

**ENGINEERING
TECHNICAL
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FIELD NOTES • TECHNICAL REPORTS
DATA RETRIEVAL • MANAGEMENT
PROFESSIONAL DEVELOPMENT

VOLUME 10 NUMBER 7

Field **Notes**

Self-Closing Trail Gate

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Location Analysis of District Centers

Washington Office News



FOREST SERVICE

JULY 1978

U.S. DEPARTMENT OF AGRICULTURE



ENGINEERING FIELD NOTES

Volume 10 Number 7

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**FOREST SERVICE
U.S. DEPARTMENT OF AGRICULTURE
Washington, D.C. 20013**

SELF-CLOSING TRAIL GATE

*Ted Zealley & Gary Pingel
Cleveland National Forest
Region 5*

On many Forest Service trails, gates are needed to fence off livestock within allotment boundaries, to delineate land ownership, or to close trails. On trails specifically designated for foot and equestrian travel, gates that are specially designed to control vehicular traffic are essential.

Figure 1 provides the plans for a self-closing gate that can be adapted for use on all types of trails. Members of the *Bonita Valley Horsemen*, of Bonita, California, submitted the gate design (which is not covered by patent or copyright) to the Forest Service. The Cleveland National Forest has about 10 of the gates in use; some of them have been in place 2 years.

There are several important advantages to the design of this gate.

1. It opens easily and is self-closing. Occasionally, a gate may not self-close efficiently; but this condition can be corrected easily by attaching a coiled door spring to the hinge post and gate hinge.
2. The gate can be fabricated of easily-obtained materials, using standard welding methods. The pipe sizes can vary according to local needs and available materials. Materials and fabrication costs are estimated at \$120 (excluding installation) for the unit illustrated, but costs can be reduced if surplus materials are used. The gate must be constructed of steel so that there is sufficient weight for self-closing.
3. Maintenance costs for the gate are low. Gate hinges may require lubrication with grease annually to ensure smooth operation, and painting may be required to control rust.
4. The optional bottom bar is a physical deterrent to vehicular traffic, and a reminder that the trail is closed to such use.

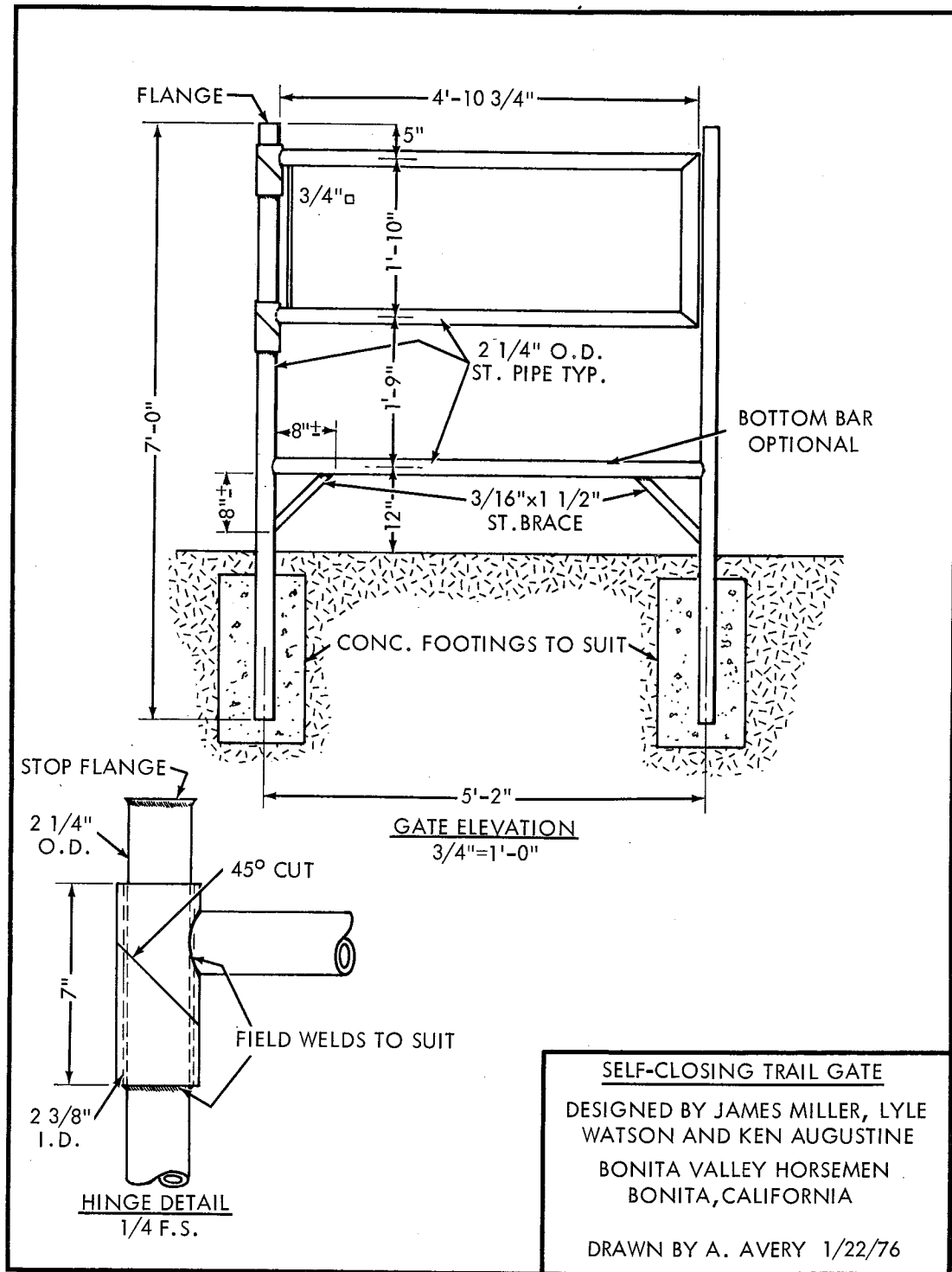


Figure 1. Plan for Self-Closing Trail Gate.

