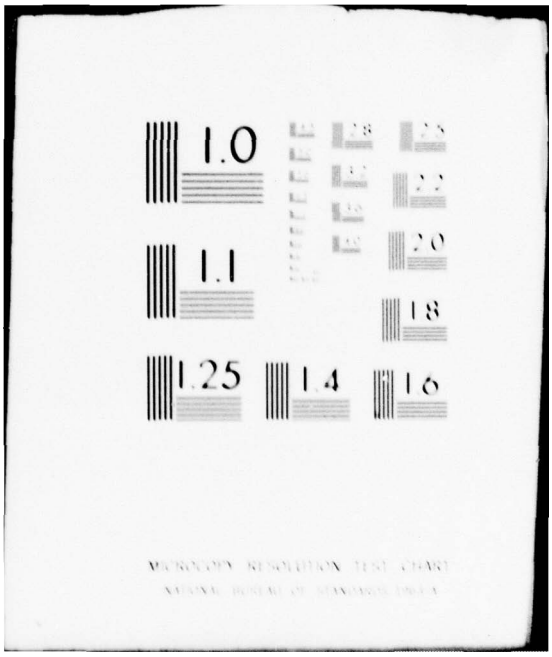
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RECREATION RESEARCH PROGRAM

RRP

A HANDBOOK FOR CONDUCTING RECREATION SURVEYS AND CALCULATING ATTENDANCE AT CORPS OF ENGINEERS PROJECTS

12

By Raymond M. Mischon, R. Chris Wyatt
Midwest Research Institute
Kansas City, Mo. 64110

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The Handbook describes survey and analytical techniques that will enable the Corps of Engineers to standardize estimation of recreation visitation. A major finding in the final report of the Midwest Research Institute (MRI) (Technical Report R-78-2) was that each Corps District and project essentially had developed its own procedures for collecting visitation data for the Recreation Resource Management System (RRMS). The procedures described in this

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20. ABSTRACT (Continued).

Handbook utilizes the best of these techniques with several minor changes that will improve the quality of the visitation data.

The collection, analysis, and reporting of recreation use information will be accomplished by use of on-site recreation surveys and measurement of traffic by traffic counters. These data will be supplemented with information obtained from other sources, including observations by resource management personnel at the project. Estimating visitation at remote areas presents a difficult problem at most projects. To make such an estimate, managers are encouraged to evaluate how visitors travel to a project (e.g., automobiles carrying hunters for waterfowl hunting, etc.) and develop load factors that might be appropriate to this type of use.

The recreation survey is the foundation for developing good estimates of use. Survey data provide the descriptive information that enables project personnel to understand what each count on the traffic meter means. The traffic to Corps projects will be classified into three component groups:

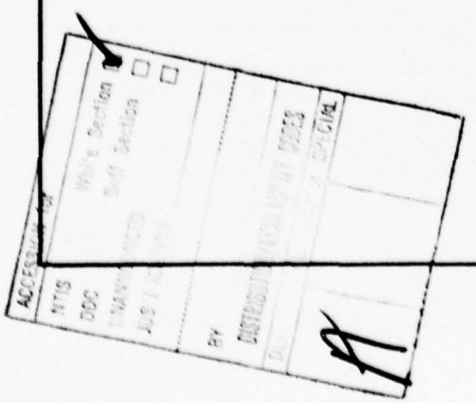
a. Recreation vehicles--Vehicles containing visitors whose primary purpose in visiting a project is to participate in recreation activities.

b. Return recreation vehicles--Vehicles traveling to and from areas on projects.

c. Nonrecreation vehicles--Vehicles including Corps maintenance vehicles, commercial vehicles, and sightseers who simply drive into an area, turn around and immediately leave.

The survey data also provide information on the number of axles per vehicle for the various classes. Other survey information includes recreation activity participation, number of campers, user preferences, etc. One of the major problems identified during the study was the fact that many Districts and projects are double counting users by counting a particular visitor every time he enters and leaves recreation areas. The Handbook describes a procedure that delineates project and area visitors and enables users to identify and count only those recreation visitors that exit an area or the project as a whole for the last time.

It is recognized that Districts and projects require additional visitor information regarding recreation areas, user preferences, etc. The Handbook essentially provides a procedure to develop information required by the RRMS and Heritage Conservation and Recreation Service (12-hour visitor days). Corps personnel are encouraged to work with the U. S. Army Engineer Waterways Experiment Station recreation staff and adapt the Handbook procedures to obtain the type of information required at specific project areas.



PREFACE

This report presents the recommendations of the Midwest Research Institute (MRI) for implementing a standardized methodology for collecting visitation information. A major finding presented in MRI's final report (Technical Report R-78-2) was that each Corps District and project essentially had developed its own procedures for collecting visitation data for the Recreation Resource Management System (RRMS). The procedures described in this Handbook are similar to the techniques utilized by a number of the Districts and projects, with several minor changes that will improve the quality of the data.

MRI wishes to express its gratitude for the cooperation extended by the many individuals contacted, both within the Corps of Engineers and throughout the Federal Government. It is believed that the requirements of this Handbook, if implemented by regulation and supported with adequate financing and staffing, will greatly improve the existing visitation information for Corps projects. This will enable the Corps of Engineers to be in a unique position among Federal agencies to pioneer major improvements in recreation visitation data.

Mr. Raymond M. Mischon, Manager of Leisure Programs at MRI, was project leader for this study. Dr. Chris Wyatt, Senior Systems Analyst had major responsibility for development of the visitor survey. Both of these individuals played a major role in the development of the Handbook.

The study was conducted under contract with the U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Mississippi, and the U. S. Army Engineer Institute for Water Resources (IWR), Ft. Belvoir, Virginia (Contract No. DACW39-77-C-0082). Mr. William J. Hansen, WES, and Mr. Richard T. Reppert, IWR, were project monitors. Dr. Adolph Anderson, WES, was program manager of the Environmental Laboratory (EL) Recreation Research Program. The study was supervised by Dr. Conrad J. Kirby, Chief, Environmental Resources Division, EL, and under the general supervision of Dr. John Harrison, Chief, EL.

Director of WES during the conduct of this study and preparation

of the report was COL J. L. Cannon, CE. Technical Director was Mr. F. R. Brown. Mr. A. J. Fredrich was Director of IWR.

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CONVERSION FACTORS, U. S. CUSTOMARY TO METRIC (SI)
UNITS OF MEASUREMENT

U. S. customary units of measurement used in this report can be converted to metric (SI) units as follows:

Multiply	By	To Obtain
feet	0.3048	metres
miles (U. S. statute)	1.609344	kilometres

A HANDBOOK FOR CONDUCTING RECREATION SURVEYS AND CALCULATING ATTENDANCE AT CORPS OF ENGINEERS PROJECTS

PART I: PURPOSE OF THIS HANDBOOK

1. This Handbook has been prepared with the understanding that many of the U. S. Army Corps of Engineers Divisions and Districts have developed procedures that supplement the guidelines provided in Technical Report No. 1, "Evaluation of Recreation Use Survey Procedures."[1] During the research phase of this study, Midwest Research Institute (MRI) visited with a number of Corps of Engineer Districts throughout the United States.[2] It was found that although field personnel were doing a commendable job with limited financing and staffing, there was a general lack of standardization in the way visitation information was collected and assembled. Although each District generally asks visitors the same types of questions, they have established their own guidelines and framework for conducting the surveys and estimating recreation visitation.

2. Some Districts have developed a rather high degree of sophistication with load factors being applied to project traffic counts at the District level through computer technology. On the other hand, some Districts did not have a single traffic counter on any Corps project lands. During the next few years, it is expected that all Districts and projects will be improving data collection and monitoring of recreation traffic. This Handbook has been prepared in such a way that the methodology can be utilized by both Divisions and Districts that already have developed procedures and guidelines as well as by those that have only recently begun to recognize the importance of recreation information. In essence, the Handbook incorporates the best of all present methodologies, together with some new ideas provided through MRI's research.

3. Throughout this Handbook, MRI has quoted rather extensively from District and Division Survey Handbooks. Because there is no reason to "reinvent the wheel," existing methodology was utilized where

appropriate. Some District and Division personnel already have developed acceptable data collection and analytical methodologies.

General Use of Information

4. Accurate estimates of project visitation and recreation activity distribution are essential for proper planning and management of the resources of projects. In addition, these records[3] provide a statistical base that may be used for a number of purposes, including:

a. Annual updating of the Recreation Resource Management System (RRMS) data base.

b. Evaluating existing project use.

c. Determining the adequacy of existing facilities.

d. Determining future facility requirements at existing projects.

e. Planning for facility requirements at new parks or new projects.

f. Providing a statistical base for use in funding justification, budgeting estimates, and resource management grade classification evaluations.

g. Assisting in public relations, including news releases and inquiries by the general public and private planning and engineering organizations.

Overall Methodology

5. Since Corps of Engineer projects vary in size, accessibility, pattern of development, and demographic profile surrounding projects, no one technique can be utilized exclusively to measure public use. After the examination of available research and existing methodologies used by the various Districts and Divisions, MRI has proposed the technique described in this Handbook. It is believed that this technique will provide accurate public use information at a minimum cost or additional effort at most projects.

6. In general, the collection, analysis, and reporting of recreation use information should be accomplished by use of on-site recreation surveys and measurement of traffic by traffic counters. These data may

be supplemented with information obtained from other sources, including observations by resource management personnel at the project.

7. Estimating visitation at remote areas presents a difficult problem at most projects. To make such an estimate, managers must evaluate how visitors travel to a project (e.g., automobiles carrying hunters for waterfowl hunting, etc.). The managers might then develop load factors appropriate to the type of remote use. Quite often remote use occurs in a rather short season, and intensive sampling can produce acceptable levels of visitation estimation. At the present time, the U. S. Forest Service and other Federal agencies are evaluating the use of remote sensing and other devices for estimating visitation in both developed and remote areas. No doubt this Handbook will have to be modified as some of these new methods are found workable at the project level.

8. Because of the extensive Corps lake developments throughout the country, the Handbook has obviously been geared to this type of operation. However, recreation areas are often very similar. Parking lots and roads often concentrate visitors into areas so that they may be counted. For example, the locks and dams along major waterways usually have parking lots and viewing facilities for visitors. In these cases, the techniques described in this Handbook are fully applicable and therefore should be used. Undoubtedly, many unique recreation resources cannot be categorized so that standardized procedures can be established. Probably the best examples are the linear river parks that meander through major metropolitan areas. In the case of such parks, District and project people will have to coordinate with the recreation research group at the U. S. Army Engineer Waterways Experiment Station (WES) to evaluate the problem and develop acceptable survey and visitation estimation techniques. If training sessions are utilized to implement the Handbook, these special problem areas should be fully discussed. Only in that way may both the District and project personnel, as well as the research group at WES, understand the scope of the problem and the possible alternative solutions.

9. A number of recommendations were made by MRI in the final

report by Mischon and Wyatt regarding organizational commitments and information system data elements.[2] These recommendations could enhance the implementation of the Handbook procedures (e.g., recommendations regarding training for survey and visitation estimation procedures). However, MRI recognizes that it may require several years to fully implement these recommendations. The Handbook has been prepared in such a way that it may be utilized immediately by Districts and projects. Of course, a part of the standardization will depend upon the central office designated by the Office, Chief of Engineers (OCE), to coordinate the overall information program. Until this responsibility has been established, Districts and projects can utilize the Handbook to guide them in conducting recreation surveys and estimating recreation visitation.

PART II: GENERAL APPROACH TO ESTIMATING RECREATION VISITATION

10. Using traffic metering to estimate project visitation is simple in concept. First of all, the concept assumes that all visitors arrive at a project by automobile and are thereby counted as they enter. Thus, with this basic assumption, one can establish the average number of people per car, reduce the traffic counts to eliminate double counting caused by vehicles counted both entering and leaving, and then multiply the resulting reduction in automobiles times the number of people per car. This factor (the average number of people per car) is usually referred to as a load factor. Although the concept itself is valid and is certainly worth using to estimate project visitation, the basic assumptions underlying the concept are in fact much more complex than they first appear.

11. To begin with, most project personnel recognize that not all visitors arrive by automobile. This means that traffic metering must be supplemented by other techniques to account more accurately for this portion of the visitation. Secondly, raw traffic counts from counters cannot be divided by two under the basic assumption that all vehicles are recreation vehicles and enter and leave an area one time. Quite often, recreation visitors arrive at an area and then go to and from that area to other recreation attractions and other areas around a lake. These other recreation trips are return recreation vehicles (RRV's). The raw traffic count is also composed of nonrecreation vehicles (NRV's). Finally, vehicles are not necessarily limited to the usually assumed two axles per car. The three-wheeled, self-contained camping vehicles that are currently in use throughout the United States quite often account for a total of five axles (three axles on the camping vehicle and two axles on a boat trailer).

12. These already complex assumptions are further complicated by a lack of standardization in the way visitation data are currently collected and tabulated by Corps project and District personnel. During MRI's field study, the research team visited a number of District and project personnel.[2] Although it was found that Corps personnel were

generally doing the best possible job with limited budget and personnel, there were some problems with regard to conducting surveys and estimating visitation. A few of these problems are outlined below:

a. Surveys.

(1) Use of survey. Where Districts are using surveys to establish project load factors, some of the surveys were conducted over 10 years ago, and the same load factors estimated by these surveys are still being utilized. Since this time, facilities have been upgraded and use patterns have shifted, thereby changing the load factors applicable to project areas.

(2) Form of the survey. Although those Districts utilizing surveys generally follow the procedures as listed in Brown et al.,[1] questions vary from District to District and the way the surveys are actually conducted also varies.

(3) Survey design. Some Districts and at least one Division have established general guidelines to assist Corps personnel in the timing, sampling of areas, and actual conduct of the survey. Other Districts conduct surveys with little regard to overall survey design.

b. Visitation estimation.

(1) Lack of standardized definitions. The research team noted that project managers themselves often differ in their overall philosophy regarding the definition of a recreation visit. The RRMS specifies the definition for a recreation visit and other terms, and it is proposed in this Handbook that these definitions be utilized by all projects.

(2) Lack of standardized application of load factors. The application of load factors also differs by Districts and projects. A few personnel simply assume that half of all traffic counts are entrance traffic counts, and these figures are simply divided by two (assuming two axles per vehicle) and then multiplied by a load factor to estimate visitation. These assumptions, however, ignore some of the complexities outlined above. It was noted that some survey personnel recognized the problem of RRV's and NRV's, but until these definitions are standardized, visitation estimation at Corps projects will have little value in terms of comparison.

(3) Lack of distinction between project and area visitation. The existing methodology for estimating

recreation visitation at projects assumes that visitors only visit a single area. But as has already been noted, visitors may camp in one area and then visit other areas and attractions around the project. Thus, use of the present methodology may result in double counting. To obtain accurate estimates, the project RV's must be identified with load factors applied to the traffic meter data representing this particular component. If it is learned from the survey that this vehicle has already entered another area, a load factor should not be applied to it again for the purpose of counting it as project visitation. On the other hand, if an estimate of area visitation is being made, then obviously a first arrival or final departure to that area must have a load factor applied to it. Currently, this important distinction is not being made by many Districts and projects.

(4) Visitation to outgrant areas. In general, visitation to outgrant agency lands is handled in a rather cavalier manner throughout the Corps of Engineers. The reason is obvious. Because of limited personnel and limited budgets, project personnel have little alternative except to take the visitation that these agencies indicate they are experiencing and add it to the total project visitation. Until a methodology is standardized for all outgrant lands, this component of project visitation will not be reliable.

13. MRI has proposed a standardized survey and visitation estimation technique in this Handbook. It can be utilized by Districts and projects already having guidelines and regulations as well as by those currently not even attempting to catalog visitation by use of traffic metering. Some of the Districts are already far advanced in computer technology in the handling of visitation data. For these Districts, the most important contribution of this Handbook will be in the standardizing of definitions and the handling of data. Essentially, the Handbook provides the framework for putting data on visitation to all projects in the same units of measure. The Handbook methodology is based on several key components:

a. Relationship of survey and traffic meter data. The basic component that should be recognized at the outset is that survey data provide the descriptive information that will enable project personnel to understand what each count on a traffic meter means. The survey will enable the users

of the information to classify recreation traffic into the various component groups (i.e., recreation vehicles, nonrecreation vehicles, return recreation vehicles). The survey data also provide the number of axles per vehicle for the various classes. Other essential information is provided about recreation activity participation, number of campers, user preferences, etc. Essentially, the survey data calibrate traffic metering so that accurate estimates of visitation can be made.

b. Classification of vehicles. There are three classes of vehicles that make up the total traffic count on the meter:

(1) Recreation vehicles (RV's). Many project personnel recognize that visitors set up camp at a particular area and then travel to other attractions and areas around the lake. They may go over the traffic counter many times during their stay at a project. Thus, applying a standard load factor to half the traffic counts (reduced to account for multiple axles) results in multiple counting of the number of visitors. By identifying the actual number of recreation vehicles, project personnel are in a position to accurately estimate visitation.

For the purpose of developing load factors, recreation vehicles are defined as those either arriving at a project or area for the very first time (entrance survey), or departing for the very last time (exit survey) on a particular trip. The distinction between project and area RV's is important so that estimates can be made of total project visitation as opposed to area visitation. For example, a particular vehicle may be arriving at an area for the first time, but the group may have already visited another area on the project. For the particular area being surveyed, this is a first entry vehicle and therefore is included in the development of load factors for the area. But the vehicle is not counted as a first entry vehicle to the project since it made its initial entry at another area. It is considered an RRV in developing the area's contribution to project visitation. It should be noted that a project RV is always an area RV; however, an area RV may be a project RRV.

(2) Return recreation vehicles (RRV's). Return recreation vehicles are those described above that are traveling to and from areas on projects after entering the project or area for the first time (entrance survey) or before leaving for the last time (exit survey).

(3) Nonrecreation vehicles (NRV's). The actual number of

recreation vehicles composing traffic counts at a particular area may be only a small portion of the traffic count. Nonrecreation vehicles may include Corps maintenance vehicles, commercial vehicles, and sightseers who simply drive into an area, turn around, and immediately leave. In other words, NRV's do not arrive at the project or area to participate in recreation. During the conduct of the surveys, personnel will no doubt encounter vehicles whose occupants do not want to be surveyed. Such vehicles may be referred to as passed vehicles (PV's). A second type of PV would include any vehicle passed by the surveyors to prevent traffic delays.

c. Estimating project and area visitation. The procedure as described in this Handbook is designed to conform with RRMS reporting standards. It provides a methodology to estimate monthly project visitation and percent of activity. It also allows estimation of annual area visitation. But the procedure does not allow estimation of percent of activity or preferences by area; this will be done only for the project as a whole. The procedures can be modified to provide percentage of activity or preference estimates for individual areas instead of project totals. It would, however, be too complicated to derive these estimates for both individual areas and project totals from the same survey.

d. Recreation use during nonsampled period. The technique proposed in this Handbook is based on sampling visitation during the daylight period. It must be recognized that the percentage of RV's and the load factors developed from such surveys are applied to the total traffic meter count. This assumes that the contribution to the traffic count during the nonsampled (nighttime) period is either an insignificant portion of the total or has the same traffic distribution (i.e., RV's, RRV's, NRV's) and load factors as the sample period. There are cases where Corps camping areas are located near theme parks and other major regional attractions. At these areas a large portion of the contribution to the traffic count may occur at nonsurveyed hours. Survey hours may have to be altered in these unusual cases to obtain data to develop meaningful load factors. For the majority of Corps projects, the daylight survey period is obviously the right one. Where the project personnel are aware of unique circumstances, such as the one described above, then a survey at times other than daylight periods, or some other special adjustment, should be considered.

e. Emphasis on quality of data. Quite often it is assumed that more data are better than fewer data. But the

technique proposed in this Handbook emphasizes quality data. This means that special care must be taken in sampling particular areas, the seasons, the time of day, and many other factors that go into survey design. It is not possible in a handbook to outline each individual circumstance that may become a special consideration in survey design. However, this Handbook attempts to outline the general factors that should be considered, and it provides guidelines so that District and project personnel can develop survey designs appropriate for particular projects. Using good statistical techniques in the survey design means that quality data can be collected and analyzed, and visitation can be accurately estimated. This will also mean effective cost control of both resources and manpower at the District and project levels, an essential component that cannot be ignored in this modern day of limited budgets.

