PROCEEDINGS

1980 National Outdoor Recreation Trends Symposium

Volume II

U.S. Department of Agriculture, Forest Service
Northeastern Forest Experiment Station
370 Reed Road, Broomall, PA 19008

Sponsored by:

Northeast Agricultural Experiment Stations, NE-100

USDA Forest Service

USDI Heritage Conservation and Recreation Service

Recreation Working Group, Society of American Foresters

University of New Hampshire, Recreation and Parks Program

In cooperation with:

Clemson University

Journal of Leisure Research

Purdue University

USDA, Forest Service General Technical Report NE—57

FOREWORD

Volume II of these proceedings contains a wide selection of papers presented at the 1980 Outdoor Recreation Trends Symposium. It includes, in addition to papers not available for Volume I, those papers presented during the keynote session, concurrent sessions, evening sessions, and the closing session. Concurrent session papers are clustered around four topics: Trend Measurement Methodologies; Trend Data for Recreation Planning; Industry Sources of Trend Data; and Applied Trend Research.

The closing-session papers provide considerable food for thought about future directions in outdoor recreation trend research. These two papers provide a balance between the need for trend measurement for professional purposes and in the limitations of trend measurement as a means for monitoring social change.

Throughout these proceedings it has been our purpose to promote, provoke, stimulate and, we hope, encourage the establishment of new and better data systems to monitor activity effectively in all sectors of outdoor recreation. We took this approach knowing there are certain inherent risks; not having an abundance of reliable trend indicators is often a politically expedient way of conducting the public's business in outdoor recreation. During an evening session in the course of the symposium, a small group of participants chose to speculate on just what some of the risks might be if we were suddenly faced with a world where all of the necessary trend measurement systems were in place. The consensus was that a number of undesirable reactions could be readily predicted: rejection—or challenging the data because of inconsistencies and a lack of representivity; procrastination--a paralysis of programs while decision makers await the latest in a series of data; prostitution--the use of data to justify more public programs rather than use it for better planning; sanctification--the establishment and growth of specialized elite decision makers to monitor an increasing array of potentially relevant phenomena; and routinization--the complete reliance on data resulting in the disappearance of a risk-taking attitude on the part of those who are paid to make difficult decisions.

The positive aspects, we firmly believe, of better data, better planning, and better decisions easily outweigh all of these risks. But the risks are there, and as we move inevitably in the direction of greater government accountability, we need to be constantly alert to their emergence.

WILBUR F. LaPAGE, Chairman
Program Committee

THE 1980 NATIONAL

OUTDOOR RECREATION TRENDS SYMPOSIUM

Held at the New England Center for Continuing Education
University of New Hampshire
Durham, New Hampshire
April 20-23, 1980

SPONSORED BY

Northeast Agricultural Experiment Stations, Project NE-100

USDA Forest Service, Northeastern Forest Experiment Station

USDI, Heritage Conservation and Recreation Service

Society of American Foresters, Recreation Working Group

University of New Hampshire, Recreation and Parks Program

PROGRAM COMMITTEE --

Wilbur F. LaPage
Malcolm I. Bevins
Robert D. Greenleaf
Floyd L. Newby
Gerald L. Cole
A. Robert Koch
Herbert E. Echelberger
Douglas M. Knudson

CONCURRENT SESSIONS --

Floyd L. Newby
Herbert E. Echelberger
Douglas M. Knudson
Kenneth J. Hock
Marvin W. Kottke
Mahmood Seyala

ADVISORS --

R. Duane Lloyd
Earl Patric
Basil J. F. Mott
Roland Robinson
Meg Maguire
Robert McLellan
Barry Tindall
Hugo John
Fred Knight

LOCAL ARRANGEMENTS --

Robert D. Greenleaf
Herbert E. Echelberger
Gus C. Zaso
Lawrence A. Rondeau
Patricia C. Merrill

COOPERATORS

Clemson University, Department of Recreation and Park Administration

Journal of Leisure Research, NRPA

Purdue University, Department of Forestry and Natural Resources

CONTENTS

A METHODOLOGY FOR THE SYSTEMATIC COLLECTION, STORAGE, AND RETRIEVAL OF TREND DATA FOR THE U.S. ARMY ENGINEERS RECREATION PROGRAM[1]

Dennis B. Propst, Outdoor Recreation Planner[2]
U.S. Army Engineers
Waterways Experiment Station
P. O. Box 631
Vicksburg, MS

Robert V. Abbey, Outdoor Recreation Planner
U.S. Army Engineers
Waterways Experiment Station
P. O. Box 631
Vicksburg, MS

INTRODUCTION

In 1979, over 450 million recreation days[3] of use were reported at 419 Corps of Engineers lakes and other project areas. This figure represents a 2.7 percent increase in use over 1977 (424 million recreation days). The Corps and other agencies (quasi-public, state, local and other federal agencies) manage 3,175 recreation areas on a total of 11.2 million acres of land and water. The Corps manages 2,229 (70 percent) of the recreation areas and has the responsibility for managing more than 44,000 developed campsites. Other agencies, excluding concessionaires, manage 946 recreation areas with 28,000 developed campsites.

The tremendous use of such a large and diverse recreation resource has led to resource deterioration, social conflicts, and inadequate manpower in some areas. As a result, Corps managers and planners need information concerning resource carrying capacities and user preferences for various facilities and activities. Recreation behavior, however, is not a static phenomenon. Thus, managers and planners also need to be able to observe trends in recreation preferences and behavior patterns over time. This paper describes current and proposed information systems developed to assist Corps personnel in monitoring such trends.

CORPS OF ENGINEERS INFORMATION SYSTEMS

Figure 1 represents the functional relationships among the various information sources and systems that influence the Corps-wide recreation programs. The arrows denote directions of information flow. Figure 1 represents the conceptualization upon which this paper was based. Thus, further discussion will focus on each of the elements of this figure. Actual data will be presented where appropriate to exemplify the types of recreation trend information being monitored.

CORPS-WIDE RECREATION PROGRAM

The Corps-wide recreation program includes all elements ranging from the individual projects and OCE are two more administrative layers, the Districts and the Divisions. There are 10 Divisions in the contigious 48 states with several Districts in each Division.[4] For this discussion, the pertinent line function running through OCE to the Divisions, to the Districts, and finally to the projects is the Recreation Resource Management Branch (RRMB). In OCE, personnel in this Branch are primarily

[1]Paper presented at the National Outdoor Recreation Trends Symposium, Durham, NH, April 20-23, 1980.

[2]Dr. Propst is on temporary assignment under the terms of an Intergovernmental Personnel Act Agreement between the Waterways Experiment Station and Virginia Polytechnic Institute and State University, Blacksburg, VA 24061.

[3]A standard unit of use consisting of a visit by one individual to a recreation development or area for recreation purposes during any reasonable portion or all or a 24-hour period.

[4]The one exception to this generalization is the New England Division, which has no Districts.

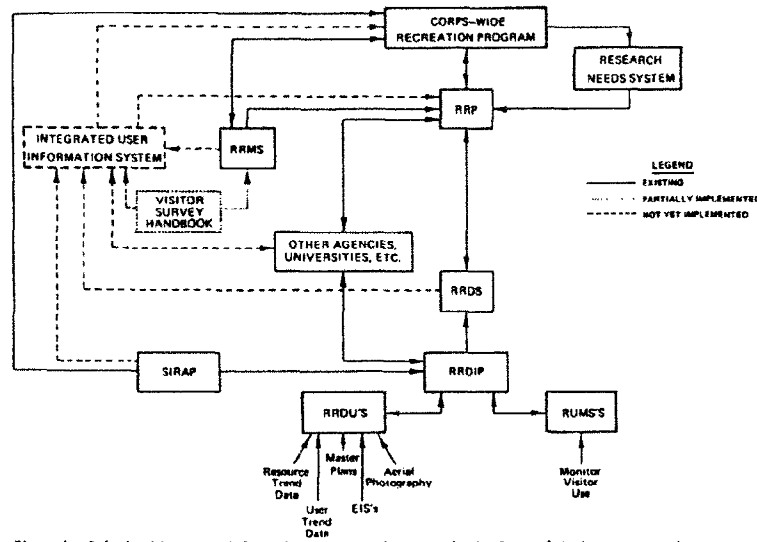


Figure 1. Relationships among information sources and systems in the Corps of Engineers recreation program (arrows denote direction of flow of information). Acronyms are defined in the text.

involved with developing field guidelines, storing and retrieving data, and disseminating information. Personnel in the RRMB's of the Districts and Divisions are involved with developing field guidelines, but also have duties in recreation planning and operations. Personnel at the project level have the responsibility for recreation site management and handling daily operations and maintenance functions, which may vary from project to project.

To help solve recreation design and management problems and to formulate policy, the Corps-wide recreation program receives information from a wide variety of sources. Three of the existing (solid line) sources are illustrated in Figure 1. First, the System of Information Retrieval and Analysis for Planners (SIRAP) was developed by OCE to assist District and Division planners. The SIRAP is a computerized system containing such census and population data as income and employment, demographics, city and county information, and economics.

Second, the Recreation Resource Management System (RRMS) is an automated system for processing recreation data for each project having an annual visitation of 5,000 recreation days of use or more. The RRMS provides for the entry, annual update, scheduled reporting, and manipulation of standardized data fields. The RRMS contains over 450 project variables ranging from monthly visitation counts to the number of unpaved road miles. The data presented in the introductory paragraph of this paper are examples of the types of information found in the current RRMS data files. OCE manages this system, using its contents for nationwide reports and for providing data to other agencies, organizations, and individuals. Field elements (i.e., project, District and Division personnel) not only enter data into the RRMS but also use such data to help make planning and management decisions. This two-way flow of information is represented by the double-pointed solid line in Figure 1.

Third, the Corps-wide recreation program receives information from the Recreation Research Program (RRP), an element administered by the Corps' Waterways Experiment Station in Vicksburg, Mississippi. The RRP is composed of personnel with expertise in recreation planning and design, resource management, park administration, economics, research design, and social sciences.

RECREATION RESEARCH PROGRAM

An important mission of the RRP is to conduct research, the results of which are responsive to the needs of field personnel. To ensure that this goal is achieved, OCE implemented a Research Needs System for all Corps research elements, including the RRP. According to the Research Needs System, anyone in the Corps can submit for review a problem which he or she feels needs to be researched. Once each year these problems are reviewed by the field and are prioritized. Generally, those problems receiving the highest ratings are funded for research. Thus, the RRP usually conducts research only on high-priority field problems.

To carry out its research and information transfer functions, the RRP receives information from a wide variety of sources that included OCE, Corps field elements, the RRMS data base, other agencies, universities, and private organizations. Once research on a given topic is completed, the results are disseminated to the field in a form suitable for implementation. Success of the RRP is measured primarily by the use of research findings rather than by the production of reports and publications. However, the RRP also produces technical reports and publications for distribution to OCE, Corps field elements, other agencies, and universities.

The RRP does not directly input data into the RRMS but may, through research, influence the methods of data collection at the project level and the types of information which the RRMS contains. For instance, Mischon and Wyatt (1979) of the Midwest Research Institute produced "A Handbook for Conducting Recreation Surveys and Calculating Attendance at Corps of Engineers Projects" for the RRP. The need for such a handbook grew out of the recognition that each Corps District and project had essentially developed its own procedures for collecting visitation data for the RRMS. Other major problems included using outdated load factors, double-counting recreation vehicles within a project, and disregarding proper sampling procedures. The new handbook offers a standarized methodology for counteracting these and other problems. Errors in collecting visitation data have not been entirely eliminated because numerous projects and Districts have not yet implemented the new procedures (dotted line in Fig. 1). However, as the handbook becomes more widely used, visitation figures entered into the RRMS should become much more reliable than in the past.

RECREATION RESEARCH AND DEMONSTRATION SYSTEM

As stated previously, the RRP conducts research on field-related problems. Those problems of highest priority are funded for research by OCE and administered by the RRP as work units to be completed by a specific date. Examples of such work units include "Cost Efficiency of Methods of Operating and Maintaining Corps Recreation Areas" and "Planning and Design Standards for Recreational Roads and Sanitary Facilities". Another work unit, of primary concern to this paper, is the Recreation Research and Demonstration System (RRDS).

The RRDS was initiated in October of 1978 with some of the following goals:

a. To monitor national and regional trends in the quantity and nature of use of Corps recreation resources and the biological, physical, economic, and social impacts associated with such use.

b. To serve as a focus for research and testing in all recreation and natural resource subject areas for which the Corps has responsibility.

c. To provide outdoor laboratories where new methods, structures, designs, and management techniques can be tested and results demonstrated.

d. To meet the requirements of as many of the RRP work units as possible.

e. To attract research interest on the part of other federal agencies, state agencies, universities, and other research organizations.

f. To draw the understanding and support of those Corps operating elements which the RRDS is designed to serve.

To meet these goals, the RRDS is composed of 25 Recreation Research and Demonstration Units (RRDU's) and 9 Recreation Use Monitoring Stations (RUMS's). With only one exception, all components of the RRDS are administered by the Corps. The exception is Lake Amistad National Recreation Area, which is under National Park Service (NPS) jurisdiction. The locations of the RRDU's and RUMS's are shown in Figures 2 and 3, respectively. Each RRDU and RUMS is either an entire Water Resources Development Project or an officially designated portion of such a project.

Projects included in the RRDS were selected to be representative of a wide range of geographic, biological, physical, social, administrative, and operational conditions found at Corps projects nationwide. A primary rational for the establishment of the RRDS is that individual research projects will be able to utilize and in turn contribute a common data base, thereby realizing savings both in

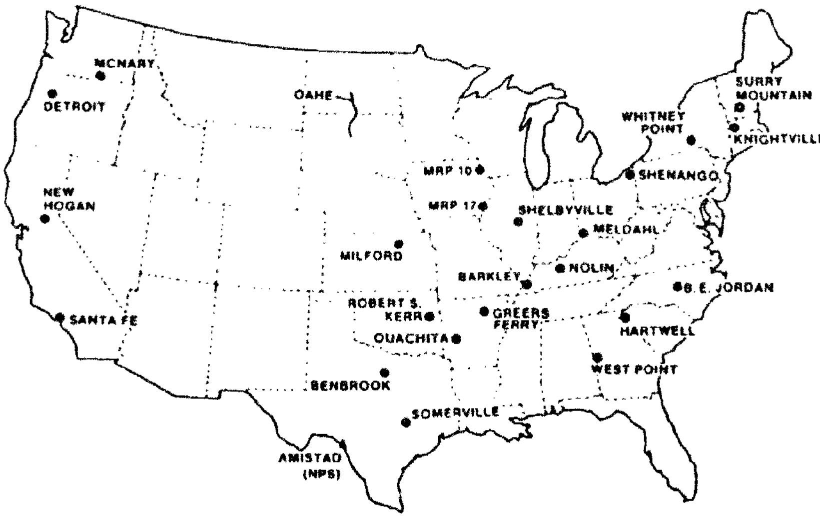


Figure 2. Locations of Recreation Research and Demonstration Units.

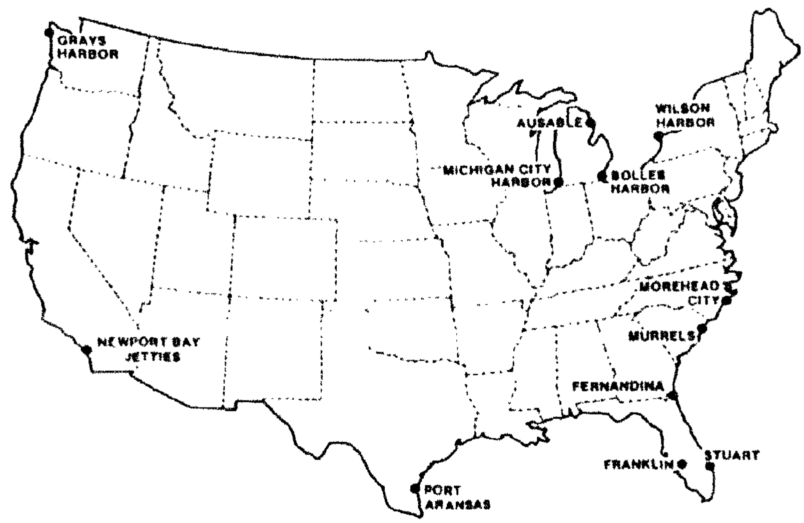


Figure 3. Locations of Recreation Use Monitoring Stations.

ime and money.

The RUMS's include such Corps projects as cean jetties, waterways, and harbors. One eason for including the RUMS's as part of the RDS is that they are not included in the RRMS. hus, annual Corps of Engineers visitation ata do not include the tremendous use in-urred at some jetties, waterways, harbors, and other such developments. One future task of the RRP is to develop a methodology for visitation trends at areas such as these RUMS's where access is not tightly controlled.

The RRDU's include the conventional multi-purpose reservoirs, navigational reservoirs with locks, dry reservoirs, modified natural lakes, and local flood-protection reservoirs. Detailed recreation data on each of the RRDU's is contained within the RRMS data base. However, such data are not available on a trend basis. That is, the RRMS contains the current year's data only. Each year the data from the previous year are erased from the computer files, thus making the chronological comparison of trend data difficult and inefficient.[5] It is for this reason that the RRP staff is currently attempting to develop special forms, identify key variables, and implement an automated system for monitoring national and regional trend information.

RECREATION RESEARCH AND DEMONSTRATION INFORMATION PROGRAM

As Figure 1 indicates, the RRP staff administers the RRDS, and in turn the RRDS is supported by the Recreation Research and Demonstration Information Program (RRDIP). Briefly, RRDIP is a program for the systematic collection, storage, manipulation, retrieval, and display of detailed information concerning the 25 RRDU's and 9 RUMS's.

For purposes of classification, the data contained in the RRDIP are divided into five components: natural, man-made, economic, social, and institutional environments. To stratify the data even farther, four geographic divisions were chosen: within project boundary, physical impact zone, economic impact zone, and recreation market zone. The combination of five components and four geographic divisions results in a matrix of 20 primary cells, the basic conceptual framework for RRDIP. Of course, there are substantial differences in the types and quantity of data that will occupy each cell. Some of the cells await the results of ongoing and future research.

The following steps are necessary for making the RRDIP operational:

a. Develop RRDU catalogs

b. Analyze District file information

c. Fill in gaps in the RRDIP data cells

d. Routine management of the RRDIP.

The first step, development of RRDU catalogs, has already been completed. The initial catalogs were limited to existing information primarily from maps, master plans, environmental impact statements (EIS's), SIRAP, other agencies, universities, and a recreation facilities inventory conducted by the RRP staff in the summer of 1979. The data are cataloged according to the 20 data cells previously described and are bound in large looseleaf notebook for ease of addition and revision. These catalogs of information are available for loan to researchers as they are needed. If funds become available, some of the data in these catalogs may be computerized, thereby increasing the ease of access. Similar catalogs for the RUMS's are not yet available.

Once key variables are identified and final methodologies are chosen, both resource and user trend data will be continual additions to the catalogs. Preliminary methodologies now being tested along with some user trend data are presented below.

The second step, analysis of District file information, has also been completed. During this step, the RRP staff obtained from each RRDU additional information such as aerial photography and reproducible drawings of recreation-area developments. Some of this information has also been incorporated into the RRDU catalog data cells. Another product of this analysis was the identification of those cells with significant gaps in data.

The third step will consist of filling in gaps in the RRDIP data base with the results of ongoing or future research. A major source of such results will be the RRP work units. Results generated by other Corps elements, other agencies, and universities will also be incorporated into the RRDIP catalogs.

The final step is routine management of the RRDIP data base. Included in this step will be such tasks as shifting from manual to computer processing of some of the data elements, redefining some of the data cells if necessary, and adding new information to the data cells.

The primary objective of the RRDIP is the support of research and demonstration; the

[5] However, it is expected that from this year forward, historical data will be retained in the RRMS.

primary users are intended to be researchers. However, the RRDIP is obviously not oblivious to field needs. The RRDIP catalogs are made available to District and project personnel as aids in administering the RRDU's. Moreover, many of the RRP research work units will use the RRDIP data to find better ways to plan and manage Corps recreation and other natural resources. Third, the trend information to be gathered will be of value to Corps planners, managers, and policy makers at all levels.

MONITORING OF TREND DATA

One of the objectives of the RRDIP is to "accept regularly generated measurements of key factors of the recreation and related natural resources environment and to report these data in timely fashion as trend information". To meet this objective, members of the RRP staff began a pilot recreation monitoring program during the summer of 1979 at selected campgrounds within the Lake Ouachita (Arkansas), West Point (Georgia/Alabama), and Shenango (Pennsylvania) RRDU's. The monitoring program was designed to select sample areas and to test a proposed recreation use-impact monitoring methodology.

Vegetation and Soil

One field test consisted of sampling various parameters of soil and vegetation in order to establish a data base for subsequent sampling. These parameters included vegetative species composition, growth habits, percent coverage, and erosion. In addition, permanent photo plots were established, and litter (trash, paper, etc.) counts taken at each sample location. Since this first effort resulted in the establishment of a data base, it will require additional testing before any meaningful conclusions can be drawn. Additional methodological tests are planned for the summer of 1980.

Campsite User Impact

Another concern of this pilot monitoring program was how to monitor effectively the number of recreation days of use per campsite, type of equipment brought to the site by users, and occupancy preference. Accurate information to assess the effects of recreation visitors on the environment is extremely important to the success of the monitoring program.

Although the Corps of Engineers already uses a standardized campground receipt form at each of its fee camping areas, the information derived from the form was not detailed enough to be of substantial value. The RRP staff concluded that a supplementary campsite registration form (Fig. 4), completed by the campground gate attendant, would be the most effective method of recording needed data and should be tried on an experimental basis. Most of the requested information would be obtained from observation, with the exception of zip codes and time departure.

RECREATION RESEARCH PROGRAM

USER IMPACT MONITORING PROJECT

CAMPSITE USE RECORD

RECREATION AREA ________ SITE NO. ________

DATE IN ________ TIME ( ) AM ( ) PM

DATE OUT ________ TIME ( ) AM ( ) PM

ZIP CODE ________

NO. IN GROUP ________

EQUIPMENT - CAMPING:	EQUIPMENT - OTHER THAN PRIMARY MOTOR VEHICLE:
( ) TENT	( ) SECOND CAR/TRUCK
( ) POP UP	( ) MOTORCYCLE
( ) PICK-UP CAMPER	( ) BOAT
( ) TRAILER	( ) TRAILER
( ) R V	( ) BICYCLE

Figure 4. Initial supplementary campsite registration form.

Initial Findings

The initial phase of the user impact study has been completed, and the data obtained from the supplementary registration forms have been compiled (Table 1). One major finding which emerges from Table 1 is the preponderance of the use of tents over other types of camping equipment in two of the three RRDU's. This finding is somewhat clouded by the fact that some camping groups possessed more than one type of equipment (e.g., a pickup camper and a tent). This is why the column percentages adjacent to "camping equipment" add up to more than 100. Future recording forms (to be discussed later) will distinguish between groups with more than one and groups with only one type of camping equipment. Other notable results include the large percentage of second vehicles at all three campgrounds and the relatively high percentage of bicycles. All these findings have direct planning and management implications, especially when the same data are collected over a period of several recreation seasons and significant trends are identified.

Table 1

Recreation Variables Monitored at Three Corps Campgrounds During the Summer of 1979 as Part of the Pilot Recreation Use Monitoring Program[a]

Variables Monitored	Amity No.	Amity %	Denby Point No.	Denby Point %	Shenango No.	Shenango %	Total No.	Total %
Camping Equipment[b]								
Tent	283	28	83	56	155	50	521	36
Pop-up Camper	140	14	18	12	29	9	187	13
Pick-up Camper	127	13	38	26	42	14	207	14
Camping Trailer	371	37	22	15	38	12	431	30
RV[c]	145	14	20	13	45	15	210	14
Other Equipment[d]								
2nd Vehicle	328	33	46	31	126	41	500	34
Motorcycle	20	2	5	3	15	5	40	3
Boat	450	45	86	58	65	21	601	41
Bicycle	110	11	12	8	51	17	173	12
No. Camping Groups	1,003.00		149.00		309.00		1,461.00	
No. Camping Visitors	3,397.00		584.00		1,293.00		5,274.00	
Avg. No. Persons/Group	3.39		3.92		4.18		3.61	
No. Rec. Days Spent/ Group[e]	3,983.00		594.00		872.00		5,449.00	
Avg. Length of Stay/Group (in Rec. Days)	3.97		3.99		2.82		3.73	
Total Rec. Days Spent[f]	13,846.00		2,330.00		3,646.00		19,462.00	

[a] The three campgrounds and dates of monitoring were: Amity Campground (West Point Reservoir), 14 May-3 September; Denby Point Campground (Lake Ouachita), 20 June-3 September; and Shenango Camping Area - Phase IV (Shenango Reservoir) 24-30 May, 1-14 July, and 20-22 July.

[b] Percentages represent the number of groups utilizing a particular type of camping equipment. Column totals exceed 100 percent because, in many cases, each group had more than one type of camping equipment (e.g., a tent and a trailer).

[c] Vans were recorded in the RV category.

[d] Column totals are less than 100 percent because not all groups possessed some type of other equipment.

[e] A recreation day is a visit by one person during any portion or all of a 24-hour period. These figures were determined by summing across all groups the number of entire and partial days each group stayed.

[f] For this table, total recreation days spent were determined by multiplying the number of camping visitors by the average length of stay per group.

The advantages of such a monitoring program are numerous. The additional information generated by the use form will be beneficial to both RRDU planners and resource managers. For instance, some of the data could be used for economic demand modeling and predicting visitor use without the added burden of having to fund and administer a special survey.

Comparison of several years' data with such secondary data as nationwide sales of recreational vehicles will provide a reliable basis for identifying both national and local trends in recreation use patterns, information that is lacking in most Corps District Offices.

Revised Registration Forms

One disadvantage of the form shown in Figure 4, the inability to separate groups with more than one type of equipment from those with only one, has already been discussed. Another disadvantage was that there were not enough categories for all the different types of equipment being use. For these reasons, this special-use form has been revised (Fig. 5) and will be further tested in other Corps-operated fee campgrounds during the summer of 1980.

PROJECT ________ DATE ________

CAMPSITE USE RECORD

REC AREA ______ SITE NO. ______ ZIP CODE ______

NO. IN GROUP ______ LENGTH OF STAY ______

IS THIS YOUR PRIMARY DESTINATION ______ OR STOPOVER FOR LONGER TRIP ______?

HOW MANY TIMES DID YOU VIST THIS AREA LAST YEAR? ____________

PRIMARY VEHICLE

( ) CAR
( ) TRUCK
( ) VAN
( ) MOTORHOME (INCLUDES CONVERTED BUSES)
( ) OTHER ________

EQUIPMENT (CAMPING)

( ) TENT
( ) POP-UP TRAILER
( ) VAN
( ) PICKUP CAMPER
( ) TRAVEL TRAILER

EQUIPMENT (NONCAMPING)

( ) SECOND CAR/TRUCK (NON 4 WHEEL DRIVE)
( ) 4 WHEEL DRIVE VEHICLE
( ) SAILBOAT
( ) CANOE/KAYAK/RAFT
( ) POWERBOAT
( ) BOAT TRAILER
( ) BICYCLE
( ) OTHER ________

Figure 5. Revised supplementary campsite registration form.

The amount of extra paperwork to be performed by the gate attendants, often retired couples working on a contract basis, was considered in the derivation of the forms. The collection of the information for the original form (Fig. 4) did not prove to be overly burdensome during the recent pilot test; thus, the expanded form (Fig. 5) is not expected to pose any serious problems, especially as gate attendants become accustomed to its use. In addition, a detailed set of instructions and definitions will accompany the new form, thereby eliminating some of the uncertainties that the gate attendants face in categorizing types of equipment and other information.

Another form for recording use data besides the forms shown in Figure 5 will also be tested during the summer of 1980. This form is simply a standard IBM computer card that has perforations for each number in each column. Instead of someone keypunching the data onto IBM cards, gate attendants will use a stylus to punch out the perforated sections in the card. For ease of location, the names of all the variables shown in Figure 5 will be printed above the appropriate columns. If gate attendants find this procedure simple enough it will have the added advantage of saving one step in the data coding process.

TREND MONITORING AND THE ENERGY SITUATION

The RRDIP will be of obvious value to planners and resource managers. However, as previously stated, a primary purpose of the RRDIP is to support research and demonstration The user-impact monitoring program now being tested provides one good example of how the RRDIP will benefit researchers.

At the beginning of the current fiscal year, the RRP staff began research on a new work unit concerning the effects of the energy crisis on the Corps recreation program. The objectives of this work unit were (1) to determine changes in visitation patterns resulting from the increased cost and decreased availability of motor fuel and (2) to determine the regional and local impacts of such changes on facility and personnel requirements.

To meet the work unit objectives, the RRP staff planned to establish trends for several visitation parameters including origin, destination, frequency, duration, type of equipment used, and group size. However, it was soon apparent that either these data were of poor or unknown quality or, in most cases, simply did not exist and would be too expensive or time-consuming to collect. Therefore, a recommendation has been made to stop progress on this work unit, prepare a report summarizing secondary data sources (e.g., U. S. Trend Data Center) indicative of trends, and redefine the goals of the work unit so that it may be successfully completed at a later date. The point is that implementation of the RRDIP, with its inherent capabilities for collecting, storing, and monitoring trend data, will enable a study of this nature to be conducted in only several months and will produce more reliable data at a considerable savings in cost.

DEVELOPMENT OF AN INTEGRATED RECREATION USER INFORMATION SYSTEM

By now the reader should be impressed with the fact that, within the Corps of Engineers recreation program, there are a wide variety of information systems that contain information from diverse sources and serve many different clients. By themselves, these systems cannot, nor were they intended to, serve the needs of every possible user. For example, the RRMS contains only a portion of the recreation information required by Corps planners and managers. This is because the RRMS was originally designed to support appropriations requests. Once fully operationalized, the RRDIP will contain much detailed information from many different sources besides the RRMS. However, the RRDIP will be based entirely upon a small but fairly representative sample of Corps projects, not the entire system. The need to integrate all the available sources of data into one supplemental user information system and the means of implementing such a system are found in a report prepared for the RRP by Midwest Research Institute (Mischon and Wyatt, 1978).

The relationship of this integrated user information system to existing systems and administrative elements is shown in Figure 1. As indicated by Figure 1, the integrated user information system would be a large, computerized data-management program that interfaces data from the RRMS, RRDS, SIRAP, other agencies, universities, and research organizations. The system would be interactive and capable of responding to the needs of field personnel, the RRP, researchers, and other agencies. One important aspect of the system would be the continual input of annual data regarding recreation use patterns. Such information would enable Corps personnel to spot changing leisure patterns and forecast the effects of these trends. Once implemented, this system would simplify the monitoring of such phenomena as the effects of the energy crisis on visitation.

SUMMARY

A good deal of text in this paper was devoted to a discussion of the functional elements in Figure 1. However, a total picture of all Corps recreation information sources and systems was required to indicate where recreation trend data will be collected and utilized by various Corps elements. Such a discussion was also felt necessary because of the relative newness of the Corps' Recreation Research Program and its associated work units.

The Corps-wide recreation program is composed of OCE's Recreation Resource Management Branch and corresponding line elements in the field (i.e., Division, Districts, and water resources development projects). The RRP has no line authority over the field but exists in a different chain-of-command as an element whose primary function is to conduct field-applied research and disseminate results in a useable form. To ensure that Corps research elements, such as the RRP, conduct only field-applied research, OCE developed a Research Needs System. Through this system, the RRP receives funding for only those research work units given high priority ratings by the field.

One of the first work units for which the RRP was given responsibility was the Recreation Research and Demonstration System (RRDS). The backbone of this system consists of 24 Recreation and Research Demonstration Units (RRDU's) and 9 Recreation Use Monitoring Stations (RUMS's) selected to be representative of Corps' projects nationwide. The data system supporting the RRDS is called the Recreation Research and Demonstration Information Program (RRDIP). A major purpose of the RRDS is to identify key variables indicative of recreation trends and then to develop appropriate methodologies for monitoring such trends. One method of monitoring developed campground use, the supplemental form shown in Figure 4, has received limited field testing. Problems that were identified during initial testing led to the development of a new form (Fig. 5) to be tested at a number of campsites in the summer of 1980. Major advantages of these forms include a heavy reliance on observation for filling out the forms and the generation of reliable data that can be used to document national, regional, and local recreation trends needed for planning and management purposes.

Another work unit, the effects of fuel shortages and prices on visitation, was used as an example of the need to collect reliable trend data. It was concluded that development and implementation of methodologies for monitoring trends at the 25 RRDU's will make the completion of this and other work units more efficient in terms of reliability, time, and dollars spent.

The need for a central location for the interfacing of recreation use data from a wide variety of sources led to the recommendation and plan for an integrated user information system. This is the only element of Figure 1 not yet implemented. Again, a primary function of this system will be to monitor trends in recreation use. However, the integrated user information system will contain data from the entire Corps recreation program, not just the 25 RRDU's, and from various secondary sources not currently being used by the RRDS. Such a system will be of obvious benefit to both researchers and field personnel.

LITERATURE CITED

Micshon, Raymond M. and R. Chris Wyatt. 1978. Development of improved Decision-Oriented Recreation User Information System. Technical Report R-78-2, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

__________. 1979. A Handbook for Conducting Recreation Survey and Calculating Attendance at Corps of Engineers Projects. Technical Report R-79-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Abbey, Robert V., 1979. Pilot Recreation Area Monitoring Project: Preliminary Results. Unpublished Report. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Coughlin, Robert E., David Berry, and Pat Cohen. 1978. Modeling Recreation Use in Water-Related Parks. Technical Report R-78-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Headquarters, Department of the Army. 1977. Recreation Resource Management System. Engineering Regulation 1130-2-414, Washington, D.C.

Propst, Dennis B. 1980. Impact of Energy Crisis on Corps of Engineers Recreation Program: A Status Reprot. Unpublished Memorandum for Record. U.S. Army Waterways Experiment Station, Vicksburg, MS.

FORECASTING TRENDS IN OUTDOOR RECREATION ACTIVITIES ON A MULTI-STATE BASIS[1]

Vincent A. Scardino
ABT Associates Inc.

Josef Schwalbe, Ph.D.
ABT Associates Inc.

Marianne Beauregard
ABT Associates Inc.

INTRODUCTION

Since a substantial amount of recreation planning takes place on a statewide basis, it is essential to have reliable information and forecasts of recreational needs on a state level. However, most of the recreation research over the last few years have used either national survey data, statewide data or site specific information. Each of these methodologies has severe limitations for projecting recreation participation on a statewide basis. Information based on national surveys, due to lack of a sufficient number of observations per state, can provide only limited information regarding recreational patterns for individual states. Alternatively, state survey efforts lack a uniform survey methodology by which results from several states can be compared. Thus, survey results from several states, unless the data were collected as part of a larger effort, can not be used to forecast the necessary interrelationships and travel patterns among neighboring states which are essential for understanding state recreational patterns. Finally, site specific data can only be used to forecast recreation at isolated sites, although such results have been used to project participation at similar sites.

Clearly, what is needed are methods for projecting recreational behavior on a regional basis so that planners from individual states, can take account of changing patterns and desires from neighboring states which will affect participation in their own states and vice versa. Only by incorporating the complex set of interactions among states can planners in any particular state obtain an accurate picture of recreational participation within his/her own state.

The research effort described below represents one of the few attempts at regional recreational modeling for the New England and New York region.[2] The states are, for the most part, geographically small. The area contains both heavily urbanized centers and rural areas. There are large topographical differences within easy traveling distance offering a wide variety of recreational activities within the region; these, and other reasons, imply that recreationists may easily travel among neighboring states. To accurately understand and project recreational trends within the region, and more importantly for individual states within the region, some form of regional model is essential. The model that was developed will be shown to be a flexible tool capable of forecasting several dimensions of recreational participation as well as spatially distributing participants throughout the region. This paper is divided into three sections: The first section describes the forecasting model; the second summarizes the steps and input data necessary to run the model; the last section presents results for 1985 for two recreation activities, Swimming in Salt Water and Hiking and Wilderness Camping.

DESCRIPTION OF THE FORECASTING MODEL

The model used to project recreation in the New England-New York area was developed by ABT Associates, Inc. under contract to the Commonwealth of Massachusetts to analyze current outdoor recreation patterns within the region and to advance the state-of-the-art in

[1]Paper presented at the National Outdoor Recreation Trends Symposium, Durham, NH, April 20-23, 1980.

[2]Other regional models exist for the Pacific Northwest region.

regional recreational forecasting.[3] The model that was developed, while being a very flexible analytic tool, is specific to the New England-New York area, although the methodology is generalizable to all regions of the country.[4]

Overall, the model is capable of forecasting recreational participation for sixteen different activities;[5] for each activity the model can predict the number of user days of overnight trips and day trips. In addition, the model can also disaggregate activity days into the total number of participants, the frequency of participation and the duration of participation (duration of participation, in activity days applicable only for overnight trips). Finally, the model makes each of these projections by activity, for subregions within the New England-New York region and distributes the resulting participants from any given subregion to each of the remaining subregions within the entire area.

In total there are 79 regression equations in the forecasting model for the 16 different summer outdoor recreation activities. The forecasts for each activity are divided into forecasts for day trips and overnight trips. The distinction between overnight and day trips is stressed because it is felt that the underlying dynamics between the two types of trips are different. Day trips usually involve less travel than overnight trips and usually involve participation in fewer activities. In contrast, for overnight trips the primary goal is the participation in a recreational trip, rather than a single or few well-defined activities. Thus, there are far more combinations of activities engaged in during an overnight trip and it is more difficult to relate a single overnight outing to a single activity.

One of the important goals of the forecasting model was the ability to project recreational participation from subunits of the entire region and then allocate the participation from each subunit to the remaining areas. Thus, the whole study area was divided into 15 geographic subregions so that movements from origins to destinations could be analyzed.[6] Participation was, therefore, projected on a subregional basis for each activity and the resultant activity days originating in each subregion were distributed to all the 15 possible destinations. It is important to note that the 15 subregions are both potential origins and destinations for each activity (for both overnight and day trips). It is also important to note that the model is restricted to forecasting activity participation for only those participants originating from within the region; the model is capable of estimating the number of recreationists that leave the subregion but is not able to project the number and destination of participants that enter the region from elsewhere.

The actual structure of the model is described in Exhibit 1. The model is divided into a day trip model and an overnight trip model,[7] and is estimated for the most part separately for each activity. For both types of trips, day trips and overnight trips, the model is further disaggregated into seven equations, three equations for day trips and four equations for overnight trips, which separately estimate several parameters of participation and together determine total number of activity days at each possible destination within the subregion.[8]

Each of the main equations of the model provide different information thought to be important for recreational planning purposes. The are:

- the probability of participation in a given activity during a given summer

---

[3]For a detailed description of the model, see the ABT Associates report Analysis and Computer Modeling of Summer Outdoor Recreation Activities in the Northeast. Only a general overview of the model is presented in this paper.

[4]Eastern New York was combined with New England to comprise a region because there is obviously a great deal of travel between New York and New England.

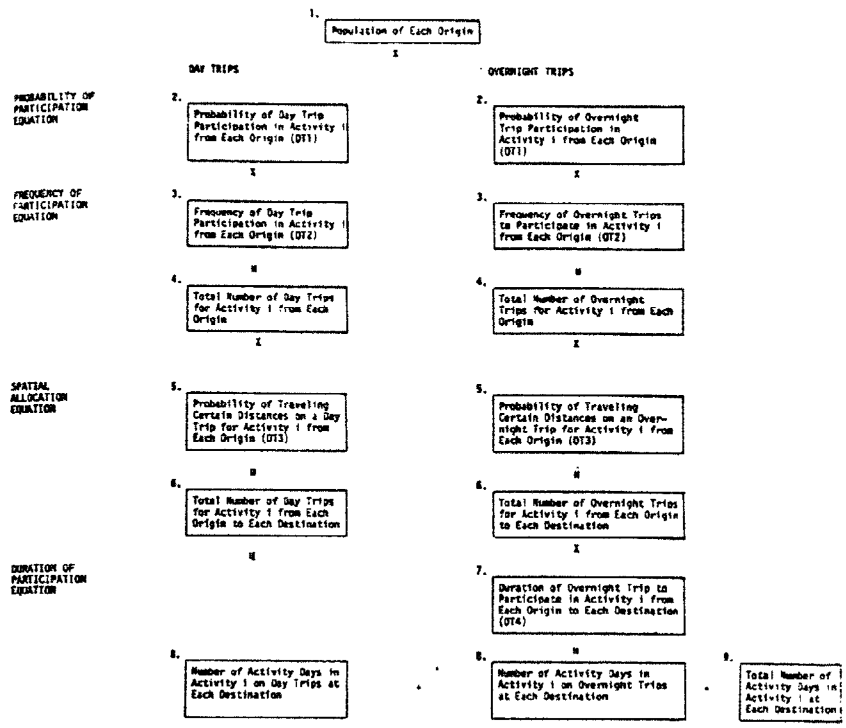
[5]The sixteen activities are Swimming in Outdoor Pools, Swimming in Fresh Water, Swimming in Salt Water, Hiking and Wilderness Camping, Campground Camping, Tennis, Golfing, Bicycling (for pleasure), Canoeing, Sailing, Power Boating, Nature Walks, Fishing, Sightseeing (by motor vehicle), Visiting Fairs, Zoos and Amusement Parks, and Watching Outdoor Sports.

[6]The breakdown of the entire region was done by state, with representatives from the individual states determining the subregions which best suited their needs.

[7]For the most part the equations for day trips and overnight trips are estimated separately, although some linkages do exist since day trip variables are used in the overnight equations.

[8]It is important to realize that the output of the model is measured in activity days. An activity day is defined as the occurrence of participation, by an individual, in a given activity during a single day. Thus, it is possible that several activity days can occur in a single 24 hour period. The model, therefore, does not project the actual amount of time engaged in for an activity. Rather, it predicts the number of occurrences, measured as an activity day, of participation.

EXHIBIT 1: OVERVIEW OF THE MODEL



- the frequency (the number of separate occurrences) of participation within a given season for a given activity

- the spatial allocation between where a recreation trip originates and where it culminates

- the duration (measured in activity days) spent participating in particular activity (applicable only to overnight trips).

The first three equations are estimated separately for day trips and overnight trips; the fourth equation is applicable only to overnight trips. All equations are activity specific, except the last two overnight trip equations which are trip specific since it was found to be impossible to separate out the individual influences of specific activities from the decision to take an entire trip.

Again referring to Exhibit 1 the linkages can be described.

The first output of the model is the determination of the total number of trips originating at each origin (Box 4). This is accomplished in two steps. The first step estimates the probability of a person, at a specific origin, participating in a given recreational activity (Box 2). The second equation, using only those who have participated in a given activity, determines the number of trips they take (Box 3).

These equations are used to predict total trips from each origin. If values of the independent variables from each origin are inserted into the two equations, the probability and frequency of participation from each origin can be predicted. This information is combined with the population of each origin, and total number of trips from each origin is obtained by multiplying the three values.

Once estimates of the total number of trips from each origin are obtained, the second part of the model allocates the total trips among the various destinations (Box 6).[9] The last equation of the model, applying only to overnight trips, estimates total number of activity days per overnight trip at a given destination.

The output at this stage is an equation predicting total number of activity days for a given activity (Box 7). When the total number of activity days from day trips is combined with the total activity days on overnight trips, the total number of activity days for a given activity has been estimated for a particular destination (Box 9).

Once the population is known, multiplying the first equation by population determines total number of participants in that activity for day trips and overnight trips. Multiplying that quantity by the output of the second equation determines the total number of activity trips for that activity and type of trip. The third equation takes the total number of activity trips and distributes them among the various destinations. Finally, the last equation predicts the number of days of participation for each activity on overnight trips.

In summary, using all the equations, the model can predict the total number of activity days from a given origin to any number of destinations for day trips and overnight trips. Taken individually, recreational planners can use any of the equations to predict a given component of total participation; either the probability of participation, frequency, spatial allocation or duration.

The equations of the model were estimated using various regression techniques using two types of data; primary survey data which contains socio-demographic data and trip specific data obtained via a telephone survey conducted by ABT Associates in 1977 and secondary data describing characteristics of each subregion and the supply information for each activity.[10] The primary data obtained via ABT Associates' Summer Activities Survey provided the key participants and non-participants for each activity. The survey was conducted during the September of 1977 using a multi-stage stratified random sample of individuals 12 years or older, living in the New England-New York region. The entire region was stratified into 15 geographic subregions -- corresponding to the subregional breakdown used to determine the spatial allocation of participation--and separate samples were drawn from each stratum. In total there were 1541 completed interviews, or approximately 100 interviews from each subregion.

Information regarding the aggregate characteristics of each subregion and supply data relevant for individual activities was obtained from the Commonwealth of Massachusetts. Unfortunately, the secondary data proved to be far less consistent or reliable than the primary data and therefore its usefulness was limited.[11] It was originally felt that such supply information would be valuable determinants of participation, especially when accounting for differences in participation among the various subregions. Thus, these secondary data were originally intended to be used as independent variables in each of the forecasting equations. However, due to data inconsistencies and a great deal of missing information, an alternative formulation was developed whereby a separate supply model was developed and

---

[9] The spatial allocation portion of the model is a relatively complex algorithm which projects the distribution of participation on the basis of the probability of traveling a given distance from an origin of known characteristics to a destination of known characteristics. The basis for these estimates is a multi-nomial logit model which was used to project the probability of traveling certain distances for each activity by day and overnight trip, based on the characteristics of the individual origin and destination. For a more detailed description see volumes 2 and 5 of ABT's report, Analysis and Computer Modeling of Summer Outdoor Recreation Activities in the Northeast and Documentation for the Summer Outdoor Recreation Forecasting Model respectively.

[10] Supply data refers to physical characteristics associated with each subregion that is necessary for participation in the various activities. Thus, number of ocean beaches would be a supply variable for Swimming in Salt Water while number of 18 hole golf courses in a subregion would be a supply variable for Golfing.

[11] The problems with the supply data were lack of consistent definition or method of collection across subregions and, most importantly, too many missing observations. In fact, there were a sufficient number of missing observations that it was not possible to use the supply data directly in the model.

linked to the main forecasting model.[12]

The dependent variables in each equation were taken from the primary data collected by ABT Associates. For the first equation, the probability of participation, respondents were categorized into two groups for each activity, and for overnight and day trips, and the dependent variable was whether or not they were in the group participating in that particular activity. For the second equation the number of different instances of participation of those respondents who participated in a given activity, separately for overnight and day trips, was used as the dependent variable. For the spatial allocation component of the model the probability of traveling a specified distance for a given activity was estimated and used as part of a more complex spatial allocation algorithm. Finally, for the fourth equation, which was estimated only for overnight trips, the number of different activity days of participation on a given trip over all activities was used as the dependent variable.

Most of the key independent variables of each equation were general socio-demographic information and specific activity trip information.[13] For the most part both types of data were obtained from the ABT Summer Activities Survey. In using the model to make predictions the user must only estimate values for the independent variables that are expected to change over time, input them into the model, and assuming that a number of other underlying relationships will be maintained over time, the model will predict the various components of recreation discussed above.

Finally, it should be noted that the entire model has been installed as a self-contained, user operated computer model. The computer model has built into it a great number of adjustments that must be made before the output of the individual equations can be used to obtain the desired projections.[14] In addition, the computer model restricts many of the independent variables, primarily the trip specific variables, to default values otained from ABT's Summer Survey. For other variables, unless the user specifies changes, the computer will default to average values used in estimating the model. The user need only specify changes in certain independent variables and the model will print out projections of participation by activity for each subregion in the New England-New York region. An example of the output of the model for one activity and one subregion are presented in Exhibit 2. If total participation for any activity within the region is required then it is a simple matter of aggregating the distribution of participation from each origin.

FORECAST RESULTS

This section presents results of implementing the model to forecast the expected number of activity days to be spent in each subregion in 1985 for two activities--Swimming in Salt Water and Hiking and Wilderness Camping. For this example, 1985 values for population, age, and income were used in the model. All other variables were assumed to remain constant at their 1977 levels.

PROJECTIONS OF EXOGENOUS VARIABLES

Table 1 presents the values of population, age, and income for 1977 and 1985 for each of the 15 subregions. The 1977 population estimates were provided by the states, themselves. The 1977 age and income estimates are the sample means of the ABT survey data. Subregional projections of population, age and income were derived using state estimates published by the National Planning Association (NPA).[15]

The subregional population estimates

---

[12]For each activity a proxy for the subregional supply characteristics was created based on the survey data. That proxy, which was an index relating activity participation within a subregion to the whole region, was then used as an independent variable in the forecasting model. In addition, a separate supply model was developed which related the actual supply variables to the proxy supply variables. Within the supply model changes in actual supply variables could be used to change the proxy values which would then be changed in the main forecasting model. This indirect technique allows inclusion of supply variables in the forecasting model without the problems of the actual supply variables. Thus, a recreation planner can still determine the effect of changes in a supply variable, for example of golf courses, on participation.

[13]Examples of the independent variables used to estimate the equations are age, income, sex, race, distance travelled, number of people on a trip and other respondent and participant characteristics.

[14]Many of the adjustments convert values in logarithms and back again, make adjustments that were necessary to calibrate the model and in general ease the process of inputing variables into the model.

[15]Scara, Timothy B., David W. Fay, and Joe Won Lee, State and Metropolitan Growth Patterns, 1960-1990, Washington: National Planning Association, Report Number 77-R-1, 1977.

ACTIVITY : HIKING

ORIGIN: W CONN

POPULATION: 1757.80 (THOUSANDS)

ALL ACTIVITY DAYS ARE RECORDED IN THOUSANDS

DAY TRIPS		OVERNIGHT TRIPS	
PROBABILITY OF PARTICIPATION------->	0.0493	PROBABILITY OF PARTICIPATION------->	0.0311
MULTIPLIED BY		MULTIPLIED BY	
FREQUENCY OF PARTICIPATION----->	10.76344	FREQUENCY OF PARTICIPATION----->	2.93640
EQUALS TOTAL # OF DAY TRIPS----->	932.97	EQUALS TOTAL # OF OVERNIGHT TRIPS----->	159.91

PROBABILITY OF MAKING DAY TRIPS TO THE FOLLOWING DESTINATIONS:

W CONN	E CONN	W MAINE	E MAINE	MA:CAPE	EAST MA	WEST MA	NO NH	SO NH	NO VT	MID VT	SO VT	R.I.	NO NY	SO NY
0.74962	0.20979	0.0	0.0	0.00195	0.00568	0.00092	0.0	0.00195	0.0	0.00029	0.0	0.0	0.0	0.0

MULTIPLIED BY THE TOTAL # OF DAY TRIPS MINUS 20.7 ACTIVITY DAYS OUTSIDE THE NY/NEW ENGLAND AREA EQUALS DAY TRIP ACTIVITY DAYS TO

W CONN	E CONN	W MAINE	E MAINE	MA:CAPE	EAST MA	WEST MA	NO NH	SO NH	NO VT	MID VT	SO VT	R.I.	NO NY	SO NY
699.5	195.7	0.0	0.0	1.0	5.4	0.9	0.0	1.0	0.0	0.3	0.0	0.0	0.0	0.0

PROBABILITY OF MAKING OVERNIGHT TRIPS TO THE FOLLOWING DESTINATIONS:

W CONN	E CONN	W MAINE	E MAINE	MA:CAPE	EAST MA	WEST MA	NO NH	SO NH	NO VT	MID VT	SO VT	R.I.	NO NY	SO NY
0.10210	0.07630	0.02696	0.05199	0.02909	0.15357	0.05916	0.02888	0.02787	0.07070	0.03459	0.01010	0.03288	0.01010	0.02729

DURATION OF PARTICIPATION IN ACTIVITY ON OVERNIGHT TRIPS IS 7.95 DAYS, MULTIPLIED BY THE ABOVE PROBABILITIES MINUS 732.4 ACTIVITY DAYS OUTSIDE THE NY/NEW ENGLAND AREA, GIVES THE NUMBER OF OVERNIGHT TRIP ACTIVITY DAYS AT DESTINATION :

W CONN	E CONN	W MAINE	E MAINE	MA:CAPE	EAST MA	WEST MA	NO NH	SO NH	NO VT	MID VT	SO VT	R.I.	NO NY	SO NY
193.5	69.1	20.6	19.1	31.8	156.7	62.9	30.7	29.6	75.1	36.7	19.2	39.1	19.3	29.0

ADDING DAY TRIP ACTIVITY DAYS TO OVERNIGHT ACTIVITY DAYS GIVES THE TOTAL ACTIVITY DAYS AT :

W CONN	E CONN	W MAINE	E MAINE	MA:CAPE	EAST MA	WEST MA	NO NH	SO NH	NO VT	MID VT	SO VT	R.I.	NO NY	SO NY
892.9	259.8	20.6	19.1	35.6	161.1	63.7	30.7	31.6	75.1	37.0	19.2	39.1	19.3	29.0

EXHIBIT 2

TABLE 1. VALUES OF EXOGENOUS VARIABLES - 1977 AND 1985

SUBREGION	POPULATION (in thousands) 1977	1985	MEAN AGE OF POPULATION 12 years and over 1977	1985	MEAN INCOME OF THE POPULATION (in thousands of 1977 dollars) 1977	1985
WEST CONNECTICUT	1754.0	1804.0	39.4	39.5	17.355	19.036
EAST CONNECTICUT	1405.0	1440.0	41.8	41.9	15.000	17.430
WEST MAINE	696.0	802.0	43.7	41.8	10.999	12.083
EAST MAINE	300.0	346.0	40.8	39.0	11.627	13.676
CAPE MASSACHUSETTS	990.0	1054.0	41.2	41.1	13.211	15.792
EAST MASSACHUSETTS	3324.0	3553.0	41.6	41.3	16.347	18.790
WEST MASSACHUSETTS	1352.0	1444.0	41.1	41.1	13.327	15.505
NORTH NEW HAMPSHIRE	305.0	341.0	46.1	41.7	13.884	15.138
SOUTH NEW HAMPSHIRE	573.0	646.0	42.6	38.1	14.725	17.266
SOUTH NEW YORK	10447.0	10488.0	40.9	41.9	16.281	18.981
MID NEW YORK	4310.0	4307.0	37.9	38.8	16.947	19.275
NORTH NEW YORK	425.0	435.0	38.9	39.8	13.700	15.613
RHODE ISLAND	1046.0	911.1	40.9	41.0	13.972	16.172
NORTH VERMONT	175.0	182.0	38.9	36.8	13.419	15.910
SOUTH VERMONT	311.0	326.0	43.9	41.8	12.380	14.659

were calculated from the state values assuming that changes at the subregional level were proportional to those at the state level. That is, the distribution of population among subgroups within a given state loss held constant, at its 1977 value.

The NPA report does not publish the mean age of the population, per se. However, the report does include a breakdown of population by age cohort groups for each state. The mean age of the population 12 years old and over of each state was estimated by taking a population weighted average of the cohort groups, 12 years of age and over. Subregional estimates were then calculated assuming that the change for each subregion was proportional to that of its encompassing state.

Mean population income was derived assuming a constant rate of growth among subregions within a state over the 1977-1985 period. The growth rates were calculated based on the NPA's estimates of state per capita income for 1977 and 1985.[16]

FORECASTS OF RECREATION PARTICIPATION

The 1985 projections of population, age, and income were used in the model to derive forecasts of the number of activity days for Swimming in Salt Water and Hiking and Wilderness Camping at each destination in 1985. These forecasts, as well as the corresponding estimates for the baseline year-1977, are presented in Tables 2 and 3 for Swimming in Salt Water and Hiking and Wilderness Camping, respectively. For simplicity, the tables show only the number of activity days resulting from both day trips and overnight trips. Note that these estimates represent the total number of activity days to be expected at each destination by recreation participants originating in the Northeast region.

The forecasts for Swimming in Salt Water (Table 2) suggest that every subregion, except East Connecticut, will experience an increase in the number of activity days spent at that destination. The two subregions in Maine show the largest percentage increases, while Cape Cod in Massachusetts and South New York exhibit the largest absolute changes.

In general, increases in day trips contribute slightly more to increases in the total number of activity days than do changes in overnight trip activity days. In East Connecticut, where visitation is expected to fall (or remain relatively constant at its 1977 level),[17] day trips are estimated to

[16] The actual 1985 income estimates (in thousands of 1977 dollars) were about 5% greater than those shown in Table A. Values used in the model are constrained to $\pm$ 3 standard deviations of the mean. The figures in Table A reflect the upper bound of this constraint and were the values used in deriving the projections.

[17] Given the accuracy of this (or any) forecasting model, a change of 0.5% can not be considered significant.

TABLE 2

FORECAST OF ACTIVITY DAYS FOR SWIMMING IN SALT WATER,

1977 AND 1985 IN THOUSANDS

SUBREGION OF DESTINATION	1977		1985		CHANGE IN TOTAL ACTIVITY DAYS (1985 MINUS 1977)	
	DAY TRIP ACTIVITY DAYS	TOTAL ACTIVITY DAYS	DAY TRIP ACTIVITY DAYS	TOTAL ACTIVITY DAYS	ABSOLUTE	PERCENT*
WEST CONNECTICUT	11,471	22,193	11,655	22,951	758	3.4
EAST CONNECTICUT	11,907	16,491	11,551	16,407	-83	-0.5
WEST MAINE	3,142	9,816	3,643	10,764	948	9.7
EAST MAINE	58	3,195	81	3,427	268	8.4
CAPE MASSACHUSETTS	12,218	16,531	13,137	17,724	1,193	7.2
EAST MASSACHUSETTS	12,465	17,176	13,076	18,082	906	5.3
WEST MASSACHUSETTS	-0-	-0-	-0-	-0-	-	-
NORTH NEW HAMPSHIRE	-0-	-0-	-0-	-0-	-	-
SOUTH NEW HAMPSHIRE	4,713	8,805	5,101	9,478	673	7.6
SOUTH NEW YORK	62,379	69,083	64,206	71,999	2,916	4.2
MID NEW YORK	-0-	-0-	-0-	-0-	-	-
NORTH NEW YORK	-0-	-0-	-0-	-0-	-	-
RHODE ISLAND	10,979	17,342	11,147	17,869	527	3.0
NORTH VERMONT	-0-	-0-	-0-	-0-	-	-
SOUTH VERMONT	-0-	-0-	-0-	-0-	-	-

* Percent Change = (1985 data minus 1977 data/1977 data)

TABLE 3

FORECAST OF ACTIVITY DAYS FOR HIKING AND WILDERNESS CAMPING

1977 AND 1985 IN THOUSANDS

SUBREGION OF DESTINATION	1977		1985		CHANGE IN TOTAL ACTIVITY DAYS (1985 MINUS 1977)	
	DAY TRIP ACTIVITY DAYS	TOTAL ACTIVITY DAYS	DAY TRIP ACTIVITY DAYS	TOTAL ACTIVITY DAYS	ABSOLUTE	PERCENT*
WEST CONNECTICUT	968	3,406	851	3,348	-58	-1.7
EAST CONNECTICUT	679	1,225	666	1,226	1	0.1
WEST MAINE	358	1,514	399	1,637	123	8.1
EAST MAINE	137	636	147	675	39	6.1
CAPE MASSACHUSETTS	317	1,239	303	1,260	21	1.7
EAST MASSACHUSETTS	1,151	2,210	1,095	2,209	-1	-0.05
WEST MASSACHUSETTS	126	836	309	830	-6	-0.7
NORTH NEW HAMPSHIRE	776	1,819	844	1,936	117	6.4
SOUTH NEW HAMPSHIRE	870	1,790	905	1,879	89	5.0
SOUTH NEW YORK	197	1,471	34	1,307	-164	-11.1
MID NEW YORK	1,423	3,750	1,292	3,615	-135	-3.6
NORTH NEW YORK	503	912	476	893	-19	-2.1
RHODE ISLAND	233	1,226	213	1,240	14	1.1
NORTH VERMONT	179	521	180	533	12	2.3
SOUTH VERMONT	705	1,888	710	1,928	40	2.1

*Percent Change = (1985 data minus 1977 data/1977 data).

decline by 356 thousand in 1985; this decrease is partially offset by an increase in the number of overnight trip activity days.

The forecasts for Hiking and Wilderness Camping (Table 3) exhibit much smaller changes from the 1977 baseline than did swimming in Salt Water. Moreover, 6 of the 15 subregions are expected to experience a decline in visitation for Hiking and Wilderness Camping, although in several cases the decrease is too small to be considered significant.

The projections suggest that New York will be the greatest loser of activity days while Maine, New Hampshire and Vermont will be the largest gainers.

The 1985 forecasts suggest that day trips to 9 of the subregions will fall relative to their 1977 level. In three of these subregions--East Connecticut, Cape Massachusetts, and Rhode Island-- the increase in overnight trip activity days more than offsets the decline in day trips, resulting in increases in total activity days.

The differences in the magnitude and direction of the changes between the two activities stem from several sources. First, since population at each origin drives the model, increasing population and holding all variables constant at their 1977 values would result in an overall increase in the total number of activity days for both Swimming in Salt Water and Hiking and Wilderness Camping. However, when age and income are allowed to vary, the overall effect depends upon the signs and magnitude of their coefficients in the various regression equations.[18] Since the relative effects of age and income as measured by the regression coefficients are different for the two activities, changing these variables produce different results.

Secondly, participation in Swimming in Salt Water is very much constrained by natural resources. Only 9 of the 15 subregions have coastal area, limiting the number of possible destinations.

Other Uses of the Forecasting Model

The data generated by the forecasting model are amenable to other kinds of analysis as well. In particular, the model's forecasts can be analyzed in terms of recreationists' travel patterns among the sub-state regions to engage in various kinds of outdoor recreation.

[18] A detailed discussion of the equations is presented in Volume 2 of ABT's report, Analysis and Computer Modeling of Summer Outdoor Recreation Activities in the Northeast.

For a given activity, the model estimates the number of day trips which originate within each subregion, and also estimates the subregion in which the activity actually takes place, that is, the destination.[19]

For most outdoor recreation activities, some residents will remain in their own subregion to participate in the particular activity while other residents will travel to a different subregion. If a greater number of people leave a subregion than enter the subregion to engage in an activity, then that subregion is experiencing a net outflow of participants to other subregions. If more people come into the subregion than leave it, then that subregion is importing participants, that is, there is an inflow of participants for that recreation activity.

Discussion of Day Trip Recreation

Table 4 presents the net inflows and outflows for day trips to participate in Swimming in Salt Water during the summer of 1977. For each of the 15 subregions, the number of day trips (for Swimming in Salt Water) which originated in the subregion is subtracted from the total number of day trips which had that subregion as its destination.

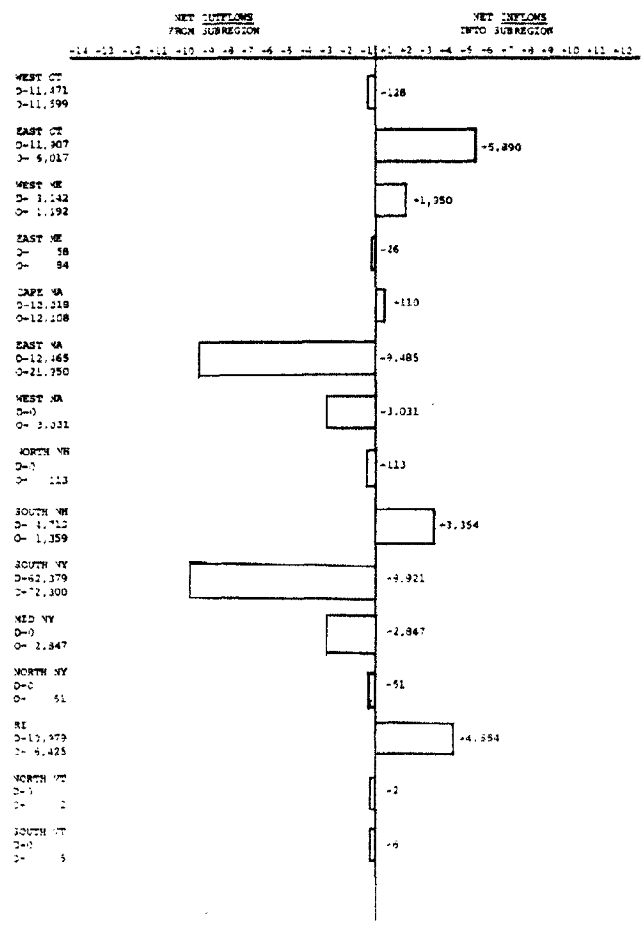
As is noted on the left hand column, residents of West Connecticut took an estimated 11,599,000 day trips to go Swimming in Salt Water during the summer of 1977 (i.e., these day trips originated from this sub-region). Of all the Salt Water Swimming day trips in the New England-New York region, West Connecticut was the final destination for 11,471,000 of these trips. Thus, while most West Connecticut residents remained within their own subregion to participate in this activity, there was a net outflow of 128,000 day trips to places outside of West Connecticut because more people exited from this subregion than entered it from the other 14 subregions. In strong contrast is East Connecticut which experienced a substantial inflow into its subregion for Salt Water Swimming day trips from other parts of the New England-New York region.

For some subregions, of course, there can be no inflow of recreationers to engage in Salt Water Swimming simply because the subregion lacks this natural resource. Thus, subregions such as West Massachusetts, North

[19] Note that the model's estimates of recreation activity at each destination is based on travel from within the New England-New York region only. The model does not provide estimates of recreationists who enter the region from Canada, other parts of the U.S., etc.

TABLE 4

1977 DAY TRIPS (IN 000) FOR SALT WATER SWIMMING



and South Vermont, can only experience outflows to the subregions which have ocean beaches.

Overall, East Connecticut, West Maine, South New Hampshire, and Rhode Island enjoy substantial inflows of recreationers for Salt Water Swimming day trips. Interestingly, both East Massachusetts and South New York experience considerable outflows of day trips for Swimming in Salt Water, even though both these subregions have ocean beaches.

Table 5 presents model projections of day trip activity for Swimming in Salt Water for the year 1985,[20] based upon expected changes in the population, age, and income in the New England-New York region.[21] The data suggest that the subregions will likely continue to exhibit the same basic patterns of either importing or exporting day trip Salt Water Swimming participants for 1985 as they did in 1977, although the size of the inflows and outflows have changed. East Connecticut and Rhode Island are each likely to experience approximately 500,000 more day trips for this beach activity in 1985 as compared to the inflows into these subregions during 1977. Also, the outflow of day trip participants from South New York is likely to be considerably less in 1985; while only slightly more day trips will originate in this subregion, substantially more participants (than in 1977) will be destinating in South New York for Salt Water Swimming day trips.

A similar analysis is presented for day trips to engage in Hiking and Wilderness Camping during 1977. Table 6, which displays the net inflows and outflows for each of the 15 subregions, demonstrates very different patterns than was observed for Swimming in Salt Water. Immediately obvious is the fact that people take far fewer day trips to engage in this activity. East Massachusetts enjoys the largest inflow of day trip participants for Hiking and Wilderness Camping (in strong contrast to its substantial outflows of day trip participants for Swimming in Salt Water). Also noteworthy is the fact that although more day trips for Hiking and Wilderness Camping originate in the Mid New York subregion, it still experiences a strong outflow of such day trips.

Table 7 presents the forecasting model's estimates for 1985 day trips for Hiking and Wilderness Camping. Again, the basic patterns remain although there are slight changes in the magnitude of the inflows/outflows.

[20] Data based on NPA estimates.

[21] As with all forecasting models, the output should not be considered as absolute predictions, but is best utilized by analyzing the relative changes which are estimated under varying assumptions.

Discussion of Total Activity Days

Tables 8 and 9 display the net inflows and outflows in 1977 and 1985 for the total activity days in which people go Swimming in Salt Water. West Connecticut, which exhibited a slight outflow of day trips (see Table 4), now experiences a significant inflow of total activity days; the reversal in flows is accounted for by the fact that this subregion is a popular destination for overnight trips where recreationists participate in Salt Water Swimming. The other coastal subregions also enjoy substantial inflows of participants, with the notable exception of East Massachusetts and South New York which continue to export participants to other areas. A comparison of 1977 and 1985 forecasts (in Tables 8 and 9 respectively) indicate that the same basic patterns will obtain throughout this time period.

Forecasts of the total activity days for Hiking and Wilderness Camping in each subregion for 1977 and 1985 are presented in Tables 10 and 11. West Connecticut, North New Hampshire, and South Vermont have the largest number of total activity days destinating in the subregion (3,750,000 activity days); but considerably more activity days are originating from this part of the state (8,537,000), and thus this subregion experiences a significant outflow of participants.

The data for 1977 in Table 12 focuses on Mid New York and displays the net inflows into the other subregions for Hiking and Wilderness Camping activity days from Mid New York. While other parts of the state are getting some inflow from Mid New York, other subregions--West Connecticut and East Massachusetts, in particular--are the greatest gainers of the Hiking and Wilderness Camping activity days which are outflowing from Mid New York.

CONCLUSIONS

There is considerable travel from one substate region to other subregions in the New England-New York area to participate in various outdoor recreation activities. The total number of activity days originating and destinating in each subregion demonstrate significant flows of recreationists throughout the entire region; this is also true, though to a lesser degree, when day trip activity is analyzed.

Model projections of recreation activity in 1985--based on estimated changes in the average age, income, and population of each subregion--suggest that some changes in magnitude, but not of direction of the subregional inflows and outflows, of recreation activities will occur.