NOTE: If the gate is installed on trails normally open for vehicular use, at intersections of a trail and road, or at similar locations where vehicles can be driven to the gate, warning panels must be attached to the front and back of the gate, as required by the *Manual of Uniform Traffic Control Devices*. This is especially important if the optional bar is installed.

Although this gate design is not a solution for all problems related to unauthorized use of certain Forest Trails, it is a practical approach to resolving the particular points described.

LESSONS FROM IMPLEMENTING TRANSPORTATION ANALYSIS METHODS:
THE NATIONAL FOREST EXPERIENCE*

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ABSTRACT

This paper reviews the features for implementation of a continuing program to introduce improved analytical methods into the transportation planning activities of the U.S. Forest Service. Most of the personnel intended to use the methodology have little prior professional experience with operations research techniques, modeling, or computer applications to systems analysis.

The program to implement improved methodology incorporates the following activities:

1. Identify needs for improved methodology;
2. Develop methodology;
3. Train Transportation Analysis Specialists within the agency;
4. Conduct awareness-motivation seminars;
5. Conduct pilot applications of methodology;
6. Provide individual consultation and technical assistance to field personnel;
7. Maintain and refine methodology developed previously;
8. Institutionalize methodology in official agency procedures.

**This is an edited version of a paper presented at the November, 1977, annual meeting of the Operations Research Society of America.*

This paper describes the approach and lessons learned, and evaluates the comparative effectiveness for each of these activities. An important conclusion is that a key to successful implementation lies in the development of human resources within the organization.

The U.S. Forest Service and the Institute of Transportation Studies of the University of California are in the tenth year of a cooperative program to improve the agency's standard of practice in Planning Transportation Systems for National Forests. The desired outcome of the program is the full implementation of improved methodology for network analysis, economic evaluation, and transportation decisionmaking at approximately 150 National Forests.

This is a review of the elements of the implementation program, in which we look at the problem from a "top down" perspective; that is, as a Service-wide effort to improve the performance of numerous--and quite autonomous--operating offices in the field. Local innovations and attempts to reorganize locally for improved planning are not directly considered. Thus, in fact, we are reviewing only a portion of the agency's efforts to effect needed change.

Attempts to improve planning and analysis practice within the Forest Service are examined in three dimensions. First, we look at the major targets of the innovation effort; that is, those aspects of the agency that affect transportation planning, and where changes were felt to be required. Second, we review the components of the methodology implementation program itself; here, we describe and critique the different activities performed over the years in pursuit of the program's objective. Finally, we examine the nature of the In-Service organization created to shape and manage the methodology implementation program.

The major lessons learned in the course of the program are listed in the text.

TARGETS OF THE IMPLEMENTATION PROGRAM

Within the Forest Service, efforts to improve methodology of Transportation Planning systems have been focused on three principal elements:

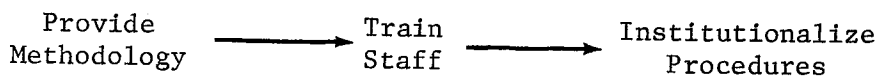
1. Defining Service-wide standards of performance and raising the expectations of Forest Managers,
2. Providing appropriate and usable analytical tools,

3. Training and motivating Forest Staff to utilize the available methodology and to do so properly.

Our experience, like that of others, suggests that these three elements are essential in any serious effort to change the practices of an agency such as the Forest Service. In any large organization, the proportion of personnel at both management and staff levels who readily embrace an innovation is small; usually, the individuals who do so are the ambitious and upwardly-mobile minority. While these early innovators are important to establish successful examples of applying methodological advances, any momentum thus established will wither unless the improvements are actively institutionalized both in the expectations of management and in the rules and procedures by which the organization functions.

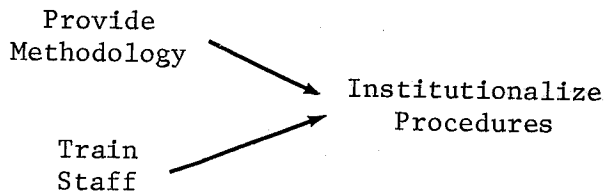
Furthermore, an organization such as the Forest Service invariably employs numerous professionals in key technical positions to whom changes in approach and procedures do not come easily. Again, implementation will wither unless such individuals can be motivated and trained to utilize the new methodology properly.

The sequence by which the above three elements are addressed determines the duration and cost of the route to full implementation. Characteristically, the approach one sees in government is linear; this is simplistically illustrated:



In that sequence, a task group or consultant is commissioned to develop seemingly needed methodology. If the methodology shows promise, a training program is established to encourage its use throughout the organization. If applications by early innovators are successful, then the use of the new methodology becomes institutionalized through changes to procedural handbooks and, possibly, job performance requirements.

The sequence by which these three elements were addressed in the Forest Service program is not the traditional linear form, but a more parallel structure; this is illustrated:



The reason this somewhat unusual sequence was adopted lies essentially in the ill-defined nature of the original problem. That is, the Forest Service program began 10 years ago with only a general idea of the kinds of methodology to be developed. Neither the Forest Service nor the cooperating universities (at that time, three academic institutions were involved) had a clear understanding of the specific methodology to be developed. However, all were convinced that methodological improvements were needed and were possible. Thus, the universities began to consider systematically the merits of adapting to National Forests the transportation planning and analysis techniques used elsewhere (such as in urban and intercity settings), and of developing altogether new approaches.

The Forest Service simultaneously began a training program for selected agency personnel in order to develop the skills they would use in identifying specific needed methodology. In addition, the parallel development of methodology and trained individuals was seen as a way to expedite the introduction and application of new methodology, as well as to provide within the organization a group that would be prepared to participate in institutionalizing the improved procedures at the appropriate time.

PROGRAM COMPONENTS

In retrospect, one can look upon the various activities of the Forest Service program as an integrated whole, and assess the contribution of each activity to the overall objective. However, it must be recognized that, earlier in the program, not all activities were seen with this perspective. To a great extent, the various activities were conducted as independent efforts to expedite implementation.

Over the past 10 years, the Forest Service engaged in the following program activities:

1. Identify needs for improved methodology;
2. Develop methodology;
3. Train Transportation Analysis Specialists within the agency;
4. Conduct awareness-motivation seminars;
5. Conduct pilot applications of methodology;
6. Provide individual consultation and technical assistance to field personnel;

7. Maintain and refine methodology developed previously;
8. Institutionalize methodology in official agency procedures.

Most of these activities are still underway; each is briefly evaluated as follows.

Identification of Needs. Methodology needs for the program were identified in various ways. Initially, personnel of the cooperating universities played the major role, using knowledge of the methodology for transportation planning applied in other settings to suggest analytical tools possibly suitable for National Forests. Specific methodology development work began when these suggestions were approved by a steering committee of Forest Service and university senior staff. Later in the program, most of the steering committee was replaced by Forest Service technical monitors who had been trained in the program itself. In addition to these internal sources, additional methodology needs were identified by direct requests and feedback from the field.

In retrospect, while these mechanisms clearly produced useful methodology, it seems that the program would have benefitted from devoting more resources and attention to identification of needs. Specifically, methodology deficiencies in the field were generally judged by agency personnel who were not the ultimate decisionmakers, i.e., the agency line officers, and university specialists not intimately familiar with the duties and problems of the agency. Ideally, a consensus of both these points of view is desirable. In the early part of the program, responsibility for identifying needs rested largely with outside technical experts who were not at the time very familiar with the territory. This observation leads us to:

LESSON 1: Careful attention should be given to defining methodology needs by consensus of the decisionmaking line officers and technical experts that are intimately familiar with field-level duties and problems. Where such informed experts are not available, sufficient resources should be used to familiarize selected outside experts in a systematic manner, which should involve considerable direct observation of field conditions.

Development of Methodology. Over the years, a variety of methodology for National Forest planning was developed by the cooperating universities and personnel of the Forest Service; most of this is identified in the appendix. In many instances, the methodology was produced by task teams containing both Forest Service and university personnel.*

**Specific examples are the traffic census techniques, and the computer model for simulating vehicle performance and operating costs (5,25,26,29).*

As discussed later, these working relationships were facilitated considerably by the unusual program organization. Generally, the results of these joint endeavors were particularly satisfying, which leads us to:

LESSON 2: Whenever possible, it is advantageous to develop methodology as a joint effort of outside technical experts and the intended recipients. Unfortunately, without special commitment and organization, this objective is extremely difficult to achieve.

Training Specialists Within the Agency. As previously indicated, training began very early in the program to provide in-agency specialists who could help guide methodology development, expedite implementation, and participate later in the institutionalization of the new procedures. Generally, the training consisted of assigning innovative and ambitious technical staff from the field to a 2-year "traineeship" with the program. During this traineeship, individuals pursued graduate study in transportation engineering at Berkeley or, in several cases, at Stanford, and they participated in on-going methodology development work. To date, approximately 20 people have received this specialized training.

The fruits of this training activity have been considerable and diverse, and perhaps constitute the single most successful component of the program, in terms of contributing to the ultimate objective. Trainees from the program now practice as Transportation Planning Specialists in seven of the nine Forest Service Regional Offices and at a number of National Forests. These individuals have motivated and trained others in the use of the advanced methodology and, even more significantly, they have developed additional needed methodology on their own. This group serves as a critical locus of in-agency expertise, allowing additional methodology needs to be defined and met in-house, or through precisely specified contracts with outside consultants. In connection with this we have:

LESSON 3: With regard to improving standards of practice, one of the best investments an agency can make is to expand the skills and horizons of its own personnel. Providing sabbaticals and other forms of extra-agency educational experiences in sufficient number are productive means to this end.

Awareness-Motivation Seminars. Over the years, program staff have conducted a number of 1- and 2-week training sessions for Forest Service personnel at various locations in the country. These ranged from "sampler" sessions covering a variety of methodology to closely-focused training sessions dealing with single techniques, such as traffic census methods.

Three impressions develop regarding this part of the program. First, the short seminars were fairly successful in reaching (and improving subsequent practice of) a number of early innovators on Forest staffs; however, other individuals were considerably less influenced. Second, the most successful sessions were those that were closely focused, and that provided enough time to receive adequate training and practice in the techniques under consideration. Third, the lasting impact of a training session (even in the case of early innovators) depends a great deal on the follow-up measures employed. Lasting impact was related closely to the subsequent availability of specialists to assist and encourage participants in their attempts to apply the new methodology. Another important follow-up is the supervisors' insistence that the new methodology be utilized.

LESSON 4: Short training sessions by themselves seem to be of limited impact in implementing new methodology. Even the most effective training, which is closely focused and which provides time to learn and practice specific skills, must be combined with effective follow-up through expert assistance and in the raised expectations of supervisors.

Pilot Applications of Methodology. In almost every case, newly-developed methodology was first applied to an actual National Forest situation through a "pilot implementation." These pilot programs had several objectives: to de-bug techniques in real-life situations; to provide examples for others to follow; and generally to advertise within the agency that new techniques were available.

In some cases, the pilot studies were conducted by Forest Service field staff with readily-available assistance from the developers of the methodology. In other cases, the developers conducted the pilot studies themselves, with help from field personnel in data collection and other matters.

In general, the value of pilot studies cannot be overemphasized. Unfortunately, resources for such activities are seldom adequate, as is organizational patience. For the most part, the success of the pilot studies conducted in this program was related to the degree of control exercised by the developers of the methodology. Where others had the principal responsibility, the frustrations associated with methodology debugging invariably interfered with the other objectives. In this, we find:

LESSON 5: Due to the frustrations of de-bugging, pilot studies generally should be performed directly by developers of methodology, with field personnel in supporting roles.

Expert Assistance to Field Personnel. Field personnel trying to use the newly-developed transportation planning methodology were able to receive assistance from several quarters. Initially, the program staff at Berkeley provided direct assistance to field staff in applying the methodology to local problems and conditions. As use spread, more and more consultation was provided by program trainees, who by then had returned to positions as Transportation Specialists in the field.

The Forest Service is somewhat unusual in the extent to which its professional staff is scattered in out-of-the-way places. (There is little question that most of them prefer it that way.) However, an obvious risk is that professionals in Forest Transportation Planning can easily feel abandoned when problems arise in applying new methodology. To a great extent, this risk has been averted by the ready availability and mobility of expert help, as well as relatively frequent contacts among affected individuals. Unfortunately, resources have not yet been sufficient to do certain additional things that might have helped enormously, such as establishing a stronger sense of community among Forest Transportation Planning professions through a regular newsletter covering problems and accomplishments.

In this regard, we have:

LESSON 6: Successful implementation of new methodology must be built on a visible structure of available technical assistance and support. Support should include efforts to create a sense of community among innovators so that implementation is nurtured by peer encouragement and approval.

Maintenance and Refinement of Methodology. Obviously, any body of methodology must constantly be maintained and improved. In general, it is necessary to set up well-structured mechanisms to guide this process. In the Forest Service program, methodology maintenance and refinement have been carried out thus far by the same unit that performed the original development. This unit is supplemented by the cadre of trained experts now working in the field. The program is now being reorganized to perform these essential activities in a manner involving less diffusion of responsibility.

LESSON 7: Maintenance and refinement of previously-developed methodology should be organized explicitly and independently at approximately the time the methodology becomes available. The alternative is a dilution of necessary maintenance and refinement functions (caused by distractions of further development of methodology), coupled with the migration of these functions to the dispersed user community.

Institutionalizing New Methodology. It takes a long time for innovations in methodology to be implemented to the extent that they become institutionalized by incorporation in official standards, procedural handbooks, and--as appropriate--published job requirements. However, until this incorporation happens, full implementation cannot be said to have occurred.

In the Forest Service program, institutionalizing new methodology is underway through an effort to produce a Service-wide Handbook of Transportation Planning practices in National Forests. (This handbook undoubtedly will be in the works for some time to come, as it undergoes needed massaging to become acceptable.) Parallel efforts are also being made to define job requirements that will insure the capability of all Forest Transportation Planners to use the new standards of practice and methodology appropriate to their jobs. While many individuals in the Forest Service are participating in these activities, it seems clear that the timing has been accelerated by activities of this 10-year program. Of particular importance has been the training of specialists, thereby creating "critical mass" of influential and skilled personnel to participate in institutionalizing the new methodology.

LESSON 8: Full implementation requires that methodology be institutionalized in official procedures and job performance requirements. Measures that will create within an agency the will and the ability to accomplish this step can significantly expedite program objective. A most effective measure is to invest in expansion of horizons and skills of key personnel.

PROGRAM ORGANIZATION

A noteworthy feature of the Forest Service effort is its program organization, which seems to explain the unusual endurance of the program, and its flexibility to undertake a large variety of activities in pursuit of program objective.

The program has been conducted as a cooperative effort between the Forest Service and several universities. Within a series of, generally, 3-year "umbrella" agreements, specific annual work programs were established to the satisfaction of the steering committee and/or the technical monitor. Originally, the University of California, Stanford, and San Jose State University participated. For its part, the Forest Service established a special unit in Berkeley called the Transportation Analysis Group (TAG); the sole mission of this unit was training and development of methodology to improve the practice of National Forest Transportation Planning. Over the years, the TAG staff has numbered from six to fifteen professionals; over half of these were usually field personnel assigned to Berkeley for 2-year traineeships. The TAG annual budget has averaged about \$300,000, of which 25 percent typically was allocated to activities at the

universities. For their part, the universities have contributed time of senior staff or overhead, the amount of which has varied considerably from year to year according to the annual work plans.

The central feature of the program is the close working relationship that this program organization has fostered between the TAG staff and personnel at the universities. Tasks were assigned to individuals on the Forest Service and university staffs as seemed appropriate, regardless of affiliation. The senior staff of the Forest Service and universities have been able to make marginal adjustments easily to the annual work plans in response to evolving problems and conditions. Such a degree of flexibility would have been impossible, except for both the considerable direct commitment of Forest Service staff to the program, and the physical proximity of all involved.

In retrospect, it seems that the organization of the program was a very effective mechanism for approaching the rather large and, initially, ill-defined program objective. This organization permitted work to proceed with a minimum of red tape, and it served to provide the agency with a cadre of trained specialists well versed in the methodology being developed.

An obvious question to ask is, "When is a special purpose organization of this type no longer needed?" As the in-house capabilities of the agency expand, it is possible and, in general, desirable for the agency to adopt a more traditional, structured approach to purchasing the services of outside experts. After almost 10 years of the development described herein, the cooperative program with the Forest Service is currently evolving in this direction.

CONCLUSION

It is appropriate to review and use the eight principal lessons learned in seeking to implement transportation analysis programs in the National Forests.

The most successful program implementation is based on the development of human resources within the organization.

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LOCATION ANALYSIS OF DISTRICT CENTERS

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Economist

R-8

INTRODUCTION

Policy requirements of the Forest Service and executive orders of the President have mandated that investments in Government facilities must derive the greatest possible economic return and must conserve energy. Generally, in the economic life of a Ranger District Work Center, the largest and most difficult cost to determine is the transportation cost of personnel to work sites. By decreasing this cost, compensation would be derived from energy conservation and maximum economic returns. Transportation costs must, therefore, be determined using a reliable and comprehensible method.

Studies of the optimal location of industries abound in the academic literature, and the concepts involved may be applied to the location of work centers¹. Having only one work site on a Ranger District, location of the work center to minimize transportation costs would be simple. The work center would be located at the site where transportation cost would equal zero. However, when several sites *pull* at this work center location, an analysis can be made to determine the location which will minimize transportation costs to all sites.

The *pull* that each work site exerts against the work center is a function of trip cost and the number of trips to the site. Theory shows that the optimum location for the work center is where the *pulls* balance.

One method for determining the balance is to locate a work center on each work site, and then calculate transportation costs to all other work sites. All costs to a work site from all other work sites are added together, and this number (total cost) is assigned to the work site considered.

¹See David M. Smith, Industrial Location: An Economic Geographical Analysis (New York: Wiley, Inc., 1971).

Total cost contours are drawn. These contours connect points of equal value and are called isocost lines. In this case, they are total cost isocost lines, as compared to the more familiar single cost isocost lines that indicate transportation costs from a single point.

Once total cost contours are drawn, the least cost contour surrounds the theoretical area where transportation costs are equal and at a minimum.

The only relevant portion of the contours are at intersection points with the transportation network. Where no road exists, transportation costs are higher.

The first case study of this method occurred on the James River Ranger District of the George Washington National Forest. The objectives of the study were to test a method of analyzing the transportation costs of work trips, and to delineate an area of the least transportation cost for further site analysis of work center location.

CASE STUDY ANALYSIS

The location analysis of the work center is based on the following formula:

$$C_{ij} = \sum_{i=1}^n \sum_{j=1}^n (D_{ij} \cdot V_c + W_a \cdot S_{ij}) 2T_{ij}$$

Where C_{ij} = Total costs of transportation from a work center location i to every other work site j .

V_c = Vehicle operating cost/mile.

W_a = Average wage rate per hour for average number of crew members.

S = Travel time between i and j

D_{ij} = Distance from i to j .

T_{ij} = Total number of trips from i to j .

Thus, the formula takes into account total vehicle operating cost and labor cost of work trips. The first major step in deriving values for the formula is to code the transportation network of the Ranger District into links and nodes (figure 1). The second step is to determine the lengths and travel times of the links. The nodes correspond to road intersections and work sites. Lastly, average wage rates, average number

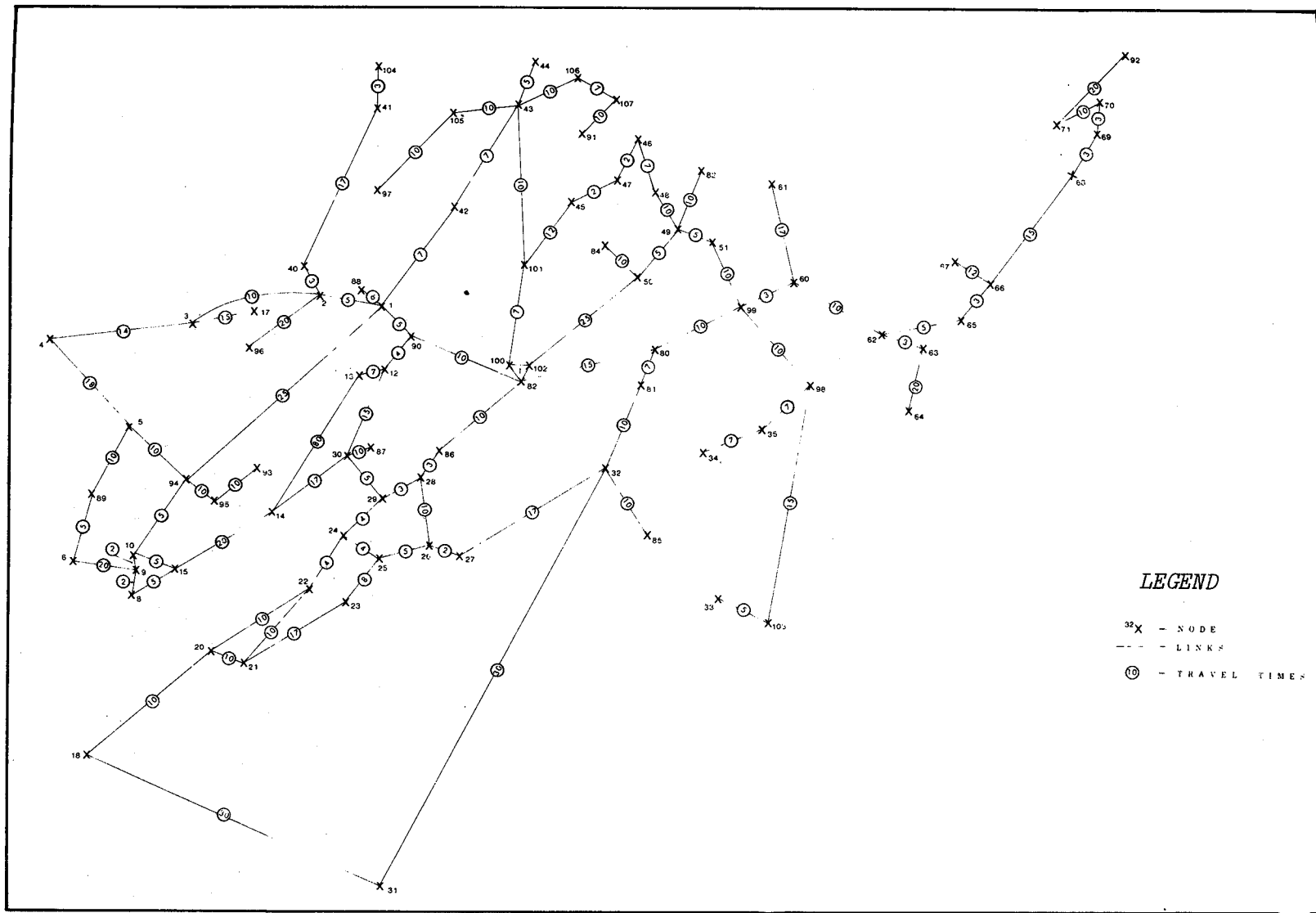


Figure 1. James River Ranger District Transportation Network
George Washington National Forest

of crew members, vehicle operating costs, and the number of trips to each work site must be determined. This information can be obtained from District records, estimated and projected over a reasonable time period.

For the James River Study, the following assumptions were made:

1. Each work trip is a single destination trip to a work site.
2. The Ranger's Office is a fixed location, and, is treated as a work site attracting administrative trips.
3. Operating costs are assumed to be the same in both directions.
4. Vehicle operating costs do not include the monthly fixed ownership rate. Only the equipment ownership rate is included since the former does not vary by usage. Vehicle operating costs do not vary by speed.
5. Several nearby work sites may be represented by one node and trips are not differentiated by resource or activity purpose.
6. The number of trips to a work site is not affected by distance to the site.

The link values of length and travel time, and the corresponding nodes were put into a matrix. Link speeds in miles per hour were calculated. Using the average number of men in crews, multiplied by the average wage rate per hour, added to vehicle operating cost per mile, a simple FORTRAN program is used to calculate cost per mile for speeds from 5 to 55 miles/hour. The timber transport model, a linear programming transportation analysis, determined the minimum distance links from each work site to every other work site. The model multiplied link distances by each link's cost per mile and by number of trips to and from each work site². These calculations resulted in a location's total transportation cost for work trips to every other site.

The transportation cost calculations were made for two types of vehicles and two average numbers of crew members. Costs were calculated from the work center's record over the past 5-years of operation, and converted to a yearly average. Thirteen nodes were selected as points for mapping

²For the methodology and usual application of the timber model, see Wallace R. Cox and Peter Wong, "A Mathematic Approach for the Analysis of Transport/Logging Systems for Timber Sale," Field Notes, ETIS 9 (May 1977), pp. 3-9.

contours on the basis of number of trips attracted and spatial distribution. The mapping of the contours was performed by the TOPAS package.

STUDY FINDINGS

The plot of the isocost lines indicates that the least cost contour is centered on the town of Covington, where the Ranger's Office is located (figure 2). The present work center site is located on the South-eastern side of Covington, and is within the least contour. Seemingly, this exercise only quantified what was intuitively obvious. The advantage to this procedure is knowing that the other locations will minimize the cost of transportation. If the Ranger's Office were not fixed, several alternative locations of the office could shift the most efficient location of the work center significantly, and these locations may not be so obvious.