14. The general approach described in this part of the Handbook is explained in more detail in the next three parts. Part III discusses the problems of traffic metering. Part IV describes the recreation survey that should be used in support of traffic metering. Finally, Part V describes visitation estimation and provides a standardized methodology for estimating project and area visitation.

PART III: TRAFFIC METERING

General Approach

15. The procedure described in this Handbook concentrates on utilizing information from recreation surveys, combined with traffic counts from mechanical or magnetic counters. The types of counters available, their operation and use, and special problems that might be encountered are described in this part of the Handbook.

Types of areas to be metered

16. Examples of the types of areas that should be metered are as follows:

a. Developed parks. These include parks developed by the Corps; other Federal agencies; state, city, or local government agencies; and other park areas open to recreation use by the general public.

b. Overlook and observation areas. Meters should be utilized to estimate the number of sightseers using recreation facilities. These are quite often in the vicinity of dam structures.

c. Launching complexes. Often launching facilities, including parking areas and restroom facilities, are provided for the general public. Some of these might be operated by the Corps, other agencies, or by a private concessionaire.

d. Other access points. There are often numerous minor access points around Corps projects. Depending on their location and the level of traffic, these should be considered for metering devices. Each year the project will monitor these types of areas on a rotating basis to establish a pattern of visitation, as well as to determine whether traffic is sufficient to warrant full-time monitoring.

Maintaining meters
and monitoring traffic

17. Traffic counters will be continuously maintained at the entrances or exits of all developed Corps areas. Lessees, licensees, etc., will be encouraged to use comparable procedures as presented in this Handbook to obtain visitation data for areas they operate and maintain. Where the lessee or licensee is unable to collect the data,

project managers will use Corps counters and conduct recreation surveys to estimate usage at these areas.

18. All traffic counters will be checked periodically to ensure satisfactory operation and accuracy of the traffic count. Where vandalism is a problem, counters shall be placed in a protective metal or concrete box. A sufficient number of standby counters, repair parts, hoses, batteries, and maintenance equipment will be available to permit prompt repair or replacement of inoperative counters.

19. The key to accurate traffic counts is frequent checking of counters to ensure that they are operating. The problem with an inoperative counter is that there is no way of knowing when it stopped counting. When a counter is found inoperative, the reading from the counter should be recorded. The counter should not be turned back to zero. This is unnecessary and, if not properly recorded, can easily lead to improper interpretation of traffic counts. Inoperative counters should be either repaired or replaced immediately and the date and counter reading recorded. A procedure for estimating missing axle count data is presented in Appendix A.

20. It would be ideal if counters could be checked daily. But this is, of course, not possible on most projects. Once a month is an absolute minimum. Depending on the manpower available, the frequency of inspection will vary from season to season. The project managers should decide their own inspection frequency. During the summer, it is strongly recommended that counters be checked once a week and repairs, if necessary, be effected as quickly as possible. Accurate visitation figures depend heavily on accurate traffic counts. Frequent inspection cannot be emphasized too strongly.

21. As an additional check on the accuracy and consistency of the traffic counter readings, checks should be made during the week preceding and the week following the recreation survey and recorded on the weekly distribution form (see Figure 1). This form should be attached to the recreation survey forms when they are returned to the Distict Office for processing. The counters should not be adjusted during this period. During the week of the survey, counter

RECREATIONAL-USE SURVEY – WEEKLY TRAFFIC DISTRIBUTION AND COUNTER CHECKS

DISTRICT	PROJECT	AREA

WEEKLY TRAFFIC DISTRIBUTION

DAY	DATE	TIME	COUNTER READING	DIFFERENCE	% OF TRAFFIC	
MONDAY						
						WEEKDAY %
FRIDAY						
						WEEKEND %
MONDAY						

TRAFFIC COUNTER CHECKS

DATE	TIME		COUNTER READINGS		METER COUNT OF AXLES	ACTUAL COUNT OF AXLES	CORRECTION FACTOR (+ OR -)
	FROM	TO	ENDING	BEGINNING			

Figure 1. Recreational use survey form

readings are used to establish the weekday-weekend distribution of traffic. Without these values, the survey is incomplete. The counter readings will be made as follows:

a. On the Monday morning preceding the survey before 9:00 a.m.

b. On the Friday afternoon during the week of the survey between 5:00 and 6:00 p.m.

c. On the Monday morning following the survey before 9:00 a.m.

22. In addition to the counter readings required above, several additional guidelines are suggested to provide accurate visitation measurements:

a. Take readings as close to the beginning and end of each month as possible. These readings are necessary for monthly visitation purposes.

b. Take readings between 5:00 and 6:00 p.m. of the day preceding holiday weekends and before 9:00 a.m. of the day after major holiday weekends. These readings are necessary to establish peak loads at recreation areas.

Local conditions may require modification of this schedule, but in general it should be used where possible. When traffic counters are not operational due to weather conditions (winter months), project personnel must estimate visitation by observation or some other technique.

Use of Traffic Counting Devices

23. Some of the essential guidelines for selecting and locating traffic counters on project lands are discussed in the following paragraphs.

Types of traffic counting devices

24. There are three basic types of traffic counting devices:

a. Pneumatic traffic counters. These are satisfactory where the traffic flow is light to moderate. These counters must be kept in good repair, inspected frequently, and adjusted properly. The counters have a pneumatic hose that stretches across the lane(s) of traffic, and the hose is inflated by the counter pump. When the tire of a vehicle passes over the hose, air pressure increases in the hose and the counter is advanced one number. This type of traffic counter may register every set of axles that

passes over it, or every second set of axles. The purpose of the latter type of counter is to count the number of vehicles (assuming two axles on each) that pass over the counter. Unfortunately, as personnel at most Districts are aware, the average vehicle does not have two axles. Thus, the use of this type of counter increases the possibility of error in visitation estimation. Generally, pneumatic traffic counters do not operate satisfactorily in snow or ice and are not recommended for use during the winter season.

b. Magnetic loop counters. Magnetic loop counters are more expensive than pneumatic tube models. However, they will operate in ice and snow conditions and are more reliable than either pneumatic tubes or tape switch devices. They should be selected and used whenever the added cost can be justified. The loop sensor is connected through a pair of lead-in wires to the detector's loop oscillator driver section. The loop resonant frequency is tuned to the detector frequency. A vehicle passing over the loop effectively reduces loop inductance. Thus, the resonant tank circuitry will energize, which advances the counter by one.[4]

c. Electric switch counters. These have been used by other agencies with reasonably good success. No single unit is available commercially, but component parts may be purchased from suppliers and assembled locally. These counters are triggered by an electronic switch, such as those produced by the Tapeswitch Corporation of America, and operate on 45-volt batteries.[5]

Placement of traffic counting devices

25. As early as 1962, OCE provided guidelines in terms of the location, number, maintenance, frequency of readings, and adjustment of vehicle axle counts.[4] Since that time, several updated versions of these guidelines have been sent to Districts and projects.

26. The RRMS regulation presently requires that an estimate be made at each project of the recreation days of use by month and the total for the entire year.[6] The regulation specifies that the visitation will not include those persons passing over, through, or along the project, or stopping momentarily to view a project area or structure.

27. Compliance with this requirement effectively rules out placement of traffic counters along highways or roads leading through or along a project but not leading to any public use area. It would not,

however, rule out the use of counters on roads that are being used for either recreation access or as a throughway connecting recreation areas. A survey, however, is required to calibrate that portion of the traffic count that contributes to recreation visitation.

28. Accurate traffic counts, particularly where recreation visitation is of primary interest, depend upon location, maintenance, accurate reading, and proper processing of data from the counters.* Basic principles guiding the placement of recreation traffic counters are discussed below:

a. Placement along straight stretches of road. Pneumatic hose type traffic counters register the passage of each wheel over the hose. To obtain accurate counts, they must be located so as to register axles correctly.[7] Location must be along a straight section of road and at a sufficient distance from side roads, pulloffs, or intersections so that front, rear, and trailer wheels of vehicles cross the hoses in pairs. Placement in a curve may result in a two-axle vehicle registering three or four counts. Traffic counters should be installed on straight sections of roads with at least 50 feet,** and preferably 100 feet, of straight road on either side of the pneumatic tube. The tube should also be at least 50 feet from points where vehicles usually stop for recreation visitors to read signs, pay fees, etc.

b. Elimination of nonrecreation traffic. Unless traffic counters are located carefully, visitation statistics may be significantly distorted by residential traffic and nonrecreation activity and/or by double counting. Problems with vandalism, as well as with unwanted nonrecreation traffic being introduced into the count, have resulted when traffic counters are located on winding roads some distance from recreation areas or have been placed between private residences and the highway leading away from Corps lands to nearby towns. In such locations, traffic counters record trips to work, school, and shopping, and passage of delivery and service vehicles to residences, etc. For this reason alone, every effort

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* The question of traffic counter placement is crucial to obtaining accurate visitation estimates. An in-depth study of this issue was conducted for the Vicksburg District (Reference 4). A portion of the final report is reproduced in this Handbook as Appendix B.

** A table of factors for converting U. S. customary units of measurement to metric (SI) can be found on page 5.

should be made to locate survey points near traffic counters. The survey of course will provide the data necessary to calibrate the traffic counter by identifying the magnitude of these types of trips.

The problem is further compounded when counters are located in the immediate vicinity of residences. Go-carts, minicycles, bicycles, and vigorous jumping up and down on the hoses may register additional erroneous counts. Vehicular adjustments from the recreation survey cannot realistically be expected to compensate for such erroneous traffic counting.

The problem of identifying and determining the level of nonrecreation traffic data might be solved by utilizing a double sampling technique. This technique was developed by the U. S. Forest Service to estimate visitation of National Forests.* The double sampling technique basically involves establishing a correlation between two or more indicators or surrogates of recreation use. In the case of the Forest Service, recreation researchers are in the process of validating a correlation between traffic counter data and other variables, such as the amount of water used in toilets and shower buildings, the number of times restroom doors open and close, etc. A similar application could be established for Corps recreation areas where erroneous traffic counts are suspected. In these cases, several traffic counters could be located along different sections of roads near the same recreation areas. A correlation between counters could be established over time; then extremely high or low readings from particular counters could be discovered by comparing the questionable counter with the others.

c. Placement of traffic counters in recreation areas. Counters should be installed on roads leading to (entrances) or from (exits) public use areas, not on roads leading past the area to other destinations. When pneumatic counters are used, two counters may be installed at each entrance or exit to provide insurance in case one of the counters fails to work.

Also of importance to consider is whether or not all vehicles entering and leaving an area are being counted. A recreation area with only one entrance and/or exit is no

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* The double sampling method involves estimating recreation use at developed areas by use of proven predictors, such as traffic counts, water flow, etc. It is designed to produce estimates of the number of visits (site entries) and visitor hours of recreation use (by activity) on certain untended developed recreation sites.

problem. The counters should be placed near the entrance and/or exit, but not too near. Areas with multiple entrances and/or exits can, in most cases, be correctly counted by utilizing several traffic counters and combining the readings to get the total amount of traffic flow in that area.

It is impossible to describe every conceivable traffic flow pattern and proper traffic counter positioning in each area. There will probably be some recreation areas that are relatively easy to monitor and several more difficult situations on every project. Care should be taken to position traffic counters in such a manner as to obtain as accurate results as possible. Figure 2 (taken directly from the U. S. Forest Service RIM Handbook) shows an example of the correct and incorrect placement of traffic counters at recreation areas near a lake.[5] For additional guidelines concerning traffic placement, see Appendix B. Maps or drawings showing locations and type of counter (pneumatic or electronic loop) at each location should be forwarded to the District for approval. Special situations may be referred to the recreation research staff at WES.

MRI has recommended that WES be designated by OCE as the central office to develop and implement the recreation information system.[2] Counter placement is only one of many

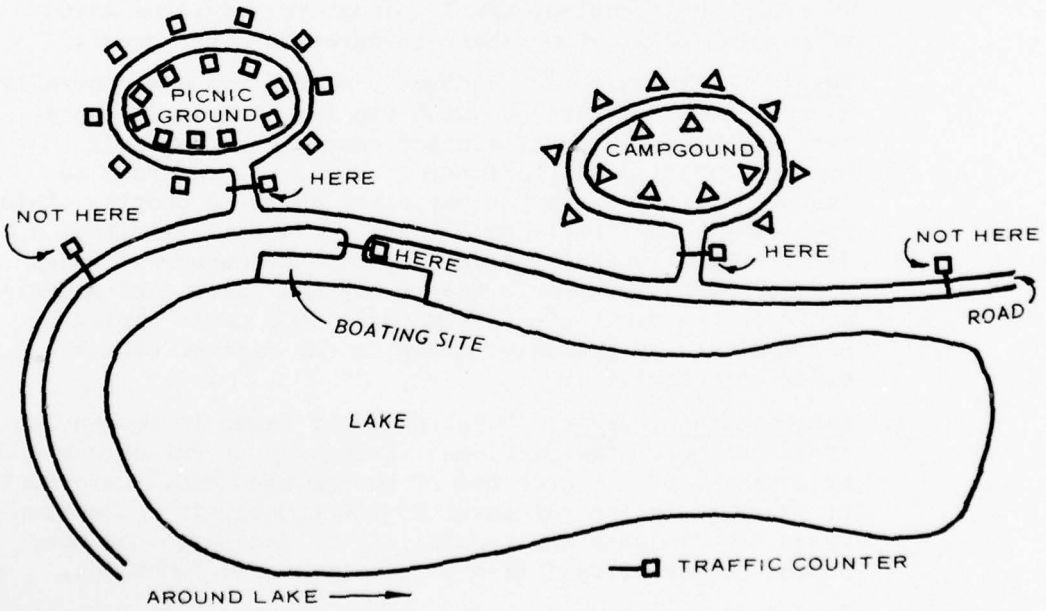


Figure 2. Placement of counters

issues that will have to be standardized by a central office. Because of the diversity of Corps projects, additional research may have to be undertaken to establish general guidelines for traffic counter placement.

Counter operation problems

29. Although proper placement of traffic counters will minimize double counting and other erroneous counts of traffic, there are several problems that project staff must be aware of. Some of these are discussed below:

a. Vandalism. This factor may prove to be somewhat of a problem if a counter is stolen or damaged. Important use information may be lost and render previous traffic counts inaccurate or incorrect.[7] An example of this kind of problem would be young people deliberately driving over or jumping on pneumatic hoses. This kind of problem could magnify an error considerably in a very short period of time. Therefore, project personnel should familiarize themselves with the possibility of this type of vandalism problem and make periodic checks on the counters to make sure that they are in good working order.

b. Turnarounds. This problem may exist at fee areas or other types of controlled use areas where people turn around because they do not want to pay fees, or they do not want to come in contact with administrative personnel. To avoid this problem, traffic counters should be moved to a point well beyond where turnarounds might occur.

c. Buses. Although buses on Corps property are not generally a significant occurrence, with the increase in interpretive and other types of visitor centers, it may well become a problem in the future. Buses are recorded as having only two axles but may carry 40 to 50 people. This could obviously create an extreme variance in visitation data. The solution is simply to log the number of buses and the number of people they carry and later make adjustments in the visitation estimates. This could easily be accomplished by personnel managing the visitor center or other such facility.

d. Maintenance of areas. Maintenance of roads in recreation areas can pose some problems. Hoses may be cut or damaged as a result of improper use of mowing machines. Care must be observed in the placement of the counter in recreation areas to eliminate any possibility of damage to the hose or the counter itself from such maintenance functions.

e. Tar, dirt, and gravel roads. Roads constructed of these materials usually reduce counter efficiency over time.

In areas where the pneumatic hose is placed across a tar or dirt road, vehicular traffic causes the hose to depress into the road after a short period of time. The hose needs only to sink a fraction of an inch or so and vehicles will not exert enough pressure to activate the counter mechanism. On gravel roads, excessive traffic causes a reduction in the effective life of the hose due to the cutting of the hose by sharp gravel. Relatively large errors can be significantly reduced by replacement of the pneumatic hose when it shows any signs of ineffectiveness or excessive wear.

PART IV: RECREATION SURVEYS

30. Recreation surveys are important because they provide needed information for a wide array of decisions that must be made by the Corps, including the development of monthly visitation reports. Therefore, accuracy in taking the survey is extremely important. Although either an entrance or exit survey might provide the useful information, in order to standardize data collection methodologies, an exit survey will be used at all projects. These are three areas important in developing the survey design: (a) timing and frequency, (b) location, and (c) method. The following discussion describes procedures for a simple but complete exit survey. These procedures will provide useful project information and the required information for reporting recreation visitation to OCE.

Timing and Frequency

31. Timing and frequency of the surveys relate to the general questions of when to survey and how often. In general, this breaks down into five areas to survey: the years, the months, the weeks, the days, and the time of day. These areas are important considerations because they influence the statistical accuracy of the survey. In conducting an effective survey, it is the representativeness of the sample that is important, not the magnitude of the numbers. In order to get a representative sample, the survey must be scheduled properly.

Years to survey

32. Recreation demands have been changing rapidly over the past several years so that it is important to schedule the survey years effectively. It is recommended that the surveys be taken for three consecutive years in order to reduce sampling error and to get a more complete picture of total project visitation, activity participation, and more accurate load factors. The survey should be conducted every third year following the initial three-year period. If the last survey results are significantly different from the earlier surveys, the survey

should be conducted for at least one more year.

33. By simply accumulating and averaging survey results, the magnitude of the sampling error could be reduced. A three-year average would result in data that would be approximately 1.7 times more likely to be representative of the whole population of visitors than the survey from any one year alone. Although the survey data may be combined over a several year period for the development of load factors, the user preference in formation should not be averaged. It is this information that is most useful at the project level in order to see what changes are occurring in recreation preferences by the public over time.

Periods to survey

34. In order to get a complete picture of recreation activity and visitor use at Corps projects, there should be four seasonal surveys. The surveys should be stratified by season so that the periods that have the most similar activities are grouped together. Some of the activities to be considered are: boating, waterskiing, snowmobiling, types of fishing or hunting seasons.

35. By developing strata, it is possible to reduce the variance of an entire population by grouping those characteristics that are most similar. Groupings may vary in different parts of the country. Samples should then be drawn on a proportional basis from each stratum. The following grouping is an example of stratifying months into seasons; however, there is no reason why a month cannot be divided:

Summer: June, July, August, September

Fall: October, Novemeber

Winter: December, January, February, March

Spring: April, May

Weeks to survey

36. The survey week should run from Monday through the following Sunday. At the beginning of the year, one week for each survey season should be selected randomly to increase the reliability of the sample. In this way the personnel needed for completing the surveys can be scheduled in advance.

37. Weeks that include holidays or special events at the project

or in the immediate vicinity, such as boat races, fishing tournaments, rodeos, etc., should be excluded from the survey sample because of the abnormal activity patterns. The remaining weeks are assigned numbers. The sample week is then selected by use of a table of random numbers.

