

INFORMATION TO USERS

This was produced from a copy of a document sent to us for microfilming. While the most advanced technological means to photograph and reproduce this document have been used, the quality is heavily dependent upon the quality of the material submitted.

The following explanation of techniques is provided to help you understand markings or notations which may appear on this reproduction.

1. The sign or "target" for pages apparently lacking from the document photographed is "Missing Page(s)". If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting through an image and duplicating adjacent pages to assure you of complete continuity.
2. When an image on the film is obliterated with a round black mark it is an indication that the film inspector noticed either blurred copy because of movement during exposure, or duplicate copy. Unless we meant to delete copyrighted materials that should not have been filmed, you will find a good image of the page in the adjacent frame. If copyrighted materials were deleted you will find a target note listing the pages in the adjacent frame.
3. When a map, drawing or chart, etc., is part of the material being photographed the photographer has followed a definite method in "sectioning" the material. It is customary to begin filming at the upper left hand corner of a large sheet and to continue from left to right in equal sections with small overlaps. If necessary, sectioning is continued again—beginning below the first row and continuing on until complete.
4. For any illustrations that cannot be reproduced satisfactorily by xerography, photographic prints can be purchased at additional cost and tipped into your xerographic copy. Requests can be made to our Dissertations Customer Services Department.
5. Some pages in any document may have indistinct print. In all cases we have filmed the best available copy.

University
Microfilms
International

300 N. ZEEB RD., ANN ARBOR, MI 48106

1318741

SHON, LISA ANN
WILDERNESS USE AND PERCEPTIONS OF CROWDING ON
THE KENAI CANOE ROUTES, ALASKA.

UNIVERSITY OF ALASKA, M.S., 1981

University
Microfilms
International

300 N. ZEEB RD., ANN ARBOR, MI 48106

**WILDERNESS USE AND PERCEPTIONS OF CROWDING
ON THE KENAI CANOE ROUTES, ALASKA**

**A
THESIS**

**Presented to the Faculty of the University of Alaska
in Partial Fulfillment of the Requirements
for the Degree of**

MASTER OF SCIENCE

**By
Lisa A. Shon, B.A.**

**Fairbanks, Alaska
September 1981**

WILDERNESS USE AND PERCEPTIONS OF CROWDING
ON THE KENAI CANOE ROUTES, ALASKA

RECOMMENDED:

Samuel Harkley

Robert E. Weeden

David R. Klein
Chairman, Advisory Committee

Samuel Harkley
Chairman, Program In Wildlife and
Fisheries

John Bligh per D.D.F.
Director, Division of Life Sciences

APPROVED:

K. B. Keefe
Vice Chancellor for Research and Advanced Study

Aug. 24, 1981
Date

ABSTRACT

The spatial and temporal distribution, characteristics, and perceptions of crowding of recreationists using the Swan Lake and Swanson River Canoe Routes in southcentral Alaska were studied in 1975. Use was distributed unevenly, with greatest concentrations at two trailheads, along main trails, and on holidays. A few lakes are particularly vulnerable to congestion and environmental impacts. Canoeists tend to be young adults of high socioeconomic status from the Anchorage area. They visit the Canoe Routes for a variety of reasons and participate in a variety of activities. They hold a negative attitude towards encounters with other people and environmental degradation. Although canoeists met an average of three other groups per day, most felt that crowding was not a problem. Route and time of travel, and previous experience with wilderness recreation, were most strongly associated with perceived crowding. The implications of these findings are related to wilderness management policies and legislative constraints.

TABLE OF CONTENTS

	<u>Page</u>
LIST OF FIGURES	viii
LIST OF TABLES	x
ACKNOWLEDGEMENTS	xiv
INTRODUCTION	1
BACKGROUND AND LITERATURE REVIEW	3
THE STUDY AREA	8
Physical Description	8
Access	16
Management History and Policies	17
METHODS AND MATERIALS	21
Sample Design	21
Questionnaire Survey	24
Aerial Surveys	27
STATISTICAL PROCEDURES	30
Population Estimates of Canoeists and One-day Users	30
Spatial Distribution of Canoeists and One-day Users	32
Estimates of Mean Group Size	32
Analysis of Questionnaire Data	34
Treatment of Response Bias	35
Estimates of Means	35
Frequency Distributions	36

	<u>Page</u>
SOCIAL CHARACTERISTICS OF CANOE ROUTE USERS	39
Place of Residence	40
Length of Residence	40
Sex and Age Characteristics	45
Marital Status	45
Environment of Upbringing	45
Education	50
Employment Status	50
Occupation	52
Income	52
Comparison of Resident and Nonresident Characteristics..	56
Anchorage Canoeists' Characteristics	59
Previous Experience	61
Discussion of Social Characteristics	66
SPATIAL AND TEMPORAL DISTRIBUTION OF VISITOR USE ..	72
Amount of Use	72
Spatial Distribution of Use	73
Temporal Distribution of Use	92
Canoe Route Use in Perspective	99
Factors Influencing Canoe Route Use	101
Factors Influencing Use Distribution	102
Length of Stay	102
Trailhead Use	103
Route Preference	105

	<u>Page</u>
Campsite Preference	108
Temporal Use	110
GROUP COMPOSITION AND ACTIVITY PARTICIPATION	111
Group Size and Composition	111
Discussion of Group Characteristics	115
Group Size	118
Intra- and Inter-Group Relationships	119
Activity Participation	120
Discussion of Activity Participation	125
REASONS FOR VISITING THE CANOE ROUTES	129
Analysis of Reasons for Visiting the Canoe Routes	130
Influence of Trip Goals on Distribution of Use	141
Significance of Users' Recreational Goals	144
PERCEPTIONS OF CROWDING	150
Numbers of Encounters	151
Response to Encounters	154
Attitudes Towards Crowding	154
Perceptions of Crowding and Impacts	162
Relationships Between Encounters and Perception of Crowding	163
Spatio-Temporal Factors Influencing Perceptions of Crowding.....	165
Social-Psychological Factors Influencing Perceptions of Crowding	167
Satisfactions and Dissatisfactions	178

	<u>Page</u>
Summary of Results on Crowding	182
Perceptions of Crowding on the Canoe Routes	183
Recreation Succession	195
Wilderness Recreation Quality	197
MANAGEMENT CONSIDERATIONS	201
Management Recommendations	211
Conclusion	216
REFERENCES CITED	218

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Location of the Kenai Canoe Routes Study Area	9
2. Map of the Swan Lake Canoe Route	10
3. Map of the Swanson River Canoe Route	11
4. Swan Lake Canoe Route: Konchanee Lake, Gavia Lake, Trout Lake, and Spruce Lake	13
5. Moose River, Swan Lake Canoe Route	14
6. Wilderness Area Boundaries, Swan Lake and Swanson River Canoe Routes	19
7. Sample of Questionnaire Used in Study of Canoe Route Users	25
8. Percentage Distribution of Year of First Visit to Canoe Routes	65
9. Locations of Canoes Observed During Four Aerial Surveys, Swan Lake Canoe Routes	78
10. Locations of Canoes Observed During Four Aerial Surveys, Swanson River Canoe Route	79
11. Locations of Canoes Observed During Aerial Survey on the 4th of July Holiday 1976, Swan Lake Canoe Route	80
12. Locations of Canoes Observed During Aerial Survey on the 4th of July Holiday 1976, Swanson River Canoe Route	81
13. Relative Proportions of Trail Use, Swan Lake Canoe Route	84
14. Relative Proportions of Trail Use, Swanson River Canoe Route	85
15. Relative Proportions of Campsite Use, as a Percentage of All Campsites Made, Swan Lake Canoe Route	86

<u>Figure</u>	<u>Page</u>
16. Relative Proportions of Campsite Use, as a Percentage of All Campsites Made, Swanson River Canoe Route	87
17. Percentage Distribution of Month of Visit to Canoe Routes	94
18. Percentage Distribution of Number of Groups Encountered	152
19. Percentage Distribution of Number of Large Groups Encountered	153

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Sampling Schedule for Questionnaire Survey of Canoe Route Users	23
2. Response Rate Among Questionnaire Survey Participants	28
3. Place of Residence: Canoe Route Users from Alaska and Population of Alaska	41
4. Geographic Region of Residence: Nonresident Canoe Route Users and Population of the United States	42
5. Size of Home Community: Resident Canoe Route Users and Population of Alaska	43
6. Size of Home Community: Nonresident Canoe Route Users and Population of the United States	44
7. Age Distribution of Canoe Route Users and the Alaska and United States Populations	46
8. Number of Children: Canoe Route Users and the Alaska and United States Populations	48
9. Number of Children by Marital Status of Canoe Route Users	49
10. Years of School Completed for Canoe Route Users and the Alaska and United States Populations	51
11. Employment Status by Sex of Canoe Route Users and the Alaska and United States Populations	53
12. Detailed Occupations by Sex for Canoe Route Users ...	54
13. Detailed Occupations of Employed Persons: Canoe Route Users and the Alaska and United States Populations in 1975	55
14. Occupations of Employed Canoe Route Users and Corresponding Mean Income for Employed Males in Alaska and the United States in 1975	57
15. Age Distribution by Residency Status of Canoe Route Users	58

<u>Table</u>	<u>Page</u>
16. Age Distribution: Canoe Route Users from Anchorage and from Other Alaska Towns, and the Anchorage Borough Population	60
17. Years of School Completed: Canoe Route Users from Anchorage and from Other Alaska Towns, and the Anchorage Borough Population	62
18. Occupations of Employed Canoe Route Users from Anchorage and from Other Alaska Towns, and the Anchorage Borough Population	63
19. Estimated Number and Percentage of Canoe Route Users in 1975, by Stratum	74
20. Estimated Number and Percentage of Canoe Route Users in 1975, by Canoe Route Used	75
21. Estimated Number and Percentage of Canoe Route Users in 1975, by Trailhead Used	76
22. Trails Followed by Canoe Route Users	83
23. Reasons Given by Canoeists for Choice of Route Traveled	89
24. Reasons Given by Canoeists for Choice of Route, by Canoe Route Used	91
25. Reasons Given by Canoeists for Choice of Route, by Actual Route Used	93
26. Types of Day on Which Canoeists Began Trips, by Canoe Route Used	96
27. Types of Day on Which Canoeists Began Trips, by Residency Status	97
28. Mean Length of Stay for Canoe Route Users, by Route Traveled	98
29. Age and Sex Composition of Canoe Route User Groups, by Type of Group	113
30. Mean Sizes of Canoe Route User Groups	114
31. Route Traveled by Canoe Route Users, by Size of Group	116

<u>Table</u>	<u>Page</u>
32. Mean Numbers of Visitor-Days Spent by Canoe Route User Groups	117
33. Participation in Recreational Activities by Canoe Route Users	121
34. Participation in Consumptive and Nonconsumptive Activities by Canoe Route Users	122
35. Reasons Given by Users for Visiting the Canoe Routes	131
36. Reasons for Canoe Route Visit, by Most Important Activity	136
37. Reasons for Canoe Route Visit, by Type of Group	138
38. REasons for Canoe Route Visit, by Residency Status of Canoeists	139
39. Reasons for Canoe Route Visit, by Area of Residence in Alaska	140
40. Reasons for Canoe Route Visit, by Route Used	142
41. Mean Length of Stay for Canoe Route Users, by Reason for Visit	143
42. Reasons for Canoe Route Visit, by Type of Day	145
43. Comments by Canoe Route Users on Encounters with Other Groups	155
44. Item Means, Standard Deviations, and Item-Total Correlations for Crowding Scale	158
45. Summary Statistics for the Seven-Item Crowding Scale ..	159
46. Percentage Distribution of Responses to Crowding Scale Items	161
47. Areas Identified as Crowded or Impacted by Canoe Route Users in 1975	164
48. Levels of Crowding and Impacts Perceived, by Feelings About Encounters	166
49. Feelings About Encounters by Route Used	168

<u>Table</u>	<u>Page</u>
50. Levels of Crowding Perceived by Route Used	169
51. Feelings About Encounters by Type of Day Trip Began .	170
52. Levels of Crowding Perceived by Type of Day Trip Began	171
53. Feelings About Encounters by Reason for Visit	173
54. Levels of Crowding and Impacts Perceived, by Previous Wilderness Experience	175
55. Levels of Crowding and Impacts Perceived, by Previous Canoeing Experience	176
56. Levels of Crowding and Impacts Perceived, by Frequency of Wilderness Trips Per Year	177
57. Levels of Crowding Perceived by Year of First Visit to the Canoe Routes	179
58. Satisfactions Identified by Canoe Route Users	180
59. Dissatisfactions Identified by Canoe Route Users	181

ACKNOWLEDGEMENTS

Financial support for this study was provided by the U.S. Fish and Wildlife Service through a Graduate Student Fellowship in the Alaska Cooperative Wildlife Research Unit. A generous contribution from the Alaska Territorial Sportsmans Association, with the help of Urban C. "Pete" Nelson, made the initial phase of the field work possible.

I gratefully acknowledge the contributions and support of those who helped me complete this project. Samuel J. Harbo (Program in Wildlife and Fisheries), David R. Klein (Alaska Cooperative Wildlife Research Unit), and Robert B. Weeden (School of Agriculture and Land Resources Management) served on the advisory committee. I am especially thankful to Dr. Harbo for his invaluable assistance and encouragement during a particularly trying phase of the study. John A. Kruse (Institute of Social and Economic Research) provided valuable advice and critically reviewed earlier drafts of the thesis. Norma Milke (Alaska Cooperative Wildlife Research Unit) assisted with the many administrative and logistical problems during the project. Mary Lee Guthrie worked as my field assistant and companion, and produced the maps illustrating this thesis. Justice Higgins and Doris Johnson worked long hours to type the final draft before the last deadline.

James B. Monnie (Refuge Manager) and John L. Fillio (Assistant Refuge Manager), and the entire staff of the Kenai National Wildlife Refuge, provided generous logistical support and general assistance with the field study. I particularly wish to thank Robert A. Richey (Assistant Refuge Manager), who gave generously of his time and knowledge to help me with aerial surveys and with understanding many aspects of refuge management.

Many persons involved in wildland and recreation research contributed ideas and advice during various stages of the project. Robert C. Lucas (University of Montana) provided valuable information on cluster sampling and estimation, as well as discussion on critical concepts in wilderness management. I also wish to thank Frederick C. Dean (Alaska Cooperative Park Studies Unit), Leonard K. Johnson (University of Alaska), Roger N. Clark (University of Washington), George H. Stankey (University of Montana), and Dean R. Yoesting (Iowa State University).

Finally, I wish to thank my friends and family for their unflagging support and encouragement during the time it took to complete this project. They truly gave me the strength and motivation to see it through.

INTRODUCTION

Recreational use of wildlands has grown rapidly in recent years, and the impacts of visitors upon each other and upon the terrain are increasingly noticeable. These impacts diminish the quality of the experience for some people. Wildland managers face the dual responsibility of protecting the wild and natural characteristics of the landscape while maintaining a flow of benefits to society from its use. Increasingly, they question whether human use can or should be restricted to maintain opportunities for high quality experiences, and if so, to what extent. Use levels, quality experiences, and carrying capacity in the wilderness setting are concepts closely linked in crucial but as yet unclear ways.

The Swan Lake and Swanson River Canoe Routes were established on the Kenai National Moose Range -- now the Kenai National Wildlife Refuge -- in 1965. They provided a new opportunity for wilderness-oriented recreation in Alaska. In 1971 the U.S. Fish and Wildlife Service included the Canoe Routes in its Kenai Wilderness Proposal. From the beginning, refuge management policies were directed toward protection of the area's wilderness characteristics, but maintenance of natural conditions became increasingly difficult as public use climbed from 500 canoeists in 1965 to approximately 3000 in 1975. In 1980 the Alaska National Interest Lands Conservation Act (Public Law 96-487) mandated wilderness management for the Canoe Routes by including them in the National Wilderness Preservation System as part of the new Kenai Wilderness.

The popularity of the Canoe Routes reflects their value to society but evidence suggests that growing numbers of canoeists are dissatisfied with the amount and impacts of human activity which they encounter there. Refuge managers are concerned about the ability of the Canoe Routes to remain a wilderness environment and to sustain the kind of wilderness experience for which it was established as the pressures of rapidly growing use increase. What social and environmental factors determine the optimum carrying capacity for high quality recreation on wildlands? Wildland managers need answers to this question to help clarify research and management priorities.

I chose the Swan Lake and Swanson River Canoe Routes for a study of wilderness use and perceptions of crowding because they epitomize the practical and philosophical problems faced by more and more wildland managers in Alaska.

The principal objectives of the study were (1) to estimate the number and distribution of canoeists using the Swan Lake and Swanson River Canoe Routes, (2) to identify environmental and social factors influencing patterns of use, (3) to identify the canoeist population in terms of social and demographic characteristics, (4) to determine canoeists' perceptions of and attitudes toward encounters with other groups in relation to their goals, previous experience, and social interactions within and between groups, and (5) to recommend management policies for the Canoe Routes within the context of National Wildlife Refuge System objectives and recent legislation on Alaska's wildlands.

BACKGROUND AND LITERATURE REVIEW

As landscape and as symbol, wilderness¹ in America has shaped our consciousness of the natural world and our relationship to it. Wilderness is the fertile ground in which our imaginations may reach beyond self to an integrative experience of the world, and the place wherein we may observe and comprehend natural processes.

As wildlands have become scarce they have become more valuable to society for a variety of reasons. Our understanding of wildlands has matured, allowing us to appreciate the values they possess as watershed, wildlife habitat, and ecological benchmarks with which the effects of human activities can be compared. Furthermore, many people find enrichment and re-creation in the idea and experience of wilderness.

Because of their value and scarcity, wildlands have been forced into the political arena of land and resource allocation. Congress, by passing the Wilderness Act of 1964 (Public Law 88-577), created a National Wilderness Preservation System and required review and evaluation of wildlands within the national parks, forests, and wildlife

1. Throughout this study, "wilderness" will be used to signify the culturally-defined idea of a landscape valued for its pristine quality and absence of any sign of contemporary human uses, or areas where people commonly seek such values. "Wilderness Area" refers to those tracts of land included in the National Wilderness Preservation System. "Wildland" refers in general to any extensive tract of undeveloped land with or without legal status as wilderness.

refuges. But once land is allocated for wilderness values it must be both used and protected in its natural conditions to fulfill the letter of the law.

Many existing and proposed units of the National Wildlife Refuge System possess outstanding wilderness characteristics. Traditionally, System objectives were directed primarily toward the protection and enhancement of wildlife resources for public benefit, with special emphasis on waterfowl production and management (Public Law 93-271; Leopold et al. 1968). However, the Recreational Use of Fish and Wildlife Areas Act of 1962 (Public Law 87-714) and the Wilderness Act added a different dimension to refuge management by including wildland recreation use within System objectives. Such use meets System objectives by enhancing visitors' understanding of, and appreciation for, wildlife and wildland ecology (Pulliam 1974).

The propriety of recreation uses on the National Wildlife Refuge System has been scrutinized (Pulliam 1974) but there have been few studies of use patterns, satisfactions, or characteristics of recreationists visiting wildlife refuges. For example, Fowler and Bury (1973) studied visitor evaluations of a developed recreation area on Okefenokee National Wildlife Refuge. In Alaska, Watt (1966) assessed the recreational potential of several overland routes of travel in the Arctic National Wildlife Refuge, but did not attempt to determine actual recreational use. On the Kenai National Wildlife Refuge, Steinhoff (1969 and 1971) surveyed visitors to determine economic values of wildlife and Wentworth (1974) used refuge public use information to analyze the

economics of all recreation uses. Quilliam (1971) measured campground visitation on the Kenai Refuge.

Public use of some of the more scenic and accessible wildlife refuges in Alaska has grown rapidly in the past few years, but little detailed information exists on the amount or kind of wildland recreation use taking place on Alaskan refuges which would help assess the physical and social impacts of increasing use.

The search for solutions to the practical problems of managing wildlands has given rise to a controversial new set of related inquiries. The meaning quality in recreation, and the ecological and ethical implications of regulating use, are issues central to the evolution of a philosophy for managing wildlands.

The ultimate yield of wildland management is its contribution to human experiences. Managers are charged with the task of maintaining the quality of these experiences. But the actual relationship between people's perceptions of quality and the amount and patterns of use in wildlands remains poorly understood. What creates an experience of quality and what diminishes it? Quality has several dimensions, including the physical dimensions of solitude and pristineness, and the psychological dimensions of needs, desires, and satisfactions (Driver and Tocher 1970).

The problems of crowding and recreation quality in the wilderness setting are closely tied to the concept of wilderness carrying capacity. The term "carrying capacity" was first widely used by ecologists in the 1930's and 1940's to describe the level of use by a species of wildlife or livestock which a habitat could sustain without lasting damage. Later

definitions recognized that many different environmental factors play a role in regulating population size, density, and health, which led to a concept of carrying capacity as a dynamic property expressing the interaction between a species and its environment (Edwards and Fowle 1955).

Concern for the quality of recreation experiences as use levels increased was expressed at an early date and reference to the recreational carrying capacity of an area followed. In a monograph on recreational carrying capacity, Wagar (1964) pointed out that the effects on quality of increasing numbers of people were not simply an inverse linear relationship. Visitors' needs, desires, and satisfactions also affected their success in attaining quality experiences.

Later researchers expanded the concept of wilderness carrying capacity. Lime and Stankey (1971) and Stankey (1974) defined it as a multidimensional and dynamic concept in which management objectives, visitor attitudes, and the physical environment are all related to the goal of maximizing satisfactions or benefits for wilderness users. Attempts to identify and measure satisfactions and thereby determine optimum use levels have dominated outdoor recreation management questions in recent years (Potter, Hendee and Clark 1973; Stankey, Lucas and Ream 1973; Rossman and Ulehla 1977; Hautaluoma and Brown 1978; Dorfman 1979).

Recent work in environmental psychology has contributed towards a more integrated view of human behavior in relation to the environment (Ittelson, et al. 1974; Ittelson, Franck and O'Hanlon 1976; Moore and Golledge 1976; Lowenthal and Prince 1976), and towards the recreation

process in particular (Driver and Tocher 1970; Knopf, Driver and Basset 1973). This has helped focus attention on the relationships between satisfaction and recreation quality (Talhelm 1973; Hendee 1974; Peterson 1974), which in turn has spurred research on the problems of crowding in wildland environments and its effects on recreation quality (Heberlein 1977; Nielsen and Shelby 1977; Roggenbuck and Schreyer 1977). Presently, visitors' preferences, perceptions, and satisfactions regarding use levels, are the pivotal factors on which turn the questions of wildland recreation quality, carrying capacity, and management.

THE STUDY AREA

The Swan Lake and Swanson River Canoe Routes are located on the northern lowland portion of the Kenai National Wildlife Refuge, an area of 797,259 ha (1,970,000 A) on the Kenai Peninsula in southcentral Alaska (Figure 1). The Swan Lake Canoe Route contains 30 lakes linked with the main branch and West Fork of the Moose River in an interconnecting system of waterways and portages 97 km (60 mi) in length (Figure 2). The Swanson River Canoe Route connects 40 lakes with 74 km (46 mi) of the Swanson River, forming a trail system 129 km (80 mi) in length (Figure 3).

Physical Description

Variability in landforms and plant and animal communities characterizes the study area. The Canoe Routes are not especially rugged or scenically spectacular, but present a diverse and subtly changing landscape.

The Kenai lowland is a region of flat to gently undulating topography occupying an ancient glacial lake bed. The terrain exhibits features associated with river and glacier development, such as river terraces, lacustrine plains, and several types of moraines (Karlstrom 1964). The numerous lakes are the most outstanding feature of this landscape. There are more than 1000, varying in size from about 3 ha to 350 ha (7 to 865 A), and generally with simple shoreline configurations. The Moose River and Swanson River are shallow streams following complex meanders through poorly-drained swamp and muskeg areas.

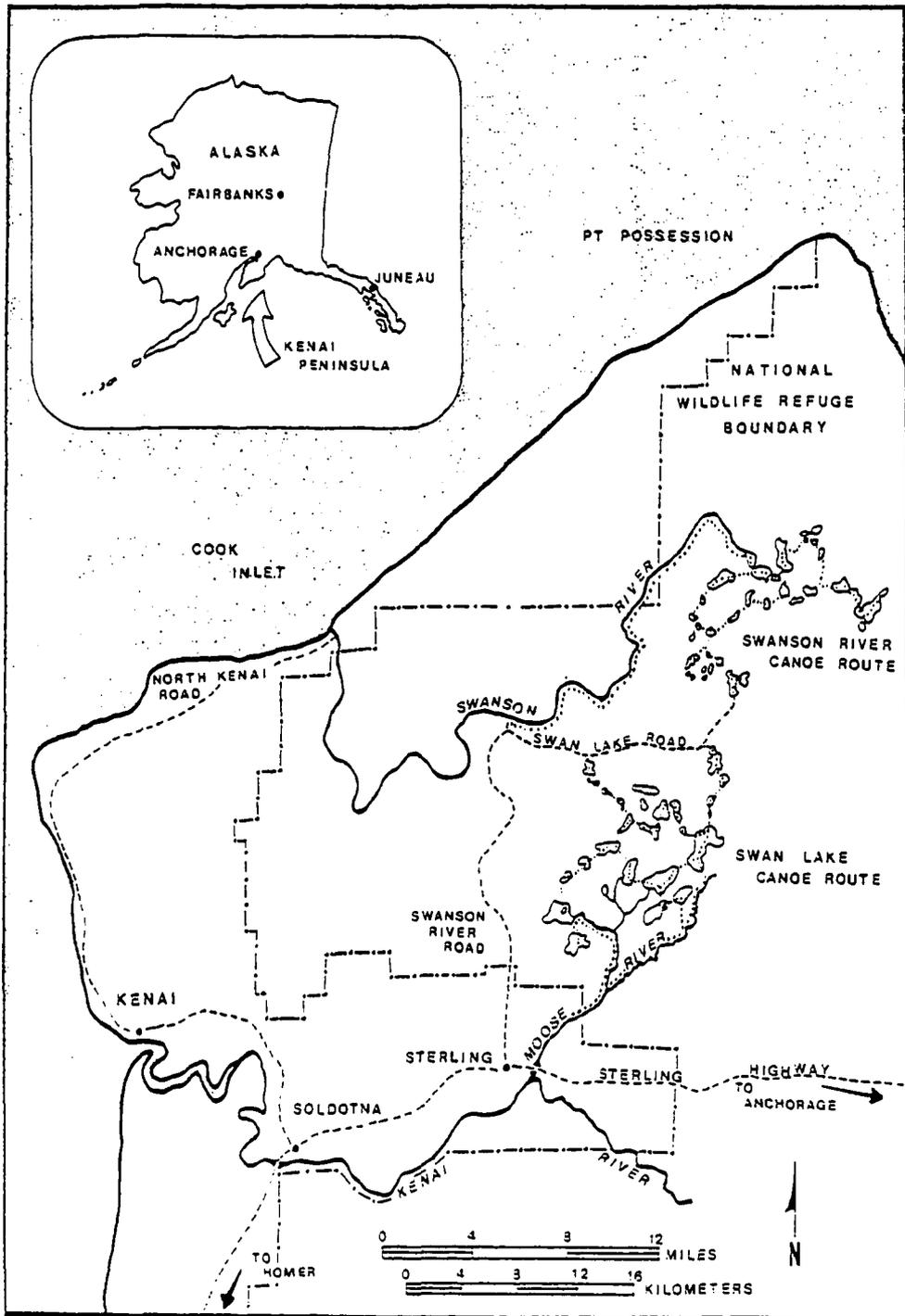


Figure 1. Location of the Kenai Canoe Routes Study Area

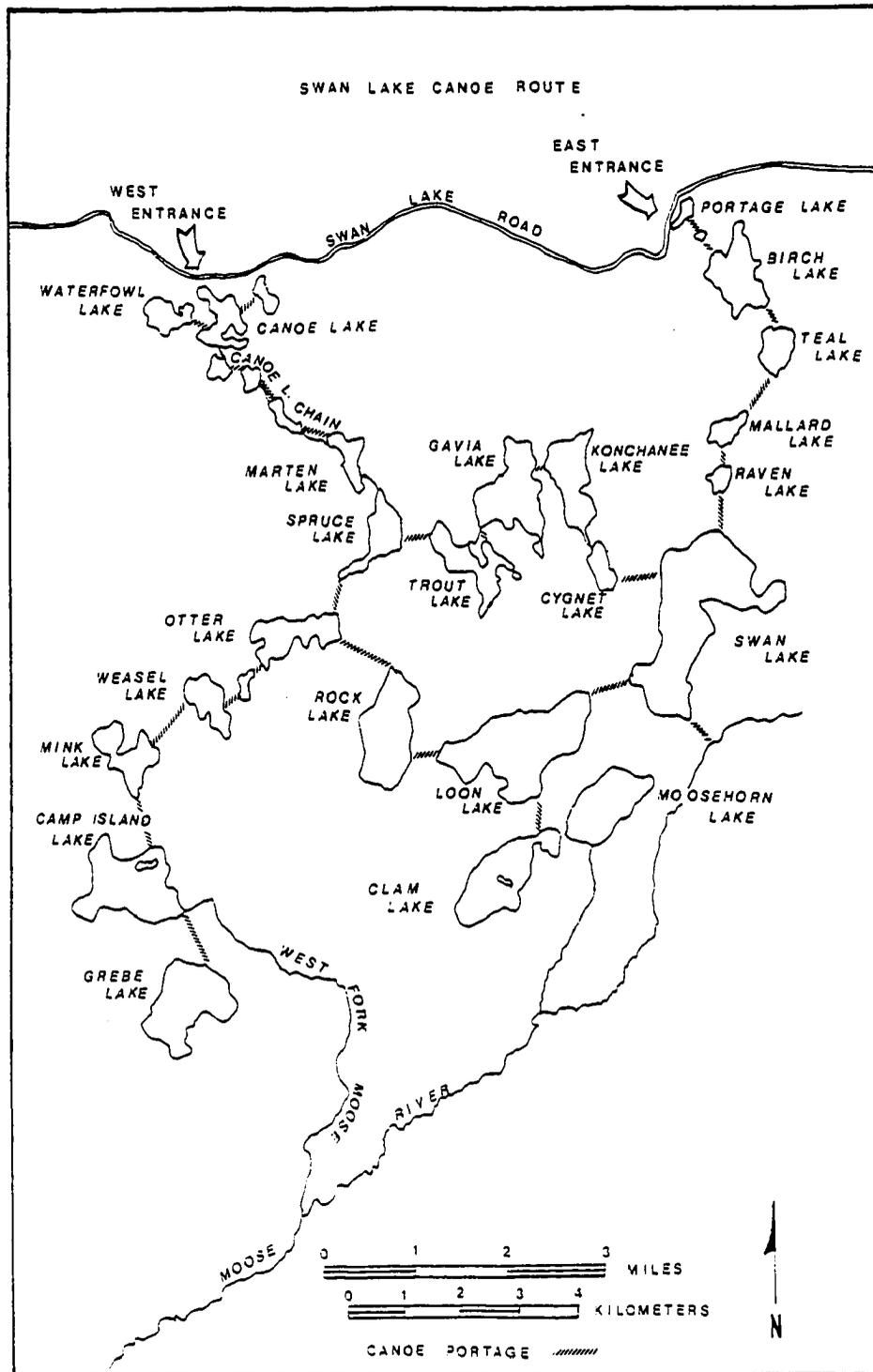


Figure 2. Map of the Swan Lake Canoe Route

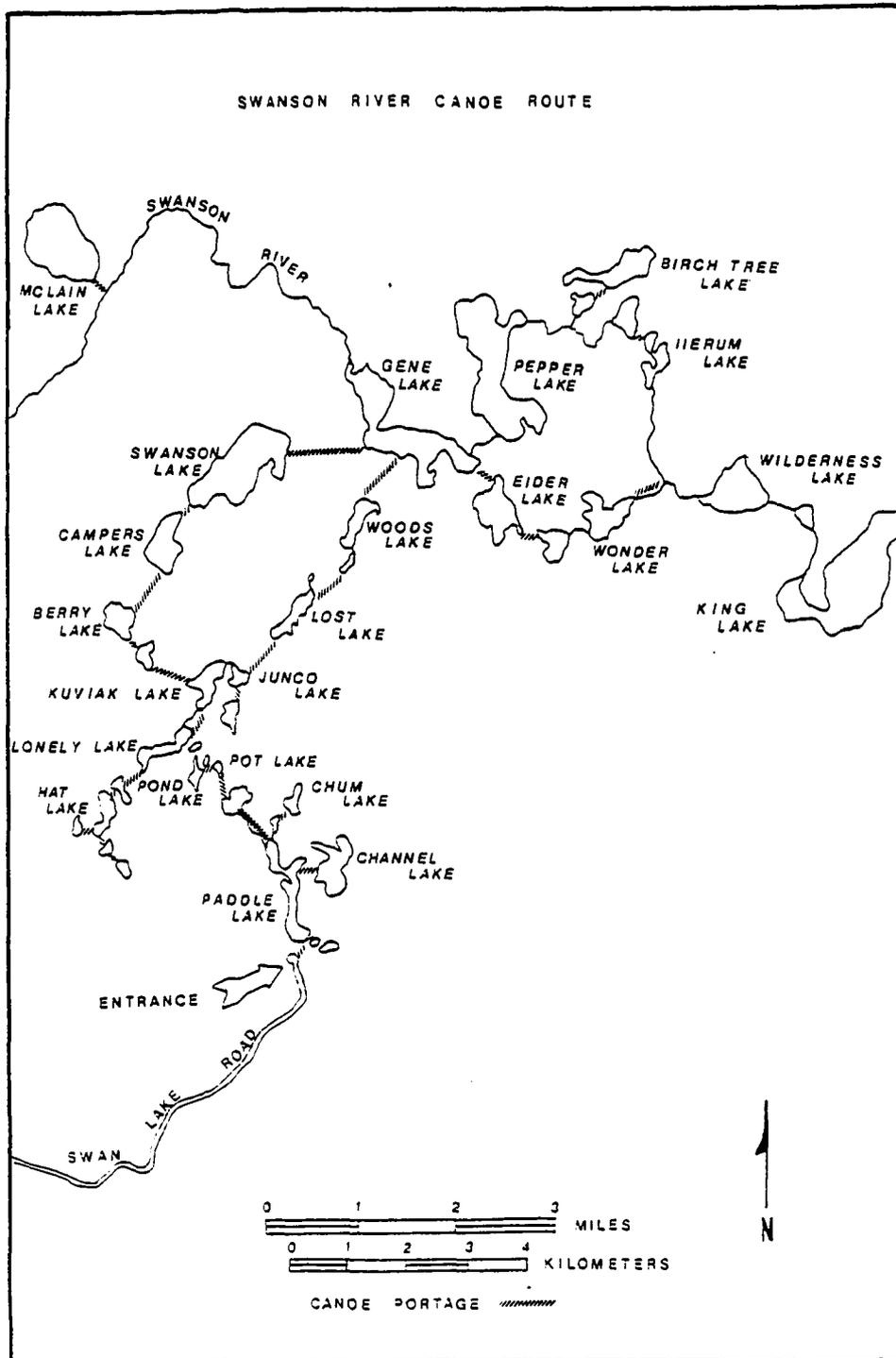


Figure 3. Map of the Swanson River Canoe Route

Surrounding the lakes are rounded hills and ridges rising to elevations of 15 to 90 m (49 to 295 ft), (Figures 4 and 5).

A complicated pattern of forest, shrub and bog communities reflects local variations in soil, exposure, drainage, and fire history. The well-drained podsollic soils of hills and ridges support a typical boreal forest with tall, mixed stands of white spruce (*Picea glauca*), paper birch (*Betula papyrifera*) and aspen (*Populus tremuloides*). Tall, mature cottonwoods (*P. trichocarpa*) and balsam poplar (*P. balsamifera*) are found in some low-lying areas. Beneath the forest canopy lies a sparse understory of lowbush cranberry (*Vaccinium vitis-idaea*), dwarf dogwood (*Cornus canadensis*), prickly rose (*Rosa acicularis*), fireweed (*Epilobium* sp.) and horsetail (*Equisetum* sp.), with grasses occurring in more open stands. Monotypic stands of spruce harbor a thick groundcover of lowbush cranberry, mosses and lichens. Interspersed among these forested areas are sedge marshes, and bogs of black spruce (*Picea mariana*) and Labrador tea (*Ledum* sp.). The poorly-drained peat and organic soils along the Moose and Swanson rivers support a dense growth of grasses, mosses, sedges and heath mixed with areas of scattered dwarf trees, mostly spruce.

In 1947 about 40% of the Kenai lowlands were burned in a fire that covered 127,522 ha (315,102 A). In 1969, fire burned another 35,208 ha (87,000 A) along the lower Swanson River. The 1947 burn covers extensive portions of the Canoe Routes and is most noticeable along the eastern half of the Swan Lake Route and the southern half of the Swanson River Route. Regrowth consists of dense, nearly monotypic stands of young paper birch or black spruce. A considerable



Figure 4. Swan Lake Canoe Route: Konchane Lake (foreground), Gavia Lake (center), Trout Lake (left), and Spruce Lake (center background)



Figure 5. Moose River, Swan Lake Canoe Route

amount of fallen timber is mixed with the regrowth, severely hampering off-trail passage by people. Stands of mature white spruce, birch and aspen form islands within the burned areas, typically on the tops of hills and ridges.

