ACTIVITY PATTERNS AT CAPE HATTERAS NATIONAL SEASHORE: AN ANALYSIS OF OFF-ROAD VEHICLE AND PEDESTRIAN USERS AMONG VISITORS AND RESIDENTS

by

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INTRODUCTION

Cape Hatteras National Seashore is a public recreational area administered by the National Park Service. It extends 72 miles along the Outer Banks of North Carolina from Nags Head to Ocracoke. In recent years, the amount and type of use of this first designated national seashore (1937) has changed. Visitor use has increased, and with the growth of off-road recreational vehicle use, the Outer Banks is getting four-wheel drive, dune buggy, and motorcycle use in greater quantities.

This change in the type of use is not unique to Cape Hatteras National Seashore. Off-road recreational use has increased dramatically throughout the nation (U.S. Department of Interior 1971). As a response to the growing pressures of this type of use on public lands, executive orders were issued in 1972 and 1977 to provide policies relating to off-road vehicle (ORV) management on federal lands. A 1972 executive order (11644) directed appropriate federal agencies to:

> ". . . establish policies and provide for procedures that will ensure that the use of off-road vehicles on public lands will be controlled and directed so as to protect the resources of those lands and minimize conflicts among various users of those lands."

This executive order attempted to provide a framework for a unified federal policy. Executive Order 11989, issued in 1977, was much more forceful and urgent in its directive. It authorized agency heads to immediately close off areas to off-road vehicle use wherever it was determined that "the use of off-road vehicles will or is causing considerable adverse effects on the soil, vegetation, wildlife, wildlife habitat, or cultural or historic resources."

After the 1977 executive order was issued, the National Park Service (NPS) felt that its existing ORV management plan at Cape Hatteras was inadequate to meet the growing pressures of resource deterioration and visitor use conflict (Mordecai and Worthington 1978). In May of 1977, public comments were requested by the NPS for the preparation of a new ORV management plan, and in January of 1978 their proposed plan was announced. In this plan, over 50 percent of the national seashore was to be closed year-round to ORV use, and as a result, severe criticism was levelled by many people. Most of this came from off-road vehicle user groups and Outer Banks local interest groups. The Outer Banks Preservation Association (OBPA), for example, went as far as to propose an alternative plan, restricting only seven percent of the beach year-round from ORV use. These groups emphasized the failure of the NPS to have documented evidence of environmental damage and social conflict that would justify closures of the beach to ORV use. As a result of this widespread criticism, the proposed plan was rejected, and an interim ORV plan was developed to be used until the NPS could prepare an environmental impact statement (EIS). Once the EIS is completed sometime in 1979, and accepted, a general management plan will be prepared. Like all federal agencies in the post-NEPA (National Environmental Policy Act) era, the NPS has found that it must base its management decisions on something more than intuition and subjective evaluation of the issues (Sumner 1977).

Necessary components for effective management of all visitors are data on the type of visitor who uses the park, and their patterns of

use. This includes identifying such things as the locations they visit and what activities they participate in while recreating (Driver and Tocher 1970; Clawson and Knetsch 1963). No visitor use studies, or documentation of this type have been done at Cape Hatteras. This is critical for proper management for the reasons listed below:

a. descriptive information of this kind may lead to policy changes;
b. it is one vital input into the planning process;
c. it provides needed baseline data for planning purposes;
d. it helps planners identify activities that need to be provided together;
e. it is immediately useful to managers;
f. it validates attitudinal measures when the two are used together;
g. it provides one input into establishing an area's carrying capacity.

In the paragraphs following, each of these reasons is developed further.

From a very general perspective, activity pattern data can influence agency policy, executive and legislative policy, and even judicial decisions. Assuming that the study of activity patterns can help to identify user conflicts, if enough evidence is presented showing extensive conflict over all National Park Service lands, a final policy decision might be to totally restrict ORV use. Also, any federal agency could very well be thrust into court, having to justify such closures. With objective data on activity patterns, and other evidence indicating social conflict, the agency would be in a better position to justify their decisions to the court. This visitor use data would have a bearing on the final court decision. Activity pattern data is useful for influencing policy.

Knowing visitor use patterns and activity choices is also valuable for planning. Many resource planners base their planning decisions on traffic counts of visitors, head counts, and other gross use data (Driver and Tocher 1970; Buhyoff 1978). The idea is to evaluate the amount of use and the trends in use, and allocate personnel, money and materials accordingly. Many problems have been cited with this approach to planning (Buhyoff and Leuschner 1978). One serious problem is that while much is know about the quantity of use, little is known about the visitor (e.g., who is he, where does he go once in the park, what are his attitudes and preferences, how does he interact with other visitors, and how satisfied was he). By an analysis of activity patterns, some of these questions can be answered, and can supplement gross use data.

Activity pattern data used as baseline information is another value of this type of data for planning purposes. Once initial information on visitor behavior is obtained, changes in behavior can be plotted over time and meaningful trends can be identified. For example, if it were known that ORV users and pedestrians did not interact on the beach at Cape Hatteras in the baseline year, but 10 years later they coexisted, statements can begin to be made about the nature of their relationship.

The specific set of activities chosen by recreationists, termed their activity aggregations, has great value to planners. It has been shown that activity aggregations differ for specific subgroups of the population (Proctor 1960), and that people who choose one group of activities have characteristics that are different from people who choose different groups of activities (Bishop 1970; Hendee et al. 1971; Maughan

and Duncan 1976). Knowledge of activity aggregations becomes of value in that it improves the ability of planners:

> "(1) to understand better the kinds of opportunities visitors are seeking, and their consequent behavior; (2) to develop facilities and visitor contact programs to enhance those opportunities; and (3) to identify those packages which may conflict with other packages in the use of a recreation site." (McCool 1978, p. 164).

From a management perspective, probably the biggest advantage of knowing visitor use patterns and activity choices among specific user groups is the immediate usefulness by managers of the data. For example, one might ask what percentage of off-road vehicle users visit interpretive facilities. If a large percentage does, then it could be feasible to recommend providing interpretive displays showing the interaction of machines with the beach environment. A greater awareness by ORV users of beach ecology may result, reducing impacts on the dune environment. Another example would be to ask if some campgrounds attract different types of users. If one campground attracts primarily family types, the managers could provide relatively more interpretive and learning experiences at this site than others. Also, if ORV users spend their time at different places than pedestrians (e.g., little interaction exists), this might suggest that some social conflict exists, and management controls such as zoning might be advisable.

For good management, the manager should know his clientele's attitudes. Many problems exist with self-reports of these attitudes, the issue of validity being the biggest problem (Wellman 1979). Data on the actual behavior of recreationists has importance for the validation of these attitudinal measures (Clark 1977; Lee 1977; Wellman 1979). By

simultaneously collecting information on visitor attitudes and behavior, more confidence can be placed in the interpretation of the data (Webb et al. 1966).

The study of behavioral use patterns and activity choices has value to managers in their concern for the carrying capacity of their area[1] (Lime and Stankey 1972). The appropriate level of use for a given recreational area would certainly be hard to estimate without some indication of the present use patterns. Also, redistributing use as a means to increase an area's carrying capacity without knowing where use presently occurs, by which user groups, and the seasonal variations of that use, becomes almost an impossible task. This information, directed by specific management objectives, and tempered with data on such variables as visitor attitudes, preferences, and the effects on the physical resource, is essential for determining an area's carrying capacity.

The Problem

Managing Cape Hatteras for off-road vehicle use while trying to maximize visitor satisfaction is a difficult process. One input into providing the proper management is objective data on the patterns of visitor use. The Cape Hatteras managers may think they know how visitors use the national seashore, or the relationship between the ORV user and pedestrian. But, as the problems surrounding the development of an adequate ORV management plan indicate, they must document these things through the use of objective measures. Activity pattern data is much

[1]"The recreational carrying capacity is 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 visitor." (Lime and Stankey 1972, p. 175)

more detailed and potentially useful than traffic counts and other commonly used objective use measures. This data goes beyond just finding out how many visitors the national seashore is receiving. It indicates where the users go once they are in the seashore, what activities they participate in, and gives an indication of the extent of the differences between the ORV user and pedestrian. Gross use data cannot provide this information.

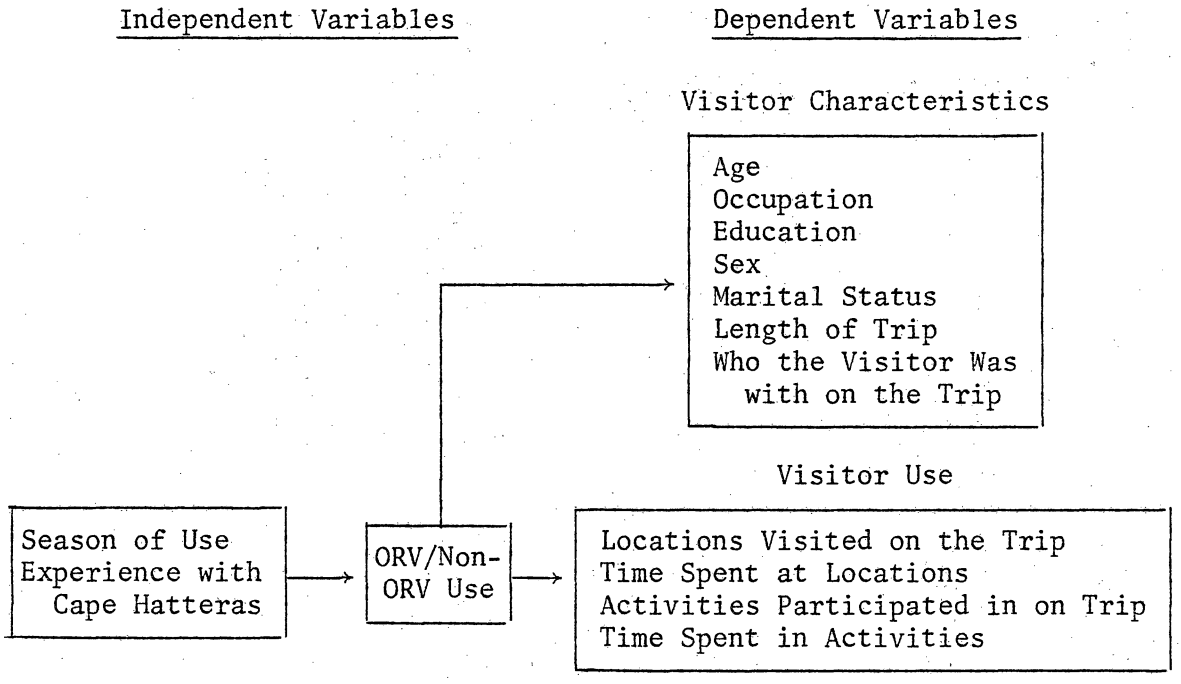
This study was designed to gather such comprehensive information, not only for the visitors of Cape Hatteras, but for the local resident population of the Outer Banks who also use the seashore. The problem is to determine the general characteristics of both of these populations, their specific use, and differences that exist between the ORV user and non-ORV user (pedestrian). Also, several control variables are used to check for other differences in use. Figure 1 identifies the variables used in this study, and provides the structure for the analysis that follows.

Objective

Therefore, given the need for resource managers and planners to understand behavioral use patterns, the specific objective of this study is:

1. to describe the use of the seashore by visitors and local residents, and analyze differences that exist between ORV and pedestrian users among these visitors and residents.

VISITOR ANALYTIC MODEL



LOCAL RESIDENT ANALYTIC MODEL

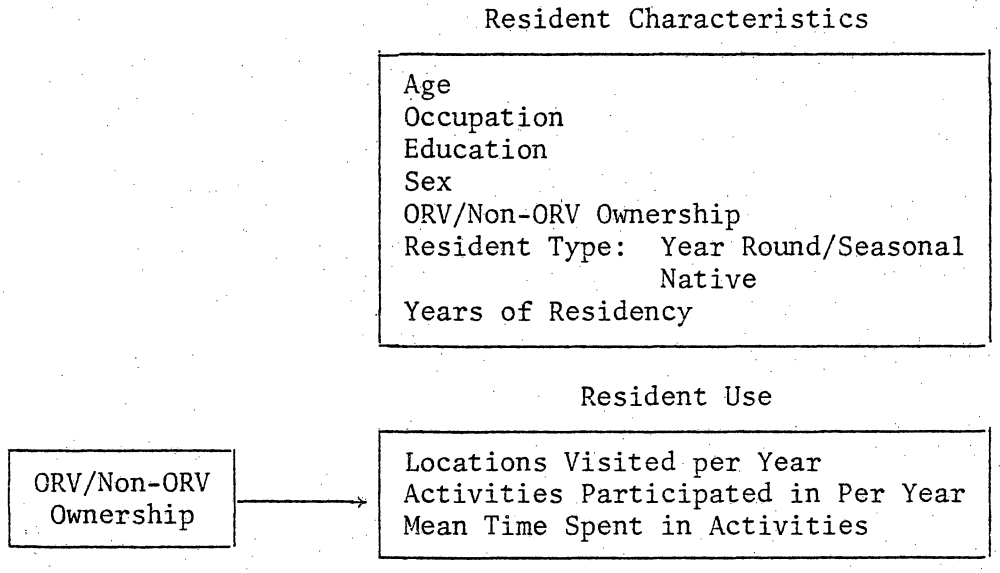


Figure 1. Analytic models of visitor and resident use of Cape Hatteras.

LITERATURE REVIEW

Many studies have been done indicating the differences between the off-road vehicle (ORV) user and non-user (pedestrian). Much of this concerns the differences in values, motivations, attitudes, and preferences between these two groups. Significantly fewer studies are available showing the relationship between these two groups in terms of use, especially when this involves use of particular parks or recreation areas. This information is usually very specific and cannot be readily generalized to other areas.

The general attitudinal literature indicates extensive social conflict between the ORV user and pedestrian (Badaracco 1976; Butler 1974; Lindsay 1974; Hope 1972). These conflicts seem to be grounded in noise, knowledge of the machines' presence, fear of personal harm, and physical impacts on the environment (Butler 1974). This conflict seems to be of a one-way nature--that is, ORV users are not bothered by pedestrians, but pedestrians are very often alarmed by these mechanized users (Badaracco 1976). In addition, public land managers and private ORV users have different attitudes and perceptions toward ORV use of public lands (Propst 1976). Roggenbuck and McCool (1974) observed that resource managers and planners have been customarily trained in the natural sciences, and ORV use is not compatible with this naturalistic value system. The ORV user, though, does not have these values, and views the ORV as an appropriate means of enjoying the recreational opportunities of public lands.

Use of recreational lands would, therefore, be expected to be

different for each user type, as would participation in activities. The few studies found will be cited below in the following order. First, there will be a discussion of use studies and the distribution of use within certain recreation areas. Second, differences in participation in activities between these user groups will be presented. Third, general literature on the topic of use patterns as they are affected by socio-economic variables and other covariates will be presented.

Most studies dealing with use by the ORV user and non-user are statewide, regional, or national surveys (e.g., 1971 and 1973 Snowmobile and Off-Road Vehicle Research Symposium; Department of Interior 1971; Department of Tourism and Information 1971; Letherberry 1976; Outdoor Recreation Resources Review Commission 1962). These are very valuable to the particular state, region, or federal government in allocating personnel, monies, and establishing policy. Studies on use at particular recreation areas are not as abundant in the literature. This is probably because they are internal reports, or unpublished. Two are cited below along with comments of their value to management.

Carrying capacity research seems to be the most involved with use distribution studies (Lucas 1964; Gilbert et al. 1972). Time budget information gathered from ORV users and non-users (canoeists, motor-canoeists, and motorboaters) provided useful data on which to base travel-behavior models for Gilbert et al. (1972). They asked these visitors to the Boundary Waters Canoe Area (BWCA) to fill out a diary during their visit, asking them where they went and the length of time spent at each location. This information was programmed into a computer

along with specific management options for controlling use as parameters. Travel patterns were developed for simulated management controls in advance of any actual implementation (see Gilbert 1972). Data on the patterns of use is essential for this kind of research.

Lucas (1964) reported that the distribution of use by canoeists, motor-canoeists, and motorboaters is not the same throughout the BWCA. Canoeists tended to penetrate the farthest into the area, whereas motorboaters concentrated around the periphery, just far enough to find wilderness fishing. Motor-canoeists were between these two groups. These conclusions lent support to different wilderness perceptions of users of the BWCA, and indicated to managers that zoning for these different uses might be acceptable.

Differences between the ORV user and pedestrian can also be seen in their patterns of participation in various recreational activities, termed their activity packages. Several sources that focus on groupings of activities for each of these user groups have been found (Maughan and Duncan 1976; Hendee et al. 1971; Chilman and Kupcikevious 1973). Probably the most interesting of these three is the one by Maughan and Duncan. They factor analyzed 34 outdoor recreation activities as responded to by Idaho residents. One of their interests was to see if a mechanized versus non-mechanized dichotomy of participation actually exists. The activities of snowmobiling, motorcycling, and four-wheel driving formed a common factor. Backpackers, cross-country skiers, and nature walkers fell into a separate factor. These findings supported the hypothesized use dichotomy. Similar studies at specific recreational areas

would provide managers and planners useful input into providing the appropriate mix of activities for their visitors.

More general studies exist that indicate the value of data on activity participation. Clark et al. (1974), for example, in their study of high-lake fishing in Washington state, found that 58.9 percent of the fishermen fished less than 1.5 hours, and 40 percent caught nothing. Also, 64 percent of the fisherman's time was spent in camp. These and other findings suggested that fishing is not the primary motive for visiting the lake, and other factors are more satisfying for most who do fish.

Extensive literature exists dealing with the effects of socio-economic and other covariates on use (Department of Tourism and Information 1971; Tingle 1977; Hecock 1972). Only a few studies are cited here. Age, education, income and family structure are a few of the socio-economic variables often related to use. Williams (1979), for example, found that as income and education of local residents adjacent to the Blue Ridge Parkway increased, so did use of the Parkway for recreational purposes. But, as age of the residents increased, use declined. Some of these variables were used in a multiple regression equation to predict use of the Blue Ridge Parkway by local residents.

Tingle (1977), in an earlier study of visitors to the Blue Ridge Parkway, found that use of the Parkway had "a much greater appeal to the young than may previously have been expected" (p. 23). Also, over 50 percent of the visitors were first-time visitors. This kind of data is useful to Parkway managers in developing such things as interpretive

programs, facilities, and in providing them with a better understanding of the characteristics of their visitor.

Hecock (1972) found a significant relationship between patterns of beach use by Cape Cod visitors and conditions existing at the various sites. Specifically, the number of nearby lodging units, the number of nearby beaches, and the average area rental costs played significant roles in determining the pattern of attendance. Also, the attraction of the visitors to these sites was highly dependent upon the socio-economic characteristics of the users. Teenagers, for example, were highly attracted to sites with food facilities, and are the only group of users identified who seemed to be affected by crowding on the beach. That is, teenagers seemed to express a strong positive reaction towards crowding, wanting to be close to other teenagers and college students.

Other literature exists dealing with the effect of socio-economic variables and other covariates on use for ORV users and non-ORV users. Most of these studies relate specifically to ORV users, particularly to snowmobilers, trailbikers, and motorcyclists (1971 and 1973 Snowmobile and ORV Research Symposium, The Department of Tourism and Information 1971). Little research has been done on the four-wheel drive vehicle owners.

There are many applications of activity pattern data. But, there seems to be a void in research dealing with the ORV and pedestrian visitor at the same time. In addition, little of this type of research deals with use at specific parks or sites within parks, especially for the four-wheel drive vehicle users and non-users.

METHODOLOGY

Study Area

Cape Hatteras National Seashore is a recreational area administered by the National Park Service and is located on the Outer Banks of North Carolina (Figures 2 and 3). It consists of a series of three barrier islands 72 miles long, containing 45 square miles of beaches. Bodie, Hatteras, and Ocracoke Islands make up the barrier islands, and are connected by a bridge and a ferry.

The beach area is accessible either by walking through the dunes from parking lots, or by ORV access ramps. Twenty designated ramps exist along the seashore, and presently each of these segments are either open year-round, closed year-round, or closed seasonally (Memorial Day to Labor Day) to off-road vehicle use.

Eight villages are within the natural boundaries of the park. They are excluded from the national seashore, and given room to expand. Also contained within the national seashore is the Pea Island National Wildlife Refuge.

Recreational activities at Cape Hatteras are numerous and varied. These include beachcombing, sun-bathing, boating, fishing, history and nature study, bird watching, photography, riding in ORV's, and many others. Pea Island National Wildlife Refuge has recorded more than 300 bird species, and is a stop-over place on the eastern flyway during seasonal bird migration. Cape Hatteras is considered to be one of the best surf fishing locations on the east coast, if not the nation.

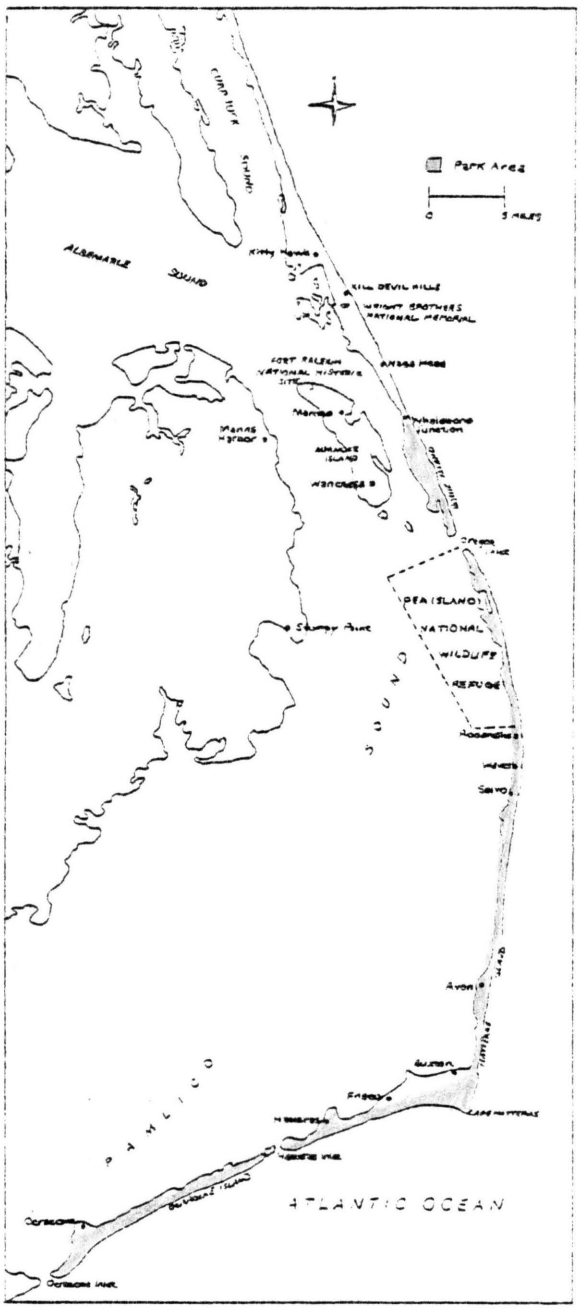


Figure 2. Cape Hatteras National Seashore--general location.

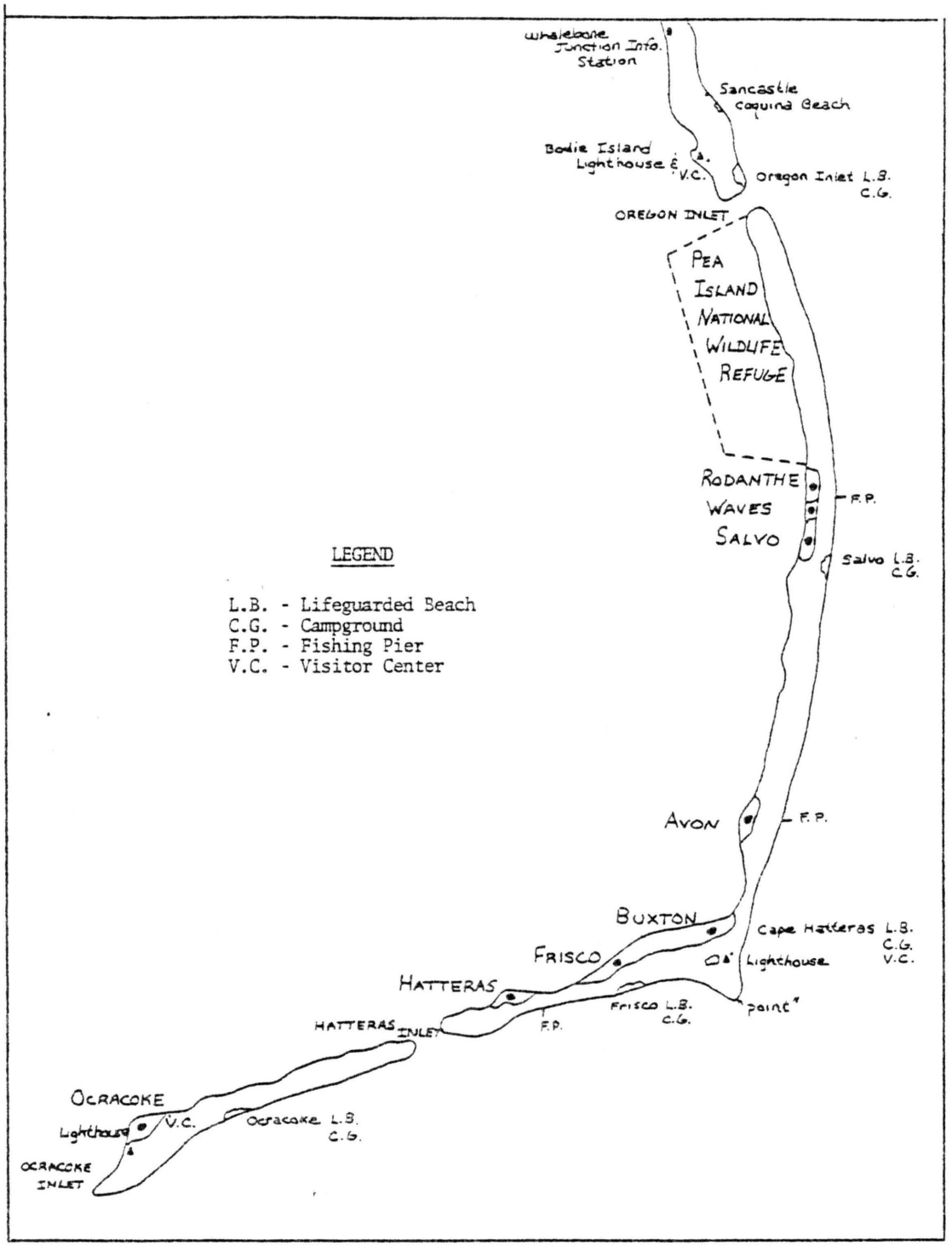


Figure 3. Cape Hatteras National Seashore--locations referenced in questionnaire.