38. The following is an example of the selection of the survey week for the summer season by a table of random numbers. The 15 weeks of the summer season, excluding the Fourth of July and Labor Day weeks, are numbered consecutively from 1 (first week of June) through 15 (last week of September). Next, a random number table is consulted. After selecting a row in the table at random, the first two-digit number between 1 and 15 encountered on that row is used; for example, if 3 was encountered, the third week of June would be the survey week for the summer season (see the random number table, Table 1).

Days to survey

39. Each recreation area to be surveyed will be sampled for 20 hours (10 hours on weekdays and 10 hours on weekend days) during the survey week. The hours selected for the weekday survey are based on a partition of the sample week into two-hour time intervals. The selection of the hours would begin with the following partition of the sample week:

Time		Days				
Hours	Interval No.	Mon.	Tues.	Wed.	Thurs.	Fri.
0600-0800	1					
0800-1000	2					
1000-1200	3					
1200-1400	4					
1400-1600	5					
1600-1800	6					
1800-2000	7					

Each weekday is divided into seven two-hour intervals, which yields 35 weekday intervals available for selection; one interval is selected at random for each day and each time. To a hieve this, begin with Monday and select one interval at random from the seven. For Tuesday, select one time at random from the remaining six. Continue the process until five intervals have been selected, one from each of the five days. An example is provided below:

Table 1

Table of Random Numbers

10	09	73	25	33	76	52	01	35	86	34	67	35	48	76	80	95	90	91	17	39	29	27	49	45
37	54	20	48	05	64	89	47	42	96	24	80	52	40	37	20	63	61	04	02	00	82	29	16	65
08	42	26	89	53	19	64	50	93	03	23	20	90	25	60	15	95	33	47	64	35	08	03	36	06
99	01	90	25	29	09	37	67	07	15	38	31	13	11	65	88	67	67	43	97	04	43	62	76	59
12	80	79	99	70	80	15	73	61	47	64	03	23	66	53	98	95	11	68	77	12	17	17	68	33
66	06	57	47	17	34	07	27	68	50	36	69	73	61	70	65	81	33	98	85	11	19	92	91	70
31	06	01	08	05	45	57	18	24	06	35	30	34	26	14	86	79	90	74	39	23	40	30	97	32
85	26	97	76	02	02	05	16	56	92	68	66	57	48	18	73	05	38	52	47	18	62	38	85	79
63	57	33	21	35	05	32	54	70	48	90	55	35	75	48	28	46	82	87	09	83	49	12	56	24
→ 73	79	64	57	53	(03)	52	96	47	78	35	80	83	42	82	60	93	52	03	44	35	27	38	84	35
98	52	01	77	67	14	90	56	86	07	22	10	94	05	58	60	97	09	34	33	50	50	07	39	98
11	80	50	54	31	39	80	82	77	32	50	72	56	82	48	29	40	52	42	01	52	77	56	78	51
83	45	29	96	34	06	28	89	80	83	13	74	67	00	78	18	47	54	06	10	68	71	17	78	17
88	68	54	02	00	86	50	75	84	01	36	76	66	79	51	90	36	47	64	93	29	60	91	10	62
99	59	46	73	48	87	51	76	49	69	91	82	60	89	28	93	78	56	13	68	23	47	83	41	13
65	48	11	76	74	17	46	85	09	50	58	04	77	69	74	73	03	95	71	86	40	21	81	65	44
80	12	43	56	35	17	72	70	80	15	45	31	82	23	74	21	11	57	82	53	14	38	55	37	63
74	35	09	98	17	77	40	27	72	14	43	23	60	02	10	45	52	16	42	37	96	28	60	26	55
69	91	62	68	03	66	25	22	91	48	36	93	68	72	03	76	62	11	39	90	94	40	05	64	18
09	89	32	05	05	14	22	56	85	14	46	42	75	67	88	96	29	77	88	22	54	38	21	45	98
91	49	91	45	23	68	47	92	76	86	46	16	28	35	54	94	75	08	99	23	37	08	92	00	48
80	33	69	45	98	26	94	03	68	58	70	29	73	41	35	53	14	03	33	40	42	05	08	23	41
44	10	48	19	49	85	15	74	79	54	32	97	92	65	75	57	60	04	08	81	22	22	20	64	13
12	55	07	37	42	11	10	00	20	40	12	86	07	46	97	96	64	48	94	39	28	70	72	58	15
63	60	64	93	29	16	50	53	44	84	40	21	95	25	63	43	65	17	70	82	07	20	73	17	90
61	19	69	04	46	26	45	74	77	74	51	92	43	37	29	65	39	45	95	93	42	58	26	05	27
15	47	44	52	66	95	27	07	99	53	59	36	78	38	48	82	39	61	01	18	33	21	15	94	66
94	55	72	85	73	67	89	75	43	87	54	62	24	44	31	91	19	04	25	92	92	92	74	59	73
42	48	11	62	13	97	34	40	87	21	16	86	84	87	67	03	07	11	20	59	25	70	14	66	70
23	52	37	83	17	73	20	88	98	37	68	93	59	14	16	26	25	22	96	63	05	52	28	25	62
04	49	35	24	94	75	24	63	38	24	45	86	25	10	25	61	96	27	93	35	65	33	71	24	72
00	54	99	76	54	64	05	18	81	59	96	11	96	38	96	54	69	28	23	91	23	28	72	95	29
35	96	31	53	07	26	89	80	93	54	33	35	13	54	62	77	97	45	00	24	90	10	33	93	33
59	80	80	83	91	45	42	72	68	42	83	60	94	97	00	13	02	12	48	92	78	56	52	01	06
46	05	88	52	36	01	39	09	22	86	77	28	14	40	77	93	91	08	36	47	70	61	74	29	41
32	17	90	05	97	87	37	92	52	41	05	56	70	70	07	86	74	31	71	57	85	39	41	18	38
69	23	46	14	06	20	11	74	52	04	15	95	66	00	00	18	74	39	24	23	97	11	89	63	38
19	56	54	14	30	01	75	87	53	79	40	41	92	15	85	66	67	43	68	06	84	96	28	52	07
45	15	51	49	38	19	47	60	72	46	43	66	79	45	43	59	04	79	00	33	20	82	66	95	41
94	86	43	19	94	36	16	81	08	51	34	88	88	15	53	01	54	03	54	56	05	01	45	11	76

Time		Days				
Hours	Interval No.	Mon.	Tues.	Wed.	Thurs.	Fri.
0600-0800	1					
0800-1000	2				4th	
1000-1200	3					
1200-1400	4		2nd			
1400-1600	5			3rd		
1600-1800	6					5th
1800-2000	7	1st				

As noted in the above tabulation, once a time interval has been selected, all other like time intervals are excluded for the remainder of the week. A sampling schedule is randomly chosen for each survey week for each selected recreation area. The weekend schedule will be from the predetermined schedule as follows:

Time		Days	
Hours	Interval No.	Saturday	Sunday
0600-0820	1	A	B
0820-1040	2	B	C
1040-1300	3	C	A
1300-1520	4	A	B
1520-1740	5	B	C
1740-2000	6	C	A

One of the schedules, A, B, or C, will be selected at random for each area. If Schedule A were selected, then recreationists exiting the area from 0600-0820 hours and 1300-1520 hours on Saturday would be interviewed, and recreationists exiting the area from 1040-1300 hours and 1740-2000 hours on Sunday would be interviewed.

40. Other than during the summer and spring recreation seasons, length of daylight is generally less than 12 hours. Accordingly, the time intervals available during the sample week are less. Therefore, the survey day should be shortened from the 0600-2000 hours used during the spring and summer recreation season to 0800-1800 hours. The weekday partition would exclude intervals 1 and 7, and selection would be made from the five remaining intervals. The weekend intervals for these shorter days would require rescheduling as follows:

Time		Days	
Hours	Interval No.	Saturday	Sunday
0800-1030	1	A	B
1030-1300	2	B	A
1300-1530	3	A	B
1530-1800	4	B	A

41. There is a potential problem with this technique, but careful planning can alleviate it. The problem is that the use of personnel at widely varied periods seven days a week is required. Because the sample week is selected in advance, it should be possible to schedule two persons to do the surveys for the entire week, although one person may be sufficient in the off-season.

42. A survey option may be to use an entire one-weekday survey. This may result in the loss of some statistical reliability but may have more advantages based on cost, time, and manpower. In this case, project personnel may randomly select among the five weekdays. In some cases, Friday may not be appropriate for a weekday survey. The characteristics of the traffic may be biased by a large volume of afternoon weekend arrivals. Because of the basic difference in weekend traffic patterns (Saturday arrivals versus Sunday departures), the survey technique described in the Handbook for weekend surveys must be followed.

Location

43. It is important to select the survey areas carefully. Not all access points at a project need to be surveyed--just enough to obtain a reliable sample.

Selection of survey areas

44. Recreation areas should be stratified according to the characteristics that affect visitation and traffic patterns. The purpose of stratification is to group areas with similar use, facilities, recreation characteristics, etc., so that meaningful load factors can be developed for application to traffic counts. After areas are stratified, a sample may then be drawn for conducting the survey. Stratified sampling enables the development of stratum averages that may be applied

to all of the areas in the stratum. If similar areas are not grouped and randomly sampled, a very large sample would have to be obtained from the population as a whole. Applying these overall average statistics to individual strata (or areas) would still not be very meaningful. An example of one of the several processes of stratification is described below (also see Appendix C):

Type of Area*	Stratum
a. Camping only.	1
b. Multipurpose camping.	2
Small	
Large	
Vicinity 1a	3
Vicinity 2a	4
c. Day use only.	5
Small	
Large	
Vicinity 1b	6
Vicinity 2b	7

* On many projects an eighth type of area may be encountered, e.g., golf courses and/or resorts. However, these areas are excluded from the survey because it is more efficient to estimate attendance from guest registration records for such areas than to include them in the survey. If no records exist, attendance estimates can be made from a simple head count.

45. To accomplish the above stratification, the recreation areas would be grouped first by activity categories as follows:

a. Camping only. These are camping areas situated such that recreationists must leave the area to participate in other project activities, i.e., water-oriented activities.

b. Multipurpose camping. These are areas where water-oriented activities are available within the area and both camping and day-use recreation occurs.

c. Day use only. All areas in this category would have immediate access to water-oriented activities and exclude camping except as incidental or as overflow areas used during peak periods.

46. The first grouping above completely defines one stratum,

specifically those areas set aside exclusively for camping. Groups b and c may require further partitioning. Group b, multipurpose camping areas, would be separated into two groups based on relative size. There is no rigid measure of size available; none would be applicable in all cases. However, the partitioning should be by number of recreationists, not by physical size of the area. If there is no obvious difference in size, the median use level is used as the dividing line. This grouping completely defines one additional stratum, i.e., small multipurpose camping areas.

47. The next step is to stratify the large multipurpose camping areas geographically. Again, no rigid measures exist. The partitioning might be in terms of east or west, north shore or south shore, or access from highway x or access from highway y. With these groupings, two more strata are defined, i.e., two groups of large multipurpose camping areas.

48. The final three strata are determined from the "day-use only" areas in the same manner as described in paragraph 45. It should be noted, however, that the division between large and small day-use areas need not correspond with that for camping. Also, the geographic partitioning need not coincide.

49. A careful review of the areas in each group should be made to determine whether visitation or activity use at any of the areas in the group would be unrepresentative for that survey period. For example, an area whose activity pattern was temporarily interrupted by the national championship baton twirling contest or by extensive road repairs would not be selected for the survey. After elimination of those areas in the group that appear unlikely to be representative, the groups should be selected in a manner designed to give broad representation to the different types of facilities and conditions affecting their use on the lake. Thus, a cross section of area groups would be involved. Finally, once the groups have been determined, a process of random selection should be employed in determining which area from within each of the preselected groups will be surveyed. Numbers are assigned to each area within a category, and the area to be sampled is randomly

selected. A minimum of 10 percent sampled should be used. All selected areas should be sampled each season, although not necessarily in the same week.

Selection of survey points

50. The individual surveyors should be situated at points in the selected sites to be surveyed that will yield accurate results. All survey points should allow the surveyor to observe the traffic counter, if possible, to be sure vehicles actually cross it. This may not be possible with one-way loops, for example. The survey point should also be situated to provide adequate control of both entering and exiting traffic. In areas with more than one entry and/or exit, it may be necessary to barricade some access points to channel all visitors past the surveyor or to provide more than one surveyor in these areas.

51. Some access areas at the projects do not lend themselves well to the above suggestions regarding positioning of surveyors. Problems in these areas will require careful study to ensure an accurate survey. These areas should be identified by project personnel and a description of the problem submitted to the District's Recreation Resource Management Branch for review and action.

Method

52. If the survey is not done correctly, its accuracy will be adversely affected. It is essential that all survey personnel use the same technique in the conduct of the surveys.

The survey

53. There has been controversy over whether an entrance or exit survey is best for obtaining the most complete information. In the past, Districts and projects have been free to choose whichever technique best reflected average conditions and measured accurately both the number of recreationists using the area and the activities in which they participated. While both entrance and exit surveys have problems, it is believed that an exit survey is more advantageous because it is safer and allows for better control of traffic. Therefore, an exit

survey will be used at all Corps projects.

The survey team

54. It is important that the survey team be thoroughly trained in survey procedures. This Handbook provides essential background and guidelines for training the team. In addition, practice interviews should be scheduled and conducted prior to the actual survey.

55. The survey team should be composed of at least two persons during the summer, although this may not be necessary in the off-season. Using two persons will expedite the flow of traffic and reduce unnecessary delays. It will also enhance the reliability of the survey by making sure that the interviews are not rushed unnecessarily. Each surveyor should have a clipboard with the survey forms and a supply of sharpened No. 2.5 pencils. No. 2.5 pencils are better than No. 2 because they do not smudge as easily.

The survey instrument

56. The survey sheet must be filled out completely and correctly in order to obtain reliable data. Care should be taken that all information written on the survey sheet is legible so that the automatic data processing personnel can transfer it to keypunch cards. Survey sheets should be thoroughly checked before they are submitted to the District personnel, by use of the following guidelines:

a. Heading. The heading of each survey sheet should be filled out completely. This includes:

(1) Made by: Name of surveyor.

(2) Sheet number: Each sheet should be numbered in sequence.

(3) Project: Name of lake or project.

(4) Area: Name of access area.

(5) Date: Date of the survey.

b. Vertical columns. All entries on the survey forms should be made neatly. Numbers must be placed in the specific space provided. Care should be taken not to make an entry in an adjacent space or in between two spaces. To assure that this will not be a problem, numbered entries should be preceded by zeros where more than one column is provided under an entry heading, i.e., fishing 02.

c. Header card. A single header card will be used to identify survey data from Corps recreation areas. It may be noted that spaces 1 through 16 (see survey form, Figure 3) are reserved to identify project, area, data, and other such information pertinent to individual survey entries. The data on the header card will be recorded as follows:

Spaces	Information
1-2	Day (1 through n)
3-4	Month (1 through 12)
5-6	Year (number)
7-10	Project (1 through n)
11-12	Area (1 through n)
13-14	Percent of total traffic on weekday
15	Weekday/weekend (1 or 2)
16	Survey (1 through n)

This information will be punched on a separate card from the survey data and will serve to identify all subsequent entries.

d. Body of the survey form. The survey form is divided into necessary information in the first 48 columns. The remainder of the form is concerned with information about user preference that may be of concern to projects. Some of this information can be altered based on project needs. In addition, there are several "free" columns that could be used for information that might be useful locally.

Figure 4 shows the types of vehicles to be included in the recreation survey. Some parties will not wish to be interviewed because of lack of time, etc. In addition, during rush periods, interviewers will not be able to stop all vehicles. These are classified as passed vehicles (PV's); only a count of such vehicles is necessary. PV's are not included in the development of load factors. However, it is useful to account for the number of PV's for survey evaluation. A high percentage of PV's may indicate a biased sample and/or the need to provide additional surveyors.

Nonrecreation vehicles (NRV's) include Corps, contractor, delivery and other such vehicles, and interviews are also not required; axle counts are necessary, however. Potential interview vehicles include RRV's (no interview, axle count only) and project and area RV's. Limited interviews will be conducted with area RV's and a full-scale interview will be conducted with project RV's. It should be noted that all project RV's are also area RV's.

Each horizontal line on the sheet reflects the information

CORPS OF ENGINEERS
RECREATION - USE SURVEY

Date (Day Mo Yr) 1 2 3 4 5 6

Number of Vehicles Passed

Pr

Area 11 12

Percent of Total Traffic on Weekday 13 14

Interviewer

	ID	VEHICLE CLASS (No. Persons)				ACTIVITIES																										ZIP CODE	EQUIP.			SELECTION							
	Identification of Survey Entries 000 up to 999	Total No. of Axles	NRV Yes - 1 No - 0	Returning to Project Yes - 1 No - 0	Returning to Area Yes - 1 No - 0	No. of Persons	Camping at Project Yes - 1 No -0	Camping at Area Yes - 1 No - 0	No. Days Spent Camping	Share Camp Area Yes - 1 No - 0	No. Persons Picnicking	Used Picnicking Facilities Yes - 1 No - 0	No. Persons Boating	No. Persons Fishing from Boat	No. Persons Fishing from Shore	Use Launching Ramp Yes - 1 No - 0	Visit Dock or Marina Yes - 1 No - 0	No. Persons Hunting	No. Persons Sightseeing (Only)	No. Persons Water Skiing	No. Persons Swimming	No. Off Road Vehicling	No. Persons Hiking	No. Persons Nature Study	No. Persons Ice Fishing	No. Persons Snowmobiling	No. Persons Cross Country Skiing	Other (List in Remarks)	Hours Spent in Day Use Activities	Origin - Zip Code	Camping Enter Code 1,2,3,4,5	Boating Enter Code 1,2,3	Other Vehicles Enter Code 1,2,3	Close to Home Yes - 1 No - 0	Recommended by Friends Yes - 1 No - 0	Visited Before Yes - 1 No - 0	Gate Attendant Yes - 1 No - 0	Electric Hookups Yes - 1 No - 0	Flush Toilets Yes - 1 No - 0	Boat Ramp Yes - 1 No - 0	
	1 2 3	4	5	6	7	8 9	10	11	12 13	14	15 16	17	18 19	20	21	22	23	24	25 26	27 28	29 30	31	32 33	34	35 36	37	38 39	40 41	42 43	44 45 46 47 48	49	50	51	52	53	54	55	56	57	58	
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Figure 4. Survey form

...mber of Vehicles Passed	Project	7 8 9 10

...l ...kday 13 14	Interviewer	Weekday or Weekend 15	Survey 16	Sheet Number ____ of ____

| ZIP CODE | EQUIP. | SELECTION | IMPROVEMENT PREFERENCES | | |

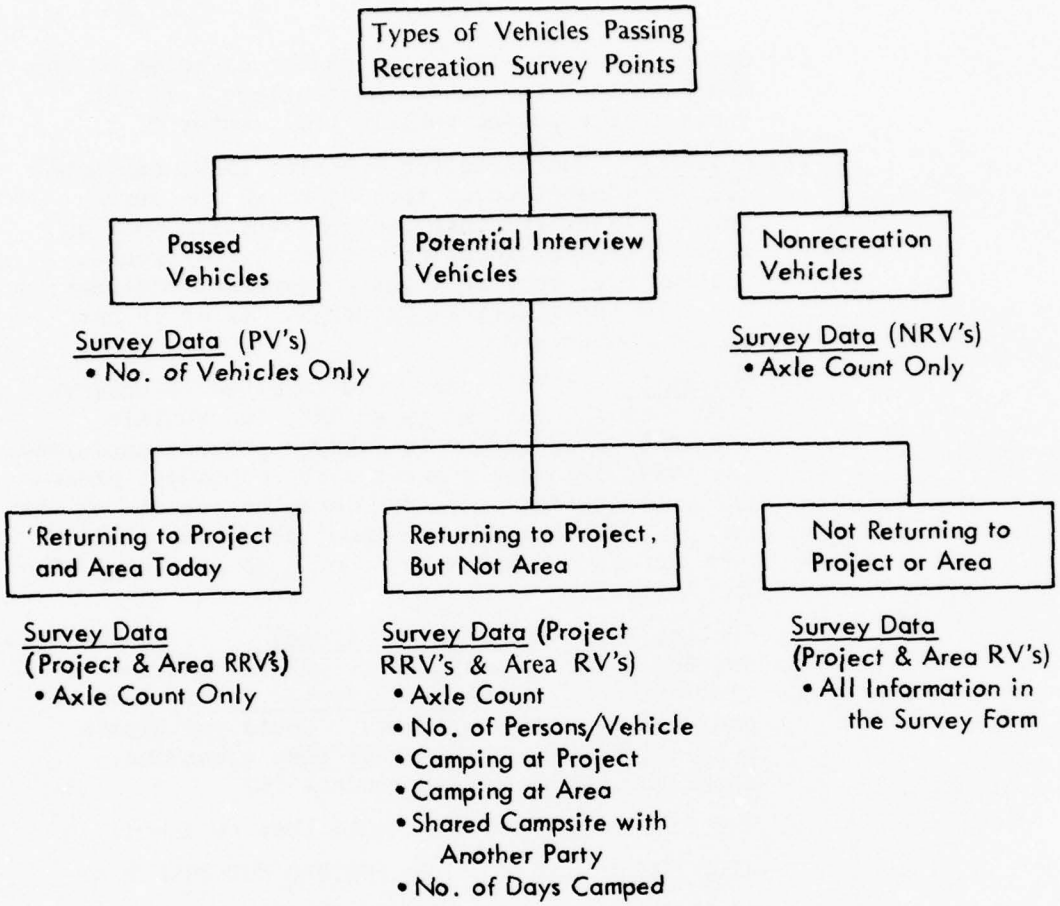


Figure 4. Types of vehicles included in the survey and the information to be obtained from each vehicle

obtained from one motor vehicle that exits past the survey point (see survey form, Figure 3).