The complex mixture of forest, bog, and aquatic habitats supports a great variety of wildlife. The Canoe Routes in general, and the 1947 burn in particular, contain a major portion of the favorable habitat for moose (Alces alces) on the refuge, including calving areas and summer range. Cow moose with young calves are often visible along the rivers and lake shores in early summer. More cryptic species such as black bear (Ursus americanus), brown bear (U. arctos), wolf (Canis lupus), coyote (C. latrans), and lynx (Felis lynx), can sometimes be glimpsed in the forest and regrowth areas. Muskrat (Ondatra zibethica), beaver (Castor canadensis), and river otter (Lutra canadensis) inhabit the lakes and streams in the area.

Great numbers of birds nest throughout the area during the summer. Refuge records list 166 species (U.S. Fish and Wildlife Service 1968). Bird enthusiasts on the Canoe Routes are likely to see common and arctic loons (Gavia immer and G. arctica), trumpeter swan (Olor buccinator), Bonaparte's gull (Larus philadelphia), bald eagle (Haliaeetus leucocephalus), osprey (Pandion haliaetus), and many other seabirds, songbirds, shorebirds, raptors and waterfowl.

Many people visit the Canoe Routes to take advantage of the excellent sport fishing. Dolly Varden char (Thymallus arcticus), rainbow trout (Salmo gairdnerii), and silver salmon (Oncorhynchus kisutch) are found in the lakes, and rainbow trout, silver and red

salmon (O. nerka) spawn in the Moose and Swanson rivers.

Proximity to the coastline mediates the climate of the study area, which is variable but generally mild during the summer. Average daily maximum temperatures at Kenai generally vary from 10°C to 21°C between May and October, peaking in July at 16°C. Temperatures tend to be slightly higher inland at Sterling, which borders the study area on the south (U.S. Dept. of Commerce 1975).

Surface winds are variable with prevailing winds from the south-east. Average precipitation increases during the summer from 2.11 cm in May to 9.19 cm in September and occurs mostly as rain (U.S. Dept. of Commerce 1975). Ice on the lakes of the study area breaks up between mid-May and early June and forms again in late October or early November in most years.

Daylight hours increase rapidly during the first part of the summer to a maximum of about 19 hours on 21 June, decreasing thereafter to about 12 hours on 21 September.

Access

Secondary roads provide access to the Canoe Routes from the Sterling Highway 34 km (21 mi) east of Kenai near the town of Sterling. The Swan Lake Canoe Route has trailheads at Canoe Lake (the West Entrance) and Portage Lake (the East Entrance) on the Swan Lake Road. The Swanson River Canoe Route has a single trailhead at Paddle Lake, the terminus of the Swan Lake Road (see Figure 1). Canoeists may also embark directly into the Swanson River at the Swanson River Campground, located at the end of the Swanson River Road 39 km (24

mi) above the river's terminus. The distance from Anchorage to the West Entrance of the Swan Lake Route is 256 km (159 mi), and from Kenai, 69 km (43 mi).

Management History and Policies

The Kenai National Wildlife Refuge is administered by the U.S. Fish and Wildlife Service as a unit of the National Wildlife Refuge System. It was originally established by Executive Order 8979 in 1941 as the Kenai National Moose Range, to protect the natural breeding and feeding range of the Kenai Moose. Current public use policy allows recreation only when it meets the criteria of compatibility with primary refuge objectives and other uses, and with wildlife or wildland values. The primary objective of recreation use on the Refuge System is to provide wildlife and wildland benefits to the public which are not available elsewhere and can be offered on the refuge with unique value in terms of quality as well as quantity (Monnie and Fillio 1976).

Refuge staff began work on the Swan Lake Canoe Route in 1964 and completed portage construction in 1966. The Wilderness Act of 1964 required review of all roadless areas 2024 ha (5000 A) or larger on wildlife refuges. The Swan Lake and Swanson River Canoe Routes were included in the Kenai Wilderness Proposal in 1971, in units of 16,188 ha (40,000 A) and 29,138 ha (72,000 A), respectively (U.S. Fish and Wildlife Service 1971). Following public hearings at Anchorage and Kenai in 1971, another 19,830 ha (49,000 A) were added to the proposal, linking the two Canoe Routes in the Moose River Flats area.

In 1974 the Swan Lake and Swanson River Wilderness Units and several others were deleted from the legislative proposal awaiting approval by Congress (House Doc. No. 93-403). This occurred in response to conflicting claims on the area resulting from the Alaska Native Claims Settlement Act of 1971 (Public Law 92-203), and renewed interest in oil and gas potential.

After lengthy and controversial debate on the fate of Alaska's national interest lands, the two Canoe Routes were included in the Kenai Wilderness established by the Alaska National Interest Lands Conservation Act in 1980, and thus became units of the National Wilderness Preservation System. The boundaries of the wilderness unit extend beyond the original wilderness proposal, going all the way to the coast at Pt. Possession and including land in the Moose River Flats linking the two Canoe Routes (Figure 6).

Early in 1981, the Secretary of the Interior designated the Swan Lake and Swanson River Canoe Routes as National Recreation Trails, part of the National Trails System established by the National Trails System Act of 1968 (Public Law 90-543).

Current management policies on the Canoe Routes seek to maintain its wilderness characteristics. No development beyond portage construction has occurred. In 1970, all permits for recreational fly-in fishing camps on the Canoe Routes were cancelled, except for those on Wilderness and King lakes in the extreme northern portion of the Swanson River Route.

Federal regulations governing public use, access and recreation on wildlife areas (50 C.F.R. 28) also apply to the Canoe Routes. Low

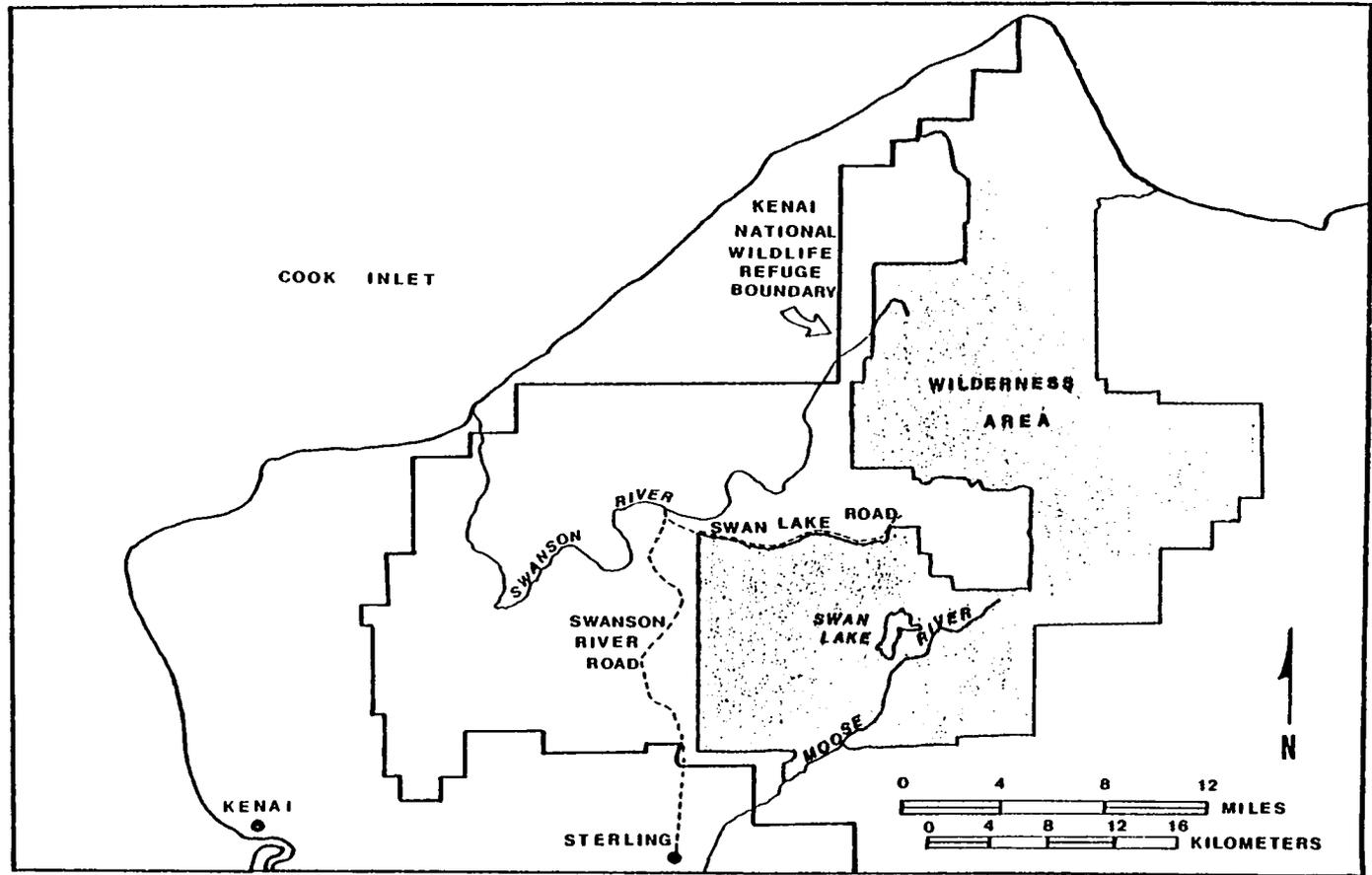


Figure 6. Wilderness Area Boundaries, Swan Lake and Swanson River Canoe Routes

level flights and landing by aircraft are prohibited (50 C.F.R. 26.32). The use of off-road vehicles, motorized boats or canoes, and all other motorized equipment is prohibited on the Canoe Routes except that boats and canoes with outboard engines are allowed on the Moose and Swanson rivers (50 C.F.R. 28.28). Target shooting is prohibited at all times and firearms may be used only in conjunction with legal hunting activities. Hunting and fishing are allowed, but seasons and bag limits are determined by the Alaska Boards of Fisheries and Game.

METHODS AND MATERIALS

The method of data collection was designed to estimate the amount and distribution of canoeing use on the two Canoe Routes, and to provide information on the characteristics, activities and attitudes of canoeists by surveying a representative sample of the population.

I conducted preliminary field investigations on the study area from 24 May to 10 September 1974. During this time I estimated approximately the number of visitors to the Canoe Routes, appraised their distribution over time and space, and pre-tested items for the questionnaire survey.

Sample Design

The sampling procedure used in 1975 for population estimates and for the questionnaire survey was based on a stratified random sample design adapted from James and Schreuder (1971 and 1972) for estimating dispersed recreation use along trails. Each of the two Canoe Routes has three possible trailheads: the West Entrance, East Entrance, and Moose River bridge on the Swan Lake Route, and Paddle Lake, the Swanson River Campground, and the North Kenai Road on the Swanson River Route. I classified each trailhead by amount of recreational use: high, medium, or low, as determined from preliminary survey data. I then classified the days of the 1975 field season (21 May to 14 September) by type of day: weekend, weekday, and

holiday, and by time of day: 0800 to 1759 hours for daytime, and 1800 to 0759 hours for nighttime. A sample unit, or "station", was defined as a day or night spent at a selected trailhead.

The sample units were classified into six strata based on the expected amount of recreational use, with emphasis on maximum similarity among members within each stratum and maximum differences between each stratum. The date, time, and trailhead to be sampled were selected randomly. A total of 55 sample units was allocated in proportion to the within-stratum variances as determined from preliminary survey data (Table 1).

At each station I observed the number of groups entering and exiting through the trailhead, the approximate age and sex composition and size of each group, and ascertained whether each group stayed for one day or for a longer time. Groups staying for more than one day were included in the questionnaire survey, while one-day users were counted only for visitor population estimates. Canoeists exiting the trailhead were asked to fill out a questionnaire at the site. If they seemed hurried or reluctant, they were asked for a mailing address, or given a questionnaire with a self-addressed, stamped envelope. Arriving canoeists were asked for a mailing address and a questionnaire was mailed within a week of contact. If a person failed to respond within four weeks, a letter of reminder and another copy of the same questionnaire were mailed.

Table 1. Sampling Schedule for Questionnaire Survey of Canoe Route Users

Stratum	Expected Use Level	Description	Total Number of Sample Units in Stratum	Expected Sample Size	Actual Sample Size*
I	High	West Entrance, weekdays, daytime	80	12	10
II	High	West Entrance weekdays and holidays, daytime	37	3	5
III	Medium	Paddle Lake, weekdays, daytime	80	14	12
IV	Medium	Paddle Lake, weekends and holidays, daytime	37	3	8
V	Low	All other trailheads, all days, daytime and nighttime	702	13	11
VI	Low	West Entrance and Paddle Lake, all nights	234	10	9

*Some sample units were dropped during the field study because of logistical problems.

Questionnaire Survey

Questionnaires have been used successfully in outdoor recreation research to measure socio-economic characteristics (Wildland Research Center 1960; Hendee, et al. 1968), and motivations and dimensions of satisfaction among wilderness users, hunters, and fishermen (Knopf, Driver and Basset 1973; Potter, Hendee and Clark 1973; Stankey 1971). The techniques and design of questionnaires and interview surveys are discussed by Jahoda, Deutsch and Cook (1951), Maccoby and Maccoby (1954), and Oppenheim (1966).

The questionnaire designed for this study focused on several aspects of canoeists' experiences: (a) route and duration of canoe trip, (b) group characteristics, (c) activities, (d) encounters with other groups of canoeists and attitudes toward encounters, (e) previous experience, and (f) social and demographic characteristics. The questionnaire was seven pages long and took respondents between fifteen and thirty minutes to complete (Figure 7).

The U.S. Office of Management and Budget reviewed and approved the questionnaire as required in OMB Circular No. A-40 Revised (1974).

Most of the questions required the respondent to provide a short answer, or check a box corresponding to the most appropriate answer. Several questions concerning motivations, reactions to encounters, and satisfactions, were of the free-response type, to permit respondents to define their feelings in their own terms and to minimize investigator bias as in multiple-choice answers.

The section on encounters included a Likert-type 5-point attitude scale which tested respondent's attitudes towards nine items repre-

**Figure 7. Example of Questionnaire Used
in Study of Canoe Route Users**



ALASKA COOPERATIVE WILDLIFE RESEARCH UNIT

25

UNIVERSITY OF ALASKA
ALASKA DEPARTMENT OF FISH AND GAME
UNITED STATES FISH AND WILDLIFE SERVICE
WILDLIFE MANAGEMENT INSTITUTE

UNIVERSITY OF ALASKA, FAIRBANKS, ALASKA
PHONE NUMBER 907 - 479-7673

Dear Canoeer:

We need your help.

The Alaska Cooperative Wildlife Research Unit, University of Alaska, with the cooperation of the Kenai National Moose Range, U.S. Fish and Wildlife Service, is conducting a survey of recreation use on the Canoe Trails area of the Kenai National Moose Range. The purpose of the study is to determine ways for improving recreation quality and opportunities for visitors. Only you can provide the information we need to determine whether the Kenai Canoe Trails are effectively serving your recreation needs.

This questionnaire will take only a few minutes to complete. The questions have been carefully designed to save your time in answering and have been kept to the minimum necessary to the study. Every one of your answers is important.

You were chosen in a scientifically selected random sample. Your replies will be held strictly confidential and the information you provide will be used only in combination with that of other respondents.

Please return the questionnaire as soon as possible in the enclosed envelope. Postage has already been paid. Your cooperation is much appreciated and will be of great value to the study.

Sincerely,

Lisa A. Shon
Graduate Research Fellow

P.S. Maps of the Swan Lake and Swanson River Canoe Routes have been enclosed to aid you in answering a few questions. Please feel free to keep them for your own personal use.

KENAI CANOE TRAILS STUDY

Alaska Cooperative Wildlife Research Unit
University of Alaska

We are interested in finding out what kind of use the Kenai National Moose Range Canoe Trails receive. Please answer questions 1 to 7 on the basis of your most recent visit to the Canoe Trails. The enclosed maps may help you answer some of the questions.

1. Which of the following routes did you take on your last canoe trip?
(Check one):

Swan Lake Route _____ Swanson River Route _____

The following locations are places where canoeists can enter and leave the Canoe Trails:

1. Swanson River Campground
2. West Entrance, Swan Lake Route (Canoe Lake)
3. East Entrance, Swan Lake Route (Portage Lake)
4. Entrance, Swanson River Route (Paddle Lake)
5. Moose River Bridge (Sterling Highway at Sterling)
6. North Kenai Road

Where did you begin your canoe trip? (Give number of location): _____

Where did you end your canoe trip? (Give number of location): _____

2. Please name the lakes and/or rivers where you camped each night during your canoe trip:

What was your main reason for choosing this route? _____

3. When did you begin your canoe trip? _____
month day time of day

When did you end your canoe trip? _____
month day time of day

4. How many people were in your group, including yourself? _____

Which of the following best describes the kind of group you were with?
(Check one):

- you alone
- members of your immediate family
- members of 2 or 3 families
- family plus friends
- friends and acquaintances
- organized group (club, tour, scouts, etc.)
- other (please describe) _____

What was the age and sex distribution of your group?

Number of women 18 years or older _____ Less than 18 years _____

Number of men 18 years or older _____ Less than 18 years _____

5. Which of the following did you personally take part in? (Check all that apply):

- nature photography
- fishing
- canoeing
- big game hunting (moose, bear)
- small game hunting (hares, grouse)
- waterfowl hunting
- berry picking
- bird observations and identification
- wildlife observations and identification (except birds)
- swimming
- other (please describe) _____

Please underline the one activity that was most important to you.

6. What was your main reason for making this trip on the Canoe Trails?

7. Did your group have any maps or guidebooks for the area you visited?

yes no

If yes, what were they? _____

Now we would like to know how you feel about meeting other groups of people on the Canoe Trails.

8. How many other groups of people did you meet during your most recent canoe trip? (If you do not know the exact number, please give your best estimate).

number of groups _____

How many of these were large groups? (10 or more people): _____

How do you feel about the number of other people you saw during your trip? (Check one):

- There were: far too many
 too many
 about the right number
 too few
 far too few
 it didn't matter one way or the other

Any comments? _____

9. Did your encounters with other people cause you in any way to change the route of your trip or length of your stay?

yes no

If yes, what change did you make? (Check any that apply):

- changed route
 stayed longer than planned
 stayed shorter than planned

10. The following situations might occur during a trip on the Canoe Trails. Please check the one box that best describes your feelings in each situation.

	<u>It would bother me greatly.</u>	<u>It would bother me somewhat.</u>	<u>It would not matter to me.</u>	<u>I would enjoy it somewhat.</u>	<u>I would enjoy it greatly.</u>
a. Camping at a place where several other groups are camped.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Seeing many people on the first few lakes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	<u>It would bother me greatly.</u>	<u>It would bother me somewhat.</u>	<u>It would not matter to me.</u>	<u>I would enjoy it somewhat.</u>	<u>I would enjoy it greatly.</u>
c. Seeing one large group of 30 people during the day.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Seeing one small group of 3 people during the day.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Seeing 5 small groups of 3 people during the day.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Seeing no other people where you camp.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Finding litter along the trails and at campsites.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Seeing no or very few other people beyond the first few lakes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Seeing campsites worn from heavy use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. Do you feel that crowding is a problem on the Canoe Trails? (Check one):

- No, it didn't appear so to me.
- Yes, but only in a few locations.
- Yes, in most places.

If yes, please name the areas where you felt crowding was a problem.

12. Do you feel that either litter or campsite wear and tear is a problem on the Canoe Trails? (Check one):

- No, it didn't appear so to me.
- Yes, but only in a few locations.
- Yes, in most places.

If yes, please name the areas and indicate whether you felt the problem was litter, campsite wear and tear, or both.

Now we would like to know something about your previous experience with wilderness outings. By wilderness outings we mean non-motorized travel.

13. Have you ever made an extended trip (2 or more days) into a Wilderness Area or other large, roadless, natural area before?

yes no

14. When did you first visit the Kenai Canoe Trails? _____
year

How many times have you visited the Canoe Trails?
(Including your most recent visit):

Please look at the numbered areas on the enclosed maps. Check the numbers of any areas you have canoed on at least once.

1. 2. 3. 4. 5.

Is there any particular route which you prefer to take?

yes no

If yes, please describe: _____

Why do you prefer that route? _____

15. Have you canoed, kayaked or rafted on wilderness-type areas other than the Kenai Canoe Trails? (Include Wild and Scenic Rivers):

yes no

If yes, what other areas have you visited? _____

Since your first wilderness trip, about how often have you gone on other wilderness trips? (Check one):

- more than once a year
- about once a year
- less than once a year

Finally, your answers to the following questions will allow us to determine some general characteristics of canoeists.

16. Where is your permanent residence? _____
city state

If you live in Alaska, how long have you lived here? _____
years

17. Please check the age category that applies to you:

- | | |
|---|--------------------------------------|
| <input type="checkbox"/> under 15 years | <input type="checkbox"/> 40-49 |
| <input type="checkbox"/> 15-19 | <input type="checkbox"/> 50-59 |
| <input type="checkbox"/> 20-29 | <input type="checkbox"/> 60-64 |
| <input type="checkbox"/> 30-39 | <input type="checkbox"/> 65 or older |

Your sex? female male

Present marital status? married single

How many children do you have? _____

18. Please circle the highest grade of school which you have completed:

elementary school: 1 to 6

junior high and high school: 7 8 9 10 11 12

college: 13 14 15 16 17 or more

19. What do you do for a living? (Please be specific): _____
occupation

20. Check those environments in which you spent a major part of your youth.
 (Before age 18):

- | | |
|--|-------------------------------------|
| <input type="checkbox"/> large city | <input type="checkbox"/> small town |
| <input type="checkbox"/> small city | <input type="checkbox"/> rural area |
| <input type="checkbox"/> suburban area | <input type="checkbox"/> farm |

21. What did you find most satisfying about your trip on the Canoe Trails?

What did you find most dissatisfying? _____

22. Would you visit the Kenai Canoe Trails again if you had the opportunity?

yes

no

Thank you for your cooperation!

If you have any comments you would like to make about your canoe trip, the Canoe Trails, or this questionnaire, please use the space below.

senting types of situations involving encounters with people and environmental impacts of human activity. The responses were scored so that persons with a low tolerance for encounters would receive high scores, and those with a higher tolerance would receive lower scores. The scale is not a true Likert scale because the items were not pre-tested.

The target population consisted of all persons visiting the Canoe Routes for a canoeing trip of more than one day, between 15 May and 30 September 1975. Questionnaires were given to all members of a canoeing group who were 15 years old or older, in order to avoid bias towards group "leaders". Although we sometimes observed members of a group consulting each other while filling out the questionnaire, substantial differences between members of a group frequently occurred on questions of motivation, satisfaction, previous experience, and social and demographic characteristics. This confirmed the importance of sampling all members of a group. There was a greater tendency for exiting canoeists, who filled out the questionnaire at the trailhead, to give less detailed responses to free-response questions, and to skip more questions, than those to whom questionnaires were mailed. However, the latter more often gave incorrect information on the route and dates of their canoe trip, as compared with field notes.

I experienced nearly complete cooperation with only two outright refusals: 759 questionnaires, including follow-ups, were given to 606 canoeists. I received 402 usable questionnaires, for a total response of

66%. The response rates, by method of delivery of questionnaires, are summarized in Table 2.

Several interviews of an informal, unstructured nature were conducted with canoeists over the course of the two field seasons, to obtain more detailed information on their experiences than provided by the questionnaire. I also made 10 trips on the Canoe Route to directly observe canoeists and environmental conditions on the study area.

Aerial Surveys

The opportunity arose on several occasions to fly aerial surveys over the Canoe Routes, although they were not included in the original research design. Refuge managers provided five aerial surveys altogether in 1974, 1975 and 1976, which allowed us to observe directly the numbers and distributions of canoeists on most or all of the Canoe Routes. The surveys took place on Wednesday, 24 July 1974; Monday, 19 August 1974; Tuesday, 29 July 1975; Wednesday, 13 August 1975; and Saturday, 3 July 1976. Surveys were flown in a single engine Piper Super Cub from an altitude of 305 m (1000 ft). The route varied according to the amount of time available and the starting location. The Moose River, West Fork, and upper Swanson River (between Gene Lake and the Swanson River Campground) were included only when time permitted.

The pilot and observer made independent counts of the number of canoes on each lake and portage. The total number of persons on the Canoe Routes was calculated using an average figure of two persons per canoe, based on data gathered in 1974. Canoes were highly visible

Table 2. Response Rate Among Questionnaire Survey Participants

Method of Delivery	Number of Questionnaires	Number of Respondents	Percent Response
Delivered on-site	188	181	96
Delivered on-site with mailing envelope	24	11	46
Mailed	394	180	46
Follow-up letter	153	31	20
Total	606*	403	66

*Total does not include questionnaires sent with follow-up letters.

when on the water. They were more difficult to see when screened by vegetation along portages, lake shores, and narrower sections of the Moose River, but light reflected from a canoe or paddle usually revealed even the least conspicuous canoes. If the pilot and observer could not agree on a count, a second pass was made over the area in question. The complete survey of lakes on the two Canoe Routes took approximately one hour.

STATISTICAL PROCEDURES

The statistical analyses of the data gathered in this study were complicated by the fact that single a sample design served two methodologically different objectives. The basic stratified random sample design described under the Methods section was applied to the first objective, which was to estimate the amount and distribution of recreation use on the Canoe Routes by sampling different trailheads at different times. The second objective was to obtain a representative sample of all canoeists for a questionnaire survey. In this case the respondents were treated as a stratified two-stage (cluster) sample. These two different applications of the same sample design required different estimators. In addition, biases due to non-response and to varying proportions of mailed to on-site questionnaires, had to be identified and controlled. Each of these problems will be explained in the following sections.

Population Estimates of Canoeists and One-day Users

The total number of individuals and groups of canoeists and one-day users entering and exiting the Canoe Routes was obtained for each sample unit, or "station". Each individual and group was counted once, even though some both entered and left the trailhead during a single time period. The estimators for one-day users are given by Harbo (1974) as:

$$\begin{aligned} \text{estimate of population mean} \quad \hat{Y} &= \frac{\sum_{i=1}^t N_i \bar{y}_i}{N} \\ \text{Variance } V(\hat{Y}) &= \frac{\sum_{i=1}^t \left(\frac{N_i - n_i}{N_i} N^2 \frac{s_i^2}{n_i} \right)}{(\sum N_i)^2} \\ \text{estimate of population total} \quad \hat{Y} &= \sum_{i=1}^t (N_i \bar{y}_i) \end{aligned}$$

$$\text{Variance } V(\hat{Y}) = \sum_{i=1}^t \left[N_i^2 V(\hat{Y}_i) \right] = N^2 V(\hat{Y})$$

- where: t = number of strata
 N_i = number of units in the i^{th} stratum
 N = total number of units in population
 s_i^2 = sample variance for i^{th} stratum
 y_i = mean of sample in i^{th} stratum

For canoeists, the best estimate of the total population was judged to be an average of the estimated number entering and the estimated number exiting, because pooling these two classes would actually result in overestimating the number on the Canoe Routes at any one time (S. Harbo, personal communication). The estimates for canoeists are (after Harbo 1974):

$$\begin{aligned} \text{estimate of population total} \quad \hat{Y} &= \frac{\sum_{i=1}^t [(N_i \bar{y}_i)]_{\text{entering}} + \left[\sum_{i=1}^t (N_i \bar{y}_i) \right]_{\text{exiting}}}{2} \\ \text{Variance} \quad V &= \frac{1}{2} \left[V(\hat{Y})_{\text{entering}} + V(\hat{Y})_{\text{exiting}} \right] \end{aligned}$$

Spatial Distribution of Canoeists and One-Day Users

Separate use estimates were made for each of the two Canoe Routes. For this purpose, sample units in Strata III and IV (see Table 1) were reapportioned according to the Canoe Route in which they belonged. The estimators were the same as those immediately preceding for canoeists. Separate use estimates were also made for each trailhead.² Sample units at Moose River and the East Entrance (Stratum V) were separated for this purpose. The numbers of entering and exiting canoeists were pooled for the final estimates, because the total amount of traffic passing through each trailhead in both directions was the statistic of interest. The estimator was the same as for one-day users.

The aerial surveys used in estimating distribution of canoeists on the Canoe Routes were assumed to approximate a simple random sample. A simple random sample design was also assumed in estimating the average number of people per canoe, which was used in conjunction with the aerial surveys. These data were obtained in 1974, when sample units were selected randomly without stratification.

Estimates of Mean Group Size

Ratio estimation was used to determine the mean group size for both canoeists and one-day users, because the number of groups was a

2. The trailhead at the North Kenai Road campground, at the mouth of the Swanson River, was eliminated from the analysis because no samples were taken there.

random variable (i.e. not fixed). The total number of people (y_i) and the total number of groups (x_i) were measured on each sample unit. For variable sampling fractions and assuming the ratios are equal for all strata, Harbo (1974) gives the following estimators:

$$\text{mean group size } r = \frac{\sum_{i=1}^t (N_i \bar{y}_i)}{\sum_{i=1}^t (N_i \bar{x}_i)}$$

For variances a Q_i is computed for each stratum, using the general ratio:

$$Q = \sum_{i=1}^n y^2 - 2r \sum_{i=1}^n x_i y_i + r^2 \sum_{i=1}^n x_i^2$$

This gives an s_{qi}^2 as follows:

$$s_{qi}^2 = \frac{Q_i}{n_i - 1}$$

The variances are:

$$V(\hat{Y}) = \sum_{i=1}^t \frac{X_{ij}^2}{(\sum x_{ij})^2} \frac{N_i - n_i}{N_i} n_i s_{qi}^2$$

and

$$V(r) = \frac{V(\hat{Y})}{\bar{X}^2}$$

where: y_i = mean number of people per unit in stratum i
 x_i = mean number of groups per unit in stratum i
 X = total number of groups in stratum i
 x_{ij} = number of groups in the j^{th} unit in stratum i

Analysis of Questionnaire Data

The sample of questionnaire respondents was treated as a stratified two-stage, or cluster, sample, with unequal cluster sizes. All of the people using the trailhead during the sampling period form a cluster (Lucas and Oltman 1971). The trailhead-time period stations formed the Primary Sample Units (PSU's) and the questionnaire respondents formed the Second-Stage Units (SSU's). The PSU's were stratified and selected using the same sampling schedule as listed in Table 1 for the stratified random sample. Within each PSU the canoeists, or SSU's, were sampled in their entirety (censused). However, only a portion of those sampled actually returned questionnaires, hence the unequal sizes of clusters.

Kish (1965) points out that individuals within clusters tend to be more homogeneous than those between clusters. The variance of cluster samples tends to be greater than for a comparable simple random sample of individuals, and the problems and costs of statistical analysis are greater. The advantage of cluster sampling is that the cost per individual is lower, due to the lower cost of both listing and locating clusters, and stratification helps to reduce the variance.

The analysis of questionnaire data was complicated by the fact that the number of individuals in each PSU varied. In addition, the proportions of mailed to on-site questionnaires, and the proportion of non-respondents, varied within each PSU, and between strata.

Treatment of Response Bias

In the initial phase of the data analysis, mailed and on-site questionnaire respondents were compared on more than 40 variables to see whether they differed significantly. If no significant differences were found, then both classes of respondents could be pooled. One could assume them to be a random sample from each PSU and infer the results to the entire canoeist population.

If a significant difference was found, mailed and on-site respondents would have to be measured separately and treated as a domain of the population (see Kish 1965). Results could be inferred only to the sample.

Estimates of Means

An equal probabilities, ratio-to-size estimate is used for estimating means of various characteristics. Harbo (1974) gives the estimator as follows:

$$\text{mean population characteristic } \frac{\hat{Y}_R}{R} = \sum_{i=1}^t \frac{W_i}{W} \left[\frac{\sum_{j=1}^{n_i} M_{ij} y_{ij}}{\sum_{j=1}^{n_i} M_{ij}} \right]$$

- where:
- M_{ij} = number of SSU's in the j^{th} PSU in stratum i
 - y_{ij} = mean characteristic per SSU in stratum i
 - n_i = number of PSU's sampled in stratum i
 - W_i = estimated number of SSU's in stratum i
 - W = estimated number of SSU's in all strata

This estimator is biased, but the bias remains small when n is large with respect to N . An approximate variance is:

$$V(\hat{\bar{Y}}_R) = \sum_{i=1}^t W_i \left[\frac{N-n}{N_n \bar{M}^2} \frac{\sum_{j=1}^n M_i (\bar{y}_i - \hat{\bar{Y}}_{R,i})^2}{n-1} + \frac{n}{N_n^2 \bar{M}^2} \sum_{j=1}^n M_i^2 \left(\frac{M_i - m_i}{M_i} \right) \frac{S_{ji}^2}{m_i} \right]$$

This is the sum of the weighted stratum variances. The estimate of s_{qi}^2 is as follows:

$$S_{qi}^2 = \frac{\sum_{i=1}^n \sum_{j=1}^n (y_{ij} - \bar{y}_i)^2}{n(m-1)}$$

and

$$M_o = \sum_{i=1}^N M_i$$

Then,

$$\bar{M} = \frac{\sum_{i=1}^N M_i}{N} = \frac{M_o}{N}$$

Student's t was used to test for independence between mail and on-site questionnaire respondents. No significant difference was found between the two groups for the variables so tested.

Frequency Distributions

For nominal and ordinal level variables, frequency distributions were compared between mailed and on-site questionnaires to check for significant differences.

The number of individuals, or SSU's, belonging to a category C in a two-stage design is estimated by:

$$\hat{Y} = \sum_{h=1}^t \left[\frac{N_h}{n_h} \sum_{i=1}^n w_i \bar{y}_{ij} \right]_h$$

where $y_i = 1$ if the unit is in category C and 0 if it is not
 $w_{ij} =$ number of SSU's sampled in the i^{th} PSU
 $W_i =$ total number of SSU's in the i^{th} PSU
 $n_h =$ number of PSU's sampled in stratum h
 $N_h =$ total number of PSU's in stratum h
 $N =$ total number of PSU's in the population

The proportion of SSU's belonging to category C is similarly estimated by:

$$P = \frac{\sum_{i=1}^h N_h \frac{\sum M_i \bar{y}_i}{\sum M_i}}{N}$$

For each variable tested, the mean frequency distribution of the characteristic per PSU was obtained for mail and for on-site cases. The two distributions were compared using the log-likelihood ratio test, of G-statistic. The G-statistic is defined by Reynolds (1977) as:

$$G = 2 \sum_{ij} f_{ij} \left[\log \left(\frac{f_{ij}}{\hat{F}_{ij}} \right) \right]$$

$$= -2 \sum_{ij} f_{ij} \left[\log \left(\frac{\hat{F}_{ij}}{f_{ij}} \right) \right]$$

where log = natural logarithm (base e).

Under the null hypothesis of independence, G-statistic has an approximately chi square distribution with $v=(I-1)(J-1)$ degrees of

freedom (Reynolds 1977). The G-statistic was used rather than chi square because mean distributions resulted in cell frequencies too low to use chi square. Furthermore, the log-likelihood test is thought to be the more exact test (Sokal and Rolf 1969).

No significant difference was found between the on-site and mail questionnaires for the variables tested, so the two groups were pooled to obtain a final frequency distribution for the canoeist population, using the above formula for Y.

In subsequent analyses, each respondent was weighted by an expansion factor, WF, to correct for unequal cluster sizes:

$$W F = \frac{W_i}{w_{ij}}$$

where W_i = total number of SSU's in the i^{th} PSU.

and w_{ij} = number of SSU's sampled in the i^{th} PSU.

Statistical analyses of questionnaire data were completed using the Statistical Package for the Social Sciences (SPSS) developed by Nie, et al. (1975), available on the Honeywell Level 66 dual processors, University of Alaska Computer Network, Fairbanks.

In the following sections, means are reported with their standard error unless otherwise specified. The log-likelihood ratio test for independence is used for large tables and in cases where cell frequencies fall below 5; otherwise, the chi square test is used. Cramer's V (Phi for 2 x 2 tables) is the measure of association used for nominal-level variables; Gamma is used for ordinal-level variables.

SOCIAL CHARACTERISTICS OF CANOE ROUTE USERS

Social surveys commonly classify people on the basis of residence, age, sex, occupation and other variables. These characteristics form a set of independent variables which allows one to see how and to what extent a particular population -- in this case Canoe Route users -- may differ from others, and to place it in a social perspective. Variability within the population is also important in identifying factors which influence its behavior. Differences between individuals or subclasses of individuals may offer as much insight into the dynamics of Canoe Route use as do similarities.

Visitors to the Canoe Routes were asked about their residence, age, sex, marital status, number of children, education, occupation, environment of upbringing, and previous wilderness experience. The results, reported in this section, provide an overall profile of the user population in 1975. They are compared with similar statistics for the state of Alaska and the United States as a whole.³ The effects of geographic origin on social characteristics are examined, and some comparisons are made with wilderness users studied by other researchers.