TABLE 5

1985 DAY TRIPS (IN 000) FOR SALT WATER SWIMMING

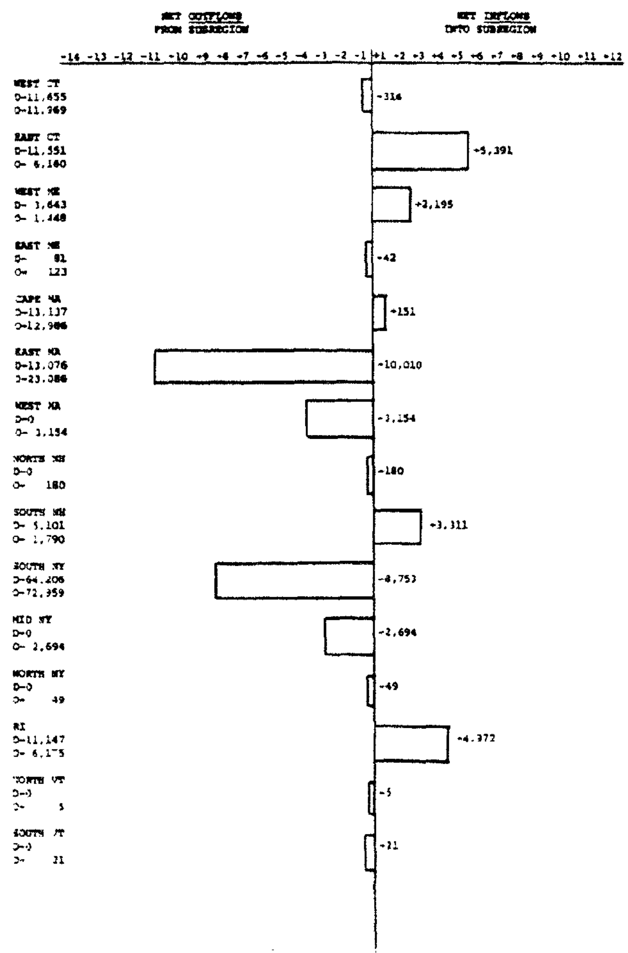


TABLE 6

1977 DAY TRIPS (IN 000) FOR HIKING & WILDERNESS CAMPING

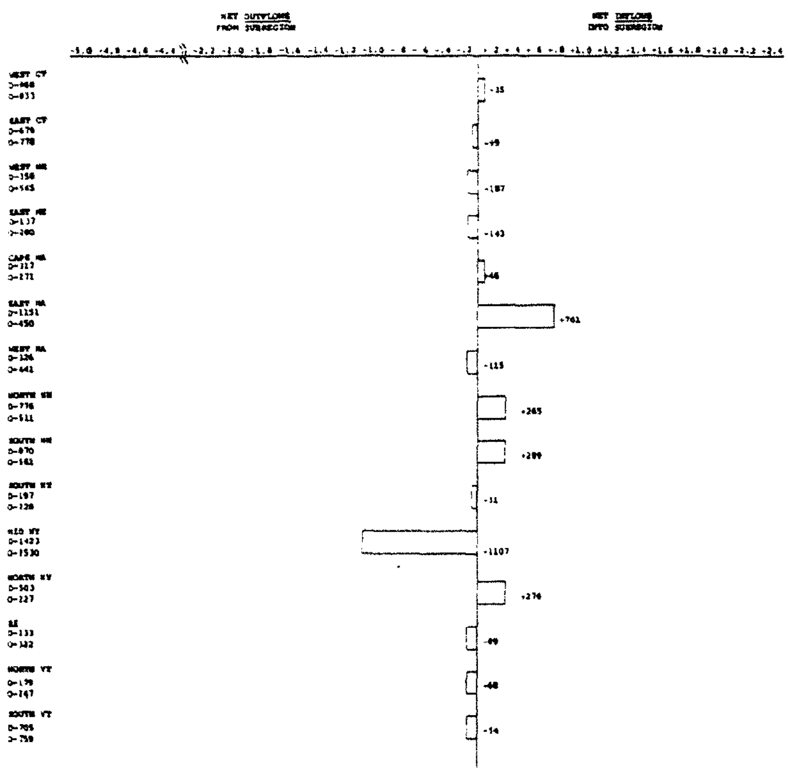


TABLE 7

1985 DAY TRIPS (IN 000) FOR HIKING & WILDERNESS CAMPING

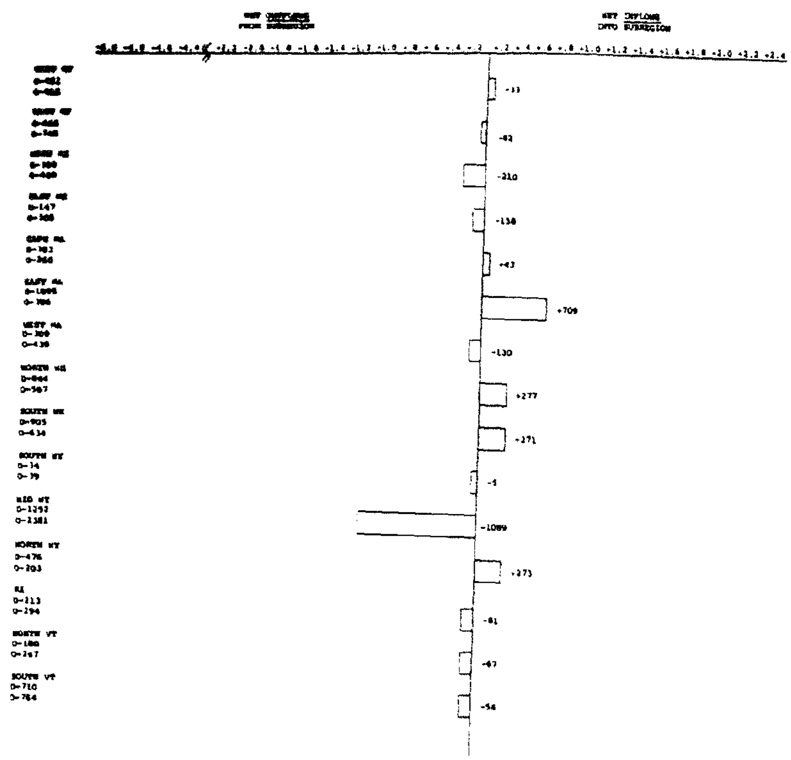


TABLE 8

1977 TOTAL ACTIVITY DAYS (IN 000) FOR SALT WATER SWIMMING

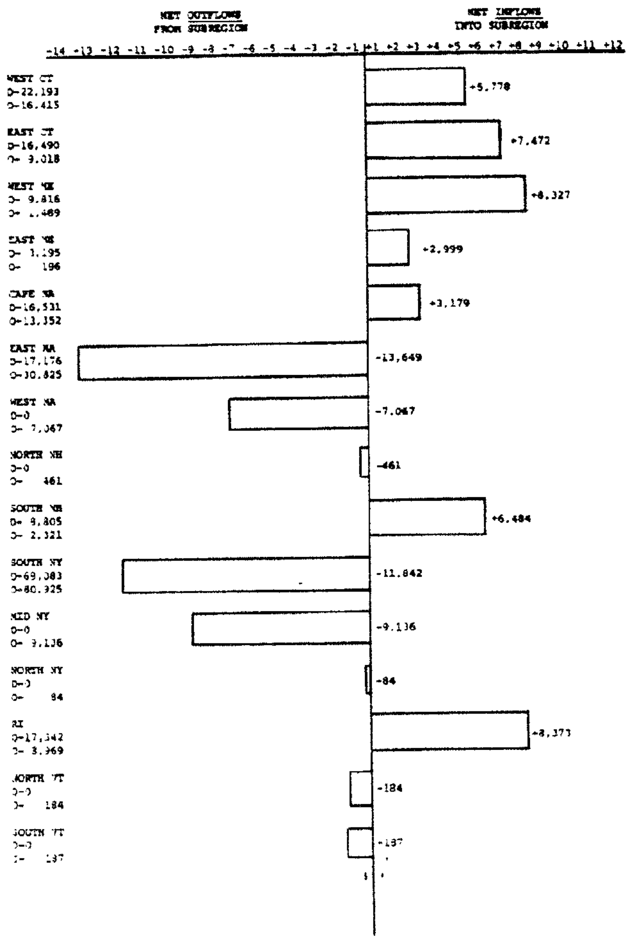


TABLE 9

1985 TOTAL ACTIVITY DAYS (IN 000) FOR SALT WATER SWIMMING

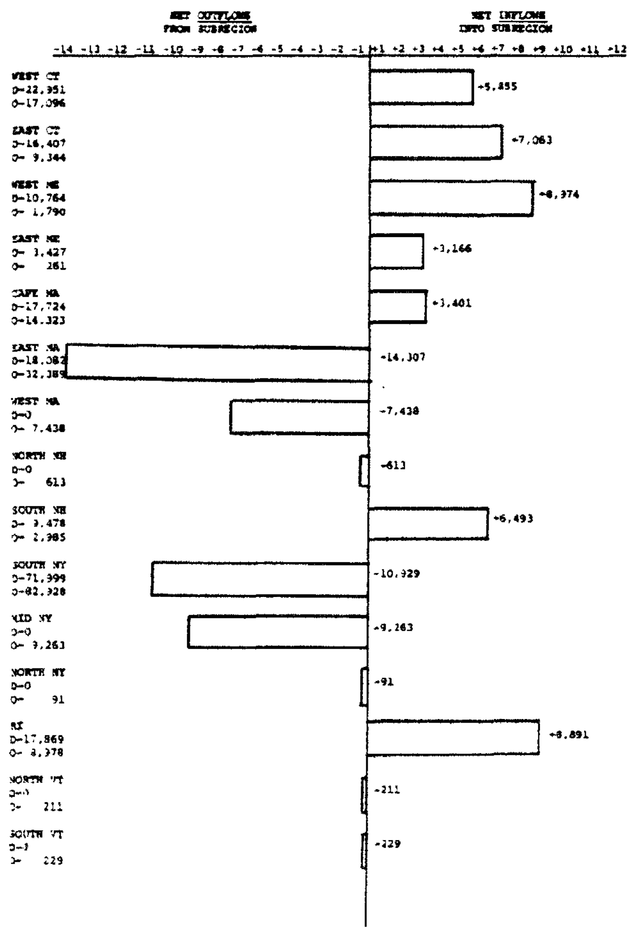


TABLE 10

1977 TOTAL ACTIVITY DAYS (IN 000) FOR HIKING & WILDERNESS CAMPING

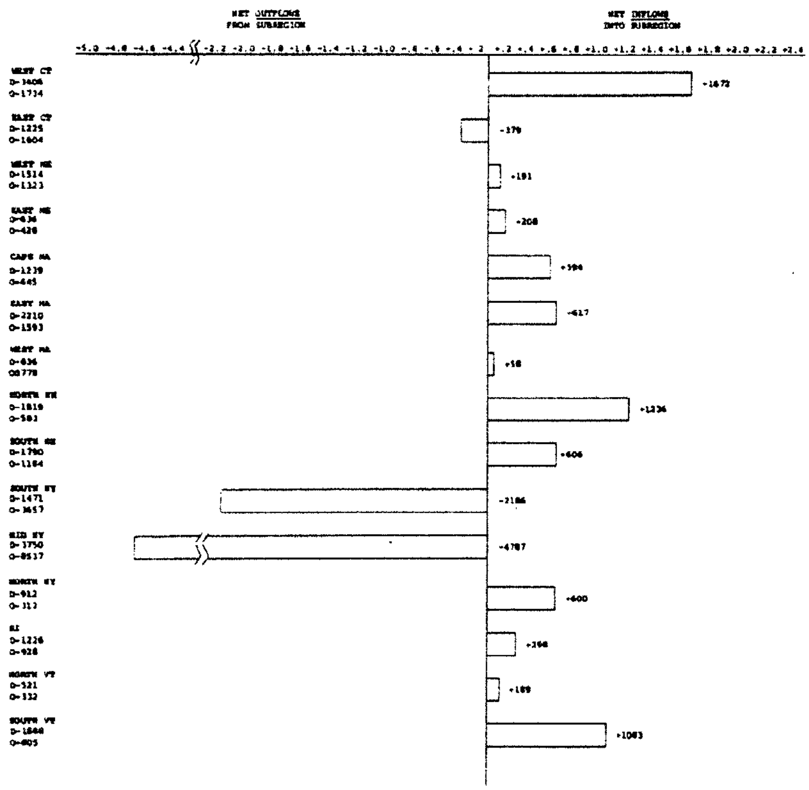


TABLE 11

1985 TOTAL ACTIVITY DAYS (IN 000) FOR HIKING & WILDERNESS CAMPING

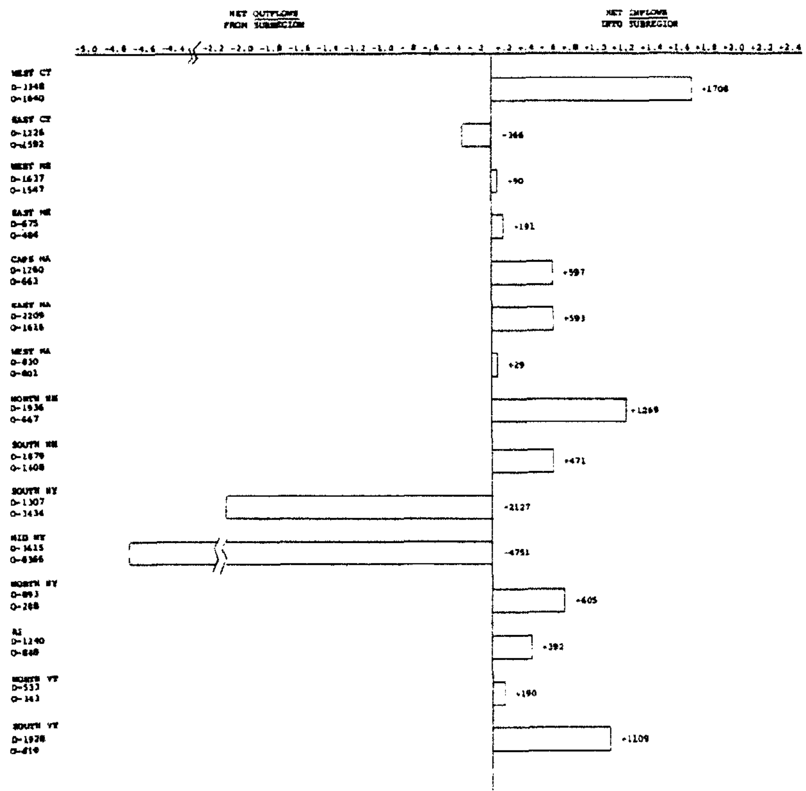
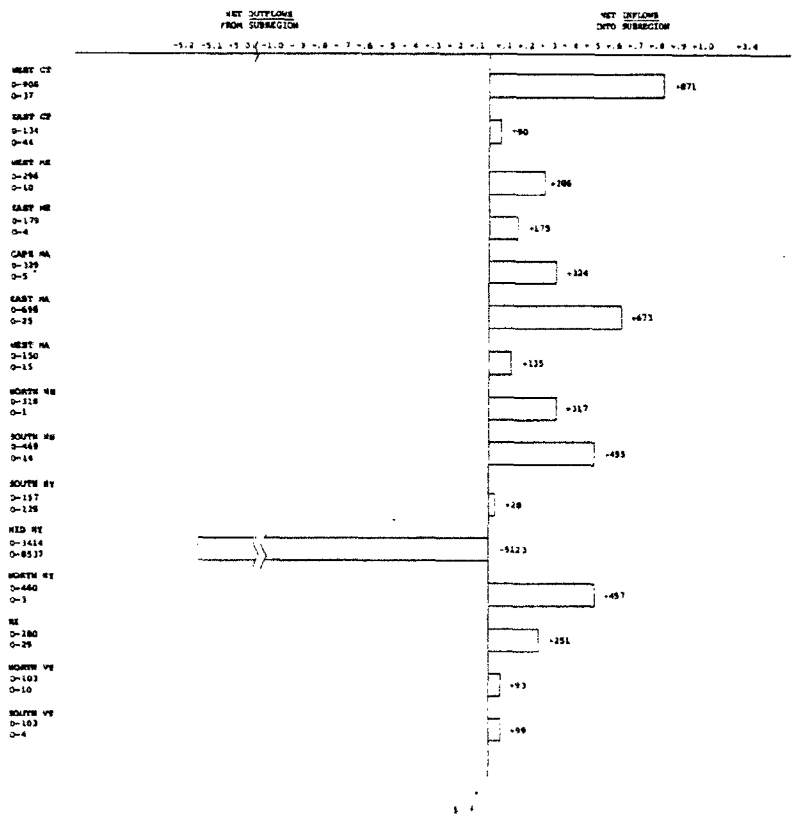


TABLE 12

NET INFLOWS IN OTHER SUBREGIONS FROM MID NEW YORK

(1977 TOTAL ACTIVITY DAYS -IN 000- FOR HIKING & WILDERNESS CAMPING)



A SIMULATION MODEL FOR FORECASTING DOWNHILL SKI PARTICIPATION[1]

Daniel J. Stynes
Department of Park and Recreation Resources
Michigan State University
East Lansing, MI

Daniel M. Spotts
Department of Park and Recreation Resources
Michigan State University
East Lansing, MI

INTRODUCTION

The purpose of this paper is to describe progress in the development of a general computer simulation model to forecast future levels of outdoor recreation participation. The model is applied and tested for downhill skiing in Michigan.

The approach combines a cohort-survival population model with a simple recursive model of skier adoption and dropout decisions. It has been implemented for computer simulation in FORTRAN. Simulations of numbers of skiers (both active and inactive) and their characteristics (age, length of involvement) can be generated for any year between 1950 and 2000. By altering model inputs the user may generate a variety of future scenarios and test various downhill ski promotion and development strategies.

THE APPROACH - COMPUTER SIMULATION

A number of distinct forecasting models have been applied to the prediction of outdoor recreation participation. These are reviewed in Moeller and Echelberger (1974) and Stynes, Bevins, and Brown (1980). Two step linear regression models and simple trend extension methods predominate. Diffusion models (West 1977, Stynes and Szcodronski 1980) and Delphi studies (Moeller et al. 1977) have also been used to predict future participation and characteristics of outdoor recreation activity.

Perhaps the most serious problem with simple analytic forecasting models is their failure to incorporate the time dimension in a meaningful way. The models are mostly static, or at best comparative static. Many are based upon cross-sectional data and do not include dynamic structural features or processes. The models do not therefore work well in a dynamic environment and they generally fail to shed much light upon the processes which underlie trends in outdoor recreation participation.

We argue here that recreation systems are quite dynamic, characterized by timelags, feedback effects, and interactions between variables over time. Understanding of these dynamic processes could yield significant improvements in our ability to forecast the behavior of recreation systems. Simulation models are more suited to the exploration and modeling of such processes.

The Limits to Growth models (Meadows 1972) are perhaps the most widely known applications of computer simulation to futures research. Within recreation, computer simulation models have been applied to planning and management. The Wilderness Travel Simulator (Shechter and Lucas 1978, Smith and Krutilla 1976) and recreation trip distribution models (Cesario 1975, Ellis and Van Doren 1967) are good examples. Ladany (1975) includes a number of simulation models in his collection, Management Science Applications to Leisure Time Operations. More widespread application of these techniques, including forecasting applications, have been constrained by a lack of suitable data bases, lack of needed simulation and modeling skills within recreation, and limited progress in quantification of relationships describing outdoor recreation behavior patterns.

Computer simulation models have several advantages over analytic approaches:

1. They are more realistic, more easily

[1]Paper presented at the National Outdoor Recreation Trends Symposium, Durham, NH, April 20-23, 1980.

understood, and more persuasive.

2. They are more flexible - no standard assumptions, easily modified, and lend themselves to a component approach.

3. They treat time in a meaningful way.

4. They permit a wide range of experiments on the model.

5. They "facilitate understanding of complicated systems of relationships relevant to policymaking". (Hamilton 1969)

6. They contribute to theory development, guide research, and pinpoint data collection priorities.

There are, of course, corresponding disadvantages. Model development can be expensive and complex, simulation models often have extensive and unique data requirements, and model validation is not straightforward.

In this case, the lack of good time series data on skiing ruled out a trend extension model. Existing data was scattered, of inconsistent quality, and very limited except for the two years 1968 and 1978. Even this data was not well-suited to estimating the numbers of skiers or the volume of skiing activity in Michigan. Hypothesized errors in the data bases did not recommend a purely "statistical" approach. Limitations in the data would have to be compensated for by a model which captured important structural features of downhill ski participation decisions.

Given the state of knowledge about the ski market and uncertainty about the future, our purpose became one of not so much to forecast the future, but to create a better understanding of the forces likely to affect the future of downhill skiing in Michigan and to permit the testing of alternative actions. The simulation model is designed to be a tool that ski area managers, planners, and marketing personnel might use to better understand the future and to assist in decision making.

A model was desired that could be adapted, extended, and refined as our understanding of the ski market increases and as the variables influencing skier decisions change over time. A secondary purpose of the model is to guide future research and data collection. The potential long-term benefits of a computer simulation model strongly recommended this approach.

MODEL SUMMARY

The forecasting model combines a cohort-survival population model with a similar model of skier adoption, dropout, and readoption decisions. The population component of the model updates the age structure of the population each year based upon estimates of fertility and mortality.

The skier component of the model determines the numbers of persons of each age that are (1) active skiers, (2) inactive skiers, and (3) non-skiers. Active and inactive skiers are further divided by years of experience in downhill skiing. The model is recursive. Rates of adoption, dropout, and readoption are applied to populations in year N to determine the numbers of active skiers, inactive skiers, and non-skiers in year N+1. New adopters are taken from the population of non-skiers and dropouts move from active to inactive status. Readoption rates are applied to the population of inactive skiers to estimate the number returning to active status each year (Figure 1).

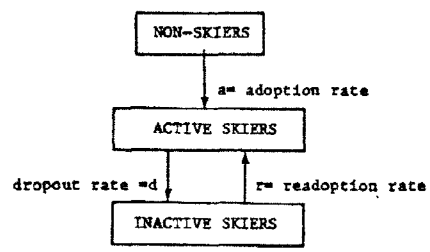


Figure 1. Skier Adoption, Dropout, and Readoption

Adoption, dropout, and readoption rates are all age-specific. This permits the modeling of relationships between family life cycles and ski activity. Age is correlated with income, physical ability, lifestyle, marital status, presence of children of various ages within the household, etc. Thus, age serves as a proxy for a number of variables influencing ski participation decisions

Dropout rates also depend upon an individual's length of involvement in skiing. Dropout rates are relatively high for first-time skiers and decline with increasing experience in the sport. The model also includes exogenously determined variables that permits the user to adjust adoption and dropout rates over time due to age-independent factors. Entry and exit rates may be altered based upon snow conditions, price increases, travel restrictions, and other variables that have not yet been incorporated into the model. The flexibility in the model permits the addition of new variables and components in the future.

PARAMETER ESTIMATION

The ski forecasting model consists of two principal components: a population model and a skier decision model. Parameters for the cohort-survival population model are the standard fertility, mortality, and migration rates. The interested reader is referred to Pittenger (1976) and Shyrock (1971) for further details on estimating vital rates for populations.

Our concern here is primarily with the skier decision model. The key parameters are age-specific adoption, dropout, and readoption rates for each year. Existing empirical data is not well-suited to straightforward estimation of these parameters. Time series data to estimate changes in rates over time are totally lacking. Adoption, dropout, and readoption rates were therefore estimated using a variety of both statistical and heuristic techniques. Parameters were first estimated independently. Simulation experiments were conducted and parameters were subsequently adjusted iteratively until model behavior was deemed reasonable and selected model outputs corresponded with empirical observations. Inconsistency in empirical data sets required judgement in selecting those variables to focus upon in statistical fitting porcedures.

Data Base

Parameter estimation and model validation draw upon two primary data bases on Michigan downhill skiers. The first complete data on Michigan skiers is provided by Leuschner (1970) in a survey of the North Central region in 1968. A 1978 Michigan skier market survey (Stynes, Mahoney, and Spotts, 1980; Stynes and Mahoney, 1980) provides the data most suited to development of the forecasting model. These two years of fairly comprehensive surveys are supplemented by national survey data from LaPage (1978) where necessary, and from selected reports of estimates of skier volumes found in Domoy (1977) and Farwell (1977).

The 1978 Michigan skier market survey gathered extensive data on adoption, inactivity, and withdrawal from downhill skiing. Active and inactive skiers were included in the design, and recall questions were used to estimate the age and year of adoption and dropout. This recall data forms the basis for estimation of age-specific adoption and dropout rates overtime. Where data was lacking, product life cycle and related theories were used to fill in gaps.

Adoption Rates

The adoption rate for individuals in age group I for year N is given by a product of two terms:

$$a^N(I) = a_1^N * a_2(I)$$

$a_2(I)$ is the adoption rate for age group I in 1970, i.e., the percent of non-skiers adopting in the year.[2] a_1^N is an exogenously determined adjustment factor permitting the model user to adjust adoption rates over time.[3] Figure 2 plots the recommended values for a_1^N for those years N between 1950 and 1978. These were estimated from Stynes and Mahoney (1980).

$a_2(I)$ are age-specific adoption rates. These were estimated for 1970 by distributing new skiers into three year age groups using an empirical distribution measured by Stynes and Mahoney (1980). The age at adoption was calculated for 503 active and former skiers. The resulting distribution is plotted in Figure 3. These estimates represent skiers adopting between the years of 1946 and 1978 and will to some extent reflect the age distribution of the population over this period. We assume that the age distribution of adopters given by Figure 3 is constant over time and can be applied to any year to distribute new skiers by age. Empirical data supports this assumption.

Dropout Rates

Dropout rates include three components. The dropout rate for individuals age I with J years of experience in year N is given by:

$$d^N(I,J) = d_1(N) * d_2(I) * d_3(J)$$

Dropout rates depend upon the year (N), the age of the skier (I), and the number of years of experience (J). These three components are assumed to be independent and to enter multiplicatively. The assumption of independence between age and length of involvement is clearly invalid, but sufficient data did not exist to estimate a joint relationship of the form $d_4(I,J)$.

[2] 1970 was selected as a base year because of fairly accurate estimates for both population (1970 Census data) and numbers of new skiers (estimated from Leuschner 1970, Stynes and Mahoney 1980, and Farwell 1977).

[3] a_1^N for N=1970 should be approximately 1.0. Values of a_1^N larger than one yield higher adoption rates than those observed for 1970, while values less than one yield rates lower than the 1970 standard.

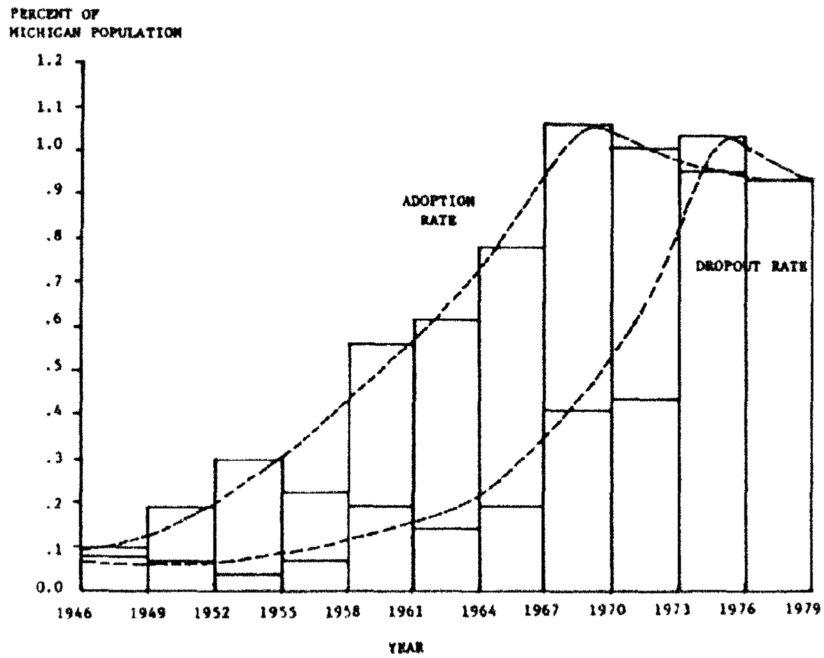


Figure 2. Estimated Adoption and Dropout Rates By Year

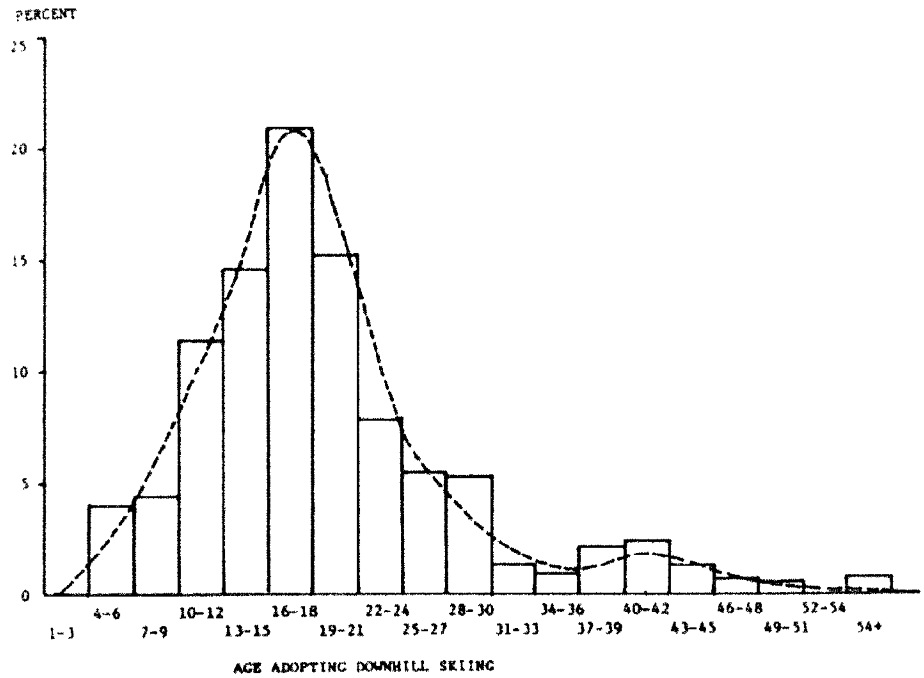


FIGURE 3. Distribution of Skiers By Age at Adoption

The first two components are directly analogous to the corresponding adoption functions, and are estimated in a similar manner. $d_1(N)$ is an exogenously determined variable permitting the user to adjust dropout rates over time. $d_2(I)$ are age-specific dropout rates assumed to be independent of N and estimated for the base year 1970. Figure 4 gives the distribution by age dropped for all inactive and dropout skiers surveyed in the 1978 Michigan ski market survey. Figure 2 plots recommended values for $d_1(N)$. These estimates should be used cautiously as they are based upon limited data.

No data exists to estimate $d_3(J)$, the relationship between dropout rates and length of involvement in skiing. An inverse square root function is assumed.

Readoption Rates

There is little data on which to base estimates of readoption. Age-specific readoption rates are based primarily upon the author's judgment and some simple experiments with the simulation model. It was assumed that readoption rates would roughly parallel adoption rates.

VALIDATION AND TESTING

Since model refinement and testing are still in progress we shall only briefly discuss validation here. It will suffice to indicate the general behavior of the model and illustrate the various model outputs. Shechter and Lucas (1978) provide a good discussion and summary of alternative methods for validating simulation models. Forecasting models offer an additional difficulty in that the "true" results are unknown.

The model's behavior is illustrated by first simulating from the year 1950 to the present and then examining forecasts to the year 2000 under alternative assumptions about the future.

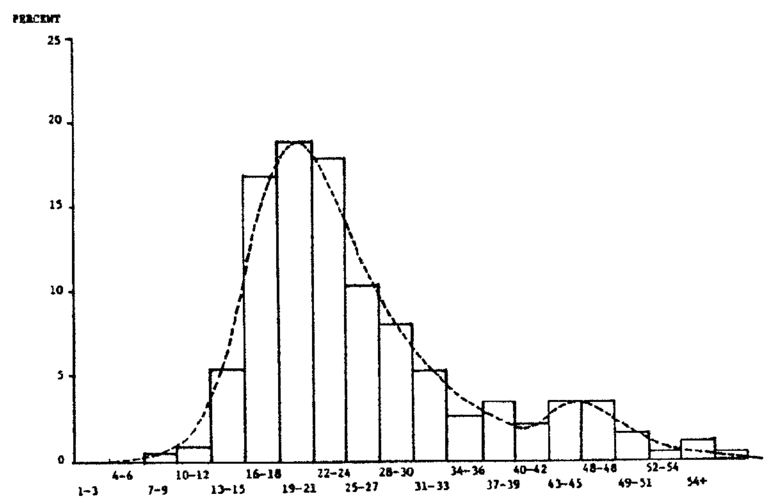


Figure 4. Distribution of Inactive Skiers by Age when Last Skied

Simulating from 1950 to 1978

The year 1950 was selected as an initial year for downhill skiing in Michigan.[4] The model was initialized using 1950 Census data for non-skiers and begun with no active or inactive skiers. A 28 year simulation period was set. Selected model outputs over this 28 year period are summarized in Tables 1-3 and Figure 5.

Simulation model results were compared with empirical data from Leuschner (1970), Stynes and Mahoney (1980), and other relevant studies of Michigan skiers. The comparisons indicate that the model predicts quite accurately both the numbers of skiers and their distribution by age and length of involvement. Leuschner estimates about 128,500 skiers in 1968 (compared with model prediction of 140,700). Leuschner included only skiers 13 years of age and older while the model keeps track of skiers 7 years and older. By 1975 active skier numbers reach 263,000. Estimating about 9 days of skiing per skier that year, this compares favorably with Domoy's (1977) estimate of 2.2 million lift tickets sold in Michigan (skier days). Growth rates of about 10% in the early 1970's drop to about 4% by 1978, resulting in just over 300,000 skiers in 1978.

Distributions of skiers by age and length of involvement compare favorably with the 1978 Michigan survey after corrections for population differences. (The Michigan survey only interviewed skiers 18 years of age and older). The 1978 Michigan skier market survey estimated that 35% of former skiers had skied only one year prior to quitting (compared with 37% predicted by the model). Also the ratio of active skiers to inactives in 1978 is almost exactly 1:2, precisely the ratio measured in the 1978 survey.

In summary, the model predicts skier numbers and characteristics for the year 1978 quite well. Of course some of this same data was used in estimating model parameters so that these comparisons do not provide a true test of the model. This will require future measurements of Michigan's skier population in order to test the model's predictive abilities.

4 We know both ski resorts and skiers existed prior to 1950, but it is assumed that the numbers of skiers in 1950 were small enough compared with growth over the next decade to have little effect on model outputs by 1968.

Table 1. Downhill Ski Simulation 1951-1978

Numbers of Skiers (Thousands)

Year	Active Skiers	Inactive Skiers	Adopters	Dropouts	Readopters
1951	6	0	6	0	0
1952	9	3	7	3	0
1953	12	8	8	5	1
1954	16	13	8	6	1
1955	20	20	10	8	1
1956	24	26	11	9	2
1957	29	34	13	11	3
1958	35	43	14	13	4
1959	41	53	16	15	5
1960	48	64	18	18	7
1961	56	77	20	21	8
1962	65	92	23	24	9
1963	75	108	26	27	11
1964	87	126	29	31	13
1965	99	146	32	36	15
1966	111	169	34	40	18
1967	125	193	38	45	20
1968	140	220	42	50	23
1969	157	249	46	56	26
1970	175	282	50	62	30
1971	194	317	54	69	33
1972	213	356	57	76	37
1973	232	397	59	83	42
1974	248	439	58	89	46
1975	263	482	57	93	51
1976	277	524	56	97	55
1977	290	566	54	101	59
1978	301	606	51	103	63

Table 2. Downhill Ski Simulation 1951-1978

Distribution of Active Skiers

Year	AGE					YRS EXPERIENCE		
	7-12	13-18	19-24	25-30	31+	1	2	9+
	percent					percent		
1951	16	25	27	16	14	100	0	0
1952	16	25	26	16	14	74	25	0
1953	16	25	26	16	14	62	26	0
1954	16	25	26	16	14	54	26	0
1955	16	26	26	16	14	49	25	0
1956	15	26	27	16	14	45	25	0
1957	15	26	27	16	14	44	23	0
1958	15	26	27	16	14	41	23	0
1959	14	26	27	16	14	39	23	1
1960	14	27	27	16	14	38	22	1
1961	13	26	27	17	14	36	21	1
1962	13	25	27	17	15	35	21	2
1963	13	26	27	17	15	34	21	3
1964	13	26	27	17	15	33	20	3
1965	12	26	28	17	15	32	20	4
1966	11	25	28	18	15	31	20	5
1967	11	25	28	19	16	30	19	5
1968	10	25	28	19	16	30	19	6
1969	10	25	28	19	16	29	19	7
1970	9	24	29	19	16	28	19	7
1971	8	24	29	20	17	28	18	8
1972	8	23	29	21	17	26	18	9
1973	7	22	29	21	18	25	18	9
1974	7	21	30	21	19	23	18	10
1975	6	20	30	23	20	22	17	11
1976	6	18	29	24	21	20	17	12
1977	5	17	29	24	22	18	16	13
1978	5	15	28	25	24	17	15	15

Table 3. Downhill Ski Simulation 1951-1978

Distribution of Inactive Skiers

Year	AGE 7-12	13-18	19-24	25-30	31+	YRS EXPERIENCE 1	2	9+
	percent					percent		
1951	0	0	0	0	0	0	0	0
1952	11	21	30	17	19	100	0	0
1953	10	20	30	18	20	87	12	0
1954	9	19	30	18	22	79	16	0
1955	8	19	29	19	23	74	18	0
1956	7	18	29	19	24	69	20	0
1957	7	18	29	19	26	65	20	0
1958	6	17	28	19	27	63	20	0
1959	6	17	27	20	28	60	21	0
1960	5	17	27	20	28	58	21	0
1961	5	16	27	20	29	56	21	0
1962	5	16	27	21	30	55	21	0
1963	5	16	26	21	30	53	21	1
1964	5	16	26	20	31	52	21	1
1965	4	15	26	20	31	51	21	1
1966	4	15	26	20	32	50	21	1
1967	4	15	26	21	33	49	21	1
1968	4	15	25	21	33	48	20	2
1969	3	14	26	21	34	47	20	2
1970	3	14	26	20	34	46	20	2
1971	3	13	25	21	35	45	20	3
1972	2	13	25	22	36	44	20	3
1973	2	12	25	22	37	43	20	3
1974	2	11	25	22	37	42	20	4
1975	2	11	25	22	38	41	20	4
1976	2	10	24	23	39	40	20	5
1977	1	9	23	23	41	38	20	5
1978	1	8	22	23	43	37	19	6

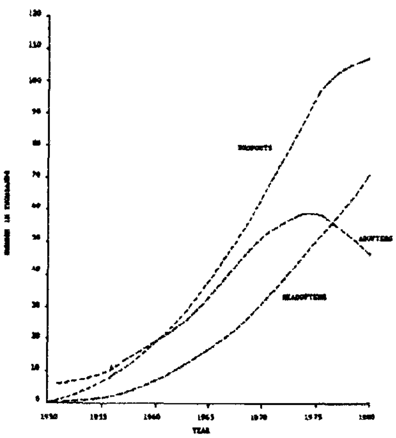


Figure 5. Growth in Downhill Ski Adoption, Dropout and Readoption 1950-1980.

However, the model's ability to begin in 1950 with no skiers and simulate 28 years ahead to accurately describe Michigan's 1978 active and inactive skier populations is very encouraging.

Formal comparisons of model outputs with empirical data bases raises a number of questions. First of all, the model produces a much greater volume of quite specific information than can be found in any empirical study. The model can predict, for example, the numbe of active or inactive skiers in 1962 who are 10 years old and have been skiing two years. No one would ever attempt to estimate this figure empirically. Secondly, empirical data generally does not precisely correspond with the model's outputs and survey data is subject to perhaps quite significant measurement errors. Differences in populations (age restrictions in surveys, for example), recall errors, and the manner in which surveys define "active" skiers are just a few of the problems that arise. Thus, in comparing model outputs with empirical data one cannot confidently assume that the empirical figure is the "true" measure. Rowan (1980) has noted the inconsistency in estimates of numbers of skiers nationally. In examining data on Michigan skiers, we uncovered similar inconsistencies.

Forecasting Experiments

Although additional model experimentation, refinement, and testing are required before the model can be used in policy analysis, we can illustrate the model's potential contribution by means of four simple experiments. In each case the model is initialized for the year 1978 and forecasts are generated through the year 2000 under alternative assumptions. The scenarios were selected to illustrate a range of possibilities.

Forecast #1 takes an optimistic view assuming that growth rates observed in 1970 will continue to the year 2000. Even under this optimistic scenario the numbers of skiers peak at 414,000 by the year 2000. The curve exhibits and S-shaped (logistic) pattern characteristic of the product life cycle (Kotler 1976). The eventual decline is in part due to an aging population structure, and also a result of market saturation. This scenario yields an active skier population in the year 2000 that is significantly older and more experienced than today's skiers.

Forecast #2 assumes a reduction in both dropout and adoption rates. This would characterize a sport with more limited entry, but with existing skiers remaining active a little longer. Skiers reach a peak in 1990 of about 373,000 and then decline to about 350,000 by the year 2000. The pattern is similar to scenario #1, but peaks a decade earlier and at a lower level.

Forecast #3 assumes a decline in adoption rates and an increase in dropout rates. It reflects a general diminishing in popularity of the sport. Under these assumptions numbers of active skiers fall to 265,000, receive a small boost from the second "baby boom," and then drop to 240,000 by the year 2000.

Forecast #4, the most pessimistic scenario, assumes that adoption rates fall to one-fifth of their 1970 values and dropout rates increase by 25%. Skier numbers drop off immediately and rapidly to less than 200,000 by 1990 and to 139,000 by the year 2000. The scenario illustrates that even under quite radical assumptions, the downhill ski market has a certain degree of inertia that will provide a degree of stability. (Figure 6)

These scenarios have illustrated only the simplest of forecasting experiments. The user may also adjust readoption rates or age-specific adoption and dropout rates to simulate skier numbers under more complex assumptions about the future. For example, a promotional campaign aimed at returning inactive skiers, or attracting skiers from older age groups could be simulated by adjusting the relevant age-specific readoption or adoption rates for years after 1980.

Experiments can also examine more datiled characteristics of future downhill ski populations. Under most scenarios future skier populations are more experienced and older than

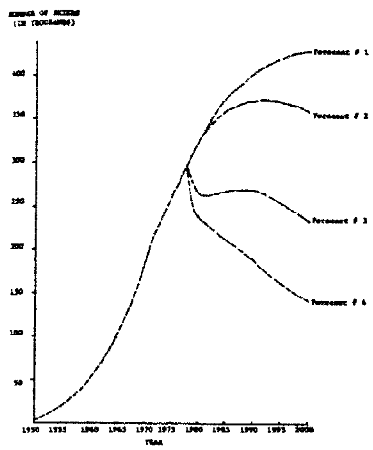


Figure 6. Downhill Ski Forecasts to the Year 2000.

today's downhill skiers. This suggests changes in marketing and ski area offerings. One may test the effects of alternative population scenarios. In one experiment the population and age structure were fixed at 1950 levels and skier numbers were simulated to 1978. This resulted in 100,000 fewer skiers than under observed population growth, indicating that approximately half of the growth in numbers of skiers since the mid-sixties can be attributed to population changes. The remainder is due to expansion in supply of skiing opportunities and increased popularity of the sport.

FUTURE MODEL DEVELOPMENT AND TESTING

Although the simulation model is operational, more testing is needed before the model can be used directly in policy analysis. Sensitivity analyses should be conducted on model parameters in order to better understand the effects of small changes in parameters on model results. This will also pinpoint key data needs of the model and guide future data collection efforts. Improved time series data on skier visits and numbers should be collected in a consistent manner in order to evaluate the predictive ability of the model and to revise and update parameter estimates. Model testing should be conducted with ski area personnel, who have a more intimate knowledge of the industry.

As with most simulation models, the number and variety of possible refinements is virtually endless. We have interrupted model testing and development in order to summarize our progress to date. There are four additions to the model that we recommend:

(1) Adding a weather variable to account for good and bad snow years

(2) Adding growth in potential substitutes like cross country skiing

(3) Predicting skier days in additon to numbers of skiers

(4) Development of a regional model

The development of a regional model is the most complex and costly and also of the greatest potential benefit. This would involve dividing the state into regions, expanding the population model to a regional one, estimating demand and supply of skiing in each region, and then predicting origin-destination patterns using a trip distribution model.

The regional model would require more data on skier trip patterns and population change within each region. Such a model could provide forecasts of more use to individual ski areas and assist in making regional development and promotion decisions.

GENERAL MODEL EVALUATION AND CONCLUSIONS

Although the model is still in a testing phase, a number of advantages over alternative forecasting approaches are already evident. Not to be overlooked is the knowledge and insight gained in the model development process itself. Raser, Campbell, and Chadwick (1970) cite five ways that simulation modeling contributes to theory development:

(1) Confrontation - modelers must confront what they do not know

(2) Explication - simulation modeling forces precise specification of relationships and assumptions

(3) Expansion - it forces a broadened, more comprehensive view

(4) Involvement - it stimulates the researcher to fill in gaps

(5) Serendipity - simulations reveal new problems, new solutions and new hypotheses

Our experience with this model confirms these advantages of computer simulation models.

The model provided a framework for evaluating the comparability and consistency of past empirical studies of downhill skiing. Many ambiguities and inconsistencies in reported market studies and forecasts were identified. Efforts to estimate model parameters and validate the model uncovered a number of gaps in existing data bases. Concentration upon active skiers in market surveys has resulted in a limited understanding of inactivity and downhill ski entry and exit decisions.

How do dropout rates change with length of involvement? Under what circumstances and at what ages do individuals tend to adopt or drop the sport? Is Michigan a net importer or exporter of downhill skiers? What are the short and long term impacts of a poor snow year on the sport? What effects will growth in cross country skiing and changing energy conditions have on downhill skiing's future? These and other questions arose during stages of model development, parameter estimation, validation, and refinement. Answers to these types of questions from future research can be directly translated into improvements and refinements of the simulation model. The simulation model therefore plays a much stronger role in the research process than one generally finds with more traditional types of models.

In concluding we discuss what we view as the five most important features of the model and then briefly address model limitations.

(1) The model is dynamic. It not only can predict change over time, but its basic structure captures the processes of entry and exit within the ski market. Timelags, feeback effects, and other dynamic features of the model can be explored to better understand change in recreation activity markets. In particular, the model illustrates a number of general growth concepts and theories including the product life cycle, diffusion theories, market saturation, and consumer involvement cycles. These processes may be generalized to other activities.

(2) The model is both simple and logical. Adoption, dropout, and readoption of activities are easily understood processes. Complexity is introduced in the model primarily in the estimation of critical model parameters. This permits a separation of the more technical aspects of the model from the more easily understood, making the model easy to use and understand for practitioners, while permitting researchers to explore more detailed and complex features of the model and the system being modeled.

(3) The model is completely general. It could be applied to virtually any activity or product in any state or region. One must simply add a population model for the region in question and estimate adoption, dropout, and readoption rates over time. The generality of the model facilitates the transfer of findings about recreation activity dynamics across regions and activities.

(4) The model is extremely flexible. It can generate an infinite array of outputs in a variety of forms. Components may be easily added to the model. Thus, it provides a framework for both guiding and integrating future research on recreation participation decisions.

(5) Finally, the model may be used in a variety of settings. Researchers will find it useful in suggesting hypotheses and in exploring dynamic aspects of the ski market. The model can also help in directing future data collection efforts by identifying gaps or inconsistencies in current data and suggesting the relative importance of precision in the measurement of different variables. For ski area personnel and students, the model may be used in a gaming format to explore futures and to test the relative effects of alternative promotional and development strategies. The effects of population change can be dramatically illustrated with the model.

Since the model in its current state is a statewide aggregated model, it cannot be tied directly to individual ski area decisions. It can however contribute to broader statewide and industrywide policy and promotion decisions. While the model could be disaggregated into a regional model including ski travel behavior, this refinement would require considerably more modeling and data collection.

Limitations of the model relate primarily to the lack of data that are ideally suited for parameter estimation or validation. The model requires estimates of adoption, dropout, and readoption rates over time. Future research should develop models to predict these rates based upon social, economic, and environmental variables. Such relationships could then be added to the existing model to internalize relationships that must presently be estimated outside the model.

Development of the model cost about $5000. A similar amount was required for the 1978 Michigan ski market survey, which in addition to gathering data to estimate model parameters, also produced two ski marketing reports (Stynes, Mahoney and Spotts 1980, Stynes and Mahoney 1980). A typical forecast to the year 2000 costs less than a dollar in computer costs and generates a wealth of data. Computer simulation models do not have to be expensive.

LITERATURE CITED

Cesario, Frank J. 1975. A Simulation Approach to Outdoor Recreation Planning. J. of Leisure Research 7(1):38-52.

Cicchetti, C.J. 1973. Forecasting Recreation in the United States. D.C. Heath. Lexington, Mass.

Domoy, Francis. M. 1977. An Employment Analysis of the Michigan Ski Industry. Michigan State University Agricultural Experiment Station Research Report No. 329. East Lansing.

Ellis, J. and C. VanDoren. 1967. A Comparative Evaluation of Gravity and Systems Theory Models for Statewide Recreation Flows. J. of Regional Science 6:57-70.

Farwell, Ted and Associates. 1977. Skiing Demand and Supply Study for the Lower Peninsula of the State of Michigan. Report prepared for the U.S. Forest Service, Huron-Manistee National Forest, Cadillac, Michigan.

Hamilton, H.R. et al. 1969. Systems Simulation for Regional Analysis: An Application to River Basin Planning. Cambridge, Mass.: MIT Press.

Ladany, Shaul F. (ed). 1975. Management Science Applications to Leisure Time Operations. American Elsevier. New York.

LaPage, Wilbur F. 1978. Growth Potential of the Skier Market. Review Draft. USDA Forest Service, Northeastern Forest Experiment Station. Broomall, PA.

Leuschner, William A. 1970. Skiing in the Great Lakes States: The Industry and the Skier. USDA Forest Service Research Paper NC-46. North Central Forest Experiment Station. St. Paul, Mn.

Meadows, Donella H., Dennis L. Meadows, Jorgen Randers, and William W. Behrens III. 1972. The Limits to Growth. Potomac Associates. New York.

Moeller, George H. and Herbert E. Echelberger. 1974. Approaches to Forecasting Recreation Consumption. Outdoor Recreation Research: Applying the Results. U.S. Forest Service General Technical Report NC-9. St. Paul, Mn.

Moeller, George H., Elwood L. Shafer, and Russell Getty. 1977. Leisure Environments of Tomorrow. Outdoor Recreation: Advances in Application of Economics. US Forest Service General Technical Report WO-2. New Orleans, La.

Pittenger, Donald B. 1976. Projecting State and Local Populations. Ballinger: Cambridge, MA.

Raser, John R., Donald T. Campbell and Richard W. Chadwick. 1970. Gaming and Simulation for Developing Theory Relevant to International Relations. General Systems 15:183-203.

Rowan, David. 1979. The Great Numbers Game. Ski Area Management. 18(3):14-18.

Shechter, Mordechai and Robert C. Lucas. 1978. Simulation of Recreational Use for Park and Wilderness Management. John Hopkins, Baltimore.

Shryock, Henry S., Jacob S. Siegel, and Associates. 1971. The Methods and Materials of Demography. Volume 2. US Department of Commerce, Bureau of the Census. Washington, D.C.

Smith, V. Kerry and John V. Krutilla. 1976. Structure and Properties of a Wilderness Travel Simulator. John Hopkins, Baltimore.

Stynes, Daniel J. 1979. A Simulation Approach to the Determination of Recreation Carrying Capacity. Proceedings National Workshop on Computers in Recreation and Parks. August 1-3, 1979. St. Louis, Missouri. National Recreation and Park Association.

Stynes, Daniel J., Edward M. Mahoney and Daniel M. Spotts. 1980. Michigan Downhill Ski Marketing Study: A Comparison of Active, Inactive, Dropout and Potential Skier Market Segments. Michigan State University Agricultural Experiment Station Research Report 389.

Stynes, Daniel J., and Edward M. Mahoney. 1980. Michigan Downhill Ski Marketing Study: Segmenting Active Skiers. Michigan State University Agricultural Experiment Station Research Report No. 391. East Lansing.

Stynes, Daniel J., and Kevin Szcodronski. 1980. Predicting Trends in Michigan Snowmobile Populations Using Product Life Cycle and Diffusion of Innovations Theories. Proceedings of the First North American Symposium on Dispersed Winter Recreation. University of Minnesota, St. Paul. (to appear May 1980).

Stynes, D.J., M.I. Bevins, and T.L. Brown. 1980. Trends or Methodological Differences? Proceedings 1980 National Outdoor Recreation Trends Symposium. Northeastern Forest Experiment Station. Broomall, PA.

West, Patrick C. 1977. A Status Group Dynamics Approach to Predicting Participation Rates in Regional Recreation Demand Studies. Land Economics 53(2):196-211.

"THE DYNAMICS OF RECREATION PARTICIPATION: SKI TOURING IN MINNESOTA"

Timothy B. Knopp, Associate Professor
University of Minnesota
College of Forestry
Department of Forest Resources
110 Green Hall
1530 North Cleveland Avenue
St. Paul, MN

G. Ballman
University of Minnesota
College of Forestry
Department of Forest Resources
110 Green Hall
1530 North Cleveland Avenue
St. Paul, MN

L. C. Merriam
University of Minnesota
College of Forestry
Department of Forest Resources
110 Green Hall
1530 North Cleveland Avenue
St. Paul, MN

ABSTRACT:

A realistic model or framework for the analysis of recreation behavior must be both comprehensive and dynamic. Most attempts to explain recreation behavior are static in that they do not allow for changes in the character of an activity or the evolution of a participant's involvement. Even predictive models tend to assume that relationships remain constant over time. A dynamic model is especially critical in the analysis of new, rapidly evolving forms of recreation.

The recent, rapid growth of ski touring in Minnesota provides an ideal opportunity to document and analyze the dynamics of participation. The parallel growth of snowmobiling is a basis for comparison and the chance to examine the effect of alternative forms of recreation on participation.

Questionnaire responses from a random sample of Minnesota ski tourers (1978) provided data used to examine two important aspects of internal dynamics. First, as the dominant image of ski touring changes we can expect a corresponding change in the motivations of persons taking up the activity. Second, as skiers increase in skill and experience they will seek more challenging situations and a greater variety of opportunities. These hypotheses were tested by comparing recent adherents to more experienced skiers.

Newer adherents were more likely to be female and less likely to be college graduates. Comparisons of age and residency were inconclusive. Participation in other forms of winter recreation relate to ski touring in a variety of ways. A growing percentage of those taking up ski touring have participated in snowmobiling. The pursuit of exercise and the outdoor environment have consistently been primary reasons for taking up the sport. The influence of friends appears to be an increasing factor. While self-rated skill level is directly correlated with years of experience, there is only a slight tendency for new skiers to prefer well groomed and marked trails, and a tendency to label longer trails and remote areas undesirable.

INTRODUCTION

A good deal of research effort has been directed toward predicting trends in the rate of participation in various recreational activities. To a large extent these have relied on extrapolations or empirically derived correlations between participation rates and the socio-economic characteristics of a population. We are now beginning to take the next step, i.e., the identification of mechanisms which explain changes.

Several individuals, including Christy (1970) and Meyersohn (1957), have described what they feel are the important determinants of "mass" recreation or "fads". More recently West (1977) developed an innovative "status group dynamic approach to predicting participation rates". While the latter goes a long way toward explaining and quantifying change, it relies heavily on the validity of the status concept and the symbolic function of recreation activities.

Motivational research has contributed a great deal to our understanding of why people participate in various activities. In particular the recent models and scales developed by Driver and Brown (Driver 1977); (Driver and Brown 1975) have brought this approach to a high level of sophistication. Tinsley (1977; 1978) has also contibuted a great deal to an understanding of motivations and need satisfaction. However, many of the concepts in motivational research are somewhat static in that they seldom allow for changes within the individual or in the character of the activity.

There is an obvious need for a comprehensive, dynamic framework which identifies factors and relationships effecting changes in recreation participation. We can begin by making unstructured, but detailed, observations of specific activities over time. Once a skeleton framework has been developed we can fill it in with statistical analyses of the linkages and mechanisms operating within the framework.

The recent, rapid growth in the popularity of ski touring in Minnesota provides an excellent opportunity for the approach outlined above. Although ancient in origin, the activity is relatively new in terms of mass participation in the United States. Some indication of the significance of this development can be ascertained by comparing the 1977-78 season Minnesota Department of Natural Resources (MDNR) estimate of 500,000 participants based on a statewide, random survey, with the few hundred to a thousand ski tourers present in 1965. Current figures show an annual growth rate of from 20 to 30 percent (Ballman, 1979).

We will begin by describing the various mechanisms believed to be operating in the evolution of ski touring in Minnesota. Many of these mechanisms can be abstracted in the sense that they probably operate to a greater or lesser extent in the history of any recreational activity. As far as is possible these mechanisms will be systematically linked within a comprehensive framework.

Next we will utilize recent data from a statewide survey of ski touring participants in Minnesota to test some of the mechanisms suggested in the first part. No data set can completely encompass the complexities of recreation participation. It is critical that any statistical analysis be proceeded by the development of a comprehensive framework so that the data can be kept in perspective and we can avoid the temptation to adopt narrow, self-contained explanations of behavior.

A FRAMEWORK FOR ANALYSIS

This framework is derived from unstructured and structured observation, the contributions of previous research, and an intuitive notion of recreation behavior. The framework consists of the various mechanisms which can influence recreation participation and the patterns of change over time. The growth and evolution of ski touring in Minnesota will be used to illustrate the framework. In this initial discussion no attempt will be made to quantify the effect of any specific factor, this will be left to an analysis of survey data. Some difficulties will be encountered where the same factor can influence different persons in dramatically opposite ways.

Defining Participation

Before we can begin to describe the factors influencing participation we must deal with the meaning of the term participation. Participation has both quality and quantity dimensions. The latter can be expressed in terms of numbers of individuals, man-hours, visitor days, or miles skied. These measures must be defined still further to be operationalized. If we are concerned with numbers it is necessary to list the criteria for inclusion; e.g., who do we consider a ski tourer? Anyone who has ever skied, or those who have skied a minimum number of miles in the past season. For some purposes "dollars invested" may be an appropriate criteria.

Man-hours also requries a more explicit definition. Do we include travel or resort time, or only the hours on the trail? A visitor day has been standardized by the U.S. Forest Service and the National Park Service as an expression of occupancy. Although "visitor day" is a practical measure for making some crude comparisons, it is generally insensitive to subtle changes in the character of participation.

The quality dimension pertains to both the nature of the activity and the environment in which it takes place. Racing is a far differenet experience than casual touring or winter camping--all of which can take place in the same area. An urban park and a remote wilderness each provide a distinctly different experience even where the physical motions are the same.

We will not elaborate further on a definition of participation. The importance of explicit definitions will become more obvious as the discussion proceeds. Suffice it to say that any definition must be appropriate for the change or comparison which is being described and the purpose to which the analysis will be applied.

Inherent Appeal

Any analysis of participation dynamics must begin with a thorough familiarity with the inherent appeal of the activity(s) in question. There are three primary characteristics to consider: novelty, variation, and efficiency. Novelty is a function of "newness" or contrast with other pastimes. Our example, ski touring, has characteristics in common with a number of other forms of recreation. It can provide some of the thrills of downhill skiing; it allows access to many of the same environments as does snowmobiling; it can offer health benefits similar to running. In part the "uniqueness" of ski touring probably lies in the combination of benefits it can furnish.

But, in addition, ski touring has some subtle attributes which are revealed only by a more intimate acquaintance with the activity. Ski touring is a form of exercise that can be performed with "grace" and "dignity". By comparison, jogging is often associated with smelly sweat clothes and an ungainly shuffle. Another alternative, the bicycle, still has connotations of a child's toy for many adults. Ski touring provides the means to ease gently into an exercise routine; the transition from a leisurely stroll to a strenuous workout is gradual and without the distinct change of gait which separates walking from running. These, and other characteristics which are not obvious to a casual observer, may be important determinants of the activity's appeal.

Variation refers to the range of experiences possible within the scope of an activity. Ski touring can vary from a leisurely stroll to strenuous competitive racing. Access to different environments also contributes to variation. Ski touring, because it is relatively unobtrusive, is tolerated in residential areas and fragile wilderness areas. A ski tourer can choose between solitude and the mayhem of a mass start tour-race. Complementary facilities also add to variety. Lodging may consist of a hole in a snow drift or a luxury resort.

Efficiency is simply the net result of a tally of costs and benefits. Costs may include monetary investment, time, energy, inconvenience, negative image or stigma, and possible loss of social relationships. Variation contributes the most to the benefit side of the ledger. The value of a specific benefit, however, will depend on individual and collective needs.

Inherent appeal is most easily comprehended relative to alternative forms of recreation. All in all, ski touring probably rates quite high compared to the major winter outdoor alternatives currently available.

Sources of New Participants and Dropouts

Participation in ski touring is often thought of in terms of the number of individuals who have skied during the current season. Generally, numbers fluctuate for one of two reasons: 1) individuals enter or leave segments of the population with varying rates of participation, or 2) individuals are attracted to or repelled by the activity due to changes, real or perceived, in its character.

The character of an activity is the product of opportunities (facilities and natural conditions), the commercial impetus and the behavior of those participating.

The first mechanism can be understood fairly easily by examining the correlation of participation with traditional socioeconomic cohorts. For example, certain individuals will begin to participate at a minimum age and drop out when they consider themselves to old. Position in the family or career cycle also affects participation in somewhat predictable ways. Although these mechanisms are always operating, they can be used to explain or predict change only when an activity has stabilized in respect to the kinds of opportunities available and the image it presents; this is definitely not the case with ski touring during its recent evolution.

Ski touring began as a relatively obscure form of recreation often confused with downhill skiing. It was, and to some extent still is, perceived as the blind men described an elephant. Some thought it was cross-country racing; others viewed it as bushwacking through remote, untracked wilderness. Few people understood the full range of opportunities the activity could provide.

At the same time real changes were occurring. The sport grew more visible--via word of mouth, popularized articles and deliberate promotions on the part of organizations such as the United States Ski Association and local ski touring clubs. Later the commercial establishment joined the efforts to promote ski touring. While all segments of the population are affected by the increase in visibility, we cannot expect the effect to be equal in magnitude across the population. The better informed individuals are the first to become aware of any new opportunity. As an activity becomes generally well known other segments of the population may account for an increasing portion of new participants.

Opportunities in the form of areas and physical facilities have also changed. Marked and groomed trails became more plentiful. Beginning in the early 1970's "citizens' tour races" were organized and promoted. Increases in trails and areas did not keep pace with growing numbers; consequently skiers confronted crowds which weren't experienced by their predecessors. The image of ski touring as a social event became more pronounced.

Ski touring equipment has also evolved. Tough, easily maintained fiber-glass skis became gnerally available in the mid to late 1970's. Waxless skis appealed to the casual participant. Lightweight poles and bindings added to the array of choices. For some the refinements in equipment make the activity easier; for others the equipment itself may be an attraction.

All of these changes meant that ski touring was not the same activity it was during the earlier stages of its development. Some would find the activity more appealing because large numbers of participants had demonstrated that it is "acceptable" and beneficial. The enthusiasm of others may have waned because it is no longer as exclusive and uncrowded trails are more difficult to find. The net effect has obviously been positive. In spite of any dominant image, the full range of experiences is still available.

External Factors

Recreation behavior does not exist in a vacuum. Independent changes occurring in society can act to discourage or encourage participation. These include economic trends, value sets, the environmental setting and alternative forms of recreation.

An affluent society can afford more expensive playthings; conversely, hard times may stimulate interest in less costly activities. Ski touring requires a smaller monetary investment than some of the competing outdoor winter recreation activities and therefore may be relatively favored by a general reduction in per capita buying power. Participants often cite low cost as a motivating factor. It is interesting to note that ski touring experienced an earlier resurgence during the depression years.

Value trends affect the image associated with a form of recreation. To the extent that people are really concerned about the environment, the energy crisis and the consumption of resources they may adopt forms of recreation which they perceive as consistent with their beliefs. The choice of recreation may be in part a genuine effort, and in part a symbolic gesture. Ski touring is considered to have a relatively low impact on the environment and a beneficial effect on health; thus the magnitude of these trends can be expected to influence participation.

Ski touring may also be considered consistent with current efforts on the part of some to become independent of complex, interdependent socio-economic systems. Some feel less vulnerable if their recreation does not depend on foreign oil and highly technical machines.

There is considerable evidence that the environmental setting of the home and workplace has an influence on the selection of a recreational activity (Knopp, 1972). Deficiences in these settings might be expected to create needs; compensation may be sought in the recreation experience. It is difficult to document this influence because it is almost impossible to control for visibility and means which may mask its effect.

The growth in ski touring may be associated with a growth in confinement and restraints imposed by urbanization and winter itself. Ski touring provides access to a vast resource of open space, nature, and freedom.

Alternative forms of recreation may complement and reinforce participation, or they may compete for time and other resources. The latter can occur in two ways: first, a direct competition for participants; and second, they can preempt space and resources, thus reducing opportunities. No discussion of ski touring would be complete without reference to the parallel growth in snowmobiling.

In a practical sense, snowmobiling made its appearance a few years before ski touring (major growth took place in the late 1960's). For this reason the activity gained a large number of adherents who may have chosen ski touring if that alternative had been equally visible. Furthermore, large areas of land and financial resources were allocated to snowmobiling, thus affecting the opportunities for ski touring experiences. Another possible relationship is that the confidence and skills learned from snowmobiling provided a pool of winter acclimated persons who could easily transfer into ski touring. The extent of these effects may be impossible to measure, but the example does serve to illustrate the importance of timing and the sequence of exposure to alternative forms of recreation.

Other forms of recreation have had a less dramatic relationship. Downhill skiing also competes for participants and their time; at the same time it also furnishes new adherents who convert entirely or partially to ski touring because of cost, crowded lift lines or threat of physical injury. The popularity of running contributes to a population which is physically better able to enjoy ski touring and is likely to seek a winter supplement to their training program. On the other hand, heavily committed runners may be reluctant to devote any effort to an activity which doesn't directly benefit their running ability.

We have discussed only a few of the most obviously related alternatives. Every other form of recreation will have some effect on participation. To cite one more example. Television may be considered a direct competitor--and yet, some have argued that coverage of the winter olympics stimulated many to take up ski touring.

Internal Dynamics

So far we have focused on factors which determine whether an individual participates in a given form of recreation. Profound changes also occur after an individual joins the ranks of participants. Some of these changes occur independently of participation and were included in our reference to sources of new participants and dropouts resulting from transfer from one socio-economic segment of the population to another. Here we will point out changes brought about by participation itself.

One change is an increase in skill, knowledge and confidence. Ski tourers, for example, might be expected to seek more demanding experiences or to increase the rate at which they utilize trails and areas. A closely correlated effect of increased experience may be a demand for variation, either in terms of the activity or new and different environments. Ski tourers who begin on the local golf course may end up in competitive racing or wilderness treking. Increased specialization or an intensified interest in a narrow segment of an activity is typical of the individual's involvement in any form of recreation. Changes in the behavior of those already participating can bring about significant shifts in demand.

Experience can affect some participants very differently. These individuals will become "saturated" with the opportunities provided by an activity and drop out altogether in order to seek an even more contrasting experience. A similar, but quicker, response can be expected from those who simply discover after a trial period that the activity is not to their liking. The net effect of these countervailing responses is dependent on the inherent appeal and variation within an activity.

When an individual elects to take up an activity he or she is making an investment in dollars, time, energy, and social alliances. These investments will tent to perpetuate involvement. In some instances the social benefits or obligations may become the primary motivation for continuing the activity. The same can be said, of course, for competing alternatives. Many of those who became involved in snowmobiling before they were aware of ski touring will have a difficult time switching to ski touring, even if they perceived the activity itself as more desirable.

The accumulative effect of internal changes may be more important than changes in total numbers of participants. In a rapidly evolving activity, such as ski touring, this effect is probably even more significant. It may be a mistake to predict demand on the basis of current preferences when a future ski touring population will be much more experienced and skilled.

The Role of the Commercial Sector

It is probably safe to assume that there is no perceived human need that someone won't attempt to "capture" in the economic sense. Recreational benefits vary tremendously in their susceptibility to capture. Ski touring, relative to its main rivals snowmobiling and downhill skiing, is more difficult to package. The equipment is relatively less expensive and the activity is not as restricted to specially developed facilities. For these reasons ski touring was largely ignored by the commercial sector during its early years of evolution in the United States. In fact, the downhill ski industry may have deliberately tried to subdue the public's exposure to a competing activity (Fishman, 1978).

Ski touring (running provides a similar parallel) continued to grow because of its inherent appeal. The commercial sector joined the "bandwagon" and has since developed innovative ways to package and sell the ski touring experience. The primary approach has been an effort to convince skiers that they need more refined, and often more expensive, equipment in order to fully enjoy the potentials of the sport. Gadgets also proliferate as any activity becomes popular. Appeals to the fashion conscious are prevalent. Resorts are providing groomed trails and elaborate lodging facilities. Organized tours to exotic environments are being made available.

There is little doubt that the commercial sector has added tremendously to the array of opportunities within the sport of ski touring and thus has helped to perpetuate interest in the activity. The success of these innovations is probably assured by the much broader range of persons now participating in ski touring. Whereas the early "pioneers" often prided themselves in their resourcefulness and spartan demands, the broader spectrum of recent adherents are more likely to include those seeking comfort and convenience. This is not to say that the old hands won't also take advantage of the new opportunities provided!

Rate of Change and Cycles

It is relatively easy to predict the direction of change; somewhat more difficult to predict the ultimate potential; and nearly impossible to predict the rate of change in participation in a recreation activity. Ski touring grew slowly during its initial stages because it lacked a strong commercial impetus. The flow of information was largely dependent on word of mouth, organizations, and magazine articles. Television and billboard exposure was minimal.

Inherent characteristics would indicate a potential for rapid growth once the visibility barrier was overcome. The sport requires a relatively small investment in money and time to learn special skills; therefore a person can quickly become a participant.

For simplicity's sake our discussion has implied a linear, one-way pattern of change. The same mechanisms, and others yet unidentified, may bring about short or long term cycles. For example, an individual may tire of ski touring, drop out temporarily and join again at a later time. When this mechanism affects a large number of persons at the same time we can expect larger cycles in the total number of participants. Even shorter, day to day or minute to minute, cycles are probably operating--although these are less important in a discussion of long term trends. The seasonal cycle brought about by the climatic requirements of ski touring may serve to prolong interest over the long term by forestalling saturation.

Summary of Framework

One is tempted to describe the changes in participation as "phases" in a predictable pattern of change. First, there is a pioneer phase led by a small cadre of individuals willing to explore and risk disappointment. These people may seek out, or even develop, a form of recreation which fulfills well defined needs. In Stanley Plog's (1974) terms these are the "alocentrics," while those who follow can be labeled "psychocentrics". Second, others, with similar motivations, take up the activity as it becomes more generally visible. In the third phase, followers join when there is an ample demonstration of acceptability and benefits. During the fourth phase the activity stabilizes when it is generally well known to the total population and there are few changes in the nature of the opportunities available. A fifth phase may or may not occur. This last phase is a decline in participation because of external factors or simply because the novelty of the experience wears off. Other events may disrupt a long period of stability. For example, a major breakthrough in equipment may make participation easier or more enjoyable. Stynes (1980) and others, have postulated a "product life cycle" concept which implies a predictable decline in participation. It is hazardous to impose a standard pattern on all recreation participation phenomena. Although this sort of description can help to organize our thinking, it is no substitute for an understanding of the specific mechanisms at work.

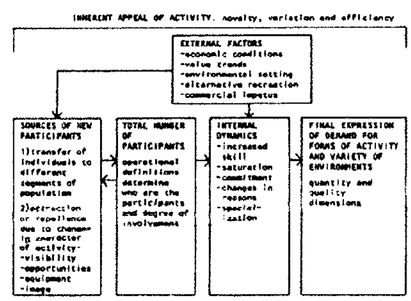


Figure 1. A schematic representation of the factors which influence the quantity and quality of participation. Short term and longer cycles may occur within the context of this framework.

Figure 1 provides a graphic summary of the mechanisms and patterns described earlier. As is true of any attempt to organize reality it is somewhat arbitrary and simplistic. It does serve the purpose of aiding researchers in their efforts to systematically deal with the complexities of participation dynamics. Modifications and refinements can occur as our knowledge and experience increases.

The ultimate output of any analysis conducted within the context of this framework is a better estimate of the demand for experiences, both the quantity and quality dimensions.

A PARTIAL TEST OF THE FRAMEWORK

Methods

A statewide, random telephone survey of Minnesota residents conducted by the Minnesota Department of Natural Resources in 1978 provided a representative sample of state ski tourers. Anyone over 14 years of age who had "cross-country skied sometime during their life" was included in the sample. Our study utilized a four page questionnaire mailed to the sample. A 75 percent response rate produced a sample of 597 completed questionnaires. The survey instrument solicited four categories of information: 1) patterns of participation; 2) reasons or motivations for participation; 3)environmental preferences; and 4) demographic characteristics. Although the questionnaire was not designed primarily to study the dynamics of participation, one question, "In which season did you first go cross-country skiing?", enables us to examine the changes over time.

For the purposes of this report several variables were cross-tabulated with the year an individual first took up the activity. While this sort of data does not lend itself well to statistical tests it does allow us to look for patterns of change and to speculate on the mechanisms at work.

Two broad questions will be addressed: 1) Are recent adherents motivated differently than those who took up the sport early in its development? and 2) Do more experienced skiers prefer more challenging areas and/or more variation in opportunities?

Changes Over Time in the Characteristics and Motivations of New Adherents

Tables 1 through 6 show some of the characteristics of participants according to the year they first took up the sport. In examining these tables it is critical to remember that the first category contains all of those who had skied prior to the 1972-73 season. This could include some elderly individuals who had skied early in the century but very little since. Given the rapid rate of increase in participation during the past 10 to 12 years the latter probably account for a very small portion of the sample.

Table 1: Level of education and first season of cross-country skiing

	YEARS OF EDUCATION, RELATIVE FREQUENCY (PERCENT)				
First Season	1-8	9-12	13-16	17+	(N) %
prior to 1972-73	(2) 3	(10) 17	(25) 42	(23) 39	(60) 100
1972-73	(1) 2	(9) 22	(17) 42	(14) 34	(41) 100
1973-74	(0) 0	(17) 28	(36) 59	(8) 13	(61) 100
1974-75	(0) 0	(29) 41	(25) 35	(17) 24	(71) 100
1975-76	(1) 1	(29) 31	(41) 43	(24) 25	(95) 100
1976-77	(3) 3	(39) 40	(43) 44	(13) 13	(98) 100
1977-78	(0) 0	(51) 39	(64) 48	(17) 13	(132) 100

The most pronounced changes have ocurred in the level of education and the sex of participants (Tables 1 and 2). College graduates have become a smaller percent of new adherents while the proportion of those with some high school education has increased. This is consistent with West's notion of "status group diffussion". The change can also be accounted for by increased visibility and the role of the media.

Table 2: Sex distribution and first season of cross-country skiing

	RELATIVE FREQUENCY (PERCENT)		
First Season	FEMALES	MALES	(N) %
prior to 1972-73	(25) 42	(35) 58	(60) 100
1972-73	(18) 45	(22) 55	(40) 100
1973-74	(28) 47	(32) 53	(60) 100
1974-75	(47) 66	(23) 34	(70) 100
1975-76	(62) 65	(33) 35	(95) 100
1976-77	(49) 50	(49) 50	(98) 100
1977-78	(86) 64	(48) 36	(134) 100

Females are increasing their involvement in many forms of recreation once considered primarily for men. Changes in the image of ski touring from a very demanding, physical type of sport to a more casual, social pastime with complementary facilities may also have contributed to the increased participation by women.

Changes in age structure (Table 3) are more difficult to interpret. There is an apparent decrease in the percentage of "older" (40-54 and 55+) skiers and an increase in the 25-39 category; although the latter accounts for a large percent of those who took up ski touring prior to 1972. At least some of the change is an artifact of the tabulation itself, i.e., younger persons are less likely to have taken up ski touring at an earlier date.

Table 3. Age distribution of participants and first season of cross-country skiing

First Season	AGE CATEGORIES, RELATIVE FREQUENCY (PERCENT) 15-24	25-39	40-54	55+	(N) %
prior to 1972-73	(4) 7	(26) 45	(14) 24	(14) 24	(58) 100
1972-73	(17) 42	(11) 28	(10) 25	(2) 5	(40) 100
1973-74	(27) 45	(17) 28	(13) 22	(3) 5	(60) 100
1974-75	(23) 34	(31) 45	(12) 18	(2) 3	(68) 100
1975-76	(40) 43	(37) 40	(13) 14	(3) 3	(93) 100
1976-77	(39) 41	(41) 43	(12) 12	(4) 4	(96) 100
1977-78	(56) 43	(52) 40	(19) 15	(3) 2	(132) 100

Responses to the question of residency (Table 4) are also difficult to analyze. We can't be sure what an individual thought was meant by "rural area," nor can we be certain whether a suburbanite would consider himself or herself a resident of a suburb or the Twin Cities Metro Area. It is probably safest to lump both ends of the spectrum for the basis of comparison. Still, at least a few of those who think of their residence as "rural" probably live on the fringe of the metro area and have a more urban lifestyle. This interpretation may help to reconcile our data with the results a statewide Department of Natural Resources survey (1979) conducted in 1978 which provided an estimate of the number of persons who had cross-country skied during that season. Sixty-three percent of the skiers were from the seven-county metro area.

Table 4. Distribution of residence and first season of cross-country skiing

First Season	DISTRIBUTION OF RESIDENCY, RELATIVE FREQUENCY (PERCENT) over 150,000	25,000-150,000	10,000-25,000	less than 10,000	rural	(N) %
prior to 1972-73	(10) 17	(8) 13	(10) 17	(14) 24	(17) 29	(59) 100
1972-73	(5) 12	(9) 22	(8) 19	(8) 19	(11) 27	(41) 100
1973-74	[illegible] 30	(17) [illegible]	[illegible]	[illegible] 19	(11) 17	[illegible] 100
1974-75	[illegible]	[illegible]	[illegible]	[illegible] 14	(16) 22	(71) 100
1975-76	(16) 17	(14) 14	(19) 20	(23) 24	(24) 25	(96) 100
1976-77	(16) 16	(23) 24	(12) 12	(21) 22	(25) 26	(97) 100
1977-78	(22) 17	(21) 16	(26) 20	(23) 17	(39) 30	(131) 100

Residency is an important factor in that it allows us to monitor the diffusion of ski touring from the urban areas (where the current resurgence has been most pronounced) to the more rural areas. The relative stability in our data may indicate that differences in visibility weren't as great as suspected. Another possibility is that snowmobiling has had a secure hold on the rural population and individuals are reluctant to give up an investment with known benefits for a (to them) new activity.

In speculating on the growth of an activity it may be valuable to know to what extent participants in similar activities are providing a reservior of potential adherents. Table 5 shows the extent to which cross-country skiers have participated in other forms of winter recreation.

Table 5. Participation in other winter activities and first season of cross-country skiing

First Season	DISTRIBUTION OF PARTICIPATION IN OTHER WINTER ACTIVITIES snowshoeing	downhill skiing	snowmobiling	winter camping	no other	(N) %
prior to 1972-73	(30) 50	(36) 60	(38) 63	(22) 37	(8) 13	(60)
1972-73	(20) 49	(26) 63	(25) 61	(12) 29	(2) 5	(41)
1973-74	(30) 49	(43) 70	(44) 72	(16) 26	(4) 6	(61)
1974-75	(30) 42	(46) 65	(55) 77	(14) 20	(6) 8	(71)
1975-76	(31) 33	(71) 75	(67) 70	(18) 19	(4) 4	(95)
1976-77	(34) 35	(63) 66	(73) 76	(18) 19	(7) 7	(96)
1977-78	(36) 27	(77) 58	(99) 74	(26) 20	(14) 10	(133)

Earlier participants were more likely to have engaged in snowshoeing. Changes in relative visibility may explain some of this trend, i.e., snowshoeing probably had nearly the same level of visibility during the early stages of the growth of ski touring. The trend is also consistent with the idea that earlier adherents were more likely to be "pioneers" who were exploring a number of different forms of recreation.

Downhill skiing is a natural complement to cross-country skiing. On the other hand it is common for individuals to state that they have switched to touring because of increased costs, crowding or concern for possible injuries. Our data is inconclusive in that it is also possible for a person to begin as a cross-country skier and switch to downhill as they gain confidence and seek a wider range of experiences.

There has been a great deal of speculation about the relationship between snowmobiling and cross-country skiing. Our data show a slight increase in the number of new skiers who have participated in snowmobiling. We can expect that as the number of ski tourers increase it will draw upon a large existing population of snowmobilers. The gradual decline in snowmobiling since 1976 (as indicated by the registration of machines) reinforces the probability that some snowmobilers are turning to ski touring as an alternative form of winter recreation; it also tends to reduce the probability of an alternative explanation, i.e., that a greater percentage of new skiers are taking up snowmobiling simultaneously.

Winter camping is more complementary than competitive in its relation to ski touring and appears to be related to experience. It seems reasonable to assume (and the data lend some support) that a cross-country skier needs to acquire a certain level of skill and confidence in the winter environment before he or she becomes involved in winter camping.

We have inferred something of the motivations of cross-country skiers from behavioral patterns and demographic characteristics. Table 6 provides a more direct measure of the reasons skiers took up the sport. The responses were given to an open ended question and more than one reason may have been offered.

Table 6. Original reason participants thought they might enjoy cross-country skiing and first season of cross country skiing

RELATIVE FREQUENCY (PERCENT) OF REASONS GIVEN

First Season	Exercise	Fresh air	Outdoors	Scenery	Peace/ tranquility	Friends liked	With friends/ family	Fun	Easy	Inexpensive	[illegible]	(N) %
prior to 1972-73	(61) 67	(4) 7	(18) 30	(3) 5	(6) 10	(8) 13	(3) 5	(6) 7	(2) 3	(5) 8	(3) 5	(61)
1972-73	(27) 51	(2) 3	(11) 27	(6) 15	(4) 10	(6) 10	(1) 3	(3) 7	(1) 3	(2) 5	(1) 2	(41)
1973-74	20(2) 33	(2) 3	25(5) 41	(5) 8	(6) 10	(5) 9	(4) 7	(3) 5	(3) 5	(3) 3	(7) 12	(61)
1974-75	(22) 31	(1) 1	(25) 35	(7) 10	(3) [illegible]	(9) 13	(0) 0	(2) 3	(5) 7	(5) 7	(7) 10	(71)
1975-76	(22) 23	(2) 2	(34) 35	(5) 5	(12) 12	(11) 11	(9) 9	(3) 3	(6) 6	(6) 6	(9) 9	(96)
1976-77	(61) 61	(10) 10	(30) 30	(2) 2	(8) 8	(16) 16	(5) 5	(11) 11	(5) 5	(7) 7	(6) 6	(99)
1977-78	(45) 32	(8) 6	(45) 34	(12) 9	(13) 10	(27) 20	(8) 6	(8) 6	(7) 5	(11) 8	(8) 6	(134)

Exercise and access to the outdoor environment have always been important motivations. The importance of exercise appears to be somewhat less than during the early years. The early association may have resulted from the dominant image of cross-country skiing as a physically demanding activity.

Our data show little change during the past five years in the importance of the "outdoors" as an attractor to cross-country skiing. This may reflect a stability in our society's attitudes toward the natural environment and the need to complement daily routines associated with the urban setting.

The influence of friends and relatives shows an interesting pattern; a slight decline from its importance prior to 1972 and then an increase during the past few years. The early

Table 8: Preferences for selected environmental characteristics and first season of cross-country skiing

FREQUENCY DISTRIBUTION (PERCENT) OF PREFERENCES FOR ENVIRONMENTAL CHARACTERISTICS

First Season	groomed trails	unbroken trails	signs	connecting trails	25 mile trails	remote, hard to reach	high skill required	encounter nobody
prior to 1972-73 (N=61)								
undesirable	9	22	0	7	29	27	36	11
neutral	42	25	33	44	55	40	34	39
desirable	49	53	67	49	16	33	30	50
1972-73 (N=41)								
undesirable	15	30	5	12	34	32	44	20
neutral	27	20	18	34	37	36	39	34
desirable	58	50	77	54	29	32	17	46
1973-74 (N=61)								
undesirable	6	17	10	17	27	25	22	20
neutral	35	37	37	41	43	34	52	49
desirable	59	46	53	42	30	41	26	31
1974-75 (N=71)								
undesirable	7	29	7	13	46	43	41	13
neutral	27	20	29	46	37	30	39	49
desirable	66	51	64	41	17	27	20	38
1975-76 (N=96)								
undesirable	8	24	6	11	39	40	39	18
neutral	30	30	23	44	40	26	37	28
desirable	62	46	71	45	21	34	24	54
1976-77 (N=99)								
undesirable	4	17	6	11	32	41	37	24
neutral	39	41	19	48	51	33	33	54
desirable	57	42	75	41	17	26	30	22
1977-78 (N=134)								
undesirable	7	19	5	12	32	45	42	22
neutral	24	39	20	44	45	29	43	51
desirable	69	42	75	44	23	26	15	27

Those seeking greater challenges may be attracted to the increasingly popular "citizens tour races". These are all comers events where everyone competes against the clock or simply attempt to go the distance. The growth in the number of scheduled events and the number of entrants is ample evidence for the appeal of this kind of challenge. This trend is not reflected in the items contained in our survey.

The best approach to determining changes which have occurred within individual participants may be by means of in-depth interviews. This process would document their life history within the activity and the linkages between changes in attitudes and behavior. For the future we may be able to establish "panel" type studies which follow the development of individual participation. In any case it is difficult to separate internal, self-initiated changes brought about by actual participation from those imposed by changes in the image of the activity as a whole.

SOME ADDITIONAL COMMENTS AND CONCLUSIONS

It should be quite obvious that there is no substitute for a thorough familiarity with the activity(s) under consideration. An understanding of participation dynamics does not lend itself to simplistic formuli or fit a standardized pattern of change. Survey instruments can be designed to answer specific questions within a comprehensive framework. Valid inferences are impossible if the researcher is not aware of the numerous variables which cannot be incorporated into the questionnaire or interview schedule.

Often we can supplement our internal analysis with a comparison to other times and places. Norway, a country similar in size, population, and climate to Minnesota, has a well established tradition of cross-country skiing. The history of skiing in Norway provides some hints as to its potential in the United States. A 1970 analysis of outdoor recreation, sports, and exercise in Norway showed that during that (1969-70) season 52 percent of the population took shorter ski trips, 29 percent took daylong trips in forests and fields and 28 percent took daylong trips in the mountains (these are not exclusive categories). With these rates as a benchmark we can proceed to qualify for the conditions in Minnesota. Minnesota does not have the traditions of Norway. Minnesota does have a well established competitor for the individual's attention, namely snowmobiling. A lot may depend on how actively public agencies develop opportunities and promote the sport. In Norway the promotion of physically demanding forms of recreation is an important part of public policy. Motorized activities, such as snowmobiling, are subject to more restrictions than in the United States.

Prediction is always a risky undertaking -- there are many "ifs" in the equation. A fundamental question is how actively we want to become involved in creating the conditions which effect change. As risky as it is, someone must take the responsibility to make a judgement.

REFERENCES

Ballman, G., Merriam, L.C., and Knopp, T.B. 1979. Interim Response Summary for the 1978 Minnesota Cross-Country Skiing Study. College of Forestry, University of Minnesota, St. Paul, Minnesota.

Christy, F.T. 1970. Elements of mass demand for outdoor recreation resources. In: Elements of Outdoor Recreation Planning edited by B.L. Driver. Ann Arbor, Michigan: University Microfilms.

Dalton, M.J. 1979. Minnesota Cross-Country

Skiers, Report No. 2321. Minnesota Department of Natural Resources, Bureau of Comprehensive Planning and Programming, St. Paul, Minnesota.

Driver, B.L. and Brown, P.J. 1975. A social-psychological definition of recreation demand, with implications for recreation resource planning. Appendix A in Assessing Demand for Outdoor Recreation. Washington, D.C. National Academy of Science. Reprinted by the Bureau of Outdoor Recreation, U.S.D.I.

Driver, B.L. 1977. Item pool for scales designed to quantify the psychological outcomes desired and expected from recreation participation. U.S.F.S. Rocky Mountain Forest and Range Experiment Station.

Fishman, J.A. 1978. A maturing sport faces growing pains. New York Time, December 31, 1978.

Knopp, T.B. 1972. Environmental determinants of recreation behavior. Journal of Leisure Research 4(2):129-138.

Meyersohn, R. and Katz, E. 1958. Notes on the natural history of fads. In: Mass Leisure, edited by Eric Larrabee and Rolf Meyersohn. Glencoe, Illinois: The Free Press.

Plog, S.C. 1974. Why destination areas rise and fall in popularity. The Cornell Hotel and Restaurant Administration Quarterly. Vol. 14: No. 4.

Statistisk Sentralbyro (Central Bureau of Statistics of Norway). 1975. Friluftsliv, Idrett og Mosjon (outdoor Recreation, Sprot and Exercise). Oslo, Norway.

Stynes, D.J. 1980. Interrelationships among three outdoor recreational sports. North American Symposium on Dispersed Winter Recreation, 27-29 February 1980. University of Minnesota, Office of Special Programs, St. Paul, Minnesota.

Tinsley, H.E.A., Barrett, T.C., and Koss, R.A. 1977. Leisure activities and need satifaction. Journal of Leisure Research 9(2):110-120.

West, P.C. 1977. A status group dynamics approach to predicting participation rates in regional recreation demand studies. Land Economics 53(2):196-211.

TRENDS IN THE TEMPORAL DISTRIBUTION OF PARK USE[1]

Robert E. Manning and Paula L. Cormier[2]

The purpose of this paper is to examine trends in the temporal distribution of park use. Plots of daily attendance data trace changes in temporal use distributions over time. A use concentration index quantifies and reduces to a single numerical indicator the degree of unevenness of recreation attendance data. The percent of total annual use accounted for by selected time periods is also examined.

INTRODUCTION

Trends in outdoor recreation are normally monitored on some aggregated level, usually on an annual basis. Participation in hunting and fishing, for example, is commonly monitored through yearly license sales, while snowmobiling and trailbiking activity is measured by annual registrations, and use of parks, forests, and campgrounds is most often reported in visits or visitor days per year. Monitoring of recreation activity at this aggregated level is highly useful in identifying long-term trends in participation and the relative popularity of various outdoor recreation activities, but disregards the manner in which recreation activity is distributed over the reporting period. Paradoxically, it is the typically uneven manner in which recreation participation is distributed over time which presents one of the most pervasive problems in outdoor recreation management.

In the classic case, park and recreation sites open for "the season" on Memorial Day weekend and close on Labor Day. The result is a full year's use condensed into little more than three months. Even within this "season" use may be skewed toward weekends and holidays resulting in a marked "peaking" phenomenon. There are a number of significant problems associated with this typical use distribution pattern. First, to satisfy demand, recreation facilities and services must be developed at a scale to meet peak loads. These facilities and services may go largely unused at most other times, resulting in inefficient resource use. Second, the social carrying capacity of recreation areas may be unnecessarily exceeded by peak loads through crowding and increased potential for conflicting uses. Third, there is preliminary evidence that even ecological carrying capacity may be unduly taxed by excessively concentrated visitor use (Lime 1972). Finally, periodic peaking of recreation use presents substantial administrative problems, particularly with respect to personnel scheduling.

While this peaking problem in outdoor recreation has been recognized for some time (Clawson and Knetsch 1966), there have been few efforts aimed at its systematic study. This is apparently due to the prevailing attitude among recreation planners, managers, and researchers that the temporal patterns of outdoor recreation use are determined by factors which are viewed as largely uncontrollable. Such factors include weather and societal work and leisure patterns. It is the purpose of this paper to report on a cooperative study recently undertaken by the University of Vermont and the Northeastern Forest Experiment Station which seeks to examine trends in the temporal distribution of park use in order to more fully understand this problem. The ultimate objective of this study is to suggest methods by which the use of park and recreation areas may be more evenly distributed over time.

METHODS AND ANALYSIS

The first phase of this study was to develop techniques to quantify the temporal distribution of selected outdoor recreation activities. Development of appropriate measurement techniques is needed to facilitate trend analysis. Three approaches to measurement have been developed to date. The remainder of this section of the paper describes these three measurement techniques, and their application to two data series. One data series traces daily attendance at forty Vermont State Park campgrounds from 1977 to 1979, while

[1]Paper presented at the National Outdoor Recreation Trends Symposium, Durham, NH, April 20-23, 1980.

[2]Robert E. Manning is Assistant Professor, Recreation Management Program, University of Vermont; Paula Cormier is Mathematical Statistician, USDA Forest Service, Durham, NH.

the other traces daily campground occupancy at one New Hampshire State Park from 1971 to 1977.

Plotting of Attendance Data

A series of computer programs were developed which graphically plot occupancy data at park and recreation areas. In Figure 1, use of four Vermont State Park campgrounds are plotted as a percentage of peak use by day. The significance of these plots is that they illustrate the peaking phenomenon in a clear and often dramatic way, and indicate visually where use redistribution efforts are needed.

Also of significance is the variety of use distributions represented in Figure 1. Daily plots for all Vermont State Park campgrounds in 1977 could be grouped into the four general types illustrated in Figure 1. Elmore State Park represents a moderately uneven distribution of use, showing consistent weekend and holiday peaking while weekdays during July and August average approximately 50 percent of maximum attendance. Townshend State Park illustrates extreme weekend peaking, while Button Bay State Park illustrates consistent holiday peaking. Lake St. Catherine State Park illustrates a relatively even distribution of use, with campground occupancy remaining above 80 percent through the months of July and August.

This variety of use distributions suggests that the peaking problem may be subject to remedy to some degree through appropriate planning and management. It is likely that some characteristics of either the recreation site or the attendant user groups result in this diversity of attendance patterns. If these characteristics can be identified, then they can be incorporated into planning and management decisions aimed at evening out the distribution of recreation use over time.

Finally, plots of daily attendance data can be used to trace changes in temporal use distributions over time. Figure 2, for example, illustrates a change toward more even distribution of use at Button Bay State Park from 1978 to 1979.

Use Concentration Index

While plots of daily attendance data are a useful graphic measure of recreation use distribution patterns, a more quantitative measure is also needed. For this purpose, the concept of a use concentration index was adopted. The use concentration index was first introduced by Stankey et al. (1976) and applied in a spatial dimension to wilderness recreation use patterns. The purpose of the index was to measure the extent to which wilderness trail systems are used in an uneven fashion; that is, some trail segments are used heavily while other trail segments remain relatively unused. By substitututing the days of a recreation season for miles of trail, the use concentration index can be applied to the temporal dimension as well.

The advantage of the use concentration index is that it quantifies and reduces to a single numerical indicator the degree of unevenness of recreation attendance data. Using data from Elmore State Park (Figure 3), the cumulative percent of use of the campground is graphed by the cumulative percent of days in the season. The days of the season are ranked and graphed in descending order of use, and use is accumulated starting with the day most used. The 45-degree diagonal represents an even distribution of use (e.g. 50 percent of all days account for 50 percent of all use), while the curve plots the actual distribution of use (e.g. 50 percent of all days account for nearly 80 percent of all use). The use concentration index is based on the area between the curve and the 45-degree diagonal as a proportion of the total area above the 45-degree diagonal. The index may take values from 0 (perfectly even distribution) to 1 (perfectly uneven distribution). In the graph for Elmore State Park, the shaded area between the 45-degree diagonal and the curve represents 35 percent of the total area above the diagonal. Therefore, the use concentration index equals .35.

As with the daily plots of attendance, a series of computer programs were prepared to draft and calculate the use concentration index. When applied to both data series, use concentration index values ranged from .12 to .45. This range of values again demonstrates, as with the daily plots of attendance, considerable diversity in the evenness of use distributions among parks.

Index values provide a convenient way to monitor trends in the temporal distribution of recreation use. Figure 4, for example, traces changes in the use concentration index for inland and waterfront campsites at Pawtuckaway State Park, New Hampshire, from 1971 to 1977. One might have hypothesized that recent gasoline prices and supplies would encourage fewer camping trips, but of longer duration, and that this would contribute to more evenly distributed recreation use. Figure 4 indicates that this is not the case, however, at least for Pawtuckaway State Park, and that, in fact, the trend is toward more unevenly distributed use. These results might be explained by speculating that higher gasoline costs and shortages are eliminating some groups of recreationists from the camping market, and the most likely group to be eliminated is those who must travel greater distances to the park. Since it is also the group that is most likely to stay longer (through the mid-week) at the park, their absence from the park is likely to contribute toward more marked weekend peaking.

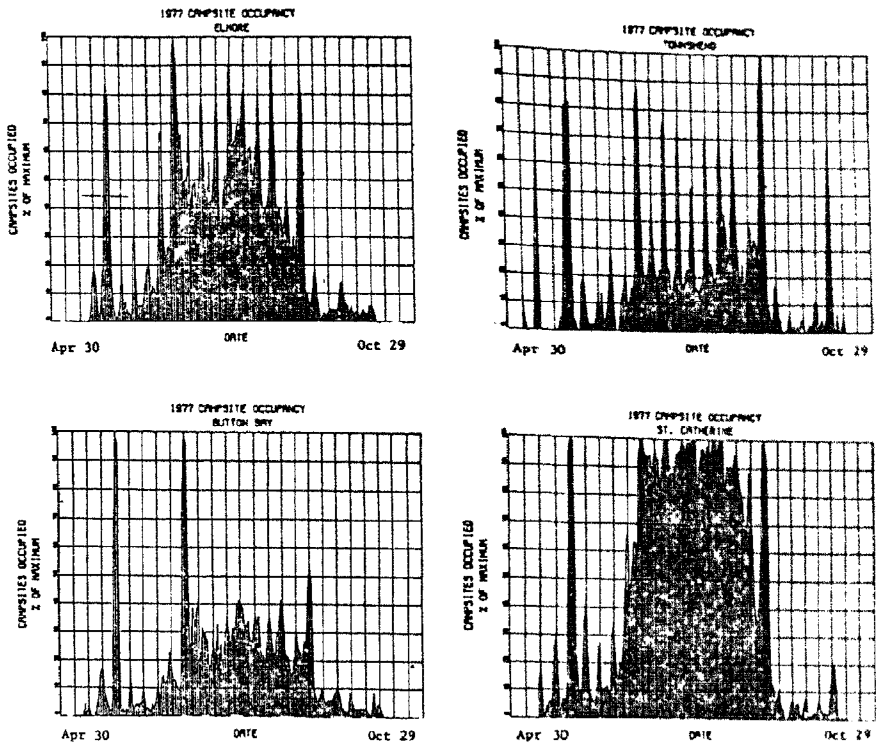


FIGURE 1.--Campsites occupied (percent of maximum) by day for four Vermont State Parks in 1977.

FIGURE 2.--Campsites occupied (percent of maximum) by day for Button Bay State Park (Vermont) in 1978 and 1979.

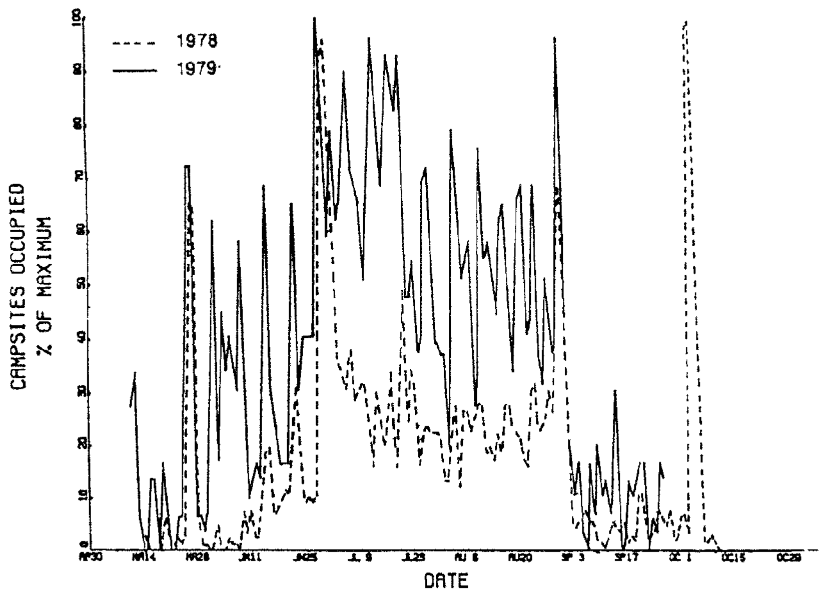
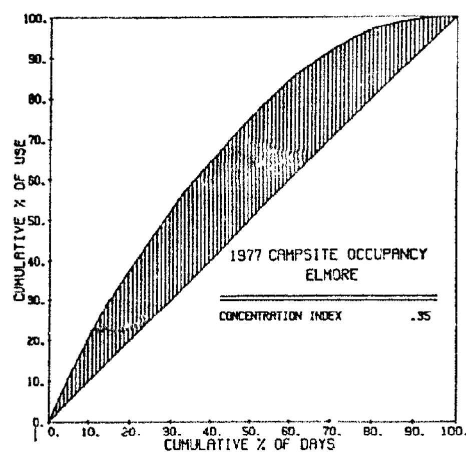


FIGURE 3.--Use concentration index for Elmore State Park (Vermont) in 1977.



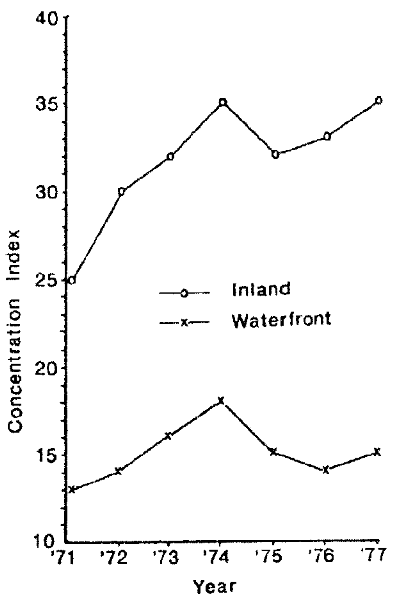


FIGURE 4.--Trends in use concentration index for inland and waterfront campsites for Pawtuckaway State Park (New Hampshire) from 1971 through 1977.

The use concentration index also has considerable potential in contributing to an understanding of why some parks have more even distribution of use than others. When the index is used as a dependent variable in regression analysis, a variety of park characteristics may be examined as independent variables and statistically tested as to their relationship with use distribution patterns. Examples of such park characteristics which might be hypothesized as explaining some of the variation in use concentration index values include distance from population centers, number of campsites, size of park, type and number of recreation activities, and miles of shoreline.

Percent of Use

A third measure of the temporal distribution of recreation use involves calculation of the percent of total annual use accounted for by selected time periods. For example, the percent of total use accounted for by each day of the week provides a measure of how evenly recreation use is distributed over the average week. The bar graph in Figure 5 illustrates the average distribution of use over the days of the week for Button Bay State Park in 1977. The unevenness of the distribution is readily apparent.

Such percentages may also be monitored over time to determine if weekly recreation use patterns are becoming more or less evenly distributed. Figure 6 indicates a trend toward more even distribution of use over the days of the week for Button Bay State Park when examined from 1977 to to 1979. Tuesday, Wednesday, and Thursday account for relatively larger percentages of total annual use, while Friday, Saturday, and Sunday account for declining percentages of total use.

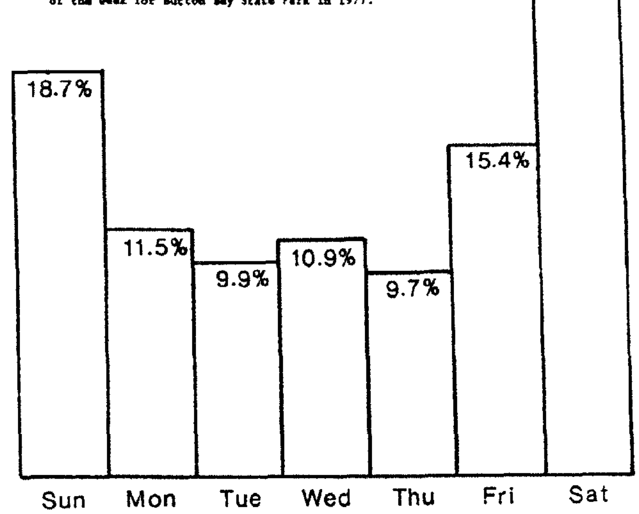
A similar graph was prepared for Pawtuckaway State Park (inland campsites) to trace trends in weekly use distributions from 1971 through 1977 (Figure 7). While trends are not as readily apparent in this case, there appears to be a tendency toward Friday and Saturday accounting for relatively larger percentages of total annual use, and thus for weekly use patterns becoming more unevenly distributed. It is interesting to note in Figure 7 the dramatic changes in the percent of use accounted for by Friday and Sunday in 1974. One might hypothesize that such a change might have been caused by Sunday closings of gasoline stations, encouraging weekend park users to camp Saturday and Sunday nights rather than Friday and Saturday nights in order to purchase gasoline for the return trip home on Monday mornings when gasoline stations reopened.

The percent of total annual use accounted for by seasons might also be an important measure of temporal recreation use patterns. The percent of use accounted for by the summer (Memorial Day weekend to Labor Day), spring (prior to Memorial Day weekend), and fall (after Labor Day) seasons for Elmore State Park from 1977 to 1979 is shown in Figure 8. While the summer season accounts for the largest percentage of total campground use, this percentage appears to be declining with a trend toward an increasing percentage of use during the fall season. Trends toward increasing percentages of total annual use for the fall and spring seasons have also been found for Michigan State Park campgrounds by Stynes and Rottmann (1979).

FURTHER RESEARCH

The three techniques described above -- plots of daily attendance data, the use concentration index, and calculation of the percent of use accounted for by selected time periods -- have proven useful in measuring the temporal distribution of recreation and tracing trends in these distributions over time. These measurement techniques will be applied more widely as additional data series become available so that we might investigate a wide variety of recreation sites and activities, and continue to monitor trends in the future.

FIGURE 5.--Percent of total annual camping use accounted for by the days of the week for Button Bay State Park in 1977.



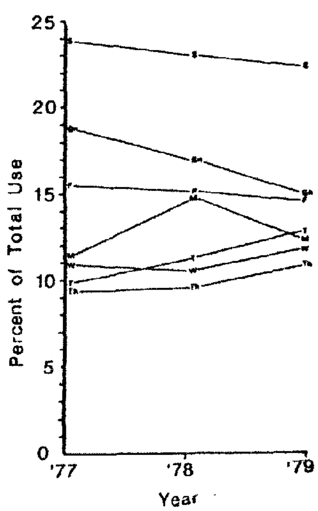


FIGURE 6.--Trends in the percent of total annual camping use accounted for by the days of the week for Button Bay State Park from 1977 through 1979.

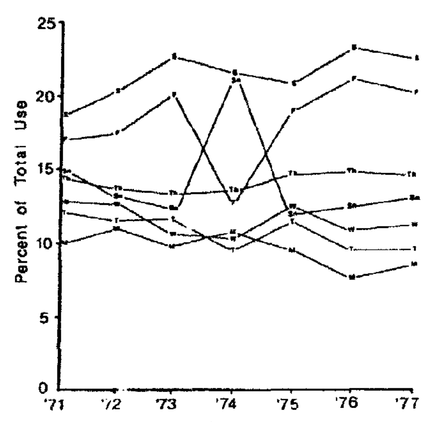


FIGURE 7.--Trends in the percent of total annual camping use accounted for by the days of the week for inland campsites of Pawtuckaway State Park from 1971 through 1979.

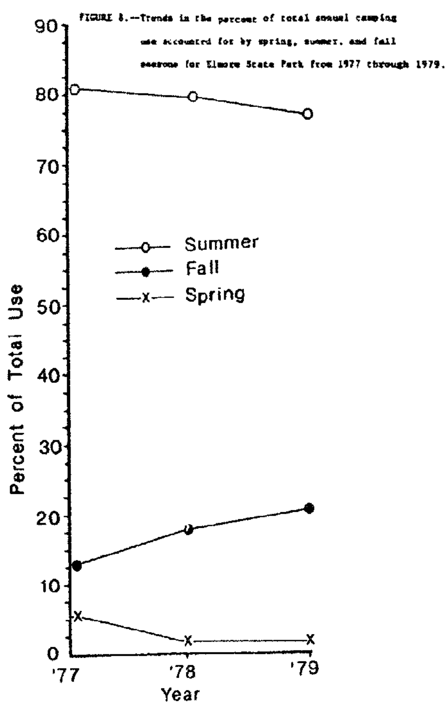


FIGURE 8.--Trends in the percent of total annual camping use accounted for by spring, summer, and fall seasons for Elmore State Park from 1977 through 1979.

A second phase of research will be aimed at explaining why there are substantial differences in the evenness of use distributions among park sites. As noted earlier, the use concentration index provides a convenient dependent variable from which regression analysis may help explain the relationship between park site characteristics and recreation use distributions.

A third phase of research will involve an analysis of recreation users to explore and evaluate selected management and marketing strategies designed to redistribute recreation use more evenly. A random selection of peak and off-peak users will be interviewed at recreation sites and a comparative analysis will be done to identify target markets for redistribution efforts. Both peak and off-peak users will be analyzed with regard to socioeconomic characteristics, stage in family life cycle, work and leisure patterns, recreation motivations and satisfactions, and response to proposed management/marketing efforts such as differential fees, changes in site development level, recreation activities and facilities offered, and dissemination of information on conditions of crowding.

It is hoped that these three phases of research will lead ultimately to a series of suggested recreation planning, management, and marketing guidelines that might be used to reduce the peaking phenomenon in outdoor recreation and result in more even distribution patterns.

LITERATURE CITED

Clawson, Marion and Jack Knetsch 1966. Economics of outdoor recreation. Johns Hopkins University Press: Baltimore.

Lime, David W. 1972. Large groups in the boundary waters canoe area--their numbers, characteristics, and impact. USDA For. Serv. Res. Note NC-142.

Stankey, George H., Robert C. Lucas, and David W. Lime 1976. Crowding in parks and wilderness. Design and Environment. 7(3):38-41.

Stynes, Daniel J., and Kathryn M. Rottman 1979. Trends in seasonality of Michigan state park use. Paper presented at the National Recreation and Park Association Congress, New Orleans, Louisiana.

NETWORK ANALYSIS: A NEW TOOL FOR RESOURCE MANAGERS[1]

Dr. Ruth H. Allen
Assistant Professor
Environmental Systems Management
Center for Technology and Administration
College of Public and International Affairs
The American University
Washington, D.C.

Resource managers manipulate ecosystems for direct or indirect human uses. Examples of relatively well studied resource management issues include familiar biological products such as: forests, ranges, fish and wildlife; or physical products such as air, water and soil. Until very recently, urban environments received much less scholarly attention. However, as Spurr (1969) notes "principles of ecosystem management apply to wilderness and to urban environments".

Within urban environments, it is people, and particularly children who are worthy of new scholarly attention. After all, why bother with long-term resource management, if we ignore the reality of life for today's urban children. They will inherit what ever future resources today's resource managers leave behind. The discussion of network analysis presented here is part of a larger study of nature and urban children, Allen (1977).

WHAT IS NETWORK ANALYSIS?

Network analysis is a new technique to uncover and map information and communication links between two or more people using a particular natural resource. Older forms of network analysis trace inanimate linkages, for example, telephone wires, sewer pipes and transportation corridors. Other human network analyses are to uncover friendship networks, Moreno (1960), political coalitions, Boissevain and Mitchell (1973) community elites, Laumann and Pappi (1976), or urban families, Bott (1977) and Gans (1962).

For this study, the network analysis is based on measured personal associations of urban children, eight to thirteen years of age. All three hundred sixty three children were located outdoors in close proximity to each other while using natural land resources within organized nature recreation, and environmental education programs. All programs serve children from metropolitan, New York, New Jersey and Connecticut. Ordinary, working class urban children, who actually use selected forest environments (parks, camps, nature centers or urban wildlands) are the focus of this study because they have large, accessible social networks. They are also numerous; therefore there are many more children to be served by a decreasing resource base. Moreover, interrelated issues of equity and resource scarcity put added burdens on resource managers and the tools and techniques of resource management.

HOW DOES NETWORK ANALYSIS WORK HERE?

I started this study with a curiosity about the commonplace event of collecting large groups of urban reared children, and moving them to a park, nature center, camp or wildlands for the summer. These events have gone on for a variety of altruistic and youth management objectives for more than one hundred years starting with the newspaper fresh air funds and settlement house outings of Jane Addams.

This study used a series of forested sites with youth outdoor programs to study the role of nature in the lives of urban children. In the study, urban children, were observed over four summers and interviewed on location.

One component of the interview schedule was a sociogram. Respondants were asked to identify companions they would choose for a hike in the woods as an index of the type of association. They are also asked to classify their choices as: relatives, neighbors, school friends or just camp/program friends.

What was different about this study was

[1]Paper presented at the National Outdoor Recreation Trends Symposium, Durham, NH, April 20-23, 1980.

that in addition to mapping the networks of reported associations, and classifying associates as to social distance a simple, unobtrusive way was devised to index the duration of the reported associations. This was done by superimposing the results of a content analysis of attendance records on to the sociograms previously classified according to kinship or associated more distant social links. Return rates were established by checking attendance lists for two consecutive years, to see who reappeared the second year.

It is estimated from the rate of other errors in attendance records that there was not more than a 2% error, since careful attendance checks are required for safety and funding reasons. However, occasionally in crowded urban day type programs a child not on the attendance list, but who knows the system from a previous year will sneak on a bus "going to the beach" or some other swimming hole.

There are at least three stages in any network analysis. Stage one is the network identification process - in this case, I selected youth outdoor programs of various sizes and types. All programs have similar goals, objectives, clients and environmental resources. Given the nature of the urban children, there are likely to be pre-existing networks worthy of analysis.

Stage two involves mapping identified networks. In this instance desk-top and computerized matrix methods were combined to show structural and functional relationships within existing social networks. Three important dimensions of stage two are keeping track of several hundred subjects, identifying returnees and cataloging pre-existing kinship, friendship, neighborhood and school groups.

Stage three is to understand the results of the network analysis. Here the key insights are derived from the comparison of a range of program types. One surprising finding is the extent of pre-existing networks embedded in these outdoor experiences. This is surprising because program managers act as if all users are new to each other and to the natural system resources.

A. Causes of Bonding

All groups change with time. Returnees slow the rate of change by adding stability and consistency to camp life. Network analysis aims to show why camp groups are cohesive and how group cohesion develops with the life history of individuals. The extent and type of pre-existing groups in camp include: kinship, neighborhood, and friendship groups which contribute to group cohesion and high return rates. Camp programs for urban children mimic the life in small, intimate, rural communities during the last century.

The concept of social networks requries an explanation before a presentation of the findings. Networks are private and more or less permanent structures which bind individuals in complex lines of transportation and communication. Moreno (1960) likened social networks to a "container, a bed which carries and mingles its currents, however different their goals may be". Social networks are important because they carry rumors of sociological current. Because networks are private, it is hard to estimate where they reach, but in the case of nature programs for urban children, it is clear that the reputation of a program and its core staff influence the constancy of return rates. In Moreno's terms, networks are "the kitchens of public opinion. It is through these channels that people affect, educate or disintegrate one another. It is through these networks that suggestions are transmitted."

Moreno devised sociometric tests to examine social structures by measuring the attractions and repulsions between individuals within a group. Moreno cautioned that it is a difficult psychological problem to introduce a sociometric instrument into a small community since it may be painful or unpleasant for a particular individual to find out his position in the group. For the present studies, there was little resistence to a sociometric measure since that measure was only a small part of the total instrument. Preparation for the sociogram came through the rapport developed earlier in the interviews. There seemed to be a little consciousness or resistence among the children to the sociogram items. In both 1972 and 1974, at the end of the interview, each child was asked, in Question 31, "If you could choose three people from camp to go on a hike with you, who would you choose?" After the three choices, children were asked to classify the individual chosen as to whether they were: camp friends, workers at the camp, counselors, school friends, neighbors, or relatives.

The hand analysis of sociometric data consisted of drawing conventional sociograms with circles for individuals or squares for categories of individuals who were not actually interviewed. Returnees are marked by a double circle and dyads are shown by arrows. A dyad is a union of two people. Moreno indicates that the level of social group cohesion is high if the number of dyads is larger than one-half the membership, thus allowing for chains, triangles, stars, and more complex structures to form. By this definition, all the camps are cohesive social groups.

Computerized analysis of the sociogram results consisted of constructing a matrix for all choosers and all chosen individuals. Each child was scored on the number of choices he or she made, and on the number of times he or she was chosen. The total number of crossovers by age, race, sex, counselor group, and type of choice; e.g., staff, camp friends, school friends, neighbors, relatives. The number of reciprocal and non-reciprocal choices was computed for the entire samples.

Kinship

At the Nature Center in 1972 there were eight pairs of siblings, four groups of three siblings, and one group of four siblings registered. This means that of thirty-two people, eleven had blood relatives in the program. There were three sets of two siblings, one set of a mother and two offspring, and one set of a mother and one offspring. Among the urban children registered, there were eighteen sets of two siblings, four sets of three siblings, and three sets of four siblings. Thus, sixty people, or 43 percent of the sample population, had a blood relative in the program.

At the YMCA/YWCA Camp in 1973 there were twenty-three sets of two brothers, three sets of three brothers, and one set of four brothers. There were twenty-nine sets of two sisters, five sets of three sisters, eleven two-member brother-sister combinations, one three-member combination, and two four-member combinations. In this case, 165 children, or over 19 percent of the 859 children registered, had a blood relative attending the program.

Composite attendance figures provided by the Scout Program do not contain information on the number of siblings attending camp together. Occasionally, relatives attend camp together. Two percent of sociogram choices were for relatives. At the Resident Camp Program in 1973 there were twenty-five sets of two same-sex siblings, and two sets of three same-sex siblings. There were also fifteen sets of opposite-sex siblings in pairs, and two sets of three-member brother-sister combinations. This means that ninety-two people, or nearly 38 percent of the 245 registered children had one or more blood siblings in the program. In short, when urban children go to natural environments in organized groups, many of them bring their existing social networks with them. When they return home, camp experiences have high story-telling value. Shared experiences, pleasant or unpleasant, bind groups together into larger social networks or a web of group affiliation. Table 1 summarizes the extent

TABLE I

Results of Network Analysis Showing Pre-Existing Networks

Program Type	% of Children with 1 or more Sibling Present	Total 1972-73 Registration
Nature Center	44%	72
Museum Program	43%	60
Day Camp	19%	859
Neighborhood House	59%	295
Scout Camps	38%	245

of pre-existing networks.

Kinship groups are highlighted in the sociogram in Figure 1. Siblings and cousins present are marked with R for relative. Such blood relationships among children are not immediately obvious because children are scattered across the campsite, and they may have different last names on attendance lists. Therefore, asking a child to categorize choices is very useful.

Neighborhood

These groups were the most conspicuous at the close-knit Neighborhood House Camp. Reported neighbors are shown in Figure 2, along with a high number of returnees. Neighbors were also evident in Nature Center and YMCA/YWCA camps. Neighbors were less frequent in the Scout Camps and Private Camp because these programs draw from a wider geographic area. When neighbors attend camp together, camps become an important extension of urban neighborhoods, and like neighborhoods, are "the place where children are brought up to become members of their own society".

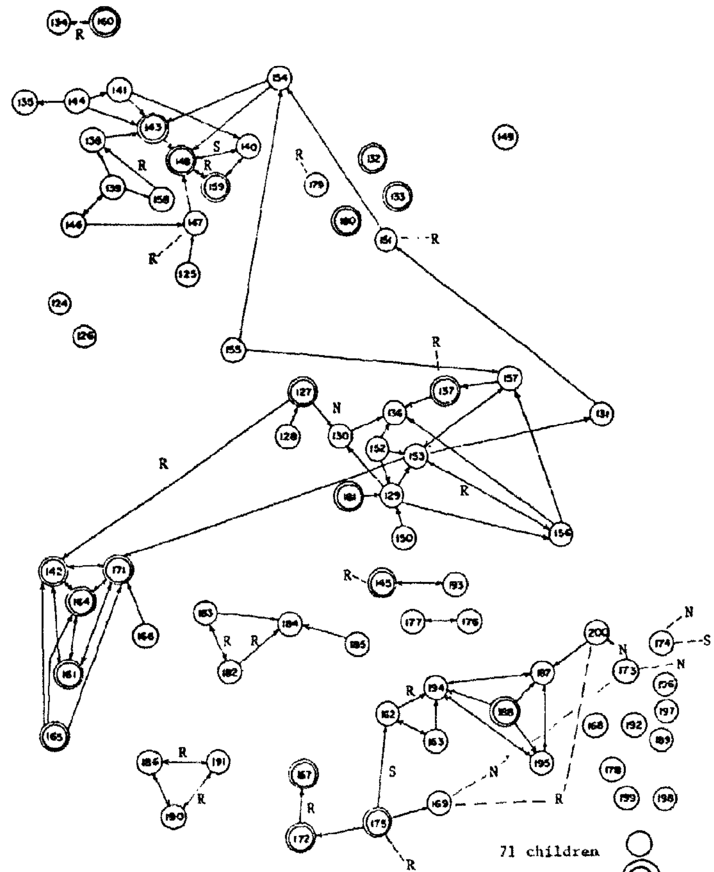
Neighbors live in proximity, by definition, and this may "necessitate many contacts of human beings and cause inurement to and intimate knowledge of one another". This knowledge is transposed to camp, and it affects the children. Neighbors also communicate sentiments and opinions about returning to camp together.

Friendship

This bond "comes most easily into existence when crafts or callings are the same or of similar nature". Friendship, though independent from neighborhood and kinship, requires "easy and frequent meetings". Friend-

Figure 1

YMCA/WYCA PROGRAM SOCIOGRAMS WITH RETURNEES AND KIN GROUPS (R)



R = relative

N = neighbor

S = school friend

71 children

20 returnees

100 Dyads

106 Dyads

206 Total Dyads

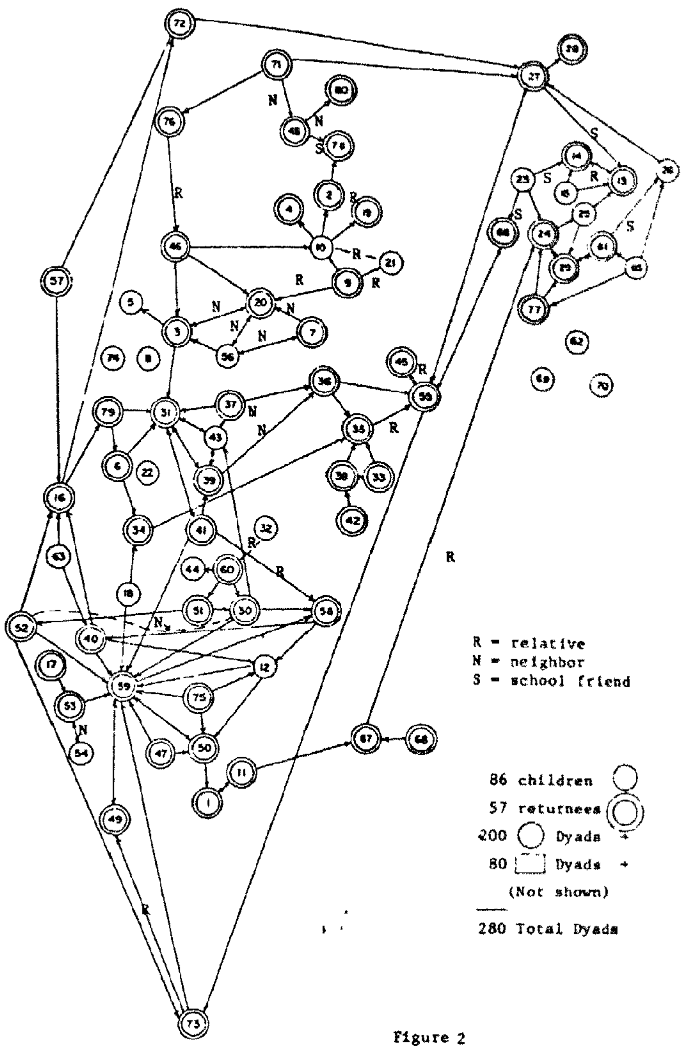


Figure 2

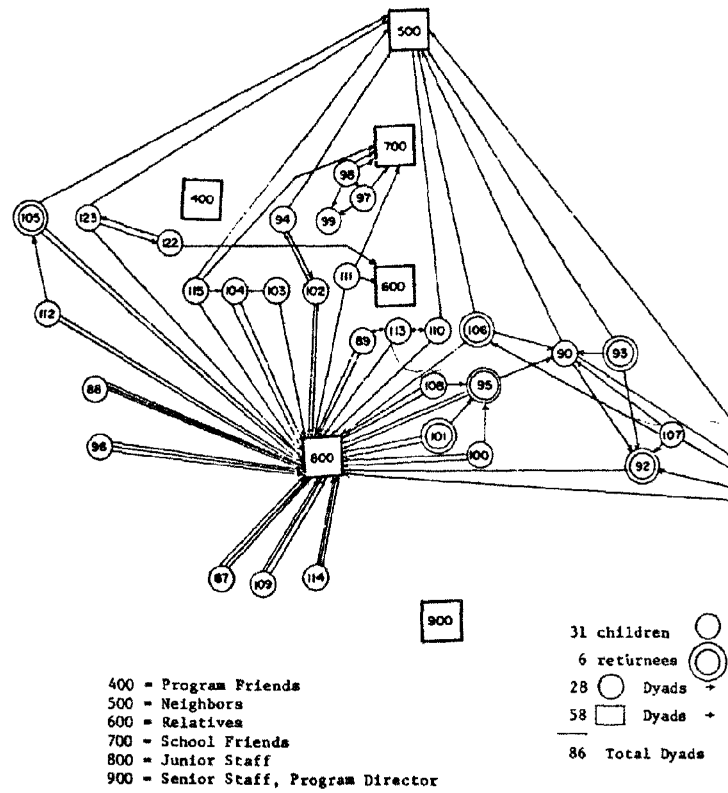
NEIGHBORHOOD HOUSE CAMP SOCIOGRAM WITH
RETURNEES AND NEIGHBOR GROUPS - N

ship among children or junior staff and children is conspicuously illustrated in Figures 2 and 3.

dren. This homogeneity in social background could account for such strong friendship bonds.

Figure 3

MUSEUM PROGRAM SOCIOGRAM WITH RETURNEES AND OTHER GROUPS



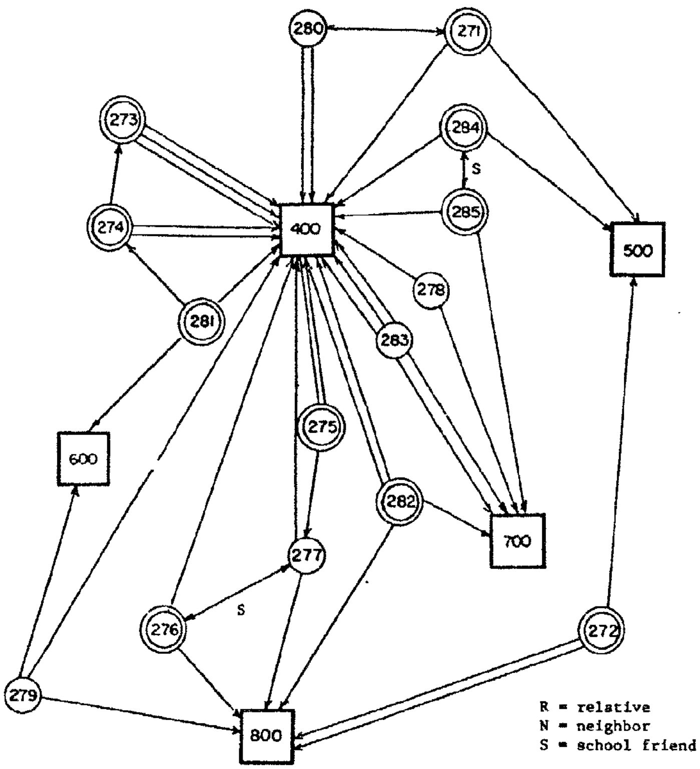
At the Museum Program, forty-two choices were made for junior staff from a total of eighty-six total dyads. There are several possible explanations. Since choices were made on three separate days, in three separate locations, a response groove is unlikely. The task for this sociogram was hiking, and many of these urban children are inexperienced in the woods, so it would be logical to choose companions who have been hiking there before. Finally, unlike most camps where junior staff are predominantly from a higher social class, these junior staff were mainly from the same social, racial, and ethnic groups as the chil-

At the Scout Camps, friendships were conspicuous without reference to kinship or neighborhood groups as illustrated in Figure 4. This finding is consistent with the mission of scouting.

In summary, although kinship extensions are generally dissolved in modern urban families, nature oriented, children's camps may serve as surrogate extended families. Outdoor programs show higher levels of group cohesion because they incorporate preexisting kinship and neighborhood groups. Friendship groups and returnees add further cohesiveness

Figure 4

SOCIOGRAM FOR SCOUT CAMP C
WITH RETURNEES AND FRIENDSHIP GROUPS



400 = Program Friends
500 = Neighbors
600 = Relatives
700 = School Friends
800 = Junior Staff
900 = Senior Staff, Program Director

15 children ○
10 returnees ◎
9 ○ Dyads →
38 □ Dyads →
47 Total Dyads

to groups of children in natural environments.

B. Development of Group Cohesion

How does group cohesion develop in the milieu of children's outdoor programs? Research on returnees suggests that some interrelated factors are important. This is not the simplest explanation, but it best encompasses the evidence. Burch (1971) notes "habitat-societal interactions do not fall into a neat deterministic pattern".

Natural Environments

First, a defined natural territory served as a focus for group interactions and a substrate for group cohesion. Coincidentally, in the Museum Program where territory is borrowed and only in use temporarily, return rates were much lower. None of the natural environments are unique or pristine, but all are available to large number of children. There is enthusiasm and obvious pride in ownership or exclusive use of natural areas, even if use is temporary. However, outside camp preferences for nature per se were rarely mentioned by this sample of children. Six percent of leisure preferences away from camp and 7 percent of preferences within the program were classified as nature-related.

Note that nature means the physical environment or acts having to do with natural scenery, birds, trees, flowers, etc. The Latin root word natura means born, and there are many connotations besides physical environments. Burch writes perceptively of different meanings people give to nature:

> The habitats of human societies are not solely the function of ecosystem characteristics. Rather nature is always composed within a specific frame of motive and expectations.... and these selective perceptions determine whether the nonhuman environment will become a resource, a taboo, or remain unseen.

Networks analyses such as the ones in Figure 1-4 reflect the cohesiveness of social groups where many neighbors, school friends and kin-groups co-exist and use resources together. A high number of returnees and a return rate of 35% typify this neighborhood house group.

The highest return rates were found in a year-round nature center. Children walk to the nature center and the return rate is over 48%, although there is a smaller total group size and hence more individualized attention.

Incidently, where children are picked by schools in an effort to equitably distribute a scarce resource, return rates dropped to a little over 6%. Where there is more time in a program over a longer time frame, say 3-5 years, there is a much higher adoption of resource management related careers in later life. Therefore, one of the most subtle but significant long-term outcomes of exposing urban children to nature related resource systems is the nurturing of resource based values and conservation aesthetics. Whether the programs create such values de novo is not clear, but the nurturing function is far more critical.

WHY IS NETWORK ANALYSIS USEFUL IN RESOURCE MANAGEMENT?

Network analysis is useful in resource management because it helps to clarify the following key elements of the human/resource complex:

- the final demand for recreation resources desired by a given society or social group;

- the spatial pattern of resources, potential resources and resource users (both current and future users);

- the quality of the resource related experience;

- the carrying capacity and reuse potential of resources;

- the resource costs and human impacts generated as a byproduct of very intense resource use;

- the interrelationships of resource users to ordinary natural environmental processes and transformations of the resource base with use;

- ambient conditions of overall environmental quality;

- final health, safety and environmental protection measures associated with the use of the land and associated physical and biological resources;

- impacts of resource use pattern changes on plants, animals or people;

- responses of individual elements in the resource use complex;

- local, regional and national governmental and institutional arrangements tied to the resource use patterns; and,

- strategies for implementing changes in the quality of the resource and the management of future resources in times of increasing resource scarcity.

This approach to resource management is patterned after Bower, (1977).

WHERE DO WE GO FROM HERE?

In a time of declining or stable births, when there are fewer eight to thirteen year olds to be served, resource managers can logically expand the ages and life cycle stages served and/or improve the quality and service given existing populations now served.

The first is a competitive approach, while the second is more cooperative in orientation.

Either approach is better if network analysis is done, at least implicitly. By measuring the user trends, beyond one annual cycle and from year to the next, resource managers can become alerted to the stability elements in the resource complex, eg. returnees enhance the quality of predictability and regularity in this resource complex. In this case, there are indications that lengthy pleasant experiences carry forward into earlier choices and throughout the life cycle into maturity.

However, it is a mistake to believe that the transfer along networks is automatic or always positive.

Dislike for forest resources are conveyed just as efficiently as positive preferences. If we are to better manage dwindling resources, it must be with a careful regard for existing networks of resource users.

REFERENCES

Allen, R. H. 1977. Children and Nature: A Field Study in Sociobiology. Ph.D. Dissertation. New Haven: Yale University.

Boissevain, Jeremy and Mitchell, J. Clyde (eds.). 1973. Network analysis Studies in Human Interaction. The Hague, Netherlands: Mouton & Co.

Bott, E. 1977. In Social Networks: A Developing Paradigm. Edited by Samuel Leizhardt. New York: Academic Press, Inc. pp. 253-292.

Bower, B. T., ed. 1977. Regional Residuals Environmental Quality Management Modeling. Washington, D.C.: Resources for the Future. p. 8.

Burch, W. R., Jr. 1971. Daydreams and Nightmares: A Sociological Essay on the American Environment. New York: Harper and Row. p. 50-51.

Gans, H. 1962. The Urban Villagers. New York: The Free Press.

Laumann, E. O. and Pappi, F. U. 1976. Networks of Collective Action: A Perspective on Community Influence Systems. New York: Academic Press, Inc.

Mead, M. 1972. In Human Identity in the Urban Environment. Edited by Gwen Bell and Jacqueline Tyrwhitt. Baltimore: Penguin Books. p. 245.

Moreno, J. M. 1960. The Sociometry Reader. Glencoe, Ill.: The Free Press. p. 440-450.

Spurr, S. H. 1969. In the Ecosystem Concept in Natural Resource Management. Edited by George M. Van Dyne. New York: Academic Press, Inc. p. 3.