(1) Columns 1-3. These columns are reserved to identify individual survey entries. Each motor vehicle that exits is assigned a consecutive number. The spaces allow up to 999 entries from an area during a single day. If only one surveyor is utilized at an area, the survey entries may be coded consecutively during the day as time permits. If several surveyors are involved, the survey entries on all forms may be coded at the conclusion of the survey period.

(2) Columns 4-13. These columns provide most of the information necessary to generate the load factors for visitation estimation. The other essential information (hours spent in day use activities) is contained in Columns 42 and 43.

(a) Column 4. Enter the total number of axles of the vehicles stopped (including trailer). If the vehicle is a passed vehicle (PV), enter Ø.

(b) Column 5. Nonrecreation vehicles (NRV) can usually be identified as they approach the survey point. Identify nonrecreation vehicles such as service trucks, gasoline trucks, Corps trucks, contractors' vehicles, law enforcement officers, etc., by entering 1 in Column 5. If it is not an NRV, enter a Ø.

(c) Column 6. If it cannot be determined by observation that the vehicle is an NRV, the vehicle should be stopped and the survey purpose explained. The surveyors should greet each respondent pleasantly by stating their name and the purpose of the survey. The opening statement need not be the same for each vehicle but should be something like the following:

"Hello, I'm (Title) (Name). We are conducting a survey designed to get information on visitation (Name of Project) so that we can better serve your needs. Would you please take a few minutes to answer some questions. Thank you, we really appreciate it."

The following question should then be asked:

WILL YOU BE RETURNING TO THE PROJECT TODAY?

If the answer is NO, enter a Ø in Columns 6 and 7 and begin the questioning with Columns 8 and 9. This is a project and area RV.

If the answer is YES, enter a 1 in Column 6 and ask the next question.

(d) Column 7. Ask:

WILL YOU BE RETURNING TO THIS AREA DURING THIS VISIT?

If the answer is YES, enter a 1 in Column 7 and conclude the interview. This is a project and area return recreation vehicle (RRV).

If the answer is NO, enter a Ø in Column 7 and record the number of persons in the vehicle (Columns 8 and 9). In addition, ask the camping questions (Columns 10-14). This is an area RV, but a project RRV.

(e) Columns 8 and 9. Enter the number of people in the vehicle. Just count them. Do not ask unless

it cannot be determined from observation (e.g., motor homes, vans, buses, etc.).

(3) Columns 10-43. These columns provide an indication of the recreation activities which visitors may participate in.

(a) Column 10. Ask:

HAVE YOU BEEN CAMPING AT THE PROJECT?

If YES, enter 1. If NO, enter Ø. If the answer is yes, proceed to the next question. If the answer is no and the vehicle is a project RV (Ø in Column 6), proceed to Column 15). If the vehicle is a project RRV (1 in Column 6), conclude the interview.

(b) Column 11. If the party has been camping ask:

HAVE YOU BEEN CAMPING AT THIS AREA?

If the answer is YES, enter 1. If the answer is NO, enter Ø. Then proceed to the next question.

(c) Columns 12 and 13. Ask:

HOW MANY DAYS HAVE YOU SPENT CAMPING?

Enter the number of days.

(d) Column 14. Ask:

DID YOU SHARE A CAMPSITE WITH ANOTHER PARTY?

If YES, enter 1. If NO, enter Ø. If the vehicle is a project RV (Ø in Column 6), skip to Column 18. If the vehicle is a project RRV (1 in Column 6), conclude the interview.

(e) Columns 15-16. Ask:

HOW MANY PEOPLE IN YOUR PARTY WERE PICNICKING?

If NONE, enter Ø in both Columns 15 and 16 and skip to Column 18. If YES, enter the number of persons and continue to Column 17.

(f) Column 17. Ask:

DID YOUR PARTY USE PICNICKING FACILITIES?

If YES, enter 1 in Column 17; if NO, enter Ø. Then proceed with next series of questions.

(g) Columns 18-41. These columns represent specific day-use activities. Some are seasonal and may be omitted if not appropriate for the project or season. Ask:

HOW MANY PERSONS PARTICIPATED IN THE FOLLOWING ACTIVITIES?*

Verbally go through the list with the head of the party and enter the number of persons in the appropriate columns.**

Ask if any members of the party used a launching ramp and enter the proper code in Column 22.

If the project has a boat dock or marina, ask if any members in the party used any of the facilities or services during their visit. Enter the proper code in Column 23. If there is no dock or marina, omit the question from the survey.

(Some other activities may be substituted in Columns 35 through 40 that are more appropriate for the project or seasons.)

If there are others not listed, place the number in Column 41 and list the activity in the remarks section.

(h) Columns 42-43. For all parties not camping ask:

HOW MANY HOURS DID YOUR PARTY SPEND IN DAY-USE ACTIVITIES?*

The minimum amount of time to be recorded in Columns 42 and 43 is 1 hour (Ø1). Round all parts of an hour above 1 hour to the nearest whole hour.

(4) Columns 44-48. These columns provide space for the necessary information about area of user origin, which can be used to derive distance traveled to the area. Ask:

WHAT IS YOUR HOME ZIP CODE?

Enter the Zip Code in the columns.

(5) Columns 49-51 provide information on the equipment that the visitors used.

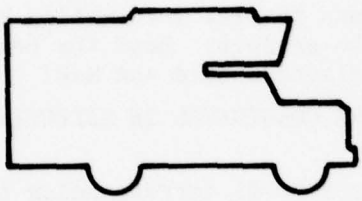
(a) Column 49. Use the card provided (see Figure 5) and enter the code for the type of camping equipment.

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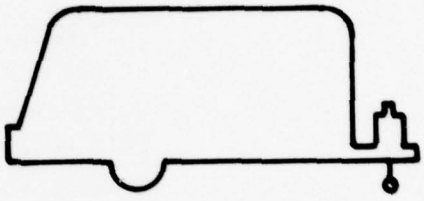
* If information by recreation area is desired rather than for the project, these questions would need to be asked of area RV's. This would require minor modifications of the questionnaire. For this reason, it is recommended that the WES research staff be available for consultation with District and project personnel.

** Additional guidelines for asking the activity questions are provided in Appendix D (also see Reference 1).

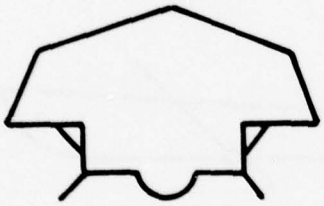
CAMPING



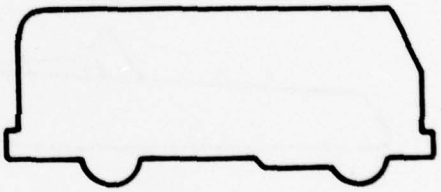
Truck Campers
Code 1



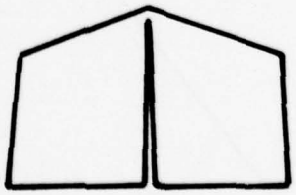
Camping Trailers
Code 2



Travel Trailers
Code 3



Motor Homes or
Self-Propelled Vans
Code 4



Tent
Code 5

Figure 5. Type of camping equipment used by party

(b) Column 50. Use the card provided (see Figure 6) and enter the code for the type of boating equipment.

(c) Column 51. Use the card provided (see Figure 7) and enter the code for the type of other recreation vehicles.

(6) Columns 52-61. These columns provide information on why the persons selected the project. Hand the head of the party the project selection card and ask:

WHICH OF THESE, IF ANY, WERE CONSIDERED IN SELECTING THIS PROJECT?

Enter 1 in any of the Columns 52-61 corresponding to an answer by the visitor.

BOATING

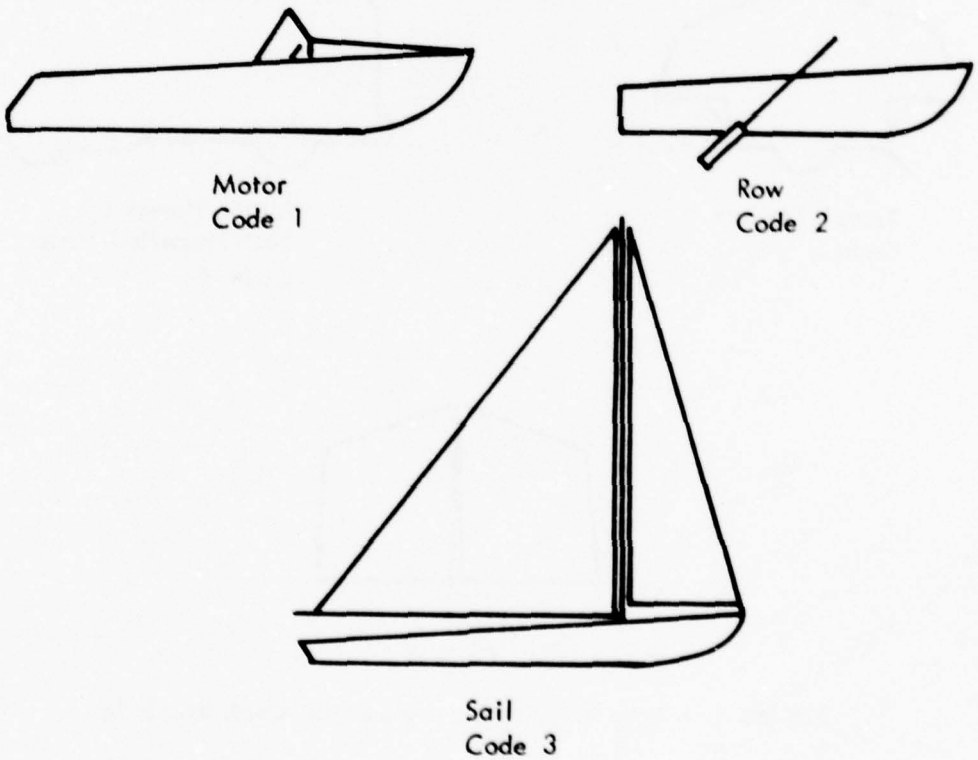
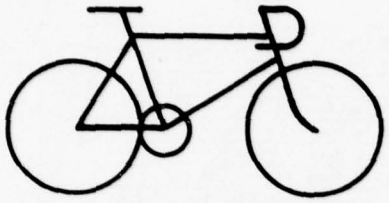
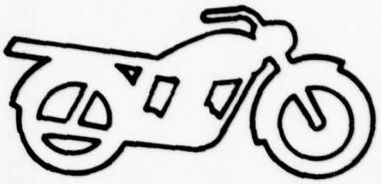


Figure 6. Type of boat used by party

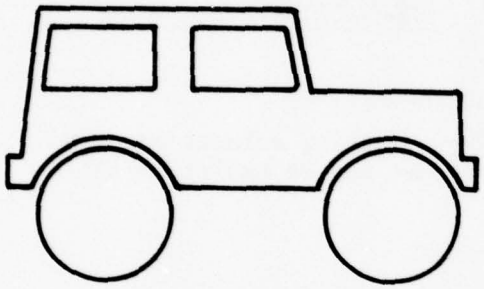
VEHICLES



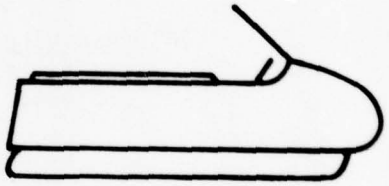
Bicycle
Code 1



Motorcycle
Code 2



Four Wheel
Code 3



Snowmobile
Code 4

Figure 7. Other recreation vehicles used by party

Column No.	List
52	Close to Home Yes - 1 No - 0
53	Recommended by Friends Yes - 1 No - 0
54	Visited Before Yes - 1 No - 0
55	Gate Attendant Yes - 1 No - 0
56	Electric Hookups Yes - 1 No - 0
57	Flush Toilets Yes - 1 No - 0
58	Boat Ramp Yes - 1 No - 0
59	Dump Station Yes - 1 No - 0
60	Nearby Attractions Yes - 1 No - 0
61	Other (List in Remarks)

Note any other reasons given under remarks.

(7) Columns 62-76. These columns provide information on user preference and desired improvements. Ask the head of the party to turn the card over and tell you:

WHAT TYPES OF IMPROVEMENTS DO YOU DESIRE AT THIS PROJECT?

Place a 1 in the appropriate column of improvements to indicate the visitor's preference.

Column No.	List
62	More Picnic Sites Yes - 1 No - 0
63	More Camp Sites Yes - 1 No - 0
64	More Group Camp Sites Yes - 1 No - 0
65	Electrical Outlets Yes - 1 No - 0
66	Flush Toilets Yes - 1 No - 0
67	Showers Yes - 1 No - 0
68	Dump Stations Yes - 1 No - 0
69	Pull Through Camp Sites Yes - 1 No - 0
70	Rifle Ranges Yes - 1 No - 0
71	Motorbike Trails Yes - 1 No - 0
72	Archery Ranges Yes - 1 No - 0
73	Tennis Courts Yes - 1 No - 0
74	Horseback Riding Yes - 1 No - 0
75	Hiking and Nature Trails Yes - 1 No - 0
76	Other Yes - 1 No - 0 (List in Remarks)

If others, list in the remarks.

(8) Remaining Columns. The remaining columns are for additional information that may be useful to the project.

PART V: ESTIMATING RECREATION VISITATION

57. The previous chapter recommended that an exit survey be used to generate the necessary recreation information to support the visitation estimation procedure. This section shows how that information will be used and provides a framework for estimating visitation in terms of the types of analyses that should be used.

General Information

58. The RRMS requires the number of recreation days of use be specified for each month of the year, as well as a total for the entire year.[6] In addition, it requires the percentage of activity use in eight activities, including picnicking, camping, swimming, waterskiing, boating, sightseeing, fishing, and hunting. The system requires the estimation of the average attendance for weekend days during the peak month(s) for both family day use and family camping. All of this information is required for each project as a whole.

59. The RRMS also requires the annual number of recreation days of use at each project area as well as the visitation to fee areas. The system, however, does not require estimation of activity days of use at individual recreation areas; many of the projects and Districts estimate this use by supplementing the survey and traffic counts with additional data collection.

60. The Heritage Conservation and Recreation Service (HCRS) requires that visitation information be assembled both in terms of visitor hours and 12-hour visitor days, as well as the more common measurement of recreation days.[8]

Definition of recreation visitation terms

61. Visitor hours, visitor days, and recreation days are defined as follows:

a. Visitor hour. This is defined as the presence of one or more persons on an area of land or water for the purpose

of engaging in one or more recreation activities during continuous, intermittent, or simultaneous periods of time, aggregating to 60 minutes.

b. Visitor day. A visitor day is defined as 12 visitor hours, which may be aggregated continuously, intermittently, or simultaneously by one or more persons.

c. Recreation day. This is defined as the presence of one person on an area of land or water for the purpose of engaging in one or more recreation activities during a portion or all of a 24-hour period.*

The procedure outlined in this report provides information that will satisfy the HCRS and RRMS data collection requirements. Essentially the Handbook presents a methodology that will estimate both 12-hour visitor days and recreation days.

Indicators of visitor use

62. In assembling visitor information, project personnel should realize that many indicators of visitor use are available for analysis. Some of these various indicators[7] are as follows:

a. Office records. Office records include information concerning conducted tours, organized group functions, camping receipts, etc.

b. Second party records. These records include activities administered by concessionaires, organized groups, public institutions, etc.

c. Membership lists. These lists include activities by clubs, organized groups, concessionaires with boat mooring spaces, boat clubs, etc.

d. Self-registration records. These records include areas where hunters, wilderness users, boaters, fishermen, etc., are required to sign in and out.

e. Traffic counters. Usually these devices are used at recreation areas with high density use and controlled access--having few entrances and exits. Traffic counters are, and no doubt will continue to be, the main information source for estimating recreation visitation on Corps lands. Therefore, guidelines for locating,

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* In many instances, the term recreation visits has been used interchangeably with recreation days. Specifically, a visit is defined as the entry of one person into a recreation area to carry on one or more recreation activities.

recording, and tabulating information from these devices have been explained in this Handbook.

f. Predetermined vehicle counts. Vehicle and/or boat counters and photography might be utilized during predetermined sampling periods when the use of traffic counters is not feasible. A technique developed by the U. S. Fish and Wildlife Service is provided in Appendix E.

g. Random vehicle counts. Vehicle counts via observation when visiting an area for another purpose might also be used when public use is not sufficient to warrant regular ranger patrols.

h. Special events. This item includes the number of spectators at boat races, water shows, dedications, etc. Where these spectators may park outside the project boundary and not cross a traffic counter, attendance estimates may be based on news clippings, interviews, observations, etc.

i. Organized camps. This type of visitation estimate includes the records of Boy Scout, Girl Scout, or church camps, and travel trailer groups. Estimates of this usage can sometimes be furnished by the sponsoring organization.

j. Walk-in visitors. Visitation estimates can also be made of those persons who gain access to Corps lands and waters without crossing a traffic counter in a recreation vehicle. Examples of such use include adjacent residents going to their docks on a lake or fishing along the shoreline or visitors from nearby business establishments (motels, resorts, etc.) who use adjacent land, water, and lakeshore. Estimates of walk-in type usage must be based on field observations and the specialized knowledge of the project managers.

A method for estimating one aspect of walk-in traffic is to establish load factors (the annual number of recreation days, etc.) to be applied to the number of second homes or permanent residences in the vicinity of a project. A technique developed and used by the Louisville District is discussed in Appendix F.[9]

Visitation Estimation Methodology

63. Some Corps Divisions and Districts have special regulations regarding the timing and type of information required from projects. The procedure described below is meant to be superimposed over existing Division and District regulations. The purpose of this procedure is to standardize recreation visitation estimation.

