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RECREATION PLANNING AND MANAGEMENT

**PARK PARTNERSHIPS: A CASE STUDY OF
YOSEMITE INSTITUTE AND YOSEMITE
NATIONAL PARK SERVICE**

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Abstract: This exploratory case study seeks to develop a better understanding of park partnerships. As partnerships continue to become popular park management solutions, in an era of federal agencies stricken with budgetary and staff constraints, it is essential to develop a clear understanding of what a partnership means. Exploration of the well-established partnership between Yosemite Institute and Yosemite National Park Service facilitated such a study. Since both organizations have worked to maintain a partnership for over twenty-eight years, their partnership was ideal for studying the meaning attached to the arrangement. A qualitative methodology was incorporated using grounded theory and in-depth interviews to reveal the meaning of the term "partnership".

Introduction

Yosemite National Park hosts a unique partnership between Yosemite Institute (YI), an environmental education organization, and Yosemite National Park Service (YNPS), a federal land management agency. In 1971, under financial constraints, YNPS developed a cooperative agreement with YI to support the mission of environmental interpretation. After twenty-eight years, the Yosemite Institute continues to support the interpretive mission and the mandates of the YNPS. Consequently, this partnership is ideal for a case study concerned with developing an understanding of the meanings and values associated with the concept of a partnership.

Currently, National Parks around the country have increasing numbers of visitors seeking the park experience. Over the past century, advancements in transportation and technology have transformed remote National Parks into increasingly viable recreation opportunities. Transportation by stagecoach, horseback and train were traditionally slow and expensive, making vacations in the National Parks a luxury for a small percentage of the population. With the introduction of the automobile, paved highways, and bus

tours, our treasured parks became increasingly accessible. Improvements in technical equipment such as tents, backpacks and clothing associated with outdoor activities have influenced and added to the increasing number of visitors seeking recreation in the National Parks. As a result, National Parks like Yosemite and Yellowstone host millions of visitors annually.

Partnerships are a potential answer for once independent parks, now faced with increases in visitation rates coupled with budgetary constraints. As resource managers begin to look to partnerships in the attempt to meet mandated goals and missions, it is important to understand what a partnership means. Consequently, this case study helps to develop an understanding of partnerships, ultimately serving as a role model for parks faced with similar constraints and demands. It is only through increased understanding of these fragile relationships that we will be better able to facilitate partnerships.

The objectives of this qualitative case study of the partnership between YI and YNPS are: (1) to identify the meaning that informants attach to the conditions essential to facilitating partnerships, and (2) to discover the connections between those conditions. Aware of the increasing demand for partnerships, we must begin to develop an understanding of what a partnership means and how to best facilitate such relationships.

Partner Organizations

Yosemite National Park Service

One of the primary goals of Yosemite National Park, as mandated in the Park Service's 1916 Organic Act, is to assist visitors in understanding, enjoying and contributing to the protection of the resources within the park. Dedicated to this mission, YNPS's interpretive division provides park programs that assist park visitors in these three major activities.

Interpretive rangers implement a variety of programs to develop visitors' understanding of the natural, cultural and scenic resources in Yosemite National Park. These interpretive programs incorporate core themes from geology and ecosystems to Native American culture and history. The programs are delivered through activities such as interpretive walks, ranger led campfires and presentations. Park programs seek to develop the visitor's understanding of the resources, and their connection to the resource. Essential to these programs is the ability of the ranger to strike a cord in the visitor and enable them to see their relationship and interconnection with the resource.

Interpretive personnel have a responsibility to assist visitors in their enjoyment of the park. Through the provision of information on where and how to utilize the park's resources (e.g., backpacking, hiking and rock climbing), the interpretive division aids in visitor enjoyment.

The interpretive division's final mandate is to assist visitors in contributing to the protection of the park's resources. The most effective way that the interpretive division meets

this goal is through their information and education programming. Whether presenting visitors with new information or altering their perspective on the park through a new experience, they can reinforce preservation attitudes and encourage environmental stewardship.

Yosemite Institute

When the interpretive division of YNPS was faced with shrinking budgets, reductions in interpretive staff and an ever-increasing visitation rate, the agency was forced to turn to an outside organization for some support. Unable to meet their mandated goals and missions, the YNPS embarked in a cooperative agreement with Yosemite Institute. The agreement stated that the Park Service did not have all the resources needed to provide park programs and desired the Institute, under the supervision and regulation of the park superintendent, to establish and operate such programs (Cooperative Agreement 1971).

YI is a private non-profit organization, which provides week-long residential field science programs. Using Yosemite National Park as a classroom, instructors work to develop a sense of place, interconnectedness and stewardship in their students. Annually, the organization facilitates 13,000 students, predominantly from the state of California. Through their work, the organization provides 400,000 hours of interpretation and educational services that serve the mission of YNPS. For the past twenty-eight years, Yosemite Institute has supported the mission of the YNPS's interpretive division through the provision of educational programs.

Literature Review

Partnerships

Concerned with the meaning of partnership, we reviewed previously published research. However, the focus has been predominately on the evolutionary process inherent in partnership development not the meaning of partnership. Research, conducted by Waddock (1989), points to three distinct stages in partnership development: initiation, establishment and maturity. Waddock refers to initiation as the most critical stage in partnership development. Crucial to initiation is issue crystallization, when partner organizations clearly establish a salient issue around which the organizations can unite. Next, the partner organizations must realize their interdependence and the mutual stakes and benefits which tie them together during coalition building. Direction setting is the final component in initiation, as partners finalize the direction that their relationship will take.

While Waddock's research reveals the importance of the initiation stage in partnership development, it unfortunately does not contribute to our understanding of the meaning of partnerships or how to facilitate such relationships. Consequently, our exploration of previous research reinforced the need for developing an understanding of what a partnership means.

A review of research conducted by Selin and Chavez (1994) and Waddock (1991) served as useful tools in

developing a greater understanding of what partnership means. Their research presented conditions essential for facilitating a healthy partnership. Since we were concerned with the meaning attached to partnerships, we found these conditions to be a good framework to organize our research. Consequently, we adopted a list of conditions from Selin, Chavez and Waddock that are essential for facilitating partnerships: interdependence, communication, shared vision, strong leadership, power equilibrium, understanding, salient issue, trust, sense of benefits, clear and well defined objectives, and feed back.

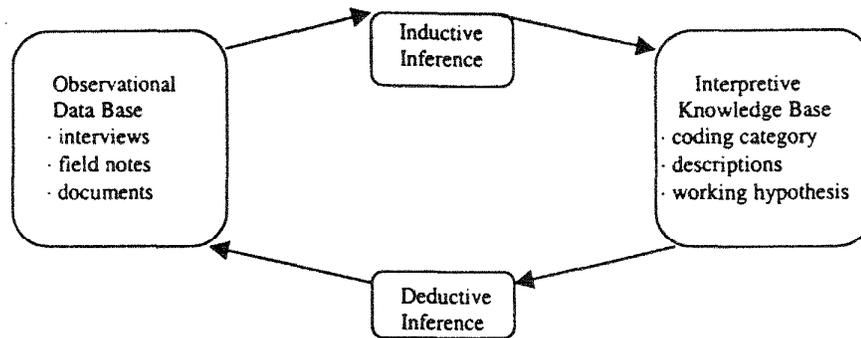
Qualitative Analysis

The qualitative approach used in this study, grounded theory, was introduced in 1967 by Glasser and Strauss and is based on the inductive conceptual process. The inductive reasoning process fundamental to grounded theory is structurally different from the traditional deductive process associated with most data analysis. Deductive analysis is working to test developed theories or hypothesis using data to either accept or reject the original hypothesis. However, in grounded theory, the researcher does not assume he or she knows what is most relevant and important to the study. Qualitative researchers implementing grounded theory, "do not search out data or evidence to prove or disprove hypotheses they hold before entering the study; rather, the abstractions are built as the particulars that have been gathered are grouped together (Bogden and Bicklen 1998)." Consequently, this type of analysis seeks to generate concepts, theories and generalizations. "Generating theory from data means that most hypotheses and concepts not only come from the data, but are systematically worked out in relation to the data during the course of the research (Glasser and Strauss 1967)." Theory is developed from the bottom up as pieces of data are connected to provide a descriptive representation of the interconnections.

While deduction is not the primary research process involved in grounded theory, it can play a role in the overall research design. Deductive reasoning is useful in the later stages of grounded theory during which inferences are measured against the data. As theories develop out of the data, the deduction process can assist in verification of the theory. Through the combination of induction and deduction processes, grounded theory both develops and tests theory. Dewey (1938) notes, "induction and deduction must be so interpreted that they will be seen to be cooperative phases of the same ultimate operations." Shelly and Sibert (1992) suggest this complementary relationship between deduction and induction process (figure 1).

This approach to qualitative research is especially useful in studies exploring subjects where no previous research has been conducted. The inductive reasoning process allows the researcher to explore phenomena and relationships between phenomena that they might not have been aware of previously. Consequently, unknown relationships and meanings attributed to phenomenon emerge as the research process generates theory through descriptive data. As a result, these exploratory projects can bolster the foundation from which future studies develop.

Figure 1. The induction-deduction process used in qualitative research (after Shelly and Sibert 1992).



The inductive-deductive inference model displayed in figure 1 (Shelly and Sibert 1992) is essential to the analysis of qualitative data acquired from in-depth interviews. Central to this model is the analysis process of generating coding categories, descriptions and inferences from the data. The researcher must look for illustrations, which help to define categories and the meaning that informants attach to them. Those definitions are then used to code the remaining data set. Codes are assigned by interpreting and reading the interview transcripts to identify responses that meet the defining characteristics of the categories. The iterative nature of the inductive-deductive process allows for the evolution of categories and concept expansion. Shelly and Sibert (1992) note, "the movement within any stage is the basic induction cycle; the movement across stages is a spiral." The inductive cycle inevitably leads the researcher upward to a more generalized and abstract explanation of the phenomena.

Research Design

In order to discover the meaning of partnerships, we employed a qualitative methodology using grounded theory. The goal of qualitative research is to improve the researcher's ability to know and discover; therefore, qualitative procedures should be used that work to these ends (Henderson 1991). Consequently, the case study approach was supported by data collected through ethnographic in-depth interviews and in combination they helped to explore the partnership between YI and YNPS.

Data collection is particularly important to developing an understanding of the phenomenon, partnership, as defined by key informants. Interviews are central to data collection to capture the informant's voice, preserving the perspective and meaning attached to the phenomenon. Ethnographic interviews allow the meaning that informants attribute to partnership to emerge. This data collection method is essential to the qualitative researcher vested in discovering what informants are experiencing, how they interpret their experiences, and how they structure the social world in which they live (Bogden and Bicklen 1998). The

researcher conducting interviews can use both informal and formal techniques to reach the goals of the study.

Study Methods

Data were collected through ethnographic in-depth interviews with employees from both Yosemite Institute and Yosemite National Park Service. The executive director of YI provided an initial list of informants to contact for interviews. The list represented employees from both Yosemite Institute and Yosemite National Park Service and various positions within the two organizations. A network sampling technique was used to gain access to members of both organizations outside the first list of employees. An effort was made throughout the study to maintain the balance between the number of informants from both organizations.

NPS employees in the sample represented a variety of divisions from interpretation and resource management to law enforcement and research. Within each division, the informants held various positions within the NPS hierarchy from employees in the field to administrators and division chiefs. Since we were searching for the meaning of partnership, we chose interviewees who had some knowledge of Yosemite Institute. The sample from YI represented administrators, executive management staff and field instructors. We chose informants who had been associated with YI for at least one year.

After acquiring the initial list of informants, interviews were conducted during the month of July. We sent out a letter of introduction to all potential interviewees explaining the purpose of the study and the reason for speaking with them about the partnership. The mailing included an interview schedule to familiarize the informants with the material to be covered during the interview.

A combination of informal and formal interview styles enabled the collection of a consistent set of data. A predetermined interview schedule was applied to all informants maintaining consistency across the interviews.

The predetermined questions presented to informants were broad open-ended questions from which the interviewer followed the lead of the informant. Through simultaneous implementation of both formal and informal techniques, interviews captured the meaning of partnership to the informants.

The interview sessions lasted anywhere from twenty minutes to an hour and a half. At the conclusion of each interview, informants were asked for any suggestions that might improve the interview schedule or the process in general. Informant's suggestions and comments were assets as they helped to shape the interview sessions that followed. Network sampling was implemented as each informant suggested members of the organizations who might contribute to the research project. Data saturation, the point at which the information collected becomes redundant (Bogden and Bicklen 1998), was achieved after interviewing twenty-nine informants. The total sample population consisted of fifteen informants from YI and fourteen from YNPS.

Results and Discussion

This paper presents preliminary results from the first stage of analysis. In this first stage, we defined the conditions essential to partnerships based on informant's testimony and discovered preliminary connections between the partnership conditions. This paper presents three of the conditions essential to partnerships. First, we explain how informants defined the conditions and then follow with illustrations and quotes from the interviews. The voices of informants emerge through the quotes, presenting their perspectives on the partnership. The informants' quotes suggest the meaning attributed to each condition and the relative importance of these conditions to the partnership. Consequently, the illustrations of the partnership aid in the development of our understanding of what is essential for partnerships.

The quotes presented here illustrate the necessity of partnerships while revealing the importance of working together towards a shared vision with common goals and missions. A constant effort to maintain a working relationship is fundamental to the success of the partnership. Communication and interaction at multiple levels are central to meet the potential of the partnership.

Shared vision

The first condition defined by informants, as essential to partnerships, was shared vision. Informants defined this condition by four general requirements: goals, opportunity, philosophical framework and the recognition of partner organization's goals, and opportunity and philosophical framework. The construct, shared vision, is dependent on its ability to encompass these four principals.

Goals help to define shared vision since informants believe that shared goals are essential to a shared vision. Informants referred to their shared goals such as: preservation, developing an educated constituency, and providing a great first time experience. Opportunity means

that there is an opportunity to provide educational or recreational programs for students or visitors. Some interviewees mentioned philosophical framework as central to their definition of shared vision, such as: vision, mission or philosophy. Finally, shared vision is the recognition of how the partner organization defines these principals. Specifically, what are the partner organization's goals, opportunity and philosophical framework?

The quotes selected to illustrate shared vision from both YI and YNPS employees refer to the goals that the two organizations share and the educational opportunities that allow them to meet their goals. An employee at YNPS stated the goals as, "To preserve and protect the resources, [and] the natural and historical objects therein. You can't do that if you don't educate the young kids and that is what it comes down to." An employee at YI stated that, "I see the Institute in building stewardship and support for parks particularly with kids, the future constituency, and support for the whole idea of National Parks. I think the Institute helps build connections between people and the park and makes people realize why a National Park is important and what goes on in a National Park that is special."

Communication

The construct communication was defined by informants as an interaction. Interaction at both the social and professional levels was essential to their definition of communication. Characteristic interactions ranged from an informal game of ultimate frisbee or a potluck dinner to a formal gathering at an interpretive management team meeting. Another key component of communication is the medium used, such as verbal, contractual, written documents, or visually just acknowledging each other in the field.

The selected quotes, which illustrate communication, display the importance of interactions on both a social and professional level. They show the connection between social interaction and its role in developing an opportunity for professional interaction. An employee with Yosemite National Park Service stated, "I really feel there needs to be more interaction. And I feel like that with our own interpretation group, so it is not just YI. It is not that YI is being kept out. It is that somehow or another the information about ongoing research and ongoing management strategies is not being dispersed." An employee from YI expresses the need for communication at both the personal and professional level stating, "Starting from a personal level is where I think the connection between the Park Service and YI has to start. I think we are very content with who we are and who we are hanging out with and who we get to talk with throughout the week and we don't need anybody else. Then when we get into the field, we realize god it would be really cool if I felt more comfortable to go up to that person."

Interdependence

The definition of interdependence dealt with three requirements: function, resource, and finance. Function was the concept that YI or YNPS was providing some function which their partner organization was dependent

on. Resource refers to YI's dependence on the natural and cultural resources within the park. Finance is at the root of interdependence since under funding constrains the park staff and requires outside organizations to assist them as they try to meet mandated goals and missions.

The selected quotes from the interviews exemplify the necessity of interdependence for both partner organizations. The mutual dependence of these two partner organizations is obvious when informants discuss the partnership. An employee from YNPS states, "Yosemite Institute is filling a niche that we can't fill in Park Service. We don't have the staff and we don't have the money to do educational programs for school groups or for groups like elder hostel or groups that want to have a more in-depth experience in the park. There is no way through federal procurement and the level of support we get that the Park Service can provide those programs." Similarly an employee from YI explains the interdependence which bind the two organizations together: "I think it is a really terrific two way street. That the service that YI provides for the Park is huge and I think our being able to operate in the park is likewise gigantic. If you look at this organization's asset, our presence of where we are is the number one thing far and away that makes us any good. So it is a thriving partnership and our agendas are healthily intermingled in a mutualistic symbiosis."

Conclusion

From these definitions and illustrations we can begin to understand what partnership means for these two organizations, realize how the conditions interrelate, and ultimately discover the influence of these conditions on the tone of the partnership. Consequently, this research provides information on how to maintain successful partnerships by developing our understanding of the relationship between the conditions essential for partnerships. Partnerships might be better managed and maintained once an understanding of what partnerships mean and how various conditions influence the partnership is reported.

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THE IMPORTANCE OF ENVIRONMENTAL HISTORY IN NATURAL RESOURCES MANAGEMENT AND PLANNING

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Abstract: The field of study known as "Environmental History" provides the opportunity for humans to, once again, see ourselves as part of nature rather than separate from it. Many current perceptions of nature omit the fact that all natural environments have a human history. Thus seemingly "pristine" parts of nature actually have been shaped by human actions, some dating back as far as 12,000 years. Environmental histories may provide the factual and defensible data we require to understand natural environments today and to develop planning efforts for the future. History isn't simply about the past. More often than not it is about the future.

Introduction:

As land managers, planners, and researchers, we are finding it more difficult to balance the multiple-use approach on public lands with public desires to increase and broaden leisure activities. In the last decade of the twentieth century increasing numbers of people work indoors and seek release from stress and pressures by visiting and recreating in the outdoors. Nature or natural settings have taken on a role as primary stress relievers in our busy lives. Recreation has evolved into much more than a pastime. It is an activity many of us consider necessary as we nurture our physical and mental health. Not only is this a heavy burden on the land, but also upon land managers whose job it is to manage public land with a view toward the future. How can managers defend their actions in the face of polarized interest groups and legal challenges? One way is through the use of environmental history.

The history of an environment, or managed parcel of land, includes actions which we commonly group under the headings of "natural disturbance" and "human disturbance". Such things as tornadoes, hurricanes, floods, fire, and beaver activity fall into what most people call natural disturbances to the land. Human disturbance include things like logging, mining, grazing, farming, floods, fire, trail and road construction, and recreation site development. It is interesting that natural disturbances can cause some of the greatest impacts to a specific piece of

land. Examples include the 1938 hurricane and the 1998 ice storm in New England.

Until fairly recently in recorded history, humans were more associated with the natural setting. It has really only been in the last three generations or so that we have increased the relocation of human beings from the natural environment. The result is that many of us view and understand nature as a place to imagine, visit, preserve, and protect. It is not viewed as a home but as a destination. Today we work hard to safeguard our ability to visit natural areas and we worry about whether or not our children and their children will have the same opportunity. Since the majority of us no longer live and work in the outdoors, the separation seems to contribute to a limited understanding of the land and perhaps to unrealistic expectations. Sometimes we even put forth the belief that areas set aside as "Wilderness" by Congress are some of the last remaining areas untouched or unspoiled by human beings. We embrace the mistaken assumption that these areas have insignificant histories when each actually has a vibrant one. Rather than taking away from the natural history of these areas, the dynamic human histories contribute to them and actually help explain why the land appears as it does today and how it will appear in the future.

We seem to focus on disturbances in environmental history which were human caused or assisted. Perhaps it's time to take a more comprehensive view of the environmental histories of the lands we manage. Prehistory and history of the land contain the facts which allow managers to plan for the future. Without this information it is very difficult to document how the land has recovered from past disturbances, what actions led to the vegetative types present, and why our proposed actions are acceptable and may even enhance the setting. If our management proposals are impacting, or are perceived to be, environmental history can provide information about the environments past response to similar disturbance. It is not far fetched for us to view the land as an informant. The story it tells through conditions present today indicate its methods of response and can point to informed land management approaches for our future. Environmental history is a tool which can provide the foundation for project planning.

Many current land management initiatives are dedicated to the "restoration" of natural settings. Environmental history can guide this effort because its focus is describing and understanding those conditions at any period within circa the last 12,000 years.

As land managers, I believe, we have erred by separating human history from natural history. They are both integral

parts of environmental history. The environment responds to disturbances of any kind and the results of those responses are what we see on and in the landscapes of our world. We have an opportunity to use this information as we plan for today and for our future.

"What we remember, what we stress as significant, and what we omit of our past defines our present. And since the boundaries of our self-definition also delimit our hopes and aspirations, this personal history affects our future."

(Lerner 1997:199)

"To plan for the future without a sense of history is like planting cut flowers."

(McCullough 1998)

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THE EFFECT OF FEES ON RECREATION SITE CHOICE: MANAGEMENT/AGENCY IMPLICATIONS

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Abstract: A personal interview survey focusing on day use was conducted on selected sites in northwestern South Carolina. The purpose of this study was to investigate the effect of fees on recreation site choice. This paper reports on the first phase of the study, and focuses on the management implications of entrance fees. Managing agencies were not well recognized by respondents at the sites surveyed and some sites were poorly recognized by name. Crowding, maintenance, and fees were the most frequently cited reasons affecting patterns of activity and site switching. There is some evidence that respondents surveyed at uncrowded sites and sites without fees may have switched to these sites because of crowding and fees at other sites. Most respondents consider time to be the most important factor limiting site choice.

Introduction

Access fees on public lands are a controversial issue both within and outside management agencies. Fees can be used to reduce use as well as to generate revenue. Public reaction to fees on public lands is of great interest to public land managers as well as managers of recreation sites supplied by private firms. The U.S.D.A. Forest Service started its Recreation Fee Demonstration Program in 1996. This is a test project in which an entrance or parking fee is charged on selected recreation sites. Although numerous studies document entrance and use fees from many perspectives, the initiation of this practice on federal lands raises many questions concerning equity and site use.

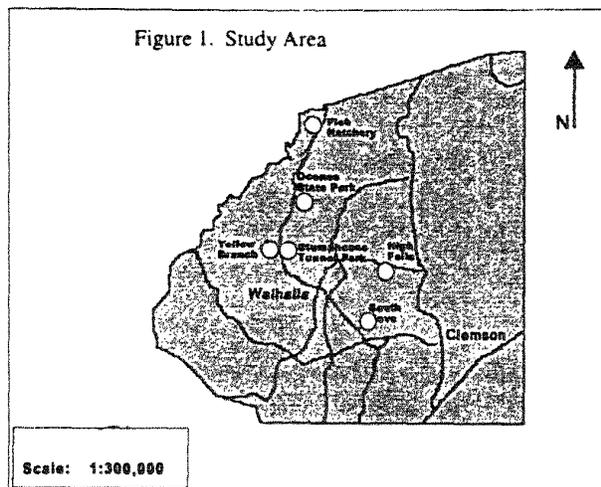
The purpose of this study was to investigate the effect of fees on recreation site choice. Of particular concern is site switching in response to fees and the role of substitute sites. This paper reports on the first phase of the study, and focuses on the management implications of entrance fees. The following subjects will be discussed:

- Management recognition
- Site recognition
- Cost factors considered by respondents
- Most important factors in site switching
- Inconsistencies and confusion regarding fees

Study Area

The primary study area is the Andrew Pickens District of the Sumter National Forest in the mountains of northwestern South Carolina (Figure 1). Recreation sites in this part of the state are operated by the Forest Service; the South Carolina Department of Parks, Recreation, and

Tourism; the Pendleton District Historical, Recreational, and Tourism Commission; the county (primarily Oconee County); the U.S. Army Corps of Engineers; and local municipalities such as the city of Walhalla. The South Carolina Department of Natural Resources operates a fish hatchery in the study area adjacent to one of the study sites. Clemson University maintains a locally popular site on the university forest and another at its botanical garden. Duke Energy Corporation operates a picnic area nearby at the site of a power plant and education center. The South Carolina Forestry Commission has a limited involvement in



recreation use, but not primarily in the study area.

To access the Andrew Pickens District from South Carolina, most traffic flows through the gateway town of Walhalla. The first site encountered after passing through Walhalla is the Yellow Branch picnic area (Figure 1), which is at the southeastern entrance to the National Forest. This is a well maintained Forest Service picnic area with several picnic tables, drinking water, a hiking trail, a picnic shelter, a waterfall, and an outhouse. This was scheduled for a fee in 1998 but, due to problems with the drinking water supply, the fee was not implemented. Almost directly across the highway is Stumphouse Tunnel Park, which would appear to be the best substitute for Yellow Branch. This site, operated in 1998 by the Pendleton District Historical, Recreational, and Tourism Commission, contains picnic facilities including a shelter, a trail created by the Boy Scouts, a waterfall, and an outhouse. The site does not have drinking water and the waterfall is not visible from the picnic area. In the past, the site had a campground, drinking water, a rail car, and access to the Stumphouse Tunnel. These amenities no longer exist, including access to the tunnel which was closed due to a cave-in. The area has sentimental significance to some local residents who picnicked at the tunnel before the park was established. The area is maintained and patrolled by a ranger working part time for the historical commission and is, not maintained as well as Yellow Branch. The picnic tables in the park are not of the same quality as those in Yellow Branch and many are in need of repair. Although both sites have paved access, some of the parking at

Stumphouse Tunnel park is considerably more primitive than that at Yellow Branch. Preliminary data collected at these sites indicated that some users do not know who operates these sites and assume the Forest Service operates both, partly because the ranger station is less than one half mile up the road. As of 1998, the Pendleton District Historical, Recreational, and Tourism Commission did not plan to charge fees at Stumphouse Tunnel. Both sites do have a rental fee for the picnic shelter.

Oconee state park, operated by the South Carolina Department of Parks, Recreation, and Tourism, is approximately 5.5 miles from Yellow Branch and Stumphouse Tunnel. It is a highly developed park with picnic facilities, a lake, a campground, cabins, and a miniature golf facility. At one time, it also had a restaurant. Parking fees of \$2 per car have been charged for the past few years. In addition, there are fees for camping, swimming, golf, picnic shelter (rental), and cabin (rental). The state park system is self supporting under an experiment began several years ago, but the effect of this experiment is currently under scrutiny (Associated Press 1998).

The Chattooga Picnic area and Fishing Pier, known to most local recreationists as the Fish Hatchery is about 15 miles one way from Yellow Branch and Stumphouse Tunnel Park. This site is near the North Carolina border and is the study site farthest from Walhalla. This site has picnic facilities, including a shelter (no rental fee), fishing facilities, a trail, and a fish hatchery (which is operated by the South Carolina Department of Natural Resources). This site is unique in this area as it contains some of the states oldest and largest white pine and hemlock trees. Currently, the Forest Service does not plan to charge fees on this area due, in part, to problems resulting from a shared parking facility.

Three roadside picnic areas lie between the Oconee State Park and the fish hatchery. These are possible substitutes for the sites discussed above and two were surveyed as the research assistants made their rounds to the other areas.

Other sites suggested as substitutes include High Falls and South Cove, both of which are highly developed Oconee County parks situated on Lake Keowee. Depot Park, a municipal picnic area operated by the city of Walhalla, is also a potential substitute, but most likely only for Walhalla residents. Twelve Mile and Twin Lakes are boat launching, swimming, and picnic areas operated by the Corp of Engineers. A campground is adjacent to the Twin Lake park. These areas are on Lake Hartwell and close to Clemson, SC. In addition, Clemson University operates the Botanical Gardens, a popular local picnic area with some walking trails, and the Lake Issaqueena Recreation area which is another popular local picnic area. With the exception of High Falls, none of these sites would normally be considered to be "in the mountains". High Falls, although not in the mountains, is quite close to them, and is considered by many to be a mountain location. There are also other sites on Lakes Hartwell, Keowee, and Jocassee as well as some municipal sites which are not on the lake.

High Falls and South Cove County Parks were selected for the study because of their locations and amenities. Similar in facilities to Oconee State Park, these county parks have a more complex fee schedule. In addition to camping and picnic shelter rental fees, these parks charge an entrance fee on weekends only between Memorial Day and Labor Day. High Falls does not have a waterfall, although many visitors look for one.

Methods

A personal interview survey was conducted on the six primary sites (Yellow Branch, Stumphouse Tunnel Park, Oconee State Park, the Fish Hatchery, High Falls and South Cove County Parks) and two roadside picnic areas in northwestern South Carolina on weekends during the period July through October 1998. The focus was on day use, primarily picnicking and walking/hiking, activities that were common to all sites. Four of the sites and the two roadside picnic areas were along the same road (Fig. 1) and were thought to be substitutes for each other because of their proximity and opportunities for similar activities. These sites were selected at the beginning of the study. When the project was initiated, it was hypothesized that most users of these facilities would come from the nearby town of Walhalla or would come from areas east of Walhalla such as Seneca, Clemson, and Greenville, SC. During the first two weeks of the study, it was apparent that this hypothesis was correct. At this time, two additional sites east of Walhalla were selected as possible substitutes, bringing the total study areas to six primary sites and two roadside picnic areas.

During the first year of the study, 679 interviews were attempted and 588 were completed. Of those that were not completed, 16 had been surveyed previously, 6 did not speak English, 14 were just leaving, and 54 refused for various reasons. We did not intend to resurvey respondents and were unable to survey the 6 who did not speak English. The response rate was 87% calculated with all observations and 90% calculated without the 16 who were previously surveyed and the 6 who did not speak English. Using the second criteria, the response rate varied by site from 84% to 95%.

Results

Respondents were asked who (what agency) they thought was responsible for managing the site at which they were surveyed. The question was worded so it referred to the site as "this place" rather than by name. This approach was used primarily because the Chattooga Picnic Area is known as the Fish Hatchery and because one of the roadside picnic areas, Burrell's Place, is also the name of a local bar. In general, few respondents were able to correctly identify the managing agency for the site. Yellow Branch was clearly marked with the typical large Forest Service sign, but only 23% of the respondents correctly identified the U. S. Forest Service as the managing agency. The Fish Hatchery fared even worse at 15% correctly identifying the managing agency, largely because of confusing signs and the fact that the U. S. Forest Service operates the picnic area and the

state Department of Natural Resources operates the adjacent fish hatchery. One sign at the entrance listed the names of both sites but only the name of the state agency. The best recognized agencies were the State (78%), and the County (57% South Cove and 42% High Falls), both of which have large clearly marked signs and personnel present on site. The worst level of managing agency recognition by far was Stumphouse Tunnel Park at 2%. There were no signs identifying the managing agency at this site.

When respondents did not know who managed an area, they were likely to say the area was managed by the State (Table 1). It is likely that some of the 78% who correctly identified the State as managing the state park were making

this common mistake. Most thought they knew who managed these sites as indicated by the few who responded by saying they didn't know. Only 6% of the respondents said they did not know who managed the Fish Hatchery. This was likely due to the highly visible presence of the state Department of Natural Resources trucks and personnel combined with a sign crediting several groups with building a walkway at the site. It is apparent from Table 1 that the State is likely to get much of the credit and blame for sites managed by other agencies. Table 1 contains only a small selection of the answers given. Perhaps the most unusual response was from an individual who thought the U.S. Postal Service managed one of the sites.

Table 1. Respondents' perception of agency responsible for managing the site.

-----Management Recognition (percent identifying as) -----

Site Where Interview Took Place	State	County	Federal	Corps of Engineers	Department of Natural Resources (State Agency)	Don't Know
Yellow Branch (USFS)	39	5	23	0	5	11
Fish Hatchery (USFS)	42	3	15	2	15	6
Oconee State Park	78	2	5	0	2	7
South Cove County Park	26	57	2	0	0	8
High Falls County Park	28	42	1	6	1	15
Stumphouse Tunnel Park	43	8	14	0	2	12
Total	45	17	9	1	4	10

Knowledge or awareness of substitute sites was assessed by questions administered at each site asking if the respondents were familiar with the other study sites. For example, respondents at Oconee State Park were asked where else they go for this type of outing. If they did not mention a study site such as Yellow Branch, they were asked if they were familiar with Yellow Branch. Those surveyed at Yellow Branch tended to have the greatest awareness of the other study sites (Table 2). As would be expected, those surveyed at Yellow Branch were highly likely to be familiar with Stumphouse Tunnel Park (91%), which is almost directly across the road. Yellow Branch, on the other hand, was least likely to be recognized by

those surveyed at the other study sites. Only 35% of all respondents surveyed at other sites were familiar with Yellow Branch. Surprisingly, while 91% of those surveyed at Yellow Branch were familiar with Stumphouse Tunnel Park, only 27% of those surveyed at Stumphouse Tunnel Park were familiar with Yellow Branch. The sign at Yellow Branch was considerably larger and more conspicuous than that at Stumphouse Tunnel Park. The Fish Hatchery, Oconee State Park, and Stumphouse Tunnel Park were all recognized by about three fourths of the respondents and these are all along the same road as Yellow Branch. High Falls and South Cove were farther away and were recognized by fewer respondents.

Table 2. Recognition of study sites by respondents surveyed at other sites.

----- Surveyed at Site -----

Site Recognition - Percent Familiar with	Yellow Branch	Fish Hatchery	Oconee State Park *	South Cove County Park *	High Falls County Park *	Stumphouse Tunnel Park	Roadside Picnic Areas	Total
Yellow Branch (USFS)		32	37	26	18	27	59	35
Fish Hatchery (USFS)	86		74	60	49	69	77	73
Oconee State Park	88	82		67	60	68	73	77
South Cove County Park	69	34	39		53	29	41	47
High Falls County Park	71	48	44	72		32	50	58
Stumphouse Tunnel Park	91	75	70	64	47		77	75

* Asterisks indicate sites with entrance or parking fees.

Respondents were asked what types of costs they considered when they went on this type of outing. The question was open ended in an effort to reduce bias. As expected, food, gas, and lodging were common responses (Table 3). It is interesting, particularly to those who work with travel cost models and expenditures, that many people did not cite food and gas. We did not ask why but respondents repeatedly volunteered the same reasons. Food cost was often not considered because respondents "had to eat if they stayed home". The cost of gas was not considered because it was below some threshold set by respondents. Thus, many respondents evaluated these costs and made a decision not to include them.

One of the purposes of the cost question was to identify how many respondents would consider fees as costs associated with the trip. Overall, 28% cited entrance fees and 8% cited parking fees (Table 3). Respondents were more likely to consider fees than food. Activity fees were more likely to be considered at sites that had these fees. Other than at Stumphouse Tunnel Park, the same is true for facility rental fees. All sites except the Fish Hatchery and roadside picnic areas rented shelters. Few respondents used the shelter at Stumphouse Tunnel Park and there were no prominent signs indicating that it could be rented. Unlike activity and facility rental fees, entrance and parking fees were likely to be considered by respondents

interviewed at all sites, regardless of whether the sites had entrance or parking fees.

When asked what limits their choice of locations (an open ended question), most cited time or time-related reasons such as work or distance (Table 4). Children were also a common limiting factor. Few cited cost and very few cited health. Some said that nothing limited their choice and some, particularly at High Falls County Park, said they liked to stick to a good place when they find one. Time was the limit cited more frequently by those surveyed at the mountain sites.

Respondents were then asked several questions about the effect of cost on site choice (Table 5). First, they were asked whether cost or time was the more important factor limiting site choice. The majority cited time, which is consistent with the open ended question discussed earlier. A few (8%), said cost and time were equally important. There was no clear relationship between the response to this question and whether the survey was conducted at a site with an entrance or parking fee. However, those with lower household incomes were more likely to cite cost. If respondents did not cite cost, they were asked if cost affects their choice of sites. A slight majority said no, except at Yellow Branch where the majority said yes. Again, there was no clear difference in responses between sites with and without entrance or parking fees.

Table 3. Types of costs considered by respondents.

----- Surveyed at Site -----

Types of Costs Considered (percent)	Yellow Branch	Fish Hatchery	Oconee State Park *	South Cove County Park *	High Falls County Park *	Stumphouse Tunnel Park	Roadside Picnic Areas	Total
Activity fee	9	6	17	5	17	10	0	11
Camping fee	6	1	9	8	19	6	0	8
Entry fee	20	27	25	23	30	31	27	27
Fee	6	1	6	0	6	10	0	5
Parking fee	9	10	9	21	3	4	0	8
Facility rental	11	1	16	26	10	0	0	9
Food	26	30	15	21	27	22	13	23
Gas	40	33	23	21	29	36	40	30
Lodging	9	24	18	3	8	20	13	16
Travel cost	0	5	2	8	2	0	7	3
Travel time	3	5	3	0	5	7	7	4

Asterisks indicate sites with entrance or parking fees

Table 4. Respondent-selected factors limiting site choice, by site where interviewed.

----- Surveyed at Site -----

Factors Limiting Site Choice (percent)	Yellow Branch	Fish Hatchery	Oconee State Park *	South Cove County Park *	High Falls County Park *	Stumphouse Tunnel Park	Roadside Picnic Areas	Total
Cost	7	8	6	3	10	7	5	7
Time	49	43	43	27	28	52	50	41
Work	9	4	6	13	6	4	0	6
Distance	5	11	11	10	13	6	5	10
Kids	5	7	10	7	14	13	9	10
Health	0	3	3	2	0	4	9	2
Stick to good place	2	3	5	5	10	2	0	4
None	2	4	3	2	2	3	14	3

* Asterisks indicate sites with entrance or parking fees

Table 5. Cost as a factor affecting site choice.

----- Surveyed at Site -----

Factors Affecting Site Choice (percent)	Yellow Branch	Fish Hatchery	Oconee State Park *	South Cove County Park *	High Falls County Park *	Stumphouse Tunnel Park	Roadside Picnic Areas	Total
Most Important Factor Limiting Choice of Sites								
Cost	14	14	11	23	21	19	23	17
Time	77	71	75	70	62	71	54	70
Both	5	9	11	2	9	6	5	8
Does Cost Affect Your Choice of Sites?								
No	44	60	60	50	54	63	52	57
Yes	56	40	40	50	46	37	48	43
Do You Consider the Cost of Travel Time?								
No	79	61	64	81	66	70	85	69
Yes	21	39	36	19	33	30	15	31
Did You Consider the Cost of Coming Here Today?								
No	88	87	74	67	77	87	86	81
Yes	12	13	26	33	23	13	14	19

* Asterisks indicate sites with entrance or parking fees

Most respondents do not consider the cost of their time when traveling to these sites. To some extent, this appears to be related to distance traveled. When asked if they consider the cost of their time when traveling to these sites, respondents were more likely to say no at Yellow Branch and South Cove County Park, the two sites closest to the population using them. They were more likely to consider the cost of their time at Oconee State Park and the Fish Hatchery, two sites farthest from the population using them. This is consistent with comments made by many respondents who said they do not consider the cost of their time but that they would if they had to drive farther.

Finally, respondents were asked if they considered the cost of their trip on the day surveyed. Most (81%) did not (Table 5). Those who were at sites with entrance or parking fees were more likely to have considered cost.

About three fourths of the respondents had not seen any changes occur that caused them to change their patterns of activity (i.e. to go to a site more or less frequently). Respondents surveyed at sites that did not charge entrance or parking fees were more likely to report that they had changed their patterns of activity (Table 6). Those who said they had reacted to changes were asked for details. Most of the changes were negative and resulted in respondents going less frequently. Crowding was cited by people surveyed at the less crowded sites, possibly indicating that they had switched to these sites due to crowding at other sites. Crowding was not cited at High Falls County Park, one of the most heavily used sites during the survey, possibly indicating that people who are sensitive to crowding do not visit the site while it is heavily used. Other than at South Cove County Park, fees were cited more frequently at sites without entrance or parking fees, possibly indicating that those most sensitive to fees

have switched to sites without fees. South Cove is the farthest from the other sites and the closest site to a town. It is likely that some respondents do not view the other sites

as substitutes but choose to go to South Cove County Park less frequently or at times when the fee is not being charged.

Table 6. Factors that have caused respondents to change their patterns of activity.

----- Surveyed at Site -----

Have You Seen Any Changes that Have Caused You to Change Your Patterns of Activity? (percent)	Yellow Branch	Fish Hatchery	Oconee State Park *	South Cove County Park *	High Falls County Park *	Stumphouse Tunnel Park	Roadside Picnic Areas	Total
No	63	75	86	81	81	64	71	75
Yes	37	25	14	19	18	36	29	24
Please Describe								
Crowding	2	5	5	3	0	3	5	4
Rowdy Behavior	0	0	0	0	4	0	0	1
Maintenance	5	5	2	3	5	4	0	4
Fees	7	4	1	8	2	4	14	4

* Asterisks indicate sites with entrance or parking fees

When asked what would cause them to go to a different site, respondents were most likely to cite crowding (Table 7). They were least likely to cite crowding at High Falls County Park which supports the previous argument that those who are sensitive to crowding do not visit that site when it is likely to be crowded. Fees and fee increases

were more likely to be considered as a reason for switching at sites that had entrance or parking fees, indicating that these respondents probably are comfortable with the current fee levels but are ready to switch sites if fees are increased.

Table 7. Factors that would cause respondents to go to a different site.

----- Surveyed at Site -----

What Would Cause You to go to a Different Location? (Percent)	Yellow Branch	Fish Hatchery	Oconee State Park *	South Cove County Park *	High Falls County Park *	Stumphouse Tunnel Park	Roadside Picnic Areas	Total
Crowding	37	16	20	20	12	23	33	20
Rowdy	7	1	4	11	11	3	5	5
Maintenance	7	6	6	2	8	7	14	7
Fees/Increase	5	2	7	7	9	3	0	5
Trees Cut	2	6	1	2	3	2	0	3
Nothing	7	16	8	15	8	15	19	12

* Asterisks indicate sites with entrance or parking fees

Conclusions and Recommendations

In general, managing agencies were not well recognized by respondents at the sites surveyed. Some might argue that this is a good thing or that it does not matter. From the viewpoint of the user, it probably does not matter who manages the site if the user does not have complaints about the site. Watson and Vogt (1998) state that public reaction to fees are influenced by the beliefs, attitudes and knowledge the public have of the managing agency. This becomes relevant when users know who the managing agency is. In this study, the state of South Carolina was most likely to be given credit for sites it does not manage. Other agencies put effort into their sites but hand over the credit to the State. If agencies are interested in raising their profile, it will take more than large signs such as the sign at the entrance to Yellow Branch. The most well recognized managing agencies had a large sign identifying the site and agency at the entrance to the site and personnel living and working at the site. The presence of workers and vehicles with agency logos raised the profile of the agency. During almost every visit, our interviewers saw vehicles and personnel working at the state and county parks. Agency personnel and vehicles were not usually observed at the other sites during these visits.

Some sites were poorly recognized by name. Large signs at the sites were not always helpful. Yellow Branch, with its large sign was the least recognized site, even by respondents surveyed at Stumphouse Tunnel Park, which is across the road from Yellow Branch.

Crowding, maintenance, and fees were the most frequently cited reasons affecting patterns of activity and site switching. There is some evidence that respondents surveyed at uncrowded sites and sites without fees may have switched to these sites because of crowding and fees at other sites. Most respondents consider time to be the most important factor limiting site choice, but few reported that they consider the cost of their time to be part of the cost of visiting the sites.

Sites in the area are managed by the U.S. Forest Service, Corps of Engineers, State, County, City, and private groups. The administration of fees differs between and within agencies and sites. Fees at state parks are administered differently from fees at other agencies and from fees at state parks located on Corps of Engineers property. Fees at county parks are charged on weekends only from Memorial Day to Labor Day. This is confusing to many users of multiple sites. Also confusing to users is combinations of fees at one site. Those who rent shelters often do not know whether they should also pay the entrance fee. Clear, consistent fee structures would help alleviate this confusion.

Although the question was not asked, some respondents volunteered they felt strongly that they should not have to pay fees on county or state parks if they were county or state residents and paid taxes, which is a common argument against fees on public lands (Harris and Driver 1987). Some felt that fees were more aggravation than expense. They were against paying but felt the expense was trivial. Managers who are thinking of instituting a fee sometimes believe that users of the site will be receptive to the fee if certain improvements are made to the site. In many cases, managers would do well to survey their customers to determine how important the improvements are to them. This would aid in the allocation of resources when it comes to making improvements to a site. One improvement thought by a manager to be important to users of a site was important to fewer than 10% of the respondents to this survey.

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BOOSTING CONFIDENCE IN IMPORTANCE-PERFORMANCE ANALYSIS: AN EXPLANATION AND APPLICATION OF AN I/P MODIFICATION

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Abstract: A common evaluative measure in recreation resource management is the Importance-Performance (I/P) analysis. It is favored for its visual display, clear outcome strategies, and ability to negotiate responses to multiple attributes in one framework. Recent studies have raised concerns with I/P analysis, including its lack of statistical analysis and insensitivity toward user differences. This paper modifies the visual display through the addition of a confidence interval. This modification offers more information on which to base decisions while maintaining the valued characteristics of I/P. Applications of the modification, as well as issues surrounding the use of I/P, will be discussed.

Introduction

Future trends in recreation resource management indicate that the decisions facing a manager will become increasingly more challenging. First, recreation settings are being asked to improve its present level of performance in significant areas such as customer service (Gore, 1993). Second, a forecasted increase in the recreating population combined with the expected decrease in available resources for recreation is leading to a greater demand for our recreation resources (English, Betz, Young, Bergstrom, & Cordell, 1993). Finally, funding from major sