ACTIVITIES, ATTITUDES, AND MANAGEMENT PREFERENCES OF RECREATIONISTS ON THE ARCTIC NATIONAL WILDLIFE RANGE, ALASKA

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ABSTRACT: A descriptive study of recreationists activities, attitudes, and management preferences was conducted on the Arctic National Wildlife Range (ANWR) in northeastern Alaska. The majority of the sampled ANWR recreationists in 1977 were male, between 25 and 44 years old, and college educated. Recreationists were generally very satisfied with their trip. Satisfaction for hunters was associated with hunting success. Developments were generally opposed; general information was desired; and limiting plane landings was the most preferred of three proposed rationing systems. The limiting social factor for hunters was sightings of groups, and the limiting social factor for recreationists not hunting was light-aircraft sightings.

INTRODUCTION

Purpose and Objectives of Study

During the mid 1970's, with the discovery of oil at Prudhoe Bay, and consideration of an Alaska National Interest Lands Conservation Act (ANILCA) in Congress, arctic Alaska received considerable national and international attention. In response to increased interest and recreational use in the arctic, the U.S. Department of the Interior, Fish and Wildlife Service, in cooperation with the University of Idaho, sponsored a descriptive, recreational use study in the Arctic National Wildlife Range (ANWR), Alaska (Warren 1980).

Information obtained from the study was to aid managers in accomplishing the ANWR objectives of preserving the area's unique wildlife, wilderness, and recreational values (Public Land Order 2214). Collected information was to provide descriptive information for a recreational use management plan, provide a framework for nonregulatory approaches to managing recreational use to maintain impacts within the limits of acceptable change (Frissel and Stankey 1972), and identify rationing tools that recreationists believed would be the most desirable In the ANWR, if necessary.

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The specific study objectives were to:

1. Estimate the number of recreationists per year and length of stay.
2. Determine if hunters and recreationists not hunting (nonhunters) were significantly different with regard to activities, attitudes, and management preferences.
3. Determine socioeconomic characteristics of recreationists.
4. Identify group size and type of recreational activities being engaged in by recreationists.
5. Determine attitudes toward wildlife, wilderness, light aircraft use, and recreational use management alternatives.
6. Determine degree of trip satisfaction of recreationists.
7. Estimate social carrying capacity for recreational use.

When ANILCA became law, the Wildlife Range was, enlarged to 18 million acres and renamed the Arctic National Wildlife Refuge. The information presented here was collected during the formulation of the ANILCA legislation and provides specific descriptive data for the Arctic National Wildlife Refuge Comprehensive Plan, 553 may also be applicable to management of other Alaska areas.

Study Area

The ANWR is located in northeastern Alaska, and at the time, of this study comprised 8.9 million acres. All but 1.4 million acres of the coastal plain of the study area are now classified wilderness.

The study area contains four major physiographic units: the Arctic Coastal Plain, Arctic Foothills, Eastern Brooks Range, and the Porcupine Plateau (Warfhatig 1965). Wet tundra is found along the coast; moist tundra dominates the foothills; alpine or dry tundra is associated with mountainous areas. Outcrop and talus communities predominate on slopes in the mountains. High brush is associated with watercourses; low brush and muskeg occur along rivers in the southern portion of the area; and upland spruce-hardwood forests are found in southern river valleys (Spetzman 1959). Large mammals inhabiting the ANWR include barren ground caribou, Dall sheep, muskox, wolves, moose, and grizzly bear.

METHODOLOGY

Recreational Use Estimates and Sample Design

Recreationists' access patterns were not known in sufficient detail to design a stratified random sample for obtaining a questionnaire mailing list. However, all major access methods and points were known; therefore, it was possible to attempt to census the recreationists population. Names and addresses were obtained from several sources including commercial guides, air taxi services, and the Alaska Department of Fish and Game. In addition, registration stations were established at airfields at Barter Island, Fairbanks, and Fort Yukon following procedures of Lucas and Oltman (1971).

To estimate the success of obtaining a recreationist census, confirmed complete lists of commercial guide clients were obtained. By comparing the names of the recreationists using guide services with the list of names of recreationists obtained from other sources, the percentage of the recreationists not included in the census attempt could be estimated. From these estimates, census coefficients were developed for both "hunters and nonhunters. The census coefficients were used to estimate total use by calibrating the lists of hunters and nonhunters by the appropriate coefficient.

The final list of recreationists was neither a random sample nor a census. Recreationists using guide services had the same opportunity as other recreationists to have their names obtained from other mailing list sources. Using this knowledge, determination was made as to whether the complete mailing list included a representative sample of recreationists to the ANWR. This was accomplished by comparing responses from those whose names were obtained from only a commercial guide with the responses of the other recreationists.

The Native Indians and Eskimos visiting the ANWR were not represented in this survey. A questionnaire was not an appropriate tool for gathering information from these groups of visitors.

Questionnaire

A questionnaire was designed to gain information about the recreationists' socioeconomic characteristics, activities in the ANWR, satisfaction, and attitudes toward recreational use and management. The questionnaire was mailed to all persons whose names and addresses were obtained. Procedures similar to those described by Dillman and Christenson (1970) were employed to achieve a high return rate on the questionnaire. The procedures included followup mailings and providing postage-paid envelopes.

Statistical Analysis

Chi-square statistic was used to determine whether a systematic relationship existed between hunters, nonhunters, wilderness attitudes, and other selected questions. For Chi-square analysis, a significant difference was defined as one that would have occurred by chance no more than 5 percent of the time—0.05 level of significance. Gamma ranges from -1 to 1; its numerical value, disregarding sign, gives the percentage of guessing errors eliminated by using knowledge of a second variable to predict order. Thus, the numerical value of gamma represents the degree of association, while the sign represents negative or positive association.

Carrying Capacity

Management decisions on carrying capacity should be made by utilizing recreationists' input in some selective and systematic manner. An approach suggested by Frissell and Stankey (1972) is to relate recreationists' objectives to management objectives. This study related reoreationists[1] objectives to management objectives by using a purism scale developed by Stankey (1973). This purism scale measured the degree to which recreationists agreed with the definition of wilderness as presented in the Wilderness Act. Ten items in the scale were concerned with three characteristics of wilderness as defined by the Wilderness Act: a natural ecosystem, minimal human development, and primitiveness of recreational activities. The remaining four items related to other attributes of a wilderness: solitude, little evidence of other recreationists, remoteness, and size of the area. Recreationists were asked to consider each item in the context of wilderness and rate it on a scale ranging from very undesirable to very desirable. Recreationists were grouped by their scores as defined by Stankey (1973), with the exception that Stankey's strong purists category was subdivided into strong purists and very strong purists.

Lime and Stankey (1971) defined carrying capacity as the character of use that can be supported over a specified time by an area developed at a certain level, without causing excessive damage to either the physical environment or the experience for the recreationist. Frissel and Stankey (1972) defined social carrying capacity as a limit of acceptable change. Other studies have measured social carrying capacity in terms of tolerance to intergroup encounters (Stankey 1973; Badger 1975; Nielson and Shelby 1977). Because of the dependence on the use of aircraft in this study area, encounters with both groups and aircraft were evaluated in terms of acceptable levels for both hunters and nonhunters. Social carrying capacity was estimated for hunters and nonhunters by requesting that the recreationists indicate the number of groups, light aircraft, and light aircraft landings that they could see and still have a satisfactory experience. Proximity to the limits of acceptable change was estimated by comparing the median average of actual encounters with the median average of the number of encounters that recreationists said they could have seen before satisfaction was decreased. Observation counts by recreationists were compared with overall visitation records to verify a strong association. Two categories were defined for

overall visitation records: high-use weeks and areas, and low- through medium-use weeks and areas. The high-use category consisted of recreationists who visited the five most heavily used zones during the seven highest use weeks.

RESULTS

Census

For nonhunting recreationists, an estimated 93 percent of names and addresses were gathered. Names and addresses were obtained for 60 percent of the estimated hunter population. For hunters, the validity of the results is highly dependent on noncontacted recreationists not being significantly different from contacted recreationists. Chi-square tests identified no statistically significant differences for noncontacted hunting guide clients and contacted hunters, with regard to attitudes toward wilderness and selected management preferences.