Visitation estimation responsibility

64. Recreation visitation estimates will be prepared on a monthly basis. The District Engineer will determine whether the data for the reports are to be computed at the project level or if the traffic count data are to be furnished to the District Office for computer analysis. Although projects in some Districts are currently applying load factors to estimate visitation, and it is expected that this may continue for some time, the Districts should attempt to shoulder this responsibility as soon as possible. In any case, raw traffic data or finished reports will be furnished to the District Office by the 10th working day of the following month (e.g., July visitation, or raw traffic data, will be furnished by 10 August).

65. Total project visitation will be the sum of the vehicle counts (with load factors applied) combined with the best estimate of visitation to lands and waters in remote areas plus any other special visitation not accounted for through traffic metering. Recreation visitation will not include persons passing over, through, or along the project, or persons who may stop momentarily to view a project area or structure. The total vehicle count to each of the reported areas will be reduced by an adjustment factor (obtained from the recreation surveys) to compensate for multiple-axle vehicles (e.g., boat and camping trailers, three-axle RV's, etc.). Adjustment in the traffic count will also be made for nonrecreation vehicles and return recreation vehicles. The general procedure in estimating visitation is outlined below:

a. Step 1. Traffic count data will be reduced to include only final exit recreation traffic.

b. Step 2. A distinction will be made between project and area visitors, if necessary. If an individual visits only one area, then he should be recorded as both a project and area visitor at that area. If he visits more than one area, his contribution to project visitation is recorded only when he makes his final departure from the project. His contribution to area visitation is recorded when he makes his final departure from each area. Project visitation is additive among all areas; area visitation is not.

c. Step 3. The exiting recreation traffic (both project

and/or area) will be converted to the total number of vehicles.

d. Step 4. Load factors will be applied to the number of exiting vehicles (both project and/or area) to estimate the number of visitors.*

e. Step 5. Another load factor (number of hours and 12-hour visitor days per visitor) will be applied to the estimate of recreation visitors (project only) to obtain the number of visitor hours and visitor days.

f. Step 6. A final load factor will be applied to the estimate of recreation visitors (both project and/or area) to estimate the recreation days.

Visitation estimation procedure
(a simple hypothetical analysis)

66. The hypothetical analysis presented here could be a single area, or a stratum of several areas, where it has been determined that a single survey provides the necessary load factors to estimate visitation for all areas. Obviously this analysis would have to be repeated for all stratified areas and combined with any other visitation information that is not picked up through traffic counters. A later example will show how this is done.

67. Table 2 presents hypothetical recreation survey data for a hypothetical project. The data are separated between weekend and weekday; it may be assumed that the data were collected by random sample and that a statistically valid estimate of population parameters was obtained.

68. As described in another section of this Handbook, traffic is split into three separate components--NRV's, RRV's and RV's. The term recreation vehicles should not be confused with RV's--those that are devoted primarily to camping (e.g., vans, buses, etc.). The term RV in this Handbook refers to any vehicle carrying visitors whose primary purpose has been recreation and who are now making a final departure from

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* Load factor, used throughout this Handbook, is a broad generic term used to describe various types of weighting factors (i.e., number of people per car, number of hours per visitor, number recreation days per visitor day, etc.). A specific definition may only be obtained by consulting the text of the Handbook.

Table 2

Hypothetical Recreation Survey Data

Weekday

	Identification of Survey Entries 000 up to 999	Total No. of Axles	NRV Yes - 1 No - 0	Returning to Project Yes - 1 No - 0	Returning to Area Yes - 1 No - 0	No. of Persons	Camping at Project Yes - 1 No - 0	Camping at Area Yes - 1 No - 0	No. Days Spent Camping	Hours Spent in Day Use Activities
1	001	2	1							
2	002	3	0	0	0	04	1	1	02	
3	003	2	0	1	1					
4	004	3	0	1	1					
5	005	4	0	0	0	02	2	0		03
6	006	2	0	0	0	03	0			02
7	007	3	0	0	0	04	1	1	01	
8	008	3	0	0	0	05	0			05
9	009	3	1							
10	010	2	0	1	1					
11	011	3	0	1	1					
12	012	3	0	0	0	04	1	1	01	
13	013	3	0	0	0	03	1	1	02	

Weekend

	Identification of Survey Entries 000 up to 999	Total No. of Axles	NRV Yes - 1 No - 0	Returning to Project Yes - 1 No - 0	Returning to Area Yes - 1 No - 0	No. of Persons	Camping at Project Yes - 1 No - 0	Camping at Area Yes - 1 No - 0	No. Days Spent Camping	Hours Spent in Day Use Activities
1	001	3	0	0	0	04	1	1	02	
2	002	3	0	0	0	05	1	1	03	
3	003	2	0	1	1					
4	004	3	0	0	0	03	1	1	02	
5	005	3	0	0	0	02	1	1	02	
6	006	3	0	0	0	04	1	1	03	
7	007	3	0	0	0	04	0			04
8	008	2	0	1	1					
9	009	2	0	1	1					
10	010	3	0	0	0	05	0			05
11	011	4	0	0	0	06	1	1	02	
12	012	3	0	0	0	03	0			02
13	013	2	0	1	1					
14	014	3	0	0	0	04	0			04
15	015	3	0	0	0	04	1	1	02	

the project or area. The vehicle could contain a group of young people who have been swimming at the beach, a family camping party, or several fishermen. For this simple example, assume that this project has only a single area. Thus, the problem of distinguishing between area and project visitation is not necessary.

69. The survey data in Table 2 are next subjected to the basic analysis necessary to develop load factors (see Table 3). At this point, it may be noted that the load factors are still in terms of weekday and weekend recreation use.

70. Before the estimate of visitation for a particular month is made, however, the factors described above must be weighted so that a single factor can be applied to axle counts. Table 4 shows how each of these factors is converted into a single factor. To develop these factors, the percentage of recreation traffic (survey data) is multiplied by the percentage of weekly distribution of vehicles for both weekday and weekend periods. This latter factor is obtained from the percentage breakdown taken directly from the counters during the survey week. This is why the traffic counters must be read at the specified times. As presented in Table 4, the weighted load factor for recreation traffic to be applied to monthly traffic counts is 0.68; the average number of axles per vehicle is 2.81; the number of recreation visitors per vehicle is 3.8; and the number of 12-hour visitor days per recreation visitor is 2.4. These data are applied to the monthly traffic counts to estimate visitation for the project. It should also be pointed out that these load factors may vary by season. This is the reason that seasonal recreation surveys are suggested for each project.

Application of the six-step procedure (a simple hypothetical example)

71. Suppose that during August, the particular project for which these hypothetical survey data are valid had a total of 37,550 axle counts (Table 5). This axle count figure would first have to be reduced to include only recreation axles. The resulting figure would be 25,534 axles. Since this is only a single area project, a distinction does not have to be made between area and project visitation. Next, the figure

Table 3

Analysis of Hypothetical Recreation Survey Data

Weekday							Weekend						
Survey Entry Number	Type Vehicle	No. Axles	Persons/ Car	How Long Stayed	Hours/ Party	Recreation Days	Survey Entry Number	Type Vehicle	No. Axles	Persons/ Car	How Long Stayed	Hours/ Party	Recreation Days
1	NRV	2	--	--	--	--	1	RV	3	4	2 days	192	8
2	RV	3	4	2 days	192	8	2	RV	3	5	3 days	360	15
3	RRV	2	--	--	--	--	3	RRV	2	--	--	--	--
4	RRV	3	--	--	--	--	4	RV	4	3	2 days	144	6
5	RV	4	2	3 hr	6	2	5	RV	3	2	2 days	96	4
6	RV	2	3	2 hr	6	3	6	RV	3	4	3 days	288	12
7	RV	3	4	1 day	96	4	7	RV	3	4	4 hr	16	4
8	RV	3	5	5 hr	25	5	8	RRV	2	--	--	--	--
9	NRV	3	--	--	--	--	9	RRV	2	--	--	--	--
10	RRV	2	--	--	--	--	10	RV	3	5	5 hr	25	5
11	RRV	3	--	--	--	--	11	RV	4	6	2 days	288	12
12	RV	3	4	1 day	96	4	12	RV	3	3	2 hr	6	3
13	RV	3	3	2 days	144	6	13	RRV	2	--	--	--	--
							14	RV	3	4	4 hr	16	4
Totals:		36	25		565	32	15	RV	3	4	2 days	192	8
							Totals:		43	44		1,623	81

	Weekday	Weekend
Recreation Traffic (percentage of RV axles)	$21/36 \times 100 = 58.3\%$	$35/43 \times 100 = 81.4\%$
Average Number Axles/RV	$21/7 = 3.00$	$35/11 = 3.18$
Average Number of Persons/RV	$25/7 = 3.6$	$44/11 = 4.0$
Average Number of Visitor Days/Person	$\frac{565 \div 12}{25} = 1.9$	$\frac{1,623 \div 12}{44} = 3.1$
Average Number of Recreation Days/Person	$32/25 = 1.3$	$81/44 = 1.8$

Table 4

Visitation Analysis of Survey Data

DISTRIBUTION OF WEEKLY VISITATION - VEHICLES DURING SURVEY PERIOD

VEHICLES

Date 7 Aug. 78 (Monday AM)	Counter Reading	43000
Date 11 Aug. 78 (Friday PM)	Counter Reading	47000
Date 14 Aug. 78 (Monday AM)	Counter Reading	50000
Vehicles DTW* (No.)	4000 or	0.57
Vehicles WE* (No.)	3000 or	0.43
Total	7000	1.00

REDUCTION FACTOR - PERCENT AXLES RECREATION TRAFFIC

Weighted	RV Distribution	WDV*
DTW	0.583 ×	0.57 DTW = 0.33
WE	0.814 ×	0.43 WE = 0.35
		0.68 WLF*

REDUCTION FACTOR - AXLES/RV

Weighted	Axles/ RV	WDV
DTW	3.00 ×	0.57 DTW = 1.71
WE	3.18 ×	0.43 WE = 1.37
		3.08 WLF

LOAD FACTOR - PERSONS/VEHICLE

Weighted	Persons/ Vehicle	WDV
DTW	3.6 ×	0.57 DTW = 2.1
WE	4.0 ×	0.43 WE = 1.7
		3.8 WLF

(Continued)

* DTW - During the week; WE - Weekend; WDV - Weekly distribution of vehicles; WLF - Weighted load factors.

Table 4 (Concluded)

LOAD FACTOR - VISITOR DAYS/PERSON

Weighted	12-Hr Visitor Days/Person	WDV
DTW	1.9 ×	0.57 DTW = 1.1
WE	3.1 ×	0.43 WE = 1.3
		2.4 WLF

LOAD FACTOR - RECREATION DAYS/PERSON

Weighted	Recreation Days/Person	WDV
DTW	1.3 ×	0.57 DTW = 0.74
WE	1.8 ×	0.43 WE = 0.77
		1.51 WLF

Table 5

Hypothetical Visitation Estimate

(Corps Project, Somewhere, USA)

Date July 31, 1978 — Counter Reading 10,250

Date Aug. 31, 1978 — Counter Reading 47,800

Total Axles (Aug.) 37,550

Step 1 - REDUCTION - PERCENT RECREATION TRAFFIC

$37,550 \times 0.68 = 25,534$ Axles

Step 3 - REDUCTION - NUMBER OF VEHICLES*

$$\frac{25,534}{3.08 \times 2} = 4,145 \text{ Vehicles}$$

(round trip)

Step 4 - LOAD FACTOR - NO. OF PERSONS

$4,145 \times 3.8 = 15,751$ Persons (or visitors)

Step 5 - LOAD FACTOR - NO. OF 12-HOUR VISITOR DAYS

$15,751 \times 2.4 = 37,802$ 12-Hr. Visitor Days

Step 6 - LOAD FACTOR - NO. OF RECREATION DAYS

$15,751 \times 1.51 = 23,784$ Recreation Days

* This project has only one recreation area; thus, step two has been eliminated.

would have to be reduced to an estimate of the recreation vehicles. Assuming all vehicles pass over the counter(s) twice in arriving at and departing from area(s) (assuming a single exit), the recreation axle count would have to be divided by twice the average number of axles per recreation vehicle (3.08 × 2). If a multiple entry/exit exists, then traffic counts would have to be combined and a survey conducted to determine the appropriate factors to reduce the multiple counts. It may be noted that a total of 4,145 recreation vehicles arrived at the project during the month of August. These basic calculations are required to compute the number of recreation visitors, 12-hour visitor days, and recreation days. Utilizing the hypothetical load factors and the Steps 1 and 3 procedure, it will be noted that 15,561 recreation visitors arrived at the project during August; a total of 37,802 12-hour visitor days and 23,784 recreation days were spent at the project. The larger number of visitor days compared with recreation days indicates that the project probably included a camping area. If the project predominantly entertained day use, then the number of recreation days could have exceeded the number of 12-hour visitor days.

Distinction between
project and area visitation

72. The previous example was for a simple, single area project. A multiple area project presents a more complex problem. In these cases, a party may visit more than one area. Their contribution to project attendance is only counted at the area of final departure. Their contribution to individual area attendance is counted as they make a final departure from each area.

73. The procedure previously described in the hypothetical example will be used to estimate area and project visitation. A major difference is that the survey results are used to distinguish between area and project visitors. Columns 6 and 7 of the survey provide the data necessary to make this distinction. The same basic statistics and load factors (see one area example) must be calculated for both the area and project visitors.

74. The best way to visualize the difference between area and/or

project visitation is to review the possible survey responses (see Table 6). In this table three possible responses categorize recreation visitors into project and area RV's, or project RRV's and area RV's, or project and area RRV's.

Table 6

Survey Data Utilized to Distinguish Between Area and/or Project Visitors

Columns on the Survey Form	Possible Survey Responses		
	1	2	3
6*	No	Yes	Yes
7**	No	No	Yes
	Project and Area RV	Project RRV, Area RV	Project and Area RRV

* Returning to project.
** Returning to area.

75. Respondent No. 1 will not be returning to the project or area. The statistics from this type of response should be included in the development of load factors for both project and area visitation.

76. Respondent No. 2 is an area RV and a project RRV. He indicates he will be returning to the project the day of the survey (Column 6), but he will not be returning to the specific area under study. For the project he is an RRV, but for the area he is a departing vehicle. These statistics should be included in the estimation of area visitation for the particular area under study. In concept, the group's statistics (vehicle traffic count) will be included at another area for the estimation of project visitation.

77. Respondent No. 3 is an RRV for both the project and area. Only his axle count will be utilized in the development of load factors for the project and area.

78. A set of hypothetical data for a single area (or strata of areas) is presented in Table 7. Using Columns 6 and 7, as suggested above, the vehicles are classified into NRV's, RRV's, and RV's. A distinction is made between project and/or area RV's and RRV's.

79. Utilizing the hypothetical data set (Table 7), load factors are developed for one area (or strata of areas) as presented in Table 8. It will be noted that the same types of load factors (as described for the simple, one area project) must be developed to estimate both project and area visitation. These load factors include: (a) percentage of recreation traffic, (b) the average number of axles per recreation vehicle, (c) the number of visitors per recreation vehicle, (d) the number of visitor days per visitor (project only), and (e) the number of recreation days per visitor.*

80. It may be noted in the hypothetical, multiarea example that the survey data (Table 7) are used to develop load factors for estimating project and area visitation (Table 8).** These load factors will be applied to the traffic count at recreation areas and any other areas in that stratum to estimate both project and area visitation.

81. Hypothetical traffic count data from five recreation areas are converted into the number of recreation vehicles and visitors in Table 9. It is assumed in this example that all areas are in the same stratum. Thus, the same load factors are applied to the traffic counts at each area. At a real project, a separate set of load factors (for both project and area visitation) will have to be developed for each area (or strata of areas) on the project. It may be noted from the

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* The number of 12-hour visitor days (per visitor, recreation traffic) is only required for the project as a whole.

** It will also be noted that weekend and weekday traffic have not been separated in Tables 7-9. To do this would have complicated the example. Weekend and weekday load factors are, however, to be developed using the same procedure as described for the simple, one area project.

Table 7

Hypothetical Recreation Survey Data

(Area Versus Project Vehicle Classification)

	ID	VEHICLE CLASS (No. Persons)										Type of Vehicle
	Identification of Survey Entries 000 up to 999	Total No. of Axles	NRV Yes - 1 No - 0	Returning to Project Yes - 1 No - 0	Returning to Area Yes - 1 No - 0	No. of Persons	Camping at Project Yes - 1 No - 0	Camping at Area Yes - 1 No - 0	No. Days Spent Camping	Hours Spent in Day Use Activities	
	1 2 3	4	5	6	7	8 9	10	11	12 13	42 43	
1	001	3	1			1			1	1	NRV
2	002	2	0	1	0	02	1	1	02	1	Project RRV, Area RV
3	003	3	0	1	0	05	0			1	Project RRV, Area RV
4	004	2	0	1	0	03	1	0	01	1	Project RRV, Area RV
5	005	2	0	0	0	02	0			04	Project and Area RV
6	006	2	0	0	0	02	1	1	03	1	Project and Area RV
7	007	3	0	1	1	1				1	Project and Area RRV
8	008	4	0	0	0	05	1	0	02	1	Project and Area RV
9	009	2	0	1	0	03	0			1	Project RRV, Area RV
10	010	5	1			1				1	NRV
11	011	3	0	0	0	04	1	1	04	1	Project and Area RV
12	012	4	0	1	0	03	1	1	01	1	Project RRV, Area RV
13	013	2	0	1	1	1				1	Project and Area RRV
14	014	2	0	0	0	02	0			05	Project and Area RV
15	015	2	0	0	0	02	0			02	Project and Area RV
	1 2 3	4	5	6	7	8 9	10	11	12 13	42 43	

Table 8

Analysis of Hypothetical Survey Data

(Project versus Area Visitation)

Project Visitation							Area Visitation					
Survey Entry Number	Type Vehicle	No. Axles	Persons/ Car	How Long Stayed	Hours/ Party	Recreation Days	Survey Entry Number	Type Vehicle	No. Axles	Persons/ Car	How Long Stayed	Recreation Days
1	NRV	3	--	--	--	--	1	NRV	3	--	--	--
2	RRV	2	--	--	--	--	2	RV	2	2	2 days	4
3	RRV	3	--	--	--	--	3	RV	3	5	day user	5
4	RRV	2	--	--	--	--	4	RV	2	3	day user	3
5	RV	2	2	4 hr	8	2	5	RV	2	2	day user	2
6	RV	2	2	3 days	144	6	6	RV	2	2	3 days	6
7	RRV	3	--	--	--	--	7	RRV	3	--	--	--
8	RV	4	5	2 days	240	10	8	RV	4	5	day user	5
9	RRV	2	--	--	--	--	9	RV	2	3	day user	3
10	NRV	5	--	--	--	--	10	NRV	5	--	--	--
11	RV	3	4	4 days	384	16	11	RV	3	4	4 days	16
12	RRV	4	--	--	--	--	12	RV	4	3	1 day	3
13	RRV	2	--	--	--	--	13	RRV	2	--	--	--
14	RV	2	2	5 hr	10	2	14	RV	2	2	day user	2
15	RV	2	2	2 hr	4	2	15	RV	2	2	day user	2
Totals:		41	17		790	38	Totals:		41	33		51

	Project Visitation	Area Visitation
Recreation Traffic (percentage of RV axles)	15/41 × 100 = 36.6%	28/41 × 100 = 68.3%
Average Number of Axles/RV	15/6 = 2.50	28/11 = 2.55
Average Number of Persons/RV	17/6 = 2.8	33/11 = 3.00
Average Number of Visitor Days/Person	$\frac{790 \div 12}{17} = 3.9$	No calculation
Average Number of Recreation Days/Person	38/17 = 2.2	51/33 = 1.6

Table 9

Hypothetical Visitation Estimate for a Multiarea Recreation Project

Recreation Areas	Traffic Count	Project Visitation				Area Visitation		
		Vehicles	Visitors	Visitor Days	Recreation Days	Vehicles	Visitors	Recreation Days
A	38,500*	2,818**	7,890**	30,771**	17,358**	5,156**	15,468**	24,749**
B	72,000*	5,270	14,756	57,548	32,463	9,642	28,926	46,282
C	54,250*	3,971	11,119	43,364	24,462	7,265	21,795	34,872
D	100,500*	7,357	20,600	80,340	45,320	13,459	40,377	64,603
E	97,350*	7,126	19,953	77,817	43,897	13,037	39,111	62,578
Totals:		26,542	74,318	289,840	163,500			

	Project Visitation	Area Visitation
Steps 1 and 2:	38,500 × 0.366 = 14,091 axles	38,500 × 0.683 = 26,296 axles
Step 3:	14,091/2.50 × 2 = 2,818 vehicles	26,296/2.55 × 2 = 5,156 vehicles
Step 4:	2,818 × 2.8 = 7,890 visitors	5,156 × 3.0 = 15,468 visitors
Step 5:	7,890 × 3.9 = 30,771 visitor days	No calculations
Step 6:	7,890 × 2.2 = 17,358 recreation days	15,468 × 1.6 = 24,749 recreation days

* Taken from the traffic counters at each area (total number of axles).