3. Similar age distributions are compared whenever possible, and are indicated in box headings of tables.

Place of Residence

Alaska residents made up 77% of all canoeists using the Swan Lake and Swanson River Canoe Routes in 1975, and the remaining 23% were residents of other states or of Canada (n=398). Table 3 compares the percentage distribution of place of residence for Alaskan Canoe Route users and for the population of Alaska in 1970. For nonresident Canoe Route users, participation tends to decrease with distance from Alaska (Table 4).

Alaskan Canoe Route users were compared to all Alaskans by size of home community (Table 5). The high proportion of canoeists from cities of 25,000-50,000 or more reflects the high proportion of Anchorage residents: less than 1% of the canoeists came from Fairbanks, the only other Alaskan community of that size class. Table 6 compares urban and rural residence for nonresident Canoe Route users and the nationwide population.

Length of Residence

Resident canoeists were asked how long they had lived in Alaska: the mean length of residence was 8.6 ± 0.05 years (n=313). The mean length of residence for canoeists only from Anchorage was 7.3 ± 0.40 years (n=266), while for other Alaska canoeists it was 9.5 ± 1.10 years (n=58): the difference was not substantial, but was significant at the $p=.05$ level (Student's $t=1.8$, $.01 < p < .05$).

Table 3. Place of Residence: Canoe Route Users from Alaska and Population of Alaska

Place of Residence	Population (%)	
	Resident Canoe Route Users, 1975	Alaska, 1970*
Greater Anchorage Area Borough		
Anchorage	76	14
Eagle River, Chugiak, and Girdwood	5	1
Ft. Richardson and Elmendorf AFB	4	8
Kenai, Soldotna, and Sterling	8	2
Other Kenai Peninsula towns	3	4
Matanuska-Susitna Valley	1	2
All other Alaska towns	3	69
Percent total	100	100
(Number of persons)	(324)	(300,382)

*Source: Alaska Department of Labor 1971.

Table 4. Geographic Region of Residence: Nonresident Canoe Route Users and Population of the United States

Geographic Region of Residence	Population (%)	
	Nonresident Canoe Route Users, 1975	United States, 1970*
Pacific coast	38	13
Rocky Mountain	22	4
Northcentral	27	27
South and Southcentral	8	32
Middle Atlantic	2	18
New England	3	6
Percent total	100	100
(Number of persons)	(69)	**

*Source: U.S. Bureau of the Census 1976a.

**Data not available

Table 5. Size of Home Community: Resident Canoe Route Users and Population of Alaska

Size of Home Community*	Population (%)	
	Nonresident Canoe Route Users, 1975	Alaska, 1970**
Urban		
25,000 to 50,000	77	16
10,000 to 25,000	4	11
5,000 to 10,000	0	14
Rural		
2,500 to 5,000	2	7
1,000 to 2,500	9	13
less than 1,000	6	7
other rural	2	32
Percent total	100	100
(Number of persons)	(324)	+

*Size classes follow the U.S. Bureau of the Census 1973a.

**Source: U.S. Bureau of the Census 1973b.

+Data not available.

Table 6. Size of Home Community: Nonresident Canoe Route Users and Population of the United States

Size of Home Community*	Population (%)	
	Nonresident Canoe Route Users, 1975	United States, 1970**
Urban		
1 million or more	0	9
500,000 to 1 million	10	6
100,000 to 500,000	21	12
25,000 to 100,000	26	17
2,000 to 25,000	28	21
Other Urban	0	8
Rural		
1,000 to 2,500	8	3
less than 1,000 and other rural	7	24
Percent total	100	100
(Number of persons)	(71)	+

*Classification follows the U.S. Bureau of the Census 1972a.

**Source: U.S. Bureau of the Census 1972a.

+Data not available.

Sex and Age Characteristics

Men outnumbered women among Canoe Route users by a ratio of 2:1 -- 71% of the canoeists were men, compared to 52% of all Alaskans (U.S. Bureau of the Census 1979) and 49% of the nationwide population (U.S. Bureau of the Census 1976a).

Canoeists were asked to check the age class to which they belonged. The resulting distribution of age classes is shown in Table 7 with Alaska and United States age distributions for comparison. A striking feature of the data is the large proportion of adults between the ages of 20 and 40 years: almost 75% of the canoeists were in that age group, compared to 53% of the statewide and 36% of the nationwide populations.

Men did not differ significantly from women in overall age distribution (chi-square=10.7, df=7, $p>.05$), although there was a somewhat greater proportion of women in the 20-29 year age class (52% compared to 42%), and a greater proportion of men in the 40-49 year age class (13% compared to 7%).

Marital Status

Information on stage of the life cycle of canoeists was indicated by marital status and number of children. Sixty percent of the men and 63% of the women were married: the distributions do not depart significantly from independence (chi-square=0.2, df=1, $p>.05$). The proportions of married men and women are about equal for canoeists,

Table 7. Age Distribution of Canoe Route Users and the Alaska and United States Populations

Age Class (Years)	Population (%)		
	Canoe Routes, 1975*	Alaska, 1970**	United States, 1970+
15 to 19	9	14	13
20 to 29	44	31	20
30 to 39	30	22	16
40 to 49	12	16	17
50 to 59	4	10	14
60 to 64	1	3	6
65 or older	1	4	14
Percent total	100	100	100
(Number of persons) (400)		‡	‡

*Persons under 15 years of age were not included in the questionnaire survey.

**Persons 14 years or older Source: (Babb 1972)

+Persons 14 years or older Source: (U.S. Bureau of the Census 1973a).

‡Data not available.

Alaskans, and Americans, indicating that marital status is not a distinguishing feature of Canoe Route users.

I expected that the proportion of married canoeists would increase with age, that is, that older people would be more likely to be married. The percent of married canoeists increased from none in the under-15 age class, to 63% in the 20 to 39 year age class, 94% in the 40 to 59 year age class, and then decreased to 71% in the 60 or more year age class. The percentage distributions differed significantly at the $p=.01$ level ($\chi^2=96.8$, $df=3$), and the association was moderate, as indicated by Cramer's $V=0.49^4$.

Canoeists were asked how many children they had (age and blood relationship were not specified). The mean number of children was 1.2 ± 0.1 ($n=372$). This is close to the mean per family for all Alaskans (1.49 children) and for the nationwide population (1.10 children) (U.S. Bureau of the Census 1979). Table 8 shows the distribution of number of children for canoeists, Alaskans, and all Americans. Table 9 shows the relationship between number of children and marital status for Canoe Route users. The distributions differed significantly at the $p=.01$ level ($\chi^2=100.0$, $df=4$), and the association was moderately strong, as measured by Cramer's $V=0.52$.

4. Cramer's V is a measure of association suitable for tables larger than 2 rows by 2 columns. It ranges in value from 0 to 1 when several nominal categories are involved. A large value of V signifies that a high degree of association exists, but does not reveal the manner in which the variables are associated. V is a modified version of Phi, a measure of association used for 2 by 2 tables (Nie, et al. 1975).

Table 8. Number of Children: Canoe Route Users and the Alaska and United States Populations

Number of Children	Population (%)		
	Canoe Routes, 1975	Alaska, 1976*	United States, 1975**
None	52	35	46
One	10	25	20
Two	19	23	18
Three or more	19	17	16
Percent total	100	100	100
(Number of persons)	(372)	+	+

*U.S. Bureau of the Census 1979.

**U.S. Bureau of the Census 1976a.

+Data not available.

Table 9. Number of Children by Marital Status of Canoe Route Users

Number of Children	Marital Status (%)		
	Married	Single	Total
None	34	89	56
One	13	3	9
Two	24	4	16
Three or more	29	4	19
Percent total	100	100	100
(Number of persons)	(143)	(227)	(370)

Environment of Upbringing

I asked canoeists what kinds of residential environments had been important in their lives before age 18. Some respondents checked more than one kind of environment. The results show a fairly even distribution of responses among all kinds of environments: a large city was important to 18% of the canoeists, a small city to 16%, a suburban area to 14%, a small town to 22%, a rural area to 14%, and a farm to 16% (n=549 responses).

Education

Table 10 compares the distributions of educational attainment for Canoe Route users, Alaskans, and Americans. The large proportion of canoeists with college and post-graduate education was especially striking: almost 75% had had one or more years of college. Evidently, the Canoe Routes are especially attractive to highly educated persons -- the upper 12% of society in terms of education.

Employment Status

Data on employment status were derived from information given by canoeists about their occupations. Overall, 75% of the canoeists were employed civilians, 1% were unemployed civilians, 8% were in military service, and 15% were not in the labor force (including students, homemakers, dependents, and retired persons).

Employment status differed significantly between men and women canoeists (chi-square=21.0, df=3, p<.01). Cramer's V=0.27 indicates a moderate degree of association. Employment status by sex is shown in

Table 10. Years of School Completed for Canoe Route Users and the Alaska and United States Populations

Years of School	Population (%)		
	Canoe Routes, 1975	Alaska, 1970*	United States 1975**
8	1	19	21
9	2	6	7
10	1	7	8
11	3	7	6
12	19	36	34
13	12	6	5
14	9	6	6
15	6	3	2
16	17	6	7
17 or more	30	4	4
Percent total	100	100	100
(Number of persons)	(399)	+	+

*Source: U.S. Bureau of the Census 1972b.

**Source: U.S. Bureau of the Census 1976b.

+Data not available.

Table 11 for Canoe Route users, Alaskans, and Americans. The higher proportion of employed women among canoeists than among Alaskans and Americans in general may be related to the high educational attainment of canoeists in general.

Occupation

Occupations listed by canoeists were classified into 12 categories following the U.S. Bureau of the Census (1971) (Table 12). Variability in the population was high overall, but occupations in the professional-technical category predominated. Men in this category listed positions such as attorney, university professor, physician, and biologist; women listed positions such as teacher, nurse, biologist, flight controller, and so on.

The distributions of occupations differed significantly between men and women ($\chi^2=117.2$, $df=12$, $p<.01$) and the association between sex and occupation was moderately strong (Cramer's $V=0.56$). Interestingly, men and women were engaged in professional and technical occupations in equal proportions.

I compared occupations of employed canoeists with those of the State and United States populations (Table 13).

Income

I did not obtain data on income from Canoe Route users, but approximate income is inferred from U.S. Census Bureau data on mean income for various occupation categories. The occupation distribution for canoeists and the mean income for Alaskans and Americans are given

Table 11. Employment Status by Sex of Canoe Route Users and the Alaska and United States Populations

Employment Status	Population (%)					
	Canoe Routes, 1975		Alaska, 1970*		United States 1970**	
	Men	Women	Men	Women	Men	Women
Civilian employed	80	68	48	40	67	37
Civilian unemployed	2	2	6	4	3	2
Armed Forces	8	1	27	+	3	<1
Not in labor force	10	29	19	56	27	60
Percent total	100	100	100	100	100	100
(Number of Persons)	(193)	(105)	+	+	+	+

*Source: U.S. Bureau of the Census 1971a.

**Source: U.S. Bureau of the Census 1973a.

+Data not available.

Table 12. Detailed Occupations by Sex for Canoe Route Users

Detailed Occupation*	Sex (%)		Total
	Males	Females	
Professional, technical, & kindred workers	39	39	38
Managers & administrators	7	4	6
Sales workers	3	2	3
Clerical & kindred workers	<1	15	5
Craft & kindred workers	14	0	9
Operatives, including transport	2	1	2
Laborers, except farm	6	0	4
Farm laborers & supervisors	0	0	0
Service workers, except private household	2	1	2
Private household workers	0	0	0
Armed Forces workers	9	1	7
Unemployed workers	1	3	2
Homemakers	0	18	6
Students	9	11	10
Retired workers	1	0	<1
Other workers	6	5	6
Percent total	100	100	100
(Number of persons)	(250)	(129)	(379)

*Classification follows the U.S. Bureau of the Census 1971b.

Table 13. Detailed Occupations of Employed Persons: Canoe Route Users and the Alaska and United States Populations in 1975

Detailed Occupation	Population (%)		
	Canoe Routes	Alaska*	United States*
Professional, technical, & kindred workers	56	17	15
Managers & administrators	6	12	11
Sales workers	5	6	6
Clerical & kindred workers	8	18	18
Craft & kindred workers	11	12	13
Operatives, including transport	4	12	15
Laborers, except farm	5	7	5
Farmers	2	**	2
Farm laborers & supervisors	0	1	2
Service workers, except private household	2	15	12
Private household workers	0	**	1
Percent total	100	100	100
(Number of persons)	(226)	**	**

*Source: U.S. Bureau of the Census 1978.

**Data not available.

in Table 14. Mean income in 1975 was much higher for Alaskans in general than for the rest of the nation, probably because of the combined effects of generally higher wages, and especially because of higher wages during the Trans-Alaska Pipeline construction period: high incomes are especially noticeable for craftsmen and operatives, whose mean incomes exceeded \$16,000. If mean income figures for Alaska are applied to canoeists, then 77% had incomes of over \$15,000.

Comparison of Resident and Nonresident Characteristics

I compared resident and nonresident canoeists on several social variables. I found no significant differences between residents and nonresidents on sex ratio (chi-square=1.2, df=1, $p>.05$), but age distributions were significantly different (chi-square=13.7, df=5, $.01<p<.05$), although the association between residence status and age was weak (Cramer's $V=0.19$) (Table 15). A higher proportion of nonresidents (50%) were single than were residents (36%). The difference was significant at $p=.05$ (chi-square=4.7, df=1, $.01<p<.05$), but the association was weak ($\Phi=0.12$). Educational attainment was compared between resident and nonresident canoeists, but did not differ significantly (chi-square=0.4, df=2, $p>.05$). Residents and nonresidents did not differ on occupation either (chi-square=15.1, df=12, $p>.05$), but the proportion of students among nonresidents was nearly double that for residents.

To summarize briefly, it appears that nonresident Canoe Route users generally possess the same complex of social characteristics as do resident users. They differ significantly, but not substantially, only

Table 14. Occupations of Employed Canoe Route Users and Corresponding Mean Income for Employed Males in Alaska and the United States in 1975

Occupation	Canoe Route Users (%)	Mean Dollar Income*	
		Alaska Males**	U.S. Males**
Professional-technical	56	22,442	15,958
Managers & administrators	6	24,586	17,176
Sales workers	6	14,273	11,407
Clerical & kindred workers	8	13,598	9,326
Craftsmen	11	18,182	10,686
Operatives, including transport	4	16,400	8,677
Laborers	5	8,871	4,921
Service workers	2	9,507	5,760
Farm workers	0	+	5,696
Farm owners	2	+	+
Percent total	100		
(Number of persons)	(226)	+	+

*Source: U.S. Bureau of the Census 1978.

**Males 14 years old or older.

+Data not available.

Table 15. Age Distribution by Residency Status of Canoe Route Users

Age Class	Residency Status (%)		Total
	Resident	Nonresident	
Less than 20	11	11	11
20 to 29	42	53	44
30 to 39	31	15	28
40 to 49	11	12	11
50 to 59	3	9	4
60 or more	2	0	2
Percent total	100	100	100
(Number of Persons)	(324)	(74)	(398)

on marital status and age distribution, and the overall similarities are more salient than the differences in terms of Canoe Route use.

Anchorage Canoeists' Characteristics

Anchorage residents comprise 77% of the Canoe Route users and are consequently of great interest in terms of users' attributes. Do Anchorage residents differ from other Alaskan canoeists? The Anchorage Area Borough contains the largest concentration of people in the state -- almost half of the population in 1975 -- and its residents may reflect its different social makeup. I compared social characteristics of canoeists from the Anchorage Borough with those of canoeists from other Alaska communities and with census data for the Anchorage Borough.

The ratio of men to women was higher among canoeists from Anchorage than among other Alaskan canoeists -- 2.0:1 compared to 1.2:1, respectively -- but the difference was not significant at the $p=.05$ level ($\chi^2=2.2$, $df=1$). The ratio of men to women in the Anchorage Borough is 1.1:1 (Greater Anchorage Area Borough Planning Dept. 1974).

Anchorage canoeists differed significantly in age distribution from other Alaska users ($\chi^2=22.2$, $df=5$, $p<.01$), although the association between age and residence was rather weak (Cramer's $V=0.26$). Age distributions for Anchorage and other Alaskan Canoe Route users and Anchorage Borough residents are shown in Table 16.

Table 16. Age Distribution: Canoe Route Users from Anchorage and from Other Alaska Towns, and the Anchorage Borough Population

Age Class	Population (%)		
	Users from Anchorage	Users from Other Alaska	Anchorage Borough*
15 to 19	9	15	13
20 to 29	42	47	32
30 to 39	34	14	23
40 to 49	11	12	18
50 to 59	3	3	10
60 or more	1	9	4
Percent total	100	100	100
(Number of persons)	(265)	(58)	**

*Source: U.S. Bureau of the Census 1973b.

**Data not available.

I compared educational attainment between Anchorage and other Alaska canoeists: they differed significantly at the $p=.06$ level (chi-square=10.7, $df=5$), but the association was weak (Cramer's $V=0.19$). Educational attainment for Anchorage and other Alaskan users over the age of 20, and Anchorage Borough residents over the age of 25, is given in Table 17.

The distribution of occupations of Anchorage and other Alaskan users also differed significantly (chi-square=39.3, $df=12$, $p<.01$), although the association was moderate (Cramer's $V=0.36$). The two distributions are compared in Table 18. These data indicate that Anchorage users tend to be from upper socioeconomic strata. The location of Elmendorf Air Force Base and Fort Richardson in the Anchorage Borough probably accounts for the greater presence of military personnel among Anchorage Canoe Route users.

In general, Anchorage Canoe Route users differ significantly from users from other areas of Alaska in age, education, and occupation, although the differences are not great. The data indicate that a disproportionately large number of canoeists are drawn from Anchorage's young adult population of high socioeconomic status.

Previous Experience

I asked Canoe Route users about the kind and extent of previous wilderness trips they had made. "Wilderness trip" was loosely defined to them as an overnight or longer stay in any large, roadless, natural area, including but not limited to units of the National Wilderness Preservation System. Nearly all of the canoeists (80%) had traveled

Table 17. Years of School Completed: Canoe Route Users from Anchorage and from Other Alaska Towns, and the Anchorage Borough Population

Years of School Completed	Population (%)		
	Users from Anchorage*	Users from Other Alaska*	Anchorage Borough**
Less than 9	0	4	10
9 to 11	2	2	14
12	18	22	43
13 to 15	28	23	17
16	19	16	16
17 or more	33	33	+
Percent total	100	100	100
(Number of persons)	(240)	(49)	+

*Age 20 or more only

**Age 25 or more only. Source: U.S. Bureau of the Census 1971a.

+Data not available.

Table 18. Occupations of Employed Canoe Route Users from Anchorage and from Other Alaska Towns, and the Anchorage Borough Population

Occupation	Population (%)		
	Users from Anchorage	Users from Other Alaska	Anchorage Borough*
Professional-technical	56	48	20
Managers & administrators	10	3	12
Sales workers	4	3	7
Clerical & kindred workers	9	3	21
Craftsmen	13	14	15
Operatives, including transport	2	3	8
Laborers, including farm	4	17	4
Service & household workers	2	9	13
Percent total	100	100	100
(Number of persons)	(189)	(35)	**

*Source: U.S. Bureau of the Census 1971a.

**Data not available.

in wilderness before, and 53% had specifically canoed or rafted in wilderness before. The latter had made an average of 2.3 ± 0.01 trips ($n=341$), and almost half of them (49%) had canoed or rafted in Alaska. Of the remainder, 8% had canoed in the Quetico-Superior country in Canada, or the adjoining Boundary Waters Canoe Area in Minnesota, the only other canoe lake-type Wilderness Area in the United States: 36% had visited other American rivers, such as the Snake and Salmon Rivers in Idaho and the American River in California, and 7% had visited other Canadian locations, such as the Bowron Lakes in British Columbia.

To gain some idea of how strongly committed to wilderness recreation Canoe Route users were, I asked how frequently they made wilderness trips. Most canoeists appeared to be fairly active wilderness users: 56% made more than one such trip each year, and 28% made about one trip each year: only 16% made fewer than one trip each year. However, most canoeists were relative newcomers to the Canoe Routes: 65% made their first visit to the Canoe Routes in 1975, the year of the study, and fewer than 25% had visited the Canoe Routes prior to 1974. The distribution of first visits by year is shown in Figure 8. For all canoeists, the mean number of visits to the Canoe Routes ever made was 2.9 ± 0.01 ($n=388$). Fifty nine percent had made only one visit, and of the remainder, 16% had made two visits, 5% had made three, 7% had made four, 4% had made five, 6% had made between six and ten, 1% had made between 11 and 15, and 3% had made more than 15 visits.

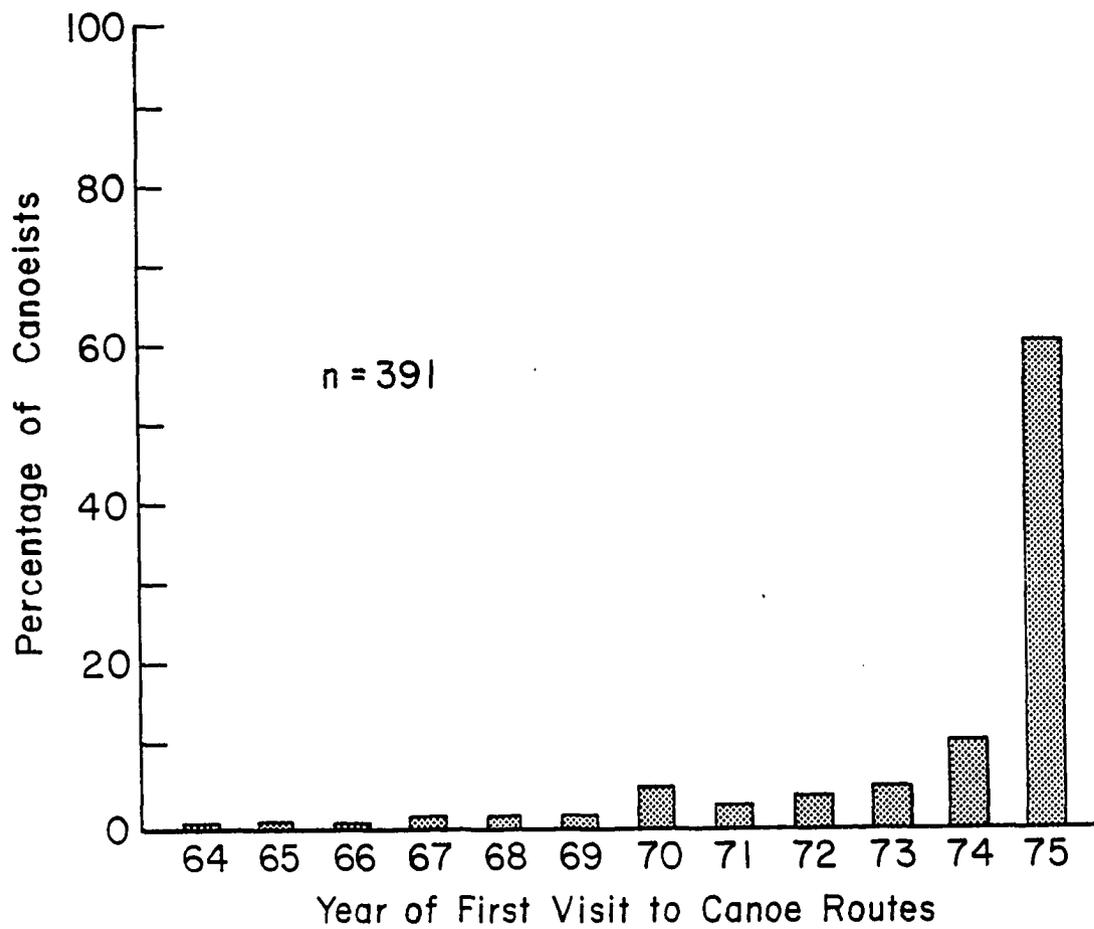


Figure 8. Percentage Distribution of Year of First Visit to Canoe Routes

I expected that a higher proportion of nonresidents than residents would be newcomers to the Canoe Routes in 1975, and that a smaller proportion would have made return visits. I found that 88% of the nonresident canoeists were making their first trip on the Canoe Routes in 1975, compared to 50% of the resident canoeists. None of the nonresident canoeists had visited the Canoe Routes prior to 1972, compared to 21% of the residents. Nonresidents made an average of 1.5 ± 0.2 visits ($n=69$), which was significantly less than average the for residents of 3.9 ± 0.4 visits ($n=316$) (Student's $t=-5.19$, $df=380$, $p<.01$).

Nonresident Canoe Route users in general appeared to be somewhat less experienced in wilderness recreation than Alaskan users: 68% had made previous wilderness trips, compared to 86% of the Alaskan users ($\chi^2=13.5$, $df=1$, $p<.01$). Resident and nonresident users differed significantly in the frequency with which they made wilderness trips: 63% of the residents made more than one trip, 25% made about one trip, and 12% made fewer than one trip each year ($n=286$), compared to 48%, 23%, and 30% respectively, for nonresidents ($n=65$) ($\chi^2=12.0$, $df=2$, $p<.01$).

Discussion of Social Characteristics

The data on place of residence show selective participation in Canoe Route use by Anchorage and Kenai area residents. Anchorage, the largest community in the state, is within a few hours' drive of the Kenai National Wildlife Refuge. Kenai and Soldotna are the largest towns on the Kenai Peninsula and, along with Sterling, are closest to the Refuge boundaries. Other communities on the Kenai Peninsula are

also within a few hours' drive of the Canoe Routes, but do not contribute much to their use. This indicates that distance from the Canoe Routes alone does not account for the observed pattern of participation by Alaskans, but distance in conjunction with accessibility, community size and other characteristics may be an important factor. Distance from the Canoe Routes is probably a major factor influencing non-resident participation -- nonresidents require much more time and incur greater expense in traveling to Alaska and the Canoe Routes. Canoeists from western states in particular may be more aware of and attracted to Alaskan wilderness areas than those from other states, because of their greater proximity to Alaska.

The difference in Canoe Route participation by urban and rural residents is substantial: four times as many urban as rural Alaskans canoed on the Kenai Refuge in 1975, and the proportion of urban users is twice the proportion of urban residents in the state. The predominance of urban users holds true for nonresident Canoe Route users as well: urban nonresidents are almost six times as numerous as rural nonresidents. Thus, urban residence appears to be an important factor relating to Canoe Route use. Childhood environments could affect later participation in wilderness canoeing in several ways -- persons with a rural background might find in wilderness an extension of the less-populated and structured environments of their youth. On the other hand, persons with an urban-suburban background might be attracted to wilderness because of the contrast it offers and the opportunity to escape temporarily from the stresses of the urban environment.

The data presented here are insufficient to draw any conclusions regarding the effects of urban or rural residence or childhood environments on Canoe Route use. However, Hendee (1969) points out that urban-rural differences in outdoor recreation participation may actually reflect differences in other demographic and cultural characteristics, that is, urban predominance may be associated with relatively high values for income, education, and occupation, or differences in life style, values, or attitudes toward the natural environment, and the kinds of pressures exerted by urban versus rural settings.

The social characteristics of campers in Oregon suggested to Burch and Wenger (1967) that childhood experiences and present kind of home community, but not childhood residence location, are associated with camping style. Backcountry and wilderness campers tend to continue in the camping patterns learned in childhood: previous experience with the outdoors leads to a greater preference for more challenging camping experiences. Burch and Wenger conclude that people neither seek leisure experiences similar to their present everyday activities, nor escape to activities that contrast sharply with their everyday lives, but look for activities pleasantly familiar to their childhood outdoor experiences.

The shorter average length of residence for canoeists from Anchorage than for those from other parts of Alaska lends some support to the idea that the former tend to be more recent arrivals to Alaska. The Anchorage area underwent more rapid growth and change than many other Alaskan communities in the 1970-75 period, partly because Trans-Alaska Pipeline construction and related activities attracted many

new people to that area. Census data from 1970 show that civilian migration rates to Alaska were high, especially for the white population, even in the previous decade. The population of Anchorage grew by 50% during that period, and a large portion of white migration to that area was probably from other states (Seiver and Fison 1975).

The preponderance among canoeists of young adults may partly reflect the greater proportion of all Alaskans in the 20-29 and 30-39 year age classes compared to Americans in general. It may also reflect the greater appeal of canoeing and portaging -- both physically demanding activities -- to young people than to older people.

To a substantial degree, the user population of the Canoe Routes departs from the general social and economic character of those communities which contribute most to its membership. The predominant attributes of urban residence, young adulthood, and high socioeconomic status are shared by wildland users in other states, particularly in the West. For example, researchers at the Wildland Research Center (1962) found that 76% of the users of California's High Sierra were from small to large cities, 80% were between 19 and 49 years old, and 48% were in professional and semi-professional occupations. A study of national forest campers in Oregon found that 68% of backcountry users were from small to large cities, about half were between 26 and 44 years old, and 58% were in white-collar occupations (Burch and Wenger 1967). Hendee, et al. (1968) found that 36% of Pacific Northwest wilderness users were between 19 and 34 years old. In Minnesota's Boundary Waters Canoe Area, paddle canoeists tended to be younger (59% between

13 and 19 years old) but 69% were students, while 71% of non-student males were in professional-technical occupations (Lucas 1964).

In all of these studies the educational attainment of wilderness users is strikingly high: between 33% and 49% had one to four years of college, and 24% to 33% had post-graduate training. For the users in this study, the percentages were 43% and 31%, respectively (see Table 12). These data point to high education as a major correlate of wilderness use, in Alaska as in other states.

Canoe Route users in 1975 differed from those in the other studies mentioned in several respects: the ratio of men to women is about one-half what it was in the 1960's, almost twice as many canoeists are single, and more than twice as many of the married canoeists are childless. The social makeup of Canoe Route users appears to reflect changes that have occurred in society as a whole since 1960. Between 1960 and 1975, attitudes toward marriage and families changed markedly throughout the nation, especially among women. Young persons tended to delay marriage longer, and young women tended to delay child-bearing longer (U.S. Bureau of the Census 1976a). Rapid increases in college attendance and employment among women may also account for their greater participation in wilderness recreation, as part of a general assertiveness in a greater range of endeavors.

Burch and Wenger (1967) suggest that stage in the family life cycle is associated with participation in different camping styles: backcountry campers are more likely to be childless couples or those whose children have matured and left home. The high proportion of young, single persons and childless couples among Canoe Route users

supports this view. It suggests that wildland recreation may contribute to the socialization and maturation process during the uncertain period of young adulthood when people are beginning to establish family relationships and careers.

The Canoe Routes appear to be like other wilderness areas in that they appeal to a rather specific class of people -- those with high socioeconomic status relative to the rest of the population. The greater interest in wildland recreation among higher socioeconomic groups may reflect different tastes and preferences regarding recreation which may be determined by educational and occupational milieus. However, it would be misleading to focus only on the young, high socioeconomic groups as characteristic of all Canoe Route users. Obviously, not all users are college-educated Anchorage professionals. The data show that many kinds of people go canoeing, that they vary in age from teenagers to retired folk, and come from occupations as diverse as roughneck and surgeon. Clearly, the appeal of wilderness canoeing cuts across the somewhat arbitrary boundaries defined by census-takers. Socioeconomic characteristics alone do not explain differences in peoples' behavior and attitudes. Participation in outdoor recreation activities is determined by many factors, including personality, social, and situational factors (Kelly 1978).

SPATIAL AND TEMPORAL DISTRIBUTION OF VISITOR USE

The dynamics of recreation use on the Canoe Routes influence the kinds of encounters, and thus, the degree of crowding, that canoeists are likely to experience. The amount, intensity, duration, timing, and location of use are critical elements in the total pattern of use and user characteristics. The physical geography of the Canoe Routes, in terms of area, topography, trail system, and scenic features, also affect the pattern of use by influencing visitors' destination preferences. Conflicts between users may occur when groups of strangers converge in particular areas and have to compete for resources such as campsites, trout, or solitude. Determining the specifics of use distribution is an important step in identifying potential areas of conflict.

This section includes the results of use estimates for the Canoe Routes in terms of total numbers of visitors using each Canoe Route and trailhead, and examines factors influencing visitors' route selections, timing and length of trip.

Amount of Use

The total number of visitors using the Canoe Routes during the summer of 1975 was estimated from a stratified random sample of observation periods at trailheads (see Methods section). Between 15 May and 15 September, 5983 people visited the Canoe Routes: of these, 52% or 3094 were canoeists (visitors who stayed one or more

nights), and 48% or 2889 were one-day users. Population estimates for canoeists and one-day users for each stratum sampled are summarized in Table 19. The variances were high because at any given sampling location the number of users varied widely from day to day, even within a stratum.

Canoeists spent a total of 25,855 visitors-days⁵ on the Canoe Routes in 1975, or approximately 115 visitor-days per kilometer (or 185 visitor-days per mile) of trail, and they made a total of 9383 overnight stays on the Canoe Routes. The mean length of stay per canoeist was 5.1 ± 0.02 visitor-days, and the mean number of overnight stays per canoeists was 1.9 ± 0.01 . In everyday terms this means that canoeists spent an average of three days and two nights on the Canoe Routes, although trips ranged in length from 0.5 to 12 visitor-days. Short trips predominated: 60% of the canoeists made trips of 5 visitor-days or less (or 3 calendar days).

Spatial Distribution of Use

Table 20 lists the population estimates for canoeists and one-day users by Canoe Route, and Table 21 gives the estimated numbers of canoeists and one-day users by trailhead. Canoeists used the West Entrance and Paddle Lake much more than the other three trailheads.

5. The U.S. Forest Service defines a visitor-day as the use of an area for a total of 12 person-hours (Schwarz, Thor and Elsner 1976).

Table 19. Estimated Number and Percentage of Canoe Route Users in 1975, by Stratum

Estimates**	Stratum*						Total
	I	II	III	IV	V	VI	
Canoeists							
Number	640	803	203	349	670	429	3094
s.d	±394	±333	±82	±138	±412	±263	±728
Percent	21	26	6	11	22	14	100
One-day Users							
Number	280	481	80	398	766	884	2889
s.d.	±101	±91	±30	±82	±508	±420	±679
Percent	10	17	3	14	26	30	100

*For explanation of strata, see Table 1.

**Estimators based on Harbo (1974). See text for explanation.

Table 20. Estimated Number and Percentage of Canoe Route Users in 1975, by Canoe Route Used

Estimates*	Canoe Route		
	Swan Lake Canoe Route	Swanson River Canoe Route	Total
Canoeists			
Number	2164	914	3078
s.d.	±644	±512	±765
Percent	70	30	100
One-day Users			
Number	1299	1725	3024
s.d.	±378	±633	±737
Percent	43	57	100

*Estimators based on Harbo (1974).

Table 21. Estimated Number and Percentage of Canoe Route Users in 1975, by Trailhead Used

Estimates*	Trailhead					Total
	West Entr.	Paddle Lake	Moose R. Br.	Swanson R. Cmp.	East Entr.	
Canoeists						
Number	1683	1118	157	157	94	3208
s.d.	±581	±448	±154	±154	±93	±770
Percent	52	35	5	5	3	100
One-day Users						
Numbers	1182	946	157	779	0	3064
s.d.	±360	±296	±154	±557	±0	±742
Percent	39	31	5	25	0	100

*Estimators based on Harbo (1974).

The greater proportion of one-day users than canoeists visiting the Swanson River Canoe Route was largely due to their greater use of the Swanson River Campground as a trailhead.

Figures 9 and 10 show the actual locations of canoes on both Canoe Routes as observed from aerial surveys on the following dates: Wednesday, 24 July 1974; Monday, 19 August 1974; Tuesday, 29 July 1975; Wednesday, 13 August 1975. I estimated a mean of 2.3 ± 0.19 persons per canoe based on observations made in 1974. Figures 9 and 10 show that canoeists are more numerous and more widely distributed on the Swan Lake Canoe Route than on the Swanson River Canoe Route.

Figures 11 and 12 show the location of canoes on the 4th of July weekend 1976, as determined by aerial survey. The contrast in amount of use between the two Canoe Routes is striking: 74 canoes (86% of the total) were observed on the Swan Lake Canoe Route, compared to 12 on the Swanson River Route. The large proportion of canoes between the West Entrance and Spruce Lake reflects the fact that many canoeists were still en route to their evening's camp when the survey was made.

The interconnecting system of trails on the Canoe Routes provides a number of possible routes of travel. There are four major junctions on the Swan Lake Canoe Route, at Spruce, Otter, Loon, and Swan lakes, and three major junctions on the Swanson River Canoe Route at Lonely, Kuviak, and Gene Lakes. Canoeists usually take one of three types of routes: (a) a through-trip from one trailhead to another, for example, from the West Entrance to the mouth of the Moose River, (b) a return-trip, starting and ending at the same trailhead, and (c) a

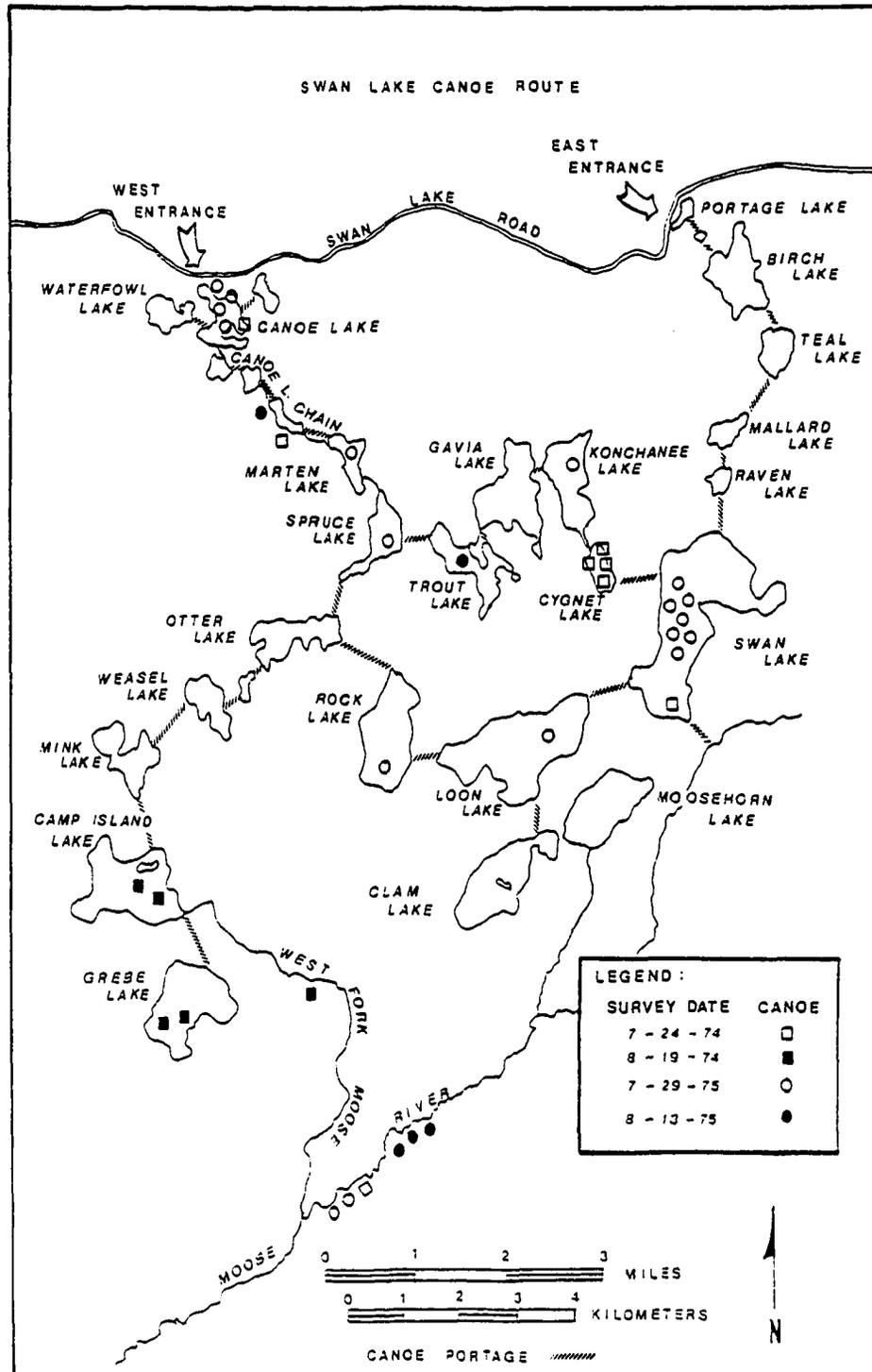


Figure 9. Locations of Canoes Observed During Four Aerial Surveys, Swan Lake Canoe Route

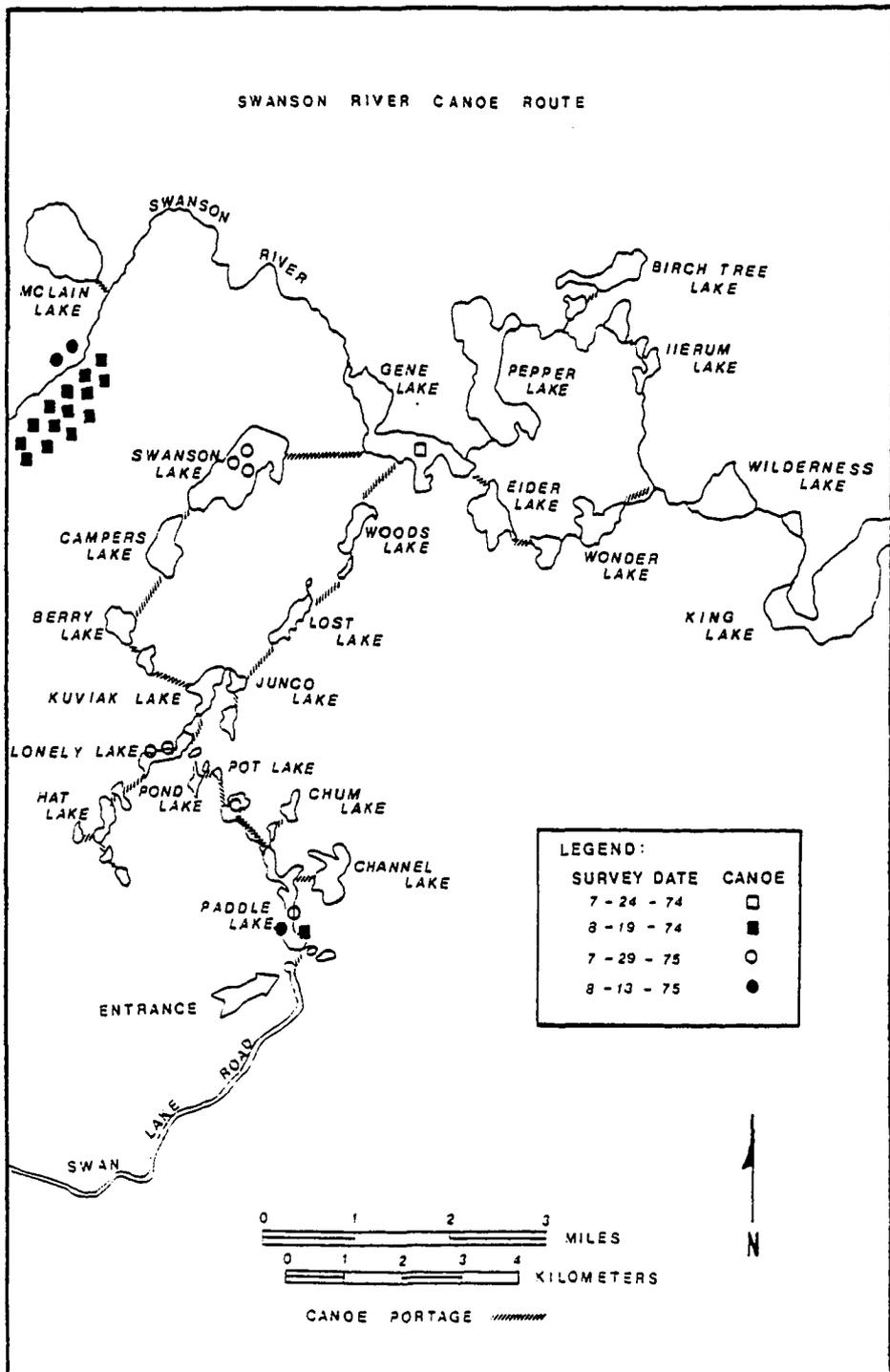


Figure 10. Locations of Canoes Observed During Four Aerial Surveys, Swanson River Canoe Route

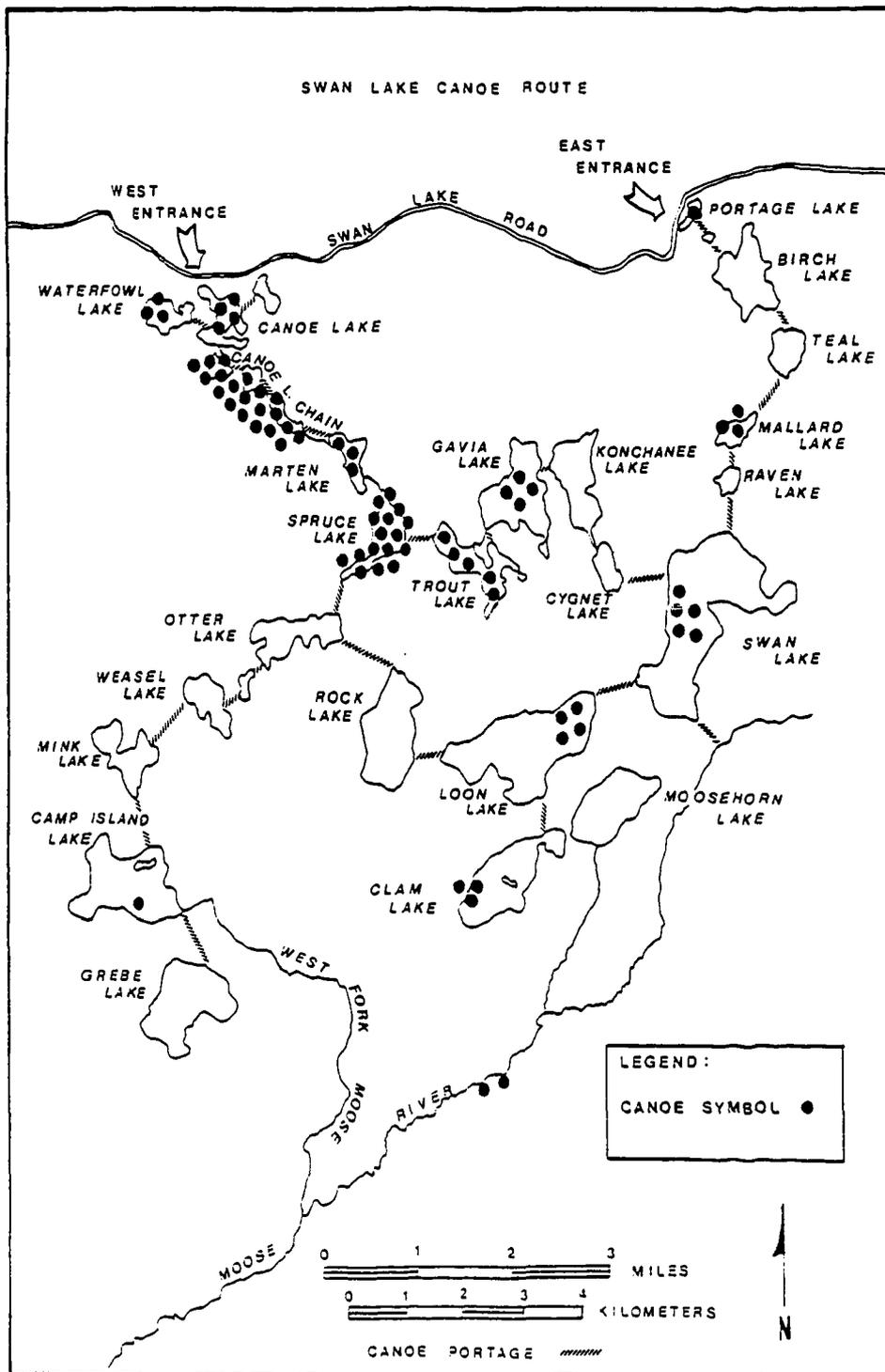


Figure 11. Locations of Canoes Observed During Aerial Survey on the 4th of July Holiday 1976, Swan Lake Canoe Route

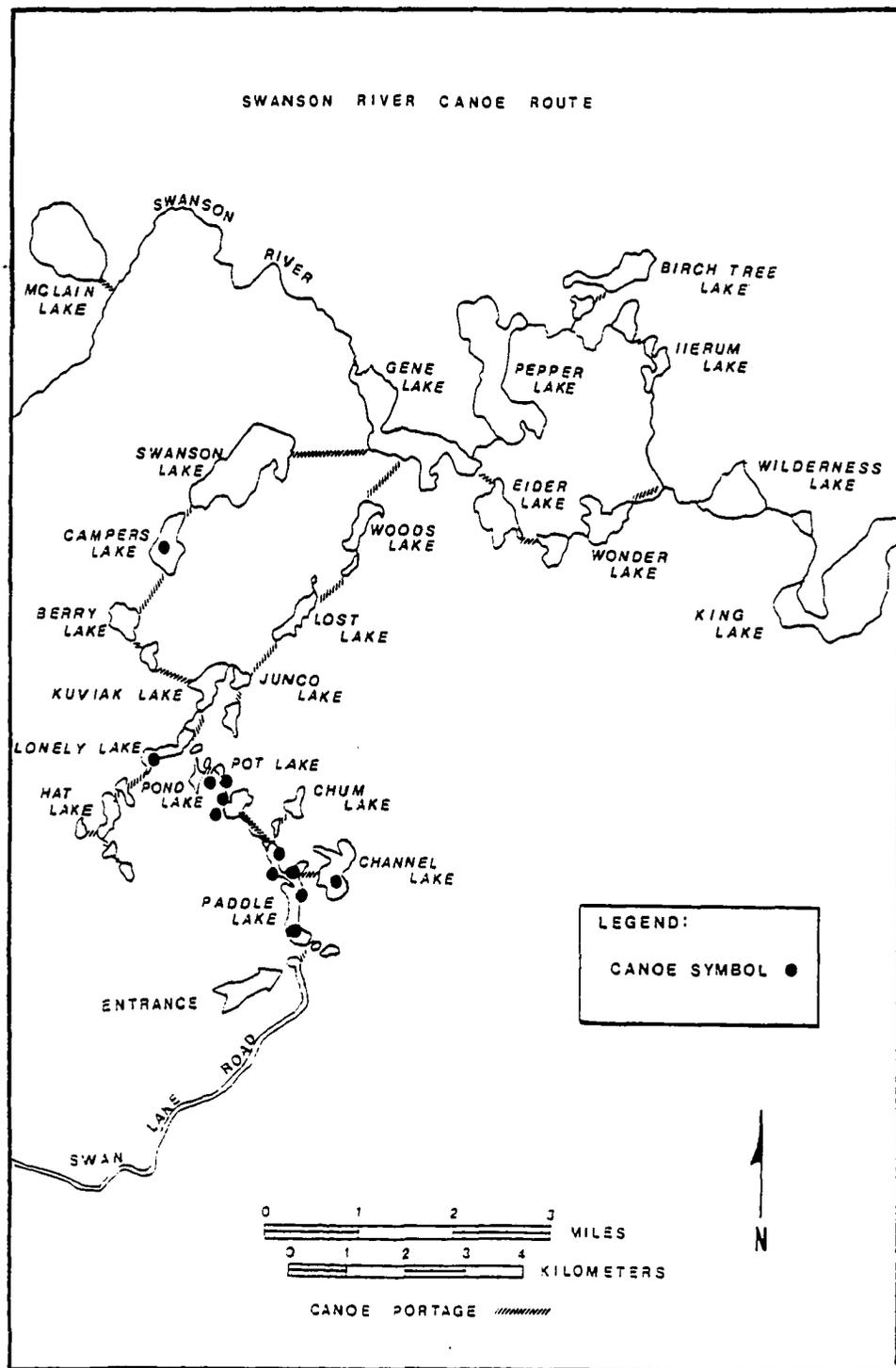


Figure 12. Locations of Canoes Observed During Aerial Survey on the 4th of July Holiday 1976, Swanson River Canoe Route

loop-trip, making a circuit through the lakes and retracing part of one's path to return to the starting trailhead. Off-trail travel is possible but unusual on the Canoe Routes, because dense vegetation, numerous deadfalls, and narrow, shallow waterways make it extremely difficult.

The proportions of canoeists using different types of routes are listed in Table 22 and are shown in Figures 13 and 14. Altogether, 84% of the canoeists used 23% of the possible routes.

Data on the locations of canoeists' campsites provided additional information on the distribution and intensity of use. Figures 15 and 16 show the relative proportions of overnight stays occurring on each lake. People camped more frequently at Spruce Lake (22% of all overnight stays) than at any other location on the Canoe Routes. Marten Lake and Swan Lake were second and third most frequently used (15% and 11%, respectively), followed by Gavia Lake (8%) and the Canoe Lakes Chain (8%). Together these lakes supported 64% of all overnight stays in 1975. Not surprisingly, all of them lie on the two most popular routes, the West Entrance-return and West Entrance to Moose River routes. On the Swanson River Canoe Route, Paddle and Gene Lakes supported the most overnight use, but together accounted for only 12% of all overnight stays. The least popular trails were the Otter Lake-Grebe Lake and Portage Lake-Swan Lake areas on the Swan Lake Canoe Route, and the Lonely Lake-Mouse Lake and Wonder Lake-Nuthatch Lake areas on the Swanson River Canoe Route.

What factors do canoeists perceive as most important in selecting a route? I asked questionnaire respondents an open-ended question on

Table 22. Trails followed by Canoe Route Users

Trail	Distribution (%)
Swan Lake Canoe Route	
West Entrance - return	42
West Entrance to Moose River	24
West Entrance to East Entrance	1
East Entrance - return	1
East Entrance to Moose River	2
Moose River Bridge - return	2
Swanson River Canoe Route	
Paddle Lake - return	17
Paddle Lake to Swanson River	
Campground	5
Paddle Lake to North Kenai Road	<1
Swanson River Campground - return	4
Swanson River Campground - North	
Kenai Road	1
Percent Total	100
(Number of persons)	(400)

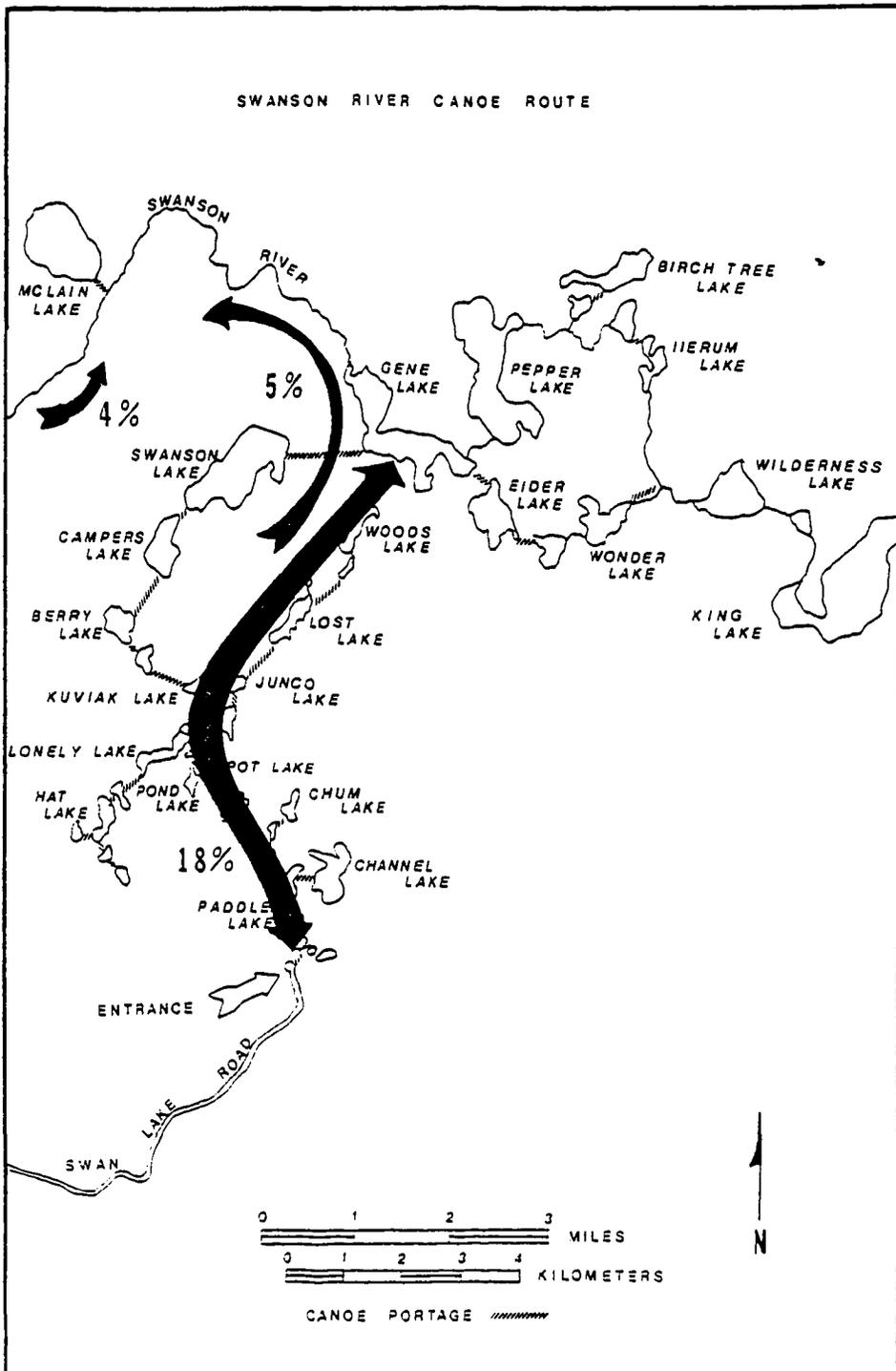


Figure 14. Relative Proportions of Trail Use, Swanson River Canoe Route

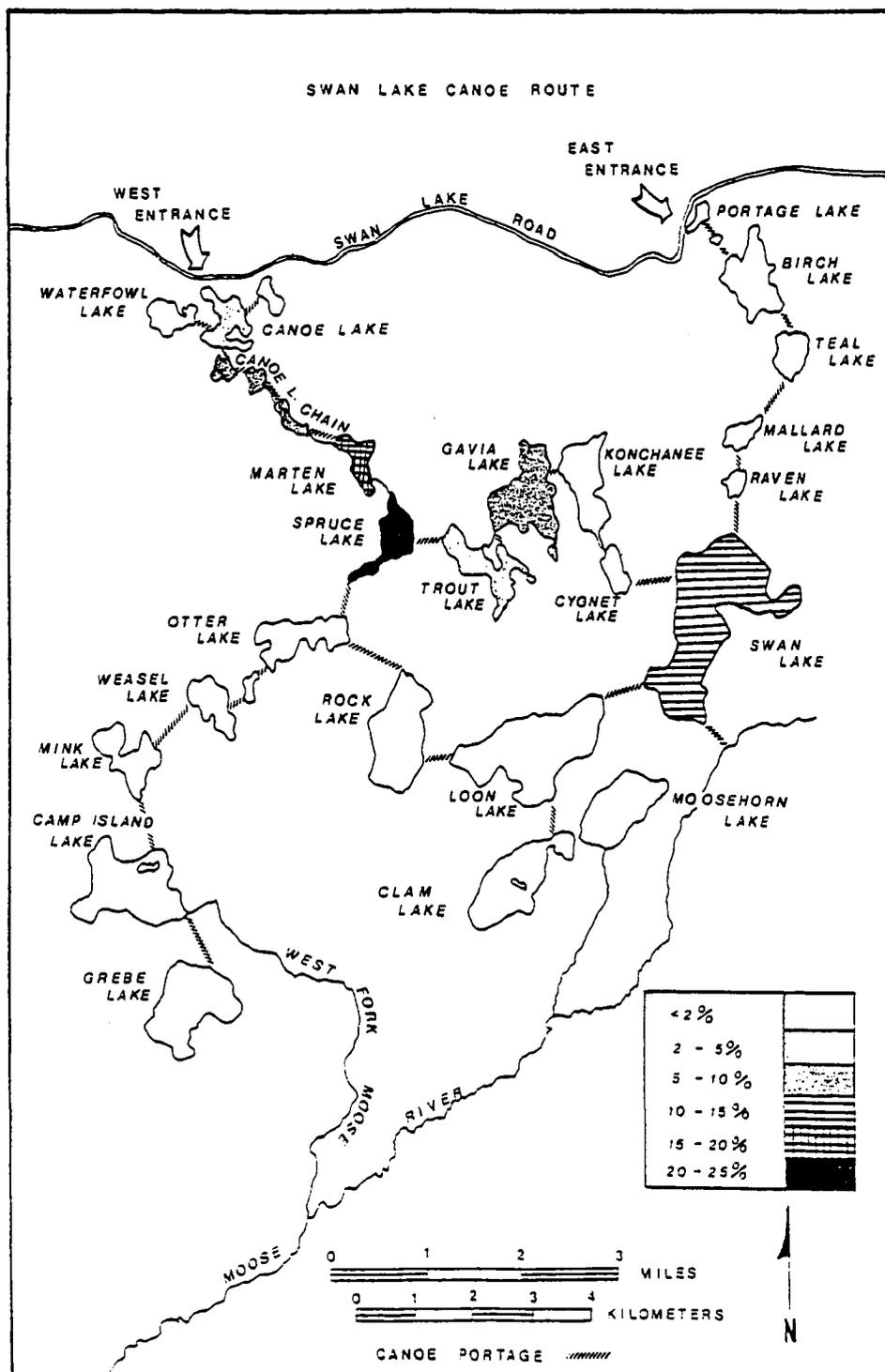


Figure 15. Relative Proportions of Campsite Use, as a Percentage of All Campsites Made, Swan Lake Canoe Route

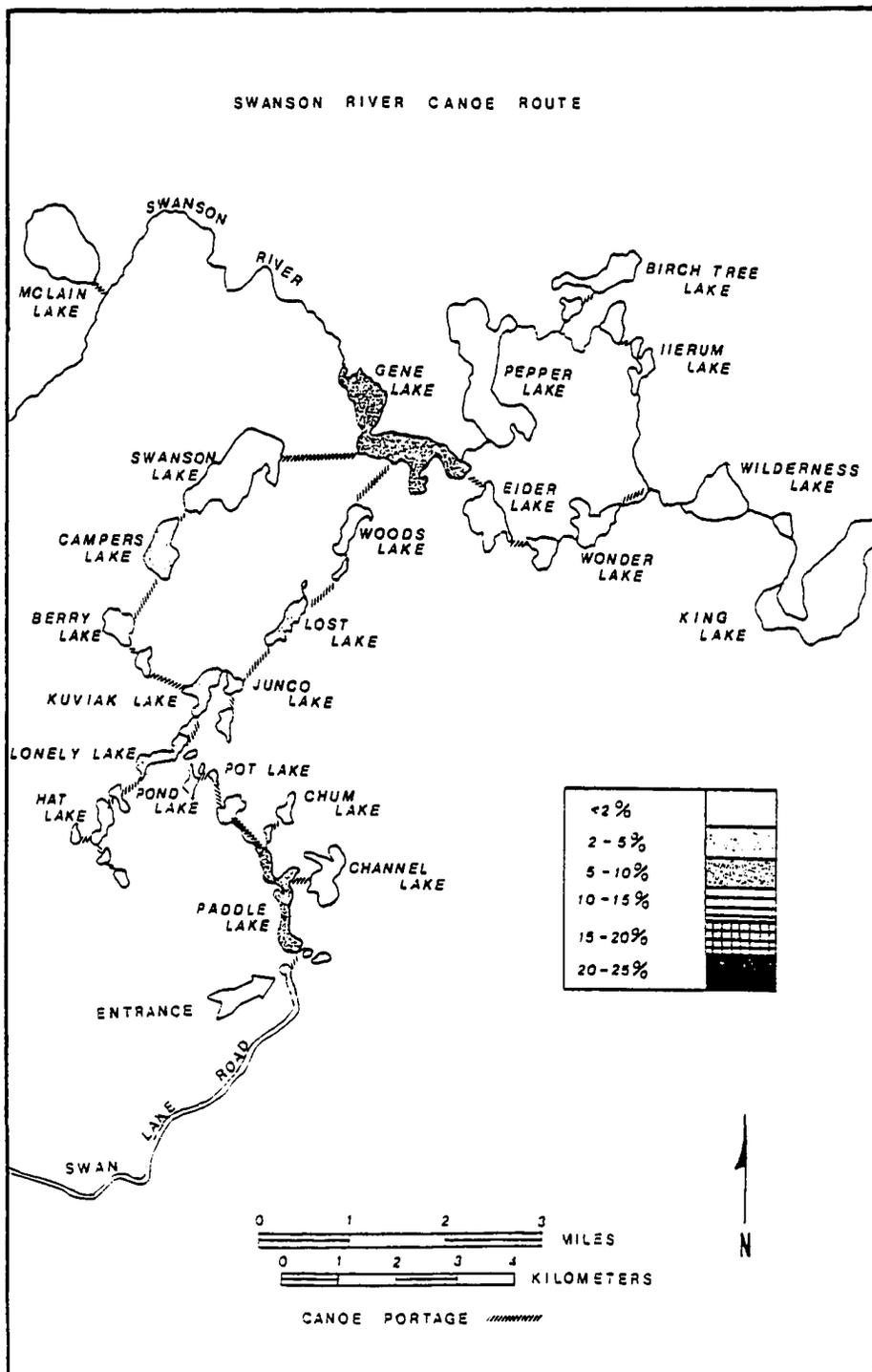


Figure 16. Relative Proportions of Campsite Use, as a Percentage of All Campsites Made, Swanson River Canoe Route

their main reason for selecting the route of their trip. The responses are listed in Table 23. I included in the "familiarity" category responses such as "We like the island on Gavia Lake," or "We come here each year, because they imply familiarity with the area, although they give little indication as to why the respondent found the area attractive. The category "others selected" includes responses such as "arranged by trip leader," or "suggested by friends." The common thread in these and similar statements seemed to be the respondents' lack of participation in the selection of a route. The tautological response "because I like it" is difficult to interpret because it gives essentially no information about factors influencing the respondent's decision. The unspecific responses "to have a good time," or "recreation," are also ambiguous and suggest that the respondent misinterpreted the question. A few respondents wrote "chance" or "no specific reason," which I interpreted as meaning that no one reason stood out in the respondent's mind. The selection process may have involved a diffuse and generalized, and possibly changing, set of expectations about the trip.

I suspected that the Swanson River Route, because of its greater distance from the Sterling Highway and less widespread reputation for fishing, would attract more of those users seeking solitude or isolation than would the Swan Lake Canoe Route. Conversely, the Swan Lake Route should attract more of those users concerned with fishing and convenience. Table 24 compares the reasons for route choice between users of the two Canoe Routes. The distributions differed significantly at the $p=.001$ level ($\chi^2=60.5$, $df=9$), and the degree of assoc-

Table 23. Reasons Given by Canoeists for Choice of Route Traveled

Reason Given	Distribution (%)
Convenience	
Portages easy or short	8
Best for time available	12
Convenient	7
Easy Access	5
Subtotal	32
Specific Activity	
Fishing	15
Hunting	4
Canoeing	2
Nature photography	<1
Subtotal	21
Exploration	
To see new area	7
Physical setting	
Prefer scenery	4
More wildlife	2
Good campsites	1
More pristine or clean	<1
Subtotal	7
Familiarity	
Previous experience	5
Prefer specific locale	2
Come this way every year	1
Subtotal	8

(Continued on next page)

Table 23 (continued)

Reason Given	Distribution (%)
Solitude	
Fewer people	4
More remote or isolated; quieter	1
Unspecific reason	
For fun or recreation	1
Chance; no particular reason	5
Others selected	
Suggested by friends	7
Planned by friend or trip leader	5
Tautology	
I liked it	2
Other reasons	1
Percent total	100
(Number of reasons given)	(462)
(Number of persons responding)	(372)

Table 24. Reasons Given by Canoeists for Choice of Route, by Canoe Route Used

Reason Given	Distribution (%)	
	Swan Lake Canoe Route	Swanson River Canoe Route
Convenience	32	11
Specific activity	22	22
Exploration	5	9
Familiarity	12	10
Solitude	1	22
Physical setting	3	3
Unspecific reason	4	6
Tautology	3	4
Others selected	17	12
Other reasons	1	1
Percent of total	100	100
(Number of responses)	(228)	(144)

iation was moderate (Cramer's $V=0.40$). "Solitude" was a much more common response among users of the Swanson River Canoe Route, whereas "convenience" was a much more common response among users of the Swan Lake Route. These results lend some support to my hypothesis, although the proportions of people interested primarily in fishing opportunities were about the same for users of both Canoe Routes.

I wanted to investigate the possibility that canoeists using different routes perceived different attractions on them. Table 25 compares the reasons for route choice by route used. The distributions differed significantly at the $p=.001$ level (G -statistic=87.2, $df=27$), but the association was weak (Cramer's $V=0.27$).

Temporal Distribution of Use

The number of Canoe Route visitors beginning canoe trips varied considerably by day of the week, month, and time of day. Figure 17 shows the percentage of canoeing use occurring during each month of the study, beginning 18 May 1975. (Prior to 18 May nearly all of the Canoe Route lakes had too much ice cover to permit canoeing. No data were gathered after 13 September, although some canoeing use occurred well into October).

Thirty four percent of the canoeists began their trips on a holiday weekend: 18% over Memorial Day,⁶ 10% over the 4th of July holiday, and

6. State and federal agencies observed Memorial Day on different weekends in 1975. I pooled the dates to include May 24 to 26 and May 30 to June 1.

Table 25. Reasons Given by Canoeists for Choice of Route, by Actual Route Used

Reason Given	Route (%)				Total
	West Entrance- return	West Entrance- Moose River	Paddle Lake- return	All others	
Convenience	30	25	9	36	24
Specific Activity	24	11	19	26	22
Exploration	15	19	17	11	16
Familiarity	11	14	8	0	9
Solitude	2	0	24	9	9
Physical setting	3	3	3	2	3
Unspecific reason	5	3	6	6	5
Tautology	4	3	5	8	5
Others selected	5	19	7	2	6
Other reasons	1	3	2	0	1
Percent total	100	100	100	100	100
(Number of responses)	(175)	(36)	(114)	(47)	(372)

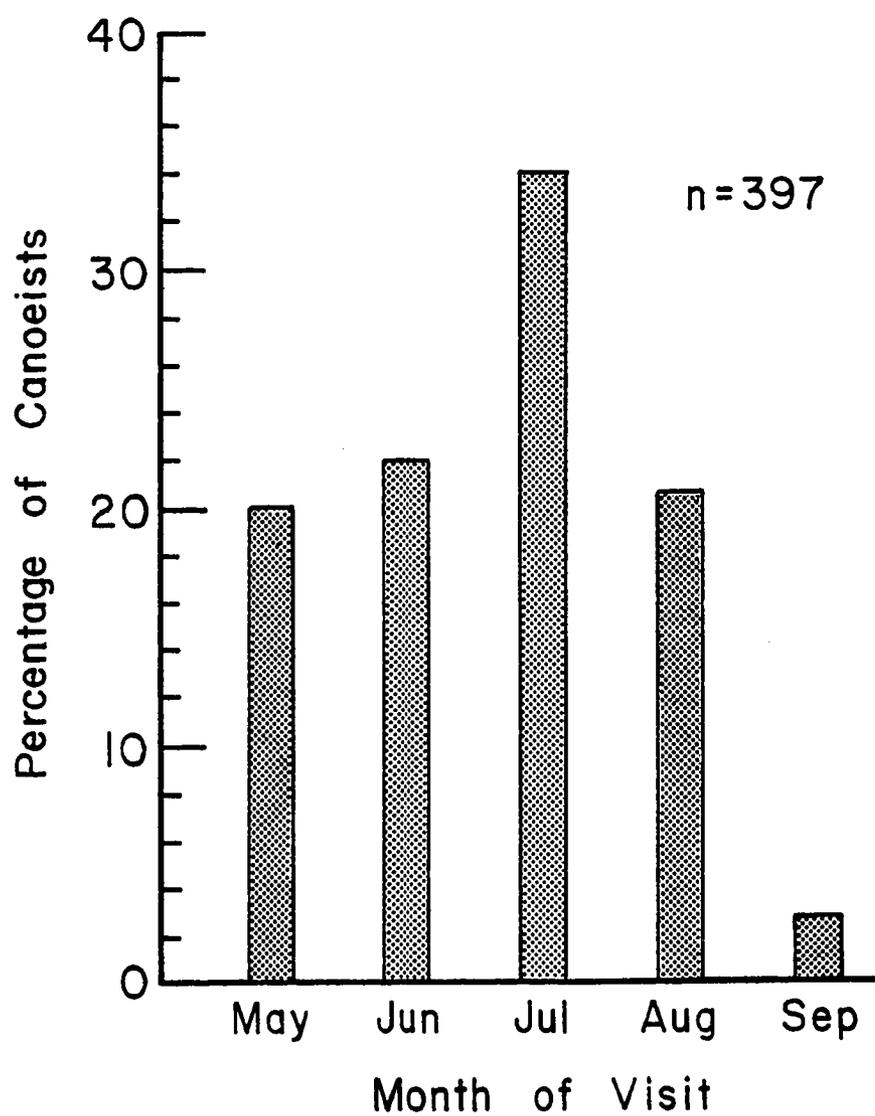


Figure 17. Percentage Distribution of Month of Visit to Canoe Routes

6% over Labor Day weekend. Thirty five percent of the canoeists began trips on a non-holiday weekend, the 30% began on a weekday (n=397). Canoeists also began trips at different times of day: 33% began in the morning (6am to 12 am), 47% began in the afternoon (12 am to 6 pm), and 20% began in the evening or early morning (6pm to 6am), (n=392). Distribution of use on the two Canoe Routes differed significantly by the type of day (chi-square=13.4, df=2, p=.001) as shown in Table 26.

