The crucial decisions in obtaining "demand" information for outdoor recreation planning

Roger Dean Fight
Iowa State University

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THE CRUCIAL DECISIONS IN OBTAINING "DEMAND"
INFORMATION FOR OUTDOOR RECREATION PLANNING

by

Roger Dean Fight

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Signature was redacted for privacy.

In Charge of Major Work

Signature was redacted for privacy.

Head of Major Department

Signature was redacted for privacy.

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INTRODUCTION

The public outdoor recreation planning process typically involves two different types of people. The policy-maker or public decision-maker is in a "line" position. He is charged with making decisions that become public policy. The policy-analyst or researcher is in a "staff" position. He is charged with providing information that the policy-maker can use in a rational planning process to make decisions. This dissertation is concerned only with the "demand" aspects of the decision-maker's informational needs. Other aspects, notably those related to methods for supplying recreational facilities, are not explicitly considered.

Objectives of This Dissertation

This dissertation has three specific objectives. One is to lay out for consideration the crucial decisions in designing studies for obtaining outdoor recreation "demand" information. The second is to specify the criteria that the policy-analyst should use for choosing among the alternatives. The third (perhaps implicit in the second) is to identify the trade-offs that exist with respect to the different alternatives.

The result of this dissertation, then, will not be a prescription for collecting and analyzing "demand" data. Rather, it is intended to be an aid to the policy-analyst in writing a prescription for collecting and analyzing "demand" data for his particular policy-maker. The dissertation is written primarily for the policy-analyst. However, it should be of some interest to the policy-maker as well. Its primary value to the policy-maker should be in helping him to understand the types of
trade-offs that the policy-analyst must weigh and what the feasible alternatives are within the framework of current methods. It should also help him to understand the types of questions that can be answered with the resulting information without seriously violating the constraints under which the information is appropriate.

Problems in the real world seldom fit neatly into the disciplinary categories within which the universities operate. The problem of the outdoor recreation policy-analyst is no exception. Having a background in forest economics, many of the tools that will be discussed in this dissertation are economic tools. There are aspects which clearly are not economics and some which might find a home in any one of several disciplinary categories. In order to make a real contribution to the policy-analysts faced with the type of problem dealt with in this dissertation, it was necessary to depart somewhat from the disciplinary category of forest economics. I have not claimed expertise in some of the aspects involving tools outside my field. However, I have tried to cover some of the preliminary and important issues outside my field in sufficient detail so that when the policy-analyst seeks consultation he will be in a position to present his case and evaluate the advice more effectively.

The Policy-Maker and His Problem

The type of procedure that the policy-analyst will propose will depend on the particular policy-maker to whom he is providing information and the particular problem faced by that policy-maker. The scope of the application of the results and conclusions of this dissertation, then,
depend on the types of policy-makers to which the analysis applies.

The analysis will consider policy-makers whose choice problem falls in any of three problem contexts. One case is the state that imports recreationists and therefore has non-residents and residents as important components of "demand." A second case is the state that has little potential for attracting significant numbers of non-resident recreationists and is therefore concerned primarily with resident users. The third case is the agency that provides recreation facilities in areas which attract recreationists from great distances. Since these areas often have a limited number of people living within their boundaries, the primary concern here is with "non-residents." Within these three problem contexts will be both state and federal recreation policy-makers.

An effort has been made to make the analysis sufficiently general to be of value to recreation planners in all three problem contexts. It would not have been possible to write the dissertation in any meaningful way without a specific problem context. It would be all too easy to ignore many important difficulties and theoretical deficiencies of various models without a specific problem context to keep those difficulties in their proper perspective. The problem context that led to this dissertation was the problem faced by the Wisconsin Department of Natural Resources. This problem clearly falls in the category of case one, mentioned previously. The specific problem context has resulted in that particular case being analyzed more fully than the other two. A separate section will, however, discuss the modifications necessary to make the analysis appropriate to the other cases.
The material in the appendix is specific to the problem faced by the Wisconsin Department of Natural Resources. It is not expected to serve as a complete prescription for data collection and processing even for other case one policy-makers. It does serve two useful purposes, however. A complete specification of procedures such as this does provide the reader with an opportunity to test his understanding of the text and the implications of the analysis of the crucial decisions discussed therein. It also provides the policy-analyst with a model that could be made to fit his particular problem context with modest modification.

The policy-maker's objectives

The objectives of recreation planning agencies in different states will vary. Federal wide-area land management agencies will have different objectives with respect to outdoor recreation partly because many such agencies are mission-oriented, which places some constraints on their objectives. Certainly the objectives of state agencies are different from the objectives of Federal agencies.

In order to make the objectives sufficiently general for application to state outdoor recreation planning agencies as well as to Federal wide-area land management agencies I propose to do the analysis in terms of a multidimensional objective function. Kalter et al. (1) have suggested the use of this concept in the evaluation of resource investments at the federal level. The objective function proposed by them for federal evaluation of resource investments may include such factors as national economic efficiency, regional economic growth, personal income distribution, and environmental quality. Many of the factors that would be found in the state
objective function would be similar to those in the national objective function. Certainly the definitions of many variables would be different, however.¹

Factors in state objective functions that would be affected by recreation decisions would include economic efficiency, regional economic growth, personal income distribution, equity, quality of the environment, and quality of the recreation experience. Certainly most state objective functions include the cost-effectiveness concept of efficiency, i.e., for a given output there is some effort to produce that output with the minimum amount of resources possible. The regional economic growth factor in the state objective function is similar to the factor in the national objective function except for the geographic location and scale. Personal income distribution is parallel to regional economic growth. The idea of equity conveys a slightly different connotation than income distribution. An equity variable could attempt to measure the proportion of the population that could participate in some specified minimum amount of outdoor recreation at some specified maximum cost that would insure availability regardless of the participants' ability to pay. Another aspect of equity at the state level is the number of outdoor recreation opportunities made available to non-residents at a subsidized price. The state objective function might also attach some weight to the environmental effects of outdoor recreation facilities and to the quality of the outdoor recreation oppor-

¹I use the term factor to mean the general concept such as regional economic growth. The term variable means a specific measure (from many possible measures), the values of which can be measured with consistency by different qualified observers. One possible variable for the factor regional economic growth is regional per capita income.
opportunities provided.

The above factors are theoretically brought together in a unique rank order by the social welfare function. While this is a conceptually useful device, its potential as a decision-making aid will, in the foreseeable future, be limited to quantification of variables without the formal attachment of weights. A decision-making framework which could be used recognizes this limitation and at the same time takes full advantage of the benefits of this concept. A social account as suggested by Davis and Bentley (2) could be used for the identification and quantification of the effects of outdoor recreation investments. The social account can be used to provide quantitative measures of the effects of selected decisions which can then be weighted in the decision-making process with a minimum of distortion of the factual content of the situation.

The policy-maker's alternatives

The generalized policy-maker has available a set of decision variables which he can manipulate to try to achieve his objectives. One decision variable is the number of facilities to provide by public investment. This is basically a decision as to the size of the overall budget for outdoor recreation facilities. A second decision variable is the distribution of this budget between facilities for different activities. The third decision variable is the distribution of this budget to geographic regions. Although closely related to the regional location decision the question of site location might best be considered as a separate decision because that will focus attention on the very different types of considerations involved in this decision. As an
example of one type of difference, the regional distribution involves consideration of efficiency from the travel cost aspect. Site location involves consideration of efficiency relatively more from the aspect of site suitability and existence of efficiencies of scale in providing access and ancillary facilities and relatively little from the travel cost aspect. A whole set of specific variables are involved in the decision "factor" which encompasses the institutional framework. These variables consist of different ways of expending time and/or money to influence the quantity, quality, and/or location of facilities provided by groups and agencies other than the decision-maker.

Another decision variable available to decision makers is the entrance fee. Public agencies can set the entrance fees at their facilities. They may also be able to exert some influence over the entrance fees charged by other producers. There may exist in some cases a constraint on the objective function which effectively eliminates this as a decision variable except to the extent that the objectives themselves are subject to change.

A thorough evaluation of the effects that the levels of each of these decision variables has on the objective function require information on the "demand" for recreation resources. "Demand" information is a very important component of the information required for some decisions. The site location decision, however, relies more heavily on "supply" information.

The Policy-Analyst and His Problem

The policy-analyst is a decision-maker in a different problem context. His objectives could be summed up succinctly as to provide the "demand" information that the policy-maker needs to solve his problem.
After some preliminary consideration of the policy-makers' problems and the type of information that they need I concluded that there were three major questions to be resolved. Each of these questions involved several alternatives. The questions do not arrange neatly in a sequential order because of the numerous interrelationships involved. However, the following arrangement seems most logical.

The first question is, "What 'demand' do we want to estimate?" There are several dimensions in the alternative definitions of "demand" that might be selected. One dimension is the relationship that the definition should have to the seasonal, weekly, and daily peaking characteristics of demand for the use of outdoor recreation facilities. Another dimension is the geographic level on which this "demand" information is needed. A third dimension is the relative priorities attached to "demand" information for different outdoor recreation activities. The final dimension is the factors that should be included in arriving at an estimate of "demand."

The second question is, "How can data be collected from recreationists?" This question also presented alternatives of several dimensions. One dimension is specifying the universe from which data would be collected and to which inferences would be made. Another dimension is selecting an appropriate survey technique and survey design. The third dimension is how the sample unit should be defined. The final dimension is how many sample units should be "observed."

The third question is, "How can 'demand' be projected?" This question also involves several dimensions of alternatives. It seems reasonable to consider the projection question in three dimensions although there are some
procedures which would collapse the first two dimensions into one. I consider the first dimension to be the alternative ways of projecting the "demand" from the origins of recreationists and the second to be the alternative ways of deciding how this "demand" would be distributed to destination areas. The last dimension to this question is the alternative sources of secondary data that could be used in estimating and projecting this "demand."
CRUCIAL DECISIONS IN DESIGNING STUDIES TO COLLECT
OUTDOOR RECREATION "DEMAND" DATA

What "Demand" Do We Want to Estimate?

This question and the various dimensions of it are not independent of the other crucial questions and the various dimensions involved in them. I propose, however, to discuss each dimension of each question independently and then discuss the interrelationships and the effects of those interrelationships in a separate section.

The relationship of demand to peaking characteristics

One dimension of how "demand" should be defined is the relationship that it should have to the peaking characteristics of the demand for the use of outdoor recreation facilities. There are three types of demand peaks that will be considered. There is a seasonal peak that occurs annually, a weekly peak, and a daily peak. There is not a uni-modal peak for all activities for all types of cycles. Neither do the peaks for different activities occur during the same month of the year, day of the week, nor time of the day. A peaking characteristic that will not be considered is the holiday peak that occurs on the Memorial Day, Independence Day, and Labor Day weekends.

To help understand the peaking characteristics in general, it is instructive to segregate recreation demand into three categories. In one category we can put the vacation trip which could be arbitrarily defined as including at least four nights away from home. In the second category we could put the overnight outing which could likewise be arbitrarily defined as including one to three nights away from home. The most predominant outings of this type will be weekend outings.
In the third category we could put the day-outing which involves no overnight stay away from home.

The typical weekly peaking characteristics are easily explained in terms of these three components of recreation demand. Virtually all areas experience some day-outing use by local residents. Because of the traditional work patterns most of the day-outing use will occur on Saturday or Sunday. Those areas that are primarily day use areas will therefore have a peak on Saturday and Sunday and virtually no use on weekdays. Overnight outings follow a very similar pattern except that they may often include Friday night. This adds to the weekend peak further with some addition to the weekday use. The vacation use weekly peaking characteristics are not subject to armchair analysis. There are two factors at work here. If there exists a tendency to stretch a one week vacation into nine days and a two week vacation into sixteen days then the effect will be to add relatively more to the weekend use than the weekday use. However, vacation trips often involve substantial travel so that a major part of the starting weekend and the ending weekend may be spent in travel. This would have the effect of leveling out the vacation demand weekly peak, or perhaps even placing the peak on a weekday. I know of no areas, however, that have their outdoor recreation weekly peak on a weekday. Most facilities have a very predominant peak on Saturday and Sunday. A recent study by Cohee (3) of private picnicking enterprises in Wisconsin reported that 70 percent of the picnicking takes place on weekend days. If the 70 percent on weekend days represents full capacity, then the remaining 30 percent on weekdays represents use of approximately 1/6 of capacity. Another
study by Cohee (4), again pertaining to Wisconsin, reported that about half of the participant days of camping occur on weekend days. Thus in terms of averages the weekend day peak is approximately two and a half times the weekday peak.

"Summer" activities are defined as those having a distinctive peak during the summer months of June, July, and August. There are many activities that fall into this category. According to Cohee (3) 70 percent of the total participant days of picnicking at private picnicking enterprises in Wisconsin occur in a 90 day summer period. It is hardly necessary to justify with data that a similar situation exists with respect to camping, swimming, water skiing, and pleasure boating. Certain other activities are less likely to have summer peaks because of actual preference for doing them in the summer. However, when you consider the opportunity structure resulting from our traditional school vacation patterns, certain other activities are also quite likely to peak during the summer. These activities include golfing, sightseeing and pleasure driving, canoeing, hiking, nature study, bicycling, and possibly fishing, horseback riding, and driving off-the-road vehicles. A study by Fine and Werner (5) concluded that approximately half of all overnight vacation-recreation trips taken by Wisconsin residents are taken during the three summer months.

The examples given here and throughout the dissertation are from studies in Wisconsin because that information is more readily available to me. Most of these examples are to illustrate a concept and the precise values are not important. In that context there is no reason to suspect that these examples are not typical of most areas that have influxes of
recreationists from considerable distances during the summer season.

There are some obvious daily peaking characteristics as well. We would expect swimming to have its peak in the afternoon. Picnicking will usually have a midday peak with a smaller evening peak. All activities have some type of diurnal pattern, however, some may have narrow sharp peaks while others have wide flat peaks.

If there were no cost involved in collecting and processing data the policy analyst would obtain sufficient data to estimate the entire consumption pattern including daily, weekly, and annual cycles. Information is not free and we must therefore attach priorities to data collection in order to obtain that information which is needed most urgently. The "demand" that is estimated should provide a basis on which alternatives can be linked with goal achievement. Empirical data show that if facilities are sufficient to meet the average mid-season weekend day then weekdays will be adequately provided for. Even if the decision were to meet only 75 percent of the average mid-season weekend day, weekdays would still be adequately provided for. Consumption that occurs in periods of excess supply do not impinge on anyone else's demand for the facility. While there is ordinarily a positive marginal cost of substantially-less-than-capacity levels of consumption there is no rationing problem. This applies to the daily off-peak use and the seasonal off-peak use as well as to the weekly off-peak use. This indicates that some peak figure will ordinarily have a higher priority than off-peak data.

If there is a goal in the objective function that is affected by the quality of the outdoor recreation experience, this also suggests the
need for "demand" which will identify the peak use rather than the average use. This is true because one aspect of quality of the outdoor recreation experience is the degree of crowding. In order to predict the impact of outdoor recreation decisions on regional economic growth it would probably be desirable to have some indication of non-peak use. This is true because the economic feasibility of private facilities might hinge on the returns to non-peak consumption. Also the income and employment multipliers will be affected by the level of non-peak use. Note, however, that peak "demand" is still required and probably of higher priority for this objective also.

The optimal peak to estimate would be that peak which exactly corresponds to the peak for which public policy will seek to provide. Since the amount to be provided is one of the decisions that this data is supposed to help the decision-maker decide, we cannot expect the decision-maker to make this decision prior to the policy analysis. The policy-analyst must settle for preliminary information about the weights in the objective function and decide this question on the basis of the relative weights of the goals discussed above. One alternative would be to determine the weekly peak day. In virtually all cases, this will be either Saturday or Sunday. Then determine the average "demand" for that day during the main part of the season, say for six weeks. This could be the generally accepted basis from which decisions requiring peak data are made. Additional data on non-peak periods could also be obtained, as needed, according to the priorities attached to that data for specific activities.

This average peak "demand" could be defined to take into account
the daily peak. The decision here involves a trade-off between survey costs and data of perhaps better quality for some uses. Unless there are special circumstances that require some specific daily peaking data I think that it would generally not be worth the cost to tie this aspect of "demand" to the survey. In order to make use of "demand" information it is necessary to have some "supply" information. Inventories of recreation facilities and resources are normally counted as numbers of picnic tables, miles of trail, acres of water, etc. Use of recreation resources is normally counted as man-days of use of a particular facility or resource. In order to determine whether we now have too many or too few resources in a particular area we must have common units for "supply" and "demand" so that they can be compared.

One way that we could fill this gap is to determine how many times particular facilities are used on the average day or how many people can use a common resource on the average day. This information can be combined with expert judgment and with decision-making authority to arrive at turnover rate standards. These standards then become an objective because they represent one aspect of quality for which the agency has established a desired minimum.

Most "demand" studies which involve personal interviews from the general public have been done to estimate total "demand" for the season or year; or average "demand" for the season or year. This ignores both the seasonal and weekly peaking characteristics. The survey costs can be reduced substantially by conducting one survey to obtain data for activities for all seasons. Unfortunately, the data that are obtained in this way are less useful for planning.
The geographic level of "demand"

The second dimension of the question, "What 'demand' do we want to estimate?" is the geographic level to which this "demand" should apply. For state planners this question will be considered in terms of three alternatives: state-wide, regions made up of groups of counties, and individual counties. Federal wide-area agency planners will be primarily concerned with the cost aspects of this analysis. Some of these agencies will be concerned almost exclusively with providing recreation opportunities to people who travel great distances. In this case the geographic level can include very broad regions because this demand is flexible with regard to different destinations with comparable attractions.

For planning purposes we may want to know the "demand" that originates in each origin area, whether origin area refers to the state, regions, or counties. More importantly, however, we need to know the "demand" that will manifest itself in consumption in each of the destination areas, however defined. We may want to know where the "demand" originates so that we may influence where the "demand" is exercised. To the extent that the locations where "demand" is exercised cannot be significantly influenced, it is much more important to know what the "demand" is for destination areas. In view of this it seems reasonable to segregate the problem into one of estimating the "demand" that originates in the origin areas and then estimating the pattern that determines how that "demand" distributes itself to destination areas.

In order to consider this question it is helpful to return to the arbitrary segregation of demand that was made earlier. The idea was to
separate demand into a day-use demand, an overnight outing demand, and a vacation demand. The earlier definitions are suitable here.

The day-use demand that manifests itself in consumption in a destination area, comes from a local population. The average distance traveled on a day-use outing is probably less than 75 miles. A survey of visitors to Wisconsin State Parks and State Forests by the Wisconsin Department of Natural Resources (6) found that the average distance traveled by resident day-users was 43 miles and the average distance traveled by non-resident day-users was 87 miles. The day-use of many areas which are less unique in their scenic, geologic, biologic, and/or historic attractiveness than the average State Park and Forest will in general attract an even more local clientele. While this demand may be subject to some manipulation, the limited distance that it is practical to travel on a day-use outing will in general require that the facilities be located in proximity to the population or the level of demand will drastically fall because of the cost involved and the actual impossi-bility of going on a day-use outing beyond some distance. Also, if this "demand" is estimated from consumption the result will depend a great deal on the current distribution of facilities. Because of the impor-tance of proximity of facilities to the population in day-use demand a state-wide "demand" estimate will not be very satisfactory.

The vacation demand that manifests itself in consumption in a destination area comes from a much wider area than the day-use demand. According to unpublished data collected by the University of Wisconsin Survey Research Laboratory (7) about 3/5 of the summer non-business trips involving four or more nights away from home had a one-way distance
of over 200 miles. I do not doubt that there is some regional preference on the part of vacationists. However, vacation demand certainly is subject to some geographic manipulation. A portion of the vacationists who travel 300 miles to the lake country for their two-week vacation will not balk at traveling an additional 50 miles or stopping 50 miles closer to home to get to the area that has the type of facilities they want. The effects on the level of vacation demand resulting from shifts in the geographic distribution of facilities would be expected to be much less than for day-use demand. The particular county by county distribution of vacation demand would therefore appear to be almost irrelevant in determining what the future distribution should be insofar as we are considering only "what people want."

The overnight outing demand is an intermediate case. The level of overnight outing demand would be expected to be more responsive to changes in the geographical distribution of facilities than the vacation demand and less responsive to changes in the geographical distribution of facilities than day-use demand.

The terminology used here pertains to the state planner. The principle involved in the relationship between the geographic level and cost depends more on the number of "regions" for which estimates are sought than on the actual size of regions. It is therefore easy to apply the analysis to the case of the wide-area land management agency by substituting appropriate terms for state-wide, regions made up of groups of counties, and individual counties.

Given that county-reliable data would be desirable for one objective and completely unnecessary for another objective we can now consider
the trade-off involved. The trade-off is between data that are more suitable for their intended purpose, i.e., more suitable for planning for day-use facilities, and data that are more expensive. In discussing the costs of obtaining county-reliable data vs. state-reliable data vs. other intermediate positions I will use only relative costs and ignore for the moment the magnitude of the cost. I will restrict the discussion further by assuming that costs are proportional to sample size and use relative sample size as a proxy for relative cost.

The problem can be looked at as one of determining the proportion of the population that goes to an area for outdoor recreation (or for a specific activity) on a given day. While we may not decide to do the estimation in this particular way it is an illuminating way to see what is involved. The problem thus stated is to estimate the value of a binomial variable.

The variance of a binomial variable, P, is

$$\frac{P(1-P)}{n}$$

(1)

where P is the proportion of the variables with the attribute of interest; n is the sample size. The standard deviation is the square root of that. If we want a 95 percent confidence interval to have a half-width of \( \alpha P \), i.e., the interval would be \( \hat{P} \pm \alpha \hat{P} \), then we need to set n such that

$$\alpha P = \frac{2 \sqrt{P(1-P)}}{\sqrt{n}}$$

(2)

or

$$n = \frac{4(1-P)}{P\alpha^2}$$

(3)

Since many of the values of P that will be considered will be in the
range of 5 percent or less we can ignore the term \((1-P)\). In doing this we will introduce a bias into the estimate of the required \(n\) which will have a maximum of 5 percent. The simplicity of the resulting approximation, however, makes this an attractive option at least for initial considerations. The approximation becomes

\[
  n = \frac{4}{p\alpha^2}.
\]

With the above approximate formula for the required sample size we are in a position to consider the costs involved with obtaining data that are "reliable" for geographic regions defined in different ways. To obtain the estimate for the \(n\) required for state-wide estimates we merely enter the appropriate values for \(P\) and \(\alpha\). If we want to have two geographic regions instead of one and we want the "same" precision, i.e., we want the same value for \(\alpha\), the value of \(P\) on the average will be one-half its former size and the required \(n\) will be twice its former size. If we want ten regions with estimates for each with the "same" precision as the state-wide estimate, we will need a sample that is ten times that required for a state-wide estimate. To obtain estimates on a county basis would require a sample of 50 to 100 times that required for a state-wide estimate.

The level of precision may be considered to be a variable in the determination of the geographic level for which estimates are desired. It may be unreasonable to compare state-wide and county estimates for the "same" precision. Perhaps county and regional estimates do not need to be as precise as state-wide estimates in order to be useful. If this is the case then we need to consider the effects of joint changes in
P and $\alpha$. We could, for example, have estimates for four regions with "half" the precision, i.e., $P$ is approximately $1/4$ of its former value and $\alpha$ is twice its former value, for the same cost as the state-wide estimate.

Given the responsibility of the state decision-maker to plan on a sub-state regional basis in order to qualify for LAWCON funds, the position for planning on the basis of state-wide "demand" estimates is untenable. However, it might be reasonable for some wide-area agencies to plan on the basis of regions that are larger than a state. The cost of providing data on a county basis within acceptable limits of precision appears to be quite high. Also as argued previously, some "demand" estimates are irrelevant to planning when estimated for geographic areas as small as counties. Certainly this is true for many of the Federal wide-area land management agencies. It appears that most agencies will conclude that "demand" estimates based on some fairly limited number of regions would be most satisfactory given their objectives and the relative costs of data collection. Other factors will influence the decision as to the exact number of regions. One such factor is the possibility of using regions established for other purposes to obtain data comparable to existing data. If new regions are to be developed they should attempt to stratify the state into areas that are homogeneous with respect to their particular outdoor recreation problems.

**Definition of activities and priorities**

The third dimension of the question, "What 'demand' do we want to estimate?" is how activities should be defined and what priorities should be attached to estimates for different activities.
An idea that comes up from time to time, but not in the literature, is that we should combine activities into packages and estimate the demand for those packages. This is an appealing possibility because it recognizes the joint consumption aspect of outdoor recreation. When the consumer goes on an outing he often "consumes" more than one activity. Consideration of the Clawson Demand Curve approach to demand estimation leads one very quickly to the conclusion that a package concept is needed. The Clawson Demand Curve uses travel costs as a proxy for price. If you were to attempt to estimate the demand for single activities and some consumers participated in more than one activity on an outing you would be forced to use some arbitrary procedure for parceling the travel costs to the activities. As in the case of joint production, Carlson (8, p. 76), there is no logical basis for determining the individual costs of different outputs. Defining the "activity" as say, man-days of water-related recreation, eliminates the need to distribute the costs to different activities because only one "activity" is involved on trips to water-related recreation areas.