The area within the least cost contour is in reality not equally accessible. Although the contour shifts south of Covington, the transportation network in the south is minimal. The contours spread outward along the east-west Interstate Highway through Covington. Therefore, the best locations would occur in the Southern half of the city and along the Interstate Highway. Relevant factors for consideration in the final site selection would be site specific costs, property ownership, land value, construction, and site preparation costs. If decided that alternative locations must be considered that lie outside the least cost contour, then the closest contour values to the alternative sites may be used in present worth of costs analysis.

CONCLUSIONS

The location study resulted in an analysis technique that utilizes available computer programs and readily determined data. The technique visually displays an area of optimal location which can be further analyzed in detail. The technique is flexible enough to consider administrative and political requirements for location.

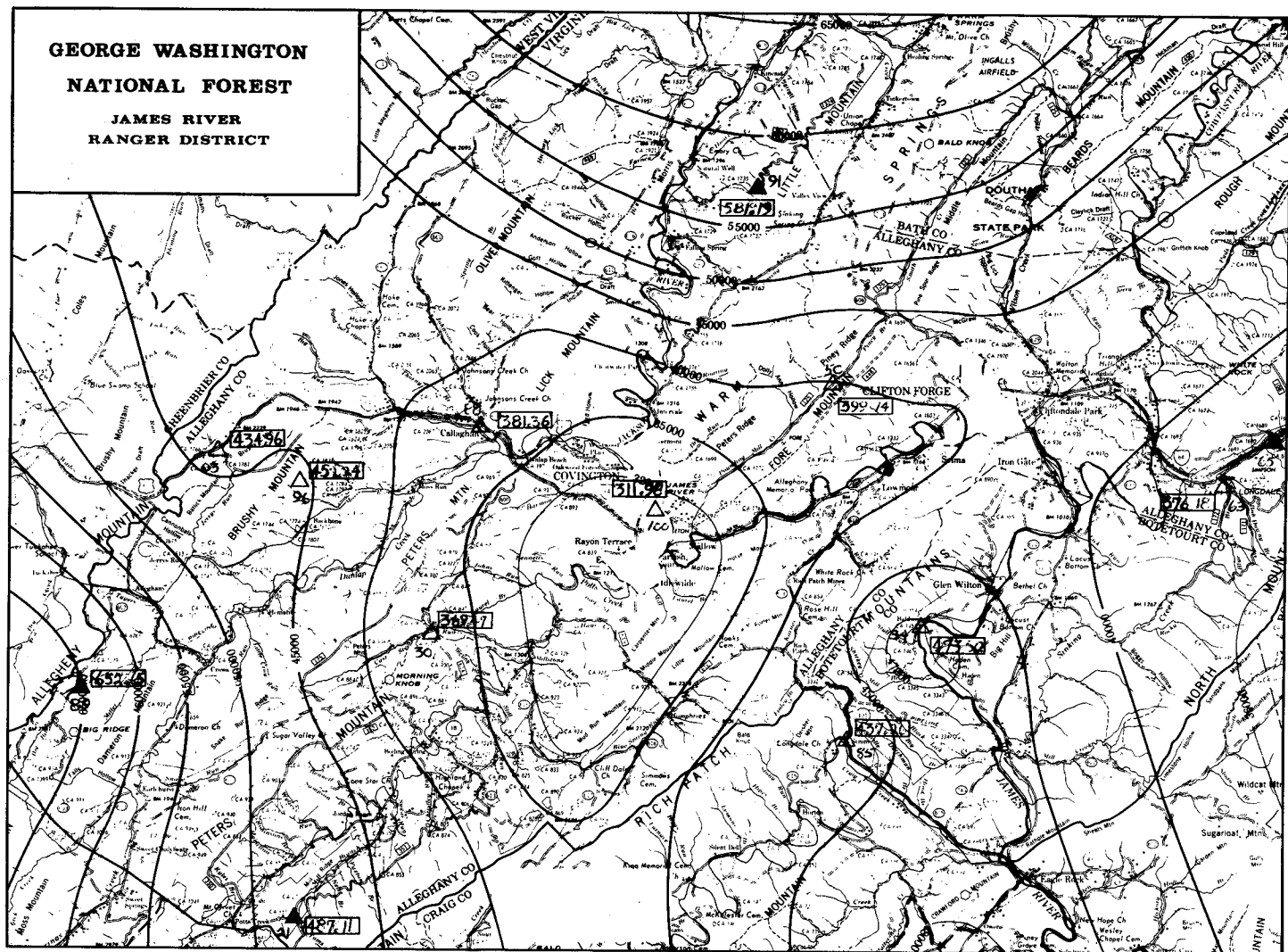


Figure 2. Transportation Cost Study Showing Total Isocost Lines.

WASHINGTON OFFICE NEWS

OPERATIONS

Harold L. Strickland
Assistant Director

THE ENGINEER AND GEOMETRONICS: A STEP IN YOUR CAREER

A daily need exists for maps and aerial photos which play a large part in Forest Service Engineering and resource operations. This need is being met by a group known as *Geometronics*. Geometronics groups exist in each Region, in the Washington Office, and at our Geometronics Service Center (GSC) in Salt Lake City. Their task is to supply maps, aerial photos, and other graphic products that fulfill the needs of the Forest Service.