Table 27 compares the type of day on which users began trips between residents and nonresidents. The distributions differed significantly (chi-square=15.2, df=2, p=.001) but the strength of association was weak (Cramer's V=0.20).

The average length of stay tended to be greater for users of longer routes, as expected. Mean number of visitor-days was compared for six different routes and analysis of variance indicated that they differed significantly (F-ratio=19.5, $df_1=5$, $df_2=389$, p=0.01). The results are summarized in Table 28. The shortest trips -- probably just overnight -- were made by those who started from and returned to the Moose River Bridge or Swanson River Campground. These canoeists probably traveled, in general, less than 10 miles round-trip, because of the difficulty of upstream paddling. Trips that started from and returned to trailheads on the Swan Lake Road averaged 4 to 5 visitor-days, and 10 to 20 miles round-trip, depending on the number of side trips. Length of stay was longest on routes which exceeded 30 miles in length.

Table 26. Types of Day on Which Canoeists Began Trips, by Canoe Route Used

Canoe Route	Type of Day (%)			Total
	Holidays	Weekdays	Weekends	
Swan Lake	60	77	53	63
Swanson River	40	23	47	37
Percent total	100	100	100	100
(Number of Persons)	(190)	(104)	(103)	(397)

Table 27. Types of Day on Which Canoeist Began Trips, by Residency Status

Type of Day	Residency Status (%)		
	Resident	Nonresident	Total
Holiday	47	27	43
Weekday	43	52	45
Weekend	10	23	12
Percent total	100	100	100
(Number of persons)	(321)	(73)	(394)

Table 28. Mean Length of Stay for Canoe Route Users, by Route Traveled

Route of Travel	Visitor-days		
	Mean	s.e.	n
West or East Entrance and return	4.3	±0.1	194
West or East Entrance to Moose River	7.7	±0.4	43
West Entrance to East Entrance	4.0	±0.1	8
Paddle Lake and return	5.0	±0.2	116
Paddle Lake to Swanson River	6.5	±0.6	28
Swanson River or Moose River only	1.9	±0.6	6
Total	5.0	±0.1	395

People who began canoe trips on weekdays tended to make longer trips than those who began on weekends or holidays. Weekday canoeists stayed, on the average, 5.4 ± 0.2 visitor-days, compared to 4.6 ± 0.4 visitor-days for weekend canoeists, and 4.6 ± 0.2 visitor-days for holiday canoeists. The difference was significant at $p=.005$ ($F\text{-ratio}=5.3$, $df_1=2$, $df_2=392$). Nonresident canoeists stayed significantly longer than resident canoeists: 5.9 ± 0.4 visitor-days compared to 4.8 ± 0.1 visitor-days, respectively (Student's $t=2.7$, $df=91$, $p=.01$).

Canoe Route Use in Perspective

The total amount of Canoe Route use relative to the rest of the Kenai National Wildlife Refuge is slight. There are no estimates available for the years 1971 to 1975, but data from earlier years indicate that the total number of recreational visits to the Refuge in 1975 was probably between 300,000 and 500,000 (U.S. Fish and Wildlife Service 1971). Canoe Route visitors thus contributed about 1% to 2% of the recreational use on the refuge during that year.

The Arctic National Wildlife Refuge in northern Alaska is the only other unit of the National Wildlife Refuge System in Alaska that receives significant backcountry recreation use. Canoe Route use in summer 1975, on a per acre basis (approximately 0.2 visitor-days per acre), was about 200 times greater than use in the Arctic Wildlife Refuge. The 1975 use estimates for the Arctic Wildlife Refuge are only approximate and include subsistence hunting by Native Alaskans, but about 1300 persons visited the 8,900,000 acre refuge between May and

September (Paul Benvenuti, personal communication). Because of its vast size and remoteness, Arctic Wildlife Refuge users probably spend at least twice as much time on trips as do Canoe Route users, so the mean number of visitor-days per acre on the Arctic Wildlife Refuge is probably about 0.001.

Use estimates for National Park System units in Alaska are also considerably lower than for the Kenai Wildlife Refuge. Total back-country overnight stays in 1975 equalled 17,410 (about 0.02 visitor-days per acre) in Denali (formerly Mt. McKinley) National Park, and equalled 1133 (about 0.001 visitor-days per acre) in Glacier Bay National Park (Hendee, Stankey, and Lucas 1979). Data for National Forest units in Alaska indicate about 0.03 visitor-days per acre in the Resurrection Pass area of the Chugach National Forest, just east of the Kenai Refuge (U.S. Forest Service 1978). Thus, use levels on the Canoe Routes appear to be among the highest for federally-owned wildland recreation areas in Alaska.

Canoe Route use is moderate compared to wildland recreation areas in other states, however. The mean number of visitor-days per acre for all National Forest Wilderness and Primitive Areas in 1975 was over twice as much as the Canoe Routes at 0.49, and ranged from a low of 0.01 (in Arizona's Galiuro Wilderness) to a high of 4.03 (in California's Desolation Wilderness, which had over one million visitors), (Hendee, Stankey and Lucas 1979). The 1975 use levels on the Canoe Routes were about the same as National Forest wildernesses in Montana (0.2 visitor-days per acre). The only other major canoe wilderness, the Boundary Waters Canoe Area in Minnesota, had over one million visitors

in 1975, or about 1.05 visitor-days per acre (Hendee, Stankey and Lucas 1979).

The proportion of one-day use on the Canoe Routes is in the same range as most western wilderness areas, that is, between 40% and 67% one-day use (Hendee, Stankey and Lucas 1979). The proportion of one-day use appears to be related to the size of the wilderness unit and the number of trailheads accessible by road to nearby population centers. For example, Lucas (1964) found that 44% of day-use groups on the Boundary Waters Canoe Area were from the local area and another 30% were from nearby areas. The Canoe Routes are within one hour's drive of Kenai or Soldotna, or visitors at other campgrounds on the Kenai Refuge, and my observations indicated that most one-day users were local residents or campers staying elsewhere on the Refuge.

Factors Influencing Canoe Route Use

Many factors influence the amount and pattern of use on the Canoe Routes compared to other areas in Alaska. Proximity to the Anchorage area makes the Canoe Routes accessible to a large proportion of the state's population. Alaska's road system is limited, so the highway access to the Canoe Routes may be especially attractive to those who wish to visit a wild area but want to avoid excessive travel time or expense. Opportunity is another factor: the Canoe Routes are the only extensive lake area set aside strictly for wilderness canoe use in Alaska. An element of glamour and status may be attached to the Canoe Route name and to National Wildlife Refuge designation, and could also attract visitors.

McKillop (1975) developed a model to test the significance of different factors in determining use levels in California wilderness areas. He found three factors that were significant at the $p=.001$ level, two of which are relevant to the Canoe Routes: (a) designation as a federal conservation unit, in this case a National Park; and (b) total acreage. Four variables significant at the $p=.10$ level were: (a) travel time from a nearby metropolitan area (the San Francisco Bay Area); (b) road construction on adjacent National Forests (a measure of accessibility); (c) population within 100 miles; and (d) number of entry points per acre.

Factors Influencing Use Distribution

The general pattern of spatial and temporal use distribution on the Canoe Routes appears typical of many wilderness recreation areas. Hendee, Stankey and Lucas (1979) summarized research on National Forest wilderness units in the United States and found that, as on the Canoe Routes, many areas supported trips of short duration, disproportionately heavy use of a few trailheads, concentration of use along shorter, main-trunk trails with greater dispersal on branches and more distant areas, and uneven campsite use.

Length of Stay: Short trips are usual on the Canoe Routes because most of the lakes on the Swan Lake or Swanson River Canoe Routes can be visited in three days. Short trips, in terms of both time and distance, are typical of small or medium-sized wildernesses and appear to be a function of size and accessibility. Merriam and Ammons

(1968) found that users of the 75,000 acre, easily accessible Mission Mountains Primitive Area in Montana, spent an average of two calendar days per trip. However, users of the 950,000 acre Bob Marshall Wilderness Area spent an average of eight calendar days. The latter area is surrounded by a roadless buffer zone which allows no direct access. Length of stay was intermediate on the largest unit studied by Merriam and Ammons, Glacier National Park (1,009,159 acres) but a network of roads allows easier access to wilderness portions of the Park. Similarly, researchers at the Wildland Research Center (1962) found that users of the 389,600 acre Mt. Marcy area in New York averaged four calendar days per trip, while users of the much larger High Sierra in California (1,500,000 acres) averaged over seven calendar days per trip. They showed that length of stay was related to distance traveled to the wilderness, in that a greater proportion of visitors who traveled over 250 miles stayed longer than those who traveled a shorter distance. Hendee et al. (1968) found that average trip length was between two and three calendar days on three wilderness areas in the Pacific Northwest, all of which were within 100 miles of a major population center. Longer stays by nonresidents than residents on the Canoe Routes suggest that similar factors may influence length of stay.

Trailhead Use: Markedly uneven trailhead use was reported for the Mission Mountains Primitive Area (Lucas, Schreuder and James 1971) and the Boundary Waters Canoe Area (Lucas 1964). On both of these

areas, about 60% of the visitors used just two trailheads, while on the Canoe Routes, 87% of the visitors used two trailheads (see Table 21).

There are several factors which may help explain why some areas of the Swan Lake and Swanson River Canoe Routes differ so markedly in their attractiveness to canoeists. The minimal amount of use of the East Entrance may be due to a combination of factors: Portage Lake is small, contains no game fish, lies in full view of the traffic on the Swan Lake Road, and offers no nearby campsites. In addition, and perhaps more importantly, none of the lakes between Portage and Swan lakes support game fish populations, and because they lie entirely within the 1947 burn, they are not especially scenic. Consequently, this route is probably not very appealing to most visitors.

One-day users' preference for the Swanson River Campground as a trailhead contrasted sharply with canoeists' trailhead preferences. This campground lies many miles downstream from the lakes of the Swanson River Canoe Route, but it does make the Swanson River itself immediately accessible. Its location relatively close to the Sterling Highway also makes it highly attractive to people interested in a one-day outing. Anglers seeking a convenient fishing spot and hunters seeking a quick, easy route into the roadless sections of the Refuge, are especially attracted to this trailhead. For example, the large proportion of canoeists observed on the Swanson River during the 19 August 1975 aerial survey (see Figure 10), reflects the influx of hunters from the Swanson River Campground who were anticipating the opening of moose season on 20 August.

The relatively heavy overnight use of Paddle Lake (Figure 16) is somewhat surprising at first glance, as it is so close to the trailhead. I observed that many canoeists camped there who arrived in the late afternoon or evening and waited until the following morning to begin their canoe trip proper.

Route Preference: Users' preferences for either the Swan Lake or Swanson River Canoe Route and for specific routes within the system, suggest that ease of access, length and number of portages, and fishing opportunities vary in importance depending on users' goals. Lucas (1964) suggested that portages had different significance for paddling canoeists than for motor canoeists on the Boundary Water Canoe Area. The latter were primarily interested in fishing and saw canoe travel as a means to get to a fishing spot, whereas paddle canoeists saw canoeing as a major objective in itself and treated portaging as part of the experience. Thus, portage number and length were less important to paddle canoeists than was the total distance from the trailhead.

Preference for trails on the Swan Lake Canoe Route seems to reflect a general perception of portages as a burden and attempts to minimize the time and effort spent portaging. The exception to this is the West Entrance to Moose River route, where exploration was the most important, and specific activities such as fishing, the least important reasons for route choice (see Table 25). On this route portaging may be viewed by more users as an integral part of the canoeing experience and exploration process.

On the Swanson River Canoe Route, where solitude and exploration ranked highly among users' reasons, portaging may also be viewed more often as part of the whole experience. These users may also see portages as barriers to other users which improve their own chances of finding solitude. Canoeists at Paddle Lake frequently commented, "the first long portage discourages a lot of people."

The central lakes on both Canoe Routes (those between Spruce and Swan lakes, and between Kuviak and Gene lakes) provide both loop- and side-trip possibilities. Portage length seemed to be the most important factor in route selection on these lakes. Most canoeists with whom I spoke preferred a route with few long portages, not necessarily one with the fewest total portages. On the Swan Lake Canoe Route, this usually meant the Gavia-Konchancee Lake area, and on the Swanson River Canoe Route it was the Lost-Woods Lake area. The Otter-Grebe Lake trail received little use and appears to have several disadvantages over the other Swan Lake Route trails: Otter and Big Mink Lakes contain no game fish; there are three long portages between Big Mink and Grebe lakes; and the route ends in a cul-de-sac, requiring users to retrace the three long portages. (Refuge maps indicate a route down the West Fork of the Moose River, which is in fact barely passable, because it follows a shallow, convoluted course that is scarcely wide enough for a canoe, and which goes through extensive areas of marsh.)

Slightly different factors combine to influence route choice on the Swanson River Canoe Route. Mouse Lake, like Grebe Lake, is a cul-de-sac, but the portages are short and the fishing is reputedly

excellent. However, the small sizes of the lakes on that branch, plus their relative proximity to the trailhead make them less attractive than other routes. Their location in the 1947 burn also makes campsites less scenic and more difficult to find. However, the lack of campsite use on this branch may not reflect actual use very well. People who camp at Lonely Lake or Kuviak Lake may make one-day excursions towards Mouse Lake to take advantage of the short portages and fishing.

Refuge maps indicate the existence of improved portages in the Wonder Lake - Nuthatch Lake area, but in fact, Refuge staff made no improvements in this area when they established the Canoe Routes. Except for the water portage to Pepper Lake, which is frequented by Gene Lake campers, the connections between these northern lakes are largely unmarked and unimproved trails, or shallow, muddy, and narrow waterways along which canoes must often be pushed or towed. Time is also a consideration: the greater distance to these lakes makes them unavailable to canoeists planning trips of less than four or five days. Twig and Birch Tree Lakes, north of Pepper Lake, and Eider and Olsjold Lakes to the east, have no game fish populations.

There were marked differences in the reasons which users of different routes gave for their route selection (see Tables 24 and 25). The more frequent mention of "solitude" as a reason by Swanson River Canoe Route users indicates that they anticipated better opportunities for solitude on that Route than on the Swan Lake Canoe Route. It may appear more remote and less heavily used because of its greater distance from the Sterling Highway and the populated areas nearby, and the vast expanse of undeveloped, roadless land around the Canoe

Route boundaries may create a greater sense of wildness than on the Swan Lake Canoe Route.

"Exploration" and "selection by others" were important reasons given by users of the West Entrance to Moose River route. The combination of lake and river travel on this route may better convey the sense of traveling through continually new country than on other routes. The logistical arrangements necessary for getting trip members to the West Entrance at the start of the trip, and picked up at the Moose River terminus afterwards, make prior planning more imperative than on return-type trips. Consequently, more trip members may relegate route choice and other logistical decisions to trip leaders, especially those with previous experience. The lower frequency of specific activity reasons may reflect users' subordination of those interests to the trip leader's plans, at least in the matter of route choice.

Campsite Preference: Factors such as scenery, fishing potential, portage length, time available, and distance from trailheads, probably influence campsite choices. The lakes with the heaviest campsite use tend to be medium- to large-sized, with mature forest and good fishing opportunities, and located about one day's travel from a trailhead or at a major junction. The lakes nearest the most popular trailheads inevitably receive heavy campsite use, as well as heavy through-traffic, especially between the West Entrance and Spruce Lake and between Paddle Lake and Kuviak Lake.

Marten and Spruce Lakes are located at about the geographical midpoint of the Swan Lake Canoe Route, and are logical sites for over-

night stays. Spruce Lake is five portages (approximately three hours) from the West Entrance and five or six portages (depending on the exact route) from Swan Lake. Gene Lake, the most popular location for campsites on the Swanson River Canoe Route, is 12 portages (approximately six hours) from Paddle Lake. Trips down the Moose or Swanson rivers begin at Swan or Gene Lake, respectively. The strategic locations of these lakes at logical stopping places result in heavy campsite use.

The pattern of heavy campsite use at a few locations on the Canoe Routes was also found to be characteristic of many wilderness areas by Hende, Stankey and Lucas (1979). A study by Brown and Schomaker (1974) cited by them showed that the most heavily used campsites on the Spanish Peaks Primitive Area in Montana and the Bridger Wilderness in Wyoming shared the following characteristics: (a) proximity to water and fishing opportunities; (b) good scenery, especially of nearby water (usually a lake rather than a stream); (c) location within 700 feet of a trail; (d) about 500 square feet of level ground; and (e) location within 300 feet of firewood. These factors seem to be important in campsite location on the Canoe Routes as well. On any given lake (or river) the actual sites used seem to depend on the availability of suitable terrain in combination with intensity of use. On Spruce and Marten Lakes all of the suitable sites appear to have been used at some time, but those closest to the portages are used most frequently. In addition, my observations indicated that users have a marked preference for established campsites; the same sites are used repeatedly while other, seemingly suitable and usually less disturbed sites, show little or no

evidence of use. The process of locating and clearing a suitable campsite in a previously unused location requires more of an effort than most people are willing to make, especially after a day of canoeing and portaging. It is simply easier and more convenient to stop at a spot where a cleared, level tent-site and a firepit already exist, even though site degradation may be extensive and in sharp contrast to the surrounding undisturbed environment. Actually, the amount of useable area for campsites is limited on many Canoe Route lakes, because of marsh and bog areas along the shoreline or, in the 1947 burn, numerous deadfalls and dense undergrowth. The small size and simple shoreline configurations of many of the lakes also mean that shoreline campsites tend to be highly visible, and the number of secluded sites available is limited.

Temporal Use: The temporal pattern of use on the Canoe Routes is probably also typical of most wilderness areas. The monthly use levels, with a general increase through July and a sharp decline in September, are similar to those shown by Elsner for the Desolation Wilderness (Hendee, Stankey and Lucas 1979). Elsner's data show large peaks on Memorial Day and the 4th of July and a smaller peak on Labor Day, similar to the peaks in the use on the Canoe Routes.

The uneven distribution of visitor use on the two Canoe Routes implies a greater potential, especially on heavily used trailheads and trails within the system, for physical and psychological impacts which can affect the kinds of encounters, and thus the quality of the experiences, that visitors have.

GROUP COMPOSITION AND ACTIVITY PARTICIPATION

The recreational needs, interests, and social relationships of Canoe Route users are in part indicated by the kinds of companions they choose to canoe with and the kinds of recreational activities they participate in. This information is important because it may provide clues to the understanding of how people perceive the Canoe Routes and the kinds of opportunities which they provide, and how people react to encounters with other groups of canoeists.

This section reports data on group size and composition and their effects on length of stay, and canoeists' participation in various recreational activities on the Canoe Routes.

Group Size and Composition

The average size of canoeing groups as determined by ratio estimation was $3.2 \pm \text{s.d.}=0.3$ persons for canoeists, and $3.1 \pm \text{s.d.}=0.1$ persons for one-day users. Group size ranged from 1 to 31 for the questionnaire sample of canoeists, but I observed at least two larger groups on other occasions, one of 44 persons and one of about 70 persons. The distribution of groups by size was as follows: 1% of the groups had one person, 37% had 2 people, 39% had 3 to 5 people, 12% had 6 to 10 people, 4% had 11 to 15 people, 2% had 16 to 20 people, and 3% had over 20 people (n=401).

To obtain some idea of the relationships between group members, I asked canoeists to indicate the type of group they were with. Thirty-three percent indicated that they were traveling with friends or acquaintances, 31% were with members of their own family, 13% were with several families together, 12% were with their family and friends, and 10% were with an organized group (for example, university classes, church-sponsored outings, summer camp and Scout groups, and other organization or agency-sponsored tours). Only 1% of the canoeists traveled alone (n=401).

I determined the approximate age and sex composition of canoeist groups from information supplied by questionnaire respondents on the number of persons of each sex in their group who were less than 18 years old or 18 years or older, and I compared sex and age composition for each type of group (Table 29). Most types of groups consisted of adults of both sexes, or a mix of both sexes and all ages. All-male groups were most common among groups of friends and acquaintances. My observations indicated that these latter groups tended to be of two types: those of 5 to 10 military employees from Elmendorf Air Force Base or Fort Richardson, near Anchorage, and those of 2 to 6 young men who appeared to be close friends of about the same age.

Among dyads, male-female couples predominated, followed by pairs of adult men. Dyad members were mostly young adults: 58% were in their twenties and 19% were in their thirties, and 74% were childless.

The mean size for each type of group is given in Table 30. Mean group sizes differed significantly) (F -ratio=88.3, $df_1=5$, $df_2=394$,

Table 29. Age and Sex Composition of Canoe Route User Groups, by Type of Group

Age and Sex Composition	Type of Group (%)						Total
	Single person	Single family	Several families	Family & friends	Friends & acqu.	Organized Tour	
Males 18 years	20	0	0	0	3	0	1
Males 18 years	80	8	7	5	45	4	20
Males, both ages	0	10	6	7	9	13	9
Females 18 years	0	0	0	0	0	0	0
Females 18 years	0	0	0	0	4	0	1
Females, both ages	0	0	0	0	1	2	1
Both sexes 18 years	0	49	43	61	35	17	41
Both sexes, both ages	0	33	44	27	3	64	27
Percent total	100	100	100	100	100	100	100
(Number of persons)	(5)	(104)	(54)	(59)	(130)	(47)	(399)

Table 30. Mean Sizes of Canoe Route User Groups

Type of Group	Mean	s.e.	n
Single person	1.0	±0.0	5
Single family	3.3	±0.2	105
Several families	6.2	±0.4	54
Family and friends	5.2	±0.2	59
Friends and acquaintances	3.4	±0.1	130
Organized tour	14.3	±1.2	47

$p < .001$), and a Student-Newman-Keuls range test identified three homogeneous subsets: (a) single person, single family, and friends and acquaintances, (b) several families, and family and friends, and (c) organized groups.

Large groups differed significantly from small groups in choice of route (chi-square=9.9, $df=3$, $p=.02$), (Table 31). More large than small groups chose the West Entrance-Moose River and Paddle Lake-return routes.

Type of day on which users began trips--holiday, weekend, or weekday--proved to be independent of group type.

There was a significant difference in mean number of visitor-days spent by each type of group (F-ratio=5.1, $df_1=5$, $df_2=390$, $p < .001$), although a Student-Newman-Keuls range test did not distinguish more than one homogeneous subset. Group means are given in Table 32.

Mean length of stay was also compared by size of group. Groups of 1 to 4 persons stayed an average of 4.5 ± 0.1 visitor-days ($n=253$), groups of 5 to 9 persons stayed an average of 5.3 ± 0.3 visitor days ($n=89$), and groups of 10 or more persons stayed an average of 6.9 ± 0.4 visitor-days ($n=53$). The results show that large groups stay significantly longer than small groups (F-ratio=22.9, $df_1=2$, $df_2=392$, $p < .001$). A Student-Newman-Keuls range test indicated that each size class formed a separate subset.

Discussion of Group Characteristics

As with other characteristics of Canoe Route use, the size and social structure of user groups closely parallel those of recreation

Table 31. Route Traveled by Canoe Route Users, by Size of Group

Route Traveled	Group Size (%)		Total
	Small Groups (10 persons)	Large Groups (10 persons)	
West Engrance-return	47	49	47
West Entrance to Moose River	10	13	11
Paddle Lake-return	28	38	29
All other routes	15	0	13
Percent total	100	100	100
(Number of persons)	(347)	(53)	(400)

Table 32. Mean Numbers of Visitor-Days Spent by Canoe Route User Groups

Group Type	Mean	s.e.	n
Single person	3.5	±1.3	5
Single family	4.6	±0.2	105
Several families	4.7	±0.4	54
Family and friends	5.0	±0.4	57
Friends and acquaintances	4.9	±0.2	127
Organized tour	6.6	±0.4	48

groups in other wilderness areas (Hendee, Stankey, and Lucas 1979). Small groups of friends and family members predominate, and only a small proportion of all groups have more than 10 members.

Group Size: Large groups, though few in proportion to small groups, may have a disproportionately large impact on both the physical and social environment of the Canoe Routes. Lime (1972) offers evidence that large groups on the Boundary Waters Canoe Area cause more extensive damage to more campsites and disturb more other groups than an equal number of people in small groups, because large groups tend to travel far farther and stay longer. Stankey(1973) was able to confirm that large groups had an extremely detrimental effect on user satisfactions in wilderness areas and suggested three reasons: (a) other users may regard large groups as inappropriate in wilderness, (b) large groups may cause severe ecological damage, and (c) large groups may contribute to a feeling of crowding. On the Canoe Routes large groups also tend to stay longer and travel somewhat farther. Consequently they utilize more campsites and have a greater probability of meeting other groups.

Large groups require more tent sites, more firewood, and contribute more foot traffic and organic waste to each campsite than do small groups. The greater concentration of people in time and space, and the higher noise levels frequently associated with them, may be perceived as a major disturbance of the wilderness environment by other groups. Some Canoe Route users had particularly strong complaints about group singing sessions taking place in some organized

tours and the consequent disruption of peace and quiet, especially in the evenings.

Intra- and Inter-Group Relationships: The social makeup of canoeist groups provides indirect evidence for users' needs and goals which relates particularly to the question of how they perceive and respond to crowding. Solitude is usually considered an essential part of the wilderness experience, yet, as Stankey notes (1973), very few people travel alone in the wilderness. However, small groups are common. On the Canoe Routes, as in other wilderness areas, most canoeists travel with family members or close friends. The small size and closeness of interpersonal relations in these groups imply that a desire for an intimate kind of social interaction is an important component of the trip, although not necessarily an explicit one. Solitude may still be viewed as important, but for the group as a whole rather than for individual members.

Stankey (1973) suggests that intra-group contacts have a different meaning than inter-group contacts. The nature and strength of a person's identity with his or her group may influence his or her perception of strangers. A theory of behavior in physical settings by Westin, elaborated by Proshansky, Ittelson, and Rivlin (1970) includes solitude and intimacy as two expressions of privacy. Among wilderness users, it seems probably that small groups with strong inter-personal relations, such as families, couples, and best buddies, would have high privacy needs and therefore tend to view encounters with strangers as unwanted intrusions. In large groups, relationships are likely to be less intimate, with more emphasis on casual social interaction with many

people rather than intense interaction with a few. This suggests that members of large groups are likely to have a higher tolerance for encounters with strangers.

Activity Participation

Questionnaire respondents were given a list of 10 recreational activities and were asked to check all of those in which they had participated while on the Canoe Routes. The results are summarized in Tables 33 and 34. Except for fishing, nonconsumptive activities were the most popular. A few people hunted moose or black bear on the Canoe Routes, but there was little interest in small game or waterfowl hunting. A substantial number of hunters traveled up the Swanson and Moose Rivers on day-long trips, but few ventured into the Canoe Route lakes (see Figure 10, distribution of canoeists on 19 August 1974). (One-day users were not included in the sample, so reported results do not reflect total hunting use of the Canoe Routes).

Canoeists were asked to indicate which single activity of all those listed they felt was most important to them. Forty seven percent reported that canoeing was most important, 30% reported fishing, 7% reported bird observations, 6% reported wildlife observations, 4% reported nature photography, and 3% each reported big game hunting and other, unlisted activities (n=346 persons). A salient feature of these results is that, while nearly everyone fished, less than half felt that it was the most important activity. The activity of canoeing overshadowed as others in importance.

Table 33. Participation in Recreational Activities by Canoe Route Users

Activity	Percent of Users Participating*
Fishing	78
Wildlife observation	59
Bird observation	50
Nature photography	48
Berry picking	15
Swimming	14
Big game hunting	7
Small game hunting	< 1
Waterfowl hunting	0
Camping	5
Other activities**	9

*Number of persons responding =401.

**Includes wildflower identification, hiking, and other activities listed by respondents with less than 2% participation.

Table 34. Participation in Consumptive and Nonconsumptive Related Activities by Canoe Route Users

Type of Activity	Percent of Users Participating
Nonconsumptive activities	18
Fishing	14
Hunting and fishing	< 1
Nonconsumptive activities and fishing	59
Nonconsumptive activities and hunting	2
Nonconsumptive and consumptive activities	6
Percent total	100
(Number of persons)	(401)

One question that I wished to explore was whether participation in a given activity tended to be associated with participation in other activities, for example, a person who watched birds might also be interested in watching other wildlife. Nature photography might include interest in both of those activities. Hunting and fishing involve a similar kind of searching and stalking behavior as do bird watching and photography, but have the additional goal of making an actual catch. One might expect a negative correlation between nonconsumptive and consumptive activities.

A correlation matrix was established using ten activity variables: photography, fishing, canoeing, hunting, berry picking, bird watching, wildlife watching, swimming, camping, and other, unlisted activities. Each activity was treated as a dichotomous variable, in which a "yes" response indicated participation, and a "no" response indicated lack of participation. Kendall's tau was the coefficient of correlation calculated, a non-parametric coefficient for ordinal-level variables (Nie, et al. 1975).

The results gave partial support to the idea of association between certain activities. Bird and wildlife watching were highly correlated with each other ($\tau=0.61$, $p=.001$). Significant correlations were also found between nature photography and bird watching ($\tau=0.12$, $p=.006$) and between photography and wildlife watching ($\tau=0.09$, $p=.029$). Hunting and fishing were not significantly correlated, but fishing was positively correlated with bird watching ($\tau=0.23$, $p=.001$), and negatively correlated with wildlife watching ($\tau= -0.19$, $p=.001$). Berry picking was significantly correlated with photography ($\tau=0.21$,

$p=.001$, hunting ($\tau=0.15$, $p=.002$), bird watching ($\tau=0.11$, $p=.017$), and wildlife watching ($\tau=0.13$, $p=.005$).

Another important question was whether participation in various activities varied between the Swan Lake and Swanson River Routes. Casual conversations with canoeists indicated that many perceived fishing as better on the Swan Lake Route, hence, I suspected greater participation in fishing by users of that Route than by users of the Swanson River Route. Conversely, a greater participation in activities such as wildlife and bird watching might be expected on the Swanson River Route. Seven activities were tested for differences in participation by Canoe Route -- nature photography, fishing, big-game hunting, berry picking, bird watching, wildlife watching, and swimming. Only hunting differed significantly between the Canoe Routes, with 2% participation by Swan Lake Route users and 7% by Swanson River Route users ($z=-2.5$, $p=.006$).

Differences in activity participation showed up when users of different routes of travel were compared. Hunting participation was significantly greater on routes other than the three most popular routes combined ($z=3.17$, $p=.001$). Participation in berry picking was greatest on the West Entrance to Moose River route (37%) and least on the West Entrance-return route (6%), with the Paddle Lake-return route (14%) and all other routes (28%) in between ($\chi^2=36.2$, $df=3$, $p<.001$). Wildlife watching follows a similar pattern, with differences significant at the $p=.01$ level ($\chi^2=11.1$, $df=3$).

Participation in an activity does not by itself indicate the perceived importance of that activity to the user. I suspected that

differences in activity participation among users might be more a matter of emphasis than of kind.

To test this idea I compared most important activity by Canoe Route used and by route traveled. The distributions did not differ significantly, but when the proportions are examined in detail, some differences do emerge: significantly fewer users said fishing was most important on the West Entrance to Moose River route (17%) than on all other routes combined (30%), ($z=1.69$, $p=.05$). On the other hand, the proportion of users for whom canoeing was most important was significantly greater on the West Entrance to Moose River route (54%) than on all other routes combined (38%), ($z=1.90$, $p=.03$). The proportion who saw wildlife viewing as most important was greater on all other routes combined (18%) than on the three most popular routes combined (7%), ($z=2.55$, $p=.005$).

Discussion of Activity Participation

The data on activity participation point out that canoeing, and to a lesser extent fishing, far outweigh other activities in attraction and importance to Canoe Route users. Participation in other activities seems to take place largely as the opportunity arises and as an adjunct to canoeing, rather than as a major pursuit. Canoeing is apparently perceived by many users as an end in itself, rather than as a means of achieving other recreational goals such as catching fish or taking photographs.

Information about participation rates in various activities among users of other wilderness areas is relatively scarce. But what is avail-

able agrees with my findings that relatively few canoeists view fishing as the most important activity, compared to the proportion who actually fish. Carpenter and Bowlus (1976) studied attitudes towards fishing among users of the Desolation Wilderness Area in California. They found that 6% of the users had a strong interest and 34% had a moderate interest in fishing, while 24% had only an occasional interest and 36% had no interest. Enjoyment of the area was not significantly related to the degree of interest in fishing, which indicated that most of the users did not consider fishing to be of primary importance. Carpenter and Bowlus noted that the expression of some interest in fishing did not imply that it was a primary reason for visiting the Desolation Wilderness.

Lucas (1965) found that 26% of paddling canoeists on the Boundary Waters Canoe Area fished "a lot", 66% fished "some", and 8% fished not at all. However, only 8% of the canoeists listed fishing as their most important activity, and only 16% listed fishing as the characteristic that attracted them to the area.

The relative lack of interest in the Canoe Routes as a place to hunt (with the exception of the lower Moose and Swanson Rivers) may be explained partly by the lack of areas where geese, ducks, or cranes congregate, and by the amount of time and effort involved in hunting by canoe, especially where repeated portaging is necessary.

Participation in a combination of activities was the rule among Canoe Route users. Many of the activities listed probably took place while people were canoeing, and this may help explain correlations

between certain activities. For example, bird watching may be positively correlated with fishing because one can watch birds while fishing with little additional effort: many species of waterfowl, shorebirds and songbirds are highly visible near the lakes and streams of the Canoe Routes. Wildlife watching may be negatively correlated with fishing because many wildlife species are cryptic, and require a greater effort to see. Canoeing and fishing enthusiasts may be unwilling to spend the time and effort away from their primary pursuits to find wildlife. The correlation of berry picking with several other activities suggests that it has widespread appeal even though it is a highly seasonal activity and takes people away from the water. Berry-picking offers immediate and tangible rewards while requiring relatively little time and effort.

The crossover between consumptive and nonconsumptive uses of wildlife, although limited, does indicate that these uses are not mutually exclusive, and that users' interests may include more than one kind of use. Fazio and Belli (1977) tried to determine actual participation by Idaho residents in a number of specified nonconsumptive wildlife-related activities. Over half of their sample (54%) engaged in a combination of nonconsumptive uses, hunting, and fishing. Participation in the nonconsumptive activities listed did not differ significantly between pure nonconsumptive and combination users. They point out that users who have traditionally been viewed as seeking only to catch fish or hunt game, may also pursue nonconsumptive wildlife activities.

More research is needed to determine the relative participation in and importance of both consumptive and nonconsumptive wildlife uses on

the Canoe Routes, but such information would contribute to a better understanding of the area's ecological values to users.

REASONS FOR VISITING THE CANOE ROUTES

Recreation behavior can be conceptualized as engagement in leisure-time activities which are instrumental in obtaining some goal or need satisfaction. Recreationists receive value from the attainment of those recreational goals or needs, and the magnitude of that value results from the interaction of three variables: (a) the antecedent conditions, which determine the nature and strength of motivations to recreate, (b) the attractiveness of the recreational goal-objects, and (c) the nature and consequences of intervening variables encountered during the pursuit of recreational goals (Driver and Tocher 1970).

Motivations to recreate are complex and multi-dimensional; they arise from many social and personal factors such as work and home environments, stage in the life cycle, physiological drives, attitudes, knowledge, and cognitive style. A person's behavior may express the pursuit of more than one goal, and the importance of those goals may change from place to place and time to time, or even from moment to moment (Driver and Tocher 1970; Maslow 1970; Ittelson, et al. 1974). Catton (1969) defines motivation as an inferential construct: motivations cannot be directly observed, but they can be inferred to some extent from people's behavior, the settings they use and inhabit, and their verbalized reasons for their actions.

In this study, information about people's activities, discussed earlier, and their stated reasons for visiting the Canoe Routes, discussed in this section, may help identify the kinds of goals and

satisfactions they seek and the qualities that attract them to the Canoe Routes.

One approach to the study of the attractions of wilderness recreation has been to ask participants to rate the importance of different attractions or goals. One disadvantage of this approach is the possibility that aspects of attraction other than those defined by the investigator may go undetected. To partially avoid this bias, I asked Canoe Route users to express their goals in their own terms, by asking a free-response question, "What was your main reason for making this trip on the Canoe Trails?" By emphasizing "main reason", I hoped that respondents would decide for themselves which aspect of their trip they valued most highly.

The free-response approach creates some difficulties however. It tends to elicit responses which are sometimes vague or ambiguous, or the question may be misinterpreted and lead to inappropriate responses. In this case, the wording of the question also precluded the possibility of multiple responses and their relative importance, so the information obtained was somewhat limited in usefulness.

Analysis of Reasons for Visiting the Canoe Routes

Table 35 lists the responses of Canoe Route users to the question on reasons for their trip. I grouped conceptually similar responses into nine dimensions. Many people gave more than one reason, so percentages are based on the total number of reasons as well as respondents.

The most frequent responses were the specific activities of fishing and canoeing. It is difficult to interpret these responses because it is

Table 35. Reasons Given by Users for Visiting the Canoe Routes

Reason Given	Percent of All Responses	Percent of Persons Responding
Specific Activity		
To fish or to catch fish	12	19
To go canoeing	11	18
To go hunting	3	5
To do photography	< 1	1
Subtotal	26	43
Temporary Escape		
To get away	9	14
To get away from the city	3	5
To get away from work	< 1	< 1
To get away from people or crowds	5	8
For solitude or isolation	1	2
For peace and quiet or tranquility	2	3
Subtotal	20	33
Contact with Nature		
To experience wilderness	4	6
To visit pristine area	< 1	1
To be in the outdoors or open space or woods	8	12
To see birds or wildlife	3	5
Subtotal	15	24

(Continued on next page)

Table 35. Continued

Reason Given	Percent of All Responses	Percent of Persons Responding
Exploration		
To see new country or area	5	7
To see Alaska	1	2
To see the Kenai Peninsula	1	1
For a new experience, adventure	1	1
Recommended by a friend	4	6
Subtotal	12	17
Play		
To have fun, for vacation, or pleasure, or something to do	8	13
Social Affiliation		
To be with family or friends	2	4
To be with organized group	2	3
Friends asked me to come	2	3
Subtotal	6	10
Education		
To teach canoeing or outdoor skills	2	3
To teach wilderness apprecia- tion	1	1
To provide guidance for young people	3	5
Subtotal	6	9

(Continued next page)

Table 35. Continued

Reason Given	Percent of All Responses	Percent of Persons Responding
Health		
To get some exercise	1	2
Pioneering		
To go camping; roughing it	3	4
Tautology		
Because I wanted to, or liked it	2	4
Other	1	2
Percent total	100	160
(Sample size)	(615)	(392)

not clear whether the activity was an end in itself, or the means to some other end. However, the data given earlier on the importance of different activities suggests that canoeing is often viewed as an end in itself.

The desire to escape temporarily from the everyday environment was also a prominent theme among users' responses. Some people sought escape from specific aspects of the environment: crowds, "people" in general, the noise and congestion of the city, and the routine or pressures of work were mentioned.

The desire for contact with nature seems to encompass the idea of an emotional or aesthetic encounter with a wild, pristine environment. Responses such as "to get out in the woods," "open space," and "to see the beauties of nature" were included in this dimension, which ranked third in frequency overall.

The dimension of exploration differs from that of contact with nature in that the element of novelty or curiosity seemed most salient: people wanted to see country they had never visited before, although they may have heard about it from friends or publications, or they wanted to try a form of recreation new to them.

The dimensions of social affiliation and education, in which interaction with other group members was the salient feature of the response, were relatively unimportant for Canoe Route users. Health and pioneering dimensions were also rarely mentioned.

Some respondents seemed to have difficulty expressing a specific reason for their trip. The dimension of "play" includes answers ex-

expressing a generalized, unspecific desire for pleasureable activities, relaxation, or diversion.⁷

The lack of structure in the question seemed to pose difficulties for a few respondents as mentioned earlier: they gave vague, ambiguous, or tautological answers such as "we do this every year," or "we wanted to." These people may have been unsure of just what was being asked, or their goals may have been uncertain or difficult to express. However, such responses were relatively infrequent.

Fifty four percent of the respondents gave two or more reasons for their trip, even though they were asked to give only one. This implies that many users visited the Canoe Routes for several, equally important reasons, but these data are too limited to permit tests on the multi-dimensionality concept.

Table 36 compares the distributions of users' trip goals with their most important activity. If recreational activities differ in their functions or meanings to users, then participation and preference might be associated with trip goals. Some subclass sizes are small, so the results must be interpreted cautiously, but the distributions differed significantly ($G\text{-statistic}=39.2$, $df=24$, $.025 < p < .05$). The association was rather weak (Cramer's $V=0.19$). People with different goal orientations may tend to participate in different spectra of activities.

7. A study of personality variables and outdoor recreation reported by Driver and Knopf (1977) defines the need dimension of play as "does things for fun."

Table 36. Reasons for Canoe Routes Visit, by Most Important Activity

Reason for Trip	Most Important Activity (%)					Total
	Photography	Fishing	Canoeing	Wildlife Watching	Other Activities	
Temporary escape	21	23	19	16	19	20
Nature contact	21	6	10	25	5	10
Exploration	7	4	12	13	0	8
Specific activity	36	49	27	28	38	36
Social affiliation	7	5	9	6	29	8
Education	0	4	5	3	0	4
Play	7	9	18	9	9	14
Percent total	100	100	100	100	100	100
(Number of persons)	(14)	(105)	(151)	(32)	(21)	(323)

The kind of group one travels with in the wilderness may also reflect one's recreational needs and goals. One would not expect a person seeking solitude to travel with a tour group of 10 to 20 people, but a small group of intimate friends or family might be compatible with such a goal. Likewise, someone seeking new friendships or wanting to teach outdoor skills may prefer a large group context. The distribution of trip reasons by type of group is given in Table 37. The departure from independence was highly significant (G-statistic=105.2, df=24, $p < .001$). These data offer support for the idea that escape-related reasons are highest among the smallest and most intimate types of groups, and that social affiliation and education-related reasons are highest for the organized tours, the largest groups (see Table 30).

Several social variables were tested for association with Canoe Route users' goals. Age and education distributions were not significantly different but residence variables were. The distribution of canoeists' goals differed significantly by residency status (chi-square =22.8, df=6, $p=.001$), as Table 38 shows. For example, nonresident canoeists were much more likely than resident canoeists to give answers such as "to see Alaska," or "to see the Kenai Peninsula."

Canoeists residing in different areas of Alaska also differed in goals, as shown in Table 39. The difference in distributions of trip reasons was highly significant (G-statistic=34.0, df=12, $p < .001$). Kenai and Anchorage residents were much more likely to specify activities as goals than were those from other areas of Alaska. The latter were more likely to seek contact with nature, exploration, and social affiliation.

Table 37. Reason for Canoe Route Visit, by Type of Group

Reason for Visit	Type of Group (%)					Total
	Friends & Aqua.	Single Family	Several Families	Family & friends	Organized Tour	
Temporary Escape	29	22	11	19	4	20
Nature contact	9	14	11	13	6	11
Exploration	12	7	15	4	2	9
Specific activity	35	38	30	45	19	34
Social affiliation	2	7	6	2	34	8
Education	0	0	4	2	24	4
Play	13	12	23	15	11	14
Percent total	100	100	100	100	100	100
(Number of persons)	(121)	(96)	(47)	(53)	(47)	(364)

Table 38. Reasons for Canoe Route Visit, by Residency Status of Canoeists

Reasons for Visit	Residency Status (%)		
	Resident	Nonresident	Total
Temporary escape	22	12	20
Nature contact	11	11	11
Exploration	6	18	8
Specific activity	32	47	35
Social affiliation	9	6	8
Education	16	5	14
Play	16	5	14
Percent total	100	100	100
(Number of persons)	(296)	(73)	(369)

Table 39. Reasons for Canoe Route Visit, by Area of Residence in Alaska

Reason for Visit	Area of Residence (%)			Total
	Anchorage Area	Kenai Peninsula	Other Alaska	
Temporary escape	22	33	8	22
Nature contact	11	3	15	11
Exploration	6	5	12	6
Specific activity	33	36	15	32
Social affiliation	8	0	27	9
Education	4	6	4	4
Play	16	17	19	16
Percent total	100	100	100	100
(Number of persons)	(241)	(36)	(26)	(303)

The data on length of residence (Page 40) showed that almost a third of Canoe Route users were relative newcomers to the state. Do they have different reasons for visiting the Canoe Routes than those who have spent more time in Alaska? A comparison of goals by length of residence shows no significant departure from independence (G-statistic=24.6, df=18, p=.13).

Influence of Trip Goals on Distribution of Use

I wanted to determine how differences in goals related to actual patterns of use on the Canoe Routes, particularly with respect to choice of Canoe Route and actual route used, and to timing and duration of visits. I found that the distributions of users' goals did not differ significantly between the Swan Lake and Swanson River Canoe Routes. Use of specific routes and users' goals were significantly related, however (G-statistic=29.6, df=18, $.025 < p < .05$), (Table 40). Canoeists with nature and education-related goals preferred the West Entrance-Moose River route above all others, whereas activity-oriented canoeists were less likely to choose that route than any others. Canoeists who were play-oriented tended to choose the West Entrance-return and Paddle Lake-return routes most frequently, and those seeking to explore most often selected "other" routes.

Mean length of stay differed significantly by trip goals (F-ratio=3.3, $df_1=6$, $df_2=358$, p=.003). These data are given in Table 41. A Student-Newman-Keuls range test identified two homogeneous sub-groups: (a) exploration; and (b) social affiliation and education. The

Table 40. Reasons for Canoe Route Visit, by Route Used

Reason for Visit	Route Used (%)				Total
	West Entrance- return	West Entrance- Moose River	Paddle Lake- return	All Other	
Temporary escape	22	20	18	16	20
Nature contact	7	22	10	14	10
Exploration	7	10	7	19	9
Specific activities	34	22	39	39	35
Social affiliation	7	9	11	5	8
Education	3	10	3	2	4
Play	20	7	12	5	14
Percent total	100	100	100	100	100
(Number of persons)	(174)	(40)	(108)	(43)	(365)

Table 41. Mean Length of Stay for Canoe Route Users, by Reasons for Visit

Reason for Visit	Mean	s.e.	n
Temporary escape	5.1	±0.2	73
Nature contact	5.6	±0.4	38
Exploration	4.1	±0.5	31
Specific activities	4.5	±0.2	127
Social affiliation	6.0	±0.4	30
Education	6.6	±0.9	14
Play	5.1	±0.4	52
Total	5.0	±0.1	365

latter two dimensions tend to be characteristic of organized groups (Table 37), which in turn tend to make the longest trips (Table 32). The type of day on which users began trips also differed significantly by trip goals. These results are shown in Table 42.

Significance of Users' Recreational Goals

The kinds of recreational goals expressed by Canoe Route users are quite similar to those of outdoor recreationists surveyed in other studies, and the dimensions identified here conform to a pattern that appears to be generic to wildland use (Wildland Research Center 1962; Hendee, et al. 1968; Shafer and Mietz 1969; More 1973; Knopf, Driver and Bassett 1973). For example, the wilderness study by the Wildland Research Center (1962) classified appeals into five dimensions based on both qualitative comments and structured questionnaire items. These dimensions were termed exit-civilization, aesthetic-religious, health, sociability, and pioneer spirit. More recently, Rossman and Ulehla (1977) completed a factor analysis of 30 items representing reward values of wilderness. They identified five factors: spiritual or religious experience, challenge and exploration, antisocietal reaction, aesthetic experience, and escape from the problems or urban living. The studies by the Wildland Research Center, Shafer and Mietz, and Rossman and Ulehla found that aesthetic values -- those relating to the enjoyment of undisturbed nature -- rated highest in importance to wilderness users. Escape values rated equally with aesthetic values in the Rossman and Ulehla study, and rated second in the Wildland Research Center study. Canoe Route users diverged noticeably from

Table 42. Reasons for Canoe Route Visit, by Type of Day

Reason for Visit	Type of Day (%)			Total
	Holidays	Weekends	Weekdays	
Temporary escape	20	19	19	20
Nature contact	11	12	9	10
Exploration	6	16	5	9
Specific activities	41	31	30	35
Social affiliation	9	5	8	8
Education	2	8	3	4
Play	11	9	26	14
Percent total	100	100	100	100
(Number of persons)	(171)	(95)	(98)	(364)

the general pattern in that nature-related experiences rated third in frequency of occurrence, behind activity and escape dimensions. Also, Canoe Route users rarely expressed specifically spiritual goals, such as personal growth or communion with nature, which rated highly in the Wildland Research Center, and Rossman and Ulehla studies. However, these differences may also result from differences in methodology and questionnaire structure.

The kinds of reasons Canoe Route users gave suggest that people may tend to regard their trip in terms of either specific activities or psychological experiences. These different orientations are not necessarily mutually exclusive, and some goals, such as fishing and escape, may be complementary. Mercer (1976) has pointed out that motivations are often complex and obscure and not easily discerned, and Catton emphasizes that they are not directly observable but reflected in behavior. Canoeing and fishing and other activities may be pursued for their own intrinsic rewards, such as the excitement of running rapid water or catching a big trout, but they may also be expressions of other, more complex feelings.

Knopf, Driver and Bassett (1973) found that Michigan fishermen were motivated strongly by unmet needs for temporary escape, achievement, exploration, and experiencing natural settings. Thus, the expression "fishing" may encompass other goal dimensions that users find difficult to articulate. Escape and relaxation may be especially important components of fishing. Knopf, Driver and Bassett found that the need to escape from non-leisure settings rated particularly high among their subjects, and Driver and Knopf (1976) found that escape

from work and the problems of the everyday environment, and relief of tension, were consistently high in importance to fishermen. Studies of hunters by Potter, Hendee and Clark (1973), More (1973), and Schole, et al. (1973) have shown that escape from various aspects of the non-leisure environment is highly important to hunters as well, although it tends to rank below nature contact. On the other hand, fishing and hunting (and perhaps photography) are catch-oriented in a way that canoeing is not, and the elements of skill, unpredictability, and pursuit and capture may make those activities more intrinsically exciting than canoeing (with the exception perhaps of river-running).

Canoeing, like backpacking, is a way of getting around in the wilderness and in that respect, is something of a tautological response to the question on trip goals asked of Canoe Route users. But canoeing seems to be valued somewhat less for intrinsic rewards or status than as a mode of escape, of experiencing the natural environment, or of facilitating interpersonal relationships in an unstructured environment. Escape and tension-relief may also be important components of canoeing, as they are for fishing and hunting. Solomon and Hansen (1972) found that canoeists in Michigan's Manistee National Forest checked "relaxation" as the purpose of their trip most frequently after "canoeing". This was followed by "getting away from civilization." Evidence for the importance of recreation engagements in helping to relieve stress has been presented by Heywood (1978) and Wellman (1979).

Although the dimension of escape rates second highest among canoeists' goals, the desire for solitude or escape from people makes up

only a small proportion of all escape-related responses (see Table 35). This is particularly important because the opportunity for solitude is usually considered as one of the outstanding characteristics of wilderness recreation. It suggests that solitude may not always be essential to people seeking escape from other situations, such as the demands and problems of home or work. However, the low frequency of mention may be related to the structure of the question as well.

The less prominent position of the nature dimension and the infrequent mention of spiritual goals also suggests that the kinds of values specifically associated with wilderness experience -- solitude, remoteness, scenic beauty, wildlife, and contemplation of undisturbed nature -- are relatively less important to Canoe Route users than are other values. Evidently most users perceive the Canoe Routes primarily as a place to fish and canoe, or as a temporary refuge from home, work, or the city, and only secondarily as a source of aesthetic satisfaction. More importantly, this suggests that many users may not perceive the Canoe Routes as wilderness at all. This appears to be especially true for canoeists from Kenai and Anchorage communities, who may use the Canoe Routes primarily as a convenient place to relax, get away from daily problems, and get together with friends for a few days of unstructured, non-competitive, outdoor sport. The qualities of solitude, remoteness, and absence of human disturbance that are unique to wilderness, are not absolutely essential in meeting the recreational needs of these users. They can obtain satisfaction as long as the area is relatively natural, clean, and free from crowds and motorized vehicles. Consequently, they select their dates and routes of travel

primarily on the basis of ease, convenience, and perceived fishing potential. Short trips in and out of the West Entrance or Paddle Lake fit these limitations well.

Canoeists from out of state or from other areas of Alaska, and other users who seek solitude or contact with nature, are more likely to regard the quality of the setting first and foremost, hence their preference for longer, more remote routes of travel.

The fishing-oriented canoeists appear similar in their preferences and behavior to the motor canoeists that Lucas (1964) studied on the Boundary Waters Canoe Area in Minnesota. The motor canoeists were primarily interested in fishing, and chose routes of travel mostly because of their fishing potential. The solitude and nature-oriented Canoe Route users appeared similar to the paddle canoeists whom Lucas studied. These latter were motivated more strongly by wilderness, and lack of crowds was the most important factor in their selection of a route.

It appears that the degree of importance for the kinds of values that are uniquely wilderness-dependent, such as solitude, remoteness, and pristineness, may be a distinguishing factor in users' perceptions and behavior, particularly with regard to crowding.

PERCEPTIONS OF CROWDING

Wilderness managers are concerned that recreational users of wilderness achieve high levels of satisfaction with their wilderness experience. Because solitude and naturalness are key qualities of the wilderness experience, managers are naturally concerned that excessive encounters with other users, in the form of crowding, and environmental deterioration from excessive use, will diminish users' satisfactions.

Stokols (1972) defines crowding as a situation in which the restrictive aspects of limited space are perceived, leading to psychological and physiological stress. It is a multivariate phenomenon, resulting from the interactions of spatial, social, and personal factors. Altman (1975) emphasizes that crowding is an interpersonal process, occurring at the level of people interacting with one another in pairs or small groups. Conditions which lead to the experience of crowding seem to be related to privacy intrusion, space availability, access to resources, and duration of contact with others (Altman 1975; Choi et al. 1976), competition, and thwarting in the achievement of some goal (Stokols 1972 and 1976).

Many social and psychological factors influence peoples' perceptions of and responses to crowding, including the numbers and kinds of encounters with other people, the size and type of groups encountered, the location and timing of encounters, the amount and kind of human impacts on the environment, and the amount of previous experience users have had in wilderness.

These factors interact with environmental factors such as the physical characteristics of the setting and the nature and distribution of use within it. What emerges is a network of use characteristics in which, hopefully, points of congestion and conflict can be identified.

Numbers of Encounters

One major objective of this study was to determine the numbers and kinds of encounters canoeists had with other canoeing groups, and to examine the relationships between encounters and canoeists' perceptions of crowding. Each canoeist met, on the average, 6.8 ± 0.03 other groups, or about 3 groups per day. The number of large groups (defined as 10 or more persons) met averaged less than one, or 0.5 ± 0.005 . A frequency histogram of numbers of encounters shows that most canoeists met between 2 and 6 other groups (Figure 18), and about one fourth of the canoeists met more than 10 other groups. Encounters with large groups were infrequent, by contrast (Figure 19).

Although the proportions of users beginning canoe trips on holidays, weekends, and weekdays were about equal (see Pages 92-93), the numbers of encounters canoeists had differed significantly depending on the type of day they began. Canoeists starting on a holiday met an average of 10.0 ± 0.7 groups, compared to 7.1 ± 0.7 groups for those starting on weekdays (Student's $t=2.59$, $df=285$) and 4.7 ± 0.3 for those starting on weekends (Student's $t=6.79$, $df=237$). These differences are significant at the .01 level of probability. These results suggest that a greater concentration of use on fewer routes occurs on holidays than on other days (compare Figures 11 and 12 with Figures 9 and 10).

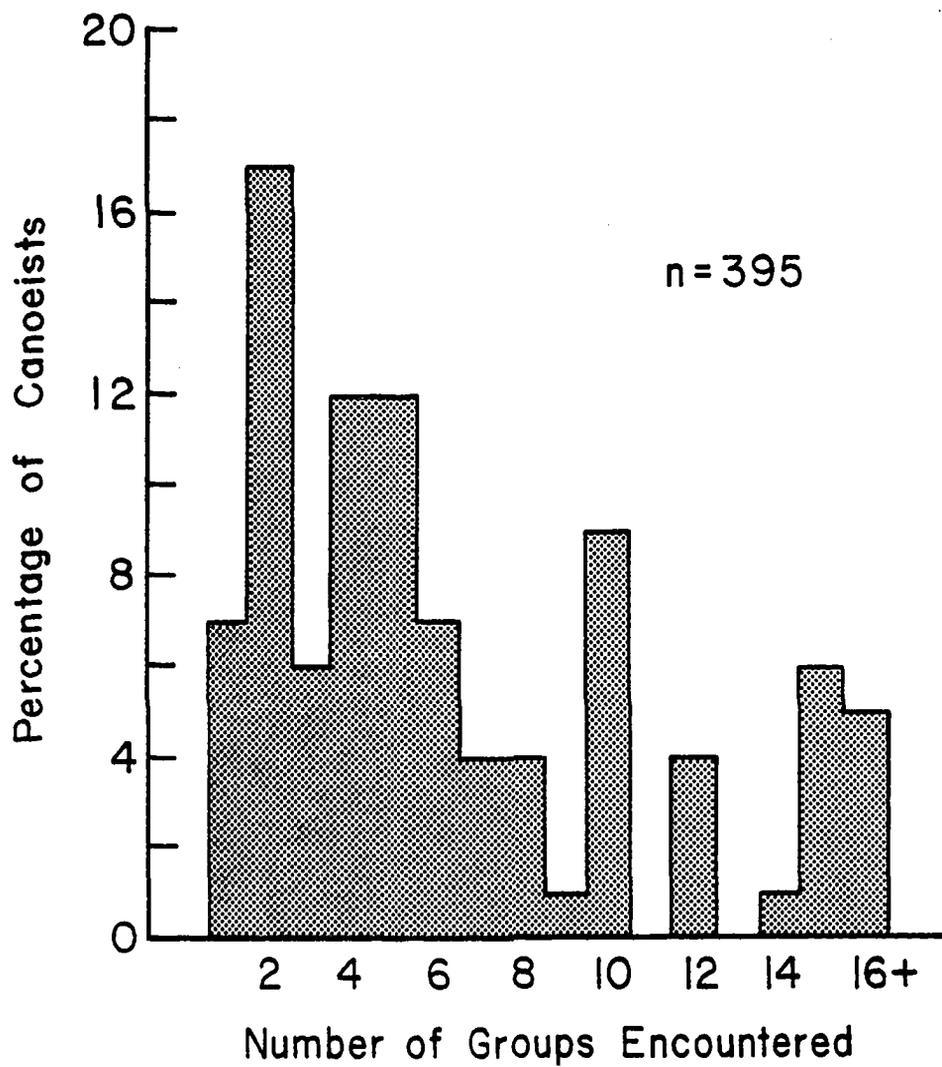


Figure 18. Percentage Distribution of Number of Groups Encountered

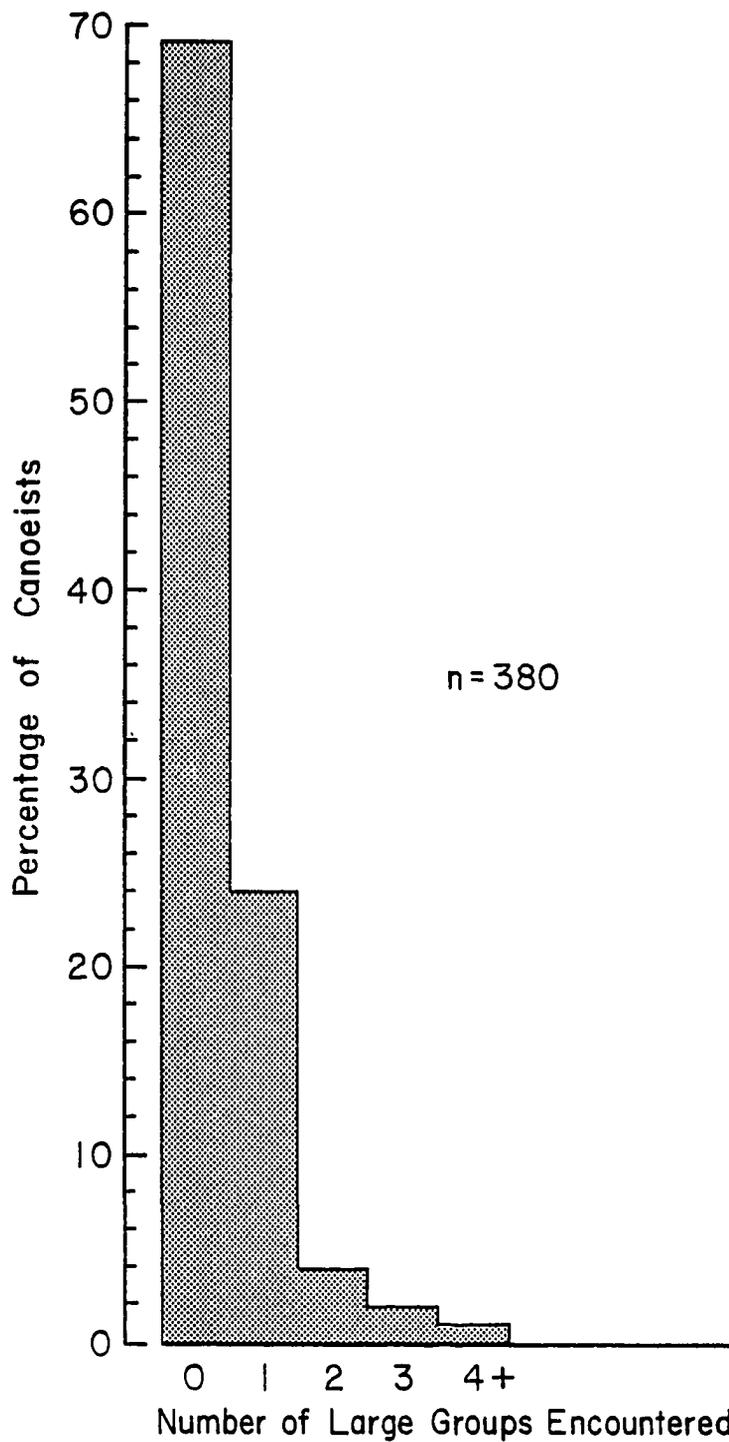


Figure 19. Percentage Distribution of Number of Large Groups Encountered

A comparison of mean numbers of encounters by route traveled shows that canoeists who began trips at the West Entrance met more than twice as many other groups as canoeists who chose any other route: 11.3 ± 0.8 compared to 4.6 ± 0.2 groups. This difference was significant at the .01 level of probability (Student's $t=8.43$, $df=226$).

Response to Encounters

Canoeists were asked to rate their feelings about the number of encounters they had. Most indicated that the number was about right (46%) or that it didn't matter to them (26%). But 19% felt that there were too many and 9% felt that there were far too many. The remaining 2% felt that there were too few or far too few. Encounters with other groups caused 11% of the canoeists to change their trip plans: of these, 28 (65%) changed their route, 12 (29%) cut their trip short, 2 (5%) both changed their route and cut their trip short, and 1 person (2%) stayed longer than planned. However, the difference in mean number of encounters between canoeists who changed their plans and those who did not, was not significant at the $p=.05$ level of probability. Questionnaire respondents offered a wide range of comments on their encounters with other groups, which are listed in Table 43.

Attitudes Towards Crowding

Canoeists were asked to respond to a series of nine items which posed different kinds of encounters with other groups and human

Table 43. Comments by Canoe Route Users on Encounters with Other Groups

Comments	Percent of All Responses	Percent of Persons Responding
Disliked others' disruptive or unethical behavior	15	27
Reaction was neutral	13	25
Expected few or no other people	9	17
Response was vague or general	8	15
Crowded at times	8	15
Encounters were brief in space or time	6	11
Expect crowding will be a problem in future	5	10
Too many people	5	10
Liked other peoples' presence	5	10
Concerns about management	4	8
Objected to litter	4	8
Miscellaneous comments	4	8
Objected to large groups	3	6
Can avoid others if necessary	3	6
Liked some aspect of encounters	3	6
Too many people at a specific place	2	4
Expected more people	2	4

(Continued next page)

Table 43. Continued

Comments	Percent of All Responses	Percent of Persons Responding
Expected some people	1	1
Objected to human waste problem	< 1	1
Percent total	100	192
(Sample size)	(300)	(157)

impacts that canoeists are likely to experience on the Canoe Routes. The items composed a Likert-type scale (see Methods section) with responses ranging in value from 1=enjoyed greatly to 5=bothered greatly for 7 of the items, and with reverse scoring for items (6) and (8). Individual scale scores could range from a low of 17 to a high of 37, with higher scores indicating a more negative attitude towards encounters and impacts. The sample mean for the nine-item scale was $36.4 \pm \text{s.d.}=3.7$, indicating that canoeists tend to hold a negative attitude towards crowding, as measured by response to encounters and impacts. The mean scores for each item are given in Table 44. Coefficient alpha =0.71 and the square root of alpha=0.85, indicating that the nine-item scale is a highly reliable measure of attitude towards crowding on the Canoe Routes.⁸ These values are improved slightly if item (4), (seeing one small group of three people during the day) and item (7), (finding litter along the trails and at campsites) are omitted: Coefficient alpha=0.74 and the square root of alpha=0.86 for the seven-item scale. Since the larger the covariance among items the more reliable the test, items with low variance do not contribute as much to the reliability coefficient (Nunnally 1979). The inter-item correlation also increases from 0.20 to 0.30 for the shorter test. Summary statistics for the seven-item scale are presented in Table 45.

8. Coefficient alpha represents the expected correlation of one test with an alternative form containing the same number of items. The square root of alpha is the estimated correlation of a test with errorless true scores (Nunnally 1979).

Table 44. Item Means, Standard Deviations, and Item-Total Correlations for Crowding Scale

Item No.	Item Description*	Mean**	s.d.	Item-Total Correlation
1	Camping at a place where several other groups are camped.	4.4	±0.70	0.48
2	Seeing many people on the first few lakes.	3.7	±0.71	0.46
3	Seeing one large group of 30 people during the day.	4.2	±0.87	0.50
4	Seeing one small group of 3 people during the day.	2.7	±0.69	0.16
5	Seeing 5 small groups of 3 people during the day.	3.4	±0.76	0.54
6	Seeing no other people where you camp.	4.6	±0.78	0.49
7	Finding litter along the trails and at campsites.	4.9	±0.41	0.06
8	Seeing no or very few other people beyond the first few lakes.	4.5	±0.87	0.48
9	Seeing campsites worn from heavy use.	4.1	±0.88	0.27

*Items were scored as follows: 1=I would enjoy it greatly; 2=I would enjoy it somewhat; 3=It would not matter to me; 4=It would bother me somewhat; 5=It would bother me greatly, except items 6 and 8, for which scoring was reversed (1=It would bother me greatly...5=I would enjoy it greatly).

**Number of respondents =386.

Table 45. Summary Statistics for the Seven-Item Crowding Scale.

Statistic	Mean	Variance	s. d.
Scale	28.8	12.30	±3.5
Item means	4.1	0.20	...
Item variances	0.6	0.02	...
Inter-item covariances	0.2	0.01	...
Inter-item correlations	0.3	0.01	...

n=386

The data in Table 44 show that item (4) had the lowest mean and a low variance compared to all other items: canoeists apparently do not feel strongly one way or the other about seeing only one small group of people. Item (7) on the other hand, elicited a strong and nearly unanimous negative reaction from canoeists as indicated by a mean of 4.9 and standard deviation of 0.41.

Percentage distributions of responses to each scale item are presented in Table 46. Attitudes towards large groups were of particular interest because of their potential for greater impacts on other Canoe Route users. The responses to item (3) on the attitude scale indicate that most canoeists thought they would be bothered by seeing one large group, which contrasts sharply with the response to (item 4), seeing one small group. Canoeists also responded less strongly to seeing five small groups per day (item 5), then to a single large group. These results confirm the idea that canoeists view large groups as a much greater source of potential displeasure than small groups.

Canoeists' attitudes towards encounters in different locations were also tested. Items (1) and (6) refer to encounters taking place at campsites. Canoeists reacted strongly against the idea of camping at a place where several other groups were camped and, conversely, agreed almost unanimously that they would enjoy camping in solitude. Most canoeists would be at least somewhat bothered at seeing many people on the first few lakes (item 2). Conversely, nearly all agreed that they would enjoy seeing no or very few other people beyond the first few

Table 46. Percentage Distribution of Responses to Crowding Scale Items.

Scale item	Response (%)				
	Enjoy greatly	Enjoy somewhat	Wouldn't matter	Bother somewhat	Bother greatly
1. Camping at a place where several other groups are camped.	0	1	7	38	54
2. Seeing many people on the first few lakes.	0	1	39	47	13
3. Seeing one large group of 30 people during the day.	0	1	25	27	47
4. Seeing one small group of 3 people during the day.	7	30	59	4	0
5. Seeing 5 small groups of 3 people during the day.	0	10	46	38	6
6. Seeing no other people where you camp.	77	13	9	1	0
7. Finding litter along the trails and at camps.	0	0	0	3	97
8. Seeing no or very few other people beyond the first few lakes.	63	17	18	2	0
9. Seeing campsites worn from heavy use.	1	2	15	45	37

n=386

lakes (item 8). Clearly, most canoeists would prefer not to see many people anywhere on the Canoe Routes, but the response to item (2) also indicates that a large percentage would not be bothered at seeing many people at the outset of their trip. Most people probably view this as an unavoidable situation, but one which can be tolerated because they believe they can reach more remote areas farther from the trailhead.

Two items on the attitude scale were concerned with litter and campsite wear and tear. The response to litter (item 7) was dramatic: no other item elicited such a strong reaction or as complete agreement among respondents. The response to campsite wear (item 9) was more variable, but most canoeists would be bothered. Worn campsites may be viewed as an inevitable fact of use that has to be tolerated, whereas littering violates a social norm and so carries a much more negative connotation.

Perceptions of Crowding and Impacts

Canoeists were asked to rate their perception of crowding as a problem on the Canoe Routes. Well over half (64%) checked "no, it didn't appear so to me," 32% checked "yes, but only in a few locations," and 4% checked "yes, in most places." More people were concerned about environmental impacts of use than about crowding. When asked if they felt that litter or campsite wear and tear were a problem, 49% checked "no, it didn't appear so to me," 45% checked "yes, but only in a few locations," and 6% checked "yes, in most places." Respondents who felt that crowding or impacts were a problem were also asked to identify specific areas. The question was open-

ended and a variety of answers were given (Table 47). Impacts were perceived to be a more widespread problem than crowding. The first few lakes were most frequently mentioned for both kinds of problems, and Spruce Lake was singled out by more than one fifth of the respondents as a crowded location.

Relationships Between Encounters and Perception of Crowding

One hypothesis common to wilderness crowding theory is that perception of crowding depends on the number of other groups seen. A Pearson Correlation Coefficient computed for the variable "perceived problem with crowding" (scored 1=no, it didn't appear so; 2=yes, in a few locations; and 3=yes, in most places) with number of groups encountered, was weak ($r=0.16$) but significant at the .001 level of probability.

The mean number of encounters differed significantly for each level of crowding perceived. Those canoeists who felt that crowding was a problem in a few locations saw, on the average, 8.8 ± 0.6 other groups, compared to 6.5 ± 0.4 groups for those who felt that crowding was not a problem: the difference is significant at the $p=.001$ level (Student's $t=3.1$, $df=366$). Those who felt that crowding was a problem in most places saw on the average, 13.1 ± 0.8 groups. Compared with those who felt crowding was not a problem, the difference is significant at the $p=.05$ level (Student's $t=1.7$, $df=24$). These data lend support to the hypothesis that the likelihood of perceiving crowding as a problem on the Canoe Routes is a function of the number of encounters with other groups.

Table 47. Areas Identified as Crowded or Impacted by Canoe Route Users in 1975.

Area	Crowded (%)	Impacted (%)
First few lakes	36	20
Spruce Lake	21	13
Portages	10	17
Entrances	9	0
Inner lakes, Swan Lake Route	9	13
Inner lakes, Swanson River Route	5	10
Everywhere	5	18
Other	4	0
Campsites	1	9
Percent total	100	100
(Number of respondents)	(225)	(235)

A comparison of levels of crowding perceived with feelings about encounters revealed a significant departure from independence ($\chi^2=108.9$, $df=6$, $p<.001$) and a strong association ($\Gamma=0.63$). People who felt that there were too many, or far too many, encounters, were much more likely to view the Canoe Routes as crowded in a few or most locations than were other canoeists (Table 48). Similarly, people who felt that there were too many encounters were much more likely to view litter and campsite wear and tear as a problem ($\chi^2=36.5$, $df=6$, $p<.001$, $\Gamma=0.41$), (Table 48).

Actual contact with large groups was relatively infrequent, and the response was not as negative as users' attitudes toward large groups indicated (see Tables 44 and 46). A chi-square test comparing level of crowding perceived for users who had seen no large groups with those who had seen one or more, showed no significant departure from independence at the $p=.05$ level of probability. This suggests that an encounter with a single group is not enough, by itself, to cause dissatisfaction. An encounter with a single large group may prove temporarily uncomfortable, but if it occurs only once during a canoeist's trip, he or she may consider it a problem of circumstance rather than of overuse, and may tolerate it more readily than repeated large-group encounters.

Spatio-Temporal Factors Influencing Perceptions of Crowding

Location, as well as number and type of encounters, and depressive impacts of use were also examined for possible influence on the perception of crowding on the Canoe Routes. The actual route and

Table 48. Levels of Crowding and Impacts Perceived, by Feelings about Encounters

Level of Perception	Distribution (%)							
	Didn't Matter		About Right		Too Many		Far Too Many	
	Crowding	Impacts	Crowding	Impacts	Crowding	Impacts	Crowding	Impacts
None	75	68	71	56	27	35	10	30
In a few locations	25	30	27	39	60	50	64	52
In most places	0	2	2	5	13	15	26	18
Percent total	100	100	100	100	100	100	100	100
(Number of Persons)	(98)	(95)	(172)	(173)	(82)	(82)	(39)	(40)

timing of trips appears to have affected canoeists' feelings about encounters and perceptions of crowding and adverse impacts. Feelings about encounters were compared by route traveled, and the results show a highly significant departure from independence (chi-square=46.8, df=9, p=.001), (Table 49). Table 50 compares level of crowding perceived by route traveled. The distributions were significantly associated (G-statistic=20.2, df=6, .001<p<.01).

The relationships between type of day trips were started, feelings about encounters, and perception of crowding, were also examined (Tables 51 and 52). A much higher percentage of holiday users felt that there were too many or far too many encounters than users who began on other days. The distributions differed significantly (chi-square=32.4, df=6, p<.001, Cramer's V=0.20). A similar pattern of response obtained for perception of crowding. The distributions differed significantly from independence (chi-square=47.9, df=4, p<.001, Cramer's V=0.25). Again, a higher percentage of holiday users than other users felt that crowding was a problem.

These results focus attention on the lakes from the West Entrance up to and including Spruce Lake, as the major contributors to user dissatisfaction with regard to use levels, and suggest a substantial problem with crowding in that area, particularly on holidays. The first few lakes on the Swanson River Canoe Route also appear to suffer from crowding.

Social-Psychological Factors Influencing Perceptions of Crowding

I hypothesized that Canoe Route users' perceptions of crowding

Table 49. Feelings About Encounters by Route Used

Feelings	Route Used (%)				Total
	West Entrance- return	West Entrance- Moose River	Paddle Lake- return	All others	
Far too many	15	2	7	7	10
Too many	22	15	20	26	21
About right	29	63	61	44	44
Didn't matter	34	20	12	23	25
Percent total	100	100	100	100	100
(Number of persons)	(190)	(41)	(116)	(43)	(390)

50. Level of Crowding Perceived by Route Used

Levels of Crowding	Route Used (%)				Total
	West Entrance- return	West Entrance- Moose River	Paddle Lake- return	All others	
None	48	76	57	74	56
In a few locations	44	22	39	20	38
In most places	8	2	4	6	6
Percent total	100	100	100	100	100
(Number of persons)	(190)	(41)	(117)	(46)	(394)

Table 51. Feelings About Encounters by Type of Day Trip Began

Feelings	Type of Day (%)			Total
	Holiday	Weekend	Weekday	
Far too many	14	6	8	10
Too many	30	16	10	21
About right	33	56	50	44
Didn't matter	23	22	32	25
Percent total	100	100	100	100
(Number of persons)	(185)	(102)	(103)	(390)

Table 52. Levels of Crowding Perceived by Type of Day Trip Began

Level of Crowding	Type of Day (%)			Total
	Holiday	Weekend	Weekday	
None	39	70	76	56
In a few locations	52	26	22	38
In most places	9	4	2	6
Percent total	100	100	100	100
(Number of persons)	(190)	(103)	(101)	(394)

would depend in part on the importance they attached to solitude and naturalness. Persons seeking escape and contact with nature would be on the higher end of a "wildness" continuum, and persons seeking companionship and unspecific recreation (play) would be at the lower end. A comparison of feelings about encounters with users' trip goals showed a significant departure from independence (G -statistic=38.4, $df=24$, $.025 < p < .05$), but the results do not clearly support the hypothesis (Table 53). The association between trip goals and feelings about encounters was not strong (Cramer's $V=0.16$), and the degree of "wildness" sought appears to be less important in explaining feelings about encounters than other, unidentified factors.

Finally, previous wilderness experience was examined as a factor influencing response to encounters and perception of crowding. Canoeists' expectations of, and reactions to, the level of use experienced on the Canoe Routes may be influenced by their experience with other wilderness areas. In particular, people who have had previous experience and who are regular wilderness users may be more likely to consider the Canoe Routes as crowded than those who have had little or no previous experience. New users, in effect, have no real-life basis for judging use levels on the Canoe Routes, and may be more likely to accept existing levels as the norm. Level of crowding perceived was compared between users with and users without previous wilderness experience, and the association was significant ($\chi^2=22.0$, $df=2$, $p < .001$). Gamma was 0.60, indicating a strong association

Table 53. Feelings About Encounters by Reasons for Visit

Feelings	Reasons for Visit (%)									Total
	Escape	Nature Contact	Exploration	Fishing	Canoeing	Other Activity	Social Affil.	Educ-ation	Play	
Far too many	17	5	3	6	10	0	17	14	14	11
Too many	18	30	32	21	20	42	10	21	10	20
About right	44	54	45	42	57	25	45	29	40	45
Didn't matter	21	11	19	31	12	33	28	36	36	24
Percent total	100	100	100	100	100	100	100	100	100	100
(Number of persons)	(72)	(37)	(31)	(67)	(49)	(12)	(29)	(14)	(52)	(363)

between the two variables. Similar results were obtained when perception of impacts was examined (chi-square=29.8, df=2, $p < .001$, Gamma=0.66). These results are summarized in Table 54. A comparison between users with and users without previous canoeing experience also resulted in significant chi-square values for level of crowding perceived (chi-square=6.8, df=2, $p = .03$, Gamma=0.18) and level of impacts perceived (chi-square=6.6, df=2, $p = .04$, Gamma=0.24), Table 55).

Levels of crowding and impacts perceived were compared by frequency of wilderness visits, and the relationships were significant (chi-square=20.0, df=4, $p = .001$ for levels of crowding, and chi-square=27.7, df=4, $p = .001$ for levels of impacts), Table 56). As frequency of all wilderness trips increases, so do the proportions of people perceiving the Canoe Routes as both crowded and impacted. levels of crowding, and chi-square=27.7, df=4, $p < .001$ for levels of impacts), (Table 56). As frequency of all wilderness trips increases, so do the proportions of people perceiving the Canoe Routes as both crowded and impacted.

Previous experience on the Canoe Routes themselves was suspected as an important influence on perceptions of existing use levels. The number of visitors to the Canoe Routes increased steadily between 1965 and 1975, so it seemed especially likely that canoeists who had used the Canoe Routes in earlier years would view them as crowded in 1975. Level of crowding perceived was compared by year of first visit to the Canoe Routes (Table 57) and the results offer strong support for this area. The chi-square value of 49.0 (df=6) was highly significant ($p < .001$) and the association between the two variables was moderately

Table 54. Levels of Crowding and Impacts Perceived, by Previous Wilderness Experience

Level of Perception	Previous Experience (%)					
	Some Experience		No Experience		Total	
	Crowding	Impacts	Crowding	Impacts	Crowding	Impacts
None	51	46	82	82	57	52
In a few locations	42	46	15	15	37	40
In most places	7	8	3	3	6	8
Percent total	100	100	100	100	100	100
(Number of persons)	(327)	(326)	(68)	(68)	(395)	(394)

Table 55. Levels of Crowding and Impacts Perceived, by Previous Canoeing Experience

Level of Perception	Previous Experience (%)					
	Some Experience		No Experience		Total	
	Crowding	Impacts	Crowding	Impacts	Crowding	Impacts
None	54	47	61	60	57	53
In a few locations	38	44	36	35	39	40
In most places	8	9	3	5	6	7
Percent total	100	100	100	100	100	100
(Number of persons)	(202)	(204)	(186)	(184)	(388)	(388)

Table 56. Levels of Crowding and Impacts Perceived, by Frequency of Wilderness Trips Per Year

Level of Perception	Frequency of Trips (%)							
	1 per Year		1 per Year		1 per Year		Total	
	Crowding	Impacts	Crowding	Impacts	Crowding	Impacts	Crowding	Impacts
None	46	38	65	63	74	72	55	50
In a few locations	47	53	27	31	22	24	38	43
In most places	7	9	8	6	4	4	7	7
Percent total	100	100	100	100	100	100	100	100
(Number of persons)	(210)	(211)	(86)	(85)	(54)	(53)	(350)	(349)

strong ($\Gamma=0.41$). Curiously however, a comparison of perception of impacts with year of first visit showed no significant departure from independence. Apparently, early users of the Canoe Routes perceived no change in the amount of litter or campsite wear and tear over the years.

Clearly, the amount and kind of previous wilderness experience bears strongly on Canoe Route users' perceptions of crowding and adverse impacts. Users who had visited the Canoe Routes or other wilderness areas prior to 1975 were much more likely to perceive the Canoe Routes as either somewhat or mostly crowded than were users with no previous experience.

Satisfactions and Dissatisfactions

Canoe Route users were asked to list the things which they found most satisfying and most dissatisfying about their trip. The questions were free-response and a wide variety of answers was given. These are summarized in Tables 58 and 59. Perhaps the most salient aspects of these figures are that, first of all, about 74% of the respondents found their greatest satisfaction in aspects of their trip directly related to the absence of people, or the natural and wild qualities of the Canoe Routes, that is, solitude, temporary escape, peace and quiet, and scenic beauty and purity. Secondly, about 31% of the users were most dissatisfied by aspects of their trip that are amenable to site management, that is, litter, poorly maintained portages, and scarce or inadequate campsites. Another 18% were dissatisfied by too many people or the presence of motor-driven boats (on the Swanson and Moose

Table 57. Levels of Crowding Perceived by Year of First Visit to the Canoe Routes

Level of Crowding	Year (%)				
	1975	1974	1970-73	1960-69	Total
None	69	43	38	41	57
In a few locations	26	52	57	45	37
In most places	5	5	5	14	6
Percent total	100	100	100	100	100
(Number of persons)	(223)	(58)	(76)	(42)	(399)

Table 58. Satisfaction Identified by Canoe Route Users

Satisfactions	Percent of All Responses	Percent of Persons Responding
Aspects of the natural environment	41	86
Peace and quiet, and tranquility	19	41
Solitude	9	19
Fishing	8	16
Feeling of accomplishment	5	11
Temporary escape	5	10
Health and well-being	4	8
Canoeing	3	7
Campanionship	2	5
Pioneering	2	4
Management of Canoe Routes	1	3
General recreation	1	2
Percent total	100	212
(Sample size)	(792)	(375)

Table 59. Dissatisfactions Identified by Canoe Route Users

Dissatisfactions	Percent of All Responses	Percent of Persons Responding
Environmental factors	32	46
Litter	17	24
Too many people	13	19
Disruptive behavior by other people	11	16
Scarce campsites	8	11
No complaints (specific mention)	8	11
Poorly-maintained portages	6	9
Motorized boats on rivers	5	7
Percent total	100	143
(Sample size)	(536)	(375)

Rivers), aspects which are amenable to visitor management. Factors which cannot be easily managed, such as noisy or discourteous behavior by people, and weather, insects, low water levels, and so on, account for less than half of the dissatisfactions listed.

Summary of Results on Crowding

Canoeists encountered 7 other groups, on the average, or about 3 groups per day. Encounters with large groups were relatively infrequent. Most canoeists felt that the number of encounters they experienced was either about right or did not matter. The point at which canoeists began to feel that there were too many others appears to be at about 9 encounters. Most canoeists felt that crowding was not a problem on the Canoe Routes but that environmental deterioration was, at least in a few places. There was a positive correlation between the number of encounters experienced and the degree of crowding perceived. Canoeists starting trips on holidays and at the West Entrance had significantly more encounters than canoeists who did not, and were more likely to perceive crowding as a problem. Amount of previous experience with wilderness recreation and on the Canoe Routes, and frequency with which wilderness trips are made, had strong associations with perceived crowding and adverse impacts.

Responses to the attitude scale items indicate that canoeists were in general agreement in preferring no or few encounters with other groups, especially on inner lakes and at campsites, and in disliking encounters with large groups and signs of litter or campsite wear and tear.

Trip aspects that canoeists found most satisfying were related to the natural environment, solitude, temporary escape, and peace and quiet. Most dissatisfactions related to physical environmental conditions. Few people mentioned crowding or environmental wear and tear as a dissatisfaction.

In general, most users did not perceive crowding as a problem, and only about 10% considered it a problem in most places. Solitude was not a widely shared goal for canoe trips, yet it appeared to be a main source of satisfaction for most users. This was in spite of a contact rate of about three groups per day.

Perceptions of Crowding on the Canoe Routes

Although crowding does not stand out as a problem on the Canoe Routes in general, there are particular times and places when it is widely perceived. Many different processes and factors must converge to produce the conditions experienced as crowding. These include: spatial restriction leading to competition for amenities and resources, invasion of privacy and territory, the intensity and duration of contacts, group size and cohesiveness, perceived goals, roles and activities, and norms and expectations regarding the use of space (Stokols 1972; Altman 1975, Choi, et al. 1976; Loo 1977).

Crowding is first and foremost an interpersonal process, and use levels or density are important to the extent that they increase the probability of interpersonal contact (Altman 1975). Similarly, the number of contacts or encounters may not be a sufficient condition by

itself to produce the experience of crowding, but achieves significance by facilitating interactive processes.

The critical level at which contacts are felt as crowding appears to be when they interfere in achieving some resource or goal, or when they interrupt or intrude upon a person's privacy (Proshansky, et al. 1972; Altman 1975; Shelby 1980).

On the Canoe Routes, a number of these processes and factors come into play in a wide variety of situations and combinations, and the number and kinds of encounters that users experience becomes significant when:

- a. the frequency, duration, or intensity -- or some combination of these -- increases to a relatively high level. This happens if a person encounters many people in a large group, or by coincidence travels in the same direction and in close proximity to another, unrelated group;
- b. when the number of groups in a given situation exceeds, or appears to exceed, the resources or amenities sought, such as campsites, trout, solitude, or silence;
- c. campsite privacy is invaded;
- d. achievement of, or progress towards, some goal, such as a particular lake, is impeded or thwarted.

The critical times and places at which crowding is most likely to occur are, as we have seen, on holidays, on the first few lakes of each Canoe Route, and in the Marten-Spruce-Trout Lake area.

The pattern of use on holidays almost insures congestion and elements of crowding on major portions of the Canoe Routes. Typically, a large number of groups converge in a short period of time at the West Entrance or Paddle Lake trailheads. They follow a main trunk of the trail system for several miles, often in close proximity and often heading for the same general destination. The duration and intensity of contacts are critical factors under these conditions: groups often must travel within view of, or even shoulder-to-shoulder with, other unrelated groups, and face congestion at portage landings. Delays, noise, intrusions into personal and group space, and a sense of urgency about finding a campsite may stem from such proximity and contribute to a feeling of crowding on the part of many users.

Encounters are also likely to be more frequent on the first few lakes of both Canoe Routes, not only on holidays but also at the beginning of a weekend. The configuration of the Canoe Routes and the concentration of arrivals at the two main trailheads tend to funnel people along two major arteries. The opportunities to disperse are limited before branching trails are reached at Kuviak or Spruce Lakes. However, the reactions to these early contacts may be mitigated by two factors: first, the belief that fewer contacts are likely to occur as one travels farther and people begin to spread out, and second, the expectation of greater numbers of encounters on the first few lakes. Both attitude scale items and free response comments indicate that these factors play a role in Canoe Route users' tolerance of such encounters.

The Marten-Spruce-Trout Lake area is undoubtedly the most heavily impacted area in the Canoe Routes, both in terms of contact

levels and environmental degradation. Several factors combine to make Spruce Lake in particular a critical bottleneck. Its overwhelming popularity stems partly from its physical attractiveness -- it has a reputation for excellent trout fishing, is scenic, and has forested, easily located campsites -- and partly from its strategic location -- it is only a few hours of travel from the West Entrance over a series of short, easy portages, and its location at a junction makes side trips possible. However, its small size and simple shoreline configuration limit its capacity to absorb human use. Because of the nature of the vegetation and topography, there are only two good campsite locations, and these border the route between Marten Lake and Trout Lake. These areas tend to be occupied quickly because they are easily seen and accessible. Marten and Trout Lakes seem to receive the spillover from Spruce Lake. On a holiday the numbers of people using the West Entrance may be so high that all available campsites on Marten, Spruce and Trout Lakes are occupied by early afternoon.

Lonely and Kuviak Lakes on the Swanson River Route, occupy similarly strategic locations and bear similar problems to Spruce Lake, but do not appear to suffer the same degree of impact. Most canoeists using the Swanson River Route seem to prefer going all the way to Gene Lake on their first day of travel. Gene Lake, because of its large size and more complex shoreline, has more campsites than Spruce Lake and appears more able to absorb large numbers of people.

Choi, et al. (1976) point out that the dimension of exposure time is critical in experiencing crowding: the longer the time span in which an individual is exposed to a crowding situation, the higher the

degree of crowding he or she is likely to experience. It is not surprising then, that the majority of canoeists who traveled on holidays or on the West Entrance-Spruce Lake route, felt that crowding was a problem, at least locally.

At other times and in other areas on the Canoe Routes, the level of contacts between unrelated groups of canoeists is probably too low to lead to problems of interference, competition, or privacy intrusion on more than a few occasions. Unoccupied campsites are easier to find, and campsite privacy is easier to achieve and maintain. Encounters are more likely to be brief and sporadic. People who begin trips in mid-week are more likely to meet groups leaving the Canoe Routes, and so anticipate greater solitude on the inner lakes. Under these conditions, encounters may be more easily tolerated and brushed aside as inconsequential, solitude prevails most of the time, and crowding is less likely to be a salient aspect of the individual's trip. This does not mean that situations of crowding do not occur except on holidays or on heavily-used routes, only that such situations are less likely to be frequent and intense enough to produce a lasting impression.

Solitude was rarely expressed as a major goal of Canoe Route users, but the desire for certain kinds of solitude, particularly at campsites, appears to be widely shared. Altman (1976) maintains that privacy is a key link interrelating the concepts of crowding, territoriality, and personal space. He defines privacy as a process of selective control over access to one's self or one's group. Crowding is a particular kind of breakdown in privacy regulation, which occurs when interaction with others is more than desired. The need for

privacy, for relief from unwanted intrusion and prying eyes, may be much stronger around a home base, even if temporary, than on the portages, which serve as public thoroughfares.

Campsites and portages seem to meet the definitions of primary and secondary (or private and public) territories proposed by Altman (1975) and Stokols (1976). Primary, or private, territories, are those where a person spends much time, relates to others on a personal basis, and engages in a wide range of personally important activities. They are subject to exclusive use and ownership, control over access is highly valued, and invasion by outsiders is regarded as a serious issue.

Secondary, or public, territories are less central and exclusive. Relations with others are relatively transitory, anonymous, and inconsequential. Public territories, such as parks, support temporary kinds of use, and have freer use and occupancy rights. Appropriate behavior and privacy regulations are determined primarily by institutions, norms, and customs.

These distinctions are important in identifying crowding problems on the Canoe Routes. The Canoe Routes are clearly a public place, yet within this broadly public setting people enact the full spectrum of daily activities and needs, including those which normally take place in the privacy of the home. The campsite and its immediate environs become, in effect, a temporary home. People eat, sleep, wash, make love, and defecate in a nebulously defined space that in daily life is hidden from the world's view by a roof and walls. However a campsite, unlike a house, is vulnerable to unpredictable intrusion by strangers, as other groups pass by or set up camp near one's own. Then, the

perceived threat of invasion and the sense of crowding are likely to be much stronger than they would be with trail encounters. At times, camping near strangers is unavoidable, as on a holiday when a group arrives at a popular site like Spruce Lake and no secluded or isolated campsites are available. Canoe Route users also frequently camp beside or even on a portage, or at portage landings, where exposure to passing travelers is unavoidable. Some people choose to camp alongside others even when more isolated campsites are available, apparently because they actually seek company or else they prefer a specific site above all others, occupied or not. In any case, camping beside or in view of another group implies a much longer, more intense, and more intrusive kind of encounter than one that takes place while portaging.

Trail encounters are likely to be brief, sporadic, and unthreatening, and since portages serve as public thoroughfares, simultaneous use by more than one group is both appropriate and acceptable. Stokols (1976) proposes that the transitory nature of secondary settings lessens one's emotional investment in the situation and so reduces arousal to unwanted contacts. The frustrations arising from such contacts are less closely associated with persisting changes in attitude, are more easily resolved, and their impact on the individual is consequently confined to the immediate situation.

How an individual or group copes with encounters and situations of congestion on the Canoe Routes may have a substantial effect on perceived and reported feelings of crowding. Mechanisms for adapting to an undesirable or frustrating situation include behavioral, verbal and para-verbal, and cognitive modes: a person can leave the

situation, avoid verbal or eye contact, or adjust his or her expectations or definition of the situation (Stokols 1972; Choi, et al. 1976; Altman 1975). For example, Canoe Route users could change their plans and move to a different locale to avoid or minimize contacts, but the data show that this option was rarely exercised. Such a relatively radical adjustment as changing routes or moving camp may be too costly in terms of time and energy. A tradeoff is involved -- the work of breaking camp or traveling one or two portages farther must be weighed against the probability of increased solitude or privacy on the next lake or two. In such cases other modes of adaptation assume greater saliency: people may decide to stay put and adjust their goals and definition of the situation, or simply try to ignore other groups.

Among Canoe Route users, the belief that one can get away from crowded areas by going farther appears to be an important factor mitigating the perception of crowding, whether one acts on that belief or not. Comments about encounters frequently ran along the line of "if it gets too crowded, we can always go a little farther."

Adaption may be an important factor in the reporting of crowding as well. Short-term adaptive mechanisms may minimize or nullify the stresses of crowding so that they assume relative unimportance. Thus, dissatisfaction may not be measured -- not, as Altman (1975) points out, because it did not occur, but because it was successfully dealt with, or measured after adaptation had occurred. Encounters may be brushed aside and dominated by other aspects of the canoeing experience, especially if they take the form of brief encounters with strangers whom one has no expectation of seeing again.

Theory and tradition regarding wilderness recreation lead one to expect that complete solitude would be the ideal situation to most Canoe Route visitors. Yet they appeared satisfied with much less. Adaptation may contribute to the low proportion of complaints about crowding. One might also argue that solitude was unimportant to Canoe Route users, as only 3% mentioned it specifically as a major goal. Yet 19% mentioned solitude or peace and quiet as a main source of satisfaction on their trip. Encounters were apparently infrequent enough, even at an average of three per day, for most canoeists to achieve satisfactory levels of solitude most of the time, or at least at times when it was most desirable. Furthermore, other aspects of the trip may have simply outweighed dissatisfaction due to crowding alone.

Roggenbuck and Schreyer (1977) studied river users in Dinosaur National Monument and found only weak correlations between motives and degree of trip satisfaction. The high rate of satisfaction overall suggested to them that users have difficulty remembering their original reasons for taking the trip. They identified three factors affecting the relationship: (1) most users do not have well-defined expectations and have no previous experience, so that the trip is exploratory in nature, (2) the variety of experience opportunities and trip scheduling, and use conditions and management regulations, permit free choice of alternatives, and (3) the actual outcomes of certain facets of the trip may so exceed expected outcomes that dissatisfaction with other aspects of the trip may be more than compensated for.

Heberlein (1977) reported no correlation between density and satisfaction for users of the Grand Canyon and the Brulé River.

Shelby (1980) reported weak correlations between satisfaction and perceived crowding, density, and level of contact for Grand Canyon river users, and Nielsen and Shelby (1977) reported that the perception of crowding among Grand Canyon users was unrelated to overall use level, contacts per day, the number of people seen each day, or time spent in sight of other people. Heberlein, and Nielsen and Shelby, suggest the possibility that density was simply not high enough to affect satisfaction among the users they studied. This might apply to the Canoe Routes as well: either the level of use, experienced as encounters, was not high enough to equal canoeists' definitions of crowding, or the amount of crowding experienced was not enough to affect overall satisfaction.

Shelby (1980) suggests that preferences and expectations are more important in perceiving an area as crowded than are actual encounters or density. Individual expectations and values explained 49% of the variance in perceived crowding in his Grand Canyon study. Expectations may also be important in explaining Canoe Route users' perceptions of crowding. Expectations and preferences regarding use levels are established by personal and social factors, including previous experience. Users who had traveled in other wilderness areas or on the Canoe Routes before 1975 may have found current use levels higher than expected by comparison, and hence were more likely to view the Canoe Routes as crowded than were users with no previous experience.

New and inexperienced users, on the other hand, are more likely to accept the level of use they find on their first trip as normal for that area, because they have little or no basis for comparison. They

may even experience discomfort or frustration but not define the problem as crowding, because they are unaware or vague about any standards regarding crowding in wilderness so do not know what to expect.

Shelby's study of Grand Canyon users tends to support this idea: 90% of the users he studied were on their first trip, and 53% did not know how many contacts to expect (Shelby 1980; Nielsen and Shelby 1977). Roggenbuck and Schreyer (1977) found similar results with river users in Dinosaur National Monument: 60% either had no opinion about the number of encounters they had or felt it was about right. In addition, 33% of the river users had no opinion on the acceptable number of people for the river, while most of the remainder said 11-25 or 26-50 users were all right. These results are very similar to those for the Canoe Routes, where 46% of the users felt that the number of encounters they had was "about right" and 26% felt that "it didn't matter". Since the average number of encounters was seven groups (about 22 persons), this provides a rough measure of the acceptable level of use for the Canoe Routes in 1975, from the users' point of view. Shelby (1980) suggests that preferences and norms about contacts and crowding are established during rather than before the trip, as least for most visitors.

Most visitors probably have at least a vague expectation regarding contact levels in a wilderness environment, associated with broad social definitions and images of parks, wildlife refuges, and wilderness areas, if not with actual experience. They may view the wilderness initially as a place to experience complete solitude. But as they encounter other

groups, they may adjust their expectations of what is appropriate or desirable. By redefining the situation, or emphasizing a different goal, they may find it easier to tolerate encounters and to maintain a high level of satisfaction (Altman 1975; Shelby 1980). Users may also consciously lower their expectations regarding solitude if they anticipate that crowding will be a problem. Canoe Route users often commented with regard to encounters, that "there were fewer people than we expected," or "we expected a lot of people on the first few lakes," or "it was a holiday, so we expected a lot of people." In either case, both the individual's definition of the situation and the nature of the experience itself have changed away from undisturbed wilderness. At the same time, overall satisfaction remains high, at least with regard to contact levels.

However, some users may remain disappointed. Even if they find temporary satisfaction through adjustment and compromise, they may in retrospect decide that the Canoe Routes are unable to provide the kind of experience they seek. Such users are, in effect, displaced from the Canoe Routes and forced to look elsewhere for less crowded wilderness. The fact that most Canoe Route users are new users and that the majority of pre-1975 users perceived crowding as a problem, suggests that sensitivity to crowding prevents many people from returning there. One might predict that, as use levels increase, the more purist users will be replaced by new users who continue to find such levels acceptable, thus shifting crowding norms ever upwards and altering the character of the experience.

Recreation Succession

The process of displacement of old users, acceptance of increasing use levels by new users, and shift in the character of the experience ("product shift") has been defined as the "last settler syndrome" (Nielsen, Shelby, and Haas 1979), "invasion-succession" (Clark, Hendee and Campbell 1971) and "recreation succession" (Shontz and Dorfman 1978). The succession process implies that average satisfaction will remain high even at higher contact levels (Nielsen, Shelby and Haas 1977), and even though the experience of low- or zero-contact wilderness is no longer provided (Heberlein 1977). Nielson, Shelby, and Haas (1977) point out that if new users continue to exceed repeat users, unacceptable levels of use, as defined by traditional values, may never be reached. Furthermore, even if a carrying capacity could be determined, the critical point might have already been reached or exceeded.

The conditions which anticipate the recreation succession process on the Canoe Routes already exist in the form of increased use levels and a rapid population turnover. Census data from 1970 show that the proportion of new residents in Alaska was second highest in the U.S., that the military population of this state turns over every five years and the civilian population almost as quickly, and that young adults are more likely to migrate than other groups, with a peak in the 20-29 year age group (Seiver and Fison 1975). Thus, a large proportion of Canoe Route users comes from the segment of the state's population that turns over most rapidly and has immigrated most recently. If those population patterns continue, then it is likely that new users will

continue to dominate the Canoe Route population, keeping crowding norms in a state of flux. If total Canoe Route visitation continues to increase, then crowding norms are likely to increase as well.

Changes in the physical environment, and users' acceptance of them, are another possible consequence of increasing use levels and recreation succession. Over the years, use on the Canoe Routes has resulted in well-trodden paths, groundcover loss and soil compaction at campsites and portage landings, construction of fire rings, and accumulation of waste. Canoe Route users also have exhibited a tendency to add to established campsites by constructing more elaborate fire rings and windbreaks and clearing more ground for tents. Such changes are cumulative, and gradually alter the character of the landscape away from pristine wilderness. New users find established campsites with fire rings and shelters and accept them as the norm. They may prove resistant to any attempts by management to curb or eliminate these structures, or even demand more such "improvements".

These observations on Canoe Route users' expectations, feelings, and attitudes about encounters, crowding, satisfactions, and dissatisfactions, all suggest that most users do not expect or perceive a completely wild, uninhabited, untouched wilderness when they visit the Canoe Routes. They seek, rather, a predominantly natural setting in which to fish, camp, canoe, and relax for a few days. Convenience, in terms of time, distance, ease of portaging, and campsite availability, is a primary consideration both in their decision to visit the Canoe Routes and in their selection of routes and campsites when they get there. Temporary escape is high among canoeists' motivations, but solitude is

not always an essential part of the "escape" complex -- which is not to say that it is unimportant -- solitude may not be a clearly articulated goal, but it is highly satisfying when achieved. The most important satisfactions had to do not with absolutely pristine, as much as just aesthetically pleasing environmental surroundings -- scenic beauty, open space, clean air and water, and tranquility. The levels of use encountered by canoeists in 1975, although perhaps higher than ideal for true wilderness, were rarely enough to prevent enjoyment of the trip's relatively great contrast with the busy-ness of home and work life.

The hypothesis guiding this study proposed that the level of satisfaction with a Canoe Routes trip depended on the level of crowding perceived. The assumption was that satisfaction -- and hence, trip quality -- had a single dimension -- solitude. But evidence presented here and in other studies indicate that satisfactions are complex and multi-dimensional. Participants may have different sets of goals, find satisfaction from different sources, and thus perceive quality differently, or even perceive quality differently at different times during a given trip. Perceived crowding is only one of many factors which affect canoeists' satisfaction, and it may be outweighed by other, more salient and enduring aspects of the experience.

Wilderness Recreation Quality

The problem with judging trip quality by users' satisfaction with perceived use levels is that satisfaction may remain high even though

use levels increase. Consequently, managing for quality creates the seemingly contradictory situation of allowing higher use levels.

Peterson (1974) and Hendee (1974) have used the concept of multiple satisfactions to define recreation quality. They maintain that quality is achieved when actual conditions (perceptions) match expectations (aspirations), that is, when an individual finds the mix of satisfactions which he or she seeks. The greater the degree of congruence between perceptions and aspirations, the higher the quality of the experience. Furthermore, the conditions and elements which affect satisfactions are identifiable and manageable (Peterson 1974; Hendee 1974; Shontz and Dorfman 1978). Managers should try to shape those conditions and elements so that the environment will provide the kinds of satisfactions which are unique to the experience they want to foster.

The key here is to look at the forest and not just the trees: managers must clearly define the nature of the experience they want to produce and the extent of environmental manipulation they will accept to produce that experience. They may find that many kinds of satisfactions arise from a particular kind of wildland use, but they should emphasize only those which are unique and essential to that experience and distinguish it from other forms of recreation. In the case of wilderness, these satisfactions include the enjoyment of pristine, undisturbed ecosystems, solitude, and primitive recreation that abjures artificial facilities and services. Managers should assign highest priority to the protection of these unique qualities, even though they may not be expressly preferred or essential to most visitors. If managers rely only on visitors' definitions and perceptions of what is appropriate and

satisfying without first establishing a reference point, they may find themselves continually readjusting the definition of acceptable use limits upwards. Management of recreation quality based on maximizing satisfaction implies, in the face of recreation succession, management for higher use levels and increasing development. At the same time, recreationists who prefer low use levels and pristine landscapes would suffer from a loss of opportunity and the special benefits derived therefrom.

Can -- and should -- visitor satisfactions be incorporated into a definition of recreation quality without it seeming either arbitrary or subjective? Management policies should be flexible and responsive to public values and concerns. Stankey (1973) proposed that wilderness managers pay particular attention to the preferences and perceptions of users whose definitions of wilderness most closely match the criteria set forth in the Wilderness Act of 1964. He essentially uses the Wilderness Act as the basic reference point for defining what is acceptable. One major advantage of this approach is that it conforms to a definition that reflects a democratically achieved, social consensus. But major problems arise from the fact that the Act contains no specific guidelines as to how the wilderness character of a particular Wilderness Area should be maintained, nor does it have any legal or binding application to lands not contained in the National Wilderness Preservation System. There are no universal criteria or absolute standards against which recreation quality can be measured (Peterson 1974). Quality is not a fixed attribute of physical things but resides in the eye of the beholder, hence, any judgement of quality is ultimately a human value

judgement (Wagar 1973). The usefulness of measurements of preferences and satisfactions lies, not in their application to definitions of acceptable use limits, but in gauging the degree of departure from the desired experience.

Heberlein (1977) points out that it is not users' satisfactions but the constraints, in the form of management objectives and mandates, that are really the important parameters in establishing social carrying capacity. They provide the reference point for decisions regarding the productivity and uses of the environment. But such objectives and mandates are rarely clearly defined. A bewildering array of agency directives, Congressional legislation, executive orders, and blue ribbon committee findings governs the management of public lands. This makes it doubly difficult to fuse management objectives and public concerns into a coherent, consistent, practical, and effective management plan for wilderness lands.

MANAGEMENT CONSIDERATIONS

The passage of the Alaska National Interest Lands Conservation Act (Public Law 96-487) in December 1980, placed the Swan Lake and Swanson River Canoe Routes, with expanded boundaries, into the Kenai Wilderness, a newly created unit of the National Wilderness Preservation System. The legislation specifies that this and other new Alaskan wilderness areas will be administered according to the Wilderness Act of 1964, unless otherwise expressly provided for in the Lands Act (Title VII, Sec. 707). The Lands Act also clearly states that earlier proclamations, executive orders, public land laws, and other administrative actions governing the National Wildlife Refuge System will remain in effect unless they clash with the Lands Act (or the Alaska Native Claims Settlement Act (Public Law 92-203)), in which case the Lands Act will prevail (Title III, Sec. 305). Thus, the Wilderness Act and the Alaska Lands Act appear to be the ultimate authorities governing the management of the new Kenai Wilderness, including the Canoe Routes.

How do the mandates of these two Acts compare? The purposes of the Alaska Lands Act are comprehensive and multiple; they include, in part, the preservation of unrivaled scenic and geological values associated with natural landscapes; maintenance of sound populations of, and habitat for, wildlife species; preservation in their natural state of extensive, unaltered, representative Alaskan ecosystems; and preservation of wilderness resource values and related recreational

opportunities within large arctic and subarctic wildlands (Title I, Sec. 101). The Lands Act is quite specific with regard to the new units of the National Wildlife Refuge System, and lists the following management goals for the Kenai Refuge:

- (i) to conserve fish and wildlife populations and habitats in their natural diversity...
 - (ii) to fulfill international treaty obligations...with respect to fish and wildlife and their habitats;
 - (iii) to insure...water quality and necessary water quantity within the refuge;
 - (iv) to provide...opportunities for scientific research, interpretation, environmental education, and land management training; and
 - (v) to provide, in a manner compatible with these purposes, opportunities for fish and wildlife-oriented recreation.
- (Title III, Sec. 303).

Clearly, recreational opportunities are lowest in priority and limited in scope to those related to fish and wildlife resources, even though the Lands Act includes wilderness preservation and recreation among its primary purposes and establishes a Wilderness Area of 1,350,000 acres on the Kenai Refuge.

The Wilderness Act, on the other hand, specifies that Wilderness Areas shall be devoted to the public purposes of recreational, scenic,

scientific, educational, conservation, and historical use (Par. 1133(b)). However, it also states that the purposes for which Wilderness Areas are established are supplemental to and within the purposes for which National Wildlife Refuge System units are established (Par. 1133(a)). At the same time, managing agencies are charged with preserving the wilderness character of the area, and with doing so while also administering for the other purposes for which the area was established (Par. 1133(b)). The degree of environmental protection afforded by the Wilderness Act seems compatible with Refuge goals of wildlife, water, and habitat conservation, and with the primary Lands Act goals of preserving natural landscape values and subarctic ecosystems. Less clear are the range and type of recreational activities permissible on Refuge Wilderness Areas, since the Act implies a restriction to "fish and wildlife-oriented recreation". Although many Canoe Route users fish and a few hunt, the primary orientation of most is towards a broader sort of environmental experience.

Over the past 20 years, refuge administrators and wildlife managers have made efforts to curb and eliminate recreational activities that are not directly related to the primary purposes and functions of refuges. The Recreational Use of Fish and Wildlife Areas Act (Public Law 87-714) addressed this concern in 1962, as did the Leopold Committee in its report to the Secretary of the Interior in 1968. However, in that report the Leopold Committee also approved of wilderness designation in refuges where it was feasible and compatible, and used the then de facto wilderness of the Kenai Wildlife Refuge Canoe Routes as an example. This support for wilderness recreation on

refuges followed the Committee's definition of appropriate recreational uses as those oriented toward the appreciation, enjoyment, and in some cases the harvesting, of fish and wildlife. The report emphasized the importance of the educational and inspirational values stemming from wildlife viewing and environmental experience in general, with hunting and fishing only one of many ways to achieve such benefits. The philosophy which they articulated is strongly oriented towards natural ecosystem management, in which native plant and animal communities are protected as an integral whole. Hence, they imply that wilderness recreation, by enhancing people's understanding and appreciation of natural, undisturbed ecosystems, is an appropriate form of refuge use.

The tendency towards broadening the definition of fish and wildlife-oriented recreation to embrace educational and interpretive aspects, and to view wilderness recreation as an appropriate form of refuge use, was more clearly outlined by Pulliam (1974). He interpreted public use policy on the National Wildlife Refuge System and placed wildland values on par with wildlife values among the major purposes and management goals of refuges. He stated that the U.S. Fish and Wildlife Service emphasizes "those uses that are directly related to the wildlife and wildland values."

The emphasis on natural ecosystem management culminates in the statement of purpose in the Alaska Lands Act. Together with the earlier administrative acts and directives, wilderness recreation emerges as an acceptable and proper use of wildlife refuges, and preservation of natural ecosystem processes and landscapes stands out as the top management priority. This fits the biocentric approach to wilderness

management outlined by Hendee and Stankey (1973) and Hendee, Stankey and Lucas (1979), which seeks to maintain, to the maximum extent possible, the natural energy flows in the wilderness ecosystem and emphasizes the natural integrity of wilderness above recreational and other human uses. Management actions are taken when an energy imbalance occurs leading to unacceptable changes in the wilderness ecosystem.

One consequence of this so-called "pure" approach is that it tends to favor the environmental preferences of "purist" users, since, theoretically at least, any changes or damage due to recreational use and facilities development would be prevented or curtailed as incompatible with natural processes. However, a potential danger also exists in relying on biological processes and capacities to provide answers to questions about social capacity and recreational quality. Heberlein (1977) points out that decisions to limit use based on technical or biological capacity -- such as the inability to expand the system or the inability of plant communities to recover from trampling -- may be easier to make, and easier to justify to the public. But the decision to limit or regulate recreational use is based on a value judgement and so is a political one (see Wagar 1973). Research and public hearings can provide insight into the values which people hold, and the consequences of their interaction with each other and with the environment, but not on the "best" level of use or quality. Even within the constraints of the Wilderness Act and a biocentric approach to management, the questions about recreational quality, about people's preferences, needs, and perceptions, must still be asked, because they are the only way to

gauge whether refuge managers are achieving their goals of environmental awareness and appreciation. To reiterate, the goal of wildland and wildlife management is not so much the preservation of wildlife and wild landscapes per se, but the generation of social and personal benefits from the experience of those things.

Lucas (1973) proposed four concepts useful in managing for wilderness recreational quality which are applicable to the Canoe Routes. These concepts are: (1) developing a spectrum of opportunities, (2) managing the wilderness periphery with sensitivity, (3) respecting visitors' freedom, and (4) providing opportunities for solitude.

The first concept relates to the idea of wilderness recreation as one extreme on a continuum of outdoor recreation opportunities ranging from completely undeveloped to developed. Greater emphasis on semi-wild areas managed for recreation can provide more opportunities for people who don't mind seeing other people, and hopefully take some of the pressure off of more rigorously defined and managed wilderness, leaving it for those who do prefer solitude.

The second concept relates to the use and management of the area bordering wilderness, which can have serious ramifications for the wilderness itself. In some cases, this area can act as a buffer zone by absorbing some of the more intensive use that occurs near trailheads.

The third concept, respect for visitors' freedom, is critical but often difficult to keep in perspective. Schreyer (1977) points out that the Wilderness Act illustrates institutional actions which themselves restrict some freedoms in order to maintain a certain kind of

experience. However, the Act also mandates preservation of opportunities for recreation of a "free and unconfined" nature. Hendee emphasizes that managers should not seize too quickly on the idea of turning people away when problems of congestion and environmental degradation occur. He and others (Hendee and Lucas 1973; Behan 1974; Schreyer 1977) have argued against authoritarian controls and excessive regulations, which can contradict the spirit, if not the letter, of the Wilderness Act. Lucas (1973) suggests in part that any controls deemed necessary should be applied at the point of access -- for example, limits on the total number of visitors or on party size -- while within the wilderness visitors should be allowed the freedom to roam at will.

The fourth concept that Lucas mentions, providing opportunities for solitude, may seem self-evident. However, in a place such as the Canoe Routes, solitude can recede in importance in the face of growing demand for the resource and users' apparent lack of preference for it. The experience of solitude in one of the most special and unique qualities of wilderness recreation and one which distinguishes it from all other forms of outdoor recreation. Recognizing solitude as an essential component of wilderness also means recognizing the need to impose limitations on the number of visitors at some times and places.

The problem on the Canoe Routes is that the kinds of values usually associated with wilderness, such as solitude, vastness, and undisturbed nature, are not of critical importance to most users. They seek the general recreational benefits of temporary escape, relaxation, and fishing, but solitude and pristineness are not essential to their

enjoyment of these, and so, for reasons already discussed, the tolerance for crowding and human impacts is in general fairly high. In short, most Canoe Route users appear to regard the area not as "wilderness," but as a convenient, semi-wild area for short, easy, canoeing and fishing trips.

Even though the majority of users may not view the Canoe Routes as crowded, managers must ask themselves whether the level of use and encounters is consistent with the kind of experience defined by the Wilderness Act. Inclusion of the Canoe Routes in the Kenai Wilderness means that refuge managers must exert a major effort to not only preserve the wilderness qualities of the Canoe Route landscape, but to foster a truly wilderness-oriented experience for visitors. They must clarify the distinction between the kind of experience available on the Canoe Routes and the kind available on non-wilderness portions of the refuge or on other public recreation lands in the region.

Balancing the values of wilderness recreation against the values of less rigorously defined and more convenience-oriented types of outdoor recreation requires a regional perspective. Opportunities for semi-developed, backcountry recreation in a variety of settings, including lake and river systems, exist on other federal and state lands throughout the Kenai-Cook inlet area. Viewed within this larger framework, the Canoe Routes provide a unique kind of experience that users cannot easily find elsewhere in the region.

The level and pattern of recreation use on the Canoe Routes have already caused noticeably adverse impacts on solitude and the natural environment: crowding may not be perceived as a problem overall, but

it certainly is at specific times and places, and trampling and human waste at some sites are obvious to the point of unpleasantness. Trailhead entrances, main-trunk trails, convenient campsites, and lakes at junctions, are especially susceptible to impacts and crowding, and these problems are exacerbated by the small size, configuration, and limited routes of access of the Canoe Routes. Additional routes and access points could relieve the pressure on the main trails and lakes, but at present there is little room for expansion.

The Canoe Routes are partly self-limited because of the sizes and locations of lakes and the feasibility of linking them by portages, and the location of access roads is limited. They are partly politically limited, because habitat rehabilitation programs have subjected areas directly adjacent to the Canoe Route boundaries and Swan Lake Road to mechanical crushing and controlled burns, which effectively eliminated them from inclusion in the Wilderness Area. The rehabilitation program has locked management into dealing with a very small wilderness, while with a little more foresight, corridors through the rehabilitation zones might have been kept intact to provide additional access to the Canoe Routes and relieve some of the pressure on the West Entrance and Paddle Lake.

The Alaska lands Act, by making the edge of the Wilderness Area coincide with the edge of the Swan Lake Road, has prevented the creation of any kind of buffer zone between the present access points and the Wilderness boundary. Consequently, the first few miles of trail must absorb the kind of use, including day use, that might otherwise be confined to a buffer zone. This fact deprives managers of one

alternative for lessening the impact of recreational use and forces them to concentrate on other methods of control or redistribution of use.

However, the tendency of Canoe Route users to make short trips makes redistribution of use to new routes in the northern part of the Swanson River drainage unlikely, even though the Wilderness boundaries extend all the way to Point Possession on the coast. As long as the Swan Lake and North Kenai Roads remain the only routes of access, the conditions of site impact and main-trunk trail congestion will continue to be a problem, and probably a certain amount of such impact and congestion will have to be tolerated.

One of the biggest challenges facing refuge managers lies in alleviating or accomodating such impacts without compromising the goals of the Wilderness Act and the Alaska Lands Act. It would perhaps be easier, and more politically expedient, to give in to the pressures of use by hardening the most heavily impacted sites, building fire rings, providing outhouses and primitive shelters and so on, because such actions might prevent further damage to the resource and would forestall the necessity of limiting the number of visitors. But unless one keeps in mind the big picture of the whole wilderness ecosystem, such small incremental changes could accumulate into large, irreversible changes in the nature of the enviroment and the kind of experience it provides. The danger of this kind of one-problem-at-a-time management is increased by the fact that the public may also encourage or demand such actions as long as they feel they are appropriate or normal.

Management Recommendations

The problems discussed here place definite limitations on the kinds of alternatives available for lessening the impacts of recreational use on the Canoe Routes. In general, there are several approaches managers can take, including: (1) expanding the resource base, (2) increasing biological or facilities capacity, (3) limiting the number of visitors, (4) regulating visitors' travel behavior, and (5) modifying visitors' preferences and behavior through education and public involvement. These approaches will be examined in turn with regard to their usefulness to Canoe Route management.

(1) Expanding the resource base: As pointed out earlier, the relatively small size of the Canoe Routes, the habitat rehabilitation project north of the Swan Lake Road, and the proximity of the major access roads to the wilderness boundary, limit the opportunities for expansion. This is particularly true of the Swan Lake Canoe Route, which is bordered on three sides by roads and on the fourth (east) side by extensive lowland muskeg unsuitable for canoeing. It may prove possible only to maintain the status quo on the Swan Lake Route, or at best, to alleviate some of the congestion occurring on holidays and at critical junctures through limitations on numbers and group size. New routes of access could be created by connecting some of the lakes in the northern portion, such as Fish, Dolly Varden, Sabaka and Drake Lakes, or Merganser, Procupine and Gavia Lakes. However, as one refuge manager points out, it is likely that the resulting biological impacts would outweigh what little benefit might be gained from reduced congestion at the West Entrance (Richard Johnston, personal communi-

cation). Access through Merganser Lake would also increase the use of Gavia Lake, which is already marginal in terms of congestion and campsite degradation.

The Swanson River Canoe Route, with boundaries extending northwards to the coast at Point Possession, has much more potential for expansion. There are many lakes as yet unconnected by portage trails, especially those east of Paddle Lake. However, the same problems of congestion and impacts would occur on these lakes as long as Paddle Lake remains the only access point. Another possibility would be to extend short portages from the upper Swanson River to nearby lakes such as McLain, Sunrise, and Grus Lakes and perhaps farther, thus making the trip down the Swanson River more varied and attractive to more visitors. Expansion to the north, by increasing the distance from roads, could also attract more of those visitors who have a strong preference for solitude and isolation.

(2) Increasing biological and facilities capacity: "Site-hardening" techniques such as planting of hardier vegetation around campsites, and provisions for human waste such as outhouses, garbage facilities and more permanent fire rings, could help reduce the most noticeable impacts in the immediate campsite areas and even help preserve naturalness, at least in terms of soil and water quality. The question is whether unnatural, man-made structures and plant configurations are justified in replacing an equally unnatural condition of erosion and human waste accumulation. Within a biocentric management philosophy, this is a potentially incompatible alternative and should be examined carefully. The only site-restoration procedures consistent with

management goals are revegetation efforts with native species (in native proportions and frequency) through site closure or actual cultivation. The creation of new sites to draw people away from established, heavily-used sites is clearly contradictory to biocentric management and should be avoided. There are some very real problems with waste disposal, especially since the soil is usually covered with a thick humus layer of moss and detritus or peat, and waste is difficult to bury. The temptation to provide primitive facilities for waste disposal on the Canoe Routes is especially great at critical campsite areas such as Marten and Spruce Lakes, the island in Gavia Lake, and sites on Swan and Gene Lakes. Some type of site protection seems both desirable and necessary to maintain the area's naturalness, but complete closure is not really feasible because the number of campsites is limited anyway. Actual construction of any kind of facility must nonetheless be a last resort. Restoration of native vegetation, and a real effort to educate visitors to low-impact camping techniques, may in the long run be equally effective. Any decision to construct facilities, even on a limited basis, represents another incremental change away from complete naturalness, and a series of such changes could accumulate into large-scale, permanent changes. Ultimately, a trade-off may be necessary between having a few, heavily impacted sites, or many moderately impacted sites. If the first alternative is chosen, then areas such as Spruce Lake are effectively "sacrificed" to preserve naturalness on the rest of the Canoe Routes.

(3) Limiting the number of people: The Canoe Routes do not yet suffer from significant losses in opportunities for solitude at most times

and places, and so widespread use rationing is probably unnecessary at the level of visitation discussed here. Use rationing is a drastic measure and should be reserved only for times and places when crowding is or has the potential to be, a serious problem. Holidays and the Spruce Lake area are good examples. The latter area acts as a bottleneck and experiences the greatest amount of congestion of any place on the Canoe Routes. It may be feasible to determine an upper limit on the number of people allowed through the West Entrance by assessing the present campsite capacity for lakes up to and including Spruce Lake. Other groups may then be redirected towards the East Entrance or Paddle Lake. However, the effects of redistribution on these areas would have to be closely monitored to insure that problems of impacts and congestion are not simply shifted from one place to another.

(4) Regulating visitors' travel behavior: Limits on group size might provide considerable relief for the problems of localized crowding and impacts. The number and frequency of encounters, physical impacts, the use and occupancy of space, and the visual and noise effects stemming from large groups are much greater than for small groups. A maximum group size of 15 persons seems reasonable and compatible with the character of wilderness recreation, and could be accommodated by most campsites on the Canoe Routes.

Another possible alternative to the problem of local congestion is zoning in space and time, with visitors restricted to particular zones or to a specified number of nights at specified campsites. Such a plan is already in effect at Denali National Park (formerly Mt. McKinley National

Park). The backcountry areas of the Park are divided into zones, and each zone has a maximum limit on the number of parties allowed per day. Visitors must obtain a permit (which is free) before entering the back-country, and when they receive it they are advised by Park personnel of the zones and their availability. Once they determine which zone they will visit, users must stay within that zone for the dates specified on the permit. This system should help prevent or slow congestion, environmental degradation, and conflicts with sensitive wildlife, and help maintain excellent opportunities for solitude. While it works, at least in a very large wilderness such as Denali Park (approximately 800,000 hectares), it is nonetheless a highly restrictive policy and infringes upon visitors' freedom to travel when and where they please. Such freedom is in fact, an important quality of wilderness recreation and embodies the sense of escape from the routines and regulations of daily life that is a common goal for wilderness visitors.

(5) Modify users' preferences and behavior: Education and behavior modification may have the most substantial and long-lasting benefits for wilderness managers in the long run. Through the use of informational brochures, personal contact, seminars, workshops, lectures, and school programs, managers can educate the user public in wilderness management philosophy and goals, wilderness etiquette, and minimum-impact camping techniques. Such attempts have proven effective in other similar areas (Simer 1979; Bradley 1979). Users may be much more agreeable to management efforts if they act voluntarily. They should be advised to pack out their garbage, reduce their group size, travel quietly, respect others' privacy, and avoid disturbing wildlife

and vegetation. The benefits of such actions in terms of the resource and their own enjoyment should be pointed out. Users should be given the opportunity to feel that they are responsible for the resource, and that they can participate in its care and management, as well as its use. Organized user groups such as the Boy Scouts, church and conservation groups, and outfitters, could be enlisted in a coordinated management effort to help, for example, remove litter, revegetate damaged sites, or carry out educational programs in the schools, thus acting as a liaison between the managing agency and the public.

The idea behind such an approach is to modify peoples' behavior and attitudes: hopefully, they will perceive the benefits of such actions and adopt them freely, thus reducing the amount of adverse social and enviromental impacts stemming from inappropriate, negligent, or destructive behavior, and reducing the need for more restrictive and regulatory management controls.

Conclusion

The most practical and feasible approach to the management of the Canoe Routes is probably an integrated one, combining educational and informational programs with zoning, party size limitations and other select regulatory techniques, and with trail system expansion and redistribution at access points, as well as careful monitoring of biological impacts with revegetation or closures to restore native vegetation. Such a plan should focus on maintaining, to the greatest extent possible, the ecological purity of the resource base and the uniquely wilderness qualities of solitude, vastness, and absence of human

activities. If management attitudes and efforts are constantly extended in this direction, managers may escape the danger of making small compromises which lead to permanent changes away from wilderness and toward a more developed, higher density recreational experience.

The pressures to accommodate increasing use and more facilities are often great, but managers should use public opinion only as a guide to the values which users hold and not as a mandate for management. Managers also have a responsibility to guide the public's understanding and appreciation of the wildlife/wildland resource, which they can do by defining and permitting only certain kinds of environmental experience which they know will foster such understanding. Specific management programs and techniques must be coordinated by a consistent, rational, and specific management philosophy, governing the whole as a system of biological and social components which together compose the wilderness resource and the wilderness experience.

REFERENCES CITED

- Alaska Dept. of Labor
1975 Alaska: geographic presentation 1970 census population counts. Juneau, AK: Research and Analysis Section, Employment Security Division, Department of Labor, 34 p.
- Altman, I.
1975 The environment and social behavior: personal space, territory, and crowding. Monterey, CA: Brooks/Cole Publishing Co., 256 p.
- 1976 Privacy: a conceptual analysis. Environ. and Behav. 8:7-29.
- Babb, J.D., Jr.
1972 Age and sex characteristics of Alaska's population. Alaska Review of Business and Economic Conditions 9(1):1-51. Available from: Institute for Social and Economic Research, Univ. of Alaska, Fairbanks, AK.
- Behan, R.W.
1974 Police-state wilderness: a comment on mandatory wilderness permits. J. Forestry 72(2):98-99.
- Bradley, J.
1979 A human approach to reducing wildland impacts. Pages 222-226; Ittner, R.; Potter, D.R.; Agee, J.K.; Anschell, S., eds. Recreational impact on wildlands: conference proceedings; 1978 October 27-29; Seattle, WA: U.S. Forest Serv. No. R-6-001-1979, 341 p.
- Brown, P.J., and Shomaker, J.H.
1974 Final report on criteria for potential wilderness campsites. Institute for Study of Outdoor Recreation and Tourism Suppl. No. 32 to 12-11-204-3; Logan, UT: Utah State Univ., 50 p.
- Burch, W.R., Jr., and Wenger, W.D., Jr.
1967 The social characteristics of participants in three styles of family camping. U.S. Forest Serv. Res. Pap. PNW-48, 29 p.
- Carpenter, M.R., and Bowlus, D.R.
1976 Attitudes toward fishing and fisheries management of users in Desolation Wilderness, California. Calif. Fish and Game 62(3):168-178.

- Catton, W.R., Jr.
1969 Motivations of wilderness users. Pulp and Paper Mag. of Canada. December 19: 121-126.
- Choi, S.C., Mirjafari, A., and Weaver, H.B.
1976 The concept of crowding: a critical review and proposal of an alternative approach. Environ. and Behav. 8(3): 345-362.
- Clark, R.N., Hendee, J.C., and Campbell, F.L.
1971 Values, behavior, and conflict in modern camping culture. J. Leisure Res. 3(3):143-159.
- Dorfman, P.W.
1979 Measurement and meaning of recreation satisfaction: a case study in camping. Environ. and Behav. 11(4): 483-510.
- Driver, B.L., and Bassett, J.R.
1977 Problems of defining and measuring the preferences of river recreationists. Pages 267-272; Proceedings: river recreation management and reserach symposium; 1977 January 24-27; Minneapolis, MN: U.S. Forest Serv. Gen. Tech. Rep. NC-28, 455 p.
- Driver, B.L., and Knopf, R.C.
1976 Temporary escape: one product of sport fisheries management. Fisheries 1:21, 24-29.

1977 Personality, outdoor recreation, and expected consequences. Environ. and Behav. 9(2):169-193.
- Driver, B.L., and Tocher, S.R.
1970 Toward a behavioral interpretation of recreational engagements, with implications for planning. Pages 91-111; Fischer, D.W.; Lewis, J.E.; Priddle, G.B., eds. 1974. Land and leisure: concepts and methods in outdoor recreation. Chicago, IL: Maroufa Press, Inc., 270 p.
- Edwards, R.Y., and Fowle, C.D.
1955 The concept of carrying capacity. Trans. N. Am. Wildl. Conf. 20:589-602.
- Fazio, J.R., and Belli, L.A.
1977 Characteristics of nonconsumptive wildlife users in Idaho. Trans. N. Am. Wildl. Nat. Resour. Conf. 42:117-128.

- Fowler, R.L., and Bury, R.L.
 1973 Visitor evaluations of a developed outdoor recreation area on a National Wildlife Refuge. *Trans. N. Am. Wildl. Nat. Resour. Conf.* 38:50-56.
- Greater Anchorage Area Borough Planning Dept.
 1974 *People in Anchorage.* Anchorage, AK.
- Harbo, S.J.
 1974 AS 402: scientific sampling. Unpublished teaching supplement on file at the Wildlife and Fisheries Program, Univ. of Alaska; Fairbanks, AK, 56 p.
- Hautaluoma, J., and Brown, P.J.
 1978 Attributes of the deer hunting experience: a cluster-analytic study. *J. Leisure Res.* 10(4):271-287.
- Heberlein, T.A.
 1977 Density, crowding, and satisfaction: sociological studies for determining carrying capacities. Pages 67-76; *Proceedings: river recreation management and research symposium: 1977 January 24-27; Minneapolis, MN: U.S. Forest Serv. Gen. Tech. Rep. NC-28, 455 p.*
- Hendee, J.C.
 1969 Rural-urban differences reflected in outdoor recreation participation. *J. Leisure Res.* 1(4):333-341.
 1974 A multiple-satisfaction approach to game management. *Wildl. Soc. Bull.* 2(3):104-113.
- Hendee, J.C., and Stankey, G.H.
 1973 Mandatory wilderness permits: a necessary management tool. *J. Forestry* 71(4):206-209.
 1973 Biocentricity in wilderness management. *Bioscience* 23(9):535-538.
- Hendee, J.C., Stankey, G.H., and Lucas, R.C.
 1979 Wilderness management. U.S. Forest Serv. Misc. Publ. No. 1365, 381 p.
- Hendee, J.C., Catton, W.R., Jr., Marlow, L.D., and Brockman, C.F.
 1968 Wilderness users in the Pacific Northwest: their characteristics, values, and management preferences. U.S. Forest Serv. Res. Pap. PNW-61, 92 p.
- Heywood, L.A.
 1978 Perceived recreative experience and the relief of tension. *J. Leisure Res.* 10(2):86-97.

- Ittelson, W.H., Franck, K.A., and O'Hanlon, T.J.
 1976 The nature of environmental experience. Pages 187-206; Wapner, S.; Cohen, S.B.; Kaplan, B., eds. 1976. Experiencing the environment. New York and London: Plenum Press, 244 p.
- Ittelson, W.H., Froshansky, H.M., Rivlin, L.G., and Winkel, G.H.
 1974 An introduction to environmental psychology. New York, NY: Holt, Rinehart and Winston, Inc., 406 p.
- James, G.A., and Schreuder, H.T.
 1971 Estimating recreation use on the San Gorgonio Wilderness. *J. Forestry* 69:490-493.
- 1972 Estimating dispersed recreation use along trails and in general undeveloped areas with electric-eye counters: some preliminary findings. *U.S. Forest Serv. Res. Note SE-181*, 6 p.
- Karlstrom, T.N.V.
 1964 Quaternary geology of the Kenai Lowland and glacial history of the Cook Inlet region, Alaska. *Geol. Survey Professional Pap. 443*: Washington, D.C.: U.S. Government Printing Office, 69 p.
- Kelly, J.R.
 1978 Situational and social factors in leisure decisions. *Pac. Sociol. Rev.* 21(3):313-329.
- Kish, L.
 1965 Survey sampling. New York, NY: John Wiley and Sons, Inc., 643 p.
- Knopf, R.C., Driver, B.L., and Bassett, J.R.
 1973 Motivations for fishing. *Trans. N. Am. Wildl. Nat. Resour. Conf.* 38:28-41.
- Leopold, A.S., Cottam, C., Cowan, I.M., Gabrielson, I.N., and Kimball, T.L.
 1968 The National Wildlife Refuge System. *Trans. N. Am. Wildl. Nat. Resour. Conf.* 33:30-54.
- Lime, D.W.
 1972 Large groups in the Boundary Waters Canoe Area: their numbers, characteristics, and impact. *U.S. Forest Serv. Res. Note NC-142*, 4 p.

- Lime, D.W., and Stankey, G.H.
 1971 Carrying capacity: maintaining outdoor recreation quality. Pages 174-184; Lanson, E.vH., ed. Recreation symposium proceedings; 1971 October 12-14; Syracuse, NY, 211 p. Available from: Northeastern Forest Experiment Station, U.S. Forest Service, Upper Darby, PA.
- Loo, C.
 1977 Beyond the effects of crowding: situational and individual differences. Pages 153-168; Stokols, D., ed. 1977. Perspectives on environment and behavior. New York and London: Plenum Press, 360 p.
- Lowenthal, D., and Prince, H.C.
 1976 Transcendental experience. Pages 117-131; Wapner, S., Cohen S.B.; Kaplan, B., eds. 1976. Experiencing the environment. New York and London; Plenum Press, 244 p.
- Lucas, R.C.
 1964 Recreational use of the Quetico-Superior Area. U.S. Forest Serv. Res. Pap. LS-8, 50 p.
- 1965 The importance of fishing as an attraction and activity in the Quetico-Superior Area. U.S. Forest Serv. Res. Note LS-61, 3 p.
- 1973 Wilderness: a management framework. J. Soil and Water Conserv. 28(4):150-154.
- Lucas, R.C., and Oltman, J.L.
 1971 Survey sampling wilderness visitors. J. Leisure Res. 3(1):28-43.
- Lucas, R.C., Schreuder, H.T., and James, G.A.
 1971 Wilderness use estimation: a pilot test of sampling procedures on the Mission Mountains Primitive Area. U.S. Forest Serv. Res. Pap. INT-109, 44 p.
- Maccoby, E.E., and Maccoby, N.
 1954 The interview: a tool of social science. Pages 449-487; Lindzey, G., ed. 1954. Handbook of social psychology, vol. 1: theory and method. Cambridge, MA: Addison-Wesley Publishing Co., Inc., 588 p.
- Maslow, A.H.
 1970 Motivation and personality. New York, NY: Harper and Row, Publishers, Inc., 369 p.

- McKillop, W.
1975 Wilderness use in California: a quantitative analysis. *J. Leisure Res.* 7(3):165-178.
- Mercer, D.C.
1976 Motivational and social aspects of recreational behavior. Pages 123-161; Altman, I.; Wohlwill, J., eds. 1976. *Human behavior and environment*, vol. 1. New York and London: Plenum Press, 301 p.
- Merriam, L.C., Jr., and Ammons, R.B.
1968 Wilderness users in three Montana areas. *J. Forestry* 66(5):390-395.
- Monnie, J.B., and Filio, J.A.
1976 Recreation management plan. Unpublished report on file at the Kenai National Wildlife Refuge; Soldotna, AK.
- Moore, G.T., and Golledge, R.G., eds.
1976 Environmental knowing: theories, research, methods. Stroudsburg, PA: Dowden, Hutchinson and Ross, Inc., 441 p.
- More, T.A.
1973 Attitudes of Massachusetts hunters. *Trans. N. Am. Wildl. Nat. Resour. Conf.* 38:230-235.
- Nie, H.N., Hull, C.H., Jenkins, J.G., Steinbrenner, K., and Bent, D.H.
1975 SPSS: statistical package for the social sciences, 2nd ed. New York, NY: McGraw-Hill Publishing Co., 675 p.
- Quilliam, K.L.
1971 Campground survey: Kenai National Moose Range, July 3-November 6, 1971. Unpublished paper on file at the Kenai National Wildlife Refuge, Soldotna, AK, 19 p.
- Reynolds, H.T.
1977 The analysis of cross-classifications. New York, NY: The Free Press, 236 p.
- Roggenbuck, J.W., and Schreyer, R.M.
1977 Relations between river trip motives and perception of crowding, management preference, and experience satisfaction. pages 359-364; *Proceedings: river recreation management and research symposium; 1977 January 24-27; Minneapolis, MN: U.S. Forest Serv. Gen. Tech. Rep. NC-28, 455 p.*

- Nielsen, J.M., and Shelby, B.
1977 River-running in the Grand Canyon: how much and what kind of use? Pages 168-177; Proceedings: river recreation management and research symposium; 1977 January 24-27; Minneapolis, MN: U.S. Forest Serv. Gen. Tech. Rep. NC-28, 455 p.
- Nielsen, J.M., Shelby, B, and Haas, J.E.
1977 Sociological carrying capacity and the last settler syndrome. Pac. Sociol. Rev. 20(4):569-581.
- Oppenheim, A.N.
1966 Questionnaire design and attitude measurement. New York, NY: Basic Books, Inc., 298 p.
- Peterson, G.L.
1974 Evaluating the quality of the wilderness environment: congruence between perception and aspiration. Environ. and Behav. 6(2):169-193.
- Potter, D.R., Hendee, J.S., and Clark, R.N.
1973 Hunting satisfaction: game, guns or nature? Trans. N. Am. Wildl. Nat. Resour. Conf. 38:220-230.
- Proshansky, H.M., Ittelson, W.H., and Rivlin, L.G.
1970 The influence of the physical environment on behavior: some basic assumptions. Pages 27-37; Proshansky, H.M.; Ittelson, W.H.; Rivlin, L.G., eds. 1970. Environmental psychology: man and his physical setting. New York, NY: Holt, Rinehart and Winston, Inc., 690 p.
- 1972 Freedom of choice and behavior in a physical setting. Pages 29-43; Wohlwill, J.F.; Carson, D.H., eds. 1972. Environment and the social sciences: perspectives and applications. Washington, D.C.: American Psychological Association, Inc., 300 p.
- Pulliam, J.W.
1974 Public use policy of the National Wildlife Refuge System. Paper presented at the Great Dismal Swamp symposium; 1974 March 14; Virginia Beach, VA, 11 p.
- Rossmann, B.B., and Ulehla, Z.J.
1977 Psychological reward values associated with wilderness use. Environ. and Behav. 9(1):41-66.
- Schole, B.J., Glover, F.A., Sjogren, D.D., and Decker, E.
1973 Colorado hunter behavior, attitudes, and philosophies. Trans. N. Am. Wildl. Nat. Resour. Conf. 38:84-90.

- Schreyer, R.
1977 Restricting recreational use of wildlands: lessons from whitewater rivers. *Western Wildlands* 4(2):45-52.
- Schwarz, C.F., Edward, C.T., and Elsner, G.H.
1976 Wildland planning glossary. U.S. Forest Serv. Gen. Tech. Rep. PSW-13, 252 p.
- Seiver, D.A., and Fison, S.R.
1975 Alaskan population growth and movements, 1960-1973. ISEGR Res. Note, April 1973. Inst. of Social and Economic Research, Univ. of Alaska, Fairbanks, AK, 20 p.
- Shafer, E.L., Jr., and Mietz, J.
1969 Aesthetic and emotional experiences rate high with northeast wilderness hikers. *Environ. and Behav.* 1(2):187-197.
- Shelby, B.
1980 Crowding models for backcountry recreation. *Land Econ.* 56(1):43-55.
- Shortz, W.D., and Dorfman, P.W.
1977 Recreation succession: a simulation model. *Ann. Reg. Sci.* 11(1):36-52.
- Simer, P.
1979 An educational alternative: practices for users. Pages 180-184; Ittner, R.; Potter, D.R.; Agee, J.K.; Anschell, S., eds. 1979. Conference proceedings: recreational impact on wildlands; 1978 October 27-28; Seattle, WA: U.S. Forest Serv. No. R-6-001-1979, 341 p.
- Sokal, R.R. and Rohlf, F.J.
1969 Biometry. San Francisco, CA: W.H. Freeman and Co., 776 p.
- Solomon, M.J., and Hansen, E.A.
1972 Canoeist suggestions for stream management in the Manistee National Forest of Michigan. U.S. Forest Serv. Res. Pap. NC-77, 10 p.
- Stankey, G.H.
1971 The perception of wilderness recreation carrying capacity: a geographic study in natural resources management. University Microfilms, Ann Arbor, MI; Publ. No. 71-23, 246, 351 p., Dissertation.

- Stankey, G.H.
 1973 A strategy for the definition and management of wilderness quality. Pages 88-114; Krutilla, J.V., ed. 1973. Natural environments: studies in theoretical and applied analysis. Baltimore and London: Johns Hopkins University Press; 352 p.
- 1974 Criteria for the determination of recreational carrying capacity in the Colorado River Basin. Pages 82-101; Crawford, B.A.; Peterson, D.F., eds. 1974. Environmental management in the Colorado River Basin. Logan, UT: Utah State Univ. Press.
- Stankey, G.H., Lucas, R.C., and Ream, R.R.
 1973 Relationships between hunting success and satisfaction. Trans. N. Am. Wildl. Nat. Resour. Conf. 38:235-242.
- Steinhoff, H.W.
 1969 Values of wildlife and related recreation on the Kenai National Moose Range. Unpublished report to the Division of Wildlife Research, U.S. Fish and Wildlife Service, Washington, D.C., 33 p.
- Stokols, D.
 1972 A social-psychological model of human crowding phenomena. J. Amer. Inst. Planners 38:72-84.
- 1976 The experience of crowding in primary and secondary environments. Environ. and Behav. 8(1):49-86.
- Talhelm, D.R.
 1973 Defining and evaluating recreation quality. Trans. N. Am. Wildl. Nat. Resour. Conf. 38:20-28.
- Treiman, D.J.
 1977 Occupational prestige in comparative perspective. New York, NY: Academic Press, 514 p.
- U.S. Bureau of the Census
 1971a Census of the population: general social and economic characteristics. Final Report PC(1)-C3, Alaska. Washington, D.C.: U.S. Government Printing Office.
- 1971b General population characteristics. Final Report PC(1)-B3, Alaska, Washington, D.C.: U.S. Government Printing Office.
- 1971c 1970 Census of population classified index of industries and occupations. Washington, D.C.: U.S. Government Printing Office.

U.S. Bureau of the Census

- 1972a Vol. 1: characteristics of the population, Part A. Number of inhabitants, Section 1, United States, Alabama-Mississippi. Washington, D.C., U.S. Government Printing Office.
- 1972b Detailed characteristics. Final Report PC(1)-D3, Alaska. Washington, D.C., U.S. Government Printing Office.
- 1973a Detailed characteristic. Final Report PC(1)-D1, United States Summary. Washington, D.C., U.S. Government Printing Office.
- 1973b Vol. 1: characteristics of the population, Part 3, Alaska. Washington, D.C.: U.S. Government Printing Office.
- 1976a Population profile of the United States: 1975. Current Population Reports, Series P-20, No. 292. Washington, D.C.: U.S. Government Printing Office.
- 1976b Educational attainment in the United States: March 1975. Current Population Reports, Series P-20, No. 295. Washington, D.C.: U.S. Government Printing Office.
- 1978 Population profile of the United States: 1977. Current population Reports, Series P-20, No. 324. Washington, D.C.: U.S. Government Printing Office.
- 1979 Demographic, social, and economic profile of states: Spring 1976. Current Population Reports Series P-20, No. 334. Washington, D.C.: U.S. Government Printing Office.

U.S. Department of Commerce

- 1975 Kenai Peninsula: climatic summaries of resort areas. Climatography of the United States, No. 21-49-6. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, 6 p.
- 1977 Social indicators 1976. U.S. Department of Commerce, Office of Federal Statistical Policy and Standards and Bureau of the Census. Washington, D.C.: U.S. Government Printing Office.

U.S. Fish and Wildlife Service

- 1968 Birds of the Kenai National Moose Range. U.S. Fish and Wildlife Service, Refuge Leaflet 197-R2, 4 p. Available from: Kenai National Wildlife Refuge, Soldotna, AK.

- U.S. Fish and Wildlife Service
1971 Refuge narrative report. Unpublished report on file at the Kenai National Wildlife Refuge, Soldotna, AK.
- 1978 RARE II: Alaska supplement to draft environmental statement roadless area review and evaluation. Series No. R10-26, June 1978; U.S. Forest Service, Alaska Region (R-10); Juneau, AK, 87 p.
- Wager, J.A.
1964 The carrying capacity of wildlands for recreation. Forest Sci. Monogr. 7.
- 1974 Recreational carrying capacity reconsidered. J. Forestry 7(25):274-278.
- Watt, R.D.
1966 The recreation potential of the Arctic National Wildlife Range. Unpublished M.S. Thesis, Univ. of Alaska, Fairbanks, AK.
- Wellman, J.D.
1979 Recreational response to privacy strsss: a validation study. J. Leisure Res. 11(1):61-73.
- Wentworth, C.
1975 Economic values of recreation on the Kenai National Moose Range. Unpublished report on file with U.S. Fish and Wildlife Service, Anchorage Area Office; Anchorage, AK, 59 p.
- Wildland Research Center
1962 Wilderness and recreation: a report on resources, values, and problems. Outdoor Recreation Resources Review Commission Study Report No. 3. Washington, D.C.: U.S. Government Printing Office.