Questionnaire Response

The questionnaire was mailed to 594 individuals. Nonrespondents totaled 14 percent of the sampled population. Information known about this group included registration site(s), gender, and place of residence. Since the list of names and addresses inadvertently included nonvisitors (mostly Defense Early Warning station employees) and nonrecreationists, the actual return rate for recreationists probably exceeded 90 percent. Chi-square analysis to test for differences between respondents and nonrespondents did not identify any source of names and addresses that resulted in significantly different questionnaire return rates. In addition, analysis of residence (Alaska or non-Alaska) and gender did not identify any statistically significant differences in return rates.

Total Use

In 1977, an estimated 434 recreationists visited the ANWR; 248 were sport hunters (70 percent confidence interval of 192 to 305) and 186 were nonhunters (70 percent confidence interval of 175 to 195). Hunter-use-days totaled 5,260, while there were 4,990 nonhunter-use-days, for a total of 10,240 recreational-use-days (one recreational-use-day equals 12 hours aggregate stay). Recreational-use-days per acre in 1977 were 0.0012.

Comparison of Hunters and Nonhunters

For most sport hunters, the most important activity was hunting. Nonhunters were diverse with regard to "most Important" activity identified and listed backpacking/hiking, viewing scenery, observing wildlife, and wilderness experience. When the activity listed by nonhunters as "most important" -was compared with wilderness attitudes, no significant difference was detected.

Hunters and nonhunters were significantly different with respect to most of their attitudes and management preferences, including their attitudes toward wilderness, increased use, and rules and regulations (table 1). Median wilderness purism values were 60 for hunters and

Table 1. — Differences between hunters and

User group	Purism scores: Nonpurist - moderate purist	Strong purist	Very strong purist	Valid cases
	Percent			
Hunter	47	32	20	137
Nonhunter	13	26	61	159

Chi-square = 60.66 Significance = 0.001 Gamma = 0.67 Total cases = 300

	Allow increased use without restriction: Strongly oppose	Oppose	Neutral	Favor	Strongly favor	Valid cases
	Percent					
Hunter	24	31	19	14	12	139
Nonhunter	50	37	7	5	2	153

Chi-square = 41.52 Significance = 0.001 Gamma = -0.53 Total cases = 300

	Rules and regulations to maintain the quality: Very undesirable	Undesirable	Neutral	Desirable	Very desirable	Valid cases
	Percent					
Hunter	9	7	10	46	28	136
Nonhunter	1	4	9	42	44	154

Chi-square = 15.18 Significance = 0.004 Gamma = 0.32 Total cases = 300

66 for nonhunters. A very high gamma value of 0.67 indicates that purism scores tended to be higher for nonhunters. Allowing use to increase without restriction was opposed by hunters, while it was strongly opposed by nonhunters. Rules and regulations to maintain quality were desirable for hunters and very desirable for nonhunters.

No significant differences were identified between Alaskan and non-Alaskan hunters, or between Alaskan and non-Alaskan nonhunters with respect to wilderness attitudes.

Socioeconomic Characteristics

Seventy-eight percent of the sampled hunters and 63 percent of the sampled nonhunters were between 25 and 45 years old. Individuals younger than 25 comprised 7 and 22 percent of the hunters and nonhunters, respectively. Hunters were 96 percent male, while nonhunters were 71 percent male.

Most recreationists were from Alaska and Pacific Coastal States (California, Oregon, and Washington). Sixty-seven percent of the hunters lived in Alaska, while 10 percent were from the Pacific Coastal States. Thirty percent of the nonhunters were from Alaska, and 30 percent lived In the Pacific Coastal States.

Median average annual incomes for Alaskan and non-Alaskan hunters were $33,900 and greater than $40,000, respectively. Median average annual incomes for Alaskan and non-Alaskan nonhunters were $25,400 and $17,700, respectively.

Hunters and nonhunters in professional-technical and management-administrative occupations accounted for 48 and 58 percent of the ANWR recreationists, respectively. Seventy percent of the hunters and 92 percent of the nonhunters had some college education. Twenty-nine percent of the hunters and 63 percent of the nonhunters had completed over 16 years of formal education.