Geometronics currently employs 325 people in technical and professional positions Service-wide, of which approximately 60 are in a professional series. Most are *dual discipline*, i.e., the position may be held either by an Engineer (810) or a Cartographer (1370). Over the past several years, attrition--caused by retirements--and vacancies--resulting from promotions have diminished the professional Geometronics cadre at starting and mid-level categories. It has been necessary to recruit outside the Forest Service to fill some of these vacancies (6 of the last 11 engineer/cartographer vacancies at the GS-11 and -12 levels have been filled from outside sources). This situation being a major concern, the Geometronics Leaders Workshop (January 1978) listed it as an agenda item. As a result, it was decided to encourage engineers currently in the Forest Service to give serious thought to the opportunities which exist in the Geometronics field.

Geometronics is an interesting field that offers excellent career opportunities. It involves all aspects of surveying, mapping, and geodesy. It covers the spectrum of producing the multi-colored administrative map to producing the large-scale special maps for road design, bridge site location, and administrative site planning. Although this work is now a major part of the Geometronics effort, the field of Forest Service Geometronics is changing. Automated systems are coming to the forefront in map production and graphic presentations; this not only explores

graphics, but the equipment, methods, and computer systems for gathering data and manipulating, overlaying, and analyzing of this data.

Based on advanced computer technology, it is now conceivable to communicate with a computer from a video display console. For example, the user can instruct the computer to display a map (graph) of a planning unit, and then further instruct it to display an area within the unit having a certain type of timber, ownership, and roads. By using the same console, a site layout exploring alternative road systems and the haul cost, and construction costs can be initiated. An administrative site can also be planned by selecting various layouts of utilities based on terrain and soil conditions. Upon selection of viable alternatives, the impact on the area can be analyzed by displaying each on an ortho-photo or perspective photo. The tools are on the horizon, but great effort is required to adapt their use to Forest Service needs; the only limiting factor in this area is imagination. The challenge of producing a product to satisfy the manager's requirements are varied and many-fold.

Geometronics should be considered as a rung in the ladder of career development. The knowledge of Geometronics gained by spending a few years in this field will greatly enhance development as a Forest Engineer and contribution one can make in that position or as advisor to a planning team.

Geometronics products are some of the basic tools used by resource managers in the Forest Service. Without the involvement of the Engineer and Cartographers, these tools cannot be obtained; and without tools, today's decisions cannot be made.

CONSULTATION AND STANDARDS

Walter E. Furen
Assistant Director

DAM SAFETY UPDATE

During this past year, the Forest Service has been involved in a considerable amount of activity relating to the safety of dams.

In April 1977, the President directed departments and agencies to review policies, procedures, and practices that could affect the safety and integrity of dams. The President also directed the Federal Coordinating Council for Science, Engineering and Technology (FCCSET) to analyze agency reports and to make recommendations for Federal dam safety guidelines. The final FCCSET review report is scheduled to be completed in November 1978. The U.S. Department of Agriculture (USDA) review was completed in September 1977, and that final report was transmitted by the Secretary to FCCSET. Concurrently, the Secretary directed each agency to develop and implement an action plan to correct identified deficiencies.

Currently, the Forest Service is taking action to correct the primary deficiencies identified during the USDA review. Interim Directives were recently published in FSM 7500 to strengthen manual direction relating to: the design and construction review process, the design criteria, and an emergency procedures plan. Regions have been directed to review field practices to ensure compliance with correct policy and procedures. The final FCCSET report may necessitate some additional USDA action next fall.

In December 1977, the President directed the U.S. Army Corps of Engineers to begin a 4-year \$70 million effort to inspect approximately 9,000 non-federal dams. This was a result of the disaster caused by the failure of a small dam near Toccoa, Georgia. The Corps inspection efforts will include non-federal dams classified as *high hazard* and selected *moderate hazard* dams located on lands administered by the National Forest System. Federal agencies are responsible for inspection of their own dams.

FSM 7500 Interim Directive No. 4 establishes policy for reevaluation and safety inspection of dams owned by the Forest Service. By September 1981, the assessment will be completed for all dams classified as *high hazard* and select *moderate hazard* class "A" dams over 20 feet high, for cases

in which, if failure occurred, appreciable damage to private lands, and improvements or public facilities, and utilities would result. Instructions for implementing the program should be submitted to the Regions by mid-summer.

In support of dam safety, both the Senate and House have developed proposed legislation to supplement PL 92-367, *National Dam Inspection Act*. This proposed legislation would provide:

1. Financial assistance to States for developing and implementing an effective dam safety program.
2. Financial aid for training of State dam inspectors.
3. Guidance to the States through a Federal Dam Safety Review Board.
4. Reinsurance on non-federal dams for all liabilities in excess of a pre-determined amount, that may be incurred in the event of a failure.
5. Close coordination with States for planning, design, construction, and maintenance of Federal dams.
6. Loans to owners for emergency repairs.

With current emphasis on dam safety, it is anticipated that a bill including most of the issues listed above will be passed.

INVITATION TO READERS OF *FIELD NOTES*

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

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

Field Notes is distributed from the Washington Office directly to all Regional, Station, and Area Headquarters, Forests, and Forest Service retirees. If you are not currently on the mailing list ask your Office Manager or the Regional Information Coordinator to increase the number of copies sent to your office. Copies of back issues are also available from the Washington Office.

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-2	Royal M. Ryser	R-5	Jim McCoy	R-10	F. W. Baxandall
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