** Visitation methodology (an example for Area A).

table that the project visitation is additive. By using the procedure described in the Handbook, the project visitation is a net figure. It eliminates the double counting caused by multiple area visitation. However, it must be recognized that the project visitation data are only meaningful when aggregated to the project level. Area visitation data are nonadditive for the project as a whole and are only meaningful at the area level.

Special visitation estimation problems

82. The preceding visitation calculations will account for a large portion of visitation to Corps projects. However, the techniques described above will probably be limited to recreation areas administered by the Corps of Engineers unless the project staff monitors traffic and administers surveys on outgrant areas. Other areas that contribute to the total visitation at each project include state and county parks, marinas, and unimproved areas.

83. State and local facilities. Ideally, these areas should be surveyed just as Corps areas are. Every effort should be made to have each state park do this. To check the validity of state park data, traffic counters can be positioned at appropriate locations to measure traffic flow. If manpower shortages, etc., prevent both the state and Corps personnel from surveying the area, load factors, percentages of day use and camping, etc., of similar areas may be applied to traffic counter readings.

84. Concession areas and marinas. Traffic counters are necessary at concession areas and marinas where they are separate from Corps recreation areas. Short surveys should provide an adequate breakdown of use types. Loads factors can then be developed and applied to traffic counter readings to obtain recreation visitation estimates.

85. Unimproved areas. An unimproved area is defined as all portions of project lands other than major recreation developments. Examples of unimproved areas are dead-end roads, hunter access areas, small gravel parking lots with or without boat launching ramps, wildlife management areas, and outgrant lands with little development.

86. It is not feasible to measure visitation on every square foot of project land. Since most visitation originates from motor vehicles, traffic to and from vehicular access points must be measured. All potential vehicular access points should be identified and numbered in some way at each project. Traffic counters should be rotated among unimproved area access points on a schedule to be decided upon by project personnel. Types of use should not vary much from area to area, but may vary from season to season. Short surveys or personal observations can be made to determine load factors and percentages of day use or overnight camping. These can then be applied to traffic counter readings to estimate recreation use. These figures may also be expanded to include all unimproved areas. For example, if one-sixth of all unimproved areas have traffic counters, the total recreation days calculated from these areas would be multiplied by six to obtain the total number of recreation days for all unimproved areas.[8]

87. Vehicle observation and hand counters can also be used to measure visitation if traffic counters are not feasible, but public use is sufficient to warrant regular ranger patrols. In these cases, a predetermined sampling plan may be designed around the patrol periods. This will provide statistical validity to the observed data. The U. S. Fish and Wildlife Service uses a predetermined vehicle sampling plan for estimating visitation in the remote areas of National Wildlife Refuges.[7] Appendix D describes this methodology; such a program could be used to estimate use on unimproved Corps project lands.

88. Vehicle counts by observation can also be used to estimate visitation when sufficient public use does not warrant regular ranger patrols. The procedures described in Appendix E can be generally followed except for the scheduling of the sampling periods. When Corps personnel visit an area for purposes other than collecting recreation use data, the ranger can obtain the same type of information (day, time, recreation use, etc.). At the end of the month or estimation period, this information might then be used to estimate recreation visitation for the respective stratum they represent. There is a chance of some bias, however, since visits to areas for purposes other than data

collection may not be random in nature (i.e., periodic maintenance, etc.).

Recreation Activity Estimation Methodology

89. The percentage of activity use by project is another data requirement of the RRMS. The percentage of visitors at each project participating in the following activities will be developed annually; picnicking, camping, swimming, waterskiing, boating, sightseeing, fishing, and hunting. The information provided by the recreation survey, in combination with the recreation traffic count, enables District and project personnel to estimate this data component. It should be noted that the methodology presented in this Handbook is for determining percentage of activity use at the project level. Since activity participation for area visitors is not obtained in the survey (other than camping), the composition of activity use for areas must be determined by other means. The methodology for estimating activity use at the project level is provided below.

90. Table 10 presents hypothetical survey data, including activity participation. It may be noted that these are the same data from the previous multiarea example.* It will be noted that activity participation is only available for project visitors. The first step is to total the number of visitors included in the recreation survey (sum of columns 8 and 9). There are 17 project visitors in this hypothetical survey (see Table 11). Next, the percentage participating in each of the activities is determined by computing the ratio of the number of visitors participating by activity to the total number of visitors. Participation rates are developed for the hypothetical survey data in Table 11. These rates are applicable to all project visitors at this area (or

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* As with the multiarea example, the weekday and weekend survey data have not been separated. This was done to simplify explanation of the methodology. Weighting factors should be developed in actual application to account for differences in weekend/weekday traffic characteristics.

Table 10

Hypothetical Recreation Survey Data

(Number of Persons Participating in Activities)

	ID	VEHICLE CLASS (No. Persons)					ACTIVITIES																									
	Identification of Survey Entries (00 up to 999	Total No. of Axles	N.P./ Yes - 1 No - 0	Returning to Project Yes - 1 No - 0	Returning to Area Yes - 1 No - 0	No. of Persons	Camping at Project Yes - 1 No - 0	Camping at Area Yes - 1 No - 0	No. Days Spent Camping	State Camp Area Yes - 1 No - 0	No. Persons Picnicking	Used Picnicking Facilities Yes - 1 No - 0	No. Persons Boating	No. Persons Fishing from Boat	No. Persons Fishing from Shore	Use Launching Ramp Yes - 1 No - 0	Visit Dock or Marina Yes - 1 No - 0	No. Persons Hunting	No. Persons Sightseeing (Only)	No. Persons Skiing	No. Persons Swimming	No. Off Road Vehicling	No. Persons Hiking	No. Persons Nature Study	No. Persons Ice Fishing	No. Persons Snowmobiling	No. Persons Snowshoeing	No. Persons Cross Country Skiing	Other (List in Remarks)	Hours Spent in Day Use Activities
	1 2 3	4	5	6	7	8 9	10	11	12 13	14	15 16	17	18 19	20	21	22	23	24	25 26	27 28	29 30	31	32 33	34	35	36	37 38	39	40	41 43
1	001	3	1																											
2	002	2	0	1	0	02	0																							
3	003	3	0	1	0	05	1	1	02	0																				
4	004	2	0	1	0	03	0																							
5	005	2	0	0	0	02	1	1	03	1			02	2							01									
6	006	2	0	0	0	02	0								2														01	
7	007	3	0	1	1																									
8	008	4	0	0	0	05	1	0	04	0			05	3		1					03		02							
9	009	2	0	1	0	03	1	1	02	0																				
10	010	5	1																											
11	011	3	0	0	0	04	0				04	0	04			1	1			02	04								04	
12	012	4	0	1	0	03	0																							
13	013	2	0	1	1																									
14	014	2	0	0	0	02	0						02			1				01	02								02	
15	015	2	0	0	0	02	1	0	02	0					2						02		02							
	1 2 3	4	5	6	7	8 9	10	11	12 13	14	15 16	17	18 19	20	21	22	23	24	25 26	27 28	29 30	31	32 33	34	35	36	37 38	39	40	41 43

Table 11

Analysis of Hypothetical Survey Data (Percent Participating in Activities)

Survey Entry Form	Type Vehicle	No. of Persons/ Car	Project Visitation (see Table 8)* Number of Persons Participating In Camping	Picnicking	Boating	Fishing**	Waterskiing	Sightseeing	Swimming	Hiking
1	NRV	--	--	--	--	--	--	--	--	--
2	RRV	--	--	--	--	--	--	--	--	--
3	RRV	--	--	--	--	--	--	--	--	--
4	RRV	--	--	--	--	--	--	--	--	--
5	RV	2	2	--	2	2	--	--	1	--
6	RV	2	--	--	--	2	--	--	--	--
7	RRV	--	--	--	--	--	--	--	--	--
8	RV	5	5	--	5	3	--	--	3	2
9	RRV	--	--	--	--	--	--	--	--	--
10	NRV	--	--	--	--	--	--	--	--	--
11	RV	4	--	4	4	--	2	--	4	--
12	RRV	--	--	--	--	--	--	--	--	--
13	RRV	--	--	--	--	--	--	--	--	--
14	RV	2	--	--	2	--	1	--	2	--
15	RV	2	2	--	--	2	--	--	2	2
Totals:		17	9	4	13	9	3	0	12	4
Percent Participating		--	53†	24	76	53	18	0	71	24

* Other than camping, activity participation is only available for project visitors.

** Total of the number of persons fishing from boats and shore.

† Example: $\frac{9 \text{ persons camping}}{17 \text{ persons surveyed}} \times 100 = 53\%$.

strata of areas). Obviously, data from a real project would be more representative than this example; the rates in the example are based on response from only six vehicles.

91. Participation rates must next be developed for application to project visitors for all areas (or strata of areas) on the projects. These rates, along with the estimated number of project visitors by area, are intermediate data necessary to calculate the percentage of recreation activity by project. They have little meaning by themselves until they are combined for the whole project. To provide a more meaningful example, Table 12 contains hypothetical data of the percentage of recreation activity at a project with five recreation areas. It may be assumed that these participation factors were developed using the procedure described above and actual survey data. The number of project visitors* to each area (or strata of areas) is then multiplied by the participation rates to estimate the number of visitors participating in each of the activities (lower half of Table 12). The percentage participating in each of the recreation activities is finally computed for the project as a whole.

92. It should be evident from this example that if visitation increases sharply at some areas, the annual project percentage activity distribution could be quite different. If visitation at all areas is growing at approximately the same rate, the overall percentage of activity participation will be similar to the previous year's estimate. Of course as the survey is updated, new factors will have to be developed for application to the number of project visitors.

93. An example of the analysis of zip codes, recreation equipment used, factors affecting selection of the projects and improvement preferences has not been developed for the Handbook. Development of this type of information is optional. Although the previously described methodology can generally be extended to include those analyses,

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* The previously described procedure for estimating the number of project visitors for a multiarea project will be utilized (see hypothetical example in Table 9).

Table 12

Percent of Recreation Activity at a Hypothetical Corps Project

Percent of Project Visitors Participating by Recreation Activity (Hypothetical Data)

Recreation Strata	Camping	Picnicking	Boating	Fishing	Waterskiing	Sightseeing	Swimming	Hunting
A	35	15	25	5	20	40	10	2
B	30	25	30	10	25	50	15	5
C	50	5	25	8	20	45	10	3
D	10	10	30	10	20	25	15	2
E	35	25	30	12	25	45	20	8

Application of Participation Rates (% above) to the Estimated Number of Project Visitors

Recreation Strata	Project Visitors	Camping	Picnicking	Boating	Fishing	Waterskiing	Sightseeing	Swimming	Hunting
A	28,000	9,800	4,200*	7,000	1,400	5,600	11,200	2,800	560
B	8,500	2,550	2,130	2,550	850	2,130	4,250	1,280	430
C	3,900	1,950	200	980	310	780	1,760	390	120
D	9,200	920	920	2,760	920	1,840	2,300	1,380	180
E	34,000	11,900	8,500	10,200	4,080	8,500	15,300	6,800	2,720
Totals:	83,600**	27,120	15,950	23,490	7,560	18,850	34,810	12,650	4,010
Percent by Use Activity:	100	32	19†	28	9	23	42	15	5

* Example: 28,000 × 0.15 = 4,200.

** Total project visitors.

† Example: (15,950 ÷ 83,600) × 100 = 19%.

several cautions should be observed:

a. Survey data for these entries will only be available for project RV's. Therefore, the analysis will only be useful for application at the project level.

b. The percentage responding to these entries will be in comparison to the total number of survey entries (e.g., 12 percent of vehicles contained parties that were using tents). Thus, the load factors will be applied to the total number of vehicles represented by the traffic count data (total recreation traffic adjusted for the average number of axles).

c. Multiresponses are possible, thus percentages may exceed 100 percent (e.g., a project may be selected for more than one reason: electric hookups, flush toilets, dump station).

Estimating Boating Use

94. Boat use estimates are not required on a monthly basis for RRMS. However, it is often desirable to know how many boats are using Corps lakes during a season. These figures are often requested by various planning elements and are used in the Annual Report (ENG Form 4378). In the past, most Districts have simply estimated these values. Using the revised survey form, these figures can be calculated by applying percentage distributions for three activities to total visitation estimates for a project, as illustrated below:

a. Example. From traffic counter readings and calculations, there were 950,000 recreation days at a hypothetical Corps project. Using recreation survey data to develop weighting and loading factors (see Tables 13 and 14), the following computations can be made of boating use.

15% Pleasure boating (weighted); weighted load factor = 2.9.

12% Fishing from boat (weighted); weighted load factor = 2.8.

8% Skiing (weighted); weighted load factor = 4.5.

b. Pleasure Boating.

15% × 950,000 = 142,500 recreation days spent boating for pleasure.

142,500 ÷ 2.9 = 49,100 boats used for pleasure.

Table 13

Boat Weighting Factors*

Pleasure Boating

DTW 50 (B) : 342 (PS) = 15%
WE 70 (B) : 546 (PS) = 13%

Boating--Weighted %

DTW 15% × 57% WDV = 9%
WE 13% × 43% WDV = 6%

15% Boating (Weighted)

Fishing from Boat

DTW 35 (FB) : 342 (PS) = 10%
WE 73 (FB) : 546 (PS) = 13%

Fishing from Boat--Weighted %

DTW 10% × 54% WDV = 6%
WE 13% × 43% WDV = 6%

12% Fishing from Boats (Weighted)

Waterskiing

DTW 23 (SK) : 342 (PS) = 7%
WE 54 (SK) : 546 (PS) = 10%

Skiing--Weighted %

DTW 7% × 57% WDV = 4%
WE 10% × 43% WDV = 4%

8% Skiing (Weighted)

Table Definitions

B - No. of persons boating for pleasure
FB - No. of persons fishing from boats
SK - No. of persons waterskiing
PS - No. of persons surveyed

* Adapted from U. S. Army Engineer District, St. Louis, "Recreation Use Survey Manual."[8]

Table 14

Boat Loading Factors*

Boating Load Factor

DTW 50 (B) : 18 No. Entries Boating DTW = 2.8 DTW Boating LF
WE 70 (B) : 23 No. Entries Boating WE = 3.0 WE Boating LF

DTW Boating LF 2.8 × 57% WDV = 1.6
WE Boating LF 3.0 × 43% WDV = 1.3

2.9 WLF - Boating

Fishing from Boat Load Factor

DTW 35 (FB) : 12 No. Entries Fishing from Boat DTW = 2.9 DTW Fishing from Boat LF
WE 75 (FB) : 28 No. Entries Fishing from Boat WE = 2.6 WE Fishing from Boat LF

DTW Fishing from Boat LF 2.9 × 57% WDV = 1.7
WE Fishing from Boat LF 2.6 × 43% WDV = 1.1

2.8 WLF - Fishing from Boat

Skiing Load Factor

DTW 23 (SK) : 5 No. Entries Skiing DTW = 4.6 DTW Skiing LF
WE 54 (SK) : 12 No. Entries Skiing WE = 4.5 WE Skiing LF

DTW Skiing LF 4.6 × 57% WDV = 2.6
WE Skiing LF 4.5 × 43% WDV = 1.9

4.5 WLF - Skiing

Table Definitions

B - No. of persons boating for pleasure
LF - Load factor (No. persons/boat)
FB - No. of persons fishing from boats
SK - No. of persons waterskiing

Note: Assume every line item indicating boating, fishing from boat, or waterskiing represents one boat.

* Adapted from U. S. Army Engineer District, St. Louis, "Recreation Use Survey Manual."[8]

c. Fishing.

12% × 950,000 = 114,000 recreation days spent fishing from boats.

142,500 ÷ 2.8 = 40,700 boats used for fishing.

d. Waterskiing.

8% × 950,000 = 76,000 recreation days spend waterskiing.

76,000 ÷ 4.5 = 16,900 boats used for waterskiing.

e. Total.

49,100 pleasure boats + 40,700 fishing boats + 16,900 waterski boats = 106,700 boats entered the lake.

Limitations in Estimating Recreation Visitation

95. The purpose of this Handbook is to present in layman's terms a methodology that will standardize both data collection and analysis for estimating recreation visitation. The primary data system for cataloging recreation visitation is the RRMS. Therefore, the methodology presented is limited to developing statistics for this system. The RRMS primarily requires project information; this is particularly true with regard to the recreation activity distribution. The Handbook does present a methodology that will separate project visitors from area visitors and enable users to estimate the number of recreation days by project area. These are only a part of the total statistics that are desirable in managing recreation areas on Corps projects. The Handbook methodology can easily be expanded to estimate some of these important statistics, but it will require modification of the Handbook procedures. Thus, it is recommended that project and District personnel work closely with the WES staff in modifying the procedures and guidelines for project use.

96. It is expected that during the next few years periodic workshops for training Corps personnel in the use of the procedures described in this Handbook will be held throughout the United States. At that time some of the desirable modifications should be discussed. Since workable field procedures will be implemented around the broad Handbook guidelines, it is suggested that these workshops address major

implementation problems and approaches that will enable project and District personnel to use the procedures.

97. Finally, effective implementation to improve recreation information throughout the Corps of Engineers will require commitment to training and quality control. Part of this commitment must come through OCE in terms of personnel and budget adjustments. In the final analysis, however, personnel of Districts and projects must effectively use this Handbook to expand their understanding and capability to estimate recreation visitation.

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APPENDIX A: TECHNIQUE FOR ESTIMATING MISSING AXLE*

(Count Readings)

* This appendix was taken directly from D. R. McCurdy, "A System for Measuring Public Use On the National Wildlife Refuges," Nov 1968, Branch of Public Use, Division of Wildlife Refuges, Bureau of Sport Fisheries and Wildlife, Washington, D. C.

1. When a traffic counter becomes inoperative or for any other reason the counter reading is not obtained, the missing reading can be estimated if readings are also being obtained at sites receiving similar amounts of public use during the time period in question. Four of the five sites at Crab Orchard, when tested statistically for a correlation between quantity of use, were found to have r of greater than 0.900.

2. Assuming for the example below at Site A, the counter was broken during the period preceding the fourth reading. However, since Site B received an equal proportion of use during the preceding recording periods, to estimate the missing counter reading (fourth), the percentage increase in axle counts for Site B can be added to Site A's third axle count reading:

Traffic Counter Readings	Number of Axles		
	Site A	Site B	
1	6,000	10,000	~ 8% increase
2	6,500	10,800	~ 11+% increase
3	7,225	12,000	~ 4+% increase
4	Missing Reading	12,500	

12,500 Site B, 4th Reading
12,000 Site B, 3rd Reading
500 + 12,000 Site A, 3rd Reading - 0.042 percentage increase in axle count, Site B
7,225 Site A, 3rd reading
0.042 (see above)
300 increase in axle counts
+7,225 Site A, 3rd reading
7,525 Site A, estimated 4th axle count reading

APPENDIX B: PLACEMENT OF TRAFFIC COUNTERS*

(Two Hypothetical Examples)

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* This appendix was taken directly from E. W. Wood, "Report on the Collection of Public Use Data on the Seven Lakes Within the Vicksburg District," Aug 1975, Vicksburg District, Vicksburg, Miss. Only minor changes were made in the text to expand the concept to all Corps Districts.

1. Interpretation of visitation and activity participation depends upon the specific location of the traffic counters.* Ideally, the counter should be located so as to measure visitation at specific sites rather than in general areas containing several recreational sites. Figure B1 illustrates some of the locational considerations at sites other than the dam. Recreational planners and those more interested in the degree of use of specific types of facilities and of specific sites around the lake would, presumably, opt for location of traffic counters at places such as those designated by "I" on Figure 1. In this way, Class A camping is distinguished from primitive camping, and day-use boating and picnicking are distinguished from camping, and certainly visitation and activities at this recreational site are carefully distinguished from visitation and activities at the site 2.1 miles farther down the access road. Such placements are far from trouble-free, however. Aside from the considerable expense of maintaining, reading, and processing the data from a large number of traffic counters, there are several important problems with such placement. The beach will be used by visitors to both camp areas and by day-use visitors who will likely park in both the adjacent camping area and the picnic ground area. Similarly, campers and day-use visitors will use the boat launching facility. Traffic counters located adjacent to campgrounds are likely to encounter many of the same kinds of artificial counts as those located close to residences. In short, the area will develop its own internal traffic flow that will effectively obscure the ability of the traffic counters located in position I to discriminate between uses and areas. As with residential area placement, conduct of the roadside survey is likely to upset the usual activity in the area and result in incorrect vehicle adjustment factors that would otherwise be able to compensate for the internal traffic flow.

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* Preparation of this section relied heavily upon George A. James, "Instructions for Using Traffic Counters to Estimate Recreation Visits and Use of Developed Sites," Apr 1966, U. S. Department of Agriculture - Forest Service, Southeastern Forest Experiment Station, Asheville, North Carolina.

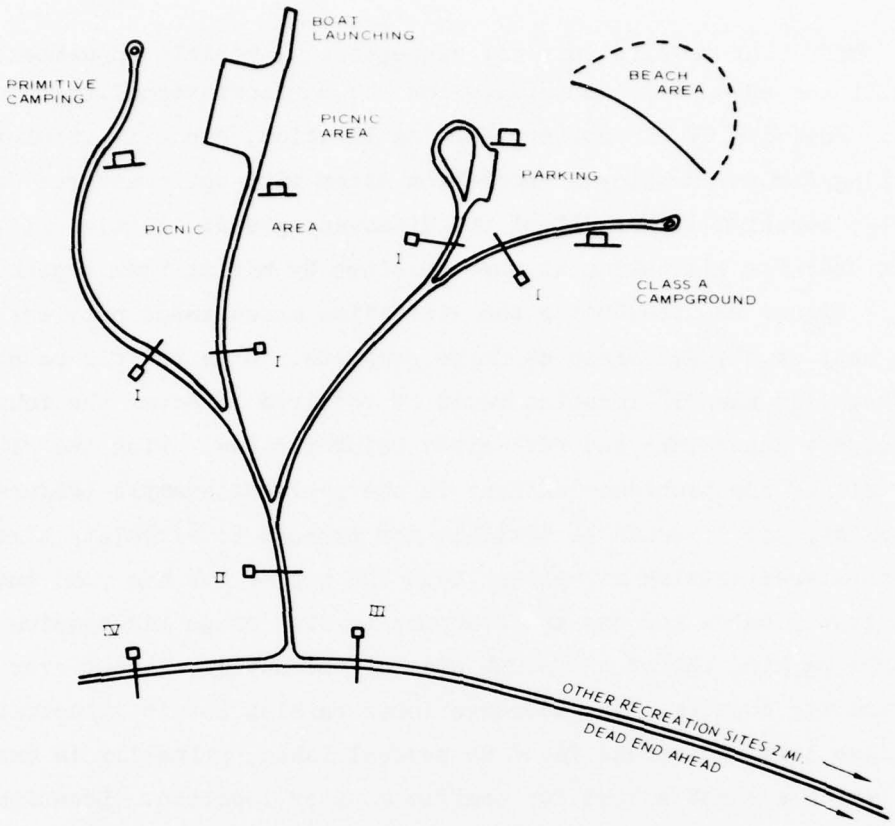


Figure B1. Some possible traffic counter locations

2. Placement at point II involves a smaller number of traffic counters and, consequently, less maintenance, reading, and calculating cost. Visitation and activity estimates based on counters located at position II tend to be less specific, but if the description of the traffic and other count-developing activities within the site are accurate, location II may effectively avoid many of the misstatements that would occur if location I were used.

3. Placement at point III would seem to measure the same thing for the recreation site 2.1 miles farther down the road that is measured by a counter at location II for the site pictured. However, this may not be true since along 2.1 miles of road there may be residences or private land used for agriculture or other nonrecreational purposes. Furthermore, a counter at location III is likely to pick up a great deal of casual traffic that turns around well before the recreational site is reached. As in many other cases, such traffic tends to be discouraged

by the conduct of on-site surveys; consequently, vehicle adjustment factors will not adequately compensate for the nonrecreational traffic.

4. Position IV is another tempting location, since it involves accounting for two developed recreation sites with one counter. Unfortunately, location IV has all of the disadvantages of location III, and also it obscures visitation at the two sites by mixing them together.

5. Figure B2 illustrates the visitation measurement problems common to many of the dam areas at Corps projects. Nine traffic counters (not shown) in the "I" location would be required to cover the four sites on the upper lake and five sites below the dam. With the "I" sites, all of the problems inherent in the previous example (Figure 1) would exist, and it would be possible for persons to circulate through the entire area driving at will on both the top of the dam road and the state highway below the dam and stopping to fish or go sightseeing at the large parking lot on the south side of the outlet without ever crossing a traffic counter. The aforementioned parking lot is illustrative of similar lots and aprons found at several lakes, primarily in dam areas, which are not suited for traffic counter location. Location I would have the distinct advantage of not counting through traffic on the state highway and county road. Unless location I is selected, with its attendant problems, the vehicle count adjustments will be required to compensate for an inflated count caused by persons living in the area and going to work, school, market, and so on, plus various kinds of business and government traffic (including Corps of Engineers office, construction, service, and maintenance vehicles).

6. Placement of the traffic counters in the five locations labeled "II" would count all vehicles entering the dam site and without recording a major portion of the traffic circulating within the site. As noted above, location II would require massive vehicle adjustment factors for NRV's. The largest advantage of the placement at point II would be the effective separation of a count for the four upper lake sites and the six (including the outlet channel lot) below-the-dam recreation areas. Unfortunately, persons going north on the county road and choosing to drive the below-the-dam road through the project will be

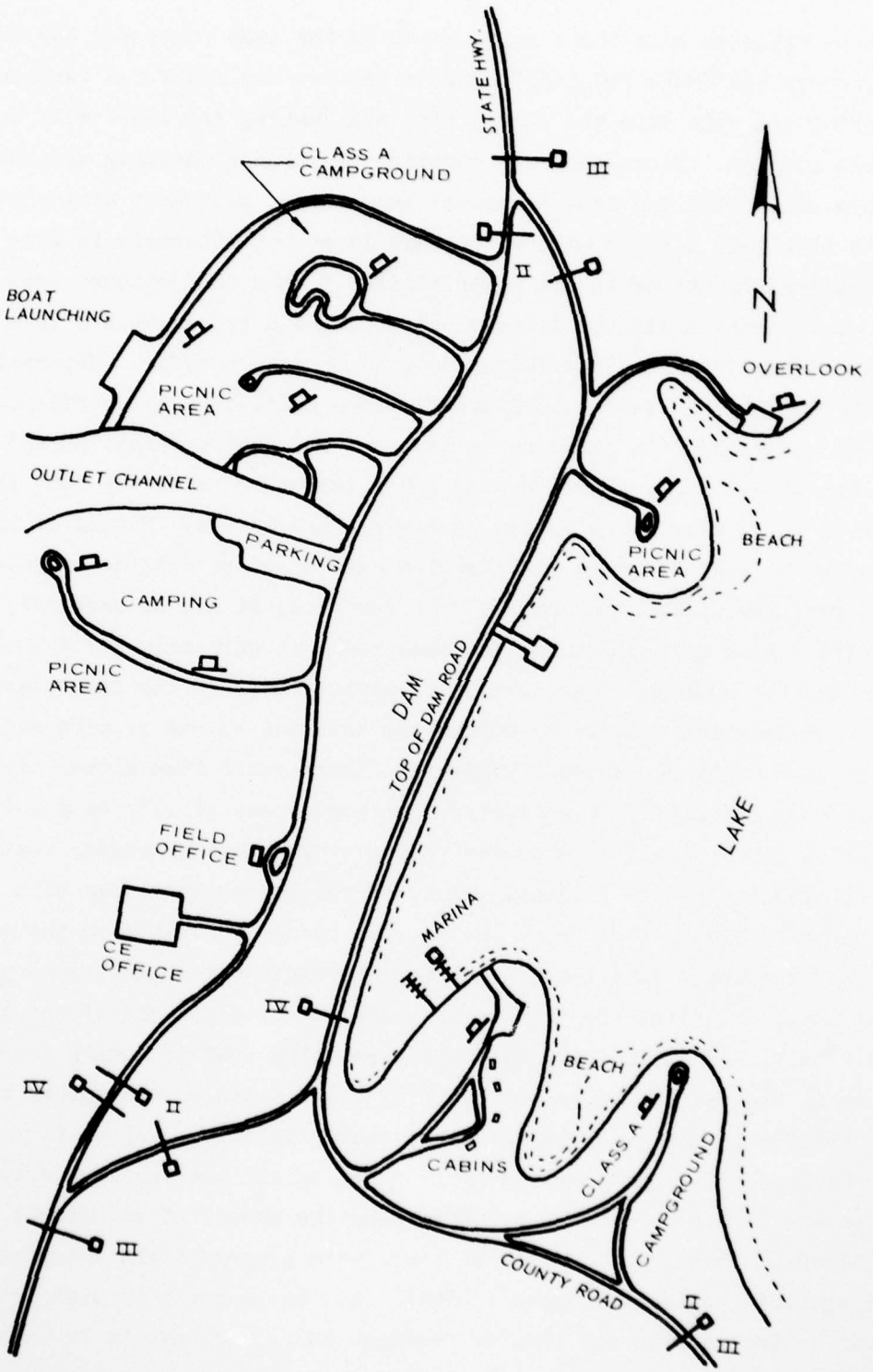


Figure B2. Illustration of dam site traffic counter location

counted twice as will those going south by the same route and any number of drivers who "make the loop" between the two dam roads. A vehicle entering the site from the county road and "making the loop" will be triple counted. Since accurate counting of persons choosing various routes within the dam area is almost impossible, placement at location II is likely to lead to errors that are large but uncertain in size in estimating visitation to dam areas similar to the one depicted here.

7. Location III would avoid the double and triple counts involved in location II while accumulating no more through traffic. Separation of the upper lake recreational traffic from below-the-dam traffic could not be attempted with counters at location III, but observation and special studies in one area or the other (above or below the dam) should be able to develop satisfactory percentage breakdowns. Should it happen that no suitable type III location exists except outside of government property in front of houses or a business, it may be necessary to sacrifice some of the general dam area count to gain reliability. For example, the counter might have to be moved closer to the dam to avoid the poor location and, in so doing, the entrance to one or more recreation sites might be passed. Visitation there would then either have to be counted separately or estimated. In some cases it will be possible to place the counters in a manner that avoids counting traffic that is merely passing by the project. Thus, if the hypothetical dam site pictured in Figure 2 did not have the two recreation sites on the south side of the upper lake, or if they were sufficiently separated to permit individual counting, the traffic counters on the south end of the dam could be placed at location IV, thus permitting traffic coming from the south on the state highway and desiring to go south on the county road (or traffic in the opposite direction taking this same route) to pass by the project without ever being recorded on the traffic counters. Results are likely to be more accurate when the amount of adjustment required is minimized. Unless counters were placed at the entrances to the specific recreation areas (location I), north-south through traffic would be included in the counter readings and would have to be removed by the vehicle count adjustment derived from roadside surveys.

APPENDIX C: AN ALTERNATIVE CLASSIFICATION FOR PROJECT AREAS

1. Another method by which project areas may be classified is by type of use. Several suggested classes are described below:

Group	
A	Dam area--state highway or county road through area, wide variety of camping, picnicking, boat launching, bank fishing, beach, scenic overlook, etc.
B	Developed recreation area--no through traffic; Class A campground (state or Corps); concession with marina, cabins, restaurant, picnicking, boat launching.
C	Developed recreation area--no through traffic; more remote than group B areas; Class B or C camping; concession rents boats, sells bait, snacks, licenses, etc.; boat launching ramp.
D	Boat launching ramp--parking area, a few picnic tables, vacation homes, a small number of permanent residences, access moderately difficult.

APPENDIX D: GUIDELINES FOR ASKING THE RECREATION ACTIVITY QUESTIONS (Columns 15-41)

1. Enter the number of persons that took part in the activity indicated. Hand them the list and ask, "How many in your group participated in the following activities?" Further clarification of the activity terminology is given as follows:

a. Picnicking. Indicate the number of people having eaten a prepared meal on the project, whether on shore or in a boat. Persons camping should not be shown as picnicking or using picnic facilities unless they are using a designated picnic area outside of their campground.

b. Using picnic facilities. If picnicking is indicated as an activity, ask if they used project facilities provided for that purpose.

c. Boating. Indicate the number of people boating for pleasure only and not in conjunction with another boating activity such as fishing or waterskiing.

d. Fishing. Indicate the number of people fishing in the project area. Separate those fishing from a boat (column 20) from those fishing from the shore (Column 21).

e. Hunting. Indicate the number of people hunting in the project area.

f. Sightseeing. Indicate only those persons in the vehicle who are taking part in no other activity on the project except sightseeing.

g. Waterskiing. Indicate the number of people taking part in any water sports where one is towed behind a boat; i.e., on a disk, sled, surfboard, skis, etc.

h. Swimming. Indicate the number of people swimming, wading, or sunbathing on the beach.

i. Other. Indicate the number of persons taking part in an activity other than those shown on the list.*

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* The list and survey form include off-road vehicling, hiking, nature study, ice fishing, snowmobiling and cross-country skiing. The number of persons having participated in each of these activities should be recorded on the survey form.

APPENDIX E: VEHICLE COUNT PROCEDURES FOR PREDETERMINED SAMPLING PERIODS*

* This appendix was taken directly from D. R. McCurdy, "A System for Measuring Public Use on the National Wildlife Refuges," Nov 1968, Branch of Public Use, Division of Wildlife Refuges, Bureau of Sport Fisheries and Wildlife, Washington, D. C.

1. When counting vehicles via observation, the first task is to develop a sampling scheme that will provide data that is representative of the amount and type of use patterns occurring on the refuge or area in question. A 100 percent vehicle count is not needed. Data from the pretest refuges indicate a minimum of a 10 percent sample is needed for reliable estimates. However, the sample must be stratified into time periods that ensure all public use patterns of a significant amount and difference be measured in proportion to its occurrence. For example, generally more and different use occurs on weekends and holidays than on weekdays, afternoons than mornings, etc.

2. The length of the stratum (hours) should be approximately the same length of time as the average public use visit for the month and refuge or area in question. A four-hour stratum time period is most common. When the average visit is significantly smaller or larger than four hours, a correction factor can be used and is described later.

3. Once the strata have been determined, vehicles should be counted at the selected public use areas, a minimum of one-tenth of each stratum occurring each estimation period (generally a month). In some situations, an estimation period for an entire season rather than a month may be more administratively feasible (for example, a six-week season). Warning: The number of strata should be kept to a minimum since each will require an equal amount of sampling. Two strata require twice the sampling as one stratum. However, stratification is the major tool for obtaining representative data.

4. The distribution of the samples for each stratum should not be done at random but spread evenly throughout the month. This is called purposive sampling, and it aids in overcoming such factors as weather.

5. As an example, assume we have stratified like periods of use into (a) weekends and holidays, weekdays; and (b) three 4-hour daily time periods, 8:00 a.m. to 12:00 p.m., 12:00 p.m. to 4:00 p.m., and 4:00 p.m. to 8:00 p.m. If we have a month with 10 weekend days and holidays, and 21 weekdays, using a 10 percent sample, each of the daily time periods would be sampled once a weekend and twice on a weekday.

Spreading these samples over the month we might have the following sample schedule:

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	Holiday					
1	2	3-C	4	5	6-A	7
8-A	9	10	11-B	12	13	14
15	16-B	17	18	19	20	21-B
22	23	24	25	26-C	27	28
29-C	30	31-A				

DAILY STRATA

A--8:00-12:00 vehicle count
B--12:00-4:00 vehicle count
C--4:00-8:00 vehicle count

6. In some cases, public use might be sufficient to warrant estimating the amount of use for specific days, such as the Fourth of July or the opening weekend of a hunting season, and then stratifying the remainder of the month or season for sampling.

7. In accordance with the sampling schedule, actual patrols should be initiated. Patrols should count stationary and moving vehicles. Counts should be made at each of the public use sites during the designated time period, regardless of weather conditions, and recorded on a patrol sheet.

8. A routine patrol route should be discouraged, since the time period for vehicle counts from start to finish may require several hours to complete. Thus, through a variety of circulation patterns and starting times, similar time situation bias can be eliminated. Also, stationary vehicles nearest to the identified site should be included in the vehicle count for that site. For example, vehicles along the gravel roads approaching a fishing access point should be included within the vehicle count for that site.

9. If public use occurs in distinct patterns and the sampling strata are based totally on these patterns, vehicle counts should not

be made at random within the strata period but when most, if not all, of the vehicles are present. An example would be morning and evening duck hunter vehicle counts.

10. The next task is to estimate vehicle counts at each dispersed site. This requires the following ratio:

$$\frac{\text{Number of a Given Strata in Estimation Period}}{\text{Estimated Number of Vehicles for a Given Strata in Estimation Period}} = \frac{\text{Number of Samples for a Given Strata}}{\text{Number of Vehicles Recorded during Samples of the Given Strata}}$$

Converted to a formula:

$$C = \frac{ac}{b}$$

Where C is the estimated number of vehicles per strata per estimation period, a is the number of days per estimation period (week or weekend days), C is the number of vehicles recorded at a given site or refuge during a given strata per estimation period, and b is the number of days sampled at a given site during a given strata per estimation period.

11. Applying the formula to a hypothetical refuge or site for a one-month estimation period, for weekdays, 8:00 a.m. to 12:00 noon time period, results were as follows:

$$C = \frac{(21 \text{ strata periods per month})\ (24 \text{ vehicles recorded})}{2 \text{ samples}}$$

$$= 252 \text{ vehicles estimated for weekdays for the month during 8:00 a.m. to 12:00 noon}$$

12. These vehicle estimates for weekday and weekend and semidaily sampling periods are then totalled to obtain a monthly estimate (or other estimation period) for the total number of vehicles at each area or refuge. Statistical methods for obtaining the error for these vehicle estimates are inclosed.

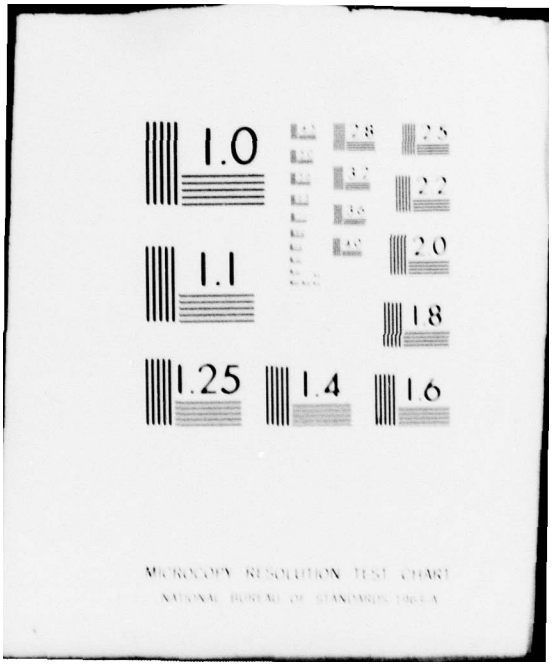
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Correction Factor to be Used When Average Visitor Stay Differs from Strata Time Periods

13. If all strata are sampled equally, they need not be the same length as the average time period visitors are at the refuge or public use area in question. However, when there is a difference of more than an hour, the vehicle estimate should be made for the entire month rather than by strata and then totalled.

14. The following ratio can be used:

$$\frac{\text{No. of patrols, vehicle counts (all strata)}}{\text{Number of vehicles counted}} = \frac{\text{No. of days in estimation period}}{\text{Vehicle estimate (uncorrected)}}$$

$$\text{Vehicle estimate (uncorrected)} = \frac{\text{Visitor estimate (uncorrected). Average time in day that use occurs during the estimation period (month)}}{\text{Average time visitors (groups, vehicles, etc.) remain at the refuge or area during the estimation period (month)}}$$

$$\text{Vehicle estimate (corrected)} = \text{Average time visitors (groups, vehicles, etc.) remain at the refuge or area during the estimation period (month)}$$

15. As an example, assume we carried out this monthly sampling scheme:

Weekend Patrols	Number of Patrols	Vehicle Count
8:00-12:00	1	10
12:00-4:00	1	15
4:00-8:00	1	12

Weekday Patrols	Number of Patrols	Vehicle Count
8:00-12:00	2	11
12:00-4:00	2	18
4:00-8:00	2	6
	9	72

$$\frac{9 \text{ patrols}}{72 \text{ vehicles}} = \frac{31 \text{ days}}{\times \text{ estimate (uncorrected)}}$$

$$\times = 248$$

$$\text{Vehicle estimate (corrected)} = 248 \times \frac{\text{12-hour day}}{\text{2-hour avg visit assumed}}$$

$$= 1{,}488 \text{ vehicles}$$

Statistical Methods for Calculating Variance and Error in Vehicle Estimates

16. In stratified random sampling, the following formulas can be used to compute means, estimates, variances, and standard errors of estimates for individual sites:

a. Stratum mean, ΣX , where ΣX = sum of vehicles during all sampling units for an individual site (c).

n = total number of patrols taken in individual stratum (one patrol per day) (b).

b. Stratum total, $N \frac{\Sigma X}{n}$, where N = total number of days available for sampling at an individual site.

c. Variance of the mean, $\frac{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}{n(n-1)}$

d. Variance of total estimate for stratum, $N^2 \frac{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}{n(n-1)}$

e. Standard error of the estimate, $\sqrt{N^2 \frac{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}{n(n-1)}}$

APPENDIX F: SUBDIVISION VISITATION SURVEY PROCEDURES*

(Louisville District)

* This appendix was taken directly from the Ohio River Division, "Project Operations, Recreation-Use Survey," ORDR 1130-2-19, 12 May 1977, Cincinnati, Ohio. While this appendix does not cover every possible situation regarding walk-on recreation use, it does provide some general guidelines for Districts and projects similar to those described in the correspondence. Corps personnel are encouraged to contact Louisville District and Ohio River Division Staff for additional information.

General: The following survey procedures were developed and successfully field tested by the Louisville District. It is inclosed in this regulation as an example of a method that may be used by other Districts.

1. During the late fall and winter of 1975 and early 1976, recreation-resource management branch personnel in Louisville isolated a statistical visitation problem--"lost," or unaccounted for, (but yet legitimate) visitation occurring at subdivisions immediately adjacent to fee lands at certain lakes. Since some of our lakes were old enough that community docks and/or licensed ramps, steps, and other means of egress to the water existed before shoreline management was an issue, we firmly believed that a rather large number of recreation days of use were not being counted by conventional means (i.e., traffic counters at developed recreation areas). We knew that many families came to the lake (often every weekend all summer long) and launched their boats at these licensed ramps or had them moored at docks. They would then recreate all weekend and return to their homes without ever tripping our traffic counters.

2. We knew the problem existed, but now we sought a solution. Placing additional meters at private ramps was discussed, but the cost of obtaining and installing them plus the time to read them periodically was prohibitive. We felt a survey of some type was in order--but what type? This, then, was our situation.

3. An organizational meeting was held in the district office between OP-R, planning division, Automatic Data Processing (ADP) Center, and management analysis branch personnel. At that time it was agreed that some type of "door-to-door" survey would have to be run in a number of dwellings. These "surveyed" cabins would be our survey "sample." The results of this survey would be a load factor that could be later applied to all dwelling units around the lake. How many houses did we need to sample? What did we want to know? How were we to do it? These were some of the questions at the first meeting.

4. Foremost in our minds was a desire for statistically sound and defensible survey procedure. For this reason, we involved the chief of the management analysis branch of the District comptroller's office.

His input was immeasurably useful in determining proper sample size for a given universe, etc. Likewise, ADP personnel were involved from the outset. We knew we would be utilizing the ADP center for both the actual counting and tabulating of individual survey forms as well as in the calculations leading up to our load factors. We did not want our methodology to conflict with, or impair, the processing of our raw information.

5. Our first decision was, how were we going to stratify the subdivisions? Also, how big did our samples need to be? Our statistician advised us of our options (Figure F1). We decided to stratify by lake as well as by type of subdivision.

6. Once this decision was made, we had each project manager (aided by his staff and some recent aerial photographs) report the number of dwellings at his given lake--by category. From this information we could determine our proper sample size. Table F1 shows the number of dwelling units at each lake by category and the survey sample size.

7. At this point, we began developing a questionnaire. Figure F2 was our first questionnaire, and we actually used it for a short while. In our opinion, as we look back now, this is where we made our biggest single procedural error. It did not affect, in any way, the purity of our survey, but considerable amounts of time and manpower were wasted. Using this early form, the surveyors (we used seasonal park aides) returned to the office and transferred the information that they had gathered onto a keypunch form. We realized our error fairly early and revised our form (Figure F3). The keypunch operator could now punch off the same piece of paper the survey was taken on in the field.

8. By the end of the summer, the questionnaires were completed and submitted to the district office. After a very brief check for completeness, we were ready to send them to the ADP center and see just how much visitation we had been missing. We believed all along that the number of uncounted visitors would be substantial, but we were delighted to find out that, at three Kentucky projects alone, we were missing slightly over two million visitor days of use per year!

9. Table F2 shows a summary for one category at one lake. The

important number here is 478.61. This is the load factor we were looking for. The procedure now was to take this factor (refer to Table F1), find the number of dwellings in Category 4 at Nolin, and multiply the two numbers. This procedure is repeated for each category of subdivisions at each lake.

10. Regarding updating procedures, we feel we can live with these load factors for about three years. Every fall we will recount the number of dwellings to pick up any new buildings. Then, every third year, we will resurvey and establish new load factors.

11. In summary, a word or two of caution regarding our methodology. First, this method should only be used at lakes that are rural in nature and locale and where the existence of subdivisions is due to the lake alone. Subdivisions at metropolitan projects (and we have some lakes near large cities) would, in all likelihood, exist even if the lake were not present, due to urban sprawl alone. Secondly, for this method of survey to be valid, some means of access to the water other than recreation areas must be in existence. This so-called secondary access (the licensed ramps and community docks) is what caused us to fail to estimate so much visitation. At newer lakes with strict shoreline management policies in effect, it would be expected that most of the visitation would enter by way of the developed recreation area and would already be counted. This type of survey would be inappropriate if this were the case.

12. This memo was meant to be a brief overview only. If you desire additional information or have specific questions, call or write either George Hardison or Jim Lindsey, ORLOP-R, FTS 352-5584.

Table F1

Sample Sizes for Visitation Survey

Category No. 1*	Sample Size	No. Households Per Lake	Sample Every Nth Household
Rough River Lake	77	385	5th
Barren River Lake	57	282	5th
Nolin River Lake	93	464	5th
	227	1,131**	
Category No. 2			
Rough River Lake	35	139	4th
Barren River Lake	0	0	--
Nolin River Lake	120	480	4th
	155	619**	
Category No. 3			
Rough River Lake	197	1,377	7th
Barren River Lake	26	180	7th
Nolin River Lake	110	768	7th
	333	2,325**	
Category No. 4			
Rough River Lake	37	148	4th
Barren River Lake	0	0	--
Nolin River Lake	121	483	4th
	158	631**	
Category No. 5			
100 percent sample where applicable			

* Category No. 1--No access; Category No. 2--Ramp only; Category No. 3--Dock(s) only; Category No. 4--Ramp & dock; Category No. 5--Special (scout or church camp, etc.).

** Numbers used to calculate sample size for all of the category. Then for each category this overall sample was proportioned to each lake.

Table F2

Nolin Lake Kentucky, Totals for Project Code 12760,
Category 4 (92 Records Processed)

Average number of family visitor days	382.72	
Average number of guest visitor days	95.89	
Average total of visitor days	478.61	
Average family size	3.98	persons
Average number of guests	38.77	persons
Average number of family recreational days	103.27	
Average number of guest recreational days	3.59	
Percentage of category by type of resident		
weekend only	60.87	
seasonal	22.83	
year-round	16.30	

DISPOSITION FORM

For use of this form, see AR 340-15, the proponent agency is TAGCEN.

REFERENCE OR OFFICE SYMBOL	SUBJECT
ORLDC-M	Statistical Sampling to Determine Visitation to Corps Lakes by Local Residents Who Do Not Trigger Counting Devices--Important Points

TO Jim Lindsey FROM Chief, Mgt Analysis Br DATE 8 Apr 76 CMT 1

Mr. Hoagland/jas/5717

1. The first step is to subdivide the total number of households (known in statistical sampling as the universe) into groups that are reasonably homogeneous. Several options here are:

a. All households at all three lake projects involved may be considered homogeneous with all being considered the universe. The number to be actually sampled would be determined by this number.

b. Each lake area may be considered different enough to divide the total number of households into three homogeneous groups (or strata). In this case, each lake area would be handled separately and the number to be sampled at each would be determined by the total number of households at each lake.

c. Even further stratification may be determined necessary at each lake project. In any event, each strata must be handled separately and independently from the others for data collection and analysis purposes.

2. It is acceptable where exact size of the universe in each strata cannot be determined to estimate the size. These estimates should be on the liberal (high) side to ensure better reliability upon the results.

3. Once the size of each strata is determined, it must be decided what Confidence Level is desired concerning the findings of the survey. Confidence level is the risk you are willing to assume that the results of the sampling will be within the precision desired. Confidence levels are expressed in percentages and are used in determining the number to be sampled in each strata. A 95-percent or above confidence level is normally desired.

4. Next is to determine the number to be sampled. This number is taken from published tables and is determined by the total number in each strata (universe) and the confidence level desired.

5. Once the sample size is determined from the proper table, some method of identification of each household must be developed. This is so that specific households to be surveyed can be identified.

6. An acceptable method for selecting which households to sample is as follows:

a. Say 5,000 homes are in a given strata to be considered.

b. With a confidence level desired of 95 percent, let's hypothetically say the tables show a sample size of 250 is required.

c. Next, you would divide 5,000 by 250 and get 20. This means that every 20th household will be surveyed. To correct for households that prove to be unsurveyable, determine that every 19th household will be surveyed.

(sheet 1 of 2)

DA FORM 1 FEB 61 2496 REPLACES DD FORM 96, WHICH IS OBSOLETE. GPO - 1975 - 665-422/1063

Figure F1. Statistical sampling to determine visitation to Corps Lakes by local residents who do not trigger counting devices--important points

d. Next, go to a table of random numbers and place a pointer on the table, without looking, until you point to a number that ends with 01 to 20. If this number is 12, the first household surveyed will be the 12th in your numbering system and every 19th household thereafter; i.e., 31st, 50th, 69th, etc.

7. As mentioned previously, the survey must determine number of unmetered visits made by each household to make the survey reliable.

8. We are in the process of securing the proper tables needed to determine sample sizes. In the meantime, you should be making determination on whether the total number of households at all three lakes are homogeneous enough to be considered as one strata or whether subgroups should be considered such as each lake. Then you must determine how many households are in each group.

9. It is noted that less reliability would be associated with the procedure of sampling 100 percent of a few household developments or clusters and applying these results to the remaining developments. This tends to nullify the randomness necessary in this type of surveying to ensure accuracy.

10. Management Analysis Branch will lend any further assistance you may wish.

Figure F1. (sheet 2 of 2)

Subdivision Questionnaire for
Visitation Survey

1. Category of the subdivision _____.
2. Do you reside in the lake area?

   Weekend only _____ (No. Rec. Days).

   Seasonally (spring, summer) _____ (No. Rec. Days)

   Year-round _____.
3. How many in the family? _____
4. How many guests during a typical visit? _____
5. How does your family use the lake? (Rank top four activities.)

   Boating _____

   Skiing _____

   Fishing _____

   Picnicking _____

   Sightseeing _____

   Hiking _____

   Hunting _____

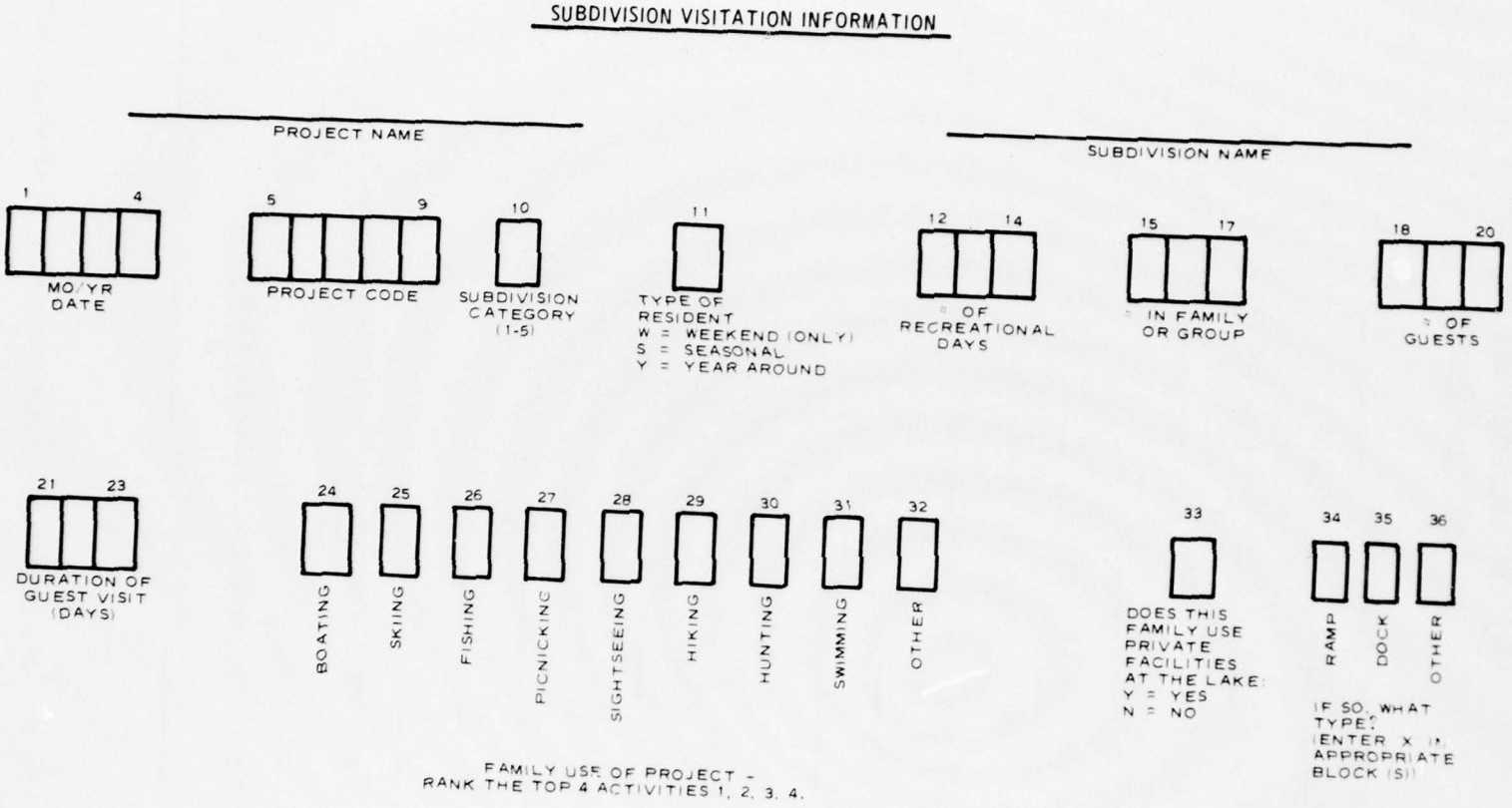
   Swimming _____

   Other _____
6. Does your family use private facilities at the lake?
7. YES ____ NO ____

   Which of the private facilities do they use?

   Ramp _____ Boat Dock _____ Other _____

Figure F2. Subdivision questionnaire for visitation survey



F10

Figure F3. Subdivision visitation information

In accordance with letter from DAEN-RDC, DAEN-ASI dated 22 July 1977, Subject: Facsimile Catalog Cards for Laboratory Technical Publications, a facsimile catalog card in Library of Congress MARC format is reproduced below.

Mischon, Raymond M
A handbook for conducting recreation surveys and calculating attendance at Corps of Engineers projects / by *Raymond M. Mischon*, R. Chris Wyatt, Midwest Research Institute, Kansas City, Mo. Vicksburg, Miss. : U. S. Waterways Experiment Station ; Springfield, Va. : available from National Technical Information Service, 1979.
76, [28] p. : ill. ; 27 cm. (Technical report - U. S. Army Engineer Waterways Experiment Station ; R-79-1)
Prepared for Office, Chief of Engineers, U. S. Army, Washington, D. C., under Contract No. DACW39-77-C-0082; monitored by U. S. Army Engineer Waterways Experiment Station and U. S. Army Institute for Water Resources, Ft. Belvoir, Va.
References: p. 76.

(Continued on next card)

Mischon, Raymond M
A handbook for conducting recreation surveys and calculating attendance at Corps of Engineers projects ... 1979.
(Card 2)

1. Handbooks. 2. Recreation. 3. Recreation facilities. 4. Surveys. I. Wyatt, R. Chris, joint author. II. Midwest Research Institute, Kansas City, Mo. III. United States. Army. Corps of Engineers. IV. United States. Institute for Water Resources. V. Series: United States. Waterways Experiment Station, Vicksburg, Miss. *Technical report* ; R-79-1.
TA7.W34 no.R-79-1