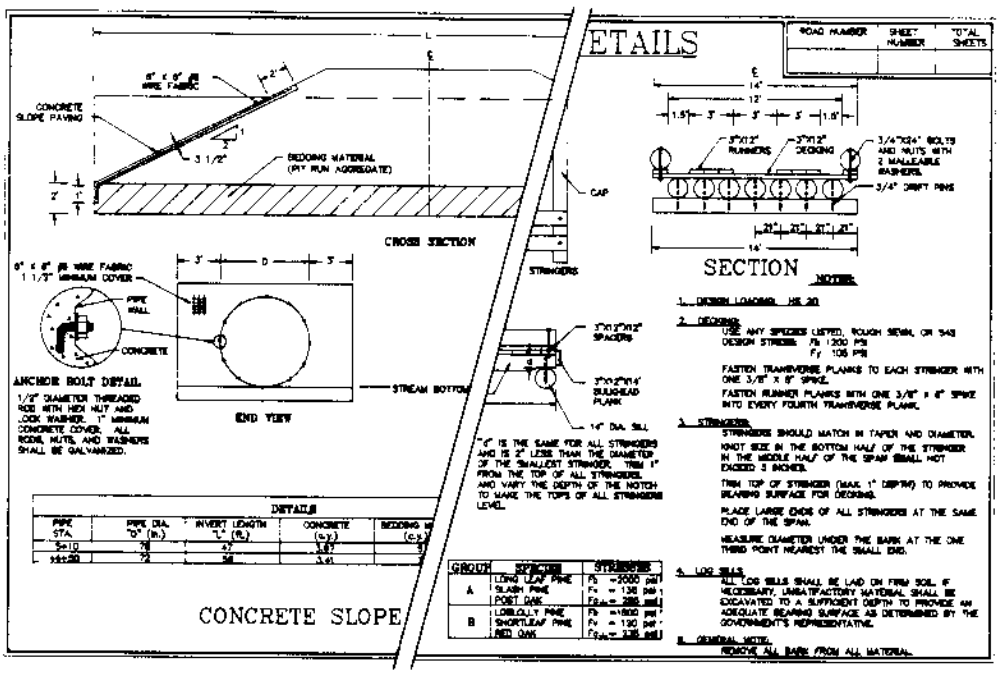


Figure 4.—Samples of drawings stored in the "library" directory. Left is slope paving detail. Right is log bridge detail. Pipe size and log bridge length are "picked" from the original drawings.

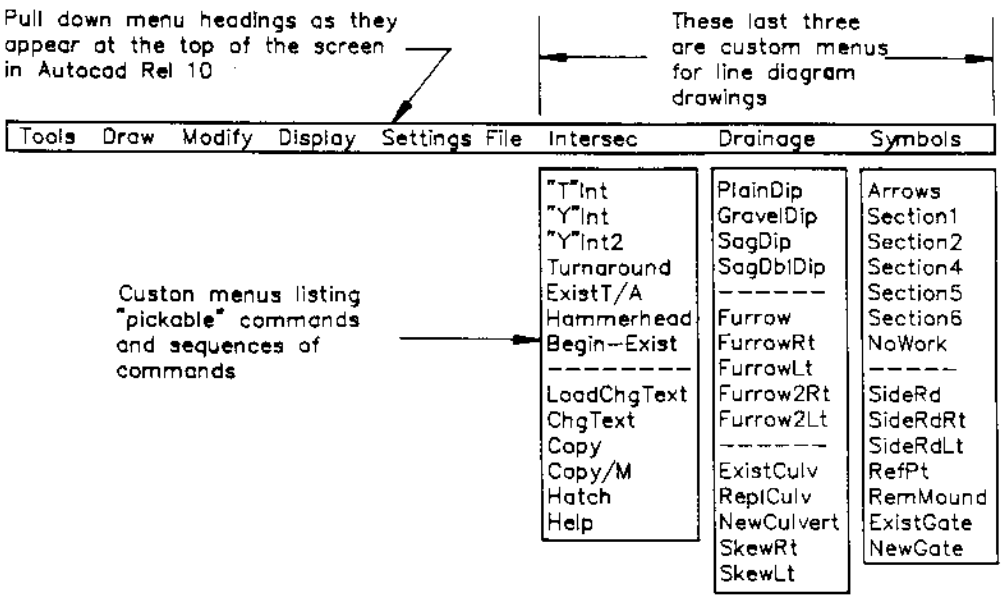


Figure 5.—Custom menu. This figure shows how one custom menu appears on the screen. This menu is in the four line diagram prototype drawings. Other menus have been created for the detail sheet drawings and for the sheet that contains general notes and the estimate of quantities. Most of the items in this menu insert symbols and explode them. Dips are inserted and copied repeatedly at points selected by the operator. LoadChgText loads and initiates an Autoslip program for text editing. Hatch is an automated hatch routine that hatches an area with two window corner picks. Copy/M initiates a multiple copy routine with two windows and a base point pick. Mouse and digitizer buttons have been customized for convenience. Menus can be modified "on the fly" using the Shell command, then DOS EDLIN, then reloading the menu with the Menu command.

(for example, a single "pick" will insert a drain dip and "explode" it for editing or copy it repeatedly at points selected by the operator). Other useful "tools" have been added to the menus, such as automated hatch routines and text line editing.

Drawing Library

Supplemental drawings, such as log bridges, Bailey bridges, major culvert details, erosion control blankets, and gates, should be included in road plans from time to time. The staff draw these, as needed, according to local drafting standards. The drawings are hard copied to a user catalog and archived in a library directory-subdirectory setup on hard drive for future recall into road plans.

Managing the Process

The staff wrote special batch files within Automenu to edit and store projects and drawing files on diskettes. If this is not done, hard disk directories can become cluttered and consume memory. Using diskettes, an operator can continue a project on a different computer.

The Learning Curve

Operators have become proficient in CADD plan production in a short period. This usually happens after experience with one or two projects. This may be because the drawings are essentially the same as those the operators have done manually and are highly structured and customized. Users quickly become "hooked" on the process when they discover that CADD releases them from tedious tasks.

The system provides an easy and attractive introduction to CADD, as shown by staff designers progressing to create original drawings in CADD.

Benefits

Most designers are experiencing a 60-percent reduction in the time needed to prepare road plans, and the rest are approaching this level.

Savings in reproduction costs are $3,500 to $4,000 per year. Drawings are plotted at a final reduced size of 11 by 17 and photocopied in-house as needed, eliminating commercial reduction and reproduction services. Also, appearance and uniformity are greatly improved.

Basic CADD file exchange standards (DXF IGES, and so on) permit easy drawing exchange with other units, third-party developers, and software packages, such as Lumberjack and Cogo.

Revisions are easier, require less time, and appear as good as the originals. Designers are more open to changes.

Costs

One high-quality PC is needed to serve two production designers. Highly rated PC's from local dealers cost $5,000 for a 386/20 processor, 387/20 math chip, 70-megabyte hard drive, high-resolution video graphics array, multisync monitor, mouse, enhanced keyboard, hard-drive floppy diskettes, and DOS 3.3.

A high-quality pen plotter is needed as well. A B size plotter is acceptable but a larger D size (about $4,500) is preferable because of speed, precision, and resolution.

Software should include a CADD package that costs $1,800 to $3,000, word-processing software (such as WordPerfect 5.0, GSA price $204), and Norton Advanced Utilities (GSA $72).

Note that someone must invest time to translate drawings (unless old drawings are scannable), customize them, and test the process. The investment in time for training and experience will not be great if the drafting package is well designed.

Implementation

At least one person trained in local plan preparation must learn CADD and the PC operating system, prepare the package, and provide training. The package must be acceptable to users. The designer has to be responsive to

changes and suggestions for improvement. Support from management is necessary to begin the initial expenditures in time and equipment.

The implementation process is becoming easier as more Forests use CADD to prepare plans. New users can benefit from the guidance and support of experienced users and from their large catalogs of drawings.

Timber Bridges Are Alive & Well!

Larry Leland
Supervisory Civil Engineer
Monongahela National Forest, Region 9

In the fall of 1987, the Monongahela National Forest in Region 9 advertised for a turnkey contract to replace a bridge superstructure over the South Fork of the Cranberry River in the Cranberry Backcountry. Project proposals were reviewed and rated on technical factors and price. Technical factors included approach, knowledge and experience, organizational support, quality control, scheduling, and facilities and equipment. Five proposals were received, with prices ranging from $55,654 to $87,828. The Engineer's Estimate was $67,250. In October 1987, the contract was awarded to Bell-free Contractors, Inc., of Redlands, CA, whose proposal had the technical/cost relationship that was most advantageous to the Government.

The contract specified the replacement of a 51-foot span superstructure. The existing concrete abutments were over 50 years old and in good condition

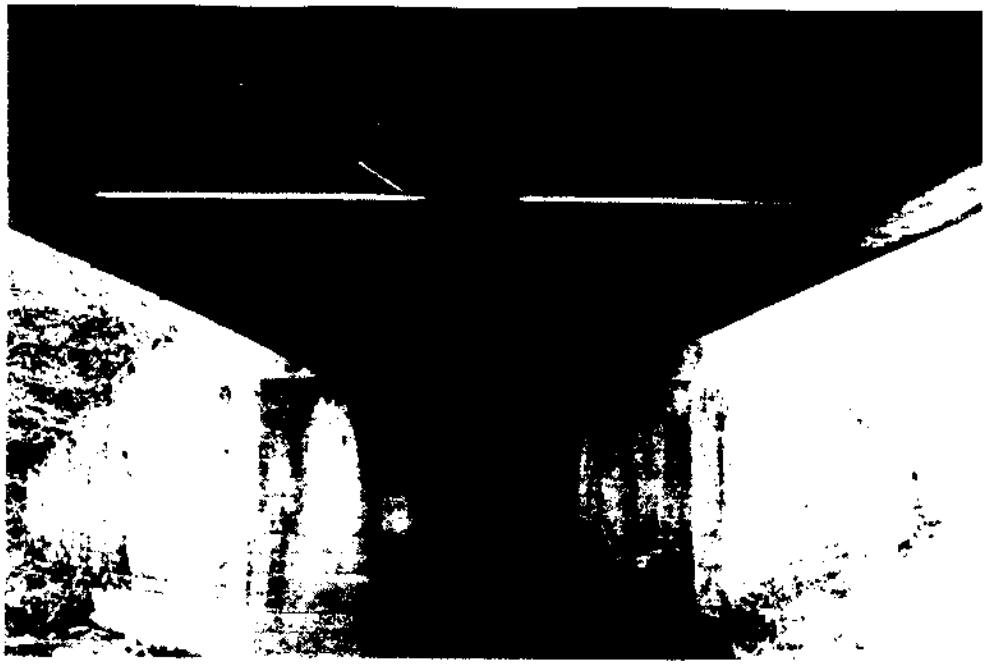
Bridge superstructure over the South Fork of the Cranberry River. Note: the right object marker shown in this photo has been replaced.

except for minor efflorescence and popouts. The maximum weight of the new bridge superstructure would be 45,000 pounds, unless the contractor provided a detailed investigation and analysis showing that the soils and abutments could support more weight. The structure had a curb-to-curb width of 11 feet, and was designed and constructed for a live load of HS 20-44 in accordance with AASHTO Standard Specifications for Highway Bridges. Because the contract did not specify the material of the bridge components, the contractor had a choice of wood, concrete, steel, or any combination of materials, although the weight specification limited the use of heavier materials.

The accepted proposal designated preservative-treated wood. Seventeen glulam deck panels (alternating sizes of 5⅛ inches by 27¼ inches by 12 feet, 7½ inches and 5⅛ inches by 37½ inches by 10 feet, 8 inches) were placed over three glulam stringers (exterior size 36 inches by 10¾ inches and interior size 36 inches by 8¾ inches). The shorter deck panels allow water to drain off the deck inside the wheel guards. The handrail system, supported by longer panels, was made of rough sawn lumber, including 6-inch by 12-inch rails, 8-inch by 8-inch posts, and 8-inch by 10-inch curbs. The contractor used galvanized hardware and wood that was pressure treated with pentachloraphenol before fabrication and drilling.

Western Wood Structures, Inc., of Tualatin, OR, designed and supplied the structure. The components, fabricated and treated at the factory, were shipped to the job site. The total on-site construction time was as follows:

Side view of bridge.



Underneath view of bridge.

May 3–8, 1988	Removal of the old bridge superstructure
May 9, 1988	Concrete patching, installation of anchor bolts and bearing plates on bridge seats
May 11–18, 1988	Installed superstructure including stringers, deck panels, and handrail system; completed compacted gravel approaches and site cleanup

The completed structure had many advantages. Its components offered a 50-year life with low initial cost and minimum long-term maintenance. The wood material, natural looking and attractive in the back-country setting, was cheaper and lighter than steel or concrete. Also, the bridge was out of service for only 15 days during construction.

The Forest has three more timber bridges to be built under contract in 1989. They are stress-laminated bridges designed in partnership with the Forest Products Laboratory and the University of Wisconsin at Madison. Two of them are similar in span and design, but one is of red oak and the other of southern yellow pine. The third bridge has a unique parallel-cord truss design.

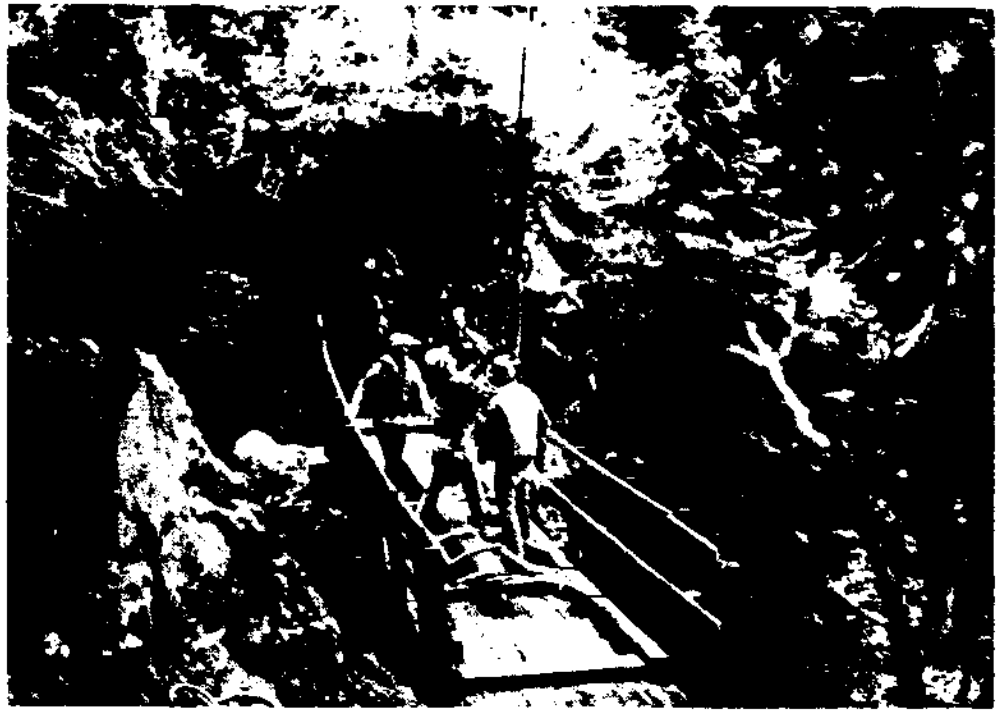
Helicopters & Trail Bridges: The Treasure Falls Project

James R. White
Civil Engineer
San Juan National Forest, Region 2

This article outlines a cooperative project between the Forest Service and U.S. Army to remove an aging trail bridge and replace it with a prefabricated structure using a CH 47 Chinook helicopter. The project was accomplished in October 1986 as a training operation for the U.S. Army, 4th Infantry Division, 4th Brigade, Fort Carson, Colorado, with the assistance of personnel from the Pagosa Ranger District and East Zone Engineers of the San Juan National Forest.

Background

The bridge was a 38.8-foot, nail-laminated deck structure that had deflected about 4.5 inches at mid-span and was condemned. The site is just below



Preparing the old bridge for removal. A steel "H" beam, sized to pick up the load, was lowered by helicopter onto braces designed to keep the nail-laminated deck from separating and strapped to the deck using cargo straps furnished by the Army.

Treasure Falls in a narrow, wooded canyon near the base of Wolf Creek Pass and is visible from U.S. Highway 160. Treasure Falls is one of the most popular recreation attractions on the San Juan National Forest.

Alternatives

Staff considered several alternatives but chose three as most feasible. The old abutments would be reused and/or modified in each case.

Alternative A would consist of saving the existing deck, turning it over, and supporting it using steel or timber trusses (joists). This alternative, with an estimated cost of $14,000, would require frequent safety inspections, high maintenance costs, and lengthy construction closure to visitors.

Alternative B would entail removing and replacing the structure by helicopter. Of several designs and materials considered, the most feasible is a prefabricated steel arch bridge. The estimated cost would be $8,000. Low maintenance costs and minimal construction closure for visitors would be expected.

The new bridge being lowered by the Chinook helicopter onto abutments. Two Forest Service personnel were stationed on each abutment to guide the ends onto blocks by use of ropes. One Army personnel was on the ground directing lowering operations by hand signals.

Alternative C would remove the old bridge by hand labor and construct a new steel or treated timber bridge. This alternative would cost approximately $18,000, with considerable disruption to visitors.

Staff selected Alternative B because of cost savings, low environmental impact, low maintenance costs, minimal disruption to visitors, and safety considerations. Staff planned to accomplish the project with teamwork, using the variety of skills and expertise available in both the Forest Service and the Army.

Coordination & Cost

The Forest Service contacted the U.S. Army, 4th Infantry Division, Fort Carson, Colorado, to determine their interest in a training mission. After a reconnaissance flight, the Army considered the project feasible and responded favorably to a formal request for assistance.

Bridge

A 40-foot long by 5-foot wide prefabricated DeBourgh Manufacturing Co. "Town and Country" bridge was selected and purchased by an open market bid of $5,098, delivered to the site. The bridge had a treated timber deck with arched weathering steel truss elements that doubled as railings. It weighed approximately 5,100 pounds. The old bridge weighed approximately 7,000 pounds.

Helicopter

The Army used a CH 47 Chinook helicopter (Model C), estimated to have approximately 8,000 pounds payload capacity at our altitude, pressure, and temperature range. (The later Model D is estimated to have a payload lifting capacity of 13,500 pounds at 8,000-foot elevation and 50 degrees Fahrenheit.) The cost to the Forest Service was approximately $600. The crew arrived the day before the operation to measure the static liftline and to knock down any unstable vegetation with blade downdraft.

Preparation

Small contracts were let to modify the abutments, prepare the old bridge for air removal, and jack the new bridge over anchor bolts after placement. This subcontracting cost $2,025. The Forest Service designed devices to safely lift the bridges.

Ground Crew

Forest Service personnel operated the heliport, stopped traffic on U.S. 160, prevented public entrance into the area, lowered the bridge into place over blocks, served as safety spotters, and provided other coordination as required by the safety plan. The operation was completed in approximately 1 hour without incident.

Cost

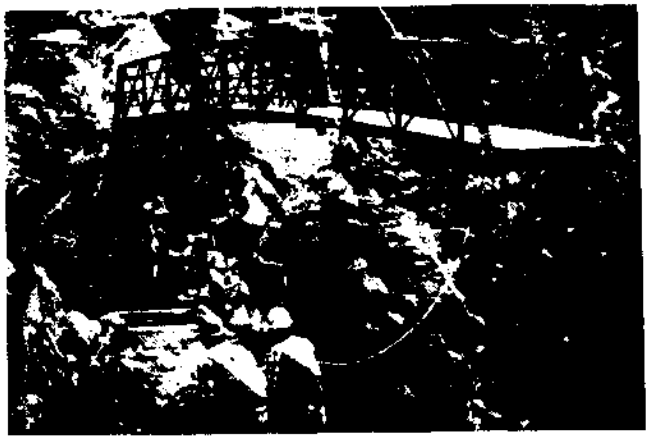
The total cost, including paperwork and Forest Service crew time, was estimated at $9,000.

Project Organization Guide

The following information may help others set up similar operations.

Prework

Determine project feasibility by discussing the proposal with the Forest and Regional Aviation Officers. Contact the Army (Ft. Carson or other air unit) to



Lowering the new bridge onto blocks set over the anchor bolts. Bridge had a tendency to twist under rotor blade downdraft.

New bridge completed in place below Treasure Falls.

determine whether and how they can cooperate. Open channels of communication between Forest Service and Army line officers. Cost quotes from helicopter contractors also may be necessary.

National Environmental Policy Act

Prepare a scoping document based on issues, concerns, and objectives raised by employees and the public. A categorical exclusion is probably appropriate for most operations outside Wilderness Areas; however, this decision is left to the line officer.

Safety Plan

Prepare an aviation operations safety plan that includes the scope of operations, areas of responsibility (Army and Forest Service), persons in charge of various duties, time and place of project briefing (official safety meeting), specific safety practices (both aviation and personal), accident or incident reporting requirements, search-and-rescue coordination, and a list of equipment needs. Cooperation with other State and/or county agencies also is advisable.

Safety Meetings

Hold meetings to organize, coordinate, and promote safety and to check radio communications.

The San Juan National Forest accomplished a similar project on the Mancos Ranger District. For more information, contact James R. White, 303-264-2268, or through the Data General, J.WHITE:RO2F13DO6A.

Scheduling & Network Analysis Program

Kenneth D. Vaughan
Transportation Planning Engineer
Region 10

Introduction

The Engineering and Timber Management Staffs in both the Alaska Region and the Pacific Northwest Region of the Forest Service joined efforts in fiscal year 1987 to contract for the development of timber sale planning and analysis tools. The intent of the contract was to consolidate the series of applications developed over a span of approximately 3 years and to model the effects of adjacency constraints on timber sale design.

The evaluation of equipment capability resulted in the selection of the HP 9020 (Lot 7) computers as the graphic computer for the contract. (At a March 1989 meeting, the Scheduling and Network Analysis Program (SNAP) advisory group agreed that the target for the SNAP software was the equipment to be acquired in the 1991 workstation procurement. The group plans to pursue conversion of the software to that equipment when sufficient detail on operating systems and operating parameters is available.) Technical approval was obtained, and a Request for Proposals was advertised. A technical evaluation panel evaluated the three submitted proposals. After proposal evaluation, best and final offers were received, and the contract was awarded to Dr. John Sessions of Corvallis, Oregon. (The contract was specific with respect to copyrights. The Forest Service obtained the unrestricted rights to the software for the Government, its employees, and its contractors for Government business. The contractor retains all other rights.)

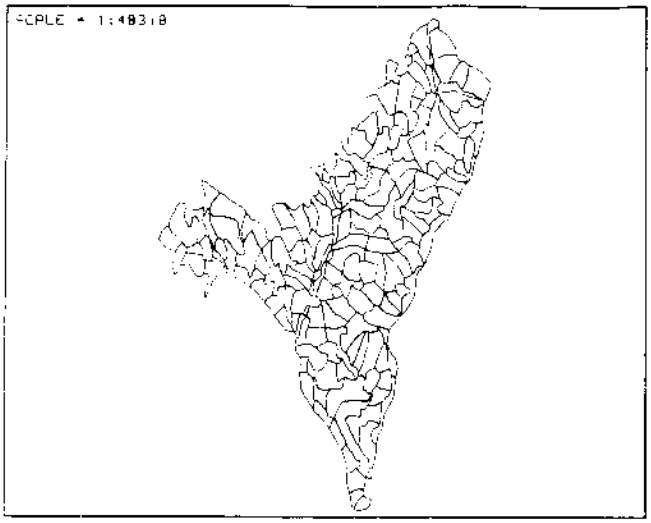
What Was Planned

This contract called for developing new algorithms and procedures, as well as incorporating existing functions from prototype software operating on the HP systems. Some of the experiences with the Integrated Resource Planning Model were the basis for features included in the design of SNAP.

Some key features of the SNAP software are as follows:

(1) The problem approach is one of network analysis, with the user having the choice of either minimum costs solutions or maximum net-value solutions. See figure 1.

(2) The choice of one, two, or three user-defined time periods can be selected. Unit adjacency is not included for the last time period. In a single time period solution, unit adjacency cannot be evaluated. Adjacency can be evaluated in two or three time period problems.



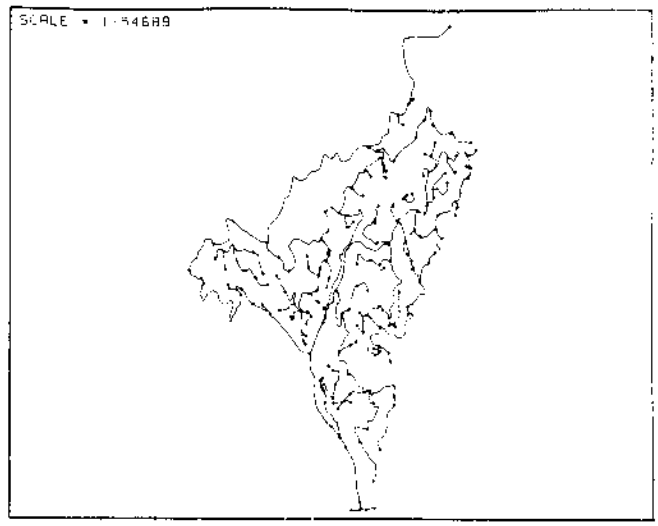


Figure 1.—Snap Creek polygons and road links.

(3) SNAP is intended to function as a timber sale planning and transportation analysis tool targeted for the GS-9 skill levels. See figure 2.

(4) The graphical data display is map based and field locatable. Display of lines and polygons is based on State plane coordinate systems (coordinates in feet). GIS is anticipated.

(5) Units are the basis for evaluating polygon data in the solution process. Unit is used in the context of a timber sale contract unit, with the

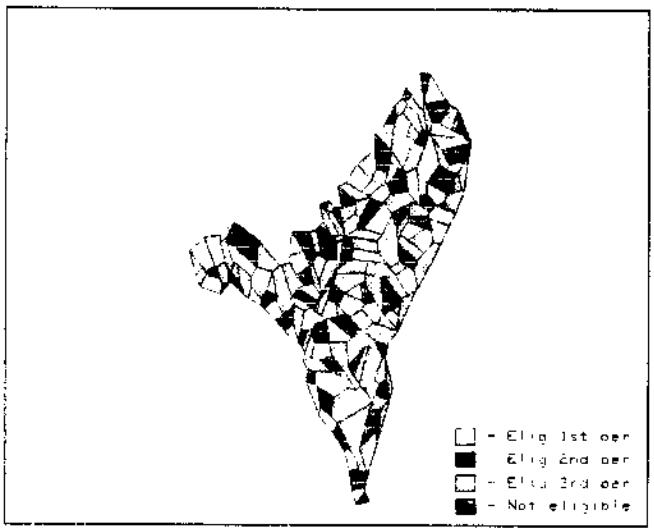


Figure 2.—Three different patterns of units for Snap Creek.

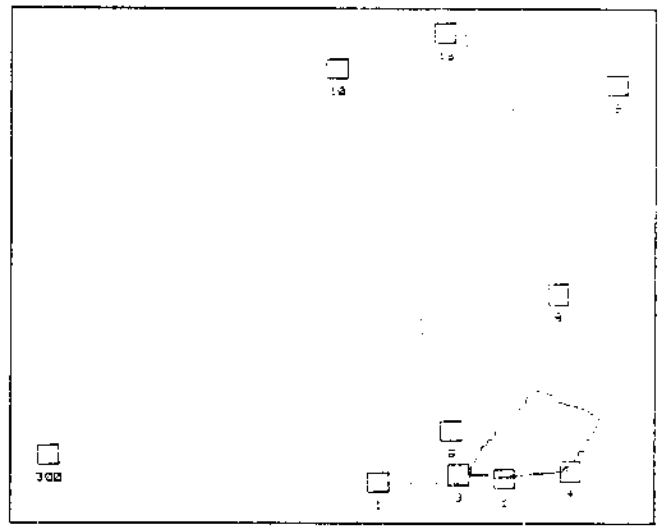


Figure 3.—Unit S-131-HOR (polygon) and alternative landing modes. In this example, modes 2 and 6 have been selected as alternatives with the same harvest system.

boundaries of the polygon expected to approximate cutting unit boundaries. See figure 3.

(6) Numerous patterns and arrangements of units are displayed if the user desires. Adjacency is user controlled, expressed as no sides adjacency, as no sides or points adjacency, or as adjacency limitations. Adjacency also can be set specifically for time periods. The user is responsible for the design of units to ensure meeting maximum opening size limitations expressed in Regional Guides.

(7) Up to three separate species or products can be identified in the data entry. Each of the species or products can be limited to certain mill locations. Each species or product can be tracked through the network solution. See figure 4.

(8) Traffic limits can be placed on individual road segments and mills to limit the amount of use. This could be a traffic limit on a road, or perhaps a maximum capacity at the mill.

(9) Minimum supply by species or product can be set for mills.

MILL SUMMARY

PERIOD: 1

	VOLUME SPEC 1		VOLUME SPEC 2		VOLUME SPEC 3		
MILL NAME	NET mbf	GROSS mbf	NET mbf	GROSS mbf	NET mbf	GROSS mbf	NET VALUE (DOLLARS)
PRINEVILL	5,948	6,396	38	46	0	0	1,480,296

PERIOD: 2

	VOLUME SPEC 1		VOLUME SPEC 2		VOLUME SPEC 3		
MILL NAME	NET mbf	GROSS mbf	NET mbf	GROSS mbf	NET mbf	GROSS mbf	NET VALUE (DOLLARS)
PRINEVILL	6,435	6,920	572	689	0	0	1,830,934

PERIOD: 3

	VOLUME SPEC 1		VOLUME SPEC 2		VOLUME SPEC 3		
MILL NAME	NET mbf	GROSS mbf	NET mbf	GROSS mbf	NET mbf	GROSS mbf	NET VALUE (DOLLARS)
PRINEVILL	9,990	10,742	0	0	0	0	2,936,192

Figure 4.—Snap Creek solution for three time periods. Only two species/products were used in this solution.

VOLUME OR MILES SUMMARY

PERIOD: 1

VOLUME: 6986.5 MBF
ACRES: 497.77

EXISTING ROAD				CONSTRUCTION				RECONSTRUCTION			
A	C	L	SUM	A	C	L	SUM	A	C	L	SUM
.1	0.0	0.0	.1	12.8	1.1	0.0	13.9	4.3	2.7	5.0	12.0

PERIOD: 2

VOLUME: 7007.2 MBF
ACRES: 581.77

EXISTING ROAD				CONSTRUCTION				RECONSTRUCTION			
A	C	L	SUM	A	C	L	SUM	A	C	L	SUM
14.5	3.8	5.0	23.3	4.0	0.0	0.0	4.0	.2	.7	0.0	.9

PERIOD: 3

VOLUME: 9990 MBF
ACRES: 755.59

EXISTING ROAD				CONSTRUCTION				RECONSTRUCTION			
A	C	L	SUM	A	C	L	SUM	A	C	L	SUM
16.5	4.5	5.0	26.0	1.9	0.0	0.0	1.9	0.0	.4	0.0	.4

Figure 5.—Road mileage for pattern 1, Snap Creek. Note that roads constructed in an earlier period are considered as existing in later time periods.

(10) Both the traditional Burns, Nelson, Googins (BNG) and the Road Log methods of estimating timber haul costs are available.

(11) Report writers, graphs, charts, and solution plots are available.

(12) The user can select "effects" accumulators to provide summary information on some key variables related to the solution. Wildlife and silvicultural measurements are expected to be the most common use. See figure 5.

(13) Silvicultural priority or other key variables can be used as a "ranking" variable to select the "best" adjacency pattern results for further analysis.

(14) Marginal analysis of the network solution currently is being included. Marginal differences are determined by ranking the units and recalculating the costs and values after sequentially deleting the lowest

ranked unit. This process also provides the data to perform for sensitivity analysis for different timber markets.

(15) A user's guide, tutorial, and sample data for learning are included in the material available.

(16) Costs and value economics (efficiency economics) are used to compare the differences between adjacency patterns and alternatives. Both costs and values can be used, and costs can be assigned from the stump to the mill pond. Value for timber is normally taken for logs at the mill yard (pond log value).

So What's the Big Deal?

Crucial to SNAP are its map-based orientation and the integration of features found in several independent programs into a single package. The map-based orientation allows cutting units to appear in the displays as they appear on maps. This orientation also allows roads to plot and fit as overlays on maps. Communication is not burdened by an additional symbolic transfer but is related directly to maps and map overlays. The reports and summaries do reflect the experience to date of providing information to National Environmental Policy Act (NEPA) disclosure documents. Economics is always a silent partner in these documents.

The integration of several packages allows for consistency for the persons entering information and for consistency in expected results from the analysis. It is not expected that one person will be responsible for developing and entering all the information used in SNAP analysis, but the common data dictionary does assist communications.

SNAP allows some better insights for examining current timber sale proposals in light of the future sales. An example could be wiring an alternative set of units as the solution for the first time period and examining the feasibility of a subsequent timber sale limited by opening size.

The SNAP package allows the traditional kinds of minimum-cost, stick-diagram network solutions used in the past. SNAP encourages realistic situations and multiperiod analysis that considers adjacency. All the combinations provide opportunities to closely match the conditions of different alternatives.

Disadvantages

SNAP is not an exact, mathematically precise solution. For small problems (under 100 to 200 units and links in total), mixed integer solutions are possible and present a more precise solution. As the number of units and road links increases, an exact solution becomes practically impossible to achieve. This is the place where SNAP is intended to function. SNAP will provide close approximate solutions.

SNAP is neither designed nor intended to be an economic model for all things. It is designed and has been tested to deal with timber sale design and related Interdisciplinary Team activities leading to NEPA disclosure.

SNAP requires considerable information to describe the timber proposed for harvest, the transportation links with costs and limits, and the mills to which timber will be transported. SNAP does not have any way to determine whether the information it uses is relevant and descriptive of what one would see standing on the ground. Information that lacks quality control or verification will yield results that lack quality control or verification.

SNAP probably is not the best tool for a simple or trivial problem. There are some economies of scale associated with the use of SNAP. The other side is the ability to increase the size of the problem with relatively little effort.

How To Try It

It helps to have a real problem in mind to begin. Learning as an academic exercise is interesting, but it does lack the motivation associated with the need to find meaningful solutions.

The primary limitation on use of SNAP is access to an HP 9020 (Lot 7) computer. The primary graphic data (position located) is based on use of the LIDES program. With the LIDES manual and the SNAP user's guide available, you are ready to begin. (See your HP systems manager for a copy of the LIDES manual. If not available at your site, LIDES should be available from your Regional Transportation Planner or from Vi Agnew, Geometronics, Region 6 Engineering. Please include seven floppy disks formatted for the HP 9020. For the SNAP user's guide, check with your HP Systems Manager first. If SNAP is not available with your HP, it is available from your Regional Transportation Planner or Don Nearhood, Region 6 Timber Management. Please include eight floppy disks formatted for the HP 9020.)

The tutorial included in SNAP and the add-on PUGH CREEK example problem (with digitizing complete) provide ready data with which to work. Allow a day for working with the SNAP CREEK tutorial and the PUGH CREEK example. Two or more work periods will be more productive than one marathon session.

At the completion of the tutorial, you probably will have an idea of the kind of work required and the answers available. The key questions are: "Do I have the information and the time to do analysis?" and "Is this the kind of solution that will address the problems and issues we face?"

If possible, a workshop on LIDES is useful, especially if you are not familiar with such topics as geodetic registration, State plane zones, DLG formats, and major-minor code pairs. These terms and others are part of the geometronics world that becomes active with GIS and position-specific map work.

If you decide to go ahead, the process of information assessment, model design, and coordination of logging systems and transportation planning is ready to begin.

The Management of Total Transportation Investments in Region 5

Jerry Wooten
Regional Programs & Operations Engineer
Region 5

In early 1981, all Regions recognized the need to improve the management of all transportation investments (haul, maintenance, and construction). This article is an overview of what happened in Region 5 as we sought new ways to reduce transportation costs and what the results were during the following years.

Recognizing the Need

The need to improve was recognized during the Forest Engineers meeting in late 1980. Everyone at the meeting agreed that the Region needed to have an effective way to openly display and compare budget requests and allocations. We needed to be able to evaluate efficiency and seek ways to improve the management of all investments related to transportation. The Forest Engineers formed a workgroup to develop a process that fulfilled these needs and to provide a report that would establish benchmarks.

By March 1981, the shortage of Purchaser Credit and the projection of large funding increases related to road costs became key issues to the Forest Service. Region 5 was projecting an increase in Purchaser Credit from $45,000,000 in fiscal year 1980 to $80,000,000 each for fiscal years 1981 and 1982. The Chief and Staff, the Department of Agriculture, the Office of Management and Budget, and Congress indicated, during various budget reviews, the need to "reduce all road costs." These concerns were outlined in the Chief's March 28, 1981, letter to Regional Foresters.

It seemed that Region 5 needed a strategy to improve the management of all investments related to road transportation. The Regional Forester was very concerned about this issue, and because we already had set up our workgroup, he volunteered the Region's help to assist the Chief in a study on Forest Road Program support service costs. By May 1981, the Regional Forester made a personal effort to meet with all Forest Supervisors and their Timber and Engineering Staff officers. During these meetings, he outlined a Regional objective and strategy that gave a positive start toward controlling the situation. He made it clear that this was not just an Engineering problem but a Forest Service problem. The objective and strategy he outlined is shown in the Action Plan in figure 1.

The entire effort was off to a successful start. The Region had an objective, a strategy to achieve the objective, an action plan to follow, and a workgroup

Figure 1. ACTION PLAN

MANAGEMENT OF TOTAL TRANSPORTATION INVESTMENTS - REGION 5

I. PURPOSE - Purpose of this action plan is to improve the management of Forest road investments. Most of this action plan has been in effect since March of 1981 and the only changes are the planned specific annual accomplishments.

II. OBJECTIVE & STRATEGY - The objective is to reduce total costs by improving the management of all transportation investments (haul, maintenance and construction) and yet maintain acceptable levels of outputs and meet land management needs. The strategy to achieve this objective is:
(1) Priority One - Insure that only necessary work is being required.
(2) Priority Two - Insure that the standards used for work require the least work to make the road functional and (3) Priority Three - Insure the amount and quality of support services is commensurate with the capital investment, maintenance and the management objectives for the transportation system.

III. RESULTS

1. SUMMARY - AVERAGE ANNUAL REDUCTIONS FROM FY 1981 THRU FY 1988

----ROAD CONSTRUCTION COSTS REDUCED	$19,500,000/YEAR
----ROAD MAINTENANCE COSTS REDUCED	$ 7,700,000/YEAR
----HAUL/TEMPORARY ROAD COSTS REDUCED	$14,800,000/YEAR
----FRP SUPPORT SERVICES REDUCED	$ 6,500,000/YEAR
ALL COSTS (OBJECTIVE) REDUCED	$48,500,000/YEAR

2. PRIORITY 1 & 2 *NECESSARY WORK AND APPROPRIATE STANDARDS*

	81	82	83	84	85	86	87	88
OUTPUTS - TIMBER VOLUME (BBF)	1.83	1.84	1.74	1.72	1.62	1.48	1.51	1.75
-PCPE (MM$)	44.9	38.9	29.3	22.9	21.9	16.5	15.2	17.6
-FRP (MM$)	9.8	23.0	16.22	7.7	6.4	3.0	12.6	8.5
-TOTAL (MM$)	53.7	61.9	45.5	30.6	28.3	19.5	27.8	26.1
-CONSTRUCTION (MILES)	426	629	524	404	410	309	383	304
-RECONSTRUCTION (MILES)	1057	1039	612	444	693	553	570	690
-TOTALS (MILES)	1483	1668	1136	848	1013	842	953	994
					*$2.7 MM fire recovery			
ROAD MAINTENANCE (NFRD MM$)	15.4	14.0	11.9	11.2	13.0	11.3	11.5	*15.9
(SALE APPRAISAL MM$)	17.0	14.8	14.7	9.9	10.1	11.0	11.1	12.7
TOTAL MAINTENANCE (MM$)	32.4	28.8	26.6	21.1	23.1	22.3	22.6	28.6
HAUL COSTS (APPRAISAL MM$)	59.8	50.4	63.8	49.0	54.4	30.7	24.6	42.2
TEMPORARY RDS.(APPRAISAL MM$)	0.6	0.9	0.7	0.4	0.5	0.3	0.8	0.5
TOTAL HAUL/TEMP RDS. (MM$)	60.4	51.3	64.5	49.4	54.9	31.0	25.4	42.7

3. PRIORITY 3 * SUPPORT SERVICES *

					*includes SSSS funds			
-FRP (MM$)	28.2	24.6	23.5	24.4	24.2	18.4	17.9	*18.9
-FTE'S (FRP)	804	772	717	625	555	475	420	410
4. TOTAL ALL COSTS (MM$)	174.7	166.6	160.1	125.5	130.5	91.2	93.7	116.3

Figure 1.—Action Plan.

to help develop ideas, data, and information. Most important, we had everyone's support to make sure it worked.

What Was Done

We did not have to wait for the Region's workgroup to finish its task to get started on reducing costs. We did not feel a need to have a process or cost data to start reducing costs. We felt that the most important action was to communicate expectations. During late 1981 and all of 1982, a major effort was undertaken on strategy priorities one (do only necessary work) and two (use appropriate standards). Monitoring teams with a carefully selected

ACTION PLAN (CONTINUED)

IV. MANAGEMENT PLANNING - The following major activities are used to establish specific actions annually to accomplish the objective and evaluate progress.

A. Program Budget and Allocation Process - Provides a detailed analysis of the major cost and productivity items. Various targets to reduce costs should be investigated and evaluated. The purpose is to provide each forest an opportunity to analyze their costs, productivity, related efficiencies and to display their needs and outputs. The purpose is also to provide adequate direction and information to each forest about expected costs and productivity where differences occur with their requests.

B. Accomplishment Reporting - Provides a detailed record of the major cost and productivity items as they were actually accomplished by the forests and the Region. The purpose is to provide forests with a tool for projecting needs and outputs, comparing themselves with others and being able to identify areas of high cost that they need to review. The purpose is also to provide the Regional Forester a tool for allocating funds, projecting future costs/productivity items and assisting forests in improving their efficiency while maintaining an acceptable level of quality and expertise.

C. Field Monitoring - Includes the following: (1) identifying solutions to cost and productivity issues resulting from the data developed in A and B above, (2) identifying technological methods or processes that should be modified or can assist other units, (3) evaluating proposed capital investments, (4) evaluating accomplishment of established functional standards and (5) identifying solutions to unusual management situations. Both the forests and/or RO will do field monitoring.

D. Follow-up - Includes the following: (1) provide a brief report that displays the progress in managing costs and productivity, (2) insure recommendations are completed for the items identified in field monitoring, (3) provide an opportunity annually through workshop or meeting situations for communications on the progress and discussion of further opportunities for improving the management of transportation investments and (4) provide opportunities for detailers to gain experience in the RO engineering program budget office or other areas in the Regional Office.

Figure 1 (cont.).—Action Plan.

makeup and with specific objectives and direction were established, and each Forest was monitored. Workshops for planning, preconstruction, maintenance, and Engineering program/budget were organized to focus on these two strategies. Joint functional assistance trips by Regional Engineering and Timber Staffs were increased.

In 1982 and 1983, training and use of value analysis on road projects and timber sales were a major effort. There also was increased emphasis on better understanding and clarification of minimum standards in manual supplements, workshops, and field trips. The use of prehaul maintenance specifications and direction was emphasized. A roles and responsibility study for all engineering-related activities was completed and used for work force reductions. Monitoring trips with Watershed, Fire Management, and Recreation also resulted in large cost savings because many of their requirements and direction affect road costs. A review of these individual resource requirements with proposed Forest Plans also helped uncover differences when applied to actual on-the-ground projects.

Cost & Productivity Study

By May 1983, the workgroup published Volume 1 of the "Region 5 Road Cost and Productivity Study." The basic ideas were to update the study about every 2 years, make sure all data used came from the Forest, use 3-year averages to eliminate the highs and lows that occur in a single year, make sure data was trackable and errors could be corrected, and use actual costs and not attempt to adjust to a common cost index.

Primary uses of the study are as follows:

(1) Develop data for leveling and evaluating budget requests and allocations.

(2) Assist in projecting future needs for out-year programs.

(3) Provide a tool for Forests to compare themselves with others.

(4) Identify high-cost areas that the Region or a Forest needs to improve.

(5) Document the Region's progress in meeting the objective of reducing costs.

The study is not used for performance evaluation.

For high-cost areas, the study provides a basis to discuss the cause or reasons for a Forest's high costs and what actions the Forest plans to take or help they need to get control of the situation. The Regional Office needs to be part of the solution. Also, unit costs only are indicators, and great care is needed in their application and use. Some high unit costs can be expected, are not necessarily bad, and may be justified. Chasing unit costs can be costly and nonproductive. After the publication of the first cost study, some of us shifted too much of our attention to unit costs and became more concerned with reducing unit costs than with the real objective of "reducing total costs." Meeting minimum quality and quantity standards and resource objectives at the least cost is the real need.

The study includes sections on recording Regional progress, summarizing Forests' apparent high-cost areas or productivity concerns, total transportation costs, productivity factors, the allocation process, the policy and process for selecting and setting priorities for capital investment projects, support service costs, future costs and coordination with Forest Plan costs and targets, and the Action Plan with a current list of actions and previous accomplished actions.

Support Services

For support services, the idea is to isolate by Forest the costs for non-engineering work, engineering management, engineering work on timber sale roads, and engineering work on nontimber roads. The key factors for evaluating support are dollars per mile, dollars per thousand board feet, and dollars of support per dollars of value of construction (which is called the performance factor). All three are important, but care must be used in their application.

As a first step, the most important indicators to look at are miles per million board feet and cost per mile (miles and cost of construction and reconstruction). This will identify mileage differences between Forests based on a per unit of million board feet and unit costs for construction or reconstruction. These indicators lead to solving problems with estimating construction costs, reconstruction versus prehaul maintenance, and minimum road

standards, to name a few areas. Eventually, these indicators lead to reducing support costs because the amount of work is less.

Action Plan

The Action Plan provided for an annual update of specific actions on what new actions or what followup needed to be done. Constant monitoring of the action plan was essential to ensure that reductions in costs were continuing. Annual Engineering program/budget workshops assisted in maintaining this focus. Figure 1 is a copy of the Action Plan with the four major activities used for developing these annual actions.

Many other significant efforts were undertaken to ensure that we were working toward meeting the objective. We conducted an engineering methods assessment that allowed all of us to take a look at how we were actually accomplishing engineering work. The methods assessment was a process for sharing information. It identified ways to do more for less because others were actually doing it that way. We conducted safety-quality monitoring trips that emphasized minimum safety standards at minimum costs.

The single most significant item that resulted in a "big payoff" was that each Forest put a lot of energy into getting reductions and making a sincere effort to do the very best that personnel knew how. This is where real results were achieved and progress was made.

Summary of Efforts

In summary, we designed our actions to support strategies one and two first—do only necessary work and use appropriate standards—so as to reduce road mileage to a minimum and obtain minimum road construction and reconstruction costs. After this was achieved, a review of support costs could proceed with more realistic workload information. On some Forests, we found we had overreacted and had reduced mileage or work too far. This required some adjusting. The objective was to not only reduce costs but maintain acceptable levels of outputs and meet land management needs. Currently, we are into the area of "fine tuning" costs and productivity and ensuring that land management needs are being fulfilled. Significant changes are not anticipated in the near future; only minor reductions can be expected.

Results of Effort

In summarizing our efforts from fiscal year 1981 through fiscal year 1988, there are no standards to meet or other Regions with which to compare, but we feel we have made significant advances in meeting the objective of reducing total transportation costs. See figures 1 and 2 for details.

A review of the data indicates that, as planned, road construction and reconstruction costs and mileage had the first significant reduction (which correlates with priority one and two strategy to ensure only necessary work and appropriate standards were used). Reductions in maintenance also are related to strategies one and two. The second most significant reduction occurred in haul costs, which was a result of developing a better way to estimate haul costs. Support cost reductions were more difficult to achieve because staffing is not that easy to change; if you are going to accomplish reductions in the other areas, you need a minimum staff that has the proper

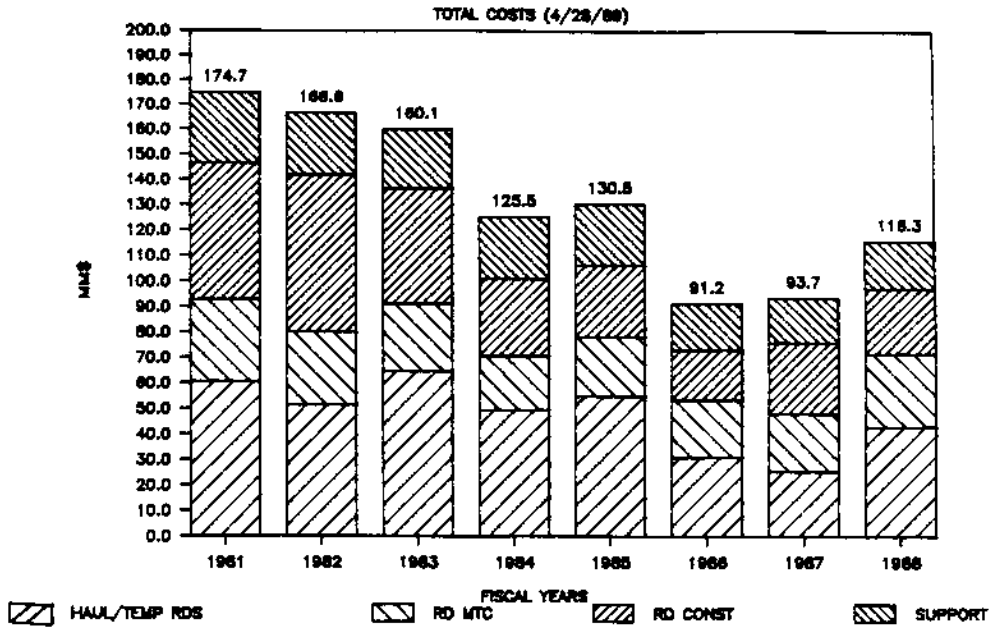


Figure 2.—Region 5 management of total road investments.

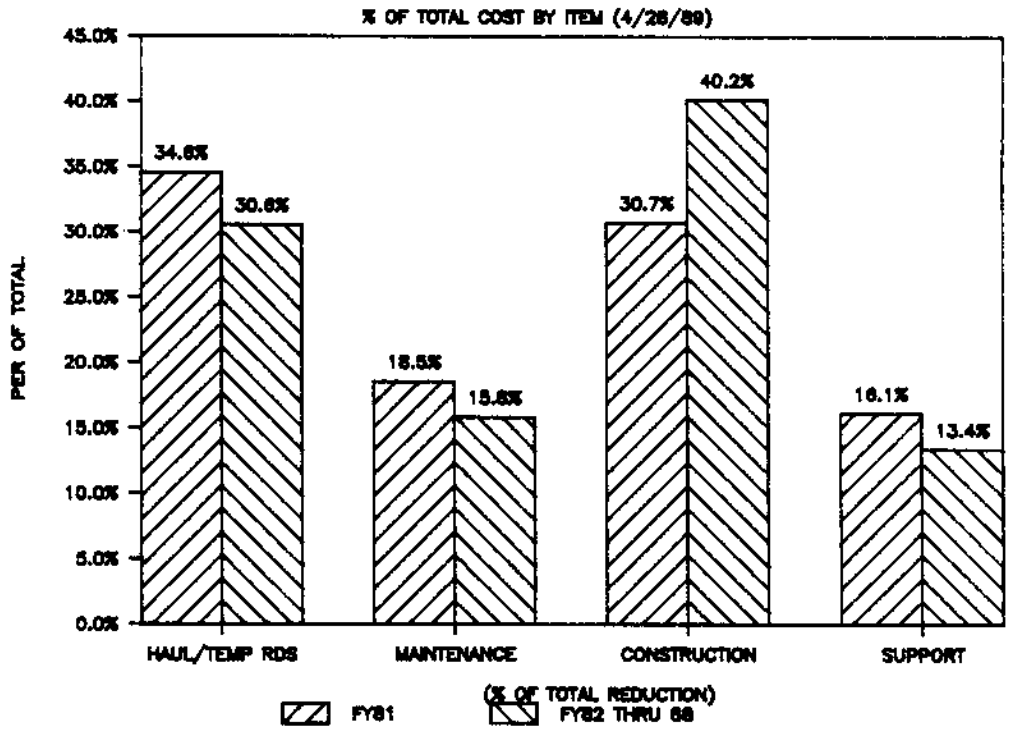


Figure 3.—Region 5 total road cost reductions.

skill mix and experience. However, the percent reduction for each area when compared with the percent of the total costs for all areas is fairly uniform and balanced. See figure 3 for details. We currently are updating our roles and responsibility study, which will improve our efficiency and quality.

Reducing unit costs was not an objective because it would not have been responsive to the problem and because unit costs can be misleading and should only be used as indicators with caution and care. The real objective was to reduce costs. The Region reduced total transportation investments from $174,700,000 in fiscal year 1981 to $116,300,000 in fiscal year 1988. This is for all roads, including recreation, all-purpose, and timber. This represents an average reduction of $48,500,000 per year when fiscal year 1981 is considered the benchmark year. This reduction is actual costs and not costs inflated to a common cost index year. Had this been done, the average annual reduction would be about 20 percent or more. See figure 4 for details.

The following is a summary of the average annual reductions per year from the benchmark:

Road construction	$19,500,000
Maintenance	$ 7,700,000
Haul/temporary roads	$14,800,000
Forest Road Program support services	$ 6,500,000
Total reductions	$48,500,000

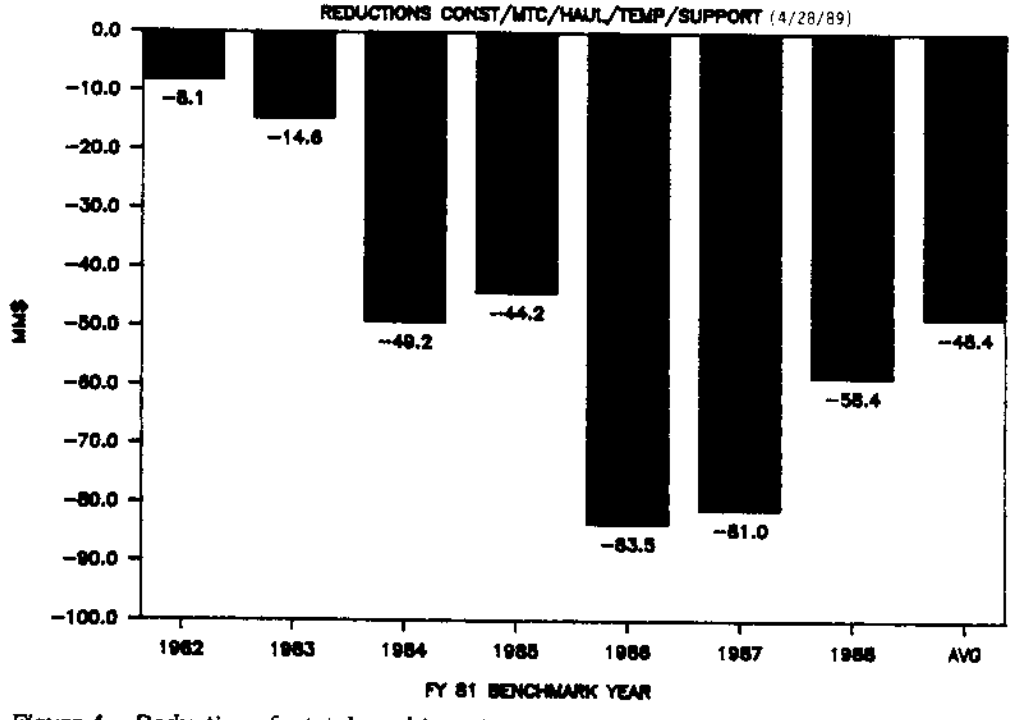


Figure 4.—Reductions for total road investments.

The Region will publish Volume IV of the "Region 5 Cost and Productivity Study" this summer. The Region should start 1990 as a new benchmark year and track cost increases and decreases for the next 10-year period. The purpose would be to get information more in tune with the Resources Planning Act and Forest Plans.

Besides the dollar savings, the big reward was seeing the Regional work force "pulling together" and finding ways to do a more professional job. If presented properly, the world of limited resources to achieve work will improve morale and job satisfaction, generate creativity and team solutions to problems, and make the job much more challenging.

A Facilities Information Center—Sharing Our Facilities Management Resources

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Washington Office

Introduction

A major improvement in our ability to share facilities information and management resources was approved by the Information Resources Management Board on April 24, 1989. The approval allowed the establishment of a Service-wide electronic Facilities Information Center (FIC), which is the first functional-related information center in the Forest Service. FIC revises the format of the information provided in the previous Facilities Training System (FTS) and expands our opportunity to share additional information. Improved access, the ability to "browse" available information, and increased participation should make the center an asset to Facilities staff and Managers.

This article describes the FIC software concept, the revision of FTS, and how one can share training and other resources with other facilities personnel. Because the initial information in FIC is primarily that which is currently available in FTS, references, examples, and comparisons are provided to assist the conversion between system formats.

FIC's service for facilities information will be available by August 1, 1989. Until formal conversion is announced by letter, Forest Service personnel can access the training information and inspection forms using the Data General Information System (IS) process from the WO1A host computer. Access instructions were provided in an earlier issue of *Engineering Field Notes*.(2)

Background

FIC is the result of an extensive effort to improve the Forest Service's facilities management program area. With approximately 20,000 facilities spanning a variety of functional uses, construction types, and operation and maintenance activities, the facilities staff must be versed in a considerable number of skill areas. Common objectives and direction are necessary to achieve quality and effective facilities management activities.

Interunit committee efforts have resulted in the development of a structured maintenance management approach.(*1*) This approach led to the direction currently provided in FSH 7309.11, Section 43.1. Further activities included establishing FTS, which became operational in March 1988.(*2*) Another committee effort defining facilities management skill requirements, scope, and suggested resources is slated for publication in the summer of 1989. Related committee discussions helped shape the concept of FIC.

The core of the FIC will consist of training information that currently exists in FTS, whose focus is on the need to improve skills among facilities staff. While much is still learned through on-the-job experiences, tempering these experiences with both formal and informal training, along with or before these experiences, results in a better, more cost-effective effort. The original training concept, that of providing a means to improve facilities maintenance and operations inspection skills, was expanded to include construction inspection and a host of other facilities management considerations. FTS was designed to meet the broad range of individuals, whether new to the facilities job or experienced and seeking to expand their skills.

FTS has been relatively successful during its initial year of operation. A major drawback has been the degree of difficulty for data access and retrieval using the Data General IS program. Concurrent with the establishment of FTS, the Forest Service was experimenting with Service-wide information centers for electronic storage and retrieval of the Forest Service Manual and similar Service-wide information. FTS was designed to allow fairly easy transfer from IS to FIC software.

FIC Format

The Forest Service's FIC's are generic programs within Data General Corporation's Comprehensive Electronic Office (CEO) software. Access, file structure retrieval, and data manipulation are common knowledge among Data General users. As with all controlled data, only read and retrieve (mail) access is provided to persons other than the FIC Manager.

The file format is structured into DRAWERS, FOLDERS, and DOCUMENTS. Additional information is provided by design and through the use of document summaries and descriptions.

FIC is actually a generic, user application software program.

DRAWERS

DRAWERS consist of the major topic or "center title." Currently, two drawers exist: the Forest Service Manual and the Software Retrieval Center. Facilities will be the third DRAWER.

FOLDERS

FOLDERS consist of subtopical areas. Forest Service Manual uses chapter headings for folders. Each type of "center" can use a discrete approach. FIC will have the following four FOLDERS initially:

(1) *TRAINING LIBRARY* consists of materials the Forest Service owns. A description of the material, where it is located, and who to contact to borrow the materials are included. Some items are designed for self-instruction using video tapes and reference materials that may be obtained by the individual. These include specific purchased training materials developed by the Corps of Engineers, Forest Service, and a host of other sources. The LIBRARY will increase as time and opportunity are available.

(2) *TRAINING OPPORTUNITIES* lists courses being offered within the Forest Service, by other agencies, and by the private sector that seem

appropriate to the needs of our personnel. Obviously, this is only a brief listing of all the opportunities available. This listing includes a description of the course, location, and contact person. Some of the courses list a candid critique for guidance as to the relative worth of investigating the opportunity further. Both "one-time" courses and annual "repeat" courses are included.

(3) *INSPECTION AIDS* includes the full text of inspection forms for specific types of inspections developed by various individuals, units, and other sources to improve both the quality and efficiency in field activities. Additional information proposed includes articles discussing use of equipment, methods, and ideas that may be of interest to inspection personnel.

(4) *DATA DICTIONARY* includes a compilation of common terms used in facilities inventories and other reports. These are the "standard" definitions referred to in FSH 7309.11, Chapter 60. An update is under way. This FOLDER will be included by October 1989. A review of the dictionary content, usage, and additions is proposed on a 5-year frequency.

DOCUMENTS

DOCUMENTS require even more inventive approaches. As the documents are numbered in CEO for identification, further breakdown for subject areas, latest data changes, and course/tape titles posed a design challenge. The FIC DOCUMENTS are formatted as follows (see figure 1):

subject	*date entry/last change (yy/mm/dd/##)*	*short title or description*
ELEC	88/11/07/01	1986 Oregon Lighting Standards

where: ELEC—see subject area naming convention
yy = year of entry or last significant change
mm = month of entry or last significant change
dd = day of entry or last significant change
= number of a multiple subject entry/change in a day

FIC Access

FIC access requires knowledge of the Forest Service's Data General system's CEO only. Access for browsing and document retrieval is quite simple using the following steps:

(1) From the Main Menu, select 7—Utilities.

(2) From the Utilities Functions Menu, select 6—User Applications.

(3) From the Public User Applications Menu, select 1—Run. Then select Info_Center. Then select 1—Standard.

(4) From the menu of Forest Service FIC's, select FAC for the Facilities Information Center (the computer calls the information center requested). (Caution: If actions are delayed for several minutes from this point on,

DRAWER: FACILITIES

FOLDER: TRAINING LIBRARY

DOCUMENTS:			
	ELEC	88/11/07/01	1986 Oregon Lighting Standards
	ELEC	88/11/2	Artificial Lighting Sect 5310
	ELEC	88/11/07/02	Fundamentals Lighting Design
	ELEC	88/11/07/03	High Intens Discharge Lamps
	ELEC	88/11/07/04	Int Lighting Strategies
	ELEC	88/11/07/05	Lighting Controls Under $300
	MECH	88/03/15	COE Mech Insp
	MECH	88/11/07/01	Air to Air Heat Exchangers

FOLDER: TRAINING OPPORTUNITIES

DOCUMENTS:			
	ELEC	88/03/29/01	Comp Lighting Design
	ELEC	88/03/29/02	Elec Design for Non EE
	ELEC	88/03/29/03	Review Natl Elec Code
	ROOF	88/11/04/01	Basic Roofing Inspection

FOLDER: INSPECTION AIDS

DOCUMENTS:			
	ELEC	87/08/31/02	R4 Admin Site Distribution
	ELEC	87/10/14	R4 Bunkhouse/Kitchen
	ELEC	87/08/31/04	R4 Crew Trailer

FOLDER: DATA DEFINITIONS (Later)

Figure 1.—Format example.

the computer will "hang up" on the call, and you will have to recall the Information Center.)

(5) Select "List Documents." The document name is organized to provide the acronym of the technical subject area and the date of the last update (that is, yy/mm/dd/##, where yy = year, mm = month, dd = day of month, and ## = entry made on that date, in cases of multiple entries).

(6) Select View, Print, or Mail as desired. Users do not have access to edit, create, delete, or move/duplicate/archive.

A "HELP" folder is available that contains documents with instructions for using FIC, access instructions, browsing documents, keywords, mailing documents to oneself, and so on. Some macros, using the F1 through F5 keys, also are available. In addition, there are instructions for submitting documents to FIC, which is a must for continued vitality.

Exiting from FIC is the same as from CEO, but the user must remember that he or she is exiting from the FIC CEO first. This will put the user back to the CEO Main Menu. To get all the way out of CEO, exit again.

Naming Conventions

The design of the document descriptions required some shortening of the subject area titles from those previously used in IS-based FTS. We also have added, revised, and split some previous FTS folder names to accommodate additional subject areas. Figure 2 contains a list of current document subject area titles. Additional subject areas may be added in the future.

Personnel Participation

The basic concept of FIC is for facilities personnel to share with their peers specific types of information. Through their participation in this process, FIC will be of benefit to many others.

Searching for good material or training courses can consume considerable time if done centrally. Many of us receive considerable information and are made aware of many excellent materials generally advertised regionally. Some personnel may have attended a particular course that is repeated from time to time. We need to hear from them about that course. Some have purchased copies of materials for office use. If personnel are interested in sharing the materials, we need to know what others have. We need a collective effort to assist our fellow facilities personnel in doing a quality job.

A limited budget has been available for facilities training the past 3 fiscal years. The intended use of these funds is for developing new materials and cooperative videotaping of Regional and other technical training sessions.

Previous folder name (IS/FTS)	*Document subject area (IC)*
Concrete/Masonry/Steel (split)	CONC
	MASN
	STEL
Doors/Windows	DRS/WNDW
Electrical	ELEC
Facilities Management Training	FM TRNG
General (split summary/general/information)	GEN
Hazardous Materials	HAZMAT
Health and Safety	H&S
Historic Preservation	HIST PRES
Inspection of Existing Buildings	INSP BLDGS
Interior and Exterior Carpentry	IN EXT CARP
Interior and Exterior Finishes	INT EXT FIN
Life Safety	LIFE SAF
Mechanical	MECH
Moisture/Insulation/Roofing (split)	MOIS
	INSL
	ROOF
Site Work/Landscaping/Drainage (split)	SITE
	LDNSCP
	DRAIN
Table of contents (replaces directory)	TABLE

Figure 2.—Document/subject naming conventions.

We also have been able to provide some videotapes to the field that are readily available from various sources. We will continue this practice and encourage all units to set aside some funds for local purchase or development of similar materials. We suggest field units coordinate their efforts with their Directors to maximize both opportunity and effectiveness of facilities-related training funds.

Although many materials are located at Region or Station headquarters, this is simply a matter of convenience for intra-unit use and accountability. Materials that are the property of a Forest or District also can be included and stored at that office. The lender and borrower should arrange the terms of all loans. Some tape sets take significant viewing time and might need to be broken up temporarily. Some materials might be copied and returned immediately while others are protected.

Submittal of sharing data is not difficult. We suggest retrieving a similar document and edit in the appropriate data. Send your sharing data to G.Lippert:WO1A for review and temporary storage. The FIC Manager (InS Staff) will loan new entries on a quarterly basis from the temporary storage file. If personnel have questions, feel free to contact me through the Data General at G.LIPPERT:WO1A or FTS 235-8020. If I have questions, I will be in touch.

Future Considerations

In addition to the standard dictionary of facilities terms, several ideas for additional sharing are being considered. One idea is to provide facilities-related specifications in FIC. This seems partially viable, but including all text of all Regional specifications might prove impractical in terms of both space and cost. Indexes of Regional/Station/Forest specifications that are on the Data General are being considered. This allows the user to find out whether someone has a particular specification for use as a guide for local adaptation. In this way, the "holder" can update and/or modify the specification to ensure current validity.

The future of this and other potential uses of FIC will be explored at nationa facilities workshops. Forest Service personnel's ideas and local discussion can find their way to this forum. We need support from everyone.

References

1. Engineering Staff. Facilities Maintenance Management—A Framework for Efficient Maintenance of Buildings. USDA Forest Service, EM 7310-3 (September 1986).

2. Lippert, G.J., and W.E. Brownfield. Facilities Training System—Sharin Our Facilities Training Resources. *Engineering Field Notes 20* (March-April 1988), pp. 33–40.

Countering Vandalism to Forest Service Signs

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Covering more than 300,000 road miles and incurring replacement costs exceeding $50 million, the Forest Service sign system is a substantial investment. Vandalism is expensive and places the agency at legal risk if accidents result from improper signing.

To test techniques for countering sign vandalism, the Missoula Technology and Development Center directed a study from 1981 to 1985 on the Angeles National Forest in California and the Uinta National Forest in Utah. Researchers found that sign placement and message, materials chosen, and repair techniques all influence how well signs sustain damage or thwart vandals. Figures 1 through 4 are photographs of damage to signs.

Theft and damage can be cut by following steps developed from the study's conclusions. Although no technique is foolproof, some of the results demonstrated a decline in vandalism rates.

Managers should closely evaluate the need for existing as well as additional signs—the fewer signs to tempt vandals, the better. Because many Forest roads have low volumes of traffic, catching a vandal in the act of destroying or removing a sign is difficult.

Figure 1.—Flexible post after someone repeatedly stepped on it.

Figure 2.—Flexible post after bending and stepping on it.

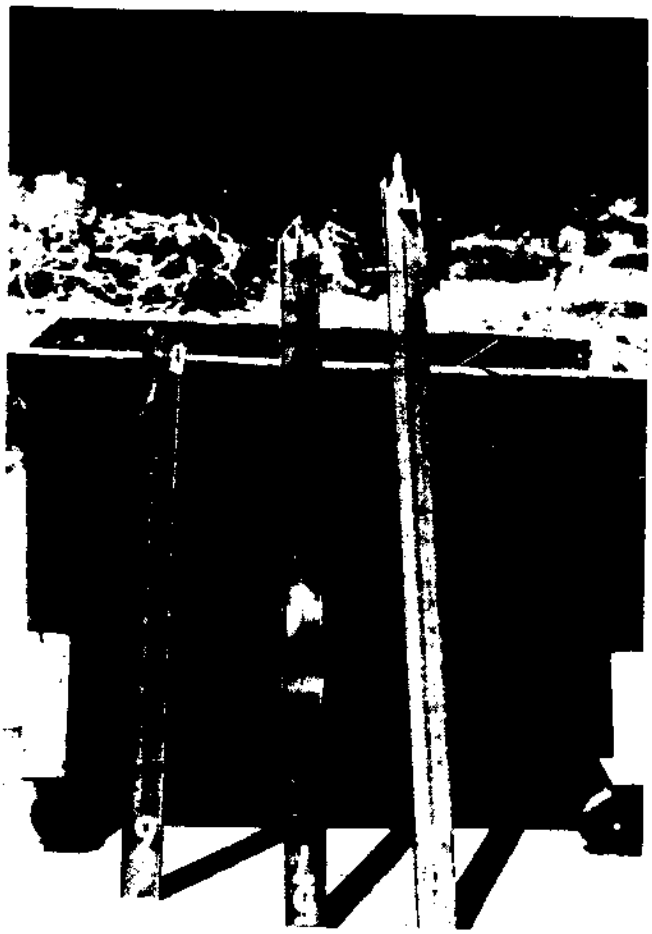

Figure 3.—Many flexible posts end up like this. Steel or wood posts might perform better in some campgrounds at considerable savings.

Also, erecting signs on sites less likely to have vandals should prevent defacement. The study showed that signs at the end of a long straightaway made better shooting targets than those located just past a curve. Signs adjacent to roadside pulloffs suffered more damage than those placed behind or before a turnout. Whenever possible, position signs where they can be read, yet are inconvenient to vandals.

Negative messages, especially those noting road closures, sometimes attract vandalism. However, softening the message with a "please" and an explanation of the inconvenience often generates respect for the limitation (figure 5). Yet, designers can go too far with a creative approach. If the message is unusual or humorous (for example, "Do Not Even Think About Parking Here"), the sign may end up in a college dormitory or private home.

After determining the need for a sign, its placement, and its message, consider the choice of sign substrates, posts, and hardware.

HDO plywood is the sturdiest substrate. Where one bullet can destroy the wording on an aluminum sign (figure 6) by indenting a ½-inch area and

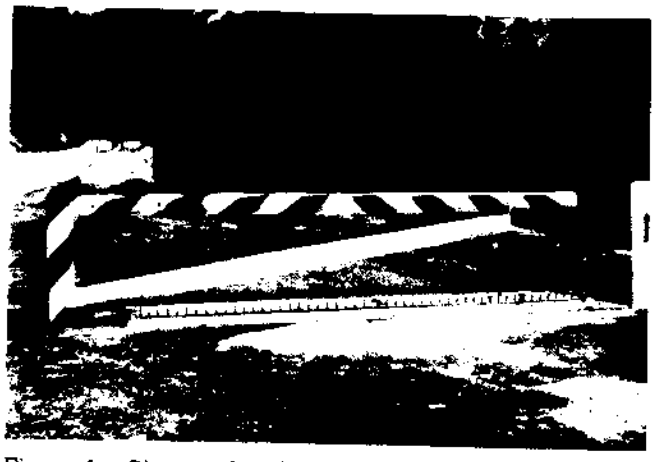

Figure 4.—Signs stolen did not have vandal-resistant hardware.

Figure 5.—Typical graffiti. An explanation ("a new plantation is being grown for the public") or indications of what uses are permitted on road ("foot travel welcome") may help.

chipping the surface, plywood substrates can withstand numerous bullet holes. Bullets may tear the back of a sign but will leave only small holes on the front. Also, plywood signs cannot be bent or easily torn loose from their mountings, whereas ABS plastic substrate signs are easily broken or torn from their mountings (figures 7 and 8). For smaller signs, such as warning, regulatory, or recreation signs, a heavy gauge poly plate is an alternative to plywood.

Existing post materials, once modified, should still be used. Because wood posts in rural areas or campgrounds are often stolen to fuel campfires, and flexible posts are often bent or broken by vandals, choose steel "U" channel or tubular posts instead.

Figure 6.—Bent aluminum sign.

Figure 7.—ABS plastic sign torn from vandal-resistant hardware.

Choice of hardware can make a dramatic difference in theft rates. When the Angeles National Forest switched from standard nuts and bolts to vandal-proof hardware, sign theft ceased. Theft once was the Forest's most costly form of vandalism. Vandlegard or Tuf Nut hardware are inexpensive and work well. The need for unusual equipment to remove the hardware stymies most thieves, regardless of the time they have to wrestle with the task.

A well-maintained system discourages vandalism. Researchers determined that once a sign is defaced, more damage follows (for example, one bullet hole seems to attract another). The sooner a sign is repaired, the better for the entire system.

A repair can be a simple, 5-minute task of applying a new reflective sheeting face to the plywood or aluminum substrate (figure 9). A pressure-sensitive, silk-screened, engineering grade face meets reflective standards for Forest Service roads and is more cost-effective than other materials, such as the 3M Company's System 5. Details on applying reflective sheeting and patching signs are in the *Signs Maintenance Guide* (7971 2608, October 1979), available from the Missoula Technology and Development Center.

Other suggestions for countering vandalism and maintaining a high-quality road sign system are detailed in the following Forest Service publications:

Placement Guide for Traffic Control Devices (8171 2603, July 1981)
Tamper-Resistant Hardware (8471 2307, October 1984)
Reflective Sheeting for Roadside Sign Repair (8471 2305, October 1984)

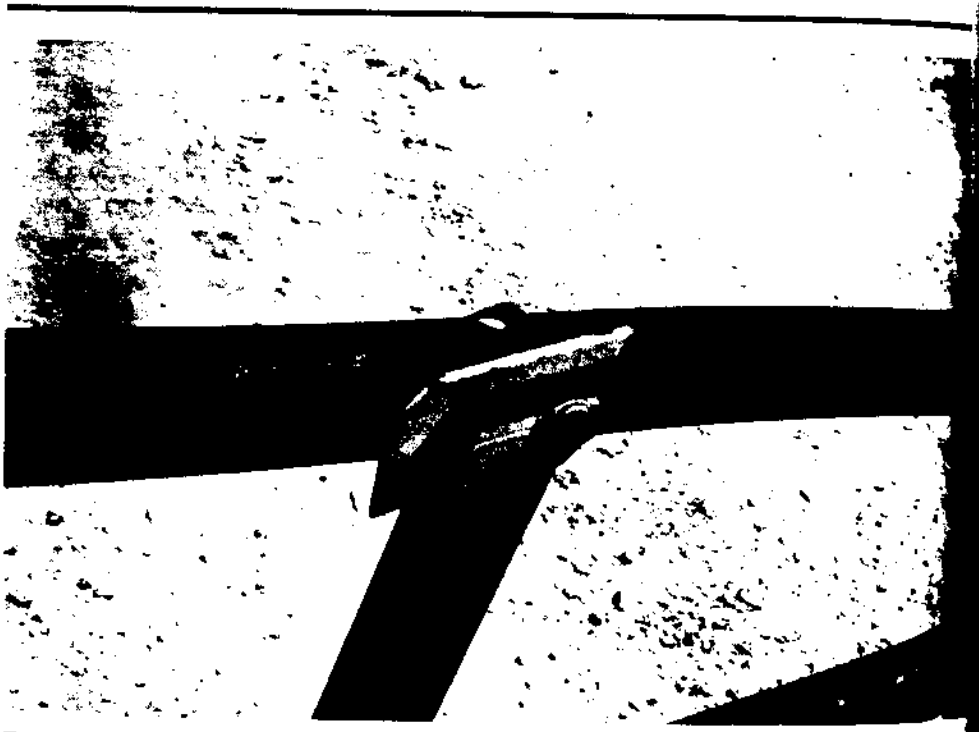

Figure 8.—ABS plastic sign broken loose from vandal-resistant hardware; plywood might have prevented this.

Figure 9.—Replacing a reflectorized sign face in the field.

Flexible Posts for Highway Signs and Markers (8471 2308, November 1984)
Plastic Traffic Barricades (8471 2309, November 1984)
Roll-up Construction Signs and Barricades (8471-2302, August 1984)

The above publications may be ordered from: USDA Forest Service, Missoula Technology and Development Center, Building 1, Fort Missoula, Missoula, MT 59803. In addition, the Federal Highway Administration publication, *Manual on Countermeasures for Sign Vandalism* (FHWA-IP 86-7) provides a detailed discussion of sign vandalism. This publication is available through the National Technical Information Service in Springfield, Virginia.

Periodic Safety Message: Parents, Teach Your Children Well!

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Parental Concern: Child Abduction

It is common for managers to mark a sharp line between safety on the job and safety at home. More and more, however, they are realizing that workers free of excessive worries about home are more productive. Children are the cause not only of happiness in the minds of workers, but also often of a great deal of anxiety. This anxiety has a price that is frequently paid in the workplace.

Until recently, parents worried only about mumps, broken legs, children lost on their way home from school, or falls from trees. Now parents face the more serious worry of abduction. Many of us in the Forest Service live in small towns or cities, and it never occurs to us that our children might simply disappear and not return home.

Abduction is an unpleasant subject. It always happens to the children of another family from a large city where all of those "weird" people live. Or does it? Child abduction is more common than most of us would like to admit, and it concerns most parents.

If you can put your mind at ease about your children, you will be happier and, consequently, more productive. Putting your mind at ease, however, is a trick. First admit there are things you can do and things you cannot control. Then take action on the things you can control.

Tips To Prevent Child Abduction

All children should be taught to stay safe from abduction. There are things they can do to help ensure their safety. Use the following information as a guide to teach your kids about staying safe:

(1) Know where your child is at all times and with whom.

(2) Explain to your child the danger of wandering off alone and especially the importance of avoiding dark or deserted places.

(3) Tell your child's teacher to inform you at once whether your child is absent. Inform the school of who is authorized to pick up your child, and, if possible, have it be the same person every day.

(4) Teach your child his or her full name and your full name, address, and telephone number.

(5) If your child talks about a man or a woman met in your absence, get as much information about the encounter as possible.

(6) Always have updated portraits of your child available; know locations of birthmarks or other distinguishing characteristics.

(7) Tell your child to scream or run away if someone is forcing him or her to do something he or she does not want to do.

(8) Do not leave your child alone in a car, and always accompany him or her to public restrooms.

(9) If it is necessary to leave your child alone at home, instruct him or her never to answer the door or tell people over the telephone that he or she is alone.

(10) Try to organize a "safe home" program in your neighborhood. Make it easy for your child to recognize which homes are safe to go to for help.

(11) Teach your child how to give a description of someone. Discuss how to judge someone's height and weight. Help him or her identify hair and eye color or any unusual body markings.

Anyone with information that could help locate a missing child should call the National Center for Missing and Exploited Children (toll-free hotline number: 1-800-843-5678) or Child Find (toll-free hotline number: 1-800-I AM LOST). For more information, write the National Committee for Prevention of Child Abuse, 332 S. Michigan Avenue, Suite 1600, Chicago, IL 60604.

Road Program Costs: Continuing Efforts Addressing the Issue

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Philanthrophy strangely enough is not the short form for Philadelphia Anthropology. Nor is it associated with enthalpy or entropy. According to Webster, philanthropy is: "works or endeavors, as charitable aid or endowments, intended to increase the well-being of humanity."

Fund Raising & the Forest Service

These "works" or "endeavors" are some of the reasons for a Forest Service Fund Raising School session held last March at the Bloomington campus of Indiana University. The host was the Park Foundation Program, Department of Recreation & Park Administration, Indiana University, and the instructor was Hank Rosso, Founder and Director, The Fund Raising School, Indiana University Center on Philanthropy, who has nearly four decades of fund-raising experience. He made the point that in all his years of asking for donations, he has never been physically abused! To provide the key linkage to the Forest Service was Bruce Hronek of Forest Service I.P.A., who is Adjunct Professor of Implementation of Recreation Policy at Indiana University. The audience was well represented with Recreation and Wildlife personnel.

In the past, the Forest Service has benefited from the generosity of the public through volunteer efforts and numerous gifts and endowments. With little or no encouragement, people have given to the Forest Service; however, this is a very small part of the total willingness to give by our society. Therefore, to tap this source, we have to be knowledgeable of fund-raising methods, and we must learn to be comfortable when asking.

Although some areas are easily marketable, such as recreation and wildlife, it becomes more difficult to sell typical operation and maintenance—items that do not draw much enthusiasm. However, the simplicity of giving is someone with a cause and someone willing to give to that cause. There are volunteers who would fight with a mule, wallow in the mud, slap horseflies, work 12 hours in 90-degree heat, and sleep on the ground to build trails while receiving little or no compensation. And there are people willing to give for historical preservation—the charm and history of an old fire lookout or the rustic cabins of the good old days. Many view obliteration and revegetation of permanently closed roads a good cause.

The Forest Service already is in the business of fund raising to a certain extent, through the Challenge Cost-Share Program, gifts, and endowments.

Within the limit of authorities and legal obligations, the Forest Service can draw from a $93.68 billion industry. Individuals alone gave $76.82 billion in fiscal year 1987—almost 33 times more than the total Forest Service expenditures and over 52 times the receipts. The winners (that is, the areas receiving the most in contributions) were religion (46.55 percent), education (11.57 percent), health (14.57 percent), human services (10.50 percent), and public/society benefit (2.60 percent), according to *Giving USA, 1988 Annual Report*, published by American Association of Fund-Raising Counsel, Inc.

How To Start a Fund-Raising Program

The Fund Raising School provided a very good overview on the principles of how money is raised. The intent of this article is to capture some of the highlights of the March session and possibly help others begin their fund-raising programs. These principles are identifying a salable product, knowing the constituency, having dedicated leadership, and having a workable plan.

When identifying the product or cause, one must prepare a case statement—a strong mission statement, with goals, objectives, and action plans well mapped out. What one raises funds for today should be for 5 or more years.

The constituency may be individuals, small and large businesses, third parties, corporations, and foundations. It is beneficial to join clubs and community interest groups and organizations. Remember, the most important element of fund raising is the donor. It is interesting that 50 percent of the donors make less than $50,000 per year, 60 percent of the donations come from 10 percent of the donors, and 5 percent of the goal comes from the two top givers.

Leadership is a must, from the basic motivator to the key contact person; this is a very integral part of the process. This may be a full-time job and, in part, the nucleus providing the energy and knowledge.

Finally, one cannot "hit the streets" without a workable campaign plan. What media one presents the program are important. Think of the ways others go about seeking donations—door to door out of a station wagon, radio, television, newspapers, and mail. How one gets names and contacts is another art in itself. A wealth of this type of information is at libraries; there are time-pay computer services and national records. There is much information that is easily available.

Why should Engineering be interested in fund raising? The reasons are the Staff's direction and the pure availability of monies to stretch existing programs. The Staff supported and implemented the Challenge Cost-Share Program initiated by Congress in 1986. In fiscal year 1990, about $1.5 million of the Forest Road Program will be used through Challenge Cost-Share in conjunction with partnerships with public- and private-sector entities. In general, the roads planned for improvement are those that provide recreational benefits, including the Scenic Byways Program. These are not additional funds; for more information, look at the *1990 Budget Explanatory Notes* or fiscal year 1990 Initial Program Budget Management Instruction.

In summary, fund raising is not something new; at the turn of the century, contributions were already at $500 million. Once one identifies a viable cause, there exists a wealth of information and expertise from which to draw to develop a program. Recreation and Wildlife Staff have a good start for implementing donor programs and would be a good source to observe and ask questions. Bruce Hronek currently has a draft paper, "Legal Aspects of Partnerships," that provides references and information. The recommended book for fund raising is Harold J. Seymour's *Designs for Fund-Raising*, published by McGraw-Hill.

Good luck to everyone in their fund-raising efforts.

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