Two polar cases involved here are single-activity packages and one package which includes all outdoor recreation activities. The all inclusive package would indicate that man-days of outdoor recreation, for example, is all that we need the "demand" for. This obviously does not provide any information that the planner can use to decide how facilities for specific activities should be combined to make up outdoor recreation complexes. Nor does it help him to decide the number of facilities needed for each activity. The water-related package mentioned above suffers from the same problems at a slightly different scale.
Single-activity packages are useful in deciding the number of facilities needed for each activity. It is not as useful for deciding the optimal mix of facilities in outdoor recreation complexes. Meaningful combinations of activities into packages would be more useful for that decision.

The question boils down to whether or not a "reasonable" number of activity packages can be defined into which the total demand can be meaningfully placed. I think we can rule out completely the possibility of non-overlapping packages, i.e., packages defined such that each activity is included in only one package. In a completely general framework we could form all possible packages by having separate packages for single activities and all combinations of two, three, etc. activities up to the total number of activities. This is non-operational because of the tremendous number of combinations involved. In order to make the concept operational we would have to limit the number of packages. When the number has been limited by combining the packages in the general framework a choice will have to be made. One possibility is to include a sample unit's demand in a package that includes more activities than he actually participated in. The other possibility is to include a sample unit's demand in a package that does not include all of the activities that he participated in. It is logically necessary that one of these two things be done (or both) unless the limiting of the number of packages was done entirely by eliminating empty sets. If we include a sample unit's demand in a package that includes more activities than he actually participated in then we have to some extent the same problem that we had with an all inclusive package, i.e., we have difficulties in deciding the proper mix of facilities for specific activities that
should go into a recreation complex. If we include a sample unit's demand in a package that does not include all of the activities that he participated in we will underestimate the demand for facilities for the specific activity that was ignored in placing his demand in the category.

There are some interactions that must not be ignored. The definition of the sample unit will affect the decision here, but that will be discussed further in another section. At this point I would say that the package concept would seem to offer more hope for success in the estimation of demand for specific facilities. It is in this context that the Clawson Demand Curve has been used and developed. The package concept is unproven to say the least, where the primary purpose is the estimation of "demand" for broadly defined regions.

Whether the decision is made to estimate "demand" for packages or for single activities the analyst will be forced to make some decisions as to the activities to be included in the data collection and processing. Depending on the data collection procedures the setting of priorities will be more or less crucial. If the data collection procedures allows increasing the amount of data collected with modest increases in cost that is one thing. You must be alert for the following possibility must be considered, however. Increasing the amount of data to be collected from each sample unit may have a significant effect on the response rate or on the cooperation of the respondent. This could result in obtaining data from a very biased segment of the universe of interest.

There are a number of factors to consider in setting priorities for data on activities. One plausible method is to first compile a "complete"
list of outdoor recreation activities and eliminate from that list so that a high priority activity does not get eliminated by default. No attempt will be made to judge the relative importance of the questions that follow. However, I think that asking the following questions of each activity will be helpful in deciding its priority.

Two questions that should be considered are the investment per user unit of land and facilities for each activity, and the expected absolute growth rate (in whatever form of approximation this is available). These figures indicate the amount of resources that must be committed to this activity in order to meet the "demand." Presumably those activities that will require the greatest commitment of resources should, ceteris paribus, be given highest priority in terms of effort to develop high-quality demand information. These figures should give an indication of the money costs of providing too many or too few facilities.

Another question is whether facilities can be built which are flexible enough to accommodate another activity besides the one in question and if so at what additional cost. If, for example, camping spaces can be made suitable for either tents or trailers at a "reasonable" cost, then the priorities attached to estimates for these activities individually should be reduced in favor of estimating them together as one activity.

Is there now and is there expected to be in the future an excess supply of facilities for this activity? An activity such as kite flying should be given a low priority because of the site requirements being sufficiently flexible and in sufficient supply than an excess demand is not likely to develop.
Is this activity now or is it likely in the future to be the center of a hot political issue? Certainly the policy-maker must protect himself from the potential criticism that might be directed toward him if he could not provide the factual data requested by higher decision-making bodies on activities within his sphere of responsibility.

There are a number of social costs involved in being in "error" in deciding how to allocate resources to the outdoor recreation area. The remaining questions deal with possible social costs. If the demand for the activity is a merit want, Musgrave (9, p. 13), then ceteris paribus, it should be given a higher priority. It is presumably a merit want because the social cost of not making at least some minimum amount available, regardless of the ability to pay, is quite high.

Is this activity one which will probably not be efficiently provided for by the private sector and which will result in enforcement problems and resource damage if it is not provided for publicly?

Certain vehicles can be used on any available public property and apparently will be used to a considerable extent in violation of regulations unless suitable areas are provided within the regulations. Ceteris paribus, such an activity should be given a higher priority so that the decision-maker will have data from which to better assess the social costs of his decision to provide or not to provide facilities.

Is this an activity that will likely be involved in serious conflicts between recreation resource users? Substantial excess demand or incompatible activities which compete for similar resources may lead to such conflicts. Such an activity should be given a higher priority.
The answers to the above questions should help to identify those activities that should be given high priority because of the potential monetary and social costs of making "incorrect" decisions. When the activities have been ranked according to their relative priorities, the remaining logical question is how far down the list to go in collecting data.

The factors that should be considered in deciding how far down the list to go in collecting data are the effect that the length of the data collecting instrument will have on the response rate and the cost of data collection. As mentioned earlier a modest increase in cost is one thing, but the possibility of a drastic decrease in the response rate should be insured against by limiting the number of activities to a level considered prudent by people knowledgeable in survey research. If there are still important activities left after the prudent number has been established, there are several ways to increase the number of activities considered. One way would be to double the sample size and split the questionnaire into two (perhaps overlapping) parts. This involves a very high marginal cost. Another alternative is to change the survey methods to a kind that will allow a longer data collection instrument. For example, a telephone survey can take ten to fifteen minutes without substantially increasing the number of refusals. A personal interview could in general take more than four times that long. The relative costs of personal interviews to telephone interviews is on the order of five to one.

There are two aspects of activity definitions that merit further consideration. One aspect is whether similar activities (like tent camping and trailer camping) are split into two activities or lumped into one,
activity. There would be some advantage to the planner in having separate estimates for them since they in general do not use identical facilities. If they are split into two activities, the length of the data collection instrument will be increased. If this is not a limiting factor then it is of little importance. However, it should be recognized that the precision of the individual estimates will be less than the precision of the lumped estimate. If they are split one can, of course, obtain both estimates. The effect on the precision can be seen by rearranging the formula for the required sample size. With a given n the effect of splitting activities will reduce the values of P to P* and (1-P*). If the split activities are of equal "size" P* will be equal to P/2. Our approximate formula gives the precision as

\[ \alpha = \frac{2}{\sqrt{nP}} \]  \hspace{1cm} (5)

the precision for the two activities then becomes

\[ \alpha_* = \frac{2}{\sqrt{nP/2}} = \frac{2\sqrt{2}}{\sqrt{nP}} \]  \hspace{1cm} (6)

These equations show that the effect is to make the coefficient of variation for the individual activities \( \sqrt{2} \) times that for the combined activities. At some point, the level of precision is low enough to make the estimate of no value even if the marginal cost were zero.

The second aspect of activity definitions to be considered here, is the language that is used to define whether a particular event qualifies as "demand" for a particular activity. We can be very precise and specify that "by pleasure boating we mean driving or riding in a boat primarily for pleasure and not for the purpose of transporting oneself to another location where other activities are the main purpose for the ride. And a
pleasure boat is any craft of more than six feet long and more than three feet wide used on a body of water whether or not said craft is propelled by a motor." It is necessary to define precisely the limits that are to apply. However, this information can be used in most types of surveys only when the respondent requests clarification. The time consumed and the irritation caused by giving precise definitions of each activity to the respondent (even if it is clear and concise) will more than negate any gains that might occur. In general, activities should be given a precise definition that corresponds as closely as possible to the interpretation that the respondents will give to the one to five word title that you give to that activity. The bulk of the data that is obtained will have as its definition whatever most respondents interpret the activity name to include. Certainly this would not rule out directing their interpretation with explanations for some activities. Explanation of this type should be added sparingly, however.

Independent factors in the "demand" model

The last dimension of the question, "What 'demand' do we want to estimate?" is what factors should be considered in arriving at an estimate of "demand." This is one of the more obvious aspects of what is meant by "demand." There are at least four ways that "demand" might be interpreted consistent with the usage of the term in the outdoor recreation literature. The question of the factors to be considered in arriving at an estimate of "demand" is highly interrelated with the question, "How can 'demand' be projected?" The relative usefulness of various definitions of "demand", and the appropriateness of each under different circumstances, will be
discussed under that heading in the discussion of specific estimation
techniques. At this point the various interpretations of "demand" will
be briefly introduced and defined.

One interpretation of "demand" is a demand curve. This is the price-
quantity relationship that is familiar to students of economic theory.

Another interpretation is a demand function following the definition
of Baumol (10). This is a relationship between quantity and a number of
other variables besides price. Included as independent variables in a
demand function could be the income of consumers, advertising expenditures,
weather conditions, family size, and many other factors that can cause a
demand curve to shift.

A third interpretation of "demand" is what one could descriptively
call a consumption function, a general equilibrium use function. This
function relates the intersection of supply and demand, i.e., the level
of consumption or use, to the independent variables in both the supply
and the demand function. This involves explicit recognition of both the
supply aspects and demand aspects and the interrelationship between
supply and demand. One way that the general equilibrium use function could
be estimated would be to solve the structural demand and supply equations
to arrive at a reduced form equation. This reduced form equation estimates
the level of consumption or use and is the general equilibrium use function.

The fourth possible interpretation of "demand" is what I will call
simply a use function. This is what results when the purpose of the
estimation process is to estimate the level of consumption, but certain
factors which are known to be important factors in either demand or supply
are assumed to be fixed. Included in this category would be any models that did not include price at least in the structural equations. The use function is the largest category in terms of the amount of empirical work done. Many of these models include a number of "demand shifters," but assume price to be given. This is not to imply that this type of information cannot be very useful to answer some types of questions faced by outdoor recreation planners.

How Can Data Be Collected?

The universe

The first dimension of "How can data be collected?" is the universe. The question here involves defining the universe as the population that participates in certain recreation activities vs. some general population.

Of primary importance in determining the universe that should be sampled is the universe to which the results are to apply. In general the universe to which inference is to be made is some general population. This is true because we cannot identify the participating subset of a general population and must therefore have information that is applicable to the entire population. We could consider the problem in two steps, which will help to isolate the difficulties encountered here. Step one is the identification of the proportion of the population that participates one or more times. Step two is determining the average number of times that this subset participates. If we collect information from only those
who participate one or more times, we will have the data required for step two, but in general will not have suitable data for step one.

A procedure might be developed which would allow one to combine data from the participating subpopulation, with secondary data that applies to the general population, in such a way that the results would apply to the general population. If we were to take a 100 percent sample of the recreationists and determine the number of times each participated we would then know the percentage of the general population that participated one or more times provided that we knew the size of that population. This idea could be extended to a sample of less than 100 percent, but I am not aware of any papers that discuss the statistical properties of estimators that are arrived at in this manner. If the analysis is to be done in terms of socioeconomic sub-groups of the population, the secondary data used must be cross tabulated simultaneously on all variables involved in the subgrouping. Cross tabulated data are available for only a limited number of variables and of reasonable precision for a limited period of time.

There are difficulties in actually identifying the participating subpopulations when people live within the area for which estimates are sought. People who live within the regions for which estimates are sought will be referred to as "residents." People who live outside the area for which estimates are sought will be referred to as "non-residents." The difficulties encountered in sampling "residents" and "non-residents" will be discussed in a later section.

Survey techniques and sampling design

The second dimension of, "How can data be collected?" is the survey
techniques and sampling design. I will consider here techniques aimed at a general population as the universe and techniques aimed at a participating subpopulation as the universe.

The general population of an area might be sampled either by personal interviews in households or by telephone interviews. Both of these methods have been used by survey research organizations. I will not attempt any in-depth discussion of the reliability of data collected by these methods. A survey research consultant will generally be able to modify proposed techniques based on any special circumstances that might affect the validity of the data. There are some general considerations that will be mentioned here as guidelines for choosing a reasonable survey technique.

Two factors that will be of primary importance in determining an appropriate survey technique are the amount and the nature of the data required of each respondent. This is evident because the amount of time that you can retain the cooperation of the respondent will vary by the technique used. According to Palit the average interview time for a telephone survey should not exceed 12-15 minutes. The interview time for personal interviews can, of course, be considerably longer than this. This estimate pertains to surveys with a general population as the universe. In general the allowable times are somewhat longer if the universe is a subpopulation that has a particular interest in the subject matter of the survey.

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According to Palit it is important that all types of survey instruments be clearly written and have a continuity that makes the interview flow smoothly. This is important in maintaining the interest and cooperation of the respondent as well as obtaining answers to the right questions. The ultimate test of clarity and continuity is a pretest where the survey instrument is administered to a small sample of respondents and their reactions are assessed.

The above considerations deal with the quality of the data that will be obtained. The trade-off involved in the selection of a survey technique is between these quality aspects and the quantity of data. For a given cost, the number of sample units that can be surveyed will differ greatly with the technique used. According to Palit the cost of a household personal interview to the general population of a state is on the order of $25-$35 per completed interview. Telephone interviews to a similar population would cost about $5-$7 per completed interview.

If we are interested in sampling only the subset of the population that participates in outdoor recreation activities we could identify the sample units either at the site where they participate in the activities of interest or at some point enroute between their homes and the sites. We could use personal interviews either on-site or enroute. We could hand out questionnaires either on-site or enroute that were to be mailed back. Another possibility would be to mail out questionnaires to sample units identified either on-site or enroute. According to Palit the average

\(^3\)Ibid.
time required to complete handout and mailed questionnaires should not exceed 10 minutes. The cost of a mail survey once the names and addresses are obtained is on the order of $2 - $3 per completed interview. The cost of handout questionnaires once they have been handed out would be somewhat less because there would be no follow-up letters.

Sampling designs for sampling from general populations have been investigated at length and much of this material is now incorporated into statistics textbooks. Topics such as simple random sampling, stratified random sampling, cluster sampling, and multistage sampling contain material relevant to this question. Methods of constructing a sample frame and drawing a sample for household interviews, telephone interviews, handout questionnaires, and mailed questionnaires depend on the particular situation and the resources available for constructing a sample frame. The survey research consultant familiar with the particular situation can identify the relevant options and the implications of each.

On-site sampling aimed at sampling only the participating subpopulation has been used in a number of studies. Shafer and Hamilton (11) compared four survey techniques for sampling the participating subpopulation. Boyet and Tolley (12) used data gathered from the participating subpopulation for their "demand" analysis. We might also sample the participating subpopulation by temporarily isolating them from the population of motorists on the highways.

To summarize discussion of survey techniques and procedures for drawing samples, there are three circumstances of particular interest. One
situation is the state with an important recreation industry. In this situation both residents and non-residents are major components of the "demand." Some Federal agencies may have a similar situation where there are substantial numbers of people living within the boundaries of their planning regions. A second situation is the state which provides day-use and overnight facilities for its residents, but does not have a recreation industry that in itself attracts substantial numbers of non-residents. It may, however, have substantial use due to recreation travel that passes through the state enroute to other states. A third situation is the Federal agency which owns large blocks of land without substantial numbers of people living within the planning region. We can summarize briefly the distinction between these three situations. In the first situation we are concerned with residents and non-residents. In the second situation we are concerned primarily with residents. In the third situation we are concerned primarily with non-residents.

Resident recreationists do not cross a limited number of points enroute to their recreation destinations. Because much recreation occurs close to home, any system of cordons designed to intercept resident recreationists on outings would be ineffective. No reasonable number of cordons could be set up that would not miss a significant amount of recreation that was internal to the cordon, i.e., residents living inside the cordon participating at facilities located inside the cordon. The proportion of residents that participate in some outdoor recreation activities in their home state on mid-season weekends is sizeable. For particular activities the proportion may be quite small, say less than one percent. Even so, interviewing the general population is a viable
alternative because with the joint objectives, i.e., to obtain an estimate for each of 10 to 25 activities, something well over 50 percent of the general population will be in the participating subpopulation. The advantages of sampling the general population is probably reinforced by a lower cost of sampling for equivalent data in the case of residents.

The proportion of the non-resident population that participates in recreation activities in another state is much smaller than the proportion for residents of that state. Depending on the particular states involved, even an adjoining state may have a proportion of participants that is considerably less than one percent. The proportion involved in specific activities may be on the order of 0.0001. This makes sampling from the general population of even the immediately adjoining states an unattractive option. When you have to sample 100 or even 1000 sample units to find one sample unit with the attribute of interest the sample size required for very low levels of precision is prohibitively high. This principal applies to the Federal agency as well. As long as the proportion of the general population that is included in the participating subpopulation is "sufficiently" high, sampling from the general population is a relevant possibility. Some Federal agencies may find it possible to sample the non-resident general population. Probably no states will find it reasonable to sample the general populations of other states.

The non-resident participating subpopulation does have to cross the planning region boundary to reach their destination. In the case of states this boundary is the state line. A large proportion of this subpopulation will be on fairly long overnight or vacation trips and will
likely use a limited number of interstate and primary highways. Some Federal agencies have limited access to their areas. In these cases a sample of the non-resident participating subpopulation could be obtained by sampling, perhaps at varying rates, traffic crossing the planning region boundary at a fairly limited number of stations.

Three alternative methods of obtaining data from travelers might be considered. One possibility is to stop traffic and interview the occupants of the vehicles for the data. Highway planners have used this method extensively in "origin-destination" studies. The information they ask is quite limited and the interview time is usually limited to 30 seconds or less. This is nowhere nearly adequate interview time to obtain information on participation in outdoor recreation activities. Also, interview times as long as 30 seconds are unacceptable on many high volume roads.

A second alternative is to handout a questionnaire to stopped or slowly moving traffic which is to be completed at the motorists convenience and mailed back. This method would probably be acceptable at least for short sample periods on high volume roads. A possible problem with this procedure is that there is no opportunity to remind the motorist to complete and return his questionnaire and the response rate might be fairly low as a result.

A third alternative might be to photograph the license plates of vehicles on a sample basis as they pass the station. The name and address of the owner of the vehicle could then be obtained from his home state and questionnaire mailed to him to be completed and returned by mail. There are a number of serious problems involved with this procedure.
One problem is that license files are not current. If there is a lag of only one month we would expect about 1/12 of the names and addresses of owners to be incorrect. The lag time involved in obtaining the names and addresses of owners may result in some recall problems. There may be legal difficulties in obtaining the names and addresses of vehicle owners because there is the possibility that at least one state may remove that information from the category of "public information." Some states will provide the information only at the unattractive cost of one to two dollars per license number. The techniques for photographing license plates on moving traffic have been experimented with to some extent. However, there are problems with those techniques. If the rear plate is photographed you will be unable to obtain a suitable photo of vehicles towing trailers or boats because the trailer or boat will in many cases obscure the plate. Since the occupants of these vehicles are quite likely to be members of the population we are seeking to identify it would be extremely unwise to ignore this problem. Photos could be taken from the front, but some states do not require a front license plate. In addition I am not aware of any procedure for photographing from the front at night that does not constitute a traffic hazard.

It appears that planners who have significant numbers of residents and non-residents in the participating subpopulation will need to sample the general population of residents and the participating subpopulation of non-residents. Planners who have very few resident users may be able to sample the general population of non-residents, but in many cases will have to sample only the participating subpopulation of non-residents. Planners who have only incidental non-resident participation can con-
centrate their efforts on sampling the general population of residents.

The cost of a traffic survey is quite high if a large area is involved. The cost of a state-line survey is probably at least as much as the cost of a survey of the general population of state residents. This makes one more alternative worthy of consideration. That alternative is the possibility of regional coordination of data collection efforts.

Let's look at the data that we want to obtain from the resident population. We are interested in determining how frequently they participate, what activities they participate in, and where they go to participate in these activities. As long as we are asking those questions anyway, the marginal cost of obtaining the answers when they pertain to outings outside our planning area is very low. In order to prevent the respondent from being frustrated at having taken a vacation trip and not being able to "count" it, it might be desirable to pick up this data even if there were no use for it.

What would be involved in a regional data collection system? States could be given the responsibility to collect data from their residents. If this were done, basically what would be involved, would be that when each state sampled its population, it would ask for information on all outdoor recreation outings regardless of the destination. This would require some standardization of procedures and content. One item that would have to be standardized would be the desired relationship between the demand data and the peaking characteristics. Data that are in terms of man-days per year and data that are in terms of man-days per mid-season weekend are incompatible and cannot be converted with any degree of
precision. Activities would have to be standardized so that coverage and definitions would be compatible. There are a number of options that could be left to the individual discretion of the states. It would not be essential that the data collection be done simultaneously in all states, although there would be some advantages in doing so. Neither the survey techniques nor the sample design would have to be standardized. As long as answers to the fundamental questions of how many sample units went on outings, what activities they participated in, and where they went are obtained, the states should be able to make effective use of the data provided by cooperating states. Federal agencies could also make effective use of this kind of data.

The sample unit

The third dimension of, "How can data be collected?" is the sample unit. One important question concerns definition of the family as the sample unit vs. the individual as the sample unit. In the theory of consumer behavior the consuming unit is usually referred to as "the consumer." This term is sufficiently flexible to refer to families if one so chose. There seems to be no compelling theoretical case for either definition. Particular estimation techniques may imply a particular definition of the sample unit depending perhaps on the "demand" that is to be estimated. It may be more efficient to obtain data for family units since one member may then be able to provide data for four people at very little marginal cost. Further discussion of this question will be postponed until the specific estimation alternatives are discussed.
Sample size

The last dimension of, "How can data be collected?" is the number of sample units. This is a very straightforward question. All we need to know to answer it is the level of precision that is required and the values of the parameters that we are setting out to estimate. Unfortunately, a "correct" level of precision can seldom be determined and the information available for obtaining preliminary estimates of the parameters that we want to estimate in the survey is often very poor or lacking entirely.

Current estimates of "demand" are an important consideration in designing the "demand" study. However, another important aspect and perhaps the one used most directly in the planning process is the use of this data in making projections of future "demand." It is unreasonable to talk about the precision of projections because the assumptions involved in making those projections will not be fulfilled. These assumptions will be violated in varying and unknown degrees. Under these circumstances it is not very reasonable to operate on the precision of estimates that assume that the assumptions are perfectly met. Rather it is more reasonable to make those decisions with respect to precision and the sample size on the basis of the precision of the current estimates. Since we are usually interested in estimates for 10 to 25 activities for each of five to 15 regions, there are a large number of objectives. Perhaps it would be helpful to think of the problem as determining the number of man-days of recreation per region, recognizing that the estimates for particular activities will have a lower level of precision because of the smaller value of P. While we may use a regression estimator and thereby in...
the precision of our current estimates, the quality of preliminary estimates in most cases will be sufficiently poor so that this level of sophistication in determination of the required sample size is more trouble than it is worth. If our objective is to obtain an estimate for the number of man-days of participation in a particular region we could increase our precision with the same sample size or reduce the sample size for a given level of precision by an optimal allocation of sample units to geographic regions of the state. Since we have multiple objectives the simplicity of a self-weighting sample probably outweighs any gains that might be realized by juggling the allocation away from a proportional allocation.

The sample size with proportional allocation that is required for the precision of any particular estimate for a given region to have a 95 percent confidence interval half-width of \( \alpha P \) is given by the following formula:

\[
    n = \frac{4(1-P)}{\alpha^2p}
\]  

(7)

This formula ignores the gains in precision that may be realized by the use of regression estimators instead of simple random sample estimators. It also ignores the losses in precision that will occur if a sample design is used whose statistical efficiency is less than one; the efficiency of a simple random sample is one.

The trade-off to be considered in setting the sample size is precision vs. cost. I will propose no formula for determining the marginal value of an increment in precision,
How Can "Demand" Be Projected?

For discussion purposes, "How can 'demand' be projected?" will be split into the arbitrarily determined dimensions of techniques for projecting "demand" from the origins of consumers, and techniques for distributing participation to areas of consumption. The final dimension deals with the secondary data that are available and the implications this has for the alternative techniques.

Projecting "demand" from origins

Consistent with previous statements that the objective of this dissertation is not to forge new tools, but to put the available ones to better use, I will discuss only those projection techniques that have been tested, including slight modifications of techniques that do not necessitate a retesting of basic concepts.

To facilitate discussion, projection techniques can be classified according to the type of "demand" that is being estimated, and the type of data that is used. One type of "demand" is the demand curve which involves only price and quantity. Another "demand" is the demand function which involves price, quantity, and socioeconomic factors that are "demand shifters." A third type of "demand" is the general equilibrium use function which explicitly solves a general equilibrium system to estimate the level of consumption. The fourth type of "demand" is the use function. The use function is designed to also estimate the level of consumption, but it assumes that "price" and/or supply factors are not variables. The types of data involved are time-series and cross-sectional.

If we consider all possible combinations of types of "demand"
crossed with types of data we see that there are eight possible combinations. Of these eight combinations I am aware of five that have been reported in the recreation literature.

Of the two combinations of data that might be used to estimate a recreation demand curve only the cross-sectional approach has received mentionable attention in the literature. The Clawson Demand Curve, Clawson and Knetsch (13), makes use of cross-sectional data in the estimation of a demand curve.

Of the two combinations of data that might be used to estimate a recreation demand function only the cross-sectional approach has been reported in the literature. A modified Clawson Demand Curve as suggested by Knetsch (14) uses cross-sectional data to estimate a demand function. Boyet and Tolley (12) use cross-sectional data for five years to estimate a demand function.

Both types of data have been used to estimate use functions. The resulting functions that have been estimated are quite diverse. Zivnuska and Shideler (15) used time series data to obtain use of national parks and national forests in California as a function of population only. The multivariate analysis of socioeconomic factors used in ORRRC #20 (16) is one of many examples of cross-sectional data used to estimate a use function.

Only cross-sectional data has been used to estimate a general equilibrium use function. This was done by Cicchetti et al. (17).

Several specific problems involved in each of the combinations of type of data and type of "demand" can now be usefully considered. In particular I want to mention the usefulness of each
in different types of applications and the estimation problems encountered.

The Clawson Demand Curve uses travel costs as a proxy for price to estimate a demand curve. Through data collection at a particular facility the number of people coming from each of several distance (travel cost) zones can be determined. This combined with population data can be converted to a per capita use rate. We can then plot travel costs against per capita use. You then assume that a one dollar change in the entrance fee will have the same effect as a one dollar change in travel costs. To derive the demand curve you hypothesize successive one unit increments in the cost. For each hypothesized cost you determine the per capita use rate that would be expected from each distance zone at the new cost. The total visits at each successive cost increment traces out the Clawson Demand Curve. This procedure would be modified slightly if the facility for which the demand curve were being estimated had an entrance fee at the time the data were collected.

There are a number of difficulties with this estimation procedure. Most of these difficulties have been pointed out by Clawson and Knetsch (13) so I will only discuss the ones that are of particular importance to the kinds of applications in which we are interested. One thing that can be noted is that this procedure ignores the time cost of traveling to the recreation site. We would expect that a one dollar increase in the entrance fee would reduce the level of demand less than moving the facility one dollar's worth of travel distance farther away. This is to be expected because the one dollar more in travel cost has associated with it a 15 minute or so increment in travel time which for most people will have a negative utility. This bias may be small enough to be of
little concern. It is an empirical question which could be tested.

In making projections we are talking about extending data from a
given time and space either over other spaces, over future times, or
both simultaneously. The Clawson Demand Curve might be used successfully
to extend over a short time into the future. The effects of a change in
the entrance fee might be analyzed for a given facility to which the
demand curve applied. It might also be used to extrapolate across space
and time to project the demand for a proposed facility. The facility
must be similar to the one for which the demand curve was estimated.
A condition more likely to be violated is that the population which will
use the facility must be similar to the one using the facility where the
demand curve was estimated. They must be similar in socioeconomic back­
ground, cultural background, and in the alternative facilities available
to them.

This estimation technique has some implications for how activities
should be defined and what the relevant universe is. If we are going to
use travel costs as a proxy for price it follows that we must be able to
determine what the relevant travel cost is for our choice of definitions
for activities. If the sample unit "consumes" one man-day of swimming,
one man-day of picnicking, and one man-day of nature study while on an
outing, any allocation of the travel costs to these activities will be
arbitrary. This implies that any definition other than man-days of
participation in outdoor recreation, or for a particular facility perhaps
man-days of participation in, say, water-based outdoor recreation, will
involve arbitrary and meaningless "prices." It appears to me that it is
the Clawson Demand Curve that gives rise to the suggestion that we should
estimate the demand for packages of activities rather than for individual activities. And certainly it is a valid suggestion in the context of the Clawson Demand Curve. A previous section discussed the relative usefulness of different definitions of "activities." The Clawson Demand Curve could be estimated from a sample of the general population, but it could probably be estimated at a lower cost by sampling users of a particular facility since it is ordinarily a particular facility for which the demand curve is sought.

While the Clawson Demand Curve may have applications useful to planners, the question I want to consider now is its possible application to the estimation and projection of regional demand. An immediate difficulty that arises is that the travel cost is no longer so well specified. If we are talking about the demand for a region that is composed of five to ten counties, the travel costs will vary considerably depending on the exact sub-regional location of the destination of a particular sample unit. What I am suggesting is that the assumption that the users are concentrated at a point in the middle of the distance zone and the users travel to a common point in the destination zone is no longer tenable. The definition of the activity implied here is man-days or family-days of outdoor recreation. The usefulness of such a broad definition is limited.

The demand function suggested by Knetsch (14) is basically a Clawson Demand Curve that has been modified to make it a demand function. The estimation technique is quite similar, but it takes more factors into account. The first step is to determine the relationship between per capita visits and travel costs, income of the population groups, con-
gestion, and some measure of substitute areas that might be used. We can then obtain a multi-dimensional demand function which gives the level of demand for the given facility for each population sub-group, i.e., each combination of cost, income, congestion, and substitute areas. The level of total demand is found by summing the level of demand for each population sub-group. The analysis would not necessarily be restricted to these factors. Other socioeconomic factors besides income might be included.

This demand function would eliminate some of the difficulties involved in a spatial projection of the use of a potential development. Since we can now isolate some of the effects of different user populations, congestion, and substitute facilities we have substantially expanded the scope of application of the estimated demand function over the Clawson Demand Curve.

Trying to apply this estimation technique in a regional context encounters the same major difficulty that the Clawson Demand Curve encounters; the travel cost is not well defined. In addition the definition of the activity is the same. This leaves many regional questions unanswerable.

A paper by Boyet and Tolley (12) is not fundamentally different from the general suggestion of Knetsch for estimating a demand function. They do, however, use two different procedures one of which accounts for the distribution of socioeconomic variables and one which uses only the averages for socioeconomic variables. The only difference resulting from their use of cross-sectional data available for more than one year is that they have combined the data for several years. If sufficient
data were available the possibility would exist for testing the hypothesis that the relationships are stable over time. They have demonstrated the estimation of a demand function in two different contexts with the procedures modified accordingly.

The first test of the demand function model was with data for national parks. The second test was with data for a five-county area in western North Carolina. In both instances the dependent variable of interest was the number of visits to the area, either total or per capita. Thus we encounter once again the difficulty of obtaining information to help decide the distribution of budget between different activities. Both examples involve data obtained by surveying only users. This is relatively simple and inexpensive in the case of a specific facility such as a national park. Obtaining samples with known properties from users of a five-county area is neither simple nor inexpensive. The authors do not elaborate on how they obtained the data from users of the five-county area in western North Carolina. It would appear that this procedure does offer promise as a useful technique for projecting the level of demand for specific facilities. However, the feasibility of using this procedure for obtaining regional estimates and projections of demand for broad regions has not been demonstrated.

The first type of use function that I will discuss is one that was estimated with time-series data. Zivnuska and Shideler (15) made projections of the use of national parks and national forests in California on the basis of a time-series relationship between population and use. Their final model was:

\[ Y = a + bX \] (8)
where: \( Y = \) total visitors in thousands  
\( X = \) population in thousands.

This model assumes that marginal increments in population will result in constant marginal increments in visits. This may in fact be the case and projections made in this way may turn out to be "good." This type of projection, however, does not help us to understand the forces that are at work. The past correlation between population and park visits was probably caused by some complex interacting forces. Current evidence suggests that the per capita use of outdoor recreation facilities in general is not the same for different socioeconomic subgroups of the population. It is also reasonable to suspect that the amount of resources available in national parks and national forests in California may have been interacting with other factors. If this type of data is available, however, it may still be an attractive alternative.

This is another situation in which projections have been made for specific facilities. Even if the procedure is useful for that purpose there may be difficulties in using the same technique in a regional context. The particular difficulty encountered with this technique is that there is no suitable time-series data from which such projections could be made. The decision-maker charged with coordinating all outdoor recreation development cannot ignore the recreation use that occurs at privately owned facilities. Even many public agencies do not have data that could be used for making time-series projections. And even the public decision-maker who is interested only in deciding how many facilities to provide through public ownership is not in a position to ignore the amount of recreation and the number of facilities provided by
other agencies and groups.

A procedure used in a number of studies of outdoor recreation "demand" is a cross-sectional analysis of participation in various activities. This has been done most often with cross-sectional data from some general population. The first multivariate analysis of socioeconomic factors in their relation to participation in outdoor recreation activities based on a national survey was reported by ORRRC #20 (16). This multivariate analysis was done with the individual as the sample unit. It considered such factors as income, age, education, and occupation of the head of the household, weeks of paid vacation, place of residence, region of residence, race, and the stage in the family life cycle. The dependent variable was an "activity score" which was a weighted score depending on the amount of participation in various activities and whether or not the respondent mentioned the activity spontaneously in an open-ended question. The main purpose of this work and of many other studies was to increase our understanding of the factors that affect participation in outdoor recreation and the relative importance of these factors. One of the primary differences between studies of this type and studies specifically designed to obtain projections of outdoor recreation "demand" is that studies of the latter type are more limited in the independent variables that they may consider. Projections which are based on independent variables, which cannot themselves be projected with any degree of certainty, are of little value.

A number of "demand" studies using multivariate analysis have been done under the assumption that "price" and "supply" will remain the same, i.e., the analysts have considered socioeconomic "demand" shifters
while ignoring "price" and "supply" factors. The rationale for ignoring "supply" is that in the relatively near future the "supply" will not change dramatically and can therefore be ignored. If the use of recreation areas is growing at ten percent per year and the amount of facilities is growing at a rate somewhat slower than that, it will be several years before the distribution of facilities and the availability of facilities is "substantially" affected. "Price" can be ignored if it is not expected to change "substantially" in the future. For some "demands" travel costs are more important than entrance fees because of their relative magnitudes. A "substantial" price change would have to be "substantial" in terms of real cost, not money cost. The assumption involved in making projections on the basis of a multivariate analysis of socioeconomic factors is that the socioeconomic status of the sample unit, at least in part, determines his recreation preferences. If this is correct, people in the future with the same socioeconomic status as those we observe today will have similar recreation preferences.

One study that involved multivariate analysis of socioeconomic factors while ignoring "price" and "supply" was done by Gillespie and Brewer (18). This study was based on a survey of the general population of the St. Louis, Missouri area. This study considered one activity: water-oriented recreation days per family. One thing to note about this particular study is that estimates of the standard errors of estimated parameters should be considered suspect since they started with 32 independent variables and omitted 16 of those because of insufficient contribution to the $R^2$. Another point of interest is that they have included some interaction terms in their analysis. One interaction
term was in the final model: family income x age of the head. The result of this is that when they used their model for estimates they had to estimate the use for the average family rather than the average use for all families. This was their only alternative because cross tabulated data were not available from which the frequency distribution of cross tabulated cells could be obtained. Census data may be available in the future for obtaining this kind of information. However, in making projections into the future a model with interaction terms requires projections of cross tabulated data. Projections of individual factors are sufficiently subject to error that projections of cross tabulated population characteristics are just not worth the bother.

The Ph.D. dissertation by Manning (19) is another example of a multivariate analysis that did not include any "supply" factors nor "price." This analysis, however, was done for each of 23 activities rather than for a general multi-activity package, such as days of water-related outdoor recreation. Given that projections are for a short enough period that the "supply" will not change dramatically and given that no major changes in the "price" are to be expected, this type of procedure may be useful in establishing a projection that represents maintaining the status quo. How such a projection might be used for making rational decisions about how the status quo should be altered will be mentioned later. There were no interaction terms in the final model. Both this study and the one by Gillespie and Brewer (18) were done in terms of the number of occasions per year. Both of these studies ignored the locations where the sample population participated in the activities. A later section will deal with the question of how
to estimate and project the distribution pattern of participation.

Cicchetti et al. (17) estimated the parameters of a general equilibrium use function. This was a multivariate analysis using cross-sectional data. It claims to be fundamentally different from previous "demand" studies because it attempts to estimate the effect of various "supply" factors on "demand." A point often raised with respect to recreation "demand" studies is that supply affects demand, and should therefore be taken into account. Certainly the amount of outdoor recreation consumed is not independent of the availability of facilities. An appropriate way to approach such a situation is to hypothesize the form of the demand function and the supply function and solve these equations to obtain a reduced form equation. This explicitly recognizes the general equilibrium nature of the outdoor recreation market. The empirical feasibility of such a model depends on the ability of the researcher to hypothesize meaningful supply and demand functions with resulting reduced form parameters that can be estimated with obtainable data.

The theoretical specification of their reduced form equation is sufficiently general that the choice of variables to be entered is rather broad. They used a two-stage estimation procedure which appears to be a good idea and perhaps essential when many of the variables used are non-dummy variables. That, however, is not relevant to the question of whether in fact the resulting model, as they have specified it, is useful for making projections. Their model is based on the individual as the sample unit. They use the usual socioeconomic characteristics. In addition they use income and population figures for "primary sample
units" and states. Some of the "supply" variables are acreages of
various categories of land and water. They also include numbers of
various privately owned recreation establishments. And to top it off
they have receipts of recreation-related establishments and day visits
and night visits per capita. Many of these variables are lagged one
year. This does not avoid the difficulty of trying to project the:
values of the independent variables. The number of night visits per
capita to a state probably is correlated with the number of camper
nights, since night visits by campers is a component of the number
of night visits. But how are we going to project the number of night
visits per capita to 1979 so that we can use it to project the number
of camper nights for 1980? In actually making projections the authors
assume that private recreation establishments will increase proportionally
to population. They abbreviated the socioeconomic variables in the
projection model to include only race and age.

Perhaps other choices of variables would result in a model with
fewer estimation problems. Going back to the theoretical reduced form
equation we find that the level of demand for year $t$ is equal to a
constant plus a linear coefficient of the following: "distance$_{t-1}$," 
"quality$_{t-1}$," and "socioeconomic$_t$." "---distance$_{t-1}$ is a proxy for price
lagged one period and is the physical distance between the $i^{th}$ individuals
point of origin and a major body of water, quality$_{t-1}$ and quantity$_{t-1}$
is a composite of the level of crowding and relative availability of
recreational resources in the period immediately preceding $t$, and
socioeconomic$_t$ are the characteristics of individual $i$ (e.g., age, race,
sex, income, etc.) in time period \( t \)" (17, p. 54). When viewed in this light the intent becomes clear. The supply factors which are introduced to account for the interacting nature of the general equilibrium system are measures of the availability of recreation resources. We are compelled to reach the conclusion that to project the level of demand for 1980 we must first know at least two things. One is the level of demand for 1979 and the other is the amount of resources in 1979 so that we can use these figures to determine the availability of recreation resources in 1979. I must therefore conclude that while their theoretical formulation has led them to a reduced form model, the parameters of which can be estimated, there is no statistically sound way of projecting with this model that is consistent with the intent of their theoretical formulation.

Potential changes in our social institutions include a number of things that might have a significant impact on the level and pattern of outdoor recreation demand. The most obvious of these are the length of the workday and the length of the work week. A four day work week, for example, would certainly affect the pattern of outdoor recreation demand. The traditional vacation pattern for primary and secondary schools precludes vacation trips for many people for much of the year. If these institutional factors are subject to significant changes, then those effects should be considered.

Two other areas that may significantly affect future outdoor recre-
ation "demand" are technological changes in transportation and in recreation equipment. Technological changes which lower the cost of transportation lower the "price" of outdoor recreation. Since the amount of "price" reduction cannot in general be predicted, the "price" changes cannot be incorporated into the projection techniques. Technological changes which lower the cost of recreation equipment also lower the "price" of outdoor recreation. The development of new types of recreation equipment may have dramatic effects on the total demand for outdoor recreation, the distribution of demand between activities, and the location where participation occurs.

It may be possible to make some adjustments for these technological changes in future projections. Each time a new "demand" study is done it provides an opportunity to evaluate the success of the previous projections. We will begin to generate a time-series of projected "demands" and actual "demands." At each of these points it will be useful to speculate on why the projections were not precise. Does the difference between actual and projected appear to have a consistent bias? If a consistent bias does appear in this series, it might be reasonable to adjust future projections made by the mechanical procedures outlined in this dissertation by a proportional amount.

It would be valuable to determine whether the projections missed the mark because of our inability to project the independent variables satisfactorily or because there were important factors at work which were not included or were inadequately included in the projection model. We could determine this by entering known values of independent variables for given years into previous models and noting how this affected the
resulting "projections." If this were done for a number of projections, the test of whether or not the inability to project the independent variables is critical, is whether or not the precision of these projections is "significantly" increased by the use of known values.

Another useful analysis of past projections would be to compute confidence intervals for them using the known values for independent variables. A measure of the validity of projections through time made in that way is a comparison of the proportion of the actual values that fall within the calculated confidence intervals with the expected proportion. If the proportion of actual values falling outside the confidence intervals is higher than expected it is because of errors in the measurement of variables or model mis-specification.

Projecting "demand" to destinations

The second dimension of, "How can demand be projected?" is techniques for distributing participation to areas of consumption. None of the models discussed in the preceding section dealt with the question of where the demand was manifested as consumption. Indeed, very few "demand" studies have considered this question. Presumably, the current distribution of consumption reflects at least in part the desires of recreationists, although the distribution of recreation resources is certainly important, too.

What are the options available for projecting the distribution of consumption? The options include composite models to estimate consumption by destination, and strictly distributional models that assume the level of consumption by origin populations is known. I will discuss four possibilities: regression equations, gravity models, linear systems
analysis, and proportional changes.

Each of the first three techniques was developed for explaining the attendance at a set of facilities. For planners who are interested only in a specific set of facilities these models may be useful. For a very excellent, concise discussion of these techniques in that context see Cesario (20, pp. 33-42). Difficulties may arise in trying to apply these procedures to geographic regions. It is in the context of a regional distribution pattern that these techniques will be evaluated.

Cesario (20) discusses two ways of applying regression analysis. Both involve combining of the distribution pattern with the estimation of consumption into one regression model. One procedure is to estimate through regression analysis the number of recreationists going from origin i to destination j per period of time. Factors in the model include the number of people residing in origin i, some measure of the socioeconomic status of residents of origin i, the distance or travel time from origin i to destination j, some measure of the attractiveness of destination j, and some measure of the competing opportunities of destination j. One difficulty with this approach is finding meaningful variables for the attractiveness factor and the competing opportunities factor. This difficulty would be no less severe with a regional definition of destinations than with a site definition of destinations. The model as presented by Cesario does not allow for different rates of consumption by different socioeconomic sub-groups of the population at origins, but only for different rates by origins with different average levels of socioeconomic variables.

Since the results of the previous model could be summed to arrive
at total consumption for any destination in the system one is logically led to consider the possibility of using a regression model that estimates directly the consumption for each destination. The factors in the model of this type discussed by Cesario include some joint function of population and distance as a proxy for accessibility of destination j, attractiveness of destination j, other competing destinations, and some saturation factor. This formulation has the same difficulties as the previous one with respect to defining meaningful variables for attractiveness and competing destinations.

A second possibility is a gravity model. The gravity model takes the level of consumption at origins to be given and provides a procedure for projecting how this consumption will distribute itself to the possible destinations. The gravity model assumes that the pattern of distribution is some function of the total trips generated at origins, the ability of destinations to absorb trips, and the distance between each origin and destination. An appealing feature of the gravity model is that the distance could be measured in travel times and could be changed to reflect changes in travel times resulting from changes in highways and congestion. The ability of destinations to absorb trips implies some measure of recreation resources which is a good feature, but one for which it is difficult to find a suitable variable. Unless attractiveness is included here the model will "assume" that areas are equally attractive. With this model we are again required to determine the distance by some definition between origins and destinations. If we use a broad spatial breakdown for regions, that distance is not well defined. If we use a fine spatial breakdown of regions the amount of data required
to "calibrate" the model is enormous.

I think some modification of the basic gravity model would be necessary in a regional context to account for a directional bias in the system. For summer activities in the midwest for example, I suspect that facilities 200 miles south of home in general have less attraction than similar facilities 200 miles north of home. This north-south difference of 400 miles has a considerable climatic difference. Mountains or lakes will have an attraction over and above that due to the facilities located there. These are a few of the many problems involved in constructing a meaningful attractiveness variable.

Linear systems analysis is another technique for determining the distribution of consumption to destinations given that we have predetermined the level of consumption coming from each origin. This technique will not be presented because it is, as Cesario states, "in an embryonic stage of application" (20, p. 42). He does point out that this model offers the desirable possibility of introducing park congestion into the analysis. As with the gravity model, however, since the level of consumption is predetermined, congestion in the system can only be reflected in the distribution pattern and not in restricting the level of consumption.

Another possibility that should be considered is to estimate the distribution pattern directly from a sample and assume that as the total consumption coming from an origin changes, the proportion that goes to
each destination will remain constant. One objection to this procedure might be that changing socioeconomic characteristics of the population will tend to not only affect the amount of recreation that people consume, but will also change where they go. This may be true, but none of the more sophisticated models can allow for that either. The changes that one or more of the more sophisticated models are supposed to be able to handle are changes in distribution caused by congestion and changes in the quality and location of facilities. The difficulties encountered in trying to apply one of those models in a regional context are quite serious, however. This makes a procedure that basically represents maintaining the status quo a reasonable alternative if it can be shown to be a useful input in the planning process. That will be discussed in a later section.

Secondary data

The final dimension of the question, "How can 'demand' be projected?" is the secondary data which are available and the implications that they have for deciding what techniques are feasible.

The most comprehensive socioeconomic data available on the population of the United States and sub-divisions is from the Bureau of the Census (21). The Office of Business Economics has made projections of economic data of states and sub-divisions for the United States Water Resources Council (22). The census data are of course only appropriate for a particular year. These data are updated by sample data in the interval between Censuses, but not for units as small as counties.

The real difficulty is obtaining projections of socioeconomic characteristics of the population which are needed in making projections
of recreation "demand." Projections of population by age, sex, and perhaps race can be obtained from state agencies. These projections can be made easily by anyone using standard techniques applied to Census data. Many studies have shown other variables to be correlated with recreation participation. Can we obtain reasonable projections for these variables? There is some implied average family size involved in projections of population. The population projection may be based on fertility rates, but this implies some average family size. It does not seem unreasonable to combine information about the projected average family size with the known current family size distribution to obtain a projected family size distribution. Other variables could be handled in a similar manner. Substantial knowledge of demography would be most valuable in making such projections.

While it does not seem unreasonable to make projections of single variables based on the best information available, it is unreasonable to try to project cross tabulated data. We could project the number of families in each of five income classes. We could project the number of families in each of five family size categories. However, it would be ridiculous to try to project the number of families in each of 25 categories of size of family cross tabulated with income. This implies that we should try to avoid models that include interaction terms that require projections of this type.
INTERRELATIONSHIPS IN THE CRUCIAL DECISIONS

Up to this point, each of the crucial questions have been considered independently. The manner in which these decisions depend on each other can now be examined.

The analysis has shown that we can define "demand" so it will have whatever relationship to the peaking characteristics we desire, as long as we select an appropriate sampling design and survey technique to obtain the desired relationship. We are then at liberty to establish whatever relationship will prove to be most useful in the information that is used in the planning process.

We have less flexibility with the geographic level for which we want to make estimates and projections of demand. This is due to the fact that as we make the geographic breakdown finer we increase the costs substantially. The agency that is interested in providing for all types of demand, i.e., day-use, overnight, and vacation demand, has a slightly different perspective on this question than the agency that considers its primary obligation to a particular type of demand.

The definitions of activities and the priorities attached to them can be determined on the basis of the need for information. There are no important interrelationships between this decision and others. The one aspect that does involve some interrelationship with the particular estimation and projection techniques employed is whether or not activities will be combined into packages of activities and the "demand" estimated and projected for those packages.
The question of the factors that should be included in the estimation and projection of "demand" is highly interrelated with how estimates and projections will be made. In deciding whether a demand curve, a demand function, a use function, or a general equilibrium use function is the best choice for a particular application to the planning process you must consider the relative cost of obtaining each. For the particular application you have in mind each of the choices may involve some theoretical deficiencies. In addition, the estimation techniques will cause the resulting information to diverge somewhat from its theoretical properties. The empirical deficiencies and cost must be balanced against the theoretical advantages in order to arrive at a choice that is best for a particular application. The choice will be affected considerably by whether the application involves primarily a projection across space, a projection across time, or a projection across both space and time.

There are no technical reasons to prefer one definition of the universe over another when considered in isolation. The choice of definition of the universe can be made for the convenience of the other decisions involved. If the necessary secondary data are available and if for some particular application the recreating population is preferred over the general population, there are no grounds on which this can be judged inappropriate.

The survey technique and sampling design choices are numerous. These decisions involve the consideration of many interrelationships. These decisions should be based primarily on the cost differences, which are substantial, and on the appropriateness of the particular technique and design for obtaining the type of data that is required as
an input to the estimation and projection of the desired "demand."

As we have seen, the definition of the sample unit will affect the required sample size, the survey techniques, and the sample design. There are no technical reasons to prefer one definition over the other. If secondary data are available for either choice of definition for the sample unit, then the choice can be made on the basis of the relative cost and the convenience for the other related decisions. Since one member of a family can speak for the whole family it may often prove more efficient to use the family as the sample unit.

The "required" sample size is affected quite directly and substantially by many of the other decisions that were discussed. The choice of sample size is a function of the level of precision desired and many of the other decisions that have been discussed. But it is also a function of the amount of money the agency has available or is willing to make available for "buying" information. Once the other decisions have been made, this one involves weighing the marginal cost of information against the benefits of marginal increments in quantity and quality of information. This cannot be done, except in a very crude subjective way.

The decision of how to estimate and project the "demand" at origins is partially made when the independent factors in the "demand" model have been specified. However, the choice of variables to account for the various factors that are to be included is very wide. The appropriateness of particular variables for estimation is an empirical question which can be answered in part by looking at previous similar studies to see how successful various variables were in increasing the precision of estimates.
The primary objection to the use of distribution models that are supposed to account for different patterns of recreation resources is the empirical difficulties of finding variables that provide a meaningful measure of the quantity, quality, and distribution of those resources. In addition to that, it is not clear that this can be applied to anything but recreation trips. This leaves the question of individual activities unanswered. In the absence of further work to demonstrate the empirical feasibility of such models for application to outdoor recreational travel, it appears that a simple direct estimation procedure might be preferred for many applications.

The secondary data that are available will have a constraining effect on the independent variables that may be included in any projection model. In particular the lack of projections of cross tabulated data will preclude the inclusion of interaction terms in the projection model.
APPLICATION OF ANALYSIS TO THREE CASES

Now that the crucial questions have been discussed and alternatives considered, it is time to apply the analysis to each of the three problem contexts and see what type of prescription is indicated.

The three cases were identified in the introduction. One case is where the planning area (for which "demand" estimates and projections are sought) has people living within the boundary and people living outside the boundary as major components of the recreation demand. A state with a recreation-tourism industry is one example. The second case is where the planning area is used for recreation primarily by people living within the boundary. The concern here then is only for "residents." An example of this is the state that has little potential for attracting tourists and recreationists, but must provide recreation facilities for its own population. The third case is where the planning area attracts recreationists from a wide area, but has few people living within its boundaries. An example of this case is a National Park that has virtually nobody living within its boundaries and virtually all recreationists are therefore "non-residents."

Prescription for "Demand" Projections for Wisconsin Department of Natural Resources

The outdoor recreation problem faced by policy-makers in the Wisconsin Department of Natural Resources clearly falls in the category involving major concern for recreational activities of both residents and non-residents.

The balance of this section is an analysis of the needs of this particular agency for recreation "demand" information. A procedure
that can be used by WDNR to obtain this information is then developed. This analysis and procedure were developed whereby the author was involved in a project specifically designed to both meet the needs of WDNR and to develop material for this dissertation. The procedure will actually be carried out by the University of Wisconsin Survey Research Center under a contract with the Department of Natural Resources.

The decision-making framework

The decision-maker

In order for states to receive funds from the Land and Water Conservation Fund Act (LAWCON), they must submit a comprehensive outdoor recreation plan. The Wisconsin Department of Natural Resources has been appointed by the Governor as the agency responsible for the preparation of this plan and the recipient of these funds. These funds are provided on a matching basis and the Wisconsin State Legislature is therefore also involved. To the extent that the Natural Resources Board established policy, they also have a share in outdoor recreation decision-making. The Wisconsin Outdoor Recreation Plan (WORP) is aimed primarily at providing a data base for rational decision-making by the three bodies mentioned above. DNR serves as a funnel for funds to local units of government, however, so the plan must also provide a data base for deciding which projects by local units are the best investments. In determining the need for recreation areas and facilities, DNR must take into account those facilities provided by other groups and agencies.

(U.S.F.S., Bureau of Sport Fisheries and Wildlife, Bureau of Indian Affairs, United States Army, Wisconsin Department of Transportation, State Historical Society, counties, cities and villages, forest industry enterprises, hydropower companies, civic and other non-profit organizations,
and private outdoor recreation enterprises.) The WORP must also provide the data base required to coordinate efforts with these other groups and agencies.

**DNR objectives** It is not easy to get a clear statement of objectives from any public agency. There are several reasons why this is so. The agency may be reluctant to state objectives precisely, because their long-term objectives will change over time. Since the agency is often not the sole creator of objectives, they may wish to operate under imprecise objectives to prevent the other policy-making bodies from intervening. There is also the possibility that someone will mistake a perfectly adequate objective for a particular study, for a complete specification of objectives. If this were done, accusations might be brought (unjustly) against the agency for ignoring some objectives.

With respect to this study, the following simplification of DNR objectives appears adequate. It is to see that recreation areas and facilities are provided in sufficient quantity to meet the resident and non-resident outdoor recreation demand on the average seasonal weekend. This can be reasonably interpreted to mean the demand on the average peak weekend day during the middle part of the season (for some activities the peak occurs on Saturday and for some it occurs on Sunday). Holiday weekend demand will not be met. The overcrowding that occurs on Memorial Day, the Fourth of July, and Labor Day is sufficiently spread and of sufficiently short duration that it will not impair the resources. And the cost of providing facilities that would be utilized only a few times a year is prohibitive.
The preceding is not to imply that DNR will attempt to provide this quantity of facilities. A significant part of their efforts will be directed to encouraging and facilitating development by other agencies and groups. This study should provide the data base required to accomplish these goals.

Decision variables DNR has a number of decisions to make in trying to achieve its objectives. They must decide how much money to spend for (1) acquisition of recreation lands, (2) development of recreation areas, and (3) maintenance and administration of recreation areas. They must also decide where (geographically) to spend their budget for (1) acquisition, (2) development, and (3) maintenance and administration.

Other decision variables available to DNR are various ways of spending money to induce private investment. This could take a wide variety of forms. It could be education of prospective investors to the best potential investments. It could be in the form of low interest loans or guarantees to creditors for certain types of investments. It could take the form of provision of certain services or facilities adjacent to potential private developments. These means may succeed in getting a million dollars worth of facilities for a public investment of a few thousand dollars.

Using public dollars to influence the quality or type of facilities provided in the private sector requires several considerations. The facilities provided by private investment are available under different circumstances with respect to pricing and public control. DNR must recognize this and decide what mix of arrangements will best meet their objectives. Certainly some types of arrangements would further their
objectives better than others. It is beyond the scope of this study to elaborate further on this point, but these decision variables should not be ignored in finding solutions to the problems faced by DNR.

Implications The objectives of DNR determine the type of data that is needed. One obvious implication is that data is needed for non-residents as well as residents of Wisconsin. Also, weekend "demand" is higher priority than weekday "demand." The necessity of making decisions on a local level requires data on something finer than a statewide basis. Also implied is the need to estimate "demand" during mid-season rather than for an annual average. Later when the cost of making estimates is considered, we will see that priorities must be established and compromises made about the data that are "required."

The resident "demand" estimates and projections

General description The estimation and projection package consists of several parts. There are two types of data used in the package. The primary data will be obtained by surveying Wisconsin residents. Secondary data will be obtained from Population Censuses and other published sources. Estimates based on survey and census data will apply only to 1970. Projections combine the survey data with projected secondary data to project the activity participation for future periods. There will be a cross section analysis of summer activities. This will be used to project future participation rates. A distribution pattern will be estimated which will be combined with the participation rates to project participation by destination areas. There will be a cross section analysis for non-summer activities. This will be used to project participation rates for non-summer activities. Finally, distance-travelled distributions for day
trips for two to four day trips, and five or more day trips, will be estimated. This will tell us what proportion of the trips of each type have a one-way distance of 0-50 miles, 50-100 miles, etc.

The cross section analysis. The summer activities to be included in the model are: (1) sightseeing or pleasure driving, (2) picnicking, (3) swimming, (4) camping, (5) camping in a remote area where no drinking water, no toilets, and no picnic tables are provided, (6) golfing, (7) hiking less than four hours, (8) hiking four hours or more (9) bicycling continuously for two hours or longer, (10) canoeing, (11) motorboating when fishing and water skiing are not involved, (12) water skiing, (13) fishing, (14) nature study on a guided nature walk or designated self-guided nature trail, and (15) driving or riding an off-the-road vehicle such as a dune buggy or trail bike. This list of activities resulted from meetings with personnel from DNR Planning and Research Bureau. These activities are defined in Appendices A and B.

The cross section analysis can best be done in such a way as to take into account the different activity participation patterns on day trips vs. two to four day trips vs. five or more day trips. It will also separately consider Saturday vs. Sunday.

Most cross section analysis used in outdoor recreation "demand" studies have been done with the individual as the basic unit. This study can best use the family as the basic unit. Certainly, outdoor recreation decisions of family members are interdependent. For making projections it is unimportant whether three man-days of fishing consists of Mother, Father, and their 17 year old son, or Father, the 17 year old son, and the 15 year old daughter. The Bureau of the Census uses the
family as the basic unit in much of the data they present. Sampling procedures for data collection are simpler and less interview time is required, if the family is considered as the basic unit. For these reasons, the family can be chosen as the logical basis for analysis.

No statistical test of the cross section model has been built into these procedures. While this model has not been previously tested with variables defined in the same way, previous studies have indicated that the variables included are important ones. Applying the model with some variables included which are not statistically "significant" does not lead to biased or invalid conclusions. It is not customarily done because "non-significant" variables add nothing and require some additional effort. In the case of WDNR, it would require more effort to eliminate them than to include them. At some future date it would be worthwhile to subject the model to thorough testing. This information would be helpful for improving the model for future use.

Due to inadequate secondary data and inadequate sample size, the cross section analysis will not be used for unrelated individuals. For families, a number of socioeconomic factors will be taken into account. The factors are: (1) type of head, (2) age of head, (3) number of members in family, (4) family income, and (5) location of residence.

Cross section analysis for non-summer activities will be similar to the one for summer activities. However, it seems appropriate to talk about the average number of man-days for the past year, rather than distinguishing between different types of trips. The non-summer activities to be recognized are: (1) horseback riding, (2) snow skiing, (3) snowmobiling, (4) target shooting (bow), (5) target shooting (rifle or pistol),
(6) shooting trap or skeet, and (7) hunting.

**Distribution patterns**  A distribution pattern shows the proportion of man-days of a given activity that goes from a given origin-region to each of a number of destination-regions. One such pattern is needed for each activity, from each origin, for people 12 and over and people under 12, for Saturday and for Sunday, and for three types of trips. The data will then be reaggregated so that the reliability of the resulting output is much better than the reliability of any individual distribution pattern.

In making projections of summer activities, use can be geographically distributed according to the current pattern. This is restrictive in some ways, but flexible in other ways. It is restrictive in that it does not permit an adjustment due to changing road conditions and changing supply distribution. It does, however, account for a changing pattern of day trips vs. weekend trips vs. vacation trips. It accounts for a changing pattern of day outings on Saturday vs. Sunday. It will allow for a changing pattern of participation of people 12 and over vs. people under 12 caused by the changing socioeconomic structure of the population.

**Output**  Computer instructions have been prepared (although not presented here in detail) for seven programs: (1) Non-Summer Activity Estimates, (2) Non-Summer Activity Projections, (3) Distribution Pattern, (4) Summer Activity Estimates, (5) Summer Activity Projections, (6) Estimates of Reliability, and (7) Distance Travelled Distribution.

The Non-Summer Activity Estimates Program will read out the ANGTOT (I,K,N). ANGTOT stands for activity, non-summer, grand total. There are
seven activities (I), two age groups (K), and eight origin regions (N). There will be a total of 112 numbers (7\times2\times8=112).

The Non-Summer Activity Projections Program will read out the YNGTOT (I,K,N) for each year that a projection is desired and for 1970. Y is used in place of A whenever we are talking about a result of a cross section analysis. There will be a total of 112 numbers in the output for each year.

The Distribution Pattern Program may be entirely internal. The results of this program are the P(I,J,K,M,N,N1). These figures are the proportions of man-days of activity I, on trip type J, for age group K, on day M, going from origin N, to destination N1. This will involve 12,960 numbers (15\times3\times2\times2\times8\times9=12,960). It would obviously be inefficient and unnecessary to read out this data and then read it in again.

The Summer Activity Estimates Program will read out the ASGTOT (I,K,M,N1). This stands for activity, summer, grand total. This will give us the number of man-days for activity I, for age group K, on day M, in destination region N1. This will involve 540 numbers (15\times2\times2\times9=540).

The Summer Activity Projections Program will read out the YSGTOT (I,K,M,N1). These numbers are interpreted in the same way as the ASGTOT except the YSGTOT refer to results of the cross section model. There will again be 540 numbers in the output for each year.

The Estimates of Reliability Program will read out a 95\% confidence interval for each of the YNSTOT estimated for 1970 and for each of the YSGTOT estimated for 1970. The use and interpretation of these numbers will be discussed later.
The Distance Travelled Distribution Program will read out the proportion of trips of a given type (day trips, two to four day trips, and five or more day trips) that have a one way distance from home in each of the distance categories. These proportions refer to Wisconsin residents in general and not to those from a particular origin.

**Sampling design and selection** The sampling design that is proposed was developed after consultation with the University of Wisconsin Survey Research Laboratory. Major features of the procedure are described here. A number of highly specific procedural details remain to be worked out when the sample is actually selected.

The goal in specifying sample size is to estimate the number of Wisconsinites going to most regions on the average weekend to within \( \pm 5\% \). Estimates for the number of man-days for given activities will in general be less precise than the estimates of number of people participating in all activities in a given region. The sample size (decided after calculations using considerably less-than-ideal data) will be approximately 12,000. It will be impossible to obtain an interview from each one selected because of refusals, unavailable respondents, etc. This will likely result in approximately 8,000 to 10,000 completed interviews. "Sample size" for statistical purposes will then not be 12,000 but the number of completed interviews. However, in sample selection the number of interest is 12,000 and that number will be referred to as the sample size.

The survey will be conducted by telephone. Telephone numbers will be sampled from directories with obvious business listings not chosen. Cluster sampling with 10 replications and with clusters of approximately 20
samples each will be used. The replications make it possible to obtain estimates of reliability of the estimates. The clustering of samples reduces the cost of sample selection with little effect on the reliability of results. The samples will be drawn from regions in proportion to the population (number of telephones) in the region.

There are biases to be expected as a result of sampling by telephone. There are families without telephones, and these will not be represented in the sample. There will be some households with more than one phone or more than one listing for the same phone. However, these biases are expected to be slight after eliminating obviously inappropriate numbers such as those listed to "John Doe's children." In making estimates and projections, the cross section analysis will also remove the bias of telephone ownership that is related to income since different estimates for different income classes will be obtained.

The alternative to a telephone survey is a household survey. This does remove the biases discussed above. However, it would have some biases that the telephone survey would avoid. In household interviewing, return trips are expensive. As a result, we would miss a number of people who were on vacation when the interviewer tried to contact them. In a telephone survey these people can be contacted later at a nominal cost. Household surveying would cost approximately $25 - $35 per interview, while telephone surveying can be done for approximately $5 per interview. Cost savings of a telephone survey would appear to far outweigh its disadvantages.

The questionnaire The questionnaire to be used for this survey
is presented in Appendix A. Appendix B is the accompanying "Question by Question Objectives" that clarify for the interviewer the intent of the question when the interpretation is not apparent. Appendix B also clarifies the definitions of activities. However, it is expected that this further clarification will be presented to respondents only when requested or when some confusion about the meaning is apparent.

**Interview procedures** The sampled telephone numbers can be best divided into four equal independent groups. One group will then be slated for their first three calls during each of four weeks. For respondents not reached during their scheduled week, special procedures for calling later have been developed. Respondents not contacted during the week slated will be tried three additional times the second week, and three additional times the third week. This means there will be calling done over a period of four weeks plus two additional weeks to do repeat calling on the two final groups.

When respondents are contacted after the week for which they were slated the questionnaire will be altered in detail. Specific instructions have been prepared but will not be presented here. The sense of the matter is that data will be taken for the weeks originally intended for the particular respondent rather than the weeks immediately preceding the telephone interview.

This will be important since one important group of people who do not answer their telephones on the first week will be those who were on vacation that week. If those people are called two weeks later and asked what they did the past two weekends, they will obviously have a different answer
than they would have had if contacted while on vacation. By taking data for the weeks originally intended for the particular respondent, this source of potential bias will be avoided.

The non-resident "demand" estimates and projections

The non-resident demand data will be obtained by selecting a sample of occupants of non-resident vehicles as they enter or leave the state. These people will be asked to fill out a short questionnaire and put it in the mail. Preliminary calculations indicate that over 95% of the recreation trips entering the state by motor vehicle can be monitored at approximately 40 state-line crossings. No attempt will be made to identify recreation by non-residents who enter by plane, train, or bus. This will be a source of some potential bias but a relatively small one since recreation travel to Wisconsin is dominantly by motor vehicle.

The survey of non-residents can appropriately cover a five to seven week period coinciding with the period for which resident data is to be obtained. The data obtained can then be factored on the basis of fairly complete traffic counts taken at each station with portable traffic counters.

Due to the fact that data can be obtained only from those non-residents who actually take trips, the same type of cross section analysis that is anticipated for resident data cannot be done. Secondary data from the 1970 Census that could be used for some cross section analysis will not be available soon enough to meet certain timing constraints facing WDNR. Therefore the focus here will be on getting good current estimates with projections of non-resident demand to be based entirely on population changes in states-of-origin.
Sampling techniques One technique that might be used is to photograph the license plates of vehicles crossing the state line. Names and addresses of the owners could then be obtained from motor vehicle registration files and questionnaires sent to the owners by mail.

There are several advantages to the photo-mail technique. One of the most important is potential ability to sample on high volume roads without stopping traffic. Another advantage is the possibility of sending reminders to increase response.

There are also some disadvantages. It would be very costly to try to obtain names and addresses from all states. For this reason it would seem appropriate to only sample people from the four or five surrounding states. In addition there probably are weather conditions under which photographing is not possible. Photographing from the rear has the problem of license plates being obscured on vehicles towing trailers. Photographing from the front is possible only in the daytime and one of the five surrounding states does not require front plates. Also, the conditions under which satisfactory photos can be obtained are not known. Experimentation by the Wisconsin Department of Transportation would be necessary to determine the combinations of road conditions and photographic equipment giving satisfactory results.

When traffic volumes are below some as yet unspecified level, it would be possible to hand a questionnaire to each non-resident motorist. It appears that during peak traffic hours this would not be possible on one-third to one-half of the roads involved.

There are advantages to this technique when it is feasible. One advantage is that data could be obtained from all non-residents and not
just those from the "important" states. It eliminates the cost of obtaining names and addresses from other states. Another possible advantage is the personal contact involved in handing out the questionnaires. This generally is helpful in increasing the response rate. If leaflets were handed out to outbound traffic they could often be filled out by an occupant of the vehicle while travelling home. This technique avoids the problem of license plates being obscured on vehicles pulling trailers.

There are also some disadvantages. One is that non-respondents cannot be contacted again to encourage them to respond. If leaflets were handed to occupants of inbound vehicles, many would get lost before the time arrived to fill them out.

**Sampling design and procedures** Since the capabilities of photographic equipment are not yet known, it is not possible at this time to write a specific prescription for conducting the survey and analyzing the data. In addition, the Department of Transportation will have requirements of their own for the study. Negotiations between the Department of Natural Resources and the Department of Transportation will be required to reach agreement on format and procedures.

**Specific items in the results** In conclusion, the primary concern in designing the non-resident survey is to insure that the results are compatible with the data for Wisconsin residents. For example, if the non-resident data did not split the "demand" into two age classes, it could be combined with the resident data only by also lumping the resident "demand" into one group. We would then have wasted our time in collecting the resident data in two separate categories. The results of the non-
resident survey then will be in a form very similar to the results for residents.

There will be a distribution pattern for each state of origin. There will be summer activity estimates and projections for the same set of summer activities that we have for residents. These estimates and projections will be distributed according to our estimated distribution pattern so that the final result is an estimate or projection for each planning region. Results will be for the average mid-season Saturday and Sunday just as for the residents.

The projection package indicated for resident "demand" is summarized in column one of Chart 1 by specifying the answers to each of the crucial questions. The projection package for non-resident "demand" is likewise summarized in column two of Chart 1. Column three of Chart 1 outlines the Clawson Demand Curve which will be discussed later.

In order to use the information provided by the three packages outlined in Chart 1 we must remember that these estimates apply to the current quantity, quality, and location of recreation resources. When we make projections on the basis of the above information we are implicitly assuming that the availability of recreation resources remains the "same." Certainly it is not reasonable to expect socioeconomic sub-groups of the population to behave the same in the future as their current counterparts if the availability of recreation resources to them is very different from the current ones. The difficulty of defining what is meant by availability remaining the "same" was discussed in a previous section. It does not mean that the number of facilities remains constant. It
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Chart 1. Alternative models
means that the same quality of recreation resources are available to the consumer at the same real cost and time cost. The implication of this is that whenever changes which will have a significant impact on the relative availability of recreation resources are being considered, the impacts of those changes cannot be shown through a mechanical manipulation of the model. In order to project the impact of those changes it will be necessary to make some subjective changes based on the information available.

I will now outline a planning process for case one which will make use of the type of information that can be provided by the three packages described in Chart 1. The purpose of the planning process is to provide a rational basis for the decision-maker to manipulate his set of decision variables in attempting to maximize his objective function.

The case I will consider now is one in which the decision-maker has available a use function of the type described in column one or two of Chart 1 and can obtain a Clawson Demand Curve for selected facilities. One thing that the decision-maker might want to look at is projected use for each region minus current inventories. This certainly is not the answer to all of our problems. The decision-maker cannot just provide the difference and be done with it. If he did do that and provided the necessary ancillary facilities we could expect the projections to be self-fulfilling to the extent that multivariate analysis of socio-economic characteristics is a valid projection technique. There are several reasons why this would not be a good way to provide for the recreation "demand."

One reason that the above procedure would not be optimal is that it
maintains whatever inequities might currently exist, because it gives no consideration to geographic and socioeconomic sub-groups of the population who do not participate because the current distribution of recreation resources is unfavorable to them.

It has been argued previously that recreation demand of the three types, i.e., day-use, overnight, and vacation, are subject to varying degrees of manipulation as to the location of the participation. This means that we can take advantage of this to further several of the objectives in our objective function by manipulating the distribution of recreation resources. Through the manipulation of the distribution of recreation resources we could further our efficiency goal by providing facilities where it is less expensive to provide them. We could further our regional economic growth by providing facilities in areas where some form of economic stimulation is needed. It may likewise be desirable to depart from the existing pattern of development to meet the quality of the environment objective and the quality of the recreation experience objective.

The procedures that will be suggested for projecting the effects of different decisions will not be mechanical manipulations of the data. They will be suggestions of how these subjective adjustments might be made. As suggested earlier, the difference between projected use for regions and the current inventory is one figure of interest. It seems appropriate that the projected use be broken down into its component parts. It is useful to look separately at the day-use, overnight, and vacation "demand" because they have different relative responsivenesses to changes in the distribution pattern. As argued
previously, a change in the distribution of facilities which might make
the level of day-use demand zero could at the same time leave the level
of vacation demand unchanged or even increase it. In order to make
adjustments in estimates based on different decisions we need some way to
estimate the relative responsiveness of the level of demand to price and
distance changes. We can get some sort of estimate of this by construct-
ing a Clawson Demand Curve for selected facilities or complexes. From
this we could compute the entrance fee elasticity of demand and the
distance elasticity of demand. If there is a zero entrance fee and we
assume that "price" is some coefficient times distance, then obviously
the entrance fee elasticity and the distance elasticity of demand will
be the same. If a more realistic proxy is used for price and if
facilities are carefully selected to avoid interference from competing
facilities, we may be able to obtain a reasonable estimate for these
elasticities. The demand function estimated by a similar technique
might eliminate the difficulties in finding suitable areas to select.
Since congestion and some socioeconomic characteristics are isolated
by this technique the selection of facilities would be less restrictive.

Hopefully the information obtained above can be used to modify
projections based on assumptions that are not expected to be fulfilled.
This modification could be done for the regional projections. Of
primary importance in making these modifications would be the distance
elasticity of overnight and vacation demand. A similar consideration
would be necessary in the site location problem. Site location refers
to the sub-regional location of facilities. As a result we are pri-
marily concerned here with distance elasticity of day-use and overnight
demand. The distance elasticity of demand will have confounded in it some regional preferences as well as the reaction to distance. Considerations of areas with similar environmental characteristics would therefore be more reasonable than comparisons of areas that differ greatly. The analysis assumes that we are comparing areas of the same quality. Any comparisons of facilities of different qualities would therefore be suspect. For site location the question is not really one of projecting the level of demand. "Demand" estimates and projections will rarely be made for such local areas, but only for broader regions. However, average turnover rate for areas can be computed, and subjective estimates made as to whether this particular location would likely be better or worse than average in its ability to attract users.

Another question that the decision-maker must consider is how to combine facilities for specific activities into outdoor recreation complexes. There is available from the data used to estimate the parameters in the use function, data which might be helpful in answering this question. The data collected will have all of the activities participated in by each sample unit, for each peak day included in their outing. It would be possible to compute from this data the proportion of trips and the proportion of trip-days that fell into each combination of one, two, three, etc. activities. It might also be useful to compute this for each type of trip. This shows which combinations of activities are participated in by sample units on given days and on given trips. This is admittedly a function of the current pattern of activity combinations found at recreation complexes as well as the preferences of users.
Guidelines for "Demand" Projections for Cases Two and Three

While in specific applications there will be changes in geographic scale between different problem contexts, there is a great deal of similarity. Case one is the general case involving both "resident" and "non-resident" recreationists. Cases two and three each involve only one component.

The most common case two situation (residents only) is the state that has little recreation attraction potential. The recreation industry is therefore geared to serving people who cannot or do not wish to travel the necessary distance to recreate in areas of greater recreation attraction.

This case is so similar to the "resident" portion of the case one situation that no elaboration is required. The policy-maker can use the same planning framework and make the same types of modifications using the "resident" data.

There are also similarities between case three, where we have only "non-resident" recreationists, and the "non-resident" component of case one. The most common case in this category is the federal land management agency that has few people living within its planning area. There are a couple of options open to the policy-analyst in this situation. Planning could be done on the basis of estimates and projections from state recreation plans. In that case the planner would look at the entire market and his share of it, and decide what share of the projected "demand" he should provide for. The other option would be to set up a procedure to obtain data as described in column two or three of
Chart 1. A use function as described in column two of Chart 1 could be obtained using procedures specified in the general case for "non-residents." The planning framework described there and the suggested modifications could also be used.

The Clawson Demand Curve is another possibility. This "demand" is based on data only from users of specific areas or facilities. The specifications of this model are presented in column three of Chart 1. A demand function as reported by Boyet and Tolley (12) is another feasible alternative for obtaining information about users of specific facilities or areas. The specifications for it would be the same as for the Clawson Demand Curve except that the factors considered would include some socioeconomic characteristics. The type of data required for either of these models can be obtained at reasonable cost for areas that have limited access.

How can information which is based only on users of specific facilities or areas be used in planning? The approach is a bit different than that described above. A previous planning procedure was based on projecting the total demand for facilities for specific activities and making some modifications to it. When this type of information is available the planner can operate by looking at the whole market and then determining the role of his particular agency in providing facilities for a certain proportion of and for certain segments of the market. He can also determine his role in coordinating the development of resources to meet the whole "demand." If information is based on data from only users of the facility, there is insufficient information on
which to make many decisions dealing with the development of the entire resources of the region to meet the total "demand." Neither the Clawson Demand Curve nor the demand function has been used to estimate the "demand" for specific activities. I argued in a previous section that it was not reasonable to do so in a model that uses travel costs as a proxy for price. This was due to the jointness of consumption of different activities. However, information on the activities engaged in by a sample unit on given days and on given trips to the facility could be assessed in the same manner as with the procedure using the use function information. Whereas, with the information as specified in column one of Chart 1 the planning process involved looking at the whole market and determining your part in it, with information based only on users of specific facilities the planning process involves looking at the market that you would have if you in some sense maintained your relative share of the market. Both have merit if used with discretion, recognizing the somewhat tenuous assumptions involved.
CONCLUSIONS

The problem of obtaining "demand" information for outdoor recreation planning has been discussed in terms of three crucial decisions.

One crucial question that must be considered is, "What 'demand' do we want to estimate?" One dimension of this question is the relationship that "demand" should have to the peaking characteristics of facility use. A second dimension is the geographic level for which estimates are sought. A third dimension is the definitions of activities and the priorities that should be attached to them. A fourth dimension is the independent factors that should be included in the "demand" model.

The second crucial question is, "How can data be collected?" The dimensions involved here include the definition of the universe, appropriate survey techniques and sampling designs, the definition of the sample unit, and the number of sample units that should be "observed."

The final crucial question is, "How can 'demand' be projected?"
The first two dimensions of this question are methods for projecting the "demand" for origin populations and methods for projecting the distribution of "demand" to destination areas. The third dimension is secondary data that are available.

The best alternative to some of the crucial decisions depend on the particular decision-maker and his objectives. Others depend primarily on characteristics of the situation which affect the costs of various decisions.

Costs depend to some extent on the relationship of "demand" to the peaking characteristics. However, it is possible to get data to estimate summer peak "demand" and non-summer annual "demand" for a
very little increase in costs over getting data to estimate annual "demand" for all activities. This is a good compromise for areas whose recreation business is concentrated in the summer season.

Costs are very dependent on the geographic level for which estimates and projections of "demand" are sought. The costs for estimates of "equal" precision are approximately related in an inverse proportion to the number of geographic regions.

The definitions of activities and their relative priorities should be decided according to the relative need for information.

Costs may be affected by the number of activities, but will be affected very little by the specific definitions and priorities.

The factors to be included in the "demand" model should be decided in light of two considerations. One consideration is to make the relationship as relevant as possible to the decision-maker's alternatives. However, this must be tempered by the feasibility of using various theoretical models in light of the inadequacy of some estimation techniques.

The definition of the universe should be decided on the basis of the relative cost of sampling the alternative universes and the usefulness for recreation planning of the implied types of information.

Survey techniques and sampling designs are means of obtaining data and are not ends in themselves. As such they should be chosen to minimize the cost of obtaining the kinds of data that are needed. There are, however, quality aspects of the resulting data that should be weighed against costs.

The definition of the sample unit will have some impact on the costs and should be chosen to minimize those costs unless a particular
definition is required for some decisions.

The sample size has obvious implications for the survey costs. The trade-off involved here is between costs and precision of the resulting estimates.

The decision of how to estimate and project "demand" from the origins of recreationists is partially made when the independent factors in the "demand" model have been specified. However, the choice of variables to account for the various factors that are to be included is very wide. The choice of variables should be made on the basis of the results of similar studies.

It is my conclusion that there are very serious problems associated with the distribution models applied to outdoor recreation travel. As a result of this I think that a direct estimation technique would be preferable for most planners until there are further advances and empirical tests of these distribution models.

The secondary data that are available will have a constraining effect on the independent variables that may be included in any projection model. In particular the lack of projections of cross tabulated data will preclude the inclusion of interaction terms in the projection model.

The specific problem context of the Wisconsin Department of Natural Resources had some impact on the results of this study. The constraint that the procedure be fully specified prior to any data collection limited the number of models that could be considered. While many "action agencies" will find it prudent to limit themselves to such models many researchers will want to consider other untested models.
The stated objective of the Wisconsin Department of Natural Resources was somewhat narrow and therefore may not be representative of other decision-makers in that category. However, the crucial decisions were discussed in terms of objectives somewhat broader so that the analysis would apply to decision-makers with broader objectives.

As an overall conclusion I would sum up by saying I think most planners who need information now, will conclude that they should concentrate on refining tested models and techniques to make them more relevant to their particular problems. I think they will conclude that this, combined with refined planning techniques, will prove more successful for solving immediate problems than trying to use more sophisticated, but as yet relatively untested techniques.
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   Magnetic tape. Madison, Wisconsin, Survey Research Laboratory,
   University of Wisconsin. 1963.

   P. S. King & Son, Ltd. 1939.


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    NE-86. 1967.

12. Boyet, Wayne E. and Tolley, George S. Recreation projection based

13. Clawson, Marion and Knetsch, Jack L. The economics of outdoor


ACKNOWLEDGEMENTS

My special thanks to Henry H. Webster, Department of Forestry, Iowa State University and William B. Lord, Department of Agricultural Economics, University of Wisconsin.
APPENDIX

Questionnaire and Related Documents
COVER SHEET

OUTDOOR RECREATION SURVEY

Interviewer:__________________________________________

1. Is this (INSERT TELEPHONE NUMBER)?
   Yes  No
   ↓  TERMINATE CALL
   AND REDIAL

   I am___________ from the Survey Research Lab at the University of Wisconsin. We are calling to discuss outdoor recreation with you. Perhaps you recall our recent letter. Before we get to outdoor recreation I have a couple of other questions to ask.

2. Is this a residential phone number?
   Yes  No  Both
   ↓  TERMINATE INTERVIEW

3. How many times is this telephone number listed in your local directory? ______

   Call Number  Date  Hour  Result of Call
   1
   2
   3
   4
   5
   6 or more

   Refusal  Phone disconnected  Phone never answered
   Other (EXPLAIN):__________________________
SCHEDULE

OUTDOOR RECREATION SURVEY

Interviewer: ___________________________ Sample No.: ___________________________

4. First we need to know the approximate age and the sex of each member of your household and their relation to the head of the household. It is not necessary, but our discussion will probably be easier if we also have their first names. Let's start with the head of the household.

(CHECK RESPONDENT) [NOTE: R MUST BE AT LEAST 18 IF ANY MEMBER OF HOUSEHOLD IS 18 OR OVER]

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<thead>
<tr>
<th>R</th>
<th>Rel. to head</th>
<th>name</th>
<th>age</th>
<th>sex</th>
<th>R</th>
<th>Rel. to head</th>
<th>name</th>
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</table>

5. There are _________ people in the household. Is that correct?

5a. __________ Check here if household is composed of unrelated individuals, i.e., no member of the household is related to the head. Ask questions of respondent only. Eliminate "or other members of your household" from all questions. Eliminate "who went" and other irrelevant questions.

6. In what county is your residence located?

7. In what city, village, or town is your residence located?

8. Is that a city, a village, or a town? City Village Town
9. Now we would like to know what outdoor recreation activities members of your family participate in. During this summer have you or any other members of your family . . .

_____ gone swimming?

_____ 10. Has anyone gone picnicking this summer?

_____ 11. Has anyone gone camping? (IF NO, GO TO 13)

_____ 12. Has anyone camped in a remote area where no drinking water, no toilets, and no picnic tables were provided?

_____ 13. Has anyone gone golfing?

_____ 14. . . . sightseeing or pleasure driving?

_____ 15. . . . canoeing?

_____ 16. . . . fishing?

_____ 17. . . . water skiing?

_____ 18. . . . motor boating when fishing or water skiing was not involved?

_____ 19. Has anyone gone on a guided nature walk or a designated self-guided nature trail?

_____ 20. Has anyone gone hiking?

_____ 21. . . . bicycling continuously for 2 hours or more?

_____ 22. Has anyone gone riding or driving an off-the-road vehicle such as a dune buggy or trail bike?

_____ 23. Are there other outdoor recreation activities, where members of your household have participated in them over five miles from home? ______________, ______________, ______________,

_____________, ______________

[**NONE**]

GO TO Q 106 IF NO TO ALL OF Q9-Q23
24. Now we want to talk about trips where people stayed away from home one or more nights. We are interested only in trips that included a Saturday or Sunday and involved at least one outdoor recreation activity. Before we ask about activities let me run down the list of activities once more so they will be fresh in your mind. We are interested in these activities when they involve public facilities or property, or when they are done in a place where a fee is normally charged. This would include all lakes because the water is publicly owned. It would include federal, state, county and city parks and forests. It would include private property only if a fee is normally charged for the use of this area or facility. It would exclude your backyard, your friends' backyards, and member-only clubs such as golf clubs and YMCA's where the general public is not admitted on a daily fee basis. The activities of interest are swimming, picnicking, camping, golfing, sightseeing or pleasure driving, canoeing, fishing, water skiing, motor boating when fishing and water skiing are not involved, nature study on a guided nature walk or a designated self-guided nature trail, hiking, bicycling, driving, or riding on an off-the-road vehicle, and any others that occur more than five miles from home. Did you or any other member of your family take a trip of one or more nights involving at least one outdoor recreation activity that included at least one Saturday or Sunday in the past four weekends?

[Yes] [No] 

GO TO Q57

When was the most recent trip?

What was the overall destination of this trip?

How far is that from your home?

What was the main purpose for this trip?

Which members of your family went?

Now for each Saturday and each Sunday involved we would like to know where you were, what outdoor recreation activities members of your family participated in, how many did it, and how many of these were under 12 years old.
25. Trip No.: __________
26. Date left: __________ 27. Date returned: __________
28. Overall destination (State, lake, and nearest city or village): 

29. Distance from home: ______________
30. Main purpose: _________________________
31. Who went: ___________________________

<table>
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<tr>
<th>32. Day &amp; date:</th>
<th>36. Day &amp; date:</th>
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</thead>
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<td>34. County:</td>
<td>38. County:</td>
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</table>

<table>
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<th># under 12</th>
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<th># under 12</th>
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<td>45. State, lake (if app.), &amp; nearest city or village:</td>
</tr>
<tr>
<td>42. County:</td>
<td>46. County:</td>
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</tbody>
</table>

<table>
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<th># under 12</th>
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<th># people</th>
<th># under 12</th>
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</tbody>
</table>
48. Day & date: __________________________
49. State, lake (if app.), & nearest city or village: __________________________
50. County: __________________________

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<thead>
<tr>
<th>Activity</th>
<th># people</th>
<th># under 12</th>
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52. Day & date: __________________________
53. State, lake (if app.), & nearest city or village: __________________________
54. County: __________________________

55. Activity | # people | # under 12 |
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</table>

Comments (If Appropriate):

56. Are there other trips of one night away from home or longer that included a Saturday or Sunday and at least one outdoor recreation activity in the past four weekends?

Yes ☐
No ☐

TAKE A SUPP. AND REPEAT TRIP QUESTIONS

57. So far we have been talking about trips. Now we want to talk about occasions where people were not away from home overnight. These might include very short outings where you walked from your home to a park or swimming pool as well as outings where you drove someplace. Here again, we are interested in the same activities as before, and only when they occurred on public property or where a fee is normally charged. Has any member of your family gone on such an outing involving at least one outdoor recreation activity on the past two weekends?

Yes ☐
No ☐

GO TO Q106

When was the most recent such outing?
Where did you (he, she, they) go?
How far is that from your home?
What was the main purpose for this outing?
Which members of your family went?

What activities did members of your family participate in, how many did it, and how many of these were under 12 years old?

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<th>Day &amp; date:</th>
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<td>State, lake (if app.), &amp; nearest city or village:</td>
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<td>Main purpose:</td>
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<td>Who went:</td>
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<td>Activity</td>
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<td># people</td>
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<td>under 12</td>
<td>under 12</td>
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<tr>
<td>Are there other outings?</td>
<td>Are there other outings?</td>
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<th>Day &amp; date:</th>
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<td>State, lake (if app.), &amp; nearest city or village:</td>
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<td>Are there other outings?</td>
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<td>Activity</td>
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<tr>
<td>Horseback riding</td>
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<tr>
<td>Snow skiing</td>
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<tr>
<td>Snowmobiling</td>
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</table>

Comments (If Appropriate):

106. Were there any trips last Sunday of 20 miles or more one way, made by members of your family besides the ones we have talked about?

   Yes   No

GO TO Q108

107. How many such trips were there?

108. These final questions ask information about the whole year. We want to know approximately how many times each member of your household did each of the following things within the state of Wisconsin, on public land or where a fee is normally charged, in the past 12 months.

Did anyone go (INSERT ACTIVITY) in the past 12 months? (IF YES) On how many days did each person do it in Wisconsin on public land or where a fee is normally charged?
111. For the following activities we want to know how many times each member of your family did it anyplace in Wisconsin in the past 12 months.

Did anyone go (INSERT ACTIVITY) in the past 12 months? (IF YES) On how many days did each person do it in Wisconsin?

<table>
<thead>
<tr>
<th>Target shooting (bow)</th>
<th>[USE NAME OR SEX, AGE]</th>
<th>[USE NAME OR SEX, AGE]</th>
<th>[USE NAME OR SEX, AGE]</th>
<th>[USE NAME OR SEX, AGE]</th>
<th>[USE NAME OR SEX, AGE]</th>
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<td>X IF</td>
<td>Name #</td>
<td>Name #</td>
<td>Name #</td>
<td>Name #</td>
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112. Target shooting (rifle or pistol)

113. Trap or skeet shooting

114. Hunting

115. To help us interpret the results of this study we would like to know the approximate total income for your family for 1969 from all sources, such as wages, rents, profits and interest. Please tell me in which of the following categories it goes.

Under $3,000  8-10,000
3-5,000  10-15,000
5-8,000  Over 15,000

TERMINATE
We want to caution you that for this study we will not interview persons in group quarters. Group quarters exist when the person in charge lives with five or more persons unrelated to him. When you are asking question four be alert for clues which would indicate the phone is not located in a housing unit, but is associated with group quarters.

Note that in households without a family present we interview the respondent only. When only one person is being interviewed some questions will sound odd if read without alteration. Try to anticipate these and make appropriate changes.

This always means the county where the phone is located.

In Wisconsin, villages refer to aggregations of residences and are "little cities." Towns are rural political subdivisions called "townships" in many states.

In this question the crucial distinction is town vs. the other two.

All questions from this point on refer only to family members in the household and not to other members in the household. For example: we would not include a maid who lives in nor a boarder who is unrelated to the family. In households that do not contain a family these questions refer only to a single unrelated individual, the respondent.

The following questions need not be clarified until recording activities, as the list Q9-23 is primarily to get the respondent geared to the activities we are interested in.

For SIGHTSEEING OR PLEASURE DRIVING, PICNICKING, and CAMPING mere presence is adequate for inclusion in the count, i.e. six month old babies picnic, etc. and are counted in the number of people under 12 for those activities. For other activities children are counted if the respondent says they participated.

SWIMMING is a broad term including wading and splashing. As you will note in question 24 it must be done on public property or where a fee is normally charged. A motel pool would generally not count because the general public would not be admitted on a daily fee basis, i.e. it would normally
be for patrons only. A campground pool often will admit the general public on a daily fee basis and would therefore be counted.

Q11 Whenever CAMPING is mentioned as an activity (Q35, etc.) you must ask "Was it in a remote area where no drinking water, no toilets, and no picnic tables were provided?" only if Q12 is checked yes.

Camping is recorded for a given day only if they camped on the night of the day in question. This is probably only important on the day they returned home or when they camped only part of the time on a given trip.

Q17 The count for WATER SKIING includes only those persons who were on the skis or other apparatus and not the driver and observers in the boat.

Q18 MOTORBOATING should pick up motorboating for the pleasure of the ride and should not include persons riding in the boat while towing a skiier or traveling to the fishing grounds.

Q19 By a "GUIDED NATURE WALK" we mean going with a group where there is a guide to explain or comment on the natural features.

By a "DESIGNATED SELF-GUIDED NATURE TRAIL" we mean a trail with signs and/or brochures to explain and identify the natural features.

Q20 Whenever HIKING is mentioned as an activity you must ask "Was the hike of at least four hours?" and record "yes" or "no" after it.

Included in the less than four hours category will be short walks, strolls, and nature walks that do not fall into the Q19 category.

Q21 Whenever BICYCLING is mentioned as an activity be sure to ask "Was it for at least two hours?" and record as an activity only if it was two hours or longer.

Q24 We will record trips that included an "outdoor recreation" activity that is not on the list, only if it occurred at least five miles from home. Any activity that is done outdoors and was done for relaxation and recreation is "outdoor recreation." However, we will exclude entirely any outdoor recreation engaged in by children at summer camps. We will exclude trips to zoos, fairs, and spectator sports events unless they are incidental to the trip rather than the main purpose.
Q25 Number overnight trips consecutively. If a trip involves more than six weekend days within the past four weekends be sure to use the same trip number on the supplement. Each trip is recorded on a separate page.

Q25-56 Record explanation under "Comments" if overall destination is unclear, for example a circle trip, or if location on a given day is unclear, for example they traveled and engaged in activities in two different places.

Q26 If the trip starts before our past four weekend period and ends within the period, record Q26 & 27 as stated, but fill in boxes (Q32, etc.) only for Saturdays and Sundays that are within the period.

Q26-27 Record date in the form July 12, etc.

Q28 Write in the state, the lake or other place mentioned that is not a city or village, and the city or village. Always include the state and the city or village. If either is unknown, clearly indicate it.

Q29 Record in miles. If unknown, but hours of travel time given, clearly indicate "hours."

Q30 Record whatever the respondent offers. The breakdown we are interested in is vacation, outdoor recreation, relaxation, to get away, etc. vs. visit relatives or friends vs. business, personal business or other purpose.

Q32-55 These boxes are used to record where they were and what they did on each Saturday and Sunday involved on the trip. We will never record information in these boxes for any day other than Saturday and Sunday. The box will be filled for each Saturday and each Sunday involved on a trip even though there are no activities involved on some of those days.

Q32, 36, 40, 44, 48, 52 Record the date in the form Sun., August 16, etc. Be sure to put day of weekend, month, and day of month.

Q33, 37, 41, 45, 49, 53 Write in the state, the lake or other place mentioned that is not a city or village, and the city or village. Always include the state and the city or village. If either is unknown, clearly indicate it.
Q35, 39, 43, 47, 51, 55

NOTE: If the purpose of the trip is to camp, for example, the respondent may not volunteer that they camped when you ask about activities. Be sure to elicit any activities that are listed in the trip purpose by asking "Did all of you camp on this day?" or some other appropriate phrase.

NOTE: Be sure to ask questions indicated in question objectives 11, 20, and 21 when camping, hiking, and bicycling are mentioned.

NOTE: Under "# people" record the total number of people that participated, not just the number 12 and over.

Q57

We will record trips that included an "outdoor recreation" activity that is not on the list, only if it occurred at least five miles from home. Any activity that is done outdoors and was done for relaxation and recreation is "outdoor recreation." However, we will exclude entirely any outdoor recreation engaged in by children at summer camps. We will exclude trips to zoos, fairs, and spectator sports events unless they are incidental to the trip rather than the main purpose.

Q58, 66, 74, 82, 90, 98

Record the date in the form Sun., August 16, etc. Be sure to put day of weekend, month, and day of month.

Q59, 67, 75, 83, 91, 99

Write in the state, the lake or other place mentioned that is not a city or village, and the city or village. Always include the state and the city or village. If either is unknown, clearly indicate it.

Q61, 69, 77, 85, 93, 101

Record in miles. If unknown, but hours of travel time given, clearly indicate "hours."

Q62, 70, 78, 86, 94, 102

Record whatever the respondent offers. The breakdown we are interested in is vacation, outdoor recreation, relaxation, to get away, etc. vs. visit relatives or friends vs. business, personal business or other purpose.

Q64, 72, 80, 88, 96, 104

NOTE: Camping is not accepted here as it implies the trip was overnight. Probe for details if camping is mentioned and make necessary corrections.

NOTE: If the purpose of the trip is fishing, for example, the respondent may not volunteer that they fished when you ask about activities. Be sure to elicit any activities that are listed in the trip purpose by asking "Did all of you fish on this day?" or some other appropriate phrase.
NOTE: Be sure to ask questions indicated in question objectives 20 and 21 when hiking and bicycling are mentioned. 

NOTE: Under "# people" record the total number of people that participated, not just the number 12 and over.

The question is abbreviated here because of the lack of space. Be sure the proper connotation is understood, i.e.,

Are there other day outings involving at least one outdoor recreation activity on public property or where a fee is normally charged on the past two weekends?
Background of the Study

This study is being done by the Wisconsin Department of Natural Resources. It will tell us about trips and outings that Wisconsinites take. We want to find out how many people participate in various outdoor recreation activities on these occasions and where they go. We are interested only in weekend participation because it is more relevant to the problem of deciding where and how many public and private facilities are needed.

The data from this study will provide current estimates of outdoor recreation use patterns. When combined with data from other sources it will provide a basis for projecting what those patterns might be like ten to twenty years in the future. Another survey will deal with the outdoor recreation patterns of non-residents vacationing in Wisconsin.
Dear Sir or Madam:

The Survey Research Laboratory of the University of Wisconsin is conducting a study for the Wisconsin Department of Natural Resources. This survey asks about trips and outdoor recreation activities such as swimming, picnicking, boating, camping, and fishing. We are also much interested in the opinions of those Wisconsin people who don't happen to engage in outdoor recreation.

Your telephone number has been selected at random from Wisconsin telephone directories. If your telephone number has not changed recently you will receive a call from us within the next few weeks. The information we ask for will not be identified with your name. Your name will not appear in our records nor in any publication. The interviewer is an employee of the University of Wisconsin, and is not a salesman for any product or service.

The interviewer will talk with any responsible member of the household, 18 years of age or older.

We will appreciate your cooperation in this important research.

Sincerely,
### Deck 1
**Socioeconomic Characteristics**
**Non-Summer Activities**
**One Record Per Interview**

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<td>5-6</td>
<td>Deck # (01)</td>
<td></td>
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<tr>
<td>7-9</td>
<td>Project # (410)</td>
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<td>9. Not ascertained</td>
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<td>Type of head</td>
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<td>16. Sixteen</td>
<td></td>
</tr>
<tr>
<td></td>
<td>17. Seventeen</td>
<td></td>
</tr>
<tr>
<td></td>
<td>etc. etc.</td>
<td></td>
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<tr>
<td></td>
<td>75. Seventy-five and over</td>
<td></td>
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<tr>
<td></td>
<td>88. Inappropriate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>99. Not ascertained</td>
<td></td>
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</tbody>
</table>
| 17-18   | Age of wife (if husband head, wife present) | 16. Sixteen  
17. Seventeen  
etc. etc.  
75. Seventy-five and over  
88. Inappropriate  
99. Not ascertained |
| 19-20   | Age of respondent | 16. Sixteen  
17. Seventeen  
etc. etc.  
75. Seventy-five and over  
88. Inappropriate  
99. Not ascertained |
| 21      | Sex of Respondent | 1. Male  
2. Female |
| 22      | No. own children under 18 | 0. Zero  
1. One  
etc. etc.  
7. Seven or more  
8. Inappropriate  
9. Not ascertained |
| 23      | No. own children under 12 | 0. Zero  
1. One  
etc. etc.  
7. Seven or more  
8. Inappropriate  
9. Not ascertained |
| 24      | No. own children under 6 | 0. Zero  
1. One  
etc. etc.  
7. Seven or more  
8. Inappropriate  
9. Not ascertained |
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<tbody>
<tr>
<td>25</td>
<td>4  No. other relatives under 18 (besides wife and own children under 18)</td>
<td>0. Zero 1. One etc. etc. 7. Seven or more 8. Inappropriate 9. Not ascertained</td>
</tr>
<tr>
<td>26</td>
<td>4  No. other relatives 18 or over (besides wife)</td>
<td>0. Zero 1. One etc. etc. 7. Seven or more 8. Inappropriate 9. Not ascertained</td>
</tr>
<tr>
<td>27</td>
<td>4  No. unrelated individuals under 18</td>
<td>0. Zero 1. One etc. etc. 7. Seven or more 8. Inappropriate 9. Not ascertained</td>
</tr>
<tr>
<td>28</td>
<td>4  No. unrelated individuals 18 or over</td>
<td>0. Zero 1. One etc. etc. 7. Seven or more 8. Inappropriate 9. Not ascertained</td>
</tr>
<tr>
<td>29-30</td>
<td>5  Total no. of individuals in household</td>
<td>1. One 2. Two etc. etc. 25. Twenty-five 88. Inappropriate 99. Not ascertained</td>
</tr>
<tr>
<td>31</td>
<td>5a Is household composed of unrelated individuals?</td>
<td>0. No 1. Yes</td>
</tr>
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<td>Columns</td>
<td>Question</td>
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<td>---------------------------------------</td>
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</tr>
<tr>
<td>32-34</td>
<td>County of origin</td>
<td>6</td>
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<tr>
<td></td>
<td>(See place code)</td>
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<td>35-39</td>
<td>MCD of origin</td>
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<td>40</td>
<td>Are there overnight trips?</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>0. No</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Yes</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Are there day outings?</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>0. No</td>
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</tr>
<tr>
<td></td>
<td>1. Yes</td>
<td></td>
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<tr>
<td>42</td>
<td>Number of non-recreation trips</td>
<td>106, 107</td>
</tr>
<tr>
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<td>0. Zero</td>
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</tr>
<tr>
<td></td>
<td>1. One</td>
<td></td>
</tr>
<tr>
<td></td>
<td>etc. etc.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. Seven or more</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. Inappropriate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9. Not ascertained</td>
<td></td>
</tr>
<tr>
<td>43-44</td>
<td>No. people days horseback riding</td>
<td>108</td>
</tr>
<tr>
<td></td>
<td>0. Zero</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. One</td>
<td></td>
</tr>
<tr>
<td></td>
<td>etc. etc.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>98. Ninety-eight</td>
<td></td>
</tr>
<tr>
<td></td>
<td>99. Not ascertained</td>
<td></td>
</tr>
<tr>
<td>45-46</td>
<td>No. people days under 12 horseback riding</td>
<td>108</td>
</tr>
<tr>
<td></td>
<td>0. Zero</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. One</td>
<td></td>
</tr>
<tr>
<td></td>
<td>etc. etc.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>98. Ninety-eight</td>
<td></td>
</tr>
<tr>
<td></td>
<td>99. Not ascertained</td>
<td></td>
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<td>47-48</td>
<td>No. people days snow skiing</td>
<td>109</td>
</tr>
<tr>
<td></td>
<td>0. Zero</td>
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</tr>
<tr>
<td></td>
<td>1. One</td>
<td></td>
</tr>
<tr>
<td></td>
<td>etc. etc.</td>
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</tr>
<tr>
<td></td>
<td>98. Ninety-eight</td>
<td></td>
</tr>
<tr>
<td></td>
<td>99. Not ascertained</td>
<td></td>
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<tr>
<td>Columns</td>
<td>Question</td>
<td>Code</td>
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</tr>
</tbody>
</table>
| 49-50   | 109      | No. people days under 12 snow skiing  
|         |          | 0. Zero 
|         |          | 1. One 
|         |          | etc. etc. 
|         |          | 98. Ninety-eight 
|         |          | 99. Not ascertained |
| 51-52   | 110      | No. people days snowmobiling  
|         |          | 0. Zero 
|         |          | 1. One 
|         |          | etc. etc. 
|         |          | 98. Ninety-eight 
|         |          | 99. Not ascertained |
| 53-54   | 110      | No. people days snowmobiling  
|         |          | 0. Zero 
|         |          | 1. One 
|         |          | etc. etc. 
|         |          | 98. Ninety-eight 
|         |          | 99. Not ascertained |
| 55-56   | 111      | No. people days target shooting (bow)  
|         |          | 0. Zero 
|         |          | 1. One 
|         |          | etc. etc. 
|         |          | 98. Ninety-eight 
|         |          | 99. Not ascertained |
| 57-58   | 111      | No. people days under 12 target shooting (bow)  
|         |          | 0. Zero 
|         |          | 1. One 
|         |          | etc. etc. 
|         |          | 98. Ninety-eight 
|         |          | 99. Not ascertained |
| 59-60   | 112      | No. people days target shooting (rifle or pistol)  
|         |          | 0. Zero 
|         |          | 1. One 
|         |          | etc. etc. 
|         |          | 98. Ninety-eight 
<p>|         |          | 99. Not ascertained |</p>
<table>
<thead>
<tr>
<th>Columns</th>
<th>Question</th>
<th>Code</th>
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</thead>
</table>
| 61-62 | No. people days under 12 target shooting (rifle or pistol) | 0. Zero  
1. One  
etc. etc.  
98. Ninety-eight  
99. Not ascertained |
| 63-64 | No. people days trap or skeet shooting | 0. Zero  
1. One  
etc. etc.  
98. Ninety-eight  
99. Not ascertained |
| 65-66 | No. people days under 12 trap or skeet shooting | 0. Zero  
1. One  
etc. etc.  
98. Ninety-eight  
99. Not ascertained |
| 67-68 | No. people days hunting | 0. Zero  
1. One  
etc. etc.  
98. Ninety-eight  
99. Not ascertained |
| 69-70 | No. people days under 12 hunting | 0. Zero  
1. One  
etc. etc.  
98. Ninety-eight  
99. Not ascertained |
| 71 | Income | 1. Under $3,000  
2. 3-5,000  
3. 5-8,000  
4. 8-10,000  
5. 10-15,000  
6. Over 15,000  
9. Not ascertained |
<p>| 72 | Replication number |</p>
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<td>Deck # (02, 03, ...)</td>
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<td>Project # (410)</td>
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<tr>
<td>10 25</td>
<td>Trip #</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. One</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Two</td>
<td></td>
</tr>
<tr>
<td></td>
<td>etc. etc.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9. Nine</td>
<td></td>
</tr>
<tr>
<td>11 26</td>
<td>Month left</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. July</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. August</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9. September</td>
<td></td>
</tr>
<tr>
<td>12-13 26</td>
<td>Day of month left</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. One</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Two</td>
<td></td>
</tr>
<tr>
<td></td>
<td>etc. etc.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>31. Thirty-one</td>
<td></td>
</tr>
<tr>
<td>14 27</td>
<td>Month returned</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. July</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. August</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9. September</td>
<td></td>
</tr>
<tr>
<td>15-16 27</td>
<td>Day of month returned</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. One</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Two</td>
<td></td>
</tr>
<tr>
<td></td>
<td>etc. etc.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>31. Thirty-one</td>
<td></td>
</tr>
<tr>
<td>17-18 28</td>
<td>State of main destination</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(See place code)</td>
<td></td>
</tr>
<tr>
<td>19-21 28</td>
<td>County of main destination</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(See place code)</td>
<td></td>
</tr>
<tr>
<td>Columns</td>
<td>Question</td>
<td>Code</td>
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<td>---------</td>
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</tbody>
</table>
| 22-26   | 28       | MCD of main destination  
|         |          | (See place code)         |
| 27-28   | 29       | Distance from home  
|         |          | 00. Less than 10 miles  
|         |          | 01. 10-19  
|         |          | 02. 20-29  
|         |          | etc. etc.  
|         |          | 98. 980 and over  
|         |          | 99. Not ascertained |
| 29      | 30       | Purpose of trip  
|         |          | 1. Vacation, outdoor recreation, to get away, relax, etc. |
| 30      | 31       | No. 12 years and over on trip  
|         |          | 0. Zero  
|         |          | 1. One  
|         |          | etc. etc.  
|         |          | 8. Eight |
| 31      | 31       | No. under 12 on trip  
|         |          | 0. Zero  
|         |          | 1. One  
|         |          | etc. etc.  
|         |          | 8. Eight |
| 32      | 32, 36,  
|         | 40, 44,  
|         | 48, 52   | Day of week  
|         |          | 1. Saturday  
|         |          | 2. Sunday |
| 33      | 32 etc.  | Day of month  
|         |          | 1. One  
|         |          | 2. Two  
|         |          | etc. etc.  
|         |          | 31. Thirty-one |
| 36-37   | 33, 37,  
|         | 41, 45,  
|         | 49, 53   | State of destination  
|         |          | (See place code) |
| 38-40   | 33 etc.  | County of destination  
|         |          | (See place code) |
| 41-45   | 33 etc.  | MCD of destination  
<p>|         |          | (See place code) |</p>
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<td>46-47</td>
<td>35, 39, 43, 47, 51, 55</td>
<td>Activity</td>
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<td></td>
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<td>01. Sighseeing or pleasure driving</td>
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<td></td>
<td>02. Picnicking</td>
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<td></td>
<td></td>
<td>03. Swimming</td>
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<td></td>
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<td>04. Camping</td>
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<td></td>
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<td>05. Camping in a remote area</td>
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<td>06. Golfing</td>
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<td>07. Hiking less than 4 hours</td>
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<td>08. Hiking 4 hours or more</td>
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<td>09. Bicycling 2 hours or more</td>
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<td>10. Canoeing</td>
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<td></td>
<td>11. Motorboating</td>
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<td></td>
<td>12. Water skiing</td>
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<td></td>
<td></td>
<td>13. Fishing</td>
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<td>14. Nature study</td>
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<td></td>
<td>15. Driving or riding an off-the-road vehicle</td>
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<tr>
<td>48-49</td>
<td>35 etc.</td>
<td>No. of people</td>
</tr>
<tr>
<td></td>
<td></td>
<td>01. One</td>
</tr>
<tr>
<td></td>
<td></td>
<td>02. Two</td>
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<tr>
<td></td>
<td></td>
<td>etc. etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20. Twenty</td>
</tr>
<tr>
<td>50</td>
<td>35 etc.</td>
<td>No. of people under 12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0. Zero</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. One</td>
</tr>
<tr>
<td></td>
<td></td>
<td>etc. etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8. Eight</td>
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<tr>
<td>51-52</td>
<td>35 etc.</td>
<td>Activity</td>
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<tr>
<td></td>
<td></td>
<td>(Same as above)</td>
</tr>
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<td>53-54</td>
<td>35 etc.</td>
<td>No. of people</td>
</tr>
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<td></td>
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<td>(Same as above)</td>
</tr>
<tr>
<td>55</td>
<td>35 etc.</td>
<td>No. of people under 12</td>
</tr>
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<td></td>
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<td>(Same as above)</td>
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<td>76-77</td>
<td>35 etc.</td>
<td>Activity</td>
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<td></td>
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<td>(Same as above)</td>
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<td>Columns</td>
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<tr>
<td>78-79</td>
<td>35 etc.</td>
<td>No. of people (Same as above)</td>
</tr>
<tr>
<td>80</td>
<td>35 etc.</td>
<td>No. of people under 12 (Same as above)</td>
</tr>
<tr>
<td>Columns</td>
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<td>7-9</td>
<td>Project # (410)</td>
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</table>
| 10      | Day of week  
74, 82,  
90, 98 | 1. Saturday  
2. Sunday |
| 11      | Month  
58 etc. | 7. July  
8. August  
9. September |
| 12-13   | Day of month  
58 etc. | 1. One  
2. Two  
etc. etc.  
31. Thirty-one |
| 14-15   | State of destination  
59 | (See place code) |
| 16-18   | County of destination  
59 | (See place code) |
| 19-23   | MCD of destination  
59 | (See place code) |
| 24-25   | Distance from home  
61, 69,  
77, 85,  
93, 101 | 00. Less than 10 miles  
01. 11-19  
02. 20-29  
etc. etc.  
98. 980 and over  
99. Not ascertained |
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<th>Columns</th>
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<td>26</td>
<td>Purpose of trip</td>
<td>26, 70, 78, 86, 94, 102</td>
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<tr>
<td></td>
<td>1. Vacation, outdoor recreation, to get away, relax, etc.</td>
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</tr>
<tr>
<td></td>
<td>2. Visit friends or relatives</td>
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</tr>
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<td></td>
<td>3. Other</td>
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</tr>
<tr>
<td>27</td>
<td>No. 12 years and over on trip</td>
<td>63, 71, 79, 87, 95, 103</td>
</tr>
<tr>
<td></td>
<td>0. Zero</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. One</td>
<td></td>
</tr>
<tr>
<td></td>
<td>etc. etc.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. Eight</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>No. under 12 on trip</td>
<td>63 etc.</td>
</tr>
<tr>
<td></td>
<td>0. Zero</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. One</td>
<td></td>
</tr>
<tr>
<td></td>
<td>etc. etc.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. Eight</td>
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<tr>
<td>29-30</td>
<td>Activity</td>
<td>64, 72, 80, 88, 96, 104</td>
</tr>
<tr>
<td></td>
<td>01. Sightseeing or pleasure driving</td>
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<td>02. Picnicking</td>
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<td></td>
<td>03. Swimming</td>
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<td></td>
<td>06. Golfing</td>
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<td>07. Hiking less than 4 hours</td>
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<td>08. Hiking 4 hours or more</td>
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<td>09. Bicycling 2 hours or more</td>
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<td>10. Canoeing</td>
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<td>11. Motorboating</td>
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<td>12. Water skiing</td>
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<td>13. Fishing</td>
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<td>31-32</td>
<td>No. of people</td>
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<td>01. One</td>
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<tr>
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<td>37-38</td>
<td>No. people days 12 and over shooting trap or skeet</td>
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<tr>
<td>41-42</td>
<td>No. people days 12 and over hunting</td>
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<tr>
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<tr>
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1-4 | ID #
5-6 | Deck # (52, 53, . . . , 59)
7-9 | Project # (410)
10 | Type of head
   1. Husband with wife present
   2. Other head
   9. Not ascertained
11 | Age of head
   1. Under 35
   2. 35-44
   3. 45-64
   4. 65 and over
   9. Not ascertained
12 | No. of people in family (household if unrelated individuals)
   0. One
   1. Two
   2. 3 or 4
   3. 5 or 6
   4. 7 or more
13 | Family income
   1. Less than $3,000
   2. 3-5,000
   3. 5-8,000
   4. 8-10,000
   5. 10-15,000
   6. More than 15,000
   9. Not ascertained
14-16 | County of origin
(See place code)
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<td>Man-days activity (1, 3, ..., 15) day trips, 12 &amp; over, Sat.</td>
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<tr>
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<td>80. Eighty</td>
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<td>Man-days act. (1, 3, ..., 15) day trips, 12 &amp; over, Sun.</td>
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<td>21-22</td>
<td>Man-days act. (1, 3, ..., 15) day trips, under 12, Sat.</td>
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<tr>
<td>23-24</td>
<td>&quot; &quot; &quot; Sun.</td>
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<td>&quot; day trips, 12 &amp; over, Sat.</td>
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<td>27-28</td>
<td>&quot; &quot; &quot; Sun.</td>
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<td>29-30</td>
<td>&quot; &quot; under 12, Sat.</td>
</tr>
<tr>
<td>31-32</td>
<td>&quot; &quot; &quot; Sun.</td>
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<tr>
<td>33-34</td>
<td>&quot; 5 or more day trips 12 &amp; over, Sat.</td>
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<td>35-36</td>
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<td>45-46</td>
<td>&quot; &quot; under 12, Sat.</td>
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<td>47-48</td>
<td>&quot; &quot; &quot; Sun.</td>
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<td>49-50</td>
<td>&quot; 2-4 day trips, 12 &amp; over, Sat.</td>
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<td>53-54</td>
<td>&quot; &quot; under 12, Sat.</td>
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<td>55-56</td>
<td>&quot; &quot; &quot; Sun.</td>
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<tr>
<td>57-58</td>
<td>&quot; 5 &amp; more day trips, 12 &amp; over, Sat.</td>
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<td>Man-days act. 5 &amp; more day trips, 12 &amp; over, Sun.</td>
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<tr>
<td>61-62</td>
<td>&quot; &quot; under 12, Sat.</td>
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<tr>
<td>63-64</td>
<td>&quot; &quot; Sun.</td>
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<td>Is household composed of unrelated individuals? 0. No 1. Yes</td>
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### Work Deck 60

**Distribution Pattern**

**Current Estimates**

**One Record Each Trip Day**

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<td>7-9</td>
<td>Project # (410)</td>
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</table>
| 10-12   | County of origin  
          (See place code) |
| 13-14   | State of destination  
          (See place code) |
| 15-17   | County of destination  
          (See place code) |
| 18      | Day of week  
          1. Saturday  
          2. Sunday |
| 19      | Type of trip  
          1. Day trip  
          2. 2-4 day trip  
          3. 5 or more day trip |
| 20-21   | Activity  
          01. Sightseeing or pleasure driving  
          02. Picnicking  
          03. Swimming  
          04. Camping  
          05. Camping in a remote area  
          06. Golfing  
          07. Hiking less than 4 hours  
          08. Hiking 4 hours or more  
          09. Bicycling 2 hours or more  
          10. Canoeing  
          11. Motorboating  
          12. Water skiing  
          13. Fishing  
          14. Nature study  
          15. Driving or riding an off-the-road vehicle |
<table>
<thead>
<tr>
<th>Columns</th>
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</table>
| 22      | No. of people 12 years and over  
|         | 0. Zero  
|         | 1. One  
|         | etc. etc.  
|         | 8. Eight |
| 23      | No. of people under 12 years  
|         | 0. Zero  
|         | 1. One  
|         | etc. etc.  
|         | 8. Eight |
| 24-25   | Activity  
|         | (Same as above) |
| 26      | No. of people 12 and over  
|         | (Same as above) |
| 27      | No. of people under 12  
|         | (Same as above) |
| 28-29   | Activity  
|         | (Same as above) |
| 44-45   | Activity  
|         | (Same as above) |
| 46      | No. of people 12 and over  
|         | (Same as above) |
| 47      | No. of people under 12  
|         | (Same as above) |
| 48      | No. of people 12 and over on trip  
|         | (Same as col. 23) |
| 49      | No. of people under 12 on trip  
|         | (Same as col. 23) |
| 50      | Replication number |
### Work Deck 61
Distance Traveled
One Record Per Trip

<table>
<thead>
<tr>
<th>Columns</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4</td>
<td>ID #</td>
</tr>
<tr>
<td>5-6</td>
<td>Deck # (61)</td>
</tr>
<tr>
<td>7-9</td>
<td>Project # (410)</td>
</tr>
<tr>
<td>10</td>
<td>Trip type</td>
</tr>
<tr>
<td></td>
<td>1. Day trip</td>
</tr>
<tr>
<td></td>
<td>2. 2-4 day trip</td>
</tr>
<tr>
<td></td>
<td>3. 5 or more day trip</td>
</tr>
<tr>
<td>11</td>
<td>Trip purpose</td>
</tr>
<tr>
<td></td>
<td>1. Vacation, outdoor recreation, to get away, relax, etc.</td>
</tr>
<tr>
<td></td>
<td>2. Visit friends or relatives</td>
</tr>
<tr>
<td></td>
<td>3. Other</td>
</tr>
<tr>
<td>12-13</td>
<td>Distance traveled</td>
</tr>
<tr>
<td></td>
<td>00. Less than 10 miles</td>
</tr>
<tr>
<td></td>
<td>01. 10-19</td>
</tr>
<tr>
<td></td>
<td>02. 2-29</td>
</tr>
<tr>
<td></td>
<td>etc. etc.</td>
</tr>
<tr>
<td></td>
<td>98. 980 and over</td>
</tr>
<tr>
<td></td>
<td>99. Not ascertained</td>
</tr>
</tbody>
</table>
Work Deck 62  
Secondary Data  
One Record for Each Region for Each Year

<table>
<thead>
<tr>
<th>Columns</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4</td>
<td>(blank)</td>
</tr>
<tr>
<td>5-6</td>
<td>Deck # (62)</td>
</tr>
<tr>
<td>7-9</td>
<td>Project # (410)</td>
</tr>
</tbody>
</table>
| 10      | Region  
  1. Region one  
  2. Region two  
  etc. etc.  
  8. Region eight |
| 11-16   | No. of families |
| 17-19   | Proportion of families with husband-wife head |
| 20-22   | Proportion of families with income $3,000-$5,000 |
| 23-25   | " " " " " $5,000-$8,000 |
| 26-28   | " " " " " $8,000-$10,000 |
| 29-31   | " " " " " $10,000-$15,000 |
| 32-34   | " " " " " over $15,000 |
| 35-37   | " " " " " head under 35 years |
| 38-40   | " " " " " 35-44 years |
| 41-43   | " " " " " 45-64 years |
| 44-46   | " " " " " 3 or 4 members |
| 47-49   | " " " " " 5 or 6 members |
| 50-52   | " " " " " 7 or more members |
| 53-58   | No. of unrelated individuals |
| 59-60   | Year (70, 80, 90) |
Flow Chart for Work Decks

Before making work decks do a sort on deck 1 and throw out any records that have the following:

<table>
<thead>
<tr>
<th>Deck #</th>
<th>Col. #</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14</td>
<td>8 or 9</td>
</tr>
<tr>
<td>1</td>
<td>15-16</td>
<td>88 or 99</td>
</tr>
<tr>
<td>1</td>
<td>27</td>
<td>8 or 9</td>
</tr>
<tr>
<td>1</td>
<td>28</td>
<td>8 or 9</td>
</tr>
<tr>
<td>1</td>
<td>29-30</td>
<td>88 or 99</td>
</tr>
<tr>
<td>1</td>
<td>71</td>
<td>9</td>
</tr>
</tbody>
</table>

Do a sort on Decks 2-49 and throw out records with interview number same as those thrown out by previous sort.
Flow Chart for Work Deck 51

Col.

1-4  Col. 1-4, deck 1

5-6  51

7-9  410

10  1. If col. 14, deck 1=1
    2. If col. 14, deck 1=2 or 3

11  1. If col. 15-16, deck 1=14-34
    2. If col. 15-16, deck 1=35-44
    3. If col. 15-16, deck 1=45-64
    4. If col. 15-16, deck 1=65-75

12  If col. 31, deck 1=0, compute:
    T=col. 29-30, deck 1
    minus col. 28, deck 1
    minus col. 27, deck 1
    If col. 31, deck 1=1
    T=col. 29-30, deck 1 then:
        0. If T=one
        1. If T=two
        2. If T=3 or 4
        3. If T=5 or 6
        4. If T=7 or more

13  Col. 71, deck 1

14-16  Col. 32-34, deck 1

17-18  Col. 43-44, deck 1
    minus col. 45-46, deck 1

19-20  Col. 45-46, deck 1

21-22  Col. 47-48, deck 1
    minus col. 49-50, deck 1

23-24  Col. 49-50, deck 1

25-26  Col. 51-52, deck 1
    minus col. 53-54, deck 1

27-28  Col. 53-54, deck 1
<table>
<thead>
<tr>
<th>Col.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>29-30</td>
<td>Col. 55-56, deck 1 minus col. 57-58, deck 1</td>
</tr>
<tr>
<td>31-32</td>
<td>Col. 57-58, deck 1</td>
</tr>
<tr>
<td>33-34</td>
<td>Col. 59-60, deck 1 minus col. 61-62, deck 1</td>
</tr>
<tr>
<td>35-36</td>
<td>Col. 61-62, deck 1</td>
</tr>
<tr>
<td>37-38</td>
<td>Col. 63-64, deck 1 minus col. 65-66, deck 1</td>
</tr>
<tr>
<td>39-40</td>
<td>Col. 65-66, deck 1</td>
</tr>
<tr>
<td>41-42</td>
<td>Col. 67-68, deck 1 minus col. 69-70, deck 1</td>
</tr>
<tr>
<td>43-44</td>
<td>Col. 69-70, deck 1</td>
</tr>
<tr>
<td>45</td>
<td>Col. 31, deck 1</td>
</tr>
<tr>
<td>46</td>
<td>Col. 72, deck 1 after matching ID #</td>
</tr>
</tbody>
</table>

NOTE: Since ID #’s will be ordered the same in all decks it should be easy to match ID #’s in different decks.
Flow Chart for Work Deck 52-59

<table>
<thead>
<tr>
<th>Col.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4</td>
<td>Col. 1-4, work deck 51</td>
</tr>
<tr>
<td>5-6</td>
<td>52, 53, . . . , 59</td>
</tr>
<tr>
<td>7-16</td>
<td>Col. 7-16, work deck 51</td>
</tr>
</tbody>
</table>

We must now compute $A_{i,j,k,m}$ where:

- **Activity** $i = 1, 2, . . . , 15$ (see code)
- **trip type** $j = 1, 2, 3$
  - 1 = day trip,
  - 2 = 2-4 day trip,
  - 3 = 5 or more day trip
- **age** $k = 1, 2$
  - 1 = 12 and over,
  - 2 = less than 12
- **day** $m = 1, 2$
  - 1 = Saturday
  - 2 = Sunday

From decks 2-19:

- $i = \text{col. 46-47, 51-52, 56-57, 61-62, 66-67, 71-72, 76-77}$
- $j = 2$ if $J_2 - J_1 < 4$
  - 3 if $J_2 - J_1 \geq 4$

where $J_1$ & $J_2$ are Julian dates (day of year numbering from 1 to 365).

- $J_1 = \text{If col. 11, deck 2-19 = 7, 181 plus col. 12-13, deck 2-19}$
  - If col. 11, deck 2-19 = 8, 212 plus col. 12-13, deck 2-19
  - If col. 11, deck 2-19 = 9, 243 plus col. 12-13, deck 2-19
- $J_2 = \text{If col. 14, deck 2-19 = 7, 181 + col. 15-16, deck 2-19}$
  - If col. 14, deck 2-19 = 8, 212 + col. 15-16, deck 2-19
  - If col. 14, deck 2-19 = 9, 243 + col. 15-16, deck 2-19

Now we must sum up the activity days for each cell.

$\text{TEMP}_{A_{i,j,k,m}} = \text{col. 48-49 minus col. 50, col. 53-54 minus col. 55, col. 58-59 minus col. 60, etc., col. 78-79 minus col. 80}$

$\text{TEMP}_{A_{i,j,2,m}} = \text{col. 50, 55, 60, etc., 80}$

$m = \text{col. 32}$
From decks 20-49:

\[ i = \text{col. } 29-30, 34-35, \text{ etc.}, 59-60 \]

\[ j = 1 \]

\[ \text{TEMPA}_{i,j,1,m} = \text{col. } 31-32 \text{ minus } 33, 36-37 \text{ minus } 38, \text{ etc. } 61-62 \text{ minus } 63 \]

\[ \text{TEMPA}_{i,j,2,m} = \text{col. } 33, 38, \text{ etc. } 63 \]

\[ m = \text{col. } 10 \]

\[ A_{i,j,k,m} \text{ should be set to zero.} \]

Then go through decks 2-19 and 20-49 setting

\[ A_{i,j,k,m} = A_{i,j,k,m} \text{ plus } \text{TEMPA}_{i,j,k,m} \]

as indicated.

<table>
<thead>
<tr>
<th>Deck Range</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>17-18</td>
<td>1,1,1,1</td>
</tr>
<tr>
<td>19-20</td>
<td>1,1,1,2</td>
</tr>
<tr>
<td>21-22</td>
<td>1,1,2,1</td>
</tr>
<tr>
<td>23-24</td>
<td>1,1,2,2</td>
</tr>
<tr>
<td>25-26</td>
<td>1,2,1,1</td>
</tr>
<tr>
<td>27-28</td>
<td>1,2,1,2</td>
</tr>
<tr>
<td>29-30</td>
<td>1,2,2,1</td>
</tr>
<tr>
<td>31-32</td>
<td>1,2,2,2</td>
</tr>
<tr>
<td>33-34</td>
<td>1,3,1,1</td>
</tr>
<tr>
<td>35-36</td>
<td>1,3,1,2</td>
</tr>
<tr>
<td>37-38</td>
<td>1,3,2,1</td>
</tr>
<tr>
<td>39-40</td>
<td>1,3,2,2</td>
</tr>
<tr>
<td>41-42</td>
<td>2,1,1,1</td>
</tr>
<tr>
<td>43-44</td>
<td>2,1,1,2</td>
</tr>
<tr>
<td>45-46</td>
<td>2,1,2,1</td>
</tr>
<tr>
<td>47-48</td>
<td>2,1,2,2</td>
</tr>
<tr>
<td>49-50</td>
<td>2,2,1,1</td>
</tr>
</tbody>
</table>
Note: For this work deck we must draw simultaneously from two sets of decks. As we go through decks 2-19, we must get data from the card in work deck 51 with the same ID # (col. 1-4). It could be gotten from deck 1, and this might be the best way if a tape is used and unlimited columns are available. In computing $A_{i,j,k,m}$'s we must look at all records in decks 2-19 and the record in work deck 51 for a given ID # and compute the $\text{TEMPA}_{i,j,k,m}$. Then we must look at all records in decks 20-49 and the record in work deck 51 for the same ID # and compute the remainder of the $\text{TEMPA}_{i,j,k,m}$.

Work decks 53-59 are derived in the same way as work deck 52 with the following changes:

1. Col. 5-6 becomes 53, 54, . . . , 59
2. In col. 17-64, $i = 3 \& 4, 5 \& 6, . . . , 13 \& 14, 15$ in the $A_{i,j,k,m}$
Flow Chart for Work Deck 60

Col.

1-4  Col. 1-4, deck 2-19
5-6   60
7-9   410
10-12  Col. 32-34, deck 1
13-14  From deck 2-19
       Col. 17-18
       From deck 20-49
       Col. 14-15
15-17  From deck 2-19
       Col. 19-21
       From deck 20-49
       Col. 16-18
18    From deck 2-19
       Col. 32
       From deck 20-49
       Col. 10
19    1  If deck 20-49
       2  If \( J_2 - J_1 < 4 \) from deck 2-19
       3  If \( J_2 - J_1 \geq 4 \) from deck 2-19
       Where \( J_2 \) and \( J_1 \) are as defined in flow chart for work deck
       52
20-21  If deck 2-19, col. 46-47
       If deck 20-49, col. 29-30
22    If deck 2-19, col. 48-49 minus col. 50
       If deck 20-49, col. 31-32 minus col. 33
23    If deck 2-19, col. 50
       If deck 20-49, col. 33
24-25  If deck 2-19, col. 51-52
       If deck 20-49, col. 34-35
26    If deck 2-19, col. 53-54 minus col. 55
       If deck 20-49, col. 36-37 minus col. 38
<table>
<thead>
<tr>
<th>Col.</th>
<th>Description</th>
</tr>
</thead>
</table>
| 27   | If deck 2-19, col. 55  
      | If deck 20-49, col. 38 |
|      |             |
| 44-45| If deck 2-19, col. 76-77  
      | If deck 20-49, col. 59-60 |
| 46   | If deck 2-19, col. 78-79 minus col. 80  
      | If deck 20-49, col. 61-62 minus col. 63 |
| 47   | If deck 2-19, col. 80  
      | If deck 20-49, col. 63 |
| 48   | If deck 2-19, col. 30  
      | If deck 20-49, col. 27 |
| 49   | If deck 2-19, col. 31  
      | If deck 20-49, col. 28 |
| 50   | col. 72, deck 1 after matching ID #  
      | NOTE: Since ID #'s will be ordered the same in all decks,  
      | it should be easy to match ID #'s in different decks. |
Flow Chart for Work Deck 61

Col.
1-4 Col. 1-4, deck 20-49, deck 2-19
5-6 61
7-9 410
10 For deck 20-49: 1
   For deck 2-19:
      2 If \( J_2 - J_1 \leq 4 \)
      3 If \( J_2 - J_1 \geq 4 \)
       where \( J_1 \) & \( J_2 \) is defined as in flow chart for work deck 52.
11 If deck 2-19, col. 29
   If deck 20-49, col. 26
12-13 If deck 2-19, col. 27-28
   If deck 20-49, col. 24-25
Procedure for "Type of Head" and "Number of Families" Projections

Projections for type of head can be obtained from the 1960 Census and the first count tapes from the 1970 Census. The 1960 Census (1) has number of families and number of husband-wife families by county. These figures can be aggregated to planning regions. All families that are not husband-wife families are families with "other head." We can, therefore, obtain the number of families that are husband-wife families and the number of families with "other head."

The first count tapes (2) of the 1970 Census have by county a count of husband-wife families and counts of families with "other male head" and "female head." We can therefore obtain the number of husband-wife families and the number of families with "other" head ("other male head" and "female head" combined) for the planning regions for 1970.

These numbers can then be extrapolated in a linear trend to obtain the projected number of families, the number of husband-wife families and the number of families with "other heads." We want to convert these numbers to proportions.

The number of families is recorded in col. 11-16, deck 62. The proportion of husband-wife families is recorded in col. 17-19, deck 62.
References


Procedure for "Income" Projections

Income projections are available in a preliminary report from the Office of Business Economics. I have obtained a review draft. Robert E. Graham, Jr., Chief, Regional Economics Division, stated in an August 19, 1969 letter to me "The revised economic projections about which you inquired should be available by mid-1970, but we can give no assurance of this schedule at this time." The projections in this publication are for 167 "OBE Economic Areas." These OBE areas are not coincident with our planning regions, but they do follow county lines and can therefore be converted to our areas without a great deal of difficulty.

To change these projections to our planning regions we must use Census data which gives us the income on a county basis. The County and City Data Book gives income in 1959 of families, 1960 by county. Since OBE income and Census income is not strictly comparable it will be necessary to adjust the totals in converting from OBE areas to planning regions. We will do this by assuming that each county now and in the future will receive the same proportion of the OBE projected income that it received of Census income in 1960. This is not realistic on a county basis, however when we reaggregate into planning regions which are similar in size to OBE regions, the effects of differential growth rates should average out.

Following is a sample problem to illustrate the procedure. OBE area 78 consists of the following counties: Green and Rock (in Wisconsin), Ogle, Boone, Stephenson, and Winnebago (in Illinois). The Census income of these counties in 1960 (in millions of 1958 dollars) was 40, 214, 64,
37, 82, and 442 respectively. The proportion of total (879) for the Wisconsin counties is \( \frac{40}{879} = .046 \) and \( \frac{214}{879} = .244 \) respectively. To get the projected income for each county, multiply these proportions by the projected income for this OBE area. The resulting projection is the county income in 1958 dollars. When this has been done for all counties in the state the results can be added by planning region to get projected income for each planning in 1958 dollars. Since the data we collect from the telephone survey will be in 1969 dollars, however, we need to convert all projections to 1969 dollars. This is easily done since the consumer price index (CPI) = 100 in the 1957-59 base period (4). All projections in 1958 dollars are converted to 1969 dollars by multiplying .01 (CPI) by the projection.

The next step is to convert this total income to income distribution. This will tell us the number of families with incomes in the range 0-\$3,000, 3-\$5,000, etc. To do this we will assume that the families in the 0-\$1,000 category etc. are distributed evenly within that class. This is not too unreasonable since we are working with quite narrow categories, i.e. \$1,000 increments up to \$10,000. We will further assume that the median income of unrelated individuals is equal to the mean income. This will probably introduce a bias, but is necessary since Census data does not provide us with the means. The bias should be slight, however, because the number of unrelated individuals and the income of unrelated individuals is small compared to the totals. The final assumption is that the income distribution will not change over time. This means that when total income goes up by, say 50%, the income of each income group goes up
by 50%. Thus people earning $5,000 would move up to $7,500 and people earning $10,000 would move up to $15,000. Under this definition of constant distribution of income, inflation does not affect the distribution because it is a proportionate change in everyone's income. This makes it very easy to account for the change in the purchasing power of the dollar (as measured by the CPI).

To project the distribution of family income we must first project the distribution of income between families and unrelated individuals. We will assume that when the total income increases the percentage increase in the income of unrelated individuals will equal the percentage increase in the income of families. The first things we need are the mean income per family and the mean income of unrelated individuals for each planning region. Census data (1) gives us the number of families in each income category by county. These should be added up by planning regions. The mean income per family (1959 dollars) can then be obtained by multiplying the number of families in each income class by the midpoint of the class and dividing the total by the number of families. The mean income of unrelated individuals is found by multiplying the median income for unrelated individuals by the number of unrelated individuals and summing up this for each region. Divide this figure by the number of unrelated individuals in the region to get the mean income of unrelated individuals (1959 dollars).

It will be necessary to introduce some symbols at this point:

---

1 The midpoint of the over $25,000 is assumed to be $50,000.
\[ \bar{X}_{F1} = \text{mean income of families in period one (1959)} \]
\[ \bar{X}_{F2} = \text{mean income of families in projected period} \]
\[ \bar{X}_{U1} = \text{mean income of unrelated individuals in period one} \]
\[ \bar{X}_{U2} = \text{mean income of unrelated individuals in projected period} \]
\[ F_1 = \# \text{families in period one} \]
\[ F_2 = \# \text{families in projected period} \]
\[ U_1 = \# \text{unrelated individuals in period one} \]
\[ U_2 = \# \text{unrelated individuals in projected period} \]
\[ Y_2 = \text{total income in projected period (1969 dollars)} \]
\[ P = \text{the proportionate change in t, mean income of families and unrelated individuals between period one and the projected period} \]

The assumption that the mean income of unrelated individuals will change by the same proportion as the mean income of families is stated as follows:

\[ \frac{\bar{X}_{F1}}{\bar{X}_{F2}} = \frac{\bar{X}_{U1}}{\bar{X}_{U2}} = P \]  \hspace{1cm} (1)

We also know that the total income must be equal to the following:

\[ Y_2 = \bar{X}_{F2} (F_2) + \bar{X}_{U2} (U_2) \]  \hspace{1cm} (2)

Solving for \( \bar{X}_{F2} \) and plugging into (2) we obtain:

\[ \bar{X}_{U2} = \frac{Y (\bar{X}_{U1})}{\bar{X}_{F1} (F_2) + \bar{X}_{U1} (U_2)} \]  \hspace{1cm} (3)

From (1) and (3) we can obtain \( \bar{X}_{F2} \) as:

\[ \bar{X}_{F2} = \frac{(\bar{X}_{F1}) (\bar{X}_{F2})}{\bar{X}_{U2}} \]  \hspace{1cm} (4)
From (4) we know the projected mean income for families and the relation between $\bar{X}_{F1}$ and $\bar{X}_{F2}$. $P = \frac{\bar{X}_{F2}}{\bar{X}_{F1}}$. With this result, our assumption about a constant distribution of income, and our assumption about families being distributed evenly within income classes, we can now proceed to find the new distribution of income (1969 dollars). If we in turn set the low end of each income class equal to $\bar{X}_{F2}$ and calculate $\frac{\bar{X}_{F2}}{P}$ we will find the minimum income that will move into that class.

For example if $P = 1.5$:

\[
\begin{align*}
\frac{1000}{1.5} &= 667 \\
\frac{2000}{1.5} &= 1333 \\
\frac{3000}{1.5} &= 2000 \\
\frac{4000}{1.5} &= 2667 \\
\end{align*}
\]

etc.

Adding our assumption that families are distributed evenly within classes we see that 1/3 of the 0-1,000 class will move into the 1-2,000 class. 2/3 of the 1-2,000 class will move into the 2-3,000 class. 2/3 of the 2-3,000 class will move into the 3-4,000 class and 1/3 of the 2-3,000 class will move into the 4-5,000 class, etc.

After this has been computed for all income classes they should be multiplied by the number of families in the projected period to obtain the new income distribution. These classes should then be collapsed.

\[^2\] The procedure for obtaining projections for the number of families appears elsewhere in the appendix.
to the broader classes we will use, i.e. $0-3,000, 3-5,000, 5-8,000, 8-10,000, 10-15,000, over 15,000. If the computations were done in these classes, instead of the finer classes and then collapsed, a substantial bias would creep in due to the effect of the assumption that families are distributed evenly within classes.

The end product of this process is a table showing the number of families in each income class (1969 dollars) by planning regions, for each period for which a projection is desired. These should then be converted to the proportion of families in each income class (1969 dollars) for each planning region, for each period. These proportions are to be entered in col. 20-34, deck 62.
References


Procedure for "Age of Head" Projections

To obtain the age of head distribution we will assume that the proportion of the population in each age class that is a head of household is the same for each region and therefore equal to the proportion for the state. From Census data (1) we have the number of families with the head <35, 35-44, 45-64, and 65 and over by type of family. These can be added to get the number in each age class for all types of families combined. Census data (2) also gives us the total population by age categories. We can now divide the number of families with head under 35 by the total population 15-34. We can divide the number of families with head 35-44 by the total population 35-44, etc. These proportions, when multiplied by the population projections in the appropriate age class for each region, give us the relative number of families with heads in each age class.

We want to convert these figures to proportions. If we divide in turn the number of families in each age class by the sum of the number of families in each age class we will have the desired result. These proportions are recorded in col. 35-37, 38-40, and 41-43, deck 62.
References


Procedure For "Family Size" Projections

The projections of family size will be made in a two step process. First, we will project household size distribution. Then, we will adjust these figures to get family size distribution.

The distribution of occupied housing units by the number of occupants on a county basis is available from the Census (1) for 1960 and will be available in 1970 from the 1970 Census first count tapes on a county basis. By adding the counties we can get the distribution for planning regions for these two dates. Project the trend linearly and this will give a projected distribution with an implied total population in households and a total number of households.

Now for each region we need to know the distribution of household size for those households without families so we can subtract this distribution from the above distribution and end up with the distribution of family size. We will assume that the distribution of households without families for each region is the same as the distribution for the state. This assumption appears to give more precise results than the assumption that the distribution of households without families for each region is the same as the distribution of households with families for the same region (after accounting for one member households, all of which are without families.) The distribution of household size for the state can be obtained by adding the distributions for counties found in the Census of Housing.1

1 The state tables in this series have been omitted. This may indicate there were some discrepancies in the data. Also note that for Table 15, owner occupied and renter occupied must be added together for those counties in SMSA's.
state in the Census of Population (2). Subtracting these two distributions gives us the state distribution of households without families. This should be converted to proportional distribution.

We know that all households with one person are without families. We can, therefore, improve our estimates of family size distribution for planning regions by eliminating all one person households instead of subtracting off a state average. We therefore compute a new state distribution of household size for only those households having more than one person. This is also converted to a proportional distribution.

For example, if the state distribution of households without families in percentages is as follows:

<table>
<thead>
<tr>
<th># persons</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 or more</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of households</td>
<td>.877</td>
<td>.009</td>
<td>.039</td>
<td>.025</td>
<td>.016</td>
<td>.016</td>
<td>.017</td>
<td>.999</td>
</tr>
</tbody>
</table>

Then the distribution of households without families of more than one person is as follows:

<table>
<thead>
<tr>
<th># persons</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 or more</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of households</td>
<td>.074</td>
<td>.320</td>
<td>.205</td>
<td>.131</td>
<td>.131</td>
<td>.139</td>
<td>1.00</td>
</tr>
</tbody>
</table>

To obtain the distribution of family size by planning region we must first subtract from the number of households in the region, the number of families, to obtain the number of households without families. We then subtract off the number of one member households to obtain the

---

2This is a very good approximation because there are very few households with more than one family. By Census definitions, all persons related to each other constitute one family, so that a husband and wife with daughter, her husband, and child living together constitute one family. Two families occur in one household only when no member of one family is related to any member in the other.
number of households without families with more than one member. This figure is then multiplied in turn by the proportions in the distribution of household size for households of more than one member, without families (Table 2). The distribution that results is subtracted from the distribution of household size for the region (with the one member households dropped). This distribution is the distribution of families by number of persons. This distribution should then be converted to proportions. These proportions are then combined appropriately to fit the categories in col. 44-52, deck 62, and are entered in those columns.
References


Procedure for "Unrelated Individuals In Households" Projections

We must first set our terminology straight. In Census terminology an "unrelated individual" "is a member of a household who is not related to anyone else in the household or is a person living in group quarters who is not an inmate of an institution." (1) We are interested only in those in the first category, i.e., those who are members of a household and who are not related to anyone else in the household, and we will call them "unrelated individuals in households."

The category "unrelated individuals" is not available from the 1970 first count tapes so we will have to build it from its components. We will make our projection of "unrelated individuals in households" by first projecting "unrelated individuals in households" plus "members of secondary families" and then adjusting that projection to remove the bias caused by including "members of secondary families."

We will need several items computed for each planning region. From the 1960 Census (2) we need the sum of "primary individuals" and "nonrelative of head." This equals the number of "unrelated individuals in households" plus "members of secondary families." We also need "others in group quarters" for each planning region. From Table 82, we need "unrelated individuals" for each planning region.

From the 1970 first count tapes we need the sum of "male primary individuals," "female primary individuals," and "nonrelative of head." This figure is the number of "unrelated individuals in households" and "members of secondary families," and is comparable to the 1960 figure. We can now make a linear trend extrapolation of it.
Now we need the correction factor to remove the bias from including "members of secondary families." We first need the 1960 "members of secondary families." This is obtained by subtracting "unrelated individuals" from the sum of "primary individuals," "nonrelative of head," and "other in group quarters." The correction factor is obtained by dividing "unrelated individuals in households" by the sum of "members of secondary families" and "unrelated individuals in households" for each region. This factor when multiplied by the projection of "unrelated individuals in households" and "members of secondary families" results in a projection of "unrelated individuals in households." This number goes in col. 53-58, deck 62.
References


Flow Chart for Non-Summer Activity Estimates

We want to estimate the number of people days of each non-summer activity for each origin region. The necessary data comes mainly from work deck 51. All columns referred to are from deck 51 unless specified otherwise.

We can use ANF (I,K,N) (Activity, non-summer, families) and ANU (I,K,N) (activity, non-summer, unrelated individuals) for the number of man-days of a non-summer activity for family members and unrelated individuals respectively. The subscripts I, K, N will be used for activity, age class, and region respectively. Where:

Activity I = 1, 2, . . . , 7
1. horseback riding
2. snow skiing
3. snowmobiling
4. target shooting (bow)
5. target shooting (rifle or pistol)
6. shooting trap or skeet
7. hunting

Age group K = 1, 2
1. people 12 and over
2. people under 12

Origin N = 1, 2, . . . , 8
1. Region one
2. Region two
3. etc. etc.
4. Region eight

We obtain the ANF (I,K,N) and ANU (I,K,N) from work deck 51. If col. 45 = 0 we have ANF (I,K,N) and if col. 45 = 1 we have ANU (I,K,N).

The value of N is:

1. if col. 14-16 = 0
2. if col. 14-16 = 0
3. if col. 14-16 = 0
4. if col. 14-16 = 0
5. if col. 14-16 = 0
6. if col. 14-16 = 0
7. if col. 14-16 = 0
8. if col. 14-16 = 0

Regions will be defined later because of possible changes.
The value of ANF and ANU come from the following columns:

\[
\begin{align*}
\text{AN} (1,1,N) &= \text{col. } 17-18 \\
\text{AN} (1,2,N) &= \text{col. } 19-20 \\
\text{AN} (2,1,N) &= \text{col. } 21-22 \\
\text{AN} (2,2,N) &= \text{col. } 23-24 \\
\text{AN} (3,1,N) &= \text{col. } 25-26 \\
\text{AN} (3,2,N) &= \text{col. } 27-28 \\
\text{AN} (4,1,N) &= \text{col. } 29-30 \\
\text{AN} (4,2,N) &= \text{col. } 31-32 \\
\text{AN} (5,1,N) &= \text{col. } 33-34 \\
\text{AN} (5,2,N) &= \text{col. } 35-36 \\
\text{AN} (6,1,N) &= \text{col. } 37-38 \\
\text{AN} (6,2,N) &= \text{col. } 39-40 \\
\text{AN} (7,1,N) &= \text{col. } 41-42 \\
\text{AN} (7,2,N) &= \text{col. } 43-44
\end{align*}
\]

We read through deck 51 summing up the ANF and ANU.

We also need a count of the number of families sampled in each region, F(N), and a count of the number of unrelated individuals sampled in each region, U(N). This is just a count of the number of records for which col. 45 = 0 and the number of records for which col. 45 = 1, respectively.

After we obtain the ANF (I,K,N) and ANU (I,K,N) we want to compute the estimated totals, ANFTOT (I,K,N) and ANUTOT (I,K,N). We do this by multiplying the ANF (I,K,N) times col. 11-16, deck 62 for col. 10, deck 62 = N and col. 59-60, deck 62 = 70 times 1/F(N) i.e.

\[
\text{ANFTOT (I,K,N)} = \text{ANF (I,K,N) } \times \text{ col. } 11-16, \text{ deck } 62
\]

(for col. 10, deck 62 = N and col. 59-60, deck 62 = 70) /F(N)

and:

\[
\text{ANUTOT (I,K,N)} = \text{ANU (I,K,N) } \times \text{ col. } 53-58, \text{ deck } 62
\]

(for col. 10, deck 62 = N and col. 59-60, deck 62 = 70) /U(N)
We can now add ANFTOT (I, K, N) and ANUTOT (I, K, N) to obtain ANCOTO (I, K, N) (activity, non-summer, grand total). This is the number of people days, activity I, age group K, origin N.
Flow Chart for Non-Summer Activity Projections

We want to do a regression of the number of people days for family members 12 and over and for family members under 12 for each non-summer activity. All independent variables will be entered as dummy variables. The value for each variable will be one if the respondent falls in that category and zero if the respondent does not fall in that category.

Columns referred to are deck 51 unless stated otherwise. The independent variables are defined as follows:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1</td>
<td>Family from region 1 = 1 if col. 14-16 = ( )</td>
</tr>
<tr>
<td>X2</td>
<td>Family from region 2 = 1 if col. 14-16 = ( )</td>
</tr>
<tr>
<td>X3</td>
<td>Family from region 3 = 1 if col. 14-16 = ( )</td>
</tr>
<tr>
<td>X4</td>
<td>Family from region 4 = 1 if col. 14-16 = ( )</td>
</tr>
<tr>
<td>X5</td>
<td>Family from region 5 = 1 if col. 14-16 = ( )</td>
</tr>
<tr>
<td>X6</td>
<td>Family from region 6 = 1 if col. 14-16 = ( )</td>
</tr>
<tr>
<td>X7</td>
<td>Family from region 7 = 1 if col. 14-16 = ( )</td>
</tr>
<tr>
<td>X8</td>
<td>Husband-wife head = 1 if col. 10 = 1</td>
</tr>
<tr>
<td>X9</td>
<td>Family income 3-$5,000 = 1 if col. 13 = 2</td>
</tr>
<tr>
<td>X10</td>
<td>Family income 5-$8,000 = 1 if col. 13 = 3</td>
</tr>
<tr>
<td>X11</td>
<td>Family income 8-$10,000 = 1 if col. 13 = 4</td>
</tr>
<tr>
<td>X12</td>
<td>Family income 10-$15,000 = 1 if col. 13 = 5</td>
</tr>
<tr>
<td>X13</td>
<td>Family income &gt; $15,000 = 1 if col. 13 = 6</td>
</tr>
<tr>
<td>X14</td>
<td>Head under 35 = 1 if col. 11 = 1</td>
</tr>
<tr>
<td>X15</td>
<td>Head 35-44 = 1 if col. 11 = 2</td>
</tr>
<tr>
<td>X16</td>
<td>Head 45-64 = 1 if col. 11 = 3</td>
</tr>
<tr>
<td>X17</td>
<td>Family with 3-4 members = 1 if col. 12 = 2</td>
</tr>
<tr>
<td>X18</td>
<td>Family with 5-6 members = 1 if col. 12 = 3</td>
</tr>
<tr>
<td>X19</td>
<td>Family with 7 or more members = 1 if col. 12 = 4</td>
</tr>
</tbody>
</table>

There are 14 dependent variables (seven activities times two age groups). Dependent variables are YNF (I,K) where

Activity I = 1, 2, . . . , 7

1. horseback riding
2. snow skiing
3. snowmobiling
4. target shooting (bow)
5. target shooting (rifle or pistol)

1Regions will be defined later due to possible changes.
For these regressions use only those records for which col. 45 = 0.

We will compute projections using the results of these regressions.

The model is:

\[ YNF(I, K, N) = \beta_0 (I, J) + \beta_1 (I, K) X_1 + \beta_2 (I, K) X_2 + \ldots + \beta_{19}(I, K) X_{19} \]

Where N refers to the region. To compute the projected YNF (I, K, N) we multiply the \( \beta \) coefficients found in the regressions by the proportion of the population in each independent variable category region by region.

\[ YNF(I, K, N) = \beta_0 (I, K) + \beta_N(I, K) + \beta_8 (I, K) \times \text{col. 17-19, deck 62} \]
\[ + \beta_9 (I, K) \times \text{col. 20-22, deck 62} + \beta_10 (I, K) \times \text{col. 23-25, deck 62} \]
\[ + \beta_11 (I, K) \times \text{col. 26-28, deck 62} + \beta_12 (I, K) \times \text{col. 29-31, deck 62} \]
\[ + \beta_13 (I, K) \times \text{col. 32-34, deck 62} + \beta_14 (I, K) \times \text{col. 35-37, deck 62} \]
\[ + \beta_15 (I, K) \times \text{col. 38-40, deck 62} + \beta_16 (I, K) \times \text{col. 41-43, deck 62} \]
\[ + \beta_17 (I, K) \times \text{col. 44-46, deck 62} + \beta_18 (I, K) \times \text{col. 47-49, deck 62} \]
\[ + \beta_19 (I, K) \times \text{col. 50-52, deck 62} \]

Where: \( N = \text{col. 10, deck 62} \)

\[ YNFTOT(I, K, N) = YNF(I, K, N) \times \text{col. 11-16, deck 62} \]
\[ N = \text{col. 10, deck 62} \]

\[ YNUTOT(I, K, N) = ANU(I, K, N) / U(N) \times \text{col. 53-58, deck 62} \]
\[ N = \text{col. 10, deck 62} \]

NOTE: ANU(I, K, N) and U(N) are from results of "Non-Summer Activity Estimates."
YNCTOT (I,K,N) = YNFTOT (I,K,N) + YNUTOT (I,K,N)

YNCTOT (I,K,N) is the projected grand total number of man-days for non-summer activity I, age group K, and region N for residents of Wisconsin.

If the projections for 1980 and 1990 are run at the same time, an additional subscript may be needed to denote that. Col. 59-60, deck 62 indicates the year.

We should also make a 1970 estimate using the cross-section model. This would be our "best" estimate for 1970.
Flow Chart for Distribution Pattern

It is necessary to determine for each origin region 180 distribution patterns. Each distribution pattern will have nine destinations: the eight identical to the origin regions plus one for all areas outside Wisconsin. The 180 distributions are required because of the splits required on activities, trip type, age group, and days. The subscripts will be as follows:

Activity $I = 1, 2, \ldots, 15$
1. Sightseeing or pleasure driving
2. Picnicking
3. Swimming
4. Camping
5. Camping in a remote area
6. Golfing
7. Hiking less than 4 hours
8. Hiking 4 hours or more
9. Bicycling 2 hours or more
10. Canoeing
11. Motorboating
12. Water skiing
13. Fishing
14. Nature study
15. Driving or riding an off-the-road vehicle

Trip type $J = 1, 2, 3$
1. Day trip
2. 2-4 day trip
3. 5 or more day trip

Age group $K = 1, 2$
1. 12 and over
2. Under 12

Day $M = 1, 2$
1. Saturday
2. Sunday

Origin $N = 1, 2, \ldots, 8$
1. Region one
2. Region two
e tc. etc.
8. Region eight

Destination $N_l = 1, 2, \ldots, 9$
1. Region one
2. Region two
e tc. etc.
To obtain the distribution pattern we first need to compute the 
\( D(I, J, K, M, N, N_1) \), where \( D \) is the total number of people days of activity 
\( I \), trip type \( J \), age group \( K \), day \( M \), origin \( N \), destination \( N_1 \). This 
involves 12,960 cells. Many of these cells will be, of course, zero. 
Four digits should be adequate for the "biggest" cell. Allowing 4.0 for 
each cell will require storage for a total of 51,840 digits. If machine 
capacity is limiting this could be done for one origin at a time which 
would require only 1/8 as much storage.

The \( D(I, J, K, M, N, N_1) \) will be computed from work deck 60. All columns 
referred to are from deck 60 unless specified otherwise. Deck 60 has 
one record for each trip day. We need to read each record and put the 
number of people days into the appropriate categories. We will continue 
through the deck accumulating in those categories so we will end up with 
the totals in the \( D(I, J, K, M, N, N_1) \) categories.

\[
\begin{align*}
I & = \text{col. 20-21, 24-25, 28-29, 32-33, 36-37, 40-41, 44-45} \\
J & = \text{col. 19} \\
D(I, J, 1, M, N, N_1) & = \text{col. 22, 26, 30, 34, 38, 42, 46} \\
D(I, J, 2, M, N, N_1) & = \text{col. 23, 27, 31, 35, 39, 43, 47} \\
M & = \text{col. 18} \\
N & = 1. \text{ if col. 10-12 = ( }^1 \\
   & = 2. \text{ if col. 10-12 = ( } \\
   & \vdots \\
   & = 8. \text{ if col. 10-12 = ( } \\
\end{align*}
\]

\(^1\) Regions will be defined later due to possible changes.
\[ N_1 = 1. \text{ if col. 13-14} = 48 \text{ and col. 15-17} = ( ) \]
\[ = 2. \text{ if col. 13-14} = 48 \text{ and col. 15-17} = ( ) \]
\[ \vdots \]
\[ = 8. \text{ if col. 13-14} = 48 \text{ and col. 15-17} = ( ) \]
\[ = 9. \text{ if col. 13-14} \neq 48 \]

After the \( D(I,J,K,M,N,N_1) \) have been calculated we want to convert them to distribution patterns that show what proportion of the \( D(I,J,K,M,N,N_1) \) from each origin \( (N = 1, 2, \ldots, 8) \) go to each destination \( (N_1 = 1, 2, \ldots, 9) \). For each origin we will have \( 15 \times 3 \times 2 \times 2 \) distribution patterns. Each pattern will consist of nine proportions which sum to 1.000. These proportions are the proportions of the total number of people days, activity I, trip type J, age group K, day M that go from that origin to the nine destinations. Proportions should be to at least 3 decimal places. These proportions will be named \( P(I,J,K,M,N,N_1) \). As stated earlier \[ \sum_{N_1=1}^{9} P(I,J,K,M,N,N_1) = 1.000. \] There will be the same number of \( P(I,J,K,M,N,N_1) \) as there are \( D(I,J,K,M,N,N_1) \).
Flow Chart for Summer Activity Estimates

We want to estimate the number of people days (split by activity, age, etc.) for destination regions. This is done most easily by estimating for origin regions and then distributing them by the estimated distribution pattern. This is equivalent to directly summing up activities for destination areas. It will be easier because it follows the format that will have to be used for projections anyway.

Our first step is to sum up man-days by activity, trip type, age group, day, and origin region. The subscripts are defined as follows:

**Activity** I = 1, 2, . . . , 15

1. Sightseeing or pleasure driving
2. Picnicking
3. Swimming
4. Camping
5. Camping in a remote area
6. Golfing
7. Hiking less than 4 hours
8. Hiking 4 hours or more
9. Bicycling 2 hours or more
10. Canoeing
11. Motorboating
12. Water skiing
13. Fishing
14. Nature study
15. Driving or riding in an off-the-road vehicle

**Trip type** J = 1, 2, 3

1. Day trip
2. 2-4 day trip
3. 5 or more day trip

**Age group** K = 1, 2

1. 12 and over
2. Under 12

**Day** M = 1, 2

1. Saturday
2. Sunday

**Origin** N = 1, 2, . . . , 8

1. Region one
2. Region two
   etc. etc.
3. Region eight
We obtain the $\text{ASF}(I,J,K,M,N)$ and $\text{ASU}(I,J,K,M,N)$ from work decks 52-59. All columns referred to are from decks 52-59 unless specified otherwise. If col. 65 = 0 we have ASF and if col. 65 = 1 we have ASU. Since day trips are for the past two weekends and overnight trips are for the past four weekends we must convert them to a common basis. We will convert them to a per day basis. We do this by multiplying each entry for $J = 1$ by $\frac{1}{2}$ and each entry for $J = 2$ or 3 by $\frac{1}{4}$ before summing them up. It of course would give equivalent results to multiply the sums for $J = 1$ by $\frac{1}{2}$ and for $J = 2$ or 3 by $\frac{1}{4}$. The important point is that ASF and ASU refer to people days per day and not per two or four weekends. From decks 52-59 we want to read col. 65 to determine if we have ASF or ASU.

\[
\begin{align*}
\text{AS}_-(I,1,1,1,N) & = \text{col. } 17-18 & I = 1 \text{ if deck } = 52 \\
\text{AS}_-(I,1,1,2,N) & = \text{col. } 19-20 & 3 \text{ if deck } = 53 \\
\text{AS}_-(I,1,2,1,N) & = \text{col. } 21-22 & \text{etc.} \\
\text{AS}_-(I,1,2,2,N) & = \text{col. } 23-24 & \text{etc.} \\
\text{AS}_-(I,2,1,1,N) & = \text{col. } 25-26 \\
\text{AS}_-(I,2,1,2,N) & = \text{col. } 27-28 & N = 1 \text{ if } \text{col. } 14-16 = ( )^1 \\
\text{AS}_-(I,2,2,1,N) & = \text{col. } 29-30 & 2 \text{ if } \text{col. } 14-16 = ( ) \\
\text{AS}_-(I,2,2,2,N) & = \text{col. } 31-32 & \text{etc.} \\
\text{AS}_-(I,3,1,1,N) & = \text{col. } 33-34 & \text{etc.} \\
\text{AS}_-(I,3,1,2,N) & = \text{col. } 35-36 & 8 \text{ if } \text{col. } 14-16 = ( ) \\
\text{AS}_-(I,3,2,1,N) & = \text{col. } 37-38 & \text{I = 2 if deck = 52} \\
\text{AS}_-(I,3,2,2,N) & = \text{col. } 39-40 & 4 \text{ if deck = 53} \\
\text{AS}_-(I,1,1,1,N) & = \text{col. } 41-42 & \text{etc.} \\
\text{AS}_-(I,1,1,2,N) & = \text{col. } 43-44 & \text{etc.} \\
\text{AS}_-(I,1,2,1,N) & = \text{col. } 45-46 & 14 \text{ if deck = 58} \\
\text{AS}_-(I,1,2,2,N) & = \text{col. } 47-48 & \text{none if deck = 59} \\
\text{AS}_-(I,2,1,1,N) & = \text{col. } 49-50 & \text{N = 1 if } \text{col. } 14-16 = ( ) \\
\text{AS}_-(I,2,1,2,N) & = \text{col. } 51-52 & 2 \text{ if } \text{col. } 14-16 = ( ) \\
\text{AS}_-(I,2,2,1,N) & = \text{col. } 53-54 & \text{etc.} \\
\text{AS}_-(I,2,2,2,N) & = \text{col. } 55-56 & \text{etc.} \\
\text{AS}_-(I,3,1,1,N) & = \text{col. } 57-58 & 8 \text{ if } \text{col. } 14-16 = ( ) \\
\text{AS}_-(I,3,1,2,N) & = \text{col. } 59-60 & \text{etc.} \\
\text{AS}_-(I,3,2,1,N) & = \text{col. } 61-62 \\
\text{AS}_-(I,3,2,2,N) & = \text{col. } 63-64
\end{align*}
\]

\footnote{Regions will be defined later because of possible changes.}
We read through decks 52-59 and sum up the ASF and ASU, keeping in mind that when summed up the ASF and ASU refer to people days per day and not per two or four weekends.

We need to determine the number of families and the number of unrelated individuals that these sums represent in each region, $F(N)$ and $U(N)$ respectively. This is just a count of the number of records for which col. 65 = 0 and the number of records for which col. 65 = 1 respectively.

We want to compute the estimated totals for the ASFTOT $I,J,K,M,N$ and ASUTOT $I,J,K,M,N$. We do this by multiplying the ASF $I,J,K,M,N$ times col. 11-16, deck 62 (for col. 10, deck 62 = N and col. 59-60, deck 62 = 70) times $1/F(N)$ i.e.

$$ASFTOT (I,J,K,M,N) = ASF(I,J,K,M,N) \times \text{col. 11-16, deck 62}$$

(for col. 10, deck 62 = N and col. 59-60, deck 62 = 70) $/ F(N)$

And:

$$ASUTOT (I,J,K,M,N) = ASU (I,J,K,M,N) \times \text{col. 53-58, deck 62}$$

(for col. 10, deck 62 = N and col. 59-60, deck 62 = 70) $/ U(N)$

We can now add ASFTOT $I,J,K,M,N$ to ASUTOT $I,J,K,M,N$ to obtain ASGTOT $I,J,K,M,N$ (activity, summer, grand total) for each origin region.

To obtain ASGTOT $I,J,K,M,N,L$ i.e. for destination regions instead of origin regions we need to multiply the ASGTOT $I,J,K,M,N$ by the appropriate distribution pattern. We want to multiply ASGTOT $I,J,K,M,N$ by $P(I,J,K,M,N,L)$. We will multiply each element in ASGTOT $I,J,K,M,N$ by nine numbers, i.e. the $P(I,J,K,M,N,L)$ for $I = I$, $J = J$, $K = K$, $M = M$, $N = N$, and $L = 1, 2, \ldots, 9$. These multiplications result in ASGTOT $I,J,K,M,N,L$. We want to sum up the ASGTOT $I,J,K,M,N,L$ over $K$
and N to obtain ASGIOT (I,K,M,Nl), i.e. the number of man-days, activity I, age group K, day M, and destination region Nl.
Flow Chart for Summer Activity Projections

We want to do a regression of the number of people days for family members split by age group, type of trip, and day of weekend for each activity. This results in 12 regressions for each of 15 activities or 180 regressions in all. All independent variables will be entered as dummy variables. The value for each variable will be one if the respondent falls in that category and zero if the respondent does not fall in that category. Columns referred to are from decks 52-59 unless specified otherwise. The independent variables are defined as follows:

- $X_1$: Family from region 1 = 1 if col. 14-16
- $X_2$: Family from region 2 = 1 if col. 14-16
- $X_3$: Family from region 3 = 1 if col. 14-16
- $X_4$: Family from region 4 = 1 if col. 14-16
- $X_5$: Family from region 5 = 1 if col. 14-16
- $X_6$: Family from region 6 = 1 if col. 14-16
- $X_7$: Family from region 7 = 1 if col. 14-16
- $X_8$: Husband-wife head = 1 if col. 10
- $X_9$: Family income 3-$5,000 = 1 if col. 13
- $X_{10}$: Family income 5-$8,000 = 1 if col. 13
- $X_{11}$: Family income 8-$10,000 = 1 if col. 13
- $X_{12}$: Family income 10-$15,000 = 1 if col. 13
- $X_{13}$: Family income > $15,000 = 1 if col. 13
- $X_{14}$: Head under 35 = 1 if col. 11
- $X_{15}$: Head 35-44 = 1 if col. 11
- $X_{16}$: Head 45-64 = 1 if col. 11
- $X_{17}$: Family with 3-4 members = 1 if col. 12
- $X_{18}$: Family with 5-6 members = 1 if col. 12
- $X_{19}$: Family with 7 or more members = 1 if col. 12

There are 180 dependent variables (15 activities times 3 trip types times 2 age groups times 2 day categories). Dependent variables are YSF (I,J,K,M).

Activity $I = 1, 2, \ldots, 15$

1. Sightseeing or pleasure driving
2. Picnicking

Regions will be defined later due to possible changes.
3. Swimming
4. Camping
5. Camping in a remote area
6. Golfing
7. Hiking less than 4 hours
8. Hiking 4 hours or more
9. Bicycling 2 hours or more
10. Canoeing
11. Motorboating
12. Water skiing
13. Fishing
14. Nature study
15. Driving or riding in an off-the-road vehicle

Trip type $J = 1, 2, 3$
1. Day trip
2. 2-4 day trip
3. 5 or more day trip

Age group $K = 1, 2$
1. People 12 and over
2. People under 12

Day $M = 1, 2$
1. Saturday
2. Sunday

For these 180 regressions use only those records for which col. 65 = 0. The values for the dependent variables come from col. 17-64, deck 52-59. However, since the day trips are for the past two weekends and the overnight trips are for the past four weekends we need to convert them to a common basis. We will convert them to a per day before entering them in the regressions. That means that when $J = 1$ we multiply the value of the dependent variables by $\frac{1}{2}$ before entering it. When $J = 2$ or 3 we multiply by $\frac{1}{2}$ before entering it. This means that the B's that we obtain from the regressions will be for YSF and YSU on a per day basis.

We will compute projections using the results of these regressions.

The model is:
YSF \((I,J,K,M,N)\) = \(\beta_0 (I,J,K,M) + \beta_1 (I,J,K,M)X_1 + \beta_2 (I,J,K,M)\)
\[+ \ldots + \beta_{19} (I,J,K,M)X_{19}\]

where \(N\) refers to the region. To compute the projected YSF \((I,J,K,M,N)\), we multiply the \(\beta\) coefficients found in the regressions by the proportion of the population in each independent variable category region by region.

\[\text{YST} (I,J,K,M,N) = \left[ \beta_0 (I,J,K,M,N) + \beta_N + \beta_8 (I,J,K,M,N) \right] \times \text{col. } 17-19, \text{ deck } 62 + \beta_9 (I,J,K,M,N) \times \text{col. } 20-22, \text{ deck } 62 + \ldots \ldots \text{ (same as non-summer activity projections)} \]
\[\ldots + \beta_{19} (I,J,K,M,N) \times \text{col. } 50-52, \text{ deck } 62 \]
\[1/4 \text{ or } 1/3\]

where: \(N = \text{col. } 10, \text{ deck } 62\)

\[\text{YSFTOT} (I,J,K,M,N) = \text{YSF} (I,J,K,M,N) \times \text{col. } 11-16, \text{ deck } 62\]

where: \(N = \text{col. } 10, \text{ deck } 62\)

\[\text{YSUTOT} (I,J,K,M,N) = \text{ASU} (I,J,K,M,N) / U(N) \times \text{col. } 53-58, \text{ deck } 62\]

where: \(N = \text{col. } 10, \text{ deck } 62\)

\[\text{NOE: ASU} (I,J,K,M,N) \text{ and } U(N) \text{ are from results of } \]
"Summer Activity Estimates."

\[\text{YSGTOT} (I,J,K,M,N) = \text{YSFTOT} (I,J,K,M,N) + \text{YSUTOT} (I,J,K,M,N)\]

YSGTOT \((I,J,K,M,N)\) is the grand total number of man-days for summer activity \(I\), trip type \(J\), age group \(K\), day \(M\), from origin \(N\).

The next step is to convert these to destination regions. We obtain YSGTOT \((I,J,K,M,N_1)\) by multiplying the YSGTOT \((I,J,K,M,N)\) by the appropriate distribution pattern. We want to multiply YSGTOT \((I,J,K,M,N)\) by \(P(I,J,K,M,N,N_1)\). We will multiply each element in ASGTOT \((I,J,K,M,N)\) by nine numbers, i.e., the \(P(I,J,K,M,N_1)\) for \(I = I, J = J,\)
K = K, M = M, N = N, and N1 = 1, 2, . . . , 9. These multiplications result in YSGTOT (I,J,K,M,N,N1). We want to sum up the YSGTOT (I,J,K,M,N,N1) over K and N to obtain YSGTOT (I,K,M,N1), i.e., the number of man-days, activity I, age group K, day M, and destination region N1.

If projection for 1980 and 1990 are done simultaneously, an additional subscript may be needed to denote that. The 1980 projections are obtained by using the eight cards from deck 62 for which col. 59-60 = 80. The 1990 projections are obtained by using the eight cards from deck 62 for which col. 59-60 = 90.

We should also make a 1970 estimate using the cross-section model. This would be our "best" estimate for 1970.
Flow Chart for Estimates of Reliability

Non-Summer Activities

A replicated sampling design has been used to enable us to obtain estimates of the reliability of our estimated number of people-days. We will not make any estimates of the reliability of projections. When we input all of work deck 51 into the "Non-Summer Activity Estimates Program" and the "Non-Summer Activity Projections Program" we obtain the YNGTOT. The YNGTOT for 1970 is our best estimate for 1970 man-days for each activity. We could, however, sort deck 51 into 10 groups according to the digit in col. 46, deck 51. If we then run each of these smaller decks through the above programs using 1970 data from deck 62 we will have 10 independent estimates of the true YNGTOT (I,K,N). We can input these 10 estimates into any statistical package that will give us the variance of a random sample of size 10. We want outputted a 95% confidence interval for each of the YNGTOT (I,K,N). This should be in the form

$$P_{c}\left[\bar{X} - 1.96S\bar{x} < \mu < \bar{X} + 1.96S\bar{x}\right] = .95$$

Summer Activities

We can do a similar procedure for summer activities. For summer activities we need to sort decks 52-59 into ten groups according to the digit in col. 66, deck 52-59. We also need to sort deck 60 into 10 groups according to the digit in col. 50, deck 60. We then run each of these "minidecks" in turn through the "Distribution Pattern Program," the "Summer Activity Estimates Program," and the "Summer Activity Projections Program." This results in 10 estimates for the YSGTOT (I,K,M,NL). These 10 estimates for each YSGTOT (I,K,M,NL) are then inputted into the same
statistical package as for non-summer activities. We want outputted here a 95% confidence interval for each of the \( YSGTOT (I,K,M,N1) \) in the same form as for non-summer activities.

NOTE: When programming for the distribution pattern, allow for the possibility that some \( ASGTOT (I,J,K,M,N) \) may be zero. If no allowance for this is made you may divide zero by zero and blow the program. When the decks have been split into 10 groups it is almost certain that some \( ASGTOT (I,J,K,M,N) \) will be zero.
Flow Chart for Distance Travelled Distribution

We want to print out the total number of trips in each of three types. For each type we want to print out the proportion of trips that were of various distances. All columns referred to are from work deck 61 unless specified otherwise.

The distance categories for trip type one (col. 10 = 1) are 00-01, 02-03, 04-05, 06-07, 08-09, 10-11, 12-13, 14-98. Count the trip in one of these categories when col. 10 = 1, col. 11 = 1 and col. 12-13 = the indicated categories.

The distance categories for trip type two (col. 10 = 2) are 00-01, 02-03, 04-05, 06-07, 08-09, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, 40-98. Count the trip in one of these categories when col. 10 = 2, col. 11 = 1, and col. 12-13 = the indicated category.

The distance categories for trip type three (col. 10 = 3) are 00-04, 05-09, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, 40-49, 50-59, 60-69, 70-79, 80-98. Count the trip in one of these categories when col. 10 = 3, col. 11 = 1, and col. 12-13 = the indicated category.

For each trip type we want to compute the proportion of trips that fell in each of the distance categories. This is obtained by dividing the number of trips in a given distance category by the total number of trips of that type.