Recreational Activities, Group Size, and Length of Stay

Although prior experience in backcountry and wilderness was quite diverse among the recreationists, ranging from less than four trips to over 100, there was no significant systematic relationship with the "most important" activity identified. Each major activity group had approximately the same breadth of backcountry and wilderness experience.

Forty-two and 4 percent of the hunters and nonhunters, respectively, used a private or rented plane with a group member as pilot of the plane. Almost all the other recreationists hired an air taxi service. The most common method of travel included combination of an aircraft flight into the Wildlife Range with hiking. One group hiked the entire length of the AHWR. One guide in 1977 flew to all camps, thus reducing hiking by recreationists using his services.

Besides sport hunting, over 50 percent of the hunters indicated participating in backpacking/hiking, camping, observing wildlife, photography, viewing scenery, and flying. Over 50 percent of the nonhunters indicated participating in observing wildlife, backpacking/hiking, photography, observing plants, viewing scenery, and camping. Although there are a few activities that are the recreationists' focal point of a trip in the ANWR, many activities added to their total experience.

Ninety-six percent of the hunters visited in groups of less than seven people. Fifty-four percent of the nonhunter groups were less than seven people. For hunters and nonhunters, group size ranged from one to 15 people.

Length of stay ranged from 2 to 61 days. The mean average length of visit for hunters was 11 days and 13 days for nonhunting recreationists. The median length of visit for hunters and nonhunters were 8 and 11 days, respectively.

Recreationist Attitudes

The presence of wildlife in the ANWR was important or very important to almost all recreationists. Thirty-four and 61 percent of the hunters indicated that wildlife was important and very important, respectively. Sixty-one and 30 percent of the nonhunters indicated that wildlife was important and very important, respectively. Approximately 75 and 42 percent of the hunters and nonhunters, respectively, saw as much or more wildlife than they expected.

Attitudes toward wilderness, as shown earlier, were not significantly different between Alaskan and non-Alaskan residents. Prior experience in backcountry and wilderness areas was not shown to be significantly different between wilderness purism groups.

Some use of light aircraft was generally accepted by hunters and nonhunters: only 4 and 8 percent of the these groups, respectively, indicated that they wished to see no aircraft. However, 41 percent of the hunters and 60 percent of the nonhunters indicated that three light aircraft would be the maximum number to see or hear in 1 week and still have a satisfactory experience.

Developments were generally opposed by both hunters and nonhunters. Specifically they believed bridges, manmade trails, improved landing strips, and cabins at the largest lakes in the study area were undesirable (table 2).

Nonhunters' responses ranged from neutral to strongly favoring low-impact use regulations, including moving their camp, using gas stoves, prohibiting pack animals, and removing their trash. Hunters were strongly opposed to moving their camp and using gas stoves only; they were neutral toward prohibiting pack animals, and they strongly favored removing their own trash.

Table 2.--Attitudes of hunters (H) and nonhunters (NH) toward recreational-use developments

Development		1 VUD[1]	2 UD	3 N	4 D	5 VD	Median response	Valid cases
		Percent						
Bridges across rivers and streams	H	81	12	4	2	2	1.1	139
	NH	70	24	3	3	0	1.2	152
Manmade trails	H	73	17	7	1	2	1.2	138
	NH	72	20	6	1	1	1.2	159
Improved light aircraft landing strips	H	61	21	7	4	7	1.3	138
	NH	52	26	16	5	2	1.5	157
Cabin at lake Peters/ Schrader for public use	H	49	11	22	13	6	1.6	136
	NH	36	20	27	13	4	2.2	158

[1]VUD=Very Undesirable UD=Undesirable N=Neutral D=Desirable VD=Very Desirable

Recreationists were asked to respond to the desirability of three rationing systems. These systems involved timing of trips, issuing permits, and limiting plane landings. The most favored rationing system was to limit plane landings (table 3).

Availability of information was neutral to very desirable to most recreationists, including general information on what to see, what to expect, and low-impact camping techniques (table 4). Detailed information was less desirable than general information.

Trip Satisfaction

Seventy-nine percent of the hunters and 84 percent of the nonhunters indicated that they were very satisfied with their trip in the ANHR. Trip satisfaction for hunters was related to hunting success. For hunters, satisfaction may be affected by intergroup encounters (Chi-square significance of 0.07), while for nonhunters satisfaction may be affected by the number of light aircraft seen (Chi-square significance of 0.11). High gamma values indicate a strong association in the expected direction (table 5).

Table 3.--Attitudes of hunters (H) and nonhunters (NH) toward regulations

Regulation		1 SO[1]	2 O	3 N	4 F	5 SF	Median response	Valid cases
		Percent						
Require visitors to move camp every other night to protect vegetation	H	43	35	12	7	3	1.3	139
	NH	8	29	17	29	17	3.2	157
Require visitors to use gas stoves only	N	43	29	17	5	7	1.7	139
	NH	9	18	15	22	36	3.9	159
Prohibit pack animals	H	20	15	30	13	23	3.0	138
	NH	3	9	20	18	50	4.5	159
Require visitors to carry out their trash	H	3	5	2	21	69	4.8	136
	NH	0	1	1	8	90	4.9	159
Regulate the timing of trips	H	37	34	18	7	5	1.9	137
	NH	15	26	23	26	11	2.9	148
Require visitors to obtain a permit for all areas, limiting the number of permits in heavily used areas only	H	33	24	17	14	12	2.2	137
	NH	8	10	10	42	30	4.0	156
Limit number of planes that can land in any one zone per week	H	25	18	22	19	17	2.8	139
	NH	5	11	21	27	36	4.0	155

[1]SO=Strongly Oppose O=Oppose N=Neutral F=Favor SF=Strongly Favor

Table 4.--Desirability of providing recreationist information; H indicates hunters, NH nonhunters

Information		1 VUD[1]	2 UD	3 N	4 D	5 VD	Median response	Valid cases
		Percent						
General information available about where to go and what to see	H	24	9	25	28	15	3.2	139
	NH	11	9	30	33	17	3.5	159
Information about what to expect	H	20	4	25	29	23	3.6	138
	NH	3	2	23	44	28	4.0	160
Information Available about low impact camping techniques	H	14	4	23	27	32	3.9	139
	NH	2	1	9	24	64	4.7	160

[1] VUD=Very Undesirable UD=Undesirable N=Neutral D=Desirable VD=Very Desirable

Table 5.--Relationship between trip satisfaction and hunting success, and the number of groups and aircraft seen

Hunters	Hunting Success: No	Hunting Success: Yes	Valid cases
	Percent		
Less than very satisfied	48	52	27
Very satisfied	24	76	107

Chi-square = 5.94 Significance = 0.02 Gamma = 0.49 Total cases = 139

	Groups Seen: 0	Groups Seen: 1 to 3	Groups Seen: 4+	Valid cases
	Percent			
Less than very satisfied	19	56	25	16
Very satisfied	47	44	10	73

Chi-square = 5.40 Significance = 0.07 Gamma = -0.52 Total cases = 139

Nonhunters	Aircraft Seen: 0	Aircraft Seen: 1 to 3	Aircraft Seen: 4+	Valid cases
	Percent			
Less than very satisfied	10	52	38	21
Very satisfied	26	54	20	113

Chi-square = 4.41 Significance = 0.11 Gamma = -0.42 Total cases = 161

Social Carrying Capacity

Sampled hunters indicated that they observed a median average of 1.5 visitor groups, 2.7 light aircraft, and 0.7 aircraft landings per week. Sampled nonhunters indicated observing a median average of 0.9 visitor groups, 2.5 light aircraft, and 0.7 aircraft landings per week. Observation counts made by the recreationists were highly associated with overall visitation patterns (table 6).

Hunters indicated being able to see a median average of 2.8 groups, 5.8 light aircraft, and 2.3 light aircraft landings per week and still have a satisfactory experience. Thus, hunters indicated being able to see 87 percent more groups, 115 percent more light aircraft, and 156 percent more aircraft landings than observed. These figures suggest that the limiting measured social factor for hunters is group sightings. As shown earlier, trip satisfaction results support this finding. Twenty-five percent of the hunters saw more than three groups.

Nonhunters indicated being able to see a median average of 2.3 groups, 3.4 light aircraft, and 1.3 light aircraft landings per week and still have a satisfactory experience. This is 156 percent more groups, 36 percent more light aircraft, and 86 percent more aircraft landings than what nonhunters observed. This suggests that aircraft sightings is the limiting measured social factor for nonhunters. As shown earlier, trip satisfaction results support this finding. Twenty-five percent of the nonhunters saw more than three light aircraft.

Table 6.--Relationships between groups and light aircraft seen compared to visitation patterns

All groups	Groups seen			
	0	1 to 3	4+	Valid cases
	Percent			
High use week and area	32	49	19	37
Low-medium use week and area	55	39	6	154

Chi-square = 9.82 Significance = 0.01 Gamma = -0.61 Total cases = 300

	Aircraft seen				
	0	1 to 3	4 to 8	9+	Valid cases
	Percent				
High use week and area	14	46	19	22	37
Low-medium use week and area	20	58	17	5	154

Chi-square = 11.13 Significance = 0.01 Gamma = -0.34 Total cases = 300

Very strong purist recreationists indicated being able to see a median average of 2.1 groups, 3.0 planes, and 1.0 plane landing per week. As with nonhunters, these figures suggest that aircraft sightings is the limiting measured social factor.

For strong and very strong purists, no significant difference was detected between high-use and low-use time-and-area visits and the number of groups and planes indicated as being able to see and still have a satisfactory experience. However, for nonpurist through moderate purist groups, the more groups and planes seen, the more these groups indicated that they could see (table 7). This suggests that stronger purist groups have more crystallized beliefs regarding acceptable encounter levels.

Maximum group sizes recommended by hunters and nonhunters were nine and 11 (median values), respectively. Very strong purists recommended a median maximum group size of nine.

SUMMARY AND DISCUSSION

The surveyed hunters and recreationists that were not hunting were distinct groups. Their socioeconomic characteristics, activities, and attitudes toward management of the ANWR were generally different. Because of the differences between these groups, management should be targeted at each group individually. This should influence the design of recreationists information, educational materials, and regulations to manage use.

Lucas (1980) studied use patterns and recreationist characteristics, attitudes and preferences in eight wilderness and other roadless areas in the northern Rocky Mountains and one wilderness in California. His study included findings from the Desolation, Mission Mountains, Cabinet Mountains, Selway-Bitterroot, Bob Marshall, Scapegoat, and Great Bear Wildernesses, the Spanish Peaks Primitive Area, and the Jewel Basin Hiking Area.

Recreational-use-days per acre in the Great Bear Wilderness in 1976 was 58 times higher than 1977 levels in the ANWH, and the Great Bear Wilderness was the most lightly used wilderness in the Rocky Mountains and Desolation Wilderness study. However, social impacts of use levels in the arctic are not directly comparable to non-arctic areas, due to the openness of the arctic terrain and dependence on aircraft for transportation.

Socioeconomic characteristics of ANWR recreationists were similar to users of the Rocky Mountain areas and Desolation Wilderness with two notable exceptions. Education and income levels were above the national average for Rocky Mountain and Desolation Wilderness recreationists, but they were even higher for ANWR recreationists; 29 percent of the hunters and 63 percent of the nonhunters had some postgraduate education. Average incomes were very high, which was expected due to the costs associated with traveling to the ANWR and the relatively high Alaska salaries.

The average length of stay for recreationists was 11 days for hunters and 13 days for nonhunters. The longest average length of stay identified in the Rocky Mountain and Desolation Wilderness study was 5.7 days. Travel time and expense to reach the ANWR probably account for the much longer length of stay. Party sizes for groups visiting the ANWR were very similar to the averages found in the Rocky Mountain and Desolation Wilderness study.

Recreationists to the ANWR, the Rocky Mountains, and Desolation Wilderness participated in several of the same activities, including hiking, photography, nature study, and hunting. Participation in hunting involved an estimated 57 percent of the ANWR recreationists, and was identified by 2 to 43 percent of the Rocky Mountain and Desolation Wilderness study recreationists.

Table 7.--Comparison of the number of groups and planes visitors said they could see and still have a satisfactory experience

Nonpurist through moderate purists	Groups could see			Valid cases
	0 to 3	4 to 8	9+	
	Percent			
High use week and area	31	50	19	16
Low-medium use week and area	68	20	13	40

Chi-square = 6.54 Significance = 0.04 Gamma = -0.51 Total cases = 87

Strong purists	Groups could see			Valid cases
	0	1 to 3	4+	
	Percent			
High use week and area	13	67	20	15
Low-medium use week and area	10	78	12	49

Chi-square = 0.78 Significance = 0.68 Total cases = 87

Very strong purists	Groups could see		Valid cases
	0	1 to 3	
	Percent		
High use week and area	17	83	12
Low-medium use week and area	27	72	83

Chi-square = 0.66 Significance = 0.42 Total cases = 126

Nonpurist through moderate purists	Aircraft could see				Valid cases
	0 to 3	4 to 8	9 to 15	16+	
	Percent				
High use week and area	13	19	25	44	16
Low-medium use week and area	43	30	10	18	40

Chi-square = 8.52 Significance = 0.04 Gamma = -0.58 Total cases = 87

Strong purists	Aircraft could see					Valid cases
	0	1 to 3	4 to 8	9 to 15	16+	
	Percent					
High use week and area	13	38	13	13	25	16
Low-medium use week and area	8	43	24	18	6	49

Chi-square = 5.37 Significance = 0.26 Total cases = 87

Very strong purists	Aircraft could see			Valid cases
	0 to 3	4 to 8	9+	
	Percent			
High use week and area	92	0	8	12
Low-medium use week and area	67	23	11	84

Chi-square = 3.71 Significance = 0.16 Total cases = 126

Attitudes towards recreational use management practices favored measures that would protect the ANWR from degradation by maintaining wilderness and wildlife values. All facilities—trails, bridges, and aircraft landing areas—were unwanted. This is somewhat in contrast to the Rocky Mountain and Desolation Wilderness recreationists who accepted trails and bridges across dangerous rivers as necessities.

Shelby (1981) found little association between satisfaction and encounters on several western rivers, with factors other than encounters being more important in influencing satisfaction. In the ANWR, satisfaction appears to be associated with group and aircraft encounters; the level of association between group encounters and satisfaction is approximately the same as that of recreationists of the Rocky Mountains and Desolation Wilderness. Trip satisfaction for hunters was strongly associated with hunting success.

Several studies (Stankey 1973 and 1980; Heberlein 1977) have Indicated that as use Increases, the average recreationist's perception of excessive use is more lenient. Therefore, as recreation use increases, the people who still seek low-density opportunities and naturalness may be displaced to other areas, or may continue to visit an area for its recreational qualities rather than for its wilderness qualities. If management decisions are made for the ANWR that allow use to increase above maximum levels identified by strong and very strong purists, satisfaction in terms of a wilderness experience probably will decrease for the average strong and very strong purists. Satisfaction probably will not decrease as rapidly for the average recreationist of lesser purist groups. This would tend to displace the stronger purist recreationists to other areas, if available.

Relating recreationist's objectives to management objectives was accomplished in this study by differentiating purist groups. Very strong purists' perception of what constitutes acceptable human contact or resource quality can serve as a guide to desirable wilderness management approaches. The social element of limits of acceptable change for very strong purists may be met by limiting light aircraft sightings to three per week, in addition to their chartered, rented, or own aircraft. With decreased aircraft sightings there would be a corresponding decrease in the number of groups and aircraft landings sighted.

Information and education (I&E) program objectives for the refuge should be to inform recreationists of appropriate behavior and practices that will protect the area from excessive physical and social impacts. An I&E program may greatly decrease the need for more regulatory approaches to managing use. If managers decide that rationing is needed, the most favored permit system was limiting plane landings, and it would be the most acceptable to recreationists.

I recommend that future research further quantify the effects of encounters with groups and light aircraft. One specific recommendation is to determine whether, and to what extent, minimum altitude restrictions for light aircraft would decrease social impacts.

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