Sampling

In accordance with the purpose of the study, both visitors to Cape Hatteras and local residents of the Outer Banks were sampled. To obtain a representative sample from these populations, each was sampled differently and will be discussed as such below.

Sampling Visitors

Figure 4 represents a schematic illustration of the sampling strategy used on the visitor to Cape Hatteras. In the paragraphs following, this strategy will be discussed in detail.

The study population for the visitors to Cape Hatteras consisted of all people who visited the seashore from June through November of 1978. For each month of the six-month sample coverage, a two-day sample period, either from weekdays or weekends, was randomly chosen. For those months that received a greater percentage of the total visitor use of the seashore (June, July, and August), two two-day sample periods were scheduled. Time and cost constraints prohibited more sampling. Weekend and weekday samples were drawn separately, because differences between visitors during these days of the week has usually been found in recreation studies.

The visitors were then divided into two strata, off-road vehicle users and non-users (pedestrians). Due to the lack of data on their use numbers, each was disproportionately stratified. Specifically, both groups were sampled equally to allow for statistical comparison. Within each day of the two-day sample period, a cluster design for sampling was used. Each strata was sampled during randomly selected two-hour blocks

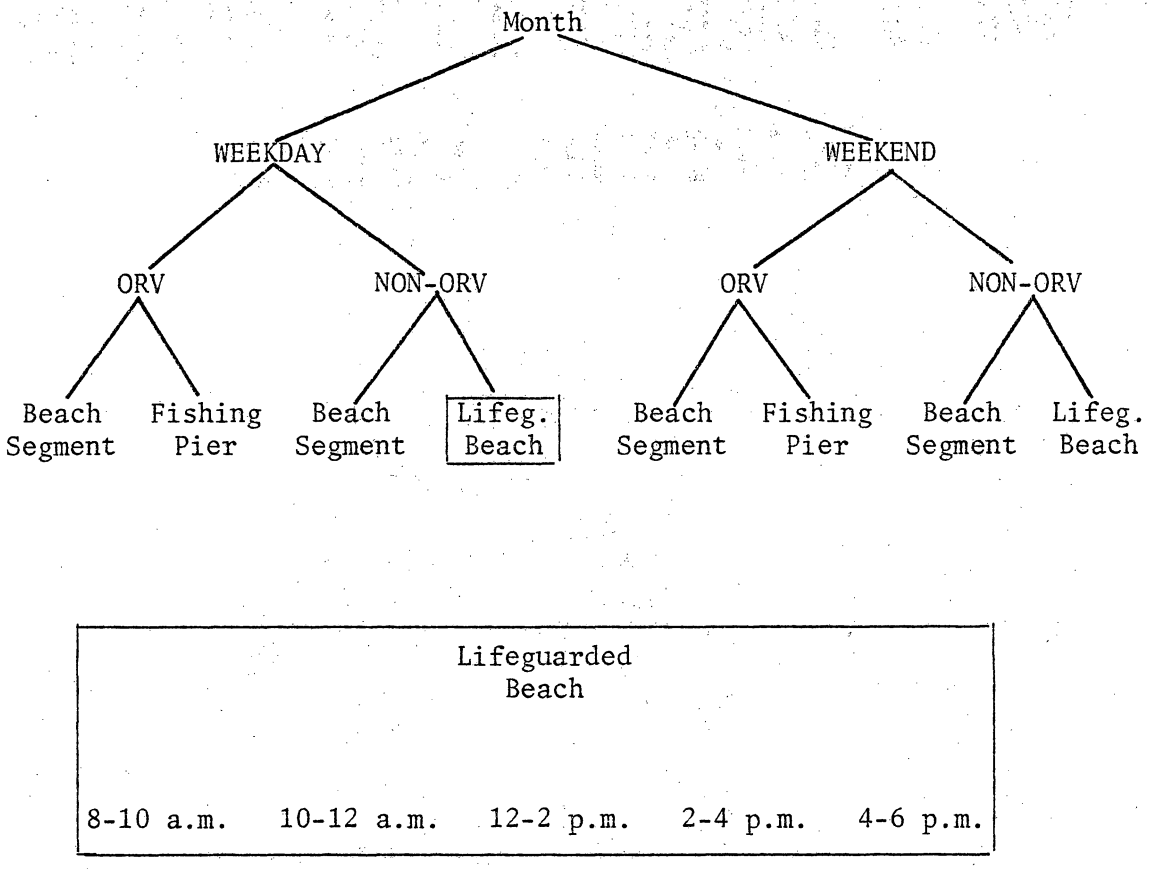


Figure 4. A schematic illustration of the sampling strategy used for sampling visitors to Cape Hatteras.

of time, at randomly selected beach segments[2], fishing piers, or lifeguarded beaches. Sampling during each day lasted six hours, or three sampling stations per day (Note: Only daylight hours were sampled). Two sampling stations involved sampling only ORV users, with 15-20 selected per station. At the other station, only non-ORV users were sampled, with 30-40 visitors selected. As mentioned previously, this approach assured nearly equal sample sizes between each strata. Also, both time and money costs were minimized as compared to other sample methods. Table 1 shows the dates sampled, the expected sample, and the number of people actually contacted.

At each sampling station every visitor, up to the maximum, was sampled. At times, all visitors were sampled. At other times, sampling ceased when the limit was reached or time ran out. When the number of visitors encountered at a sampling site exceeded the expected sample, an effort was made to sample in an unbiased fashion. This usually involved starting at one end of a beach segment or lifeguarded beach, and proceeding towards the other end until the limit was reached. Only one member per family was sampled, but when a group of unrelated or distantly related individuals were together, more than one were sampled. Using this approach a total of 598 visitors were sampled, with 308 ORV users and 290 non-ORV users.

It should be noted that a cluster sample design like the one used here can increase sample error over and above that obtained by simple random sampling (SRS). With cluster sampling, individuals are not

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[2]A beach segment is defined as that portion of the beach one off-road vehicle access ramp each direction of the designated sampling ramp.

Table 1. Expected sample and actual sample for each sampling date for visitors to Cape Hatteras.

Date	Weekend (WK) Weekend (WD)	Expected Sample		Actual Sample	
		ORV	Non-ORV	ORV	Non-ORV
June 10	WK	30	30	35	17
11	WK	30	30	23	36
27	WD	30	30	9	26
28	WD	30	30	5	21
July 5	WD	30	30	28	9
6	WD	30	30	18	14
22	WK	30	30	30	13
23	WK	30	30	1	13
August 16	WD	30	30	25	24
17	WD	30	30	4	22
29	WD	30	30	25	19
30	WD	30	30	2	11
September 4	WK	30	30	8	15
5	WK	30	30	20	22
October 17	WD	30	30	17	3
18	WD	30	30	10	25
November 6	WD	30		16	
7	WD	30		32	
	TOTALS.	540	480	308	290

selected individually, but in groups. This will cause artificially low sample errors if homogeneity in the clusters is high (Warwich and Lininger 1975). No calculations of sample error were attempted in this thesis, because it is computationally very tedious. There were no reasons to expect homogeneity in the clusters to be high with respect to the activity pattern variables. But, an analysis of the effect this design had on the standard errors should, theoretically, be done.

Sampling Residents

The study population for the local residents included all residents of the Outer Banks listed in the local phone books. Only residents from the area of Duck southward to the southern extremity of Ocracoke Island, and Roanoke Island eastward were sampled[3]. A population of 4,037 was estimated from the phone books for the area. A systematic sample of 350 residents was drawn, representing a sampling fraction of 1/12, or 8.3 percent of the population. Because of cost constraints a larger sample was not feasible.

Many problems exist with sampling from phone books. One serious problem is that some members of the population do not have a phone in their residence. A second problem is unlisted telephone numbers. These problems can cause an unrepresentative sample, and any generalizations made to the population may be spurious. The Institute for Social Research, in a national sample of household telephone ownership in 1975, found that 7.5 percent of the households in the nation did not have phones. Around 14 percent did not have phones in the South--the area

[3]Although visitors to Ocracoke Island were not sampled, residents of the island were.

covered in this study. Current figures specific to the Outer Banks could not be found. As a supplemental check, the local phone company confirmed that most residents did have phones in their residences. Despite the concern for this and other problems, the phone book sample was conducted because of the small costs, in terms of dollars and time, as compared to other sampling approaches (Warwick and Lininger 1975).

Survey Instruments

Mailback survey instruments were prepared for the visitors and local residents separately. The entire questionnaires are presented in Appendices A and B. Each questionnaire covered essentially the same subject areas, although in several instances changes in question format were made in an effort to make the questions reasonable to the respondents. Not all questions in the questionnaires are used in this study. The questions used will be indicated, as will the differences between the two questionnaires.

It is recognized that mailback questionnaires often provide limited information, low quality data, and low response rates (Warwick and Lininger 1975). With an adequate design of the questionnaire and sampling, however, many of the problems associated with this type of survey can be avoided (Dillman et al. 1974). Specifically, the mailback questionnaire is the least expensive in terms of field costs compared to personal interviews and phone interviews (Warwick and Lininger 1975). Due to the limited funds available for this study, this factor was important in choosing this method. In addition, this type of survey allows for greater use of rating scales, as compared to personal and phone interviews, which was essential for the larger project of which this study

was a part. Finally, the mailback questionnaire is probably the best means to collect data on a large scale where the major emphasis is on obtaining descriptive information. For these reasons the mailback questionnaire was the instrument chosen.

Visitor Survey Instrument

A 12-page questionnaire was prepared for the visitor that asked the following series of questions:

a. locations visited--activities participated in (Q. 1 & 4);
b. classes of motives for visiting (Q. 6);
c. expenditures (Q. 7);
d. problems experienced (Q. 9);
e. attitudes towards ORV use (Q. 11);
f. preferred management alternatives (Q. 12);
g. attitudes towards the environment (Q. 13);
h. socio-economic variables (Q. 14 through 31).

In addition to these, a brief series of questions was asked the visitor when he was initially contacted at the seashore. These included questions asking the extent of use of the seashore, a name and address question, and observational questions such as the time of day, weather and date (Appendix C).

Survey questions were developed from ideas gathered from National Park Service managers and researchers, members of interest groups, a review of relevant literature, and from other members of the forest recreation staff at Virginia Polytechnic Institute and State University. In the early spring of 1978, the initial questionnaire was pretested

among visitors at Cape Hatteras, local residents of the Outer Banks, various conservation-preservation groups, and NPS researchers. From their responses and suggestions, the final questionnaire was designed to appear professional in nature and to motivate the respondent. Many of the components emphasized by Warwick and Lininger (1975), Dillman et al. (1974), and Wellman et al. (1979) for effective questionnaire design were used. These considerations were important in minimizing low response rates.

In this study, the results for the visitors were derived from data generated from questions 1 through 5, 14 through 30, and the contact sheet questions. Questions 1 through 5 include the primary dependent variables of interest: (1) whether the visitor visited various places within Cape Hatteras on his trip; (2) the time spent at these locations; and (3) the time spent in various recreational activities on that trip. The independent variables of interest and their sources are as follows:

a. ORV/pedestrian status (Q. 3);
b. season of use (contact sheet);
c. who the visitor was with on the trip (contact sheet);
d. experience with Cape Hatteras (contact sheet);
e. length of trip (contact sheet);
f. age (Q. 24);
g. sex (Q. 23);
h. occupation (Q. 30);
i. education (Q. 29);
j. marital status (Q. 25).

The specific format of the dependent variables is discussed in the next section.

Resident Survey Instrument

The visitor questionnaire was modified for use with the residents. Only those changes on the variables pertinent to this study are discussed. First, for the dependent variables, the questions asking the visitor where he went on his visit were reworded and the level of measurement was changed for the local resident questionnaire. For example, the visitors' question dealing with Wright Brothers Memorial was constructed as such:

	Yes, Stopped there	If visited, for how long
Wright Brothers Memorial	( )	_____

Thirty locations were listed in this manner, and pertained to just that particular visit. The local resident questions dealt with the same areas except they were reworded to ask whether the resident had visited the location since January 1, 1978, and if so, how many times. The format for this was:

	Number of times visited			
	never	1-10	11-20	21 or more
Wright Brothers Memorial	( )	( )	( )	( )

Second, the questions asking what activities the visitors participated in on their visit were reworded and rescaled for the residents. For the visitors, the general form of the questions was:

	Number of different days	Average time per day
Swimming and Sunbathing	_____	_____

There were 13 activity questions asked. The local resident questions for the same 13 activities were changed to indicate the number of different times they participated in each activity since January 1, 1978, and the average time per day. The general format for the activity variables for the local residents, then, was:

	Number of different times			
	never	1-10	11-20	21 or more
Swimming and Sunbathing	( )	( )	( )	( )

Average time per day: _____

The other differences that existed in the two questionnaires for the purposes of this study were with independent variables. The local resident questionnaire included several questions not relevant for the visitors. Also, since the residents were not contacted on the beach, the initial contact sheet questions were not used or relevant for them. The independent variables used in the local resident analysis and their sources include:

a. ORV/non-ORV ownership (Q. 7)

b. Resident type: Year-round/Seasonal (Q. 25)
Native of the Outer Banks (Q. 11)

c. Years of residency (Q. 29)

d. Age (Q. 16)

e. Occupation (Q. 21)

f. Education (Q. 20)

g. Sex (Q. 15)

Due to time constraints, the resident questionnaire was reviewed only by the members of the research staff, and was not pretested as such. Pretesting was not carried out since the majority of questions were the same as the visitor questionnaire, and since the visitor questionnaire had been pretested among local residents.

Survey Procedures

Visitor Survey Procedures

Sampling of the visitors to Cape Hatteras was conducted from June through November of 1978. At each sampling location, users were contacted by a member of the research staff. If residents of the Outer Banks were contacted, their names and addresses were recorded so they could be sent a resident questionnaire at a later date. Otherwise, a research technician introduced himself, explained the importance of participating in the survey, indicated what was required of the users, and asked the visitor if he or she would participate. Each respondent was then asked a short series of questions, including his or her name and address. As soon as labels were printed for the list of names gathered during a two-day sampling period, the visitors were sent an initial packet of information containing the questionnaire, cover letter, map of Cape Hatteras, and pre-stamped pre-addressed return envelope. All of the visitor cover letters are presented in Appendix D. One week after this initial mailing, a postcard briefly reminding sampled visitors to send in the questionnaire was sent out. Those who had not responded two weeks after the postcard were sent a first follow-up packet containing the same information as the initial information, except for a somewhat stronger cover

letter. Similarly, two weeks after the first follow-up a second follow-up was sent to the remaining non-respondents. This contained a stronger cover letter along with a full packet of material. Using this approach one can expect the response rate to approach 70 percent, assuming the questionnaire is well constructed (Hawk 1978; Dillman et al. 1974).

Resident Survey Procedures

The questionnaire for the local residents was mailed out during the winter of 1978. As with the visitors, the initial packet of material contained the questionnaire, cover letter, map, and return envelope. Similar follow-up techniques were used for the residents as for the visitors. All cover letters for the local residents are presented in Appendix E.

Response

Visitor Response

Five hundred ninety-eight visitors were successfully contacted on-site with only one refusal, and they were sent questionnaires. An additional 36 local residents of the Outer Banks were sampled, representing 5.7 percent of the total sampled use of Cape Hatteras during our sampling period. Of the 598 visitors, 478 returned usable questionnaires, 116 did not respond, and four visitors had given bad addresses or had moved and left no forwarding address. This represented a 80.50 percent total response rate, with 80.39 percent rate for ORV users, and 80.56 percent rate for non-users.

This high response rate is probably attributable to careful questionnaire design, personal contact with the visitor, intensive follow-up

procedures, and to the importance the ORV issue represented to the visitors of Cape Hatteras. Because of this high response rate, non-response checks were not deemed necessary.

Resident Response

Four hundred thirty-two questionnaires were initially sent out with first-class postage to local residents of the Outer Banks. Of the original 432, 90 were returned as undeliverable. Of this 90, 48 were listed as "addressee unknown" or "insufficient address," 25 residents were either deceased, invalids, or moved and left no forwarding address, and 17 questionnaires came back marked "unclaimed." This left a sample of 342 residents. Of the 342, 211 returned usable questionnaires, representing a response rate of 60.00 percent.

This response rate is relatively high for phone book surveys of the general population. Williams (1979), for example, reported a 48 percent response rate on a sample of local residents adjacent to the Blue Ridge Parkway in Virginia and North Carolina. The high response in this study can possibly be attributed to the importance of this issue to the residents, in addition to the questionnaire design and follow-up procedures used. In addition, in contrast to Williams' study (1979), which used bulk rate mailing, first-class postage was employed in all mailings. Because of the relatively high response rate, and because of time constraints, no attempt was made to follow up on those who did not respond.

DATA ANALYSIS PLAN

Univariate Analysis

Basic univariate analysis was performed (1) on the general characteristics variables such as age, education, and occupation; and (2) on both the locations visited and activity variables for the visitors and residents. Specifically, the proportions of visitors and local residents using each site, and groups of similar sites (e.g., visitor centers, or lifeguarded beaches) were calculated, along with the average time spent in each location. Similarly, the proportion of visitors and local residents participating in each specific activity and the average time spent per day were calculated. Standard descriptive statistics of central tendency and dispersion were calculated on the time spent measures.

Bivariate Analysis

An initial test was performed to check for differences between ORV users and pedestrians for both the local residents and visitors. When no differences existed these two user groups were combined and analyzed together. Otherwise, they were treated as separate entities. From that point, a further breakdown of the visitors was done by the variables listed below:

a. Date sampled (from contact sheet): Pre-Labor Day/Post-Labor Day
b. Experience with the Seashore (from contact sheet): First visit/Not first visit

Further breakdown of local use of the seashore past the ORV/non-ORV analysis was limited by small sample sizes.

Chi-square analysis was used for comparing subgroups on the differences in proportion of visitors and residents that participated in certain activities and visited certain sites. In addition to the use of chi-square tests of significance, analysis of variance (ANOVA) was used to check for differences in time spent in locations and activities for subgroups. Appropriate measures of association were computed to explore additional relationships. The SPSS (Statistical Package for the Social Sciences, Second Edition, Nie et al. 1975) statistical package was used in this analysis.

RESULTS AND DISCUSSION

The purpose of this study was to describe the activity patterns of visitors and local residents with respect to Cape Hatteras, and to examine the behaviors of several managerially relevant subgroups of these populations. Because of the differences in the type and level of measurement on the activity pattern variables for the visitors and residents, each had to be discussed separately. Therefore, the analysis and discussion is presented in two parts, with the first part concerning visitors and the second pertaining to local residents. First, though, the general characteristics of each sampled population are presented.

Visitor and Local Resident Characteristics

Prior to a discussion of the use of Cape Hatteras National Seashore the clientele will be briefly described. Table 2 presents a group of variables that describe the visitors as a whole. Some interesting characteristics were established. The majority of visitors to Cape Hatteras were not first-time visitors, with 83 percent having been there previously. In addition, the average year of the first visit was 1969, with an average of 4.6 visits per year. The standard deviation for the 4.6 visits per year was exceedingly high, 7.3 visits. Use seemed to be quite extensive, but there was a lot of variability in the yearly attendance patterns.

Over 94 percent of the visitors spent between zero and 14 days at Cape Hatteras, with 70 percent spending seven or fewer days. The mean number of days per trip was nearly seven days, but again, this average had a large standard deviation of 5.8 days. Only 30 percent of all

Table 2. General characteristics of the visitors.

Category	Percent	n[a]
Experience		
First Visit	17	79
Not First Visit	83	377
	100	456
Mean Year of First Visit: 1969		
Mean Visits per Year = 4.6	S.D. = 7.3	
Length of Trip		
0-7 days	72	339
8-14 days	23	106
15-21 days	3	16
21+ days	2	9
	100	470
Mean Length of Trip = 6.8	S.D. = 5.8	
Who Respondent With		
Alone	14	68
Family	43	206
Friends	18	85
Family/Friends	25	119
	100	478
Marital Status		
Married	75	354
Single	25	120
	100	474
Sex		
Male	83	392
Female	17	81
	100	473
Age: Mean = 35 years	S.D. = 12 years	
Job Status		
Working	77	362
Temp. Laid Off	0	0
Unemployed	2	8
Retired	8	37
Perm. Disabled	1	5
Fulltime Homemaker	5	22
Fulltime Student	7	35
	100	469

[a] Sample size difference in this table and all tables in this study are the result of excluding those respondents from each calculation who failed to answer the corresponding question.

visitors spent three or fewer days at the seashore. Visitation, then, was highly variable, but overall, seemed to be of a long duration. The seashore received little day or weekend use, and therefore, is probably used primarily as a place to spend a vacation.

More than two-thirds of all visitors visited with just family, or family and friends, whereas only one-third of all visitors came alone or just with friends. Adding to this fact was the large percentage of visitors who were married (75 percent). Not only does the seashore support experienced frequent visitors who come on vacations, but these visitors are represented mostly by people who bring their family and a few friends with them.

Over four-fifths of the visitors sampled were male. This figure is misleading in that females are probably under-represented. As mentioned previously (page), parties were sampled, and when a family was interviewed, the male was usually the one to respond. No attempt was made to alternate between type of respondent.

The mean age of the visitor to the seashore was 35 years, with a standard deviation of only 12 years. This seems consistent given the large proportion of users who were married (75 percent), working (77 percent), and who came with their families or families and friends (68 percent). Because of the location and nature of the seashore (i.e., 100 miles from the nearest major population center, and 72 miles long), use of the area came primarily from people who were middle-aged and self-supporting. Over 85 percent of the visitors sampled were either working or retired.

Since the major emphasis in this study is to compare ORV users and pedestrians, the general characteristics of each are presented in Table 3. It is evident from the table that some major differences exist. Pedestrian users had a greater tendency to be first-time visitors. Nearly 30 percent were first-time visitors, versus only 6 percent for the ORV users. ORV users visited Cape Hatteras somewhat more often each year, although the variation was large. They averaged nearly six visits per year, as compared to around three for the pedestrian users. The variation in trip stay was also large. Other comparisons between ORV users and pedestrians include the facts that ORV users (1) were represented more by males; (2) tended to have completed less formal education; (3) were more likely to be married; (4) were slightly older; and (5) tended to come to Cape Hatteras with family and friends more so than the pedestrian users.

Table 4. presents the general characteristics of the local residents of the Outer Banks. Examining this table reveals that 88 percent were year-round residents, and 12 percent were seasonals. For the seasonal residents, over 85 percent spent 20 or fewer weeks living in the area during 1978, with a mean of 15 weeks. Only 41.5 percent of the residents were natives of the area (e.g., were born there and had lived there a large portion of their lives). Further, almost 50 percent of all residents had lived ten or fewer years in the Outer Banks. The mean number of years of residency was around 21 years. The population of the Outer Banks seems to have been influenced rather heavily by people recently moving there, either permanently or seasonally.

Table 3. General characteristics of ORV users and pedestrians.

Category	ORV Users Percent	ORV Users n	Pedestrians Percent	Pedestrians n
Experience				
First visit	6	16	29	62
Not first visit	94	239	71	153
	100	245	100	215
Mean year of first visit = 1966 Mean visits per year = 5.6; S.D. = 7.4			Mean year of first visit = 1966 Mean visits per year = 3.1 S.D. = 7.1	
Length of Trip				
0-7 days	63	160	82	175
8-14 days	29	74	15	32
15-21 days	5	11	2	5
21+ days	3	7	1	1
	100	252	100	213
Mean = 7.5 days; S.D. = 5.9			Mean = 5.7 days S.D. = 12.4	
Who Respondent With				
Alone	11	28	18	38
Family	42	108	44	96
Friends	17	44	19	41
Family/Friends	30	76	19	41
	100	256	100	216
Marital Status				
Married	82	209	65	140
Single	18	45	35	75
	100	254	100	215
Sex				
Male	90	227	75	161
Female	10	26	25	54
	100	253	100	215
Job Status				
Working	79	200	75	159
Temp. Laid Off	0	0	1	1
Unemployed	0	0	4	8
Retired	11	27	4	9
Perm. Disabled	1	3	1	2
Fulltime Homemaker	4	10	5	11
Fulltime Student	5	14	10	21
	100	254	100	211
Education				
0-4 years	0	0	0	0
5-8 years	2	5	2	5
Some High School	9	24	5	11
Technical Sch. Instead	1	3	1	2
Completed High School	29	74	19	41
Post-H.S. Business School/Trade School	8	21	6	12
1-3 Years College	23	57	23	49
Completed College	14	34	26	57
Advanced Degree	14	34	18	38
	100	252	100	215

Table 4. General characteristics of the local residents.

Category		Percent	n
Residential Status:	Year-round	88	151
	Seasonal	12	21
Weeks per Year Live in Outer Banks (Seasonals Only):			
0-10		33	7
11-20		48	10
21-30		5	1
31+		14	3
		100	21
Mean = 14.9 weeks; S.D. = 12.4			
Raised in the Outer Banks:		41.5	80
Number of Years Lived in Outer Banks (Year-round Residents Only):			
0-5		30	54
6-10		20	35
11-20		12	22
21-30		13	23
31-40		8	14
41-50		4	7
51-60		7	12
61-70		4	8
71+		2	4
		100	179
Mean = 20.6 years; S.D. = 20.7			
ORV Status:	Now Own	41	81
	Not Now Own	55	109
	Plan to Buy	4	10
		100	200
Sex:	Male	80	161
	Female	20	40
		100	201
Marital Status:	Married	83	172
	Single	17	35
		100	207
Age:	16-24	5	11
	25-34	20	39
	35-44	14	28
	45-54	14	29
	55-64	27	55
	65-74	17	35
	75+	3	6
		100	203
Mean = 49.8; S.D. = 16.4			
Education:	0-4 years	1	1
	5-8 years	5	10
	Some High School	12	25
	Technical School Instead	2	5
	Completed High School	24	50
	Post-High School Business School/Trade School	11	23
	1-3 years College	15	30
	Completed College	21	42
	Advanced Degree	9	18
		100	204
Job Status:	Working	55	110
	Temporarily Laid Off	2	4
	Unemployed	2	5
	Retired	34	67
	Permanently Disabled	1	1
	Fulltime Homemaker	4	9
	Fulltime Student	2	4
		100	200

When the recent and long-term residents were compared on several socio-economic variables, some differences became evident. Table 5 presents these comparisons. The mean age for the resident who had lived between zero and five years in the Outer Banks was 47 years, and 52 years for the resident of six to ten years. For the long-term resident, the mean age was 50 years. Little age difference was found between these groups. Large differences were present, though, when education was considered. Specifically, 46 percent of the zero to five year residents had completed college or had an advanced degree, as compared to only 21 percent for the 21 or more years resident. The percentage of recent residents who were retired also seemed to be slightly greater than for the residents of some duration. These results suggest a trend toward an immigrating resident who is somewhat more educated, and slightly more likely to be retired than the long-term residents.

Examining Table 4, again, reveals ORV ownership to be slightly lower than non-ownership. Around 40 percent of the residents owned an ORV, while 60 percent did not own one. This relationship should be interpreted with caution, because ORV ownership and use of the seashore may not be correlated. Actual use by each of these groups is of greater management interest.

Summarizing Table 4, the residents of the Outer Banks were mostly year-round residents who had lived in the area for a long time, but a large percentage had recently moved there. There was also a large proportion of highly educated and retired residents, with the recent residents being much more educated and a slightly larger percentage being

Table 5. Age, education, and working status of residents by number of years of residency.

	Years of Residency		
	0-5	6-20	21+
Age (years)	47	52	50
Completed college and had advanced degree (percent)	46	27	21
Retired (percent)	30	47	27
	(n=54)	(n=56)	(n=94)

retired than the long-term residents. Two types of residents might exist--natives of the Outer Banks and immigrants to the area. Each group may hold differing views on how to use and manage the area, because of differences in their background characteristics. Age, education, and working status were the only characteristics discussed. A further analysis of the differences in these residents could provide the managers of Cape Hatteras a better understanding of what is desired and expected from each of these resident types. Also, by monitoring the trends in the type of resident of the Outer Banks, planners can better predict who the future resident will be, and can improve their ability to provide the right kind of recreational opportunities.

Visitor Activity Patterns

Location Variables

An examination of visitor use of specific locations is the next step in the analysis. These results are presented in Table 6, and contain the percentage of all visitors who went to the various locations at Cape Hatteras. Also shown is the time spent at these locations in terms of the average time per day and average time per trip. These time spent measures are calculations based only on those who visited each location, rather than on the sample as a whole.

It can be seen in Table 6 that the lighthouse at Cape Hatteras is the most popular of the visitor centers. Forty-seven percent of all visitors stopped there, as compared to 40 percent for the Wright Brothers Memorial. This is somewhat surprising, since the Wright Brothers exhibit is the major National Park Service visitor center facility at Cape

Table 6. Visitor use of locations at Cape Hatteras.

Location	Percent Visited	Number Visited	Time per Day	S.D.	Time per Visit	S.D.
Visitor Centers						
Wright Brothers Memorial	39.7	186	0.46	0.73	1.93	2.22
Fort Raleigh	16.2	76	0.39	0.37	2.11	1.78
Whalebone Junction Information Station	8.9	42	0.12	0.15	0.57	1.01
Sandcastle	13.4	63	0.43	0.95	1.68	2.51
Oregon Inlet Visitor Center	18.1	85	0.47	2.09	2.75	10.57
Bodie Island Lighthouse	19.1	90	0.20	0.24	1.06	1.15
Cape Hatteras Visitor Center	29.6	139	0.32	1.13	1.88	6.34
Cape Hatteras Lighthouse	47.2	222	0.46	1.42	2.68	9.01
Ocracoke Visitor Center	21.1	99	0.18	0.29	1.41	2.84
Ocracoke Lighthouse	16.2	76	0.19	0.54	1.14	2.40
Campgrounds						
Oregon Inlet	17.0	80	7.90	5.00	45.61	40.84
Salvo	18.5	87	9.36	6.40	42.42	33.91
Cape Hatteras	16.2	76	7.93	4.90	65.20	63.68
Frisco	12.6	59	8.75	4.69	71.93	56.86
Ocracoke	6.6	31	3.13	3.44	26.63	35.78
Fishing Piers						
Rodanthe	14.5	68	1.98	3.28	12.61	33.13
Avon	18.5	87	1.15	1.89	8.65	21.27
Hatteras	18.9	89	1.60	3.11	12.77	31.67
Lifeguarded Beaches						
Coquina	20.4	96	2.42	2.84	13.09	30.28
Oregon Inlet	10.0	47	5.03	4.60	39.87	51.85
Salvo	15.3	72	5.48	5.70	27.21	40.37
Cape Hatteras	18.1	85	2.22	3.55	15.62	80.89
Frisco	9.4	44	5.67	4.61	45.51	44.07
Ocracoke	8.5	40	1.89	6.14	7.87	13.37
Other Areas						
Sound-side Beaches	20.0	94	2.22	7.20	11.26	16.30
Undesignated Ocean Beaches	49.5	233	5.00	5.38	29.29	35.07
Oregon Inlet	37.2	175	2.97	3.53	13.12	22.12
Hatteras Inlet	31.5	148	2.47	3.30	14.09	20.96
Ocracoke Inlet	15.3	72	1.44	1.89	8.45	11.16
Pea Island National Wildlife Refuge	22.3	105	1.84	2.96	11.02	33.53

Hatteras National Seashore. The lighthouse at Cape Hatteras has a very strong attractive power, and this may account for this large attendance. One of the goals in a visitor's trip is most likely to see the lighthouse for which the seashore was named. In addition, the area by the lighthouse offers what is probably the best surf fishing in the Outer Banks.

Also surprising is the fact that only 13.4 percent of all visitors went to the Sandcastle near Coquina Beach. In comparison, over 21 percent of the visitors visited the extremely isolated visitor center at Ocracoke. The relatively low overall percentage of use at the Sandcastle may in part be due to the inclusion of ORV users; use by pedestrians will be seen to be somewhat higher. The Sandcastle is a major interpretive center for children, sponsoring interpretive talks, demonstrations, and many other activities. A better information system to direct families with children to the Sandcastle may result in increased visitation if that is desired. Information stations, such as the one at Whalebone Junction, may not be adequate. Only 8.9 percent of the visitors sampled stopped at the Whalebone Junction Information Station. The need to continue providing a diverse system of interpretive facilities may be also evident, since the proportions of visitors going to many of the facilities was approximately equal. Still, less than 25 percent of all visitors went to seven of the ten visitor centers and interpretive facilities. If there is a high priority given to interpretation of Cape Hatteras, there is a need for improvement in reaching the visitors.

Time spent at these visitor centers and interpretive facilities was

highly variable, as are the time spent measures in every table in this study. In almost every case the standard deviation was larger than the mean for time spent in visitor centers. This is not uncharacteristic of time budget data (Marans and Wellman 1978). The extreme variation indicates how differently individuals use their time. From a statistical point of view, any conclusions made about differences in the use of time without tests of significance are open to question. This is especially true when the differences between means are small and the variation about each mean is large. In the case of the time spent measures for the visitor centers, little can be said for those reasons. Not only were the mean times similar between visitor centers, but the standard deviations were very large. For this reason, there is little discussion on time spent measures in this study, except when tests of significance were actually performed, or when large differences existed between means.

Examining Table 6 further reveals that all campgrounds were visited approximately equally, except for the Ocracoke campground. But, time spent in Cape Hatteras and Frisco campgrounds was at least 20 hours more per trip on the average than all other campgrounds. Frisco campground was the most popular, with an average stay of 72 hours (six days). This time comparison can reasonably be made because of the large differences in the mean times, and standard deviations that are smaller than the mean. It is interesting to point out that the Frisco campground offers the most diverse terrain, with rolling sand dunes often secluding one campsite from another. This campsite might attract visitors who intend to stay for long periods of time. This is valuable for management to

know because the nature of the terrain should be considered in planning for future campgrounds.

Of those visitors who visited the lifeguarded beaches, the Coquina Beach facility received the most use, with over 20 percent visiting. Coquina Beach is a very intensely developed facility, relative to the others. It offers modern shower, bathroom and picnicking facilities along with ample parking areas to accommodate large crowds. From a planning point of view, the fact that Coquina received only this amount of use might not seem to justify the expenditure of funds for similar facilities. The lifeguarded beach of Cape Hatteras, with no such facilities, received almost as much use, with 18 percent of the visitors visiting.

Even though the Frisco lifeguarded beach received only 9.4 percent of the visitors, the average time spent there was the largest, over 45 hours per trip. This makes intuitive sense in light of the discussion of the use of the campground. In fact, the degree of association (phi) between staying in the campground and visiting the lifeguarded beach was 0.58[4] ($p \leq .0000$). This relationship was true for all campground areas that had adjacent lifeguarded beaches (Table 7). These areas included Oregon Inlet, Hatteras, Salvo, and Ocracoke. All associations are significant at the $p \leq .001$ level (Table 7).

As would be expected, those visitors who stayed in the campgrounds seemed to visit those lifeguarded beaches adjacent to or very near those campgrounds. This relationship can be seen in Table 7, where visitation

[4]Phi (ϕ) is the proper measure of association for nominal level variables, especially for 2 x 2 tables. The statistic was computed for each combination of campground and lifeguarded beach (yes, stopped there, or no, did not). Phi takes on the value of 0 for no relationship, and +1 when the variables are perfectly related.

Table 7. The degree of association between campground and lifeguarded beach visitation.

Lifeguarded Beaches	Campgrounds				
	Oregon Inlet	Salvo	Cape Hatteras	Frisco	Ocracoke
Coquina	.19**	.02	.02	.03	.10
Oregon Inlet	.51**	.02	.01	.02	.20**
Salvo	.05	.62**	.09	.09	.05
Cape Hatteras	.04	.01	.23**	.14**	.12*
Frisco	.01	.02	.12*	.58**	.18**
Ocracoke	.09	.01	.14**	.14**	.38**

*Significantly different from zero at the Alpha = 0.05 level.

**Significantly different from zero at the Alpha = 0.01 level.

at each campground was compared (phi statistic) with visitation at each lifeguarded beach. Use of the Salvo campground, for example, did not significantly correlate with any lifeguarded beach except the Salvo beach. Oregon Inlet campgrounders visited in any consistent fashion only the Inlet campground beach and the Coquina facility a few miles down the road. Thus, it is clear that campground visitors use the adjacent lifeguarded beaches. This data could indicate to managers the possibility of separating campers from non-campers in their use of lifeguarded beaches. If it were desired to separate these two groups for some reason, locating other lifeguarded beaches away from those in the campgrounds might assure use by just the non-campers. The campers would be expected to use those beaches in the campgrounds or ones very near. Separating these two groups would be appropriate, for example, when the characteristics of each group are different such that it would cause losses in visitor satisfaction from constant interaction.

The next step in the analysis was to examine the use of Cape Hatteras for ORV users and pedestrians. From an examination of Table 8, it is evident that the two user groups were, in fact, distinctly different. Seven out of the ten visitor centers and interpretive facilities received a significantly greater use, in terms of actual numbers and percentages, from pedestrian users than from ORV users. The other three areas showed the same trend, but differences there were not significant. Campground use was different only for the Salvo and Cape Hatteras campgrounds. Twenty-one percent of the ORVers used the Cape Hatteras campground as compared to only 9.8 percent of the pedestrians. Conversely, Salvo received the greater percentage of pedestrians, 26.6 percent, than

Table 8. Visitor use of locations for ORV users and pedestrian users.

Location	ORV (Percent Visited)	(N=250) n	Non-ORV (Percent Visited)	(N=214) n
Visitor Centers				
**Wright Brothers Memorial	33.7	84	47.2	101
Fort Raleigh	14.0	35	19.2	41
**Whalebone Junction Information Station	5.2	13	13.6	29
**Sandcastle	8.0	20	20.1	43
*Oregon Inlet V.C.	14.4	36	22.0	47
*Bodie Isl. Lighthouse	14.8	37	23.8	51
*Cape Hatteras V.C.	25.2	63	34.6	74
*C. Hatteras Lighthouse	43.2	108	52.8	113
Ocracoke Visitor Center	24.8	62	17.3	37
Ocracoke Lighthouse	17.6	44	15.0	32
Campgrounds				
Oregon Inlet	14.8	37	19.2	41
**Salvo	11.2	28	26.6	57
**Cape Hatteras	21.2	53	9.8	21
Frisco	12.8	32	12.6	27
Ocracoke	6.4	16	7.0	15
Fishing Piers				
**Rodanthe	19.2	48	7.9	17
**Avon	25.2	63	11.2	24
**Hatteras	24.4	61	12.6	27
Lifeguarded Beaches				
**Coquina	7.6	19	36.0	77
**Oregon Inlet	4.4	11	16.4	35
**Salvo	5.2	13	27.1	58
Cape Hatteras	16.8	42	20.1	43
Frisco	8.4	21	10.7	23
*Ocracoke	5.6	14	12.1	26
Other Areas				
**Sound-side Areas	25.2	63	14.0	30
Undesignated Ocean Beaches	52.4	131	47.0	101
**Oregon Inlet	51.6	129	20.6	44
**Hatteras Inlet	46.8	117	14.5	31
**Ocracoke Inlet	21.6	54	8.4	18
*Pea Island Natl. Wild. Ref.	26.8	67	16.8	36

*Significantly different at the alpha = 0.05 level.

**Significantly different at the alpha = 0.01 level.

ORVers, 11.2 percent. The Cape Hatteras campground is located next to the "point," a prime fishing location. Fishing and ORV use, as will be shown, were highly related. The Salvo campground is located away from any major fishing spots; therefore, it received little ORV use. The location of the campgrounds with respect to popular fishing spots helps to explain use at each campground. This relationship might also indicate that the heavy ORV use of the Cape Hatteras area was displacing the pedestrians from using this location. Past research has shown that non-motorized users tend to avoid motorized recreationists (Gilbert et al. 1972). Although further data is necessary to make more substantive conclusions, this data does provide some evidence of possible conflict.

Fishing piers were visited significantly more by ORVers than by pedestrians. This relationship was very stable throughout the study, and can be explained by the fact that most ORV users were fishermen. Nearly 75 percent listed the major reason for visiting as either surf fishing or pier fishing, as compared to 12.9 percent for pedestrian users.

Finally, in every case but one, ORV users used the other areas of Cape Hatteras, such as the sound-side areas or the various inlets, more than the pedestrians. Specifically, 25 percent of the ORV users visited the sound-side areas as compared to 14 percent of the pedestrian users. Almost three times the percentage of ORV users used the inlet areas, where fishing-related and other ORV traffic was high, than did pedestrians. Almost 27 percent of the ORV users visited Pea Island National Wildlife Refuge, compared to 16.8 percent for the pedestrian users. There was no significant difference between these two groups in their

proportional visitation of undesignated ocean beach areas. The fact that Pea Island National Wildlife Refuge received a larger percentage of use from ORVers than from pedestrians was surprising, since the beaches of Pea Island were closed to ORV use during the sampling period (June through November 1978). ORV visitors may have tried to drive these beaches, found them closed, and still reported visiting this area. The ORVers, though, could have parked their vehicles and used the area as pedestrians would. No firm statements can be made for the ORV users' greater visitation than the pedestrians' at Pea Island.

To further highlight the differences that exist between these two groups, a location index was computed for each major grouping of locations (Table 9). The index is the sum of the different areas visited--e.g., the number of fishing piers visited, the number of visitor centers visited, or the number of lifeguarded beaches visited. The differences between the ORV and pedestrian users were highly significant for every index. The visitor center index, for example, indicates that over 40 percent of all ORV users did not go to one visitor center or interpretive facility. For the pedestrians, though, only 17.6 percent did not visit any. The other indices reveal similar relationships--that is, the ORV user went to fewer campgrounds, went to more of the fishing piers and other areas, and went to fewer of the lifeguarded beaches. ORV users and pedestrians seemed to be at the seashore for differing reasons.

These two user groups, then, were strikingly dissimilar in their locational choices. Relatively speaking, the pedestrian visitor of Cape Hatteras went to areas that provided him with interpretive and cultural

Table 9. Comparison of the number of sites visited for ORV and pedestrian visitors.

Location Index	Number of Sites Visited	ORV Percent Visited	ORV n	Non-ORV Percent Visited	Non-ORV n
*Visitor Centers and Interpretive Facilities	0	40.2	103	17.6	38
	1	13.3	34	19.4	42
	2	12.9	33	20.8	45
	3	10.9	28	12.5	27
	4	8.2	21	10.6	23
	5	5.5	14	6.9	15
	6	4.7	12	3.7	8
	7-10	4.3	11	8.3	18
		100.0		100.0	
*Campgrounds	0	56.3	144	41.2	89
	1	30.5	97	46.8	101
	2	8.6	22	9.3	20
	3-5	4.7	12	2.8	6
		100.0		100.0	
*Fishing Piers	0	50.4	129	74.1	160
	1	37.9	97	21.8	47
	2	5.9	15	2.8	6
	3	5.9	15	1.4	3
		100.0		100.0	
*Lifeguarded Beaches	0	72.3	185	23.6	51
	1	18.4	47	47.7	103
	2	3.9	10	16.7	36
	3	2.7	7	9.3	20
	4-6	2.7	7	2.8	6
		100.0		100.0	
*Other Areas	0	10.9	28	28.7	62
	1	22.3	57	42.1	91
	2	27.7	71	14.8	32
	3	21.9	56	10.2	22
	4-6	17.2	44	4.2	9
		100.0		100.0	

*Significantly different at the alpha = 0.01 level.

learning experiences; he went to areas to swim and sunbathe, either at lifeguarded beaches or undesignated ocean beaches; and he went to camping facilities more than the ORV user. The ORV user, on the other hand, seemed to be oriented in his use of the seashore quite differently. Areas that provided fishing and ORV opportunities were used the most. He specifically avoided the lifeguarded beaches--72 percent did not visit any. Most use went to the "other areas," where fishing and ORV use could both be done. The only confusing relationship found was in the use of the Pea Island Refuge. A larger percentage of ORV users visited this area than pedestrians, even though the beaches of the Refuge were closed to ORV use.

From a management and planning perspective, the results are very valuable. First, from a broad management viewpoint, any plan must always consider its effect on each of these visitor types. Planning for an average or overall visitor would not be advisable, since an average visitor was found not to exist. Second, visitor centers often can provide an excellent opportunity to distribute information to the park visitor. Information can also be distributed to the ORV user at visitor centers regarding ORV regulations, and can even be used to interpret the effects ORV's have on the environment, wildlife, or other people. Evidence suggests that the visitor centers and interpretive facilities of Cape Hatteras may not be able to accomplish this objective for the ORV user. Most ORV users are repeat visitors who probably have been to these areas before. Only 6 percent of the ORV visitors were first-time visitors. A large percentage (40 percent) of ORVers went to no visitor

centers, and seemed to be at Cape Hatteras just to fish. The NPS may need to develop another means to educate and distribute information to the ORVer if it places this high upon the list of priorities. Third, if restriction of ORV use is necessary, this data may be useful in making intelligent decisions on where to restrict use. Every campground received use differently from these two user groups. Oregon Inlet, Frisco, and Ocracoke, for example, received generally the same use. Cape Hatteras campground received twice the percentage of ORVers as pedestrians. Salvo beach was just the opposite. It would not be wise, consequently, to restrict ORV use at the lighthouse area (Cape Hatteras campground), given these findings. Not only do ORV users stay there in greater proportions, but the best fishing is adjacent to the campground, on what is called the "point." The Salvo area would seem to be one logical restricted area. Similarly restriction of the inlet areas would seem unwise due to the fact that nearly 50 percent of the ORV users visited each of these areas. These inlets are ideal fishing spots and are the primary reason for the large ORV use. It should be noted that these comments on restricting use are based on reducing social conflict as the goal. If the goal is to reduce biophysical impacts, restrictions would be needed at these intensively used areas.

There may be many other uses of the data from a management point of view. However, many relationships may be hidden and/or spurious without considering the effects of situational variables, such as season and experience with the area. These are the variables considered next in this study. Since differences exist between ORV users and pedestrians,

each must be analyzed separately. The ORVers and their participation at the various locations will be discussed first, followed by a discussion of pedestrian behavioral patterns.

ORV Visitors

Season. Sampling took place from June through November as already noted. This represented essentially two seasons, pre-Labor Day (summer) and post-Labor Day (fall). Pre-Labor Day users participated in many activities besides fishing. Post-Labor Day users were there exclusively for fishing purposes (Table 10). It is for this reason that the sample is divided this way. It is often felt by ORVers themselves and local residents that there are two distinct types of ORV users, depending on the season. This analysis should bear on this issue. Table 11 shows the relationship for ORV users broken down by season.

The major finding shown in Table 11 is that season influenced use very little for visitation to visitor centers, campgrounds, and fishing piers. It did, though, for use of the other areas of the seashore. In no case was there a statistically significant difference for participation at any of the 10 visitor centers or interpretive facilities. In fact, the rank orders of participation were very similar, with Cape Hatteras Lighthouse first in use, Wright Brothers Memorial second, and so on down the list. For campgrounds, only one difference was noted, and for fishing piers there was no difference.

Use of the other areas of the seashore, although not immediately observable, was quite different. The ORV user in the summer seemed to be more active, using his vehicle to go more places. The ORVers in the

Table 10. Percent of ORV visitors listing an activity as the most important reason for visiting the area.

Activity	Pre-Labor Day ORVers		Post-Labor Day ORVers	
	Percent	n	Percent	n
Swimming and sunbathing	17.4	29	0.0	0
Surfing	6.6	11	0.0	0
Surf fishing	62.3	104	97.0	65
Pier fishing	3.0	5	3.0	2
Walking for pleasure and beachcombing	2.4	4	0.0	0
Four-wheel-drive pleasure driving on the beach	8.4	14	0.0	0
	100.0		100.0	

Table 11. ORV visitor use of locations for pre-Labor Day and post-Labor Day users.

Location	Pre-Labor Day (N=177) Percent Visited	n	Post-Labor Day (N=77) Percent Visited	n
Visitor Centers				
Wright Brothers Memorial	36.0	62	28.6	22
Fort Raleigh	14.5	25	13.0	10
Whalebone Junction Information Stn.	5.8	10	3.9	3
Sandcastle	9.8	17	3.9	3
Oregon Inlet Visitor Center	15.0	26	13.0	10
Bodie Island Lighthouse	14.5	25	15.6	12
Cape Hatteras Visitor Center	28.9	50	16.9	13
Cape Hatteras Lighthouse	45.1	78	39.0	30
Ocracoke Visitor Center	27.7	48	18.2	14
Ocracoke Lighthouse	17.9	31	16.9	13
Campgrounds				
*Oregon Inlet	9.8	17	26.0	20
Salvo	12.1	21	9.1	7
Cape Hatteras	23.1	40	16.9	13
Frisco	11.0	19	16.9	13
Ocracoke	6.4	11	6.5	5
Fishing Piers				
Rodanthe	16.8	29	24.7	19
Avon	24.9	43	26.0	20
Hatteras	22.0	38	29.9	23
Lifeguarded Beaches[1]				
Coquina	9.2	16	3.9	3
Oregon Inlet	5.8	10	1.3	1
Salvo	6.4	11	2.6	2
Cape Hatteras	21.4	37	6.5	5
Frisco	10.4	18	3.9	3
Ocracoke	6.9	12	2.6	2
Other Areas				
*Sound-side Areas	32.4	56	9.1	7
*Undesignated Ocean Beaches	60.7	105	33.8	26
Oregon Inlet	47.4	82	61.0	47
Hatteras Inlet	46.8	81	46.8	36
Ocracoke Inlet	21.4	37	22.1	17
Pea Island Nat'l. Wildlife Refuge	27.2	47	26.0	20

[1]Too few cases to compute reliable X^2 statistics.

*Statistically significant at the alpha = 0.01 level.

fall were there to fish, not visiting as many areas, and spending more time fishing. This relationship was evident when three facts were observed. First, ORVers in the summer visited five out of the six "other areas" in equal or greater proportions than the fall ORVers. Because a larger or equal percentage of summer ORVers stopped at each location, this suggest that the ORVers stopped at more locations for shorter periods of time in the summer. Second, over 73 percent of the fall ORVers visited two or fewer sites, as compared to the summer ORV users' 55.1 percent. This relationship can be seen from Table 12, which presents an index of the number of "other areas" visited during their trips. Pre-Labor Day ORV users visited significantly more "other areas" than the post-Labor Day ORV users. Third, summer ORVers spent three times as much time per day driving their vehicle for pleasure driving than the fall ORVers. Specifically, summer ORVers spent an average of two hours per day pleasure driving as compared to the fall ORVer, who spent under three-quarters of an hour per day (Table 18).

It is probable that the fall ORV users had specific fishing areas, and spent the majority of time fishing. The summer ORV user was more active, spending a greater amount of time using all of the available unrestricted areas. Given these findings, social conflict is more likely to be present during the summer, because of greater ORV and pedestrian use of unrestricted beach areas. This suggests a need to possibly restrict summer ORV use if social conflict is present.

Experience. For simplicity's sake, experience with Cape Hatteras is measured by whether the respondent had visited previously, or whether

Table 12. Seasonal differences between the number of other areas visited for ORV users.

Number of Other Areas Visited	Percent of ORVers Visiting			
	Pre-Labor Day	n	Post-Labor Day	n
0	10.2	18	11.4	9
1	18.8	33	30.4	24
2	26.1	46	31.6	25
3	26.1	46	12.7	10
4-6	18.8	33	13.9	11
	100.0		100.0	

$X^2 = 9.21$; Significance = 0.0561

this was his first visit. These results are not presented because the number of first-time ORV users was too few; again, the point should be made that 94 percent of all ORV visitors had visited previously.

Pedestrian Visitors

Season. An analysis of the differences in participation at the locations for the pedestrians by season cannot be made. Sampling of post-Labor Day pedestrians resulted in too few cases. The total sample size for pedestrian visitors in the fall was only 16.

Experience. Experience was again measured by whether or not the visitor was a first-time visitor. This particular analysis was not limited by a small sample. The results are presented in Table 13. An examination of this table reveals few statistically significant differences for these pedestrians. But, from a general perspective, first-time visitors went to 21 of the 30 locations listed in the questionnaire in greater proportions. This was anticipated, since the seashore is a novelty to the new visitor.

As far as the visitor centers were concerned, Wright Brothers Memorial and the lighthouse at Cape Hatteras were the most popular for first-time pedestrian visitors. Over 60 percent stopped at the Memorial, and nearly 55 percent visited the lighthouse. For the experienced pedestrian, the participation was somewhat less, as was their order of use. Nearly 52 percent visited the lighthouse, and 41 percent stopped at the Wright Brothers Memorial. Table 14 shows the location index computed for participation at visitor centers. From this table it is evident that first-time visitors were interested in visiting a larger number of

Table 13. Non-ORV visitor use of locations for first time and experienced visitors.

Location	First Visit (N=62)		Not First Visit (N=153)	
	Percent Visited	n	Percent Visited	n
Visitor Centers				
*Wright Brothers Memorial	61.3	38	41.1	62
Fort Raleigh	17.7	11	19.9	30
*Whalebone Junction Information Station	22.6	14	9.9	15
Sandcastle	25.8	16	17.2	26
Oregon Inlet Visitor Center	27.4	17	19.9	30
Bodie Island Lighthouse	24.2	15	23.8	36
Cape Hatteras Visitor Center	38.7	24	33.1	50
Cape Hatteras Lighthouse	54.8	34	51.7	78
Ocracoke Visitor Center	25.8	16	13.9	21
Ocracoke Lighthouse	17.7	11	13.9	21
Campgrounds				
Oregon Inlet	27.4	17	15.9	24
Salvo	33.9	21	23.8	36
Cape Hatteras	9.7	6	9.9	15
Frisco	6.5	4	15.2	23
*Ocracoke	14.5	9	4.0	6
Fishing Piers				
Rodanthe	8.1	5	7.9	12
Avon	4.8	3	13.9	21
Hatteras	9.7	6	13.9	21
Lifeguarded Beaches				
*Coquina	24.2	15	40.4	61
Oregon Inlet	22.6	14	13.9	21
Salvo	35.5	22	23.2	35
Cape Hatteras	29.0	18	16.6	25
Frisco	6.5	4	12.6	19
Ocracoke	12.9	8	11.9	18
Other Areas				
Sound-side Areas	12.9	8	14.5	22
Undesignated Ocean Beaches	41.9	26	49.3	75
Oregon Inlet	14.5	9	23.2	35
Hatteras Inlet	16.1	10	13.9	21
Ocracoke Inlet	11.3	7	7.3	11
Pea Island National Wildlife Refuge	21.0	13	15.2	23

*Significantly different at the alpha = 0.05 level.

Table 14. Experience differences between the number of visitor center facilities visited for pedestrian users.

Number of Visitor Centers and Interpretive Facilities Visited	Percent of Non-ORVers Visiting			
	First-time Visitor	n	Not First-Time Visitor	n
0	8.1	5	21.6	33
1	24.2	15	17.6	27
2	16.1	10	22.9	35
3	9.7	6	13.1	20
4	16.1	10	8.5	13
5	11.3	7	5.2	8
6-10	14.5	9	11.1	17
	100.0		100.0	

$X^2 = 12.05$; Significance = 0.06

these interpretive facilities. Over 40 percent went to four or more visitor centers and interpretive facilities, as compared to less than 25 percent for experienced pedestrians.

Focusing on Table 13 again, it can be seen that first-time pedestrians used the campgrounds more than the experienced pedestrians. For example, over 27 percent stayed at Oregon Inlet campground as compared to close to 16 percent for the experienced pedestrians. Similarly, 14.5 percent stayed at the Ocracoke campground, versus only 4.0 percent for the experienced pedestrian users. In contrast to all of the other campgrounds, use of the Frisco campground seemed to be different. Twice as great a percentage of experienced pedestrians stayed there (15.2 percent) as compared to first-time pedestrians (6.5 percent). This relationship can be only suggestive, since the difference was not statistically significant. But, coupled with previous findings that the length of stay tended to be longest there (p. 43), Frisco campground might have attracted experienced users for long periods of time. Experienced campers had had a chance to observe the campgrounds and decide which was most suited to their needs.

Lifeguarded beach use for the pedestrians presented other interesting results. First-time users used the Salvo lifeguarded beach more than any of the other beaches (35.5 percent). This was compared to the experienced pedestrians, where Coquina Beach received the greatest use (over 40 percent). In addition, use of the lifeguarded beaches seemed to be spread rather evenly over four of the six sites for the first-time pedestrians. But, for the experienced pedestrian user, Coquina was used

twice as much as any other beach. Frisco lifeguarded beach, as would be expected from the previous findings and the positive relation of campground and beach use, was used primarily by experienced pedestrian users. Twice as great a percentage of experienced pedestrians went to the Frisco beach, as compared to first time users. The Frisco beach and campground seemed to stand out as different from the other similar areas of the seashore.

The results presented discussing use of the individual locations by ORV and pedestrian users broken down by season and experience may be useful only in a general sense. They provide the manager with a better understanding of the use of the seashore. When decisions are to be made, whether large or small, knowledge of how the different visitors use the area may provide him with useful insights.

Location Variables--Time Spent

The previous discussion involved very little about the time spent in these locations. This was because of the large variation in time spent by the visitors. Time spent at Frisco campground and lifeguarded beach was the only relationship discussed previously. A closer look at this data, though, follows, to further highlight the differences between the non-ORVers and ORVers.

Several points need to be mentioned before a discussion can follow. First, the time spent measures are calculations based on only those who visited the locations. Those who did not visit were not included. Second, these time estimates were actually biased upward. Visitors often listed "one day" or "two days" as the amount of time spent in a

location. A standard 12-hour visitor day was used to represent one day, even though the visit may not have lasted that long. Listing one day can mean anything from one to 24 hours. Third, in order to limit the amount of analysis, individual locations in each group were combined to form an index of time spent. All visitor centers and interpretive facilities, for example, were combined into an index that represented the total time spent in these visitor centers per day. Similar indices were calculated for time spent in campgrounds, fishing piers, lifeguarded beaches, and other areas of the seashore. The time spent measures, then, are the average time spent per day over all individuals in that group of locations.

Time spent was significantly different for each user group for each index computed (Table 15). But, again, the variation in time was large. The ORVer who visited the visitor centers, campgrounds, and lifeguarded beaches spent less time per day there than the pedestrian user. ORVers spent much more time at the fishing piers and the other areas than the pedestrians. The ORV user seemed to spend time where he could use his vehicle off the road, primarily for fishing purposes. An average of nearly six hours per day was spent in these areas. The pedestrian, though, split his time more nearly equally between lifeguarded beaches and the other areas of Cape Hatteras. An average of over 4.5 hours per day was spent at lifeguarded beaches, with just over three hours per day in the other areas.

Therefore, not only did the ORV visitor and non-ORV visitor visit the various locations in different proportions, but the time spent

Table 15. Differences in time spent at locations for ORV and pedestrian visitors.

Location Index	Average Time/Day (hrs)	
	ORV	Non-ORV
*Visitor Centers and Interpretive Facilities	0.51(1.82)	0.85(1.63)
**Campgrounds	4.04(5.68)	6.44(6.84)
**Fishing Piers	1.03(2.89)	0.30(1.31)
**Lifeguarded Beaches	1.10(3.58)	4.62(6.13)
**Other Areas	6.49(7.18)	3.13(6.46)

*Significantly different at the alpha = 0.05 level.

**Significantly different at the alpha = 0.01 level.

measures were also different. Time spent was highly variable, though, and caution should be taken in making sweeping overall judgments about time spent for this reason.

Activity Variables

While it is important to know the level of use at particular locations within an area and by whom, it is equally important to know what sorts of activities take place and who is participating in them. Ideally, of course, the two should be interwoven. That is, one should know what activities take place where. For this study that was not feasible. High response rates were necessary. They might not have been anywhere near those obtained if the visitor had been asked to describe exactly where he went, for how long, what activities took place there, and for how long for the entire visit to Cape Hatteras. In addition, the attitudinal and preference-related questions were given equal priority.

Nevertheless, knowing in a general sense the level of participation in activities by subgroups of the population may be very useful from a planning and management perspective. Such information gives a good indication of (1) the relative importance of one activity over another, (2) the average time spent in various activities of the whole national seashore, (3) the differences between various user groups, and (4) another characterization of the users of the area.

Table 16 presents the general findings for the visitors as a whole. Listed are the percentages of all visitors participating in the activity on at least one occasion on their trip, the average number of different days, the average time per day, and the average time per trip for each activity. The time spent measures were calculations made on all

Table 16. Visitor participation in activities.

Activity	Percent Partici-pating	n	Average Number Diff. Days	S.D.	Average Time Per Day (hrs)	S.D.	Average Time Per Trip (hrs)	S.D.
Swimming and sunbathing	68.2	319	4.02	4.48	2.86	2.82	17.78	28.67
Surfing	11.1	52	0.67	2.91	0.42	1.42	2.62	13.71
Surf fishing	64.9	301	3.66	5.26	3.45	3.47	20.55	33.00
Pier fishing	22.7	106	0.64	3.07	0.89	1.91	2.66	15.07
Bird watching	10.8	50	0.49	2.07	0.23	1.35	1.56	16.68
Walking for pleasure and beachcombing	61.7	288	3.13	4.29	1.23	1.49	6.12	12.00
Bicycling	2.6	12	0.13	0.95	0.03	0.24	0.14	1.00
Four-wheel-drive plea-sure driving on beach	27.8	129	1.46	3.26	0.84	2.03	4.09	12.58
Dune buggy pleasure driving on beach	0.4	2	0.04	0.54	0.01	0.17	0.08	1.25
Motorcycle pleasure driving on beach	0.4	2	0.01	0.17	0.03	0.45	0.03	0.46
Photography	23.7	111	1.06	2.48	0.42	1.30	1.80	7.05
Picnicking	17.2	80	0.49	1.42	0.33	0.87	0.94	3.27
NPS-conducted programs	12.4	58	0.37	1.25	0.21	0.69	0.59	2.11

visitors, not just those who participated in each activity.

Three activities stood out above all the rest in terms of popularity. These were swimming and sunbathing (68 percent), surf fishing (65 percent), and walking for pleasure and beachcombing (62 percent). The average time per day the visitors spent in these activities was also more than any of the other activities listed in the questionnaire. Specifically, visitors spent an average of over two and a half hours per day swimming and sunbathing, three and a half hours per day surf fishing, and one and a quarter hours per day walking for pleasure and beachcombing. The next most popular activity was using the four-wheel-drive vehicle to pleasure drive on the beach. Less than half as many visitors listed this as an activity, with 27.8 percent participating. The average time per day in this activity, over all visitors, was just over three quarters of an hour per day. Pier fishing and photography were each participated in by around 23 percent of the visitors, with the visitors spending just under an hour per day pier fishing and around half an hour in photography.

Also included in Table 16 are the time spent per trip estimates for each activity. The same relationships found when examining the time measures calculated on a per day basis were also obtained here. For this reason, these results were not discussed. The results presented indicated the strong influence of ORV users on the total use of Cape Hatteras. The data also showed the value of the seashore as a recreational fishing site, not just a sunbathing and swimming area.

One other interesting fact appeared from this table. Dune buggy

use and motorcycle use of Cape Hatteras was almost nonexistent in the survey period (June through November 1978). A total of four people out of 468 visitors actually reported participating in these activities. (Note: Since all sampling was conducted during the day, these results could be biased if a large percentage of dune buggy and motorcycle use occurred at night.) This is a major finding for management of the area. The NPS need not be worried at the present, in terms of actual numbers, about destruction of the beach environment by dune buggies or motorcycles. However, relatively few dune buggies or motorcycles could cause a great deal of environmental damage. Most destruction probably occurs from four-wheel-drive vehicle and pedestrian traffic. Environmental impact studies might focus on the impact of four-wheel-drive vehicle and pedestrian use. In addition, the NPS could probably close the beach to motorcycles and dune buggies without seriously upsetting either significant numbers of these users, or the local economy.

Swimming and sunbathing, and surf fishing, seem to be the activities most participated in by the general population of Cape Hatteras visitors. Time spent in these activities was heavily influenced by whether or not the visitor was an ORV user. Therefore, any discussion of time spent in activities should be done after this analysis. These differences are shown in the next table, Table 17.

Eight out of 11 activities received significantly different use from each user type. The ORV user spent less time swimming and sunbathing, walking for pleasure and beachcombing, photographing, picnicking, and on NPS-conducted programs. He spent more time than the pedestrian

Table 17. Time spent in activities for ORV users and pedestrians.

Activity	ORV		Pedestrian	
	Average Time Per Day(hrs)	S.D.	Average Time Per Day(hrs)	S.D.
**Swimming and sunbathing	2.01	(2.36)	3.83	(2.77)
Surfing	0.41	(1.33)	0.40	(1.46)
**Surf fishing	5.31	(3.16)	1.25	(2.08)
**Pier fishing	1.12	(2.12)	0.61	(1.59)
Bird watching	0.28	(1.77)	0.18	(0.52)
**Walking for pleasure and beachcombing	1.01	(1.58)	1.47	(1.22)
Bicycling	0.04	(0.24)	0.03	(0.25)
**Four-wheel-drive pleasure driving on the beach	1.57	(2.57)	0.00	(0.14)
Dune buggy pleasure driving on the beach	0.02	(0.23)	0.00	(0.00)
Motorcycle pleasure driving on beach	0.02	(0.23)	0.04	(0.62)
**Photography	0.25	(0.80)	0.62	(1.71)
*Picnicking	0.24	(0.79)	0.44	(0.99)
**NPS-conducted programs	0.12	(0.48)	0.33	(0.87)

*Significantly different at the alpha = 0.05 level.

**Significantly different at the alpha = 0.01 level.

in only two activities, surf fishing and using the four-wheel-drive vehicle to pleasure drive. In addition, the ordering of activities was different for the two user groups, as shown in Figure 5. For the ORVer, surf fishing far surpassed all other activities. ORVers spent an average of over five and a quarter hours per day in that activity. Swimming and sunbathing was next, with an average of 2.01 hours per day of their visit. Pleasure driving ranked higher than pier fishing, and pier fishing was ordered similarly to walking for pleasure and beachcombing. The ORVer was not there solely to fish; he was there to use the vehicle in the unrestricted beach for fishing, swimming, or pleasure driving purposes. The results presented in the next section will reveal that the fall ORVer was almost exclusively interested in surf fishing, while the summer ORVer spent time in other activities besides surf fishing.

For the pedestrian, swimming and sunbathing far surpassed all of the other activities (3.83 hours per day). Walking for pleasure was next with an average of 1.47 hours per day. Pedestrians also seemed to be interested in fishing, with surf fishing ranked third in terms of the average time per day (1.25 hours per day). The pedestrian visitor, then, seemed to be at Cape Hatteras primarily to swim and sunbathe, with walking for pleasure and surf fishing as part-time activities. These differences may be the result of seasonal visitor differences. Table 18 presents this data.

Season. Data on the seasonal differences for the pedestrian were not presented. This was because only 16 observations were obtained on the post-Labor Day pedestrians, and because the time spent measures were

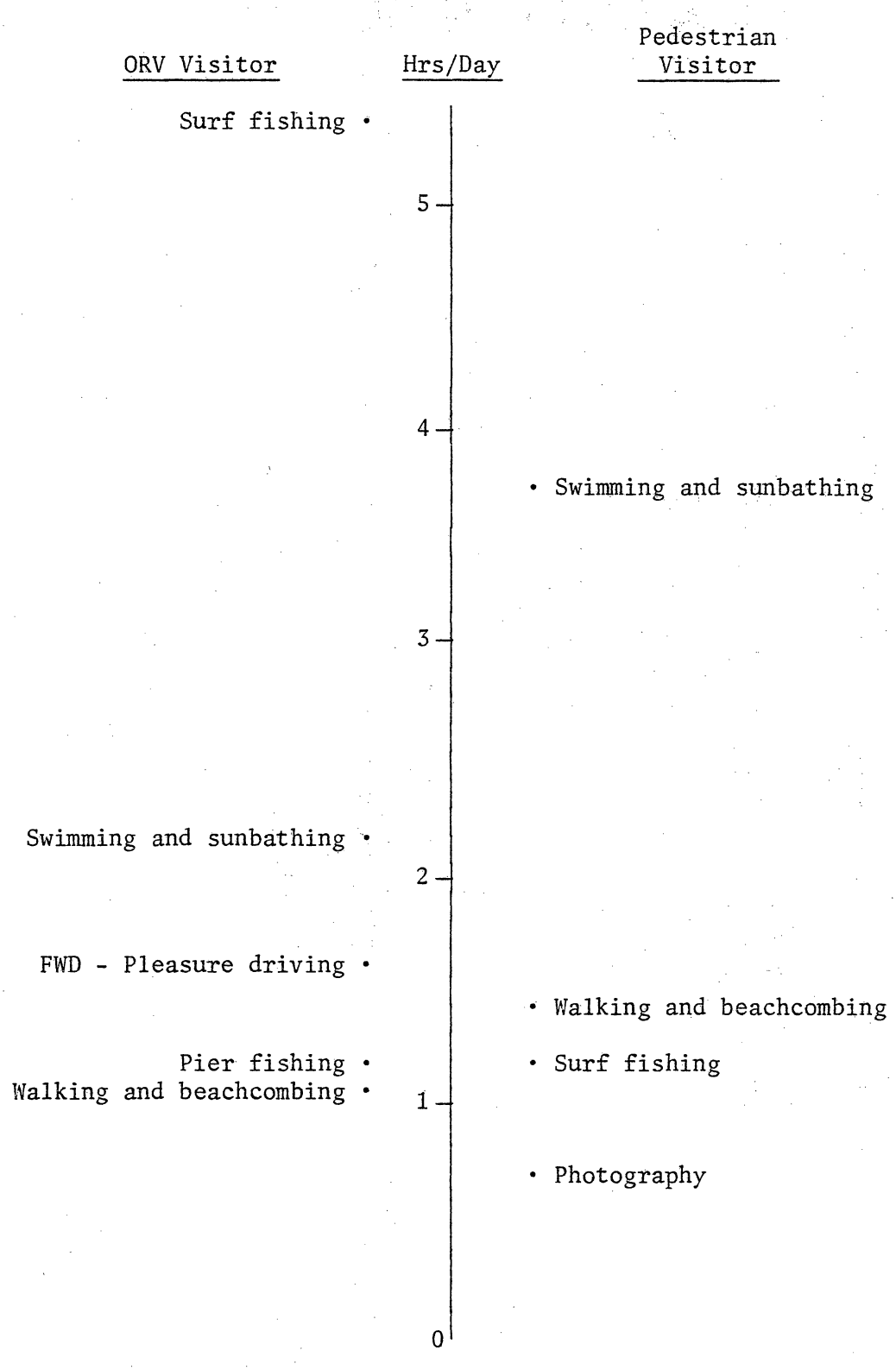

Figure 5. Order and magnitude of time spent in selected activities for ORV and pedestrian visitors.

Table 18. Seasonal differences in time spent in activities for ORV visitors.

Activity	Pre-Labor Day ORV Visitors		Post-Labor Day ORV Visitors	
	Average Time Per Day(hrs)	S.D.	Average Time Per Day(hrs)	S.D.
**Swimming and sunbathing	2.78	(2.36)	0.25	(1.02)
**Surfing	0.56	(1.46)	0.10	(0.91)
**Surf fishing	4.67	(3.11)	6.81	(2.72)
**Pier fishing	0.88	(1.94)	1.67	(2.42)
Bird watching	0.34	(2.08)	0.14	(0.73)
**Walking for pleasure and beachcombing	1.22	(1.65)	0.56	(1.31)
Bicycling	0.05	(0.29)	0.0	(0.0)
**Four-wheel-drive pleasure driving on the beach	1.98	(2.77)	0.67	(1.78)
Dune buggy pleasure driving on the beach	0.02	(0.23)	0.03	(0.23)
Motorcycle pleasure driving on the beach	0.03	(0.27)	0.03	(0.23)
Photography	0.31	(0.84)	0.13	(0.71)
**Picnicking	0.33	(0.03)	0.01	(0.11)
**NPS-conducted programs	0.17	(0.57)	0.0	(0.0)
	n = 175		n = 81	

*Significantly different at the alpha = 0.05 level.

**Significantly different at the alpha = 0.01 level.

highly variable.

Table 18 presents some interesting findings. Looking just at ORVer participation in activities revealed the influence of the fall fishing season. Pre-Labor Day ORVers spent more time per day compared to the post-Labor Day ORVers in almost every activity except for surf fishing and pier fishing. The daily recreation of the fall ORVers was dominated by surf fishing (6.81 hours per day). When the ordering and magnitudes of these differences were graphed (Figure 6). it was evident that the fall ORVers were there to surf fish, and almost no other surveyed recreational activity. Pier fishing was a distant second in terms of average time per day, with less than one and three-quarters hours per day in this activity. The summer ORVer was at the seashore primarily to surf fish, but also to spend time in other ORV-associated activities. These included swimming and sunbathing, pleasure driving, and walking for pleasure and beachcombing.

As discussed previously, pleasure driving by the ORV users was most prevalent in the summer (two hours per day). Very little time in this activity was reported by fall ORVers, with less than one-half hour per day.

Experience. In keeping with the previous analyses, the ORV user cannot be discussed in terms of experience with Cape Hatteras, since only 16 first-time ORV visitors were sampled. The large variability in the time spent in activities prevents other tests of significance that can correct for small sample sizes (e.g., the non-parametric Median test).

For the pedestrian user, very few differences exist between the

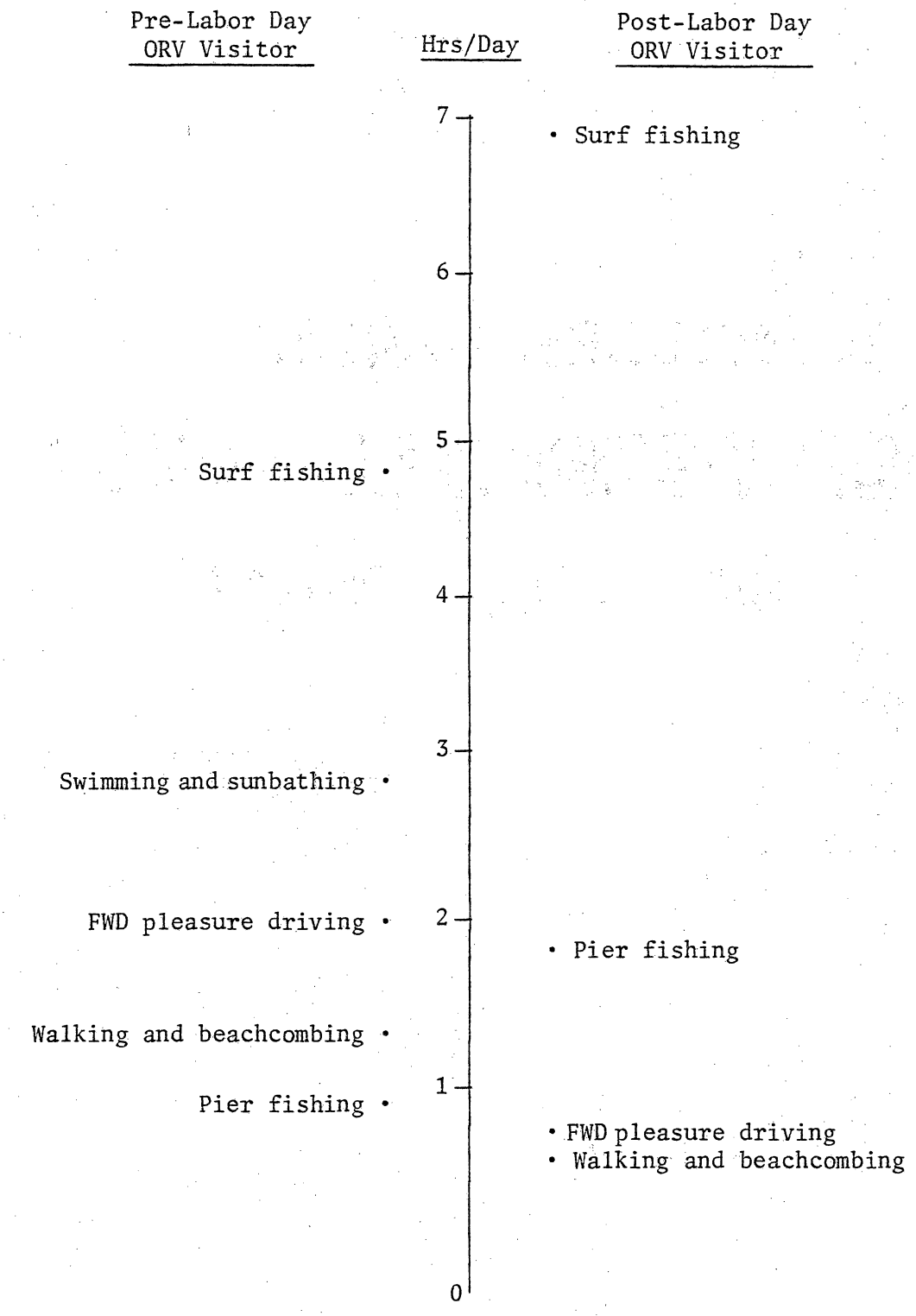

Figure 6. Order and magnitude of time spent in selected activities for the pre-Labor Day and post-Labor Day ORV visitor.

first-time and experienced visitor (Table 19). Only for surfing and surf fishing are there any statistically significant differences in time spent. The experienced visitor spent more time per day surfing (1.5 hours) than did the first-time visitor (0.75 hours).

Even though the use of the locations of Cape Hatteras was different for the experienced and first-time visitors (p. 58), the participation in the activities at these locations was not. Data on time spent in activities, such as these presented, are of limited value unless they can be tied to the locations and the first-time and experienced pedestrian visitor are readily identifiable. Data collection methods precluded such a detailed examination of behavior patterns. The data in their present form, though, can be used as baseline data to assess changes in management plans.

Local Resident Activity Patterns

The analysis of local resident use patterns will proceed along the same lines as the visitor analysis. The resident use of locations at Cape Hatteras National Seashore are first described, then their participation in recreational activities at the seashore are presented.

Location Variables

Use of Cape Hatteras from local residents was highly variable, with the greatest use going to a few visitor centers and interpretive facilities, and most extensively to the "other areas" of the seashore. These results are presented in Table 20.

For visitor centers, Wright Brothers Memorial and the lighthouse at Cape Hatteras each received over 72 percent of the resident population

Table 19. Experience differences in time spent in activities for the pedestrian visitor.

Activity	First Visit		Not First Visit	
	Average Time Per Day(hrs)	S.D.	Average Time Per Day (hrs)	S.D.
Swimming and sunbathing	3.62	(1.85)	3.93	(3.06)
*Surfing	0.03	(0.26)	0.55	(1.71)
*Surf fishing	0.75	(1.48)	1.46	(2.26)
Pier fishing	0.35	(0.99)	0.71	(1.78)
Bird watching	0.14	(0.39)	0.20	(0.56)
Walking for pleasure and beachcombing	1.46	(0.88)	1.45	(1.30)
Bicycling	0.07	(0.41)	0.02	(0.14)
Four-wheel-drive pleasure driving on the beach	0.03	(0.26)	0.0	(0.0)
Dune buggy pleasure driving on the beach	0.0	(0.0)	0.0	(0.0)
Motorcycle pleasure driving on the beach	0.0	(0.0)	0.06	(0.73)
Photography	0.76	(1.51)	0.57	(1.79)
Picnicking	0.37	(0.93)	0.47	(1.01)
NPS-conducted programs	0.33	(0.66)	0.34	(0.95
	n = 62		n = 153	

*Significantly different at the alpha = 0.05 level.

Table 20. Local resident use of locations.

Location	Percent Visited	Percent Visited 1-10 Times	11-20 Times	21+ Times	n
Visitor Centers					
Wright Brothers Memorial	74.6	66.0	5.4	3.6	197
Fort Raleigh	65.8	53.9	5.2	6.7	193
Whalebone Junction Inf. Stn.	21.9	20.2	0.6	1.1	178
Sandcastle	28.3	26.0	0.0	2.3	177
Oregon Inlet Visitor Center	38.4	31.9	2.7	3.8	185
Bodie Island Lighthouse	57.1	50.8	3.2	3.2	189
Cape Hatteras Visitor Center	58.5	50.5	4.3	3.7	188
Cape Hatteras Lighthouse	72.4	61.2	4.6	6.6	196
Ocracoke Visitor Center	43.8	35.1	4.9	3.8	185
Ocracoke Lighthouse	49.2	43.3	2.6	3.2	189
Campgrounds					
Oregon Inlet	31.0	26.1	1.6	3.3	184
Salvo	15.4	11.0	2.2	2.2	182
Cape Hatteras	29.8	26.6	1.1	2.1	188
Frisco	21.1	17.8	1.1	2.2	185
Ocracoke	19.1	13.1	2.2	3.8	183
Fishing Piers					
Rodanthe	27.0	21.1	1.1	4.9	185
Avon	31.0	25.5	0.5	4.9	184
Hatteras	32.3	29.0	0.5	2.7	186
Lifeguarded Beaches					
Coquina	45.7	35.5	4.8	5.4	186
Oregon Inlet	32.0	23.8	5.0	3.3	181
Salvo	16.5	13.6	0.0	2.8	176
Cape Hatteras	27.4	17.3	5.6	4.5	179
Frisco	20.7	14.0	2.8	3.9	179
Ocracoke	23.0	14.2	1.6	7.1	183
Other Areas					
Sound-side Beaches	74.1	40.7	9.5	23.8	189
Undesignated Ocean Beaches	86.1	38.5	13.4	34.2	187
Oregon Inlet	75.0	42.9	11.4	20.7	184
Hatteras Inlet	65.6	37.2	9.3	19.1	183
Ocracoke Inlet	47.2	30.3	3.9	12.9	178
Pea Island Natl. Wild. Refuge	66.5	42.0	9.0	15.4	188

for at least one visit during 1978. Fort Raleigh was close behind with nearly 66 percent of the residents visiting. Four other interpretive facilities received over 43 percent of the residents at least once. Most of this use to these visitor centers and interpretive facilities, though, was between one and ten visits. Very rarely was any interpretive facility visited more frequently. This suggests that most residents visited these locations a couple of times a year as a daily recreation outing.

Use of campgrounds and fishing piers was somewhat lower than use of the visitor centers. No more than one-third of all residents visited any of these locations. Almost all of this use was concentrated in the one to ten visits grouping. For fishing, this suggests that most fishing done by the locals was more of an active nature. That is, surf fishing or boat fishing was probably of more interest. There is no way of knowing whether use of the campgrounds was for visiting or overnight purposes. They could be used for access to the ocean beaches by ORV owners, since most contain ORV access ramps. Therefore, not much can be said about use of the campgrounds by local residents.

The most popular lifeguarded beach was Coquina Beach. Nearly 46 percent of all residents visited there. The second most visited lifeguarded beach was the Oregon Inlet beach, where 32 percent of the residents visited. All of the other lifeguarded beaches received approximately equal use, except for the one at Salvo. Only 16.5 percent of all Outer Banks residents visited there last year. What was most striking was the fact that most of the use of these lifeguarded beaches was

between one and ten visits per year. The lifeguarded beach areas of the seashore seemed to be used by the residents just for occasional daily outings. Most use seemed to go to the other areas of the seashore. This will be discussed shortly. Several points should be made at this juncture. First, distance did not seem to have much effect on use. The Salvo beach is much closer to the major population centers (e.g., Nags Head and the Roanoke Island area), but received less use than the farther away Cape Hatteras, Ocracoke, and Frisco lifeguarded beaches. Second, the construction of similar lifeguarded beach facilities like that at Coquina may not be wise, given the small amoung of use by the residents. Although Coquina Beach received a greater proportion of use than the other beaches, the residents also visited the other lifeguarded beaches, and use was only around one to ten times per year. This may not justify building similarly expensive and high-maintenance facilities in the future.

Use of the other areas of the seashore was the most extensive. Over 86 percent of all residents visited an undesignated ocean beach. And, nearly an equal percentage of these visitors went 21 or more times (34.2 percent) as went one to ten times (38.5 percent). The lowest use of an "other area" was at Ocracoke Inlet, with 47 percent of the residents visiting this area. As with visitation to undesignated ocean beaches, a large percentage of residents went 21 or more times to the rest of the locations listed in the "other areas" section. In fact, use seemed to be bimodal. That is, use to each of the other areas was either for a couple of visits (1 to 10 times), or for a lot of visits

(21 or more times). This suggests that the residents might fall into two categories of use. Either they use the major areas of the seashore very little, or they spend a lot of time there. Attitudes and preferences towards use of the beach, the National Park Service, and development of the seashore might be different for each of these user types. It is easy to imagine attitudinal differences between someone who knows very much about the seashore and someone who knows very little. Conversely, their level of use of the seashore might affect their attitudes, preferences, and values. Research efforts might be aimed at identifying if this split actually exists.

Many relationships may become clear when the local residents with and without an ORV are compared. Table 21 compares the visitation to the locations for the ORV owner and non-ORV owner resident. Because of small n's in many of the categories of use (e.g., 11 to 20, and 21 or more categories), collapsing was necessary. In these cases, the table should be interpreted as containing that percentage of use plus every category above. For example, ORV use of Coquina Beach was 59.5 percent never visiting, 31.1 percent visiting 1 to 10 times, and 9.4 percent visiting 11 or more times. Where collapsing could be avoided (e.g., cell sizes were greater than five), the categories of use were preserved for maximum interpretation.

Generally speaking, local resident ORV use and non-ORV use of the seashore was not as different as it was for the visitor, but there were some differences. Only three out of ten visitor centers and interpretive facilities received any differences in the percent of ORV and non-

Table 21. Local resident use of locations for ORV and non-ORV owners.

Location	Percent of ORVers Visiting					Percent of Non-ORVers Visiting				
	Never	1-10 (1+)	11-20 (11+)	21+	n	Never	1-10 (1+)	11-20 (11+)	21+	n
Visitor Centers										
Wright Brothers Memorial	29.5	70.5	--	--	78	20.2	79.8	--	--	109
Fort Raleigh	36.0	54.7	--	--	75	31.5	56.5	--	--	108
Whalebone Junction Information Station	71.8	28.2	--	--	71	81.8	18.2	--	--	99
Sandcastle	70.8	29.1	--	--	72	71.9	28.1	--	--	96
Oregon Inlet Visitor Center	62.2	37.8	--	--	74	60.4	39.6	--	--	101
*Bodie Island Lighthouse	52.0	48.0	--	--	75	35.2	64.8	--	--	105
*Cape Hatteras Visitor Center	31.5	68.5	--	--	73	47.2	52.8	--	--	106
*Cape Hatteras Lighthouse	17.9	67.9	14.1	--	78	32.4	60.2	7.4	--	108
Ocracoke Visitor Center	51.4	37.8	10.8	--	74	59.8	36.3	4.0	--	102
Ocracoke Lighthouse	46.1	53.9	--	--	76	53.4	46.6	--	--	103
Campgrounds: *Oregon Inlet	59.5	40.5	--	--	74	73.3	26.7	--	--	101
*Salvo	76.7	23.3	--	--	73	89.0	11.0	--	--	100
**Cape Hatteras	57.9	42.1	--	--	76	77.7	22.3	--	--	103
**Frisco	65.8	34.2	--	--	73	88.2	11.8	--	--	102
Ocracoke	74.3	25.7	--	--	74	84.8	15.2	--	--	99
Fishing Piers: *Rodanthe	63.5	36.5	--	--	74	77.9	22.1	--	--	104
*Avon	58.9	41.1	--	--	73	75.0	25.0	--	--	104
**Hatteras	52.6	47.4	--	--	76	76.7	23.3	--	--	103
Lifeguarded Beaches: Coquina	59.5	31.1	9.4	--	74	51.0	38.5	10.5	--	104
Oregon Inlet	68.5	20.5	11.0	--	73	67.0	26.0	7.0	--	100
Salvo	76.7	23.3	--	--	73	87.4	12.6	--	--	95
Cape Hatteras	69.4	16.7	13.9	--	72	73.7	19.2	7.1	--	99
Frisco	75.7	14.3	10.0	--	70	81.0	14.0	5.0	--	100
Ocracoke	73.7	15.8	10.5	--	76	77.8	14.1	9.1	--	99
Other Areas										
Sound-side Beaches	26.3	34.2	13.2	26.3	76	22.9	47.6	7.6	21.9	105
*Undesignated Ocean Beaches	8.0	29.3	18.7	44.0	75	14.3	47.6	10.5	27.6	105
Oregon Inlet	21.9	37.0	12.3	28.8	73	25.0	48.1	11.5	15.4	104
**Hatteras Inlet	19.0	40.5	15.2	25.3	79	44.3	36.1	5.2	14.4	97
*Ocracoke Inlet	47.4	28.9	23.7	--	76	55.8	32.7	11.6	--	95
Pea Island Natl. Wildlife Refuge	29.3	41.3	9.3	20.0	75	34.0	45.3	8.5	12.3	106

*Significantly different at the alpha = 0.05 level.

**Significantly different at the alpha = 0.01 level.

ORV residents visiting. There were large differences in use at campgrounds and fishing piers, little difference in use of lifeguarded beaches, and large differences in use of areas accessible only by ORV's. These relationships will become clear shortly.

For visitor centers and interpretive facilities, use differed between the ORV and non-ORV residents at Bodie Island Lighthouse, and the Cape Hatteras Lighthouse and Visitor Center facility. A greater percentage of non-ORV residents visited the Bodie Island Lighthouse, whereas a greater percentage of ORV residents visited the Cape Hatteras Lighthouse and Visitor Center facility. This relationship was probably due to the high degree of association between fishing and ORV use. This relationship will become evident for the residents as the analysis proceeds. The Cape Hatteras Lighthouse and Visitor Center is readily accessible on the way out to the "point," one of the most popular beach fishing locations on the Outer Banks. The Bodie Island Lighthouse is on the sound side of the island, and takes a special trip to visit. Apparent ORV user attraction to visitor centers and interpretive facilities within the boundaries of the national seashore might be related to the proximity of good fishing locations. This relationship was also found in the visitor analysis.

Campground visitation was most surely related to ORV use. Four out of the five campgrounds received significantly greater use from the ORV residents than the non-ORV residents. The other campgrounds shows the same trend. In almost every campground listed, ORV ramps were either situated in the campground or directly adjacent. The greater

percentage of ORV use to these campgrounds can probably be attributed to this fact. No check was provided to see if use to the campgrounds was for overnight purposes. For this reason, this conclusion should be interpreted with caution.

The relationship of fishing to ORV use can be further supported by observing the differences in participation at fishing piers. Every fishing pier received a greater percentage of ORVers than non-ORVers. No more than 25 percent of the non-ORV residents went to any fishing pier. Two out of the three fishing piers each received over 40 percent of the ORV residents.

Surprisingly, ORV owner use of the lifeguarded beaches was somewhat equal to non-ORV owner use. There were no statistical differences in use for any of the six lifeguarded beaches listed. This suggests that the ORV resident was a much more active user of the seashore than the non-ORV resident. The ORV resident visited fishing piers and campgrounds in greater proportions, lifeguarded beaches and visitor centers in at least equal proportions, and used the other areas of the seashore more extensively (to be discussed shortly). The ORV resident, then, might be expected to have stronger ties to the seashore. As a result of this affinity, the NPS may be more concerned with management of this user group.

The ORV resident used the undesignated beach segments, which make up the major portion of the national seashore, more extensively than the non-ORV resident. Forty-four percent of the resident ORV users visited 21 or more times, versus only around 28 percent for the non-ORV resident.

Two out of three inlet areas, those where fishing is extremely good and accessible by ORV only, received use more extensively by the ORV resident. The third inlet area, Oregon Inlet, is easily accessible in terms of both distance from the major population centers and parking. Possibly for these reasons, non-ORV resident use approximated that of ORV residents. Only when the sound-side areas and Pea Island National Wildlife Refuge were considered was there no difference in use between the ORV and non-ORV resident. As noted before, Pea Island was restricted from ORV use during the sample period (June through November 1978). The sound-side areas offered little opportunities for off-road vehicle use. These influences were probably the reason for the decrease in ORV use, and therefore, no difference between the ORV and non-ORV resident.

Overall, the ORV resident seemed to be a more active user of Cape Hatteras National Seashore. This was especially true where the ORV vehicle was permitted, and where fishing opportunities exist. Table 22 shows this relationship more clearly. Listed are indices that represent the percentage of users who went to zero, one, two, three, etc., sites for each major grouping of locations. Interpreting this table would, for example, indicate that 8.6 percent of the ORV residents visited no visitor centers, 7.4 percent visited one visitor center, 8.6 percent visited two visitor centers, 12.3 percent visited three visitor centers, and so on down the list. In no index was the non-ORV resident more active. The three significant indices showed the more active nature of the ORV resident, and indicated a relationship between ORV use and fishing. The analysis of the participation in activities will clarify

Table 22. Differences for the number of sites visited between ORV and non-ORV residents.

Location Index	Number Visited	ORV		Non-ORV	
		Percent	n	Percent	n
Visitor Centers and Interpretive Facilities	0	8.6	7	14.3	17
	1	7.4	6	8.4	10
	2	8.6	7	8.4	10
	3	12.3	10	9.2	11
	4	11.1	9	7.6	9
	5	11.1	9	11.8	14
	6	7.4	6	11.8	14
	7-10	33.3	27	28.6	34
		100.0		100.0	
**Campgrounds	0	48.1	39	66.4	79
	1	12.3	10	13.4	16
	2	13.6	11	7.6	9
	3	4.9	4	6.7	8
	4-5	21.0	17	5.9	7
		100.0		100.0	
**Fishing Piers	0	45.7	37	68.1	81
	1	18.5	15	14.3	17
	2	11.1	9	5.9	7
	3	24.7	20	11.8	14
		100.0		100.0	
Lifeguarded Beaches	0	39.5	32	42.9	51
	1	23.5	19	24.4	29
	2	17.3	14	13.4	16
	3	2.5	2	7.6	9
	4-6	17.3	14	11.8	14
		100.0		100.0	
*Other Areas	0	7.4	6	12.6	15
	1	1.2	1	5.0	6
	2	4.9	4	13.4	16
	3	16.0	14	17.6	21
	4-6	70.4	57	51.3	61
		100.0		100.0	

*Significantly different at the alpha = 0.05 level.

**Significantly different at the alpha = 0.01 level.

this relationship.

Many of the relationships so far discussed could be influenced by such things as season of use, age, sex, or family structure. These intervening variables were not discussed for two reasons. First, not all of the relevant questions were asked of the residents, because of the need for clarity and simplicity in the questionnaire. Season of use, for example, was not asked. Second, small sample sizes prevented any further breakdowns past the ORV and non-ORV cut.

Activity Variables

Table 23 presents the analysis of participation in activities for the local residents as a whole. Included are the percentage of residents who participated in each activity at least once during the year of 1978, the percent who participated 1-10, 11-20, and 21 or more times, and the average time spent per day in these activities. Averages for time spent in each activity were based only on those who participated. Those who spent no time in a particular activity were not included.

As with the visitor analysis of activities, the resident analysis showed swimming and sunbathing, surf fishing, and walking for pleasure and beachcombing as the activities most participated in of the activities listed in the questionnaire. Over 85 percent of the residents walked for pleasure on the beach, 75.3 percent swam and sunbathed, and 70.9 percent surf fished. In addition, the majority of this use was concentrated in the 21 or more times category of use. A previous table (Table 21) indicated the limited amount of use of the lifeguarded beaches, and extensive use of the other areas. It can be reasonably assumed

Table 23. Local resident participation in activities.

Activity	Percent Participating At Least Once	n	Percent Participating 1-10 Times	11-20 Times	21+ Times	Average Time/ Day (hrs)	S.D.
Swimming and sunbathing	75.3	119	25.3	6.6	43.6	2.83	1.53
Surfing	16.8	32	7.4	3.2	6.3	2.75	1.96
Surf fishing	70.9	141	24.6	12.6	33.7	3.77	2.77
Pier fishing	42.1	82	26.7	6.7	8.7	3.23	1.71
Bird watching	40.6	78	22.4	4.7	13.5	1.54	0.76
Walking for pleasure and beachcombing	85.1	172	29.2	11.4	44.6	1.98	1.14
Bicycling	29.0	56	14.5	3.1	11.4	1.39	0.57
Four-wheel-drive pleasure driving on beach	50.0	98	21.4	4.6	24.6	2.89	2.23
Dune buggy pleasure driving on beach	6.7	13	5.2	0.5	1.0	2.00	1.00
Motorcycle pleasure driving on beach	4.1	8	3.1	0.5	0.5	--	--
Photography	52.0	102	34.7	6.6	10.7	1.61	1.34
Picnicking	54.5	108	38.9	3.5	12.1	--	--
NPS-conducted programs	16.8	33	12.8	2.0	2.0	1.76	1.12

that residents swim, sunbathe, and walk on the beach mostly in undesignated ocean beach areas, not lifeguarded beaches. Residents might use these undesignated ocean beaches in such quantities as a result of, among other reasons, being displaced by the visitors to the seashore. Few residents used the lifeguarded beaches, fishing piers, visitor centers, and campgrounds, but many visitors did. This study was not designed to measure this directly, and can only be suggestive.

The local residents most actively used the seashore for recreational purposes in the above activities. The next most participated in activities were pier fishing, bird watching, four-wheel-drive pleasure driving on the beach, photography and picnicking. Around 40 percent of the residents participated in pier fishing and bird watching at Cape Hatteras. And, around 50 percent participated in four-wheel-drive pleasure driving, photography, and picnicking. Except for four-wheel-drive use, all of these activities received use mostly in the one to ten times category. The 50 percent of the residents who participated in four-wheel-drive pleasure driving were equally split between the one to ten, and 21 or more categories of use. Participation in these activities, except for four-wheel-drive pleasure driving, seemed to occur only occasionally while recreating at the seashore.

Only 16.8 percent of the residents went on NPS-conducted programs. This value can be used as a base statistics upon which to compare future use figures, given changes in the orientation of these programs, or increases (decreases) in the number of programs offered.

One other interesting fact emerged from this table. Dune buggy

and motorcycle use reportedly was almost non-existent among residents for the year of 1978. Only 6.7 percent and 4.1 percent participated in pleasure driving their dune buggy or motorcycle, respectively.

Examining time spent in activities in Table 23 reveals that surf fishing and pier fishing were the activities in which the most time per day was spent. As all previous analyses in this study indicated, surf fishing was the most time consuming. Over three and a half hours per day was spent surf fishing, with less than three and a quarter hours pier fishing. This was expected given the nature of these activities. What was surprising was the average time spent per day using a four-wheel-drive vehicle to pleasure drive on the beach. An average of nearly three hours per day was spent in this activity. The residents seemed to enjoy spending a large proportion of the day on the beaches pleasure driving. Many relationships may become clear when the ORV and non-ORV owners are considered separately. The breakdown for the percentage of residents participating in each activity is presented in Table 24. Table 25 presents this breakdown for time spent in these activities.

Generally speaking, participation in surfing, surf fishing, pier fishing, four-wheel-drive pleasure driving, photography, and picnicking was related to ORV ownership (Table 24). Four of these six activities showed a significantly greater participation by ORV owners than non-ORV owners. The other two activities showed the same trend (photography $p = 0.09$; pier fishing $p = 0.22$). This was expected given the finding that the ORV owner was a more active user of the seashore (p. 83). Without an in-depth discussion, it was evident that these results corroborated those found in the Location Variable analysis, that the ORV owners

Table 24. Resident participation in activities for ORV and non-ORV residents.

Activity	ORV Percent Participating					Non-ORV Percent Participating				
	Never	1-10 (1+)	11-20 (11+)	21 or More	n	Never	1-10 (1+)	11-20 (11+)	21 or More	n
Swimming and sunbathing	25.3	24.0	4.0	46.7	66	20.5	28.6	8.9	42.0	89
**Surfing	73.3	16.0	10.6		20	90.4	1.9	7.7		10
**Surf fishing	10.3	21.8	14.1	53.8	70	38.2	28.2	12.7	20.9	68
Pier fishing	49.4	33.8	6.5	10.4	39	63.0	24.1	7.4	5.6	40
Bird watching	64.0	17.3	4.0	14.7	27	54.2	27.1	4.7	14.0	49
Walking for pleasure and beachcombing	12.7	29.1	13.9	44.3	69	13.3	30.1	9.7	46.9	98
Bicycling	71.1	10.5	18.5		22	69.4	17.6	13.0		33
**Four-wheel-drive pleasure driving on beach	9.1	24.7	66.2		70	76.4	19.1	3.5		26
Dune buggy pleasure driving on beach	89.3	10.6			8	96.4	3.6			4
*Motorcycle pleasure driving on beach	92.0	8.0			6	98.2	1.8			2
Photography	46.7	30.7	5.3	17.3	40	46.4	39.3	8.0	6.3	60
*Picnicking	38.5	37.2	24.3		48	49.1	40.9	10.0		56
NPS-conducted programs	83.1	16.9			13	82.7	17.3			19

*Significantly different at the alpha = 0.05 level.

**Significantly different at the alpha = 0.01 level.

were much more active participants, and were oriented towards the activities of fishing and activities related to their vehicle.

Of those residents who participated in each activity, Table 25 lists the average time spent per day for the ORV resident and non-ORV resident. In no activity did the non-ORV owner spend more time per day than the ORV owner. The ORV resident, though, spent a statistically greater amount of time per day swimming and sunbathing, surf fishing, walking for pleasure and beachcombing, and bicycling. These results only reinforce the relationships previously identified.

Table 25. Time spent in activities for ORV and non-ORV residents.

Activity	ORV			Non-ORV		
	Average Time Per Day (hrs)	S.D.	n	Average Time Per Day(hrs)	S.D.	n
**Swimming and sunbathing	3.37	1.73	52	2.57	1.33	83
Surfing	2.44	1.79	16	2.91	2.07	11
**Surf fishing	4.46	3.26	65	3.03	1.96	63
Pier fishing	2.79	1.30	35	3.32	1.95	38
Bird watching	1.60	0.71	25	1.49	0.77	43
**Walking for pleasure and beachcombing	2.29	1.42	62	1.77	0.87	94
*Bicycling	1.61	0.70	18	1.27	0.45	33
Four-wheel-drive pleasure driving on beach	3.08	2.40	61	2.54	1.79	26
Dune buggy pleasure driving on beach	1.83	0.75	6	2.50	1.29	4
Motorcycle pleasure driving on beach	--	--	--	--	--	--
Photography	1.67	1.33	36	1.58	1.38	52
Picnicking	--	--	--	--	--	--
NPS-conducted programs	1.64	0.92	11	1.88	1.27	17

*Significantly different at the alpha = 0.05 level.

**Significantly different at the alpha = 0.01 level.

SUMMARY AND CONCLUSIONS

Summary

The objectives of this study were to describe the characteristics of the visitors and local residents of Cape Hatteras National Seashore, and to analyze their use, especially for ORV users and pedestrians. This information should assist Cape Hatteras managers in making decisions, particularly as they apply to managing for ORV users and pedestrians.

In order to accomplish these objectives, data was gathered from two separate surveys. Visitors to the seashore were sampled on-site from June through November of 1978, and sent mail-back questionnaires. Residents of the Outer Banks were sampled from local phone books in the winter of 1978, and sent similar but not identical mail-back questionnaires. Data gathered from this study were based on 478 visitor and 211 resident responses.

Visitor and Resident Characteristics

Overall, there were very few first-time visitors to the national seashore. Visitor use was very extensive; the average year of the first visit was 1969, with an average of 4.6 visits per year, and 6.7 days per trip. A lot of variation, though, existed in this use. Most use came from family and family/friend groups (68 percent). The average age of the respondent was 35 years.

ORV visitors tended to be more experienced with the seashore than the pedestrian visitors. Again, a lot of variation in use was present for each group. The average year of the ORVers' first visit was 1966

(1969 for pedestrians), with 5.6 visits per year (3.1 for pedestrians), and 7.5 days per trip (5.7 for pedestrians). Other relationships, although not statistically tested, include the ORV user to be (1) represented more by married people, (2) represented more by males, (3) older, (4) visited more with family and friends, and (5) less educated than the pedestrian.

For the local residents, it was found that most were year-round residents (88 percent). The average number of years of residency was 21 years. Many were fairly well educated (44 percent had at least one to three years of college), and a large percentage were retired (34 percent). The population had been influenced rather heavily by immigrating residents; only 40 percent were natives of the Outer Banks, and 50 percent had lived in the area for 10 or fewer years. These residents were more educated and slightly more likely to be retired than the residents of over 21 years.

Visitor Use of Locations

For the visitors as a whole, several key results were observed. First, the lighthouse at Cape Hatteras received a larger proportion of all the visitors (47 percent) than did the NPS major interpretive facility, Wright Brothers Memorial (40 percent). Fort Raleigh Historic Site, another major interpretive facility, was visited by only 16 percent of the visitors in this sample. Second, no more than 19 percent of the visitors used any given campground and fishing pier. Third, as far as the lifeguarded beach facilities were concerned, Coquina Beach received the most use (20 percent). But, the lifeguarded beach of Cape Hatteras,

a much less developed facility, received almost as much use (18 percent). Fourth, the undesignated ocean beaches, the area that makes up most of the national seashore, was visited by around 50 percent of the visitors.

Also noted was the extreme variability in the visitors' use of their time. Due to this variability, little could be said when comparing time spent at facilities, unless the mean times were quite different. With this in mind, the only relationship discussed was that of the Frisco campground and associated lifeguarded beach. The visitors who stayed at Frisco and went to the lifeguarded beach spent much more time per trip in this area than the visitors of the other campgrounds and lifeguarded beaches. This suggests that the nature of the campground (e.g., its rolling sand dunes that give each campsite privacy and break up the monotony of flat campsites at other locations) influenced these long stays. Finally, visitors who stayed at the campgrounds seemed to visit only those lifeguarded beach facilities at that campground, or adjacent lifeguarded areas.

When the ORV and pedestrian visitor were compared, large differences were noted in their use of almost all of the 30 locations listed in the questionnaire. Generally speaking, the ORV user visited all fishing piers and "other areas"[5] of the seashore, except for the undesignated ocean beaches, in significantly greater proportions than the pedestrian. The pedestrians, on the other hand, visited seven out of the ten visitor centers in significantly greater proportions than the ORVer, as well as four out of six lifeguarded beaches. The Salvo campground was used more

[5]The "other areas" include the sound-side areas, undesignated ocean beaches, the inlets (Oregon, Hatteras, and Ocracoke), and Pea Island National Wildlife Refuge.

by pedestrians, whereas the campground at Cape Hatteras received more ORVers. All other campgrounds received somewhat similar use from each of these user groups.

The pedestrian, relatively speaking, seemed to be at the national seashore to participate in interpretive and cultural activities, to camp, and to use the lifeguarded beaches. The ORV visitor, though, visited those types of locations in greater proportions than the pedestrian only where fishing was the major activity, or where accessible only by ORV's (Hatteras and Ocracoke Inlets). The fact that ORV users reported visiting Pea Island National Wildlife Refuge in greater proportions than the pedestrians was unexpected, since the refuge was completely closed to ORV use during the sampling period.

In support of the results reported above, time spent at each group of locations (e.g., visitor centers, campgrounds, fishing piers, lifeguarded beaches and other areas) indicated that the ORV visitor spent more time per day in only two types of areas, fishing piers and "other areas." The pedestrian, though, spent more time per day going to visitor centers, lifeguarded beaches, and campgrounds.

The season of ORV use had little effect on visitation at visitor centers, campgrounds, and fishing piers. Season did have a bearing, though, on use of the "other areas" of the seashore. Specifically, the summer ORVer was a more active user of the other areas, visiting more of these sites, and spending a statistically significant greater amount of time pleasure driving on the beach than the fall ORVer. The fall ORV user seemed to be at the seashore exclusively to surf fish.

The pedestrian who was a first-time visitor, generally speaking, visited many of the locations listed in the questionnaire in greater proportions than the visitor who had been to the seashore before. This was expected given the novelty of the seashore for them. Specifically, first-time pedestrians went to more visitor centers on their trip than the experienced pedestrians. Use of the lifeguarded beaches was also quite different. For the first-time pedestrians, use seemed to spread quite evenly among all of the lifeguarded beaches. The experienced pedestrians, though, visited the Coquina Beach facility in much greater proportions. Almost twice as many visited this site than any other. Finally, Frisco lifeguarded beach and campground stood out as being used primarily by experienced pedestrians. Very few first-time pedestrians stayed at this campground or used the lifeguarded beach. Coupled with the discussion that the visitor spent more time at Frisco campground and lifeguarded beach than at other campgrounds and lifeguarded beaches, it was suggested that Frisco campground might attract experienced visitors who tend to stay for long periods of time.

Visitor Participation in Activities

The most popular activities of the 13 listed in the questionnaire were swimming and sunbathing, surf fishing, and walking for pleasure and beachcombing (over 60 percent participated in each). Four-wheel-drive pleasure driving was next (28 percent), followed by the activities of photography (24 percent) and pier fishing (23 percent). Also of interest was the fact that only 0.4 percent of the visitors sampled participated in the activities of dune buggy and motorcycle riding on the beach

for pleasure purposes. The activity on which the most time per day was spent, as expected, was surf fishing (3.5 hours per day), with swimming and sunbathing next (2.9 hours per day). Participation in all other activities was less than one hour per day on the average, except for walking for pleasure and beachcombing (1.2 hours per day).

When the ORVer and pedestrian were compared on their use of locations, it was found that a greater percentage of ORVers than pedestrians used the fishing piers and other areas. Time spent per day was also greater for the ORVer in these locations. A greater percentage of pedestrians than ORVers, though, visited the visitor centers and lifeguarded beaches, and spent more time per day there. An analysis of participation in activities supported these results. Specifically, the ORVer spent more time per day in only three activities listed in the questionnaire. These were surf fishing, pier fishing and four-wheel-drive pleasure driving on the beach. The pedestrian spent more time per day than the ORVer in swimming and sunbathing, walking for pleasure and beachcombing, photography, picnicking, and on NPS-conducted programs.

The ORVer, then, spent more time in only those activities that emphasized fishing or use of his four-wheel-drive vehicle, whereas the pedestrian visitor averaged more time per day in almost all of the other activities. Again, caution should be used when discussing these time spent measures because of the large variability.

The most interesting observation that emerged from an analysis of the effect of season on ORV use was the fall ORVer's interest in primarily one activity, surf fishing. He averaged over six hours per day in

this activity, with no other activity receiving more than one hour per day. For the summer ORVer, surf fishing was again the activity in which the most time per day was spent (four hours), but the activities of swimming and sunbathing and ORV pleasure driving both received a lot of participation (2.5 and 1.4 hours, respectively).

Essentially no differences existed between the first-time and experienced pedestrian in their time spent in the 13 activities. This was surprising given the differences between these two for visitations at specific locations. Data collection methods precluded a detailed examination of behavior patterns that would be useful in making some comments on the reason for this incongruity.

Local Resident Use of Locations

Resident use of the seashore for the 30 listed locations in the questionnaire was the most extensive in the "other areas." Not only did a large percentage visit each "other area," but much of this use was for 21 or more times during the year of 1978. Specific observations on the use of localities included: (1) Wright Brothers Memorial and the lighthouse at Cape Hatteras each received visits from over 70 percent of the residents, but most was for occasional daily outings (one to ten times per year); (2) no more than one-third of all residents visited any one campground or fishing pier, and all of this use was primarily one to ten times per year; (3) the lifeguarded beaches were visited one to ten times per year, with Coquina Beach receiving the largest percentage of the residents; and (4) for the "other areas," use seemed to be somewhat bimodal. That is, residents visited either very few times (one to ten

times per year), or many times (21 or more times per year) to these areas.

Generally speaking, among local residents, the ORV owner was a much more active user of the seashore than the non-ORV owner. This was especially true for areas where the ORV was permitted off-the-road, and where fishing opportunities existed. Where fishing or ORV opportunities were limited or not available, non-owner use approximated that of ORV owner use. Specifically, only three out of the ten visitor centers received any differences in visitation between the two groups. The ORV owner visited campgrounds and fishing piers in greater proportions, as well as those areas of the seashore where ORV's were allowed off-the-road (undesignated ocean beaches, Hatteras and Ocracoke Inlets). But the percentage of ORV owner visitation at lifeguarded beaches and ORV restricted areas (Pea Island National Wildlife Refuge) was essentially equal to the percentage of non-owners who visited.

Local Resident Participation in Activities

The most participated in activities for the residents were swimming and sunbathing, surf fishing, and walking for pleasure and beachcombing. Most of this use was for 21 or more times per year, and indicated an extensive use of the seashore by the residents for these activities. Based on the previous analysis, it could be reasonably assumed that most of this use took place in those "other areas." Also extensive was the participation in four-wheel-drive pleasure driving on the beach. Fifty percent of the residents participated, and half of this use (25 percent) was for 21 or more times in 1978. All of the other activities received

small proportions of the residents, and mostly in the one to ten times category of use.

The analysis of ORV owner and non-ORV owner participation in activities supported the previous statements concerning the ORV owner and his more active use of the seashore for recreational purposes. A larger percentage of ORV owners than non-ORV owners participated in six of the 13 activities listed in the questionnaire (surfing, surf fishing, pier fishing, four-wheel-drive pleasure driving, photography, and picnicking). The non-owners participated in no activities in greater proportions than the resident ORV owners.

The data dealing with the average time spent per day in each activity also supported the statement of the more active nature of the ORV owner. In no activity did the non-owner spend more time per day than the ORV owner; the ORV owning resident spent more time per day swimming and sunbathing, surf fishing, walking for pleasure and beachcombing, and bicycling than the non-owner.

Implications for Planning and Management

Despite the complexity of the data presented on the characteristics and the use patterns of users to Cape Hatteras, there are several implications for effective planning and management of this area.

As far as planning of Cape Hatteras National Seashore is concerned, data on the characteristics of the visitors and local residents are important. Planners of Cape Hatteras can monitor such things as the trends in the general characteristics of the population, or the economy to see what the effect will be on their visitor. The Outer Banks was a very

popular place for older people (34 percent were retired), and if the trend toward an older population continues, this area will probably be getting a larger percentage of residents of this type. The need for providing recreational activities to meet increased use from this type of resident would exist.

Data on the proportions of total visitors and local residents using specific locations can provide planners with an indication of the total use to each facility (percent visited each site x total use = use to each site). Future use figures can be compared against these present figures to evaluate any needed changes in programs, facilities, and manpower. Traffic counters could be used to obtain this information, but they cannot provide detailed data on who the users are (e.g., are they individuals traveling alone or families, old or young, educated or uneducated, first-time or frequent visitors?).

Participation in activities for visitors to the seashore was found to be different for ORV users and pedestrians. Planning for different sets of activities for each user group is needed. The ORV visitor to Cape Hatteras needs primarily fishing and ORV-related activities. To provide just fishing opportunities would not be sufficient based on the analysis of their use of Cape Hatteras. The use of the off-road vehicle for this activity and others was evident from the data. The pedestrians need a more general set of activities, including swimming and sunbathing, walking for pleasure, surf fishing, and cultural and learning experience activities. Attitudinal data on the visitors' needs and desires for activities should be collected to supplement these data.

The management implications concerning the visitor of Cape Hatteras are many and varied. Only those relating to the relationship between the ORV and pedestrian will be discussed. Specific implications were presented in the text of the Results and Discussion chapter. First, the results gathered from this analysis of use suggest that user conflict might exist, but other supporting research needs to be done. The ORV and pedestrian went to many places in different proportions, spent different amounts of time there, and also participated in many activities differently. These inconsistencies could have been due to different interests, or as a need to avoid interaction with the other users. No evidence presented in this study could bear on this issue. Second, if social conflict or ecological damage is found to be present, this study helps to identify which management controls might be appropriate. Gilbert et al. (1972) identify a continuum of management options ranging from manipulative or "soft-handed" solutions to regulatory or "heavy-handed" solutions, with the "soft" approaches usually being the most desirable. Management controls for solving user conflict problems at Cape Hatteras, for example, could range from ORV interpretation to direct restriction of ORV's. The results found in this study reveal that ORV visitors have very little interest in interpretive facilities--suggesting that interpretation would be an ineffective solution in its present form at Cape Hatteras. A more "heavy-handed" approach might be more feasible, such as ORV regulations. Third, if restrictions are necessary, as a result of social conflict, the results indicate that the summer ORV user should probably be restricted. This is because

the fall ORV user used the beach mostly to fish, and very little to pleasure drive. The summer ORVer, though, was more active in his use of the unrestricted beach areas, and pedestrian use is the greatest during the summer months. Fourth, although limited data were gathered on use of specific segments of the seashore, restricting ORV use to those areas that minimize environmental impacts or user conflicts could be another feasible management approach. This study was not designed to comprehensively measure visitor behavior, which is needed for recommendations of this type. Therefore, only suggestions can be made. The inlets of Cape Hatteras received much more use from ORV visitors than pedestrians, and might be logical places to allow ORV users. The Cape Hatteras beach area, or the "point," would be one other area to possibly allow for ORV use. The Salvo Beach area, conversely, received mostly pedestrians, and few ORV visitors and campers. This area would probably be a logical place to restrict ORV use. These ORV management suggestions are based on minimizing user conflict as the objective. If minimizing environmental impacts is the objective, ORV use may need to be allowed where it is the lightest and restricted where it is most prevalent. Additional data are necessary for comments past those mentioned above.

The first important implication for local resident management is that only a small amount of facility development may be necessary for the residents in their recreation at Cape Hatteras. All of the facilities that existed at the time of the survey received very little use above one to ten times per year from those local residents who visited the areas. Most of their use was to the "other areas," where no facility

development exists. Thus, recreation for area residents might require little or no additional facility development. Second, a large percentage (50 percent) of the residents used a four-wheel-drive vehicle to pleasure drive on the beach. This is important for management of the area because four-wheel-drive use is probably very much a part of the recreation at Cape Hatteras, and this activity should be provided if possible. Third, ORV use of visitor centers and interpretive facilities at the seashore seemed to be related to the proximity of popular fishing locations. It might be feasible to locate interpretive facilities, or improve existing facilities near these areas, if one National Park Service objective is to reach the ORV-owning resident. Fourth, if the beaches are closed off from ORV use, managers can expect Oregon Inlet and other easily accessible good fishing locations to get excessive use pressure from ORV residents. This is because of their strong fishing orientation. Identifying these locations in advance, and establishing policies and providing for adequate planning, might help to avoid any problems of this type.

Future Research

This study identified many directions for future research. First, there should be a follow-up study to this one, and monitoring should be done on a periodic basis. This could be done by having the management personnel at Cape Hatteras interview the visitors and obtain their responses on-site. A predetermined sampling scheme and a shortened form of the questionnaire used in this study could be prepared by researchers that would provide Cape Hatteras personnel with a quick and simple means

to collect this data. This information would be helpful primarily for evaluating changes in management of the area, and for identifying trends in the visitor and local resident characteristics and use patterns.

There could also be a more in-depth analysis of visitor behavior that examines where users specifically go at Cape Hatteras, in what sequence, the time spent, and what activities were participated in there. A more accurate picture of user behavior will result, and will help to identify if user conflict exists. This research could be carried out by a survey in which visitors are asked to complete a time budget of their trip. Participant observation techniques, or some other unobtrusive data collection methods, could also be used.

Future research might be directed at a more detailed analysis of visitor use of campgrounds. Specifically, questions such as why the Frisco campground attracts visitors who tend to stay for long periods of time and who are experienced, or why the Cape Hatteras and Salvo campgrounds attract ORV and pedestrian visitors differently, need to be answered. Having some indication of what draws certain campers to specific campsites would, among other things, help in designing future campgrounds to attract specific sets of campers.

As this study indicated, research efforts aimed at the study of environmental damage of the beach environment should focus on the impacts caused by four-wheel-drive vehicle and pedestrian use. Little use of Cape Hatteras came from motorcycle and dune buggy users, and, therefore, it would be inefficient to direct research there.

Another area of research would be to determine the relationship

between the local resident and visitor in terms of their attitudes towards each other, and their use of Cape Hatteras. There was some indication in this study that local residents might be displaced by visitors in their recreation at the national seashore. If this is the case, the managers need to know so they can provide the residents with the proper recreational opportunities, as well as establish better communication lines between these two user groups.

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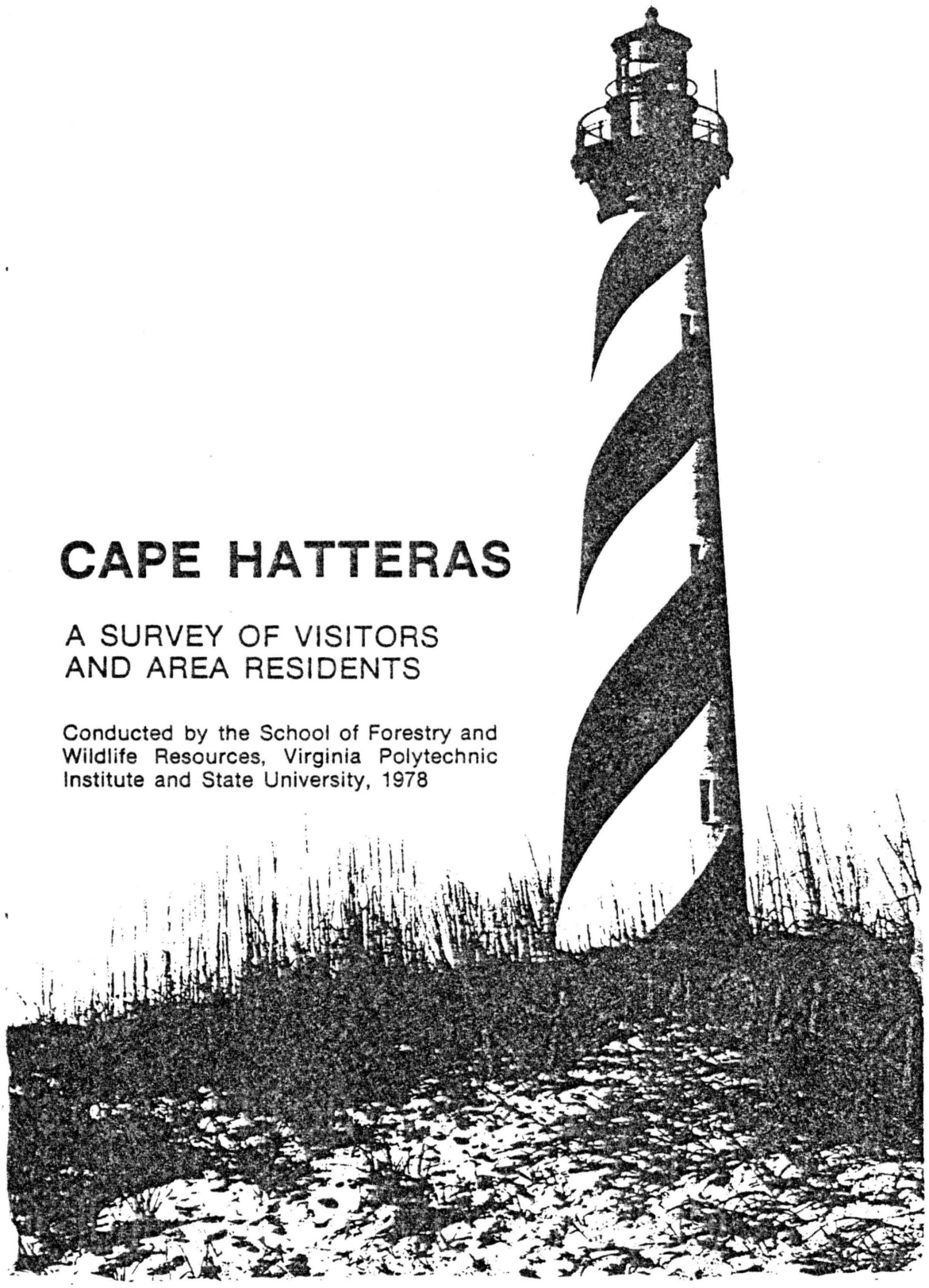
APPENDIX A



CAPE HATTERAS

A SURVEY OF VISITORS AND AREA RESIDENTS

Conducted by the School of Forestry and Wildlife Resources, Virginia Polytechnic Institute and State University, 1978

SECTION A. YOUR VISIT TO CAPE HATTERAS

The questions in this section concern the visit to Cape Hatteras National Seashore (CHNS) on which you were contacted by a member of the research staff and asked to participate in this study. In answering the questions in this section, please think only about this visit. Consider the entire visit, not just the day on which you were contacted. We have included a map of the Cape Hatteras area to help you in answering these questions. For all the questions in Section A, think about the area around which we have drawn a line.

1. Those planning how Cape Hatteras should be used need better information on where people go and how long they stay there. This question has two parts. First, please indicate with a check in the space provided whether you stopped at any of the following places. Second, for those places you visited, indicate roughly how long you stayed there.

	YES, STOPPED THERE	IF VISITED, FOR HOW LONG
Visitor Centers and Interpretive Sites:		
1. Wright Brothers Memorial	( )	_____
2. Fort Raleigh Historic Site	( )	_____
3. Whalebone Junction information station	( )	_____
4. The Sandcastle north of Coquina Beach	( )	_____
5. Visitor Center north of Oregon Inlet	( )	_____
6. Lighthouse on Bodie Island	( )	_____
7. Visitor Center at Cape Hatteras	( )	_____
8. Lighthouse at Cape Hatteras	( )	_____
9. Visitor Center on Ocracoke Island	( )	_____
10. Lighthouse on Ocracoke Island	( )	_____
Campgrounds:		
11. near Oregon Inlet	( )	_____
12. near Salvo	( )	_____
13. near Cape Hatteras	( )	_____
14. near Frisco	( )	_____
15. on Ocracoke Island	( )	_____
Fishing Piers:		
16. Rodanthe	( )	_____
17. Avon	( )	_____
18. Hatteras Island	( )	_____
Lifeguarded Beaches:		
19. Coquina Beach	( )	_____
20. near Oregon Inlet	( )	_____
21. near Salvo	( )	_____
22. near Cape Hatteras	( )	_____
23. near Frisco	( )	_____
24. on Ocracoke Island	( )	_____
Other Areas:		
25. sound-side beaches	( )	_____
26. undesignated ocean beaches	( )	_____
27. Oregon Inlet	( )	_____
28. Hatteras Inlet	( )	_____
29. Ocracoke Inlet	( )	_____
30. Pea Island National Wildlife Refuge	( )	_____

2. Again, please think back on the trip when you were contacted and asked to participate in this survey. Altogether, how many days did you spend in the area inside the line drawn on the map? _____(days)

3. Did you personally use (drive or ride in) an off-road vehicle during your visit at Cape Hatteras National Seashore? (please circle your answer)

   1. YES
   2. NO

4. This question has two parts. First, please indicate the number of different days you engaged in each of the activities listed below. Second, indicate the average time you spent each day in those activities you did.

   For example, if you went pier fishing for four hours on Sunday, three hours Monday, and two hours Tuesday, your answers would be 3 days for an average of 3 hours per day.

ACTIVITY	NUMBER OF DIFFERENT DAYS	AVERAGE TIME PER DAY
1. swimming and sunbathing.	_____	_____
2. surfing.	_____	_____
3. surf fishing	_____	_____
4. pier fishing	_____	_____
5. bird watching.	_____	_____
6. walking for pleasure and beachcombing	_____	_____
7. bicycling.	_____	_____
8. using four-wheel drive vehicles for pleasure driving on the beach. . . .	_____	_____
9. using dune buggies for pleasure driving on the beach	_____	_____
10. using motorcycles for pleasure driving on the beach	_____	_____
11. photography.	_____	_____
12. picnicking	_____	_____
13. on Park Service conducted programs . .	_____	_____

5. Which activity listed in Question 4 was the most important to you as a reason for visiting the area? (please write in the activity)

   _____

6. Some possible reasons why people visit the Cape Hatteras area are listed below. Please think about why you visited Cape Hatteras, and check the box that best shows how much you agree or disagree with each of the following statements. Please mark every statement.

I visited Cape Hatteras because I wanted:	*Strongly Agree*	*Somewhat Agree*	*Neutral*	*Somewhat Disagree*	*Strongly Disagree*	*Don't Know*
1. To add some variety to my life	( )	( )	( )	( )	( )	( )
2. To use my equipment	( )	( )	( )	( )	( )	( )
3. To be on my own	( )	( )	( )	( )	( )	( )
4. To get some exercise	( )	( )	( )	( )	( )	( )
5. To be close to nature	( )	( )	( )	( )	( )	( )
6. To do some thinking and reflecting	( )	( )	( )	( )	( )	( )
7. To learn about new things	( )	( )	( )	( )	( )	( )
8. To do something with the family	( )	( )	( )	( )	( )	( )

	Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree	Don't Know
9. To enjoy the scenery	( )	( )	( )	( )	( )	( )
10. To meet new people	( )	( )	( )	( )	( )	( )
11. To get away from the demands of other people	( )	( )	( )	( )	( )	( )
12. To experience action and excitement	( )	( )	( )	( )	( )	( )
13. To develop my skills and ability	( )	( )	( )	( )	( )	( )
14. To learn more about nature	( )	( )	( )	( )	( )	( )
15. To be with others who enjoy the same things I do	( )	( )	( )	( )	( )	( )
16. To reduce some built-up tensions	( )	( )	( )	( )	( )	( )
17. To explore things	( )	( )	( )	( )	( )	( )
18. To experience a nicer temperature	( )	( )	( )	( )	( )	( )
19. To have a change from my daily routine	( )	( )	( )	( )	( )	( )
20. To relax physically	( )	( )	( )	( )	( )	( )
21. To experience the peace and calm	( )	( )	( )	( )	( )	( )
22. To experience the solitude	( )	( )	( )	( )	( )	( )
23. To give my mind a rest	( )	( )	( )	( )	( )	( )
24. To do something with friends	( )	( )	( )	( )	( )	( )

7. An important aspect of the public discussion about Cape Hatteras concerns the local economy and the effects different policies may have on it. To improve our understanding, we need to know what you spent on your visit to the Outer Banks area shown on the map. Please write down your best estimate of what you spent for each kind of item.

ITEM	DOLLARS SPENT
1. Restaurant meals (including tips)	$ _____
2. Groceries	$ _____
3. Entertainment (bars, dancing, amusements, etc.)	$ _____
4. Retail goods other than groceries	$ _____
5. Lodging (motel and hotel)	$ _____
6. Campground fees	$ _____
7. Gasoline and oil	$ _____
8. Automobile repairs	$ _____
9. Bait	$ _____
10. Fishing tackle	$ _____
11. Equipment rentals	$ _____
12. Other (please list):	
_____	$ _____
_____	$ _____
_____	$ _____

8. How many people, including yourself, did you support on your visit?

_____(people)

9. This set of questions concerns problems you may have run into on your visit to Cape Hatteras. Please indicate how much of a problem each item was for you by placing a mark in one of the spaces provided next to each item.

PROBLEMS	NO PROBLEM AT ALL	A SMALL PROBLEM	A BIG PROBLEM
Beach Area			
1. poor fishing	( )	( )	( )
2. crowding on the beach	( )	( )	( )
3. litter on the beach	( )	( )	( )
4. not enough lifeguards	( )	( )	( )
5. seeing damage to the dunes	( )	( )	( )
Park Service Campgrounds			
6. crowded campgrounds	( )	( )	( )
7. noisy children in campgrounds	( )	( )	( )
8. loud music and TV's in campgrounds	( )	( )	( )
9. dirty restrooms and showers	( )	( )	( )
Off-road Vehicle Use			
10. off-road vehicle noise on beach	( )	( )	( )
11. tire tracks on the beach	( )	( )	( )
12. seeing off-road vehicles in places where they shouldn't be used	( )	( )	( )
13. the way some people drove their off-road vehicles	( )	( )	( )
14. improper use of dune buggies	( )	( )	( )
15. improper use of motorcycles	( )	( )	( )
16. improper use of four-wheel drives	( )	( )	( )
Park Service Information			
17. not enough information about the area's history	( )	( )	( )
18. uninteresting presentation of the area's history	( )	( )	( )
19. not enough information on current park area rules and regulations	( )	( )	( )
20. not enough information on the area's natural environment	( )	( )	( )
21. uninteresting presentation of information on the natural environment	( )	( )	( )
Other			
22. not enough wildlife	( )	( )	( )
23. insects	( )	( )	( )
24. not enough things for children to do	( )	( )	( )
25. rowdy people	( )	( )	( )
26. vandalism	( )	( )	( )
27. pet dogs not on leashes	( )	( )	( )
28. not enough parking space near beach entry points	( )	( )	( )
29. too many Park Service regulations on visitors	( )	( )	( )

10. Please check the box which best describes your own feelings about your visit to Cape Hatteras. Please consider the whole visit, not one particular place or day.

☐	☐	☐	☐	☐	☐	☐
Extremely Satisfied	Very Satisfied	Somewhat Satisfied	Neutral	Somewhat Dissatisfied	Very Dissatisfied	Extremely Dissatisfied

SECTION B. OFF-ROAD VEHICLE (ORV) USE OF CAPE HATTERAS NATIONAL SEASHORE

In answering the questions in this section, please think about all your experiences at Cape Hatteras National Seashore. We want your general responses, not just those related to the visit on which we contacted you, unless that was your first and only visit.

11. People who have been to Cape Hatteras National Seashore have different ideas about off-road vehicle use of the seashore. By off-road vehicle (ORV) we mean such vehicles as four-wheel drive trucks, jeeps, dune buggies and motorcycles. It is important in making decisions about the future use of the park to understand what users think. Please indicate how much you agree or disagree with each of the following statements by placing a mark in one of the spaces provided.

STATEMENTS:	*Strongly Agree*	*Somewhat Agree*	*Neutral*	*Somewhat Disagree*	*Strongly Disagree*	*Don't Know*
1. Travelling in an ORV is a good way to experience the outdoors at Cape Hatteras.	( )	( )	( )	( )	( )	( )
2. Surf fishing at Cape Hatteras would be almost impossible without an ORV.	( )	( )	( )	( )	( )	( )
3. ORV's damage the natural environment at Cape Hatteras.	( )	( )	( )	( )	( )	( )
4. ORV use of the marshlands behind the dunes has very little lasting impact.	( )	( )	( )	( )	( )	( )
5. ORV use of the beach is against the whole idea of a national seashore.	( )	( )	( )	( )	( )	( )
6. All types of ORV's do about the same amount of damage to the natural environment.	( )	( )	( )	( )	( )	( )
7. Most ORV problems at Cape Hatteras are caused by dune buggy users.	( )	( )	( )	( )	( )	( )
8. Most ORV problems at Cape Hatteras are caused by motorcycle users.	( )	( )	( )	( )	( )	( )
9. Surf fishermen using four-wheel drive vehicles cause just as many problems as those using dune buggies and motorcycles.	( )	( )	( )	( )	( )	( )

	Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree	Don't Know
10. Pedestrian traffic has damaged the dunes.	( )	( )	( )	( )	( )	( )
11. ORV use of Cape Hatteras conflicts with other uses.	( )	( )	( )	( )	( )	( )
12. There is no real problem for pedestrians from ORV traffic.	( )	( )	( )	( )	( )	( )
13. The tire tracks ORV use makes in the beach are a problem for pedestrian users.	( )	( )	( )	( )	( )	( )
14. The noise from ORV's at Cape Hatteras is a real problem.	( )	( )	( )	( )	( )	( )
15. ORV use of the beach creates hazards for bathers.	( )	( )	( )	( )	( )	( )
16. It's very hard to find anyplace at Cape Hatteras where you can get away from ORV's.	( )	( )	( )	( )	( )	( )
17. Whatever problems ORV users may cause are due to their lack of awareness of their impact.	( )	( )	( )	( )	( )	( )
18. The main reason ORV users get off designated roads and ramps is that the Park Service does not adequately maintain designated rights of way.	( )	( )	( )	( )	( )	( )
19. It's not the number of ORV's but how they're used that causes problems.	( )	( )	( )	( )	( )	( )
20. Very few ORV users drive their vehicles irresponsibly.	( )	( )	( )	( )	( )	( )
21. ORV users tend to think of Cape Hatteras National Seashore as their personal playground.	( )	( )	( )	( )	( )	( )
22. ORV users are unfairly blamed for litter left by other beach users.	( )	( )	( )	( )	( )	( )
23. ORV users are unfairly blamed for erosion problems caused by pedestrians.	( )	( )	( )	( )	( )	( )
24. ORV users are unfairly blamed for vandalism caused by other beach users.	( )	( )	( )	( )	( )	( )
25. Strict regulations must be placed on ORV use of Cape Hatteras National Seashore to preserve the area.	( )	( )	( )	( )	( )	( )
26. ORV use of Cape Hatteras is being unnecessarily restricted.	( )	( )	( )	( )	( )	( )

	Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree	Don't Know
27. Restricting ORV use of Cape Hatteras would seriously hurt the economy of the Outer Banks area.	( )	( )	( )	( )	( )	( )
28. Strict regulations must be placed on ORV use of Cape Hatteras National Seashore to preserve the area.	( )	( )	( )	( )	( )	( )
29. Rather than restricting use, the Park Service ought to rehabilitate damaged dunes.	( )	( )	( )	( )	( )	( )
30. Since Cape Hatteras National Seashore is public land, no restrictions should be placed on its use.	( )	( )	( )	( )	( )	( )
31. It is better to permit some damage to the dunes than to further restrict people's use of Cape Hatteras.	( )	( )	( )	( )	( )	( )

12. This question concerns possible management actions for Cape Hatteras National Seashore. Please indicate how much you favor or oppose each management action by placing a mark in one of the spaces provided.

MANAGEMENT ACTIONS:	Strongly Favor	Somewhat Favor	Neutral	Somewhat Oppose	Strongly Oppose	Don't Know
Information						
1. Develop a good public education program on the proper use of Cape Hatteras National Seashore.	( )	( )	( )	( )	( )	( )
2. Provide better information about ORV regulations.	( )	( )	( )	( )	( )	( )
3. Provide maps showing where crowded areas are likely to be.	( )	( )	( )	( )	( )	( )
4. Provide information on the area's natural environment.	( )	( )	( )	( )	( )	( )
5. Have fewer signs directing ORV use.	( )	( )	( )	( )	( )	( )
6. Sign areas and routes where ORV's are permitted.	( )	( )	( )	( )	( )	( )
Restrictions on ORV Users						
7. Continue current regulations on ORV use.	( )	( )	( )	( )	( )	( )
8. Eliminate existing regulations on ORV use.	( )	( )	( )	( )	( )	( )

	Strongly Favor	Somewhat Favor	Neutral	Somewhat Oppose	Strongly Oppose	Don't Know
9. Enforce current ORV regulations more strictly.	( )	( )	( )	( )	( )	( )
10. Require free permits for ORV use.	( )	( )	( )	( )	( )	( )
11. Require ORV permits at nominal cost.	( )	( )	( )	( )	( )	( )
12. Require ORV use permits in June, July and August.	( )	( )	( )	( )	( )	( )
13. Close Cape Hatteras National Seashore completely to ORV's.	( )	( )	( )	( )	( )	( )
14. Close Cape Hatteras National Seashore to all ORV use in June, July, and August.	( )	( )	( )	( )	( )	( )
15. Allow ORV use of the beach by fishermen only.	( )	( )	( )	( )	( )	( )
16. Close Cape Hatteras National Seashore to all ORV's except those with four weight-bearing wheels.	( )	( )	( )	( )	( )	( )
17. Restrict beach use of ORV's to a corridor 100 feet from high tide.	( )	( )	( )	( )	( )	( )
18. Reduce ORV speed limit to 5 mph when within 100 feet of pedestrians.	( )	( )	( )	( )	( )	( )
19. Prohibit all ORV use of the beaches in front of villages.	( )	( )	( )	( )	( )	( )
20. Prohibit all ORV use of the Pea Island Wildlife Refuge.	( )	( )	( )	( )	( )	( )
21. Prohibit all ORV use of any sections of the seashore where severe damage to the dunes has occurred.	( )	( )	( )	( )	( )	( )
22. Establish citizen ORV rangers to report improper vehicle use.	( )	( )	( )	( )	( )	( )
Restrictions on Other Visitors						
23. Allow bathing only at guarded beaches.	( )	( )	( )	( )	( )	( )
24. Allow only a certain number of visitors per day, regardless of the type of use.	( )	( )	( )	( )	( )	( )
25. Limit pedestrian use during peak surf fishing seasons.	( )	( )	( )	( )	( )	( )
26. Require permits of all beach users which specify where they can go.	( )	( )	( )	( )	( )	( )

	Strongly Favor	Somewhat Favor	Neutral	Somewhat Oppose	Strongly Oppose	Don't Know
27. Prohibit all pedestrian use of any sections of the seashore where severe damage to the dunes has occurred.	( )	( )	( )	( )	( )	( )
Park Service Facilities and Personnel						
28. Have more rangers.	( )	( )	( )	( )	( )	( )
29. Build more ramps over the dunes.	( )	( )	( )	( )	( )	( )
30. Reduce the number of ramps over the dunes.	( )	( )	( )	( )	( )	( )
31. Establish a public beach transportation service using special low impact vehicles.	( )	( )	( )	( )	( )	( )
32. Provide more parking sites and spaces near beach entry points.	( )	( )	( )	( )	( )	( )
33. Provide fish dumping facilities.	( )	( )	( )	( )	( )	( )

SECTION C. BACKGROUND INFORMATION

Finally, we would like to ask a few questions about yourself for statistical purposes. All information is confidential and will not be identified with your name.

13. First, we would like to get your opinion on a wide range of environmental issues. For each of the following statements, please indicate the extent to which you agree or disagree by placing a mark in one of the spaces provided.

STATEMENTS	Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree	Don't Know
1. We are approaching the limit of the number of people the earth can support.	( )	( )	( )	( )	( )	( )
2. The balance of nature is very delicate and easily upset.	( )	( )	( )	( )	( )	( )
3. Humans have the right to modify the natural environment to suit their needs.	( )	( )	( )	( )	( )	( )
4. Mankind was created to rule over the rest of nature.	( )	( )	( )	( )	( )	( )
5. When humans interfere with nature it often produces disastrous consequences.	( )	( )	( )	( )	( )	( )
6. Plants and animals exist primarily to be used by humans.	( )	( )	( )	( )	( )	( )
7. To maintain a healthy economy, we will have to develop a "steady-state" economy where industrial growth is controlled.	( )	( )	( )	( )	( )	( )

	Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree	Don't Know
8. Humans must live in harmony with nature in order to survive.	( )	( )	( )	( )	( )	( )
9. The earth is like a spaceship with only limited room and resources.	( )	( )	( )	( )	( )	( )
10. Humans need not adapt to the natural environment because they can remake it to suit their needs.	( )	( )	( )	( )	( )	( )
11. There are limits to growth beyond which our industrialized society cannot expand.	( )	( )	( )	( )	( )	( )
12. Mankind is severely abusing the environment.	( )	( )	( )	( )	( )	( )

14. Do you own (wholly or in part) an off-road vehicle, or do you have definite plans to buy one? (please circle the number next to your answer)

1. I now own an ORV
2. I do <u>not</u> now own an ORV (go to question 16)
3. I have definite plans to buy an ORV (go to question 16)

15. How often do you use the off-road vehicle for each of the following purposes? (please circle one answer for each purpose)

1. fishing	A LOT	SOME	NOT AT ALL
2. work	A LOT	SOME	NOT AT ALL
3. driving for fun on beach	A LOT	SOME	NOT AT ALL
4. hunting	A LOT	SOME	NOT AT ALL
5. surfing and/or swimming	A LOT	SOME	NOT AT ALL
6. racing in competition	A LOT	SOME	NOT AT ALL

16. In what state or country did you live most of the time before your sixteenth birthday?

_____(name of state or country)

17. In which of the following kinds of places did you spend the <u>most</u> time while growing up (to age 18)? Please mark only <u>one</u> answer.

1. on a farm or ranch
2. in the country but not on a farm or ranch
3. in a small town (2,500 or fewer people)
4. in a town or small city (between 2,500 and 25,000 people)
5. in a city (between 25,000 and 100,000 people)
6. in a suburb of a large city
7. in a large city (over 100,000 people)

18. Did you ever experience coastal settings like Cape Hatteras National Seashore and the Outer Banks while growing up (to age 18)?

1. YES
2. NO

19. Were you raised in the Outer Banks area of North Carolina?

    1. YES
    2. NO

20. When you were growing up, did your parents or close relatives use an off-road vehicle for transportation or enjoyment of coastal dune areas?

    1. YES
    2. NO

21. Do you currently belong to any of the following kinds of organizations? Please indicate your membership by placing a mark in the space provided.

Kind of Organization	Check if You Are Currently a Member
1. Conservation-preservation groups, such as the Audubon Society and the Sierra Club.	( )
2. Wildlife sporting groups, such as Ducks Unlimited.	( )
3. Fishermen's organizations, such as the Chicamacomico Anglers Club.	( )
4. Motorcycle clubs	( )
5. Dune-buggy clubs	( )
6. Jeep and four-wheel drive owners' associations	( )
7. Civic groups	( )

22. Please write in the name of the organization in which you are most active.

    _____

23. Are you:

    1. FEMALE
    2. MALE

24. What was your age at your last birthday? _____(years)

25. Are you currently married?

    1. YES
    2. NO

26. Do you have children under five years old living with you?

    1. YES
    2. NO

27. Do you have children between 5 and 17 years old living with you?

    1. YES
    2. NO

28. In what type of community do you now live?

    1. on a farm or ranch
    2. in the country but not on a farm or ranch
    3. in a small town (2,500 or fewer people)
    4. in a town or small city (between 2,500 and 25,000 people)
    5. in a city (between 25,000 and 100,000 people)
    6. in a suburb of a large city
    7. in a large city (over 100,000 people)

29. What is the highest year of formal schooling you have completed?

1. 0-4 years
2. 5-8 years
3. some high school
4. technical school instead of high school
5. completed high school (12 years)
6. post-high school business school/trade school
7. 1-3 years of college
8. completed college
9. advanced degree

30. Are you presently:

1. working
2. temporarily laid off
3. unemployed
4. retired
5. permanently disabled
6. fulltime homemaker
7. fulltime student

31. Please describe the usual occupation of the main wage earner in your household. If retired, describe the usual occupation before retirement.

Title: _____

Kind of work: _____

_____

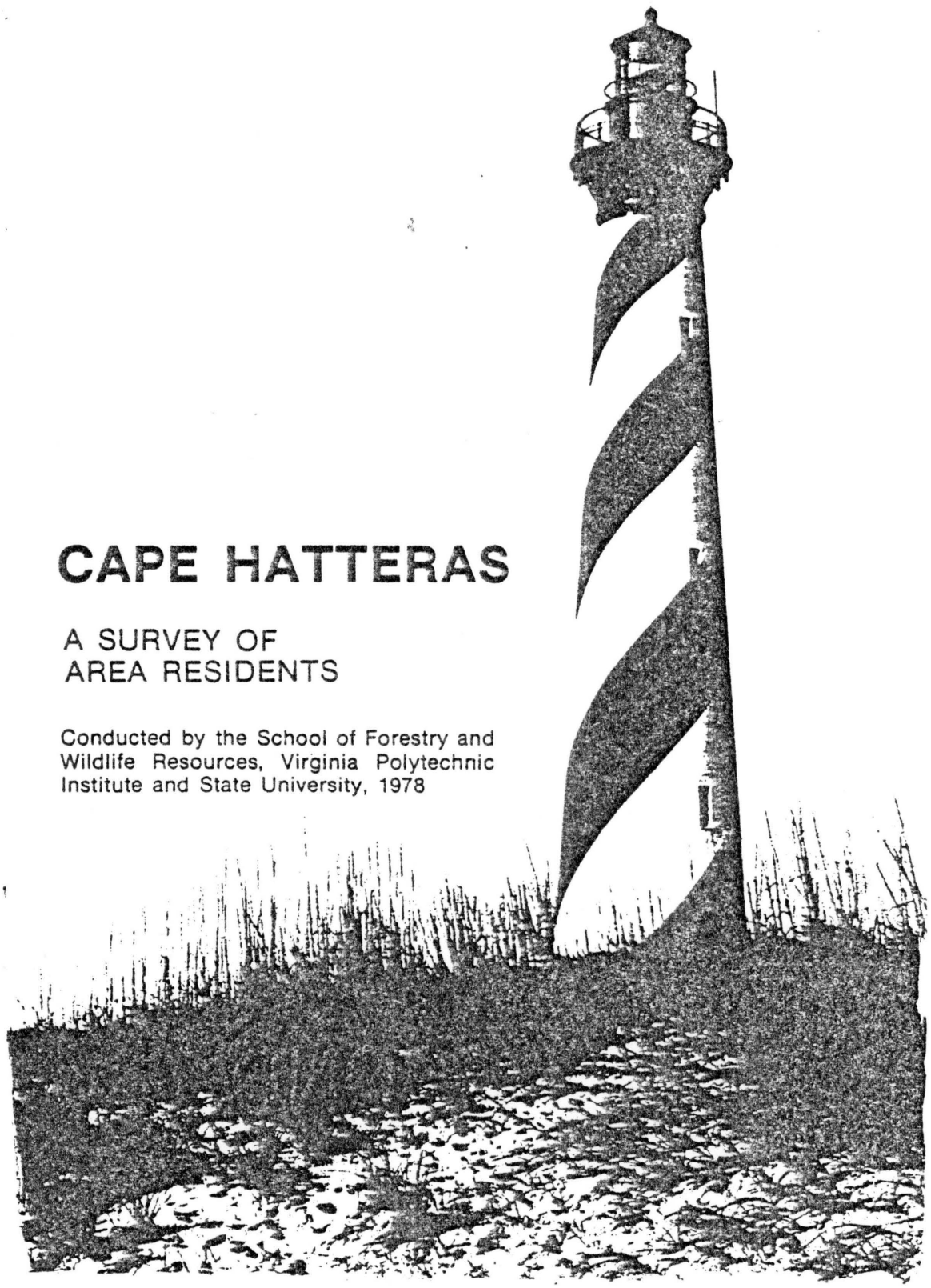
Kind of company or business: _____

_____

Thank you! This is all of the questions. If there are any comments you wish to make, please use the blank pages at the end of the questionnaire for that purpose.

Your contribution to this study is greatly appreciated. If you would like a summary of the results, please print your name and address on the back of the return envelope (NOT ON THIS QUESTIONNAIRE). We will see that you get a copy of the results.

APPENDIX B



CAPE HATTERAS

A SURVEY OF AREA RESIDENTS

Conducted by the School of Forestry and Wildlife Resources, Virginia Polytechnic Institute and State University, 1978

1

SECTION A. RECREATION INFORMATION

1. Those people who are planning how Cape Hatteras National Seashore (CHNS) should be used need better information on where people go. Please indicate how often you have visited each of the following places at CHNS for recreation since January 1, 1978. (Please check one box for each location.)

	Number of Times Visited			
	Never	1-10	11-20	21 or more
Visitor Centers and Interpretive Sites:				
1. Wright Brothers Memorial	( )	( )	( )	( )
2. Fort Raleigh Historic Site	( )	( )	( )	( )
3. Whalebone Junction information station	( )	( )	( )	( )
4. The Sandcastle north of Coquina Beach	( )	( )	( )	( )
5. Visitor Center north of Oregon Inlet	( )	( )	( )	( )
6. Lighthouse on Bodie Island	( )	( )	( )	( )
7. Visitor Center at Cape Hatteras	( )	( )	( )	( )
8. Lighthouse at Cape Hatteras	( )	( )	( )	( )
9. Visitor Center on Ocracoke Island	( )	( )	( )	( )
10. Lighthouse on Ocracoke Island	( )	( )	( )	( )
Campgrounds:				
11. near Oregon Inlet	( )	( )	( )	( )
12. near Salvo	( )	( )	( )	( )
13. near Cape Hatteras	( )	( )	( )	( )
14. near Frisco	( )	( )	( )	( )
15. on Ocracoke Island	( )	( )	( )	( )
Fishing Piers:				
16. Rodanthe	( )	( )	( )	( )
17. Avon	( )	( )	( )	( )
18. Hatteras Island	( )	( )	( )	( )
Lifeguarded Beaches:				
19. Coquina Beach	( )	( )	( )	( )
20. near Oregon Inlet	( )	( )	( )	( )
21. near Salvo	( )	( )	( )	( )
22. near Cape Hatteras	( )	( )	( )	( )
23. near Frisco	( )	( )	( )	( )
24. on Ocracoke Island	( )	( )	( )	( )
Other Areas:				
25. sound-side beaches	( )	( )	( )	( )
26. undesignated ocean beaches	( )	( )	( )	( )
27. Oregon Inlet	( )	( )	( )	( )
28. Hatteras Inlet	( )	( )	( )	( )
29. Ocracoke Inlet	( )	( )	( )	( )
30. Pea Island National Wildlife Refuge	( )	( )	( )	( )

2. This question has two parts. First, please indicate the approximate number of times you have done each of the recreation activities listed below since January 1, 1978. Second, indicate the average time you spent each day in each of the activities.

Activity

1. Swimming and sunbathing

   number of different times: never ( ); 1-10 ( ); 11-20 ( ); 21 or more ( )
   average time per day: _____ hours

2. Surfing

   number of different times: never ( ); 1-10 ( ); 11-20 ( ); 21 or more ( )
   average time per day: _____ hours

3. Surf fishing

   number of different times: never ( ); 1-10 ( ); 11-20 ( ); 21 or more ( )
   average time per day: _____ hours

4. Pier fishing

   number of different times: never ( ); 1-10 ( ); 11-20 ( ); 21 or more ( )
   average time per day: _____ hours

5. Bird watching

   number of different times: never ( ); 1-10 ( ); 11-20 ( ); 21 or more ( )
   average time per day: _____ hours

6. Walking for pleasure and beachcombing

   number of different times: never ( ); 1-10 ( ); 11-20 ( ); 21 or more ( )
   average time per day: _____ hours

7. Bicycling

number of different times: never ( ); 1-10 ( );
11-20 ( ); 21 or more ( )
average time per day: _____ hours

8. Using four-wheel drive vehicles for pleasure driving on the beach

number of different times: never ( ); 1-10 ( );
11-20 ( ); 21 or more ( )
average time per day: _____ hours

9. Using dune buggies for pleasure driving on the beach

number of different times: never ( ); 1-10 ( );
11-20 ( ); 21 or more ( )
average time per day: _____ hours

10. Using motorcycles for pleasure driving on the beach

number of different times: never ( ); 1-10 ( );
11-20 ( ); 21 or more ( )

11. Photography

number of different times: never ( ); 1-10 ( );
11-20 ( ); 21 or more ( )
average time per day: _____ hours

12. Picnicking

number of different times: never ( ); 1-10 ( );
11-20 ( ); 21 or more ( )

13. On Park Servide conducted programs

number of different times: never ( ); 1-10 ( );
11-20 ( ); 21 or more ( )
average time per day: _____ hours

3. This set of questions concerns problems you may run into while living or recreating in the Cape Hatteras area. Please indicate how much of a problem each item is for you by placing a mark in one of the spaces provided next to each item.

PROBLEMS	NO PROBLEM AT ALL	A SMALL PROBLEM	A BIG PROBLEM
Beach Area			
1. poor fishing	( )	( )	( )
2. crowding on the beach	( )	( )	( )
3. litter on the beach	( )	( )	( )
4. not enough lifeguards	( )	( )	( )
5. seeing damage to the dunes	( )	( )	( )
Park Service Campgrounds			
6. crowded campgrounds	( )	( )	( )
7. noisy children in campgrounds	( )	( )	( )
8. loud music and TV's in campgrounds	( )	( )	( )
9. dirty restrooms and showers	( )	( )	( )
Off-road Vehicle Use			
10. off-road vehicle noise on beach	( )	( )	( )
11. tire tracks on the beach	( )	( )	( )
12. seeing off-road vehicles in places where they shouldn't be used	( )	( )	( )
13. the way some people drove their off-road vehicles	( )	( )	( )
14. improper use of dune buggies	( )	( )	( )
15. improper use of motorcycles	( )	( )	( )
16. improper use of four-wheel drives	( )	( )	( )
Park Service Information			
17. not enough information about the area's history	( )	( )	( )
18. uninteresting presentation of the area's history	( )	( )	( )
19. not enough information on current park area rules and regulations	( )	( )	( )
20. not enough information on the area's natural environment	( )	( )	( )
21. uninteresting presentation of information on the natural environment	( )	( )	( )
Other			
22. not enough wildlife	( )	( )	( )
23. insects	( )	( )	( )
24. not enough things for children to do	( )	( )	( )
25. rowdy people	( )	( )	( )
26. vandalism	( )	( )	( )
27. pet dogs not on leashes	( )	( )	( )
28. not enough parking space near beach entry points	( )	( )	( )
29. too many Park Service regulations on visitors	( )	( )	( )

4. People who have been to Cape Hatteras National Seashore or live in the area have different ideas about off-road vehicle use of the seashore. By off-road vehicle (ORV) we mean such vehicles as four-wheel drive trucks, jeeps, dune buggies and motorcycles. It is important in making decisions about the future use of the park to understand what users think. Please indicate how much you agree or disagree with each of the following statements by placing a mark in one of the spaces provided.

STATEMENTS:	*Strongly Agree*	*Somewhat Agree*	*Neutral*	*Somewhat Disagree*	*Strongly Disagree*	*Don't Know*
1. Travelling in an ORV is a good way to experience the outdoors at Cape Hatteras.	( )	( )	( )	( )	( )	( )
2. Surf fishing at Cape Hatteras would be almost impossible without an ORV.	( )	( )	( )	( )	( )	( )
3. ORV's damage the natural environment at Cape Hatteras.	( )	( )	( )	( )	( )	( )
4. ORV use of the marshlands behind the dunes has very little lasting impact.	( )	( )	( )	( )	( )	( )
5. ORV use of the beach is against the whole idea of a national seashore.	( )	( )	( )	( )	( )	( )
6. All types of ORV's do about the same amount of damage to the natural environment.	( )	( )	( )	( )	( )	( )
7. Most ORV problems at Cape Hatteras are caused by dune buggy users.	( )	( )	( )	( )	( )	( )
8. Most ORV problems at Cape Hatteras are caused by motorcycle users.	( )	( )	( )	( )	( )	( )
9. Surf fishermen using four-wheel drive vehicles cause just as many problems as those using dune buggies and motorcycles.	( )	( )	( )	( )	( )	( )

	Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree	Don't Know
10. Pedestrian traffic has damaged the dunes.	( )	( )	( )	( )	( )	( )
11. ORV use of Cape Hatteras conflicts with other uses.	( )	( )	( )	( )	( )	( )
12. There is no real problem for pedestrians from ORV traffic.	( )	( )	( )	( )	( )	( )
13. The tire tracks ORV use makes in the beach are a problem for pedestrian users.	( )	( )	( )	( )	( )	( )
14. The noise from ORV's at Cape Hatteras is a real problem.	( )	( )	( )	( )	( )	( )
15. ORV use of the beach creates hazards for bathers.	( )	( )	( )	( )	( )	( )
16. It's very hard to find anyplace at Cape Hatteras where you can get away from ORV's.	( )	( )	( )	( )	( )	( )
17. Whatever problems ORV users may cause are due to their lack of awareness of their impact.	( )	( )	( )	( )	( )	( )
18. The main reason ORV users get off designated roads and ramps is that the Park Service does not adequately maintain designated rights of way.	( )	( )	( )	( )	( )	( )
19. It's not the number of ORV's but how they're used that causes problems.	( )	( )	( )	( )	( )	( )
20. Very few ORV users drive their vehicles irresponsibly.	( )	( )	( )	( )	( )	( )
21. ORV users tend to think of Cape Hatteras National Seashore as their personal playground.	( )	( )	( )	( )	( )	( )
22. ORV users are unfairly blamed for litter left by other beach users.	( )	( )	( )	( )	( )	( )
23. ORV users are unfairly blamed for erosion problems caused by pedestrians.	( )	( )	( )	( )	( )	( )
24. ORV users are unfairly blamed for vandalism caused by other beach users.	( )	( )	( )	( )	( )	( )
25. Strict regulations must be placed on ORV use of Cape Hatteras National Seashore to preserve the area.	( )	( )	( )	( )	( )	( )
26. ORV use of Cape Hatteras is being unnecessarily restricted.	( )	( )	( )	( )	( )	( )

	Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree	Don't Know
27. Restricting ORV use of Cape Hatteras would seriously hurt the economy of the Outer Banks area.	( )	( )	( )	( )	( )	( )
28. Strict regulations must be placed on ORV use of Cape Hatteras National Seashore to preserve the area.	( )	( )	( )	( )	( )	( )
29. Rather than restricting use, the Park Service ought to rehabilitate damaged dunes.	( )	( )	( )	( )	( )	( )
30. Since Cape Hatteras National Seashore is public land, no restrictions should be placed on its use.	( )	( )	( )	( )	( )	( )
31. It is better to permit some damage to the dunes than to further restrict people's use of Cape Hatteras.	( )	( )	( )	( )	( )	( )

5. This question concerns possible management actions for Cape Hatteras National Seashore. Please indicate how much you favor or oppose each management action by placing a mark in one of the spaces provided.

MANAGEMENT ACTIONS:	Strongly Favor	Somewhat Favor	Neutral	Somewhat Oppose	Strongly Oppose	Don't Know
Information						
1. Develop a good public education program on the proper use of Cape Hatteras National Seashore.	( )	( )	( )	( )	( )	( )
2. Provide better information about ORV regulations.	( )	( )	( )	( )	( )	( )
3. Provide maps showing where crowded areas are likely to be.	( )	( )	( )	( )	( )	( )
4. Provide information on the area's natural environment.	( )	( )	( )	( )	( )	( )
5. Have fewer signs directing ORV use.	( )	( )	( )	( )	( )	( )
6. Sign areas and routes where ORV's are permitted.	( )	( )	( )	( )	( )	( )
Restrictions on ORV Users						
7. Continue current regulations on ORV use.	( )	( )	( )	( )	( )	( )
8. Eliminate existing regulations on ORV use.	( )	( )	( )	( )	( )	( )

	Strongly Favor	Somewhat Favor	Neutral	Somewhat Oppose	Strongly Oppose	Don't Know
9. Enforce current ORV regulations more strictly.	( )	( )	( )	( )	( )	( )
10. Require free permits for ORV use.	( )	( )	( )	( )	( )	( )
11. Require ORV permits at nominal cost.	( )	( )	( )	( )	( )	( )
12. Require ORV use permits in June, July and August.	( )	( )	( )	( )	( )	( )
13. Close Cape Hatteras National Seashore completely to ORV's.	( )	( )	( )	( )	( )	( )
14. Close Cape Hatteras National Seashore to all ORV use in June, July, and August.	( )	( )	( )	( )	( )	( )
15. Allow ORV use of the beach by fishermen only.	( )	( )	( )	( )	( )	( )
16. Close Cape Hatteras National Seashore to all ORV's except those with four weight-bearing wheels.	( )	( )	( )	( )	( )	( )
17. Restrict beach use of ORV's to a corridor 100 feet from high tide.	( )	( )	( )	( )	( )	( )
18. Reduce ORV speed limit to 5 mph when within 100 feet of pedestrians.	( )	( )	( )	( )	( )	( )
19. Prohibit all ORV use of the beaches in front of villages.	( )	( )	( )	( )	( )	( )
20. Prohibit all ORV use of the Pea Island Wildlife Refuge.	( )	( )	( )	( )	( )	( )
21. Prohibit all ORV use of any sections of the seashore where severe damage to the dunes has occurred.	( )	( )	( )	( )	( )	( )
22. Establish citizen ORV rangers to report improper vehicle use.	( )	( )	( )	( )	( )	( )
Restrictions on Other Visitors						
23. Allow bathing only at guarded beaches.	( )	( )	( )	( )	( )	( )
24. Allow only a certain number of visitors per day, regardless of the type of use.	( )	( )	( )	( )	( )	( )
25. Limit pedestrian use during peak surf fishing seasons.	( )	( )	( )	( )	( )	( )
26. Require permits of all beach users which specify where they can go.	( )	( )	( )	( )	( )	( )

	Strongly Favor	Somewhat Favor	Neutral	Somewhat Oppose	Strongly Oppose	Don't Know
27. Prohibit all pedestrian use of any sections of the seashore where severe damage to the dunes has occurred.	( )	( )	( )	( )	( )	( )
Park Service Facilities and Personnel						
28. Have more rangers.	( )	( )	( )	( )	( )	( )
29. Build more ramps over the dunes.	( )	( )	( )	( )	( )	( )
30. Reduce the number of ramps over the dunes.	( )	( )	( )	( )	( )	( )
31. Establish a public beach transportation service using special low impact vehicles.	( )	( )	( )	( )	( )	( )
32. Provide more parking sites and spaces near beach entry points.	( )	( )	( )	( )	( )	( )
33. Provide fish dumping facilities.	( )	( )	( )	( )	( )	( )

SECTION C. BACKGROUND INFORMATION

Finally, we would like to ask a few questions about yourself for statistical purposes. All information is confidential and will not be identified with your name.

6. First, we would like to get your opinion on a wide range of environmental issues. For each of the following statements, please indicate the extent to which you agree or disagree by placing a mark in one of the spaces provided.

STATEMENTS	Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree	Don't Know
1. We are approaching the limit of the number of people the earth can support.	( )	( )	( )	( )	( )	( )
2. The balance of nature is very delicate and easily upset.	( )	( )	( )	( )	( )	( )
3. Humans have the right to modify the natural environment to suit their needs.	( )	( )	( )	( )	( )	( )
4. Mankind was created to rule over the rest of nature.	( )	( )	( )	( )	( )	( )
5. When humans interfere with nature it often produces disastrous consequences.	( )	( )	( )	( )	( )	( )
6. Plants and animals exist primarily to be used by humans.	( )	( )	( )	( )	( )	( )
7. To maintain a healthy economy, we will have to develop a "steady-state" economy where industrial growth is controlled.	( )	( )	( )	( )	( )	( )

10

	Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree	Don't Know
8. Humans must live in harmony with nature in order to survive.	( )	( )	( )	( )	( )	( )
9. The earth is like a spaceship with only limited room and resources.	( )	( )	( )	( )	( )	( )
10. Humans need not adapt to the natural environment because they can remake it to suit their needs.	( )	( )	( )	( )	( )	( )
11. There are limits to growth beyond which our industrialized society cannot expand.	( )	( )	( )	( )	( )	( )
12. Mankind is severely abusing the environment.	( )	( )	( )	( )	( )	( )

7. Do you own (wholly or in part) an off-road vehicle, or do you have definite plans to buy one? (please circle the number next to your answer)

1. I now own an ORV
2. I do not now own an ORV (go to question 16)
3. I have definite plans to buy an ORV (go to question 16)

8. How often do you use the off-road vehicle for each of the following purposes? (please circle one answer for each purpose)

1. fishing	A LOT	SOME	NOT AT ALL
2. work	A LOT	SOME	NOT AT ALL
3. driving for fun on beach	A LOT	SOME	NOT AT ALL
4. hunting	A LOT	SOME	NOT AT ALL
5. surfing and/or swimming	A LOT	SOME	NOT AT ALL
6. racing in competition	A LOT	SOME	NOT AT ALL

9. In what state or country did you live most of the time before your sixteenth birthday?

_____(name of state or country)

10. In which of the following kinds of places did you spend the most time while growing up (to age 18)? Please mark only one answer.

1. on a farm or ranch
2. in the country but not on a farm or ranch
3. in a small town (2,500 or fewer people)
4. in a town or small city (between 2,500 and 25,000 people)
5. in a city (between 25,000 and 100,000 people)
6. in a suburb of a large city
7. in a large city (over 100,000 people)

11

11. Were you raised in the Outer Banks area of North Carolina?

1. YES
2. NO

12. When you were growing up, did your parents or close relatives use an off-road vehicle for transportation or enjoyment of coastal dune areas?

1. YES
2. NO

13. Do you currently belong to any of the following kinds of organizations? Please indicate your membership by placing a mark in the space provided.

Kind of Organization	Check if You Are Currently a Member
1. Conservation-preservation groups, such as the Audubon Society and the Sierra Club.	( )
2. Wildlife sporting groups, such as Ducks Unlimited.	( )
3. Fishermen's organizations, such as the Chicamacomico Anglers Club.	( )
4. Motorcycle clubs	( )
5. Dune-buggy clubs	( )
6. Jeep and four-wheel drive owners' associations	( )
7. Civic groups	( )

14. Please write in the name of the organization in which you are most active.

_____

15. Are you:

1. FEMALE
2. MALE

16. What was your age at your last birthday? _____(years)

17. Are you currently married?

1. YES
2. NO

18. Do you have children under five years old living with you?

1. YES
2. NO

19. Do you have children between 5 and 17 years old living with you?

1. YES
2. NO

20. What is the highest year of formal schooling you have completed?

1. 0-4 years
2. 5-8 years
3. some high school
4. technical school instead of high school
5. completed high school (12 years)
6. post-high school business school/trade school
7. 1-3 years of college
8. completed college
9. advanced degree

21. Are you presently:

1. working
2. temporarily laid off
3. unemployed
4. retired
5. permanently disabled
6. fulltime homemaker
7. fulltime student

22. Please describe the usual occupation of the main wage earner in your household. If retired, describe the usual occupation before retirement.

Title: _____

Kind of work: _____

_____

Kind of company or business: _____

_____

23. Do you own property in the Outer Banks area? (Inside the circle shown on the attached map)

1. yes
2. no (go to question 29)

24. Please indicate which of these types of properties you own in the Outer Banks area:

	YES	NO	
1. commercial	( )	( )	
2. recreational	( )	( )	
3. investment	( )	( )	
4. residential	( )	( )	
5. other (please explain)	( )	( )	_____

25. Do you live in the Outer Banks area all year round or do you live there only part of the year?

1. all year (please skip to question 29)
2. part of the year

26. Where is your permanent home (your voting residence)?

_____ _____
(City or County) (State)

27. How many weeks a year do you live at your Outer Banks property?

_____ weeks

28. Do you plan to live at your Outer Banks property on a permanent basis?

1. Yes
2. No

29.

For those who live year round in the Outer Banks area.

How long have you lived in the Outer Banks area? _____ years

30.

For all respondents.

In the space provided below, please tell us how you feel about the relationship between the National Park Service management and the residents and communities of the CHNS area.

Thank you! This is all of the questions. If there are any other comments you wish to make, please use the space below.

Your contribution to this study is greatly appreciated. If you would like a summary of the results, please print your name and address on the back of the return envelope (NOT ON THIS QUESTIONNAIRE). We will see that you get a copy of the results.

APPENDIX C

CHNS-ORV STUDY
CONTACT SHEET FOR BEACH USERS

I.D. No. _____

1. Outer Banks area resident? | YES NEXT Q. | | NO TO Q. 4 |

2. (RESIDENTS ONLY) Seasonal or year-round?

| SEASONAL | | YEAR-ROUND |

3. (RESIDENTS ONLY) How long have you lived here? _____(years)

4. First visit? | YES TO Q.5 | | NO NEXT Q. |

4a. Year of first visit? _____(year)

4b. Average number of visits per year? _____(visits/year)

4c. Number of previous visits to Cape Hatteras this year? _____(visits)

4d. Total previous days in Cape Hatteras area this year? _____(days)

5. Number of people with you here today? _____(people)

5a. Number of people in immediate family? _____(people)

6. Mailing address: _____

_____

_____

7. Observation: a. date: _____ b. time: _____ a.m. p.m.

c. weather: _____

d. location: _____

e. ORV? | YES | | NO |

f. Major activity: _____

_____

APPENDIX D

COLLEGE OF AGRICULTURE AND LIFE SCIENCES

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Blacksburg, Virginia 24061

SCHOOL OF FORESTRY AND WILDLIFE RESOURCES
Department of Forestry and Forest Products

Dear Cape Hatteras Visitor:

In many places throughout the United States, people are discussing the issue of the appropriate use of off-road vehicles. Cape Hatteras National Seashore is one such place. The National Park Service recently conducted public workshops in North Carolina and nearby Virginia. Participants discussed the first draft of a Park Service plan to manage off-road vehicle use at Cape Hatteras National Seashore. These workshops yielded some valuable ideas. However, workshop participants tend to be the people most directly affected or most accessible, rather than an even sample of the visiting public. The National Park Service and others engaged in planning want a better idea of how the vast majority of visitors to this National Seashore feel. Knowledge of how people like yourself use Cape Hatteras and how you feel about it is vital to good planning.

Please take the half-hour or so necessary to carefully complete the enclosed questionnaire, and send it back to us in the self-addressed envelope. We want the opinions of a truly representative group of people, and so have scientifically chosen a sample of visitors to Cape Hatteras National Seashore. But, the sample will be good only if those few people we have contacted are responsive.

The questionnaire has an identification number for mailing purposes only. Your answers will be held in strictest confidence. All results will be analyzed in such a way that your answers on any single question cannot be identified with you.

This is a good opportunity for you to express your views on a significant regional and national issue. If you would like a copy of the results, print your name and address on the back of the return envelope.

Your help in this study will be greatly appreciated.

Sincerely,

Dr. G. J. Buhyoff
Assistant Professor, Forestry

Dr. J. D. Wellman
Assistant Professor, Forestry

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COLLEGE OF AGRICULTURE AND LIFE SCIENCES

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Blacksburg, Virginia 24061

SCHOOL OF FORESTRY AND WILDLIFE RESOURCES

Dear Cape Hatteras Visitor:

You should recently have received a survey sent to only a small portion of visitors to Cape Hatteras National Seashore. Because only a small sample of visitors are contacted, your participation in this survey becomes critical in guiding management decisions concerning off-road vehicle use of Cape Hatteras.

The issue of appropriate off-road vehicle use has great importance to all who now visit and plan to visit Cape Hatteras National Seashore. This study is an opportunity for you, as a member of the interested public, to express your personal experiences and feelings.

As of today, we have not received your completed questionnaire. We hope it is in the mail or that you will take the time to complete the enclosed copy. If you would like to know the responses of other Cape Hatteras visitors and local residents, please print your name and address on the back of the return envelope.

Sincerely,

Dr. G. J. Buhyoff
Assistant Professor, Forestry

Dr. J. D. Wellman
Assistant Professor, Forestry

GJB/JDW/ddn

Encls.

COLLEGE OF AGRICULTURE AND LIFE SCIENCES

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Blacksburg, Virginia 24061

SCHOOL OF FORESTRY AND WILDLIFE RESOURCES

Dear Cape Hatteras Visitor:

We want to be of help to you. In order to properly manage Cape Hatteras National Seashore for off-road vehicle use we need to know your preferences, problems you have experienced, and places you have visited. This information will be important in guiding public policy decisions on proper off-road vehicle use of Cape Hatteras.

We have already heard from over 60 percent of those visitors already contacted, but we have not heard from you. Please don't assume your answers would not be valid or useful because you may have had only a little experience with Cape Hatteras. The goal of the survey is to provide information about the actions and attitudes of all Cape Hatteras visitors, including the large number of individuals on their first visit.

Your participation in this survey is vital. Please complete the questionnaire and send it to us in the attached postage-paid envelope.

Sincerely,

Gregory J. Buhyoff
Assistant Professor, Forestry

J. D. Wellman
Assistant Professor, Forestry

GJB/JDW/ddn

Encls.

APPENDIX E

COLLEGE OF AGRICULTURE AND LIFE SCIENCES

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Blacksburg, Virginia 24061

SCHOOL OF FORESTRY AND WILDLIFE RESOURCES

Dear Outer Banks Resident:

In many places throughout the United States, people are discussing the issue of the appropriate use of off-road vehicles. Cape Hatteras National Seashore is one such place. In the fall of 1977 the National Park Service conducted public workshops in North Carolina and nearby Virginia. Participants discussed the first draft of a Park Service plan to manage off-road vehicle use at Cape Hatteras National Seashore. These workships yielded some valuable ideas. However, in workshops not everybody gets heard. In order to make sure that all opinions are represented, the National Park Service and others engaged in planning want a better idea of how local residents of the Outer Banks feel. Knowledge of how people like yourself use Cape Hatteras and how you feel about it is vital to good planning.

Please take the half-hour or so necessary to carefully complete the enclosed questionnaire, and send it back to us in the self-addressed envelope. We want the opinions of a truly representative group of people, and so have scientifically chosen a sample of local residents of the Outer Banks. But, the sample will be good only if those few people we have contacted return their completed questionnaire.

The questionnaire has an identification number for mailing purposes only. Your answers will be held in strictest confidence. All results will be analyzed in such a way that your answers on any single question cannot be identified with you.

This is a good opportunity for you to express your views on a significant regional and national issue. If you would like a copy of the results, print your name and address on the back of the return envelope.

Your help in this study will be greatly appreciated.

Sincerely,

G. J. Buhyoff, Ph.D.
Assistant Professor
Forestry

J. D. Wellman, Ph.D.
Assistant Professor
Forestry

GJB/JDW/ddn

Encls.

COLLEGE OF AGRICULTURE AND LIFE SCIENCES

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Blacksburg, Virginia 24061

SCHOOL OF FORESTRY AND WILDLIFE RESOURCES

Dear Outer Banks Resident:

You should recently have received a survey sent to only a small portion of Outer Banks area residents. Because only a small sample of residents are contacted, your participation in this survey becomes critical in guiding management decisions concerning off-road vehicle use of Cape Hatteras.

The issue of appropriate off-road vehicle use has great importance to all who now use and plan to use Cape Hatteras National Seashore. This study is an opportunity for you, as a member of the interested public, to express your personal experiences and feelings.

As of today, we have not received your completed questionnaire. We hope it is in the mail or that you will take the time to complete the enclosed copy. If you would like to know the responses of other Cape Hatteras visitors and local residents, please print your name and address on the back of the return envelope.

Sincerely,

G. J. Buhyoff, Ph.D.
Assistant Professor
Forestry

J. D. Wellman, Ph.D.
Assistant Professor
Forestry

GJB/JDW/ddn

Encls.

COLLEGE OF AGRICULTURE AND LIFE SCIENCES

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Blacksburg, Virginia 24061

SCHOOL OF FORESTRY AND WILDLIFE RESOURCES

Dear Outer Banks Resident:

We want to be of help to you. In order to properly manage Cape Hatteras National Seashore for off-road vehicle use we need to know your activities, your preferences, and problems you have experienced. This information will be important in guiding public policy decisions on proper off-road vehicle use of Cape Hatteras.

We have heard from many local residents, but we have not heard from you. Remember, this study is an opportunity for you, as a member of the interested public, to express your personal feelings.

Your participation in this survey is vital. Please complete the questionnaire and send it to us in the attached postage-paid envelope.

Sincerely,

Gregory J. Buhyoff, Ph.D.
Assistant Professor
Forestry

J. D. Wellman, Ph.D.
Assistant Professor
Forestry

GJB/JDW/ddn

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ACTIVITY PATTERNS AT CAPE HATTERAS NATIONAL SEASHORE: AN ANALYSIS OF OFF-ROAD VEHICLE AND PEDESTRIAN USERS AMONG VISITORS AND RESIDENTS

by

Bradley Vance Pafford

(ABSTRACT)

The purpose of this study was to describe the use of Cape Hatteras National Seashore from visitors and local residents of the Outer Banks, and to explore the differences in use for off-road vehicle (ORV) users and pedestrians within each of these user groups. During the summer of 1978, 598 visitors were randomly sampled at Cape Hatteras and sent mail-back questionnaires. Eighty percent of the 598 eligible respondents returned the questionnaire, providing half the data for this study. Four hundred thirty-two local residents were systematically sampled from phone books of residents of the Outer Banks of North Carolina, and sent mail-back questionnaires in the winter of 1978. Sixty percent of the 342 eligible respondents returned the questionnaire, providing the other half of the data used in this study.

It was found that the ORV and pedestrian visitors used the seashore quite differently, visiting many locations in different proportions and participating in activities differently. Seasonal and experience-related differences were present. Local resident ORV owners and non-ORV owners were different in their use of Cape Hatteras for recreational purposes as well. The ORV owner was a much more active user of the seashore than

the non-ORV owner.

Many implications for planning and management of Cape Hatteras are suggested. Based upon the results obtained, no substantive conclusions can be made about whether user conflict exists between ORV and non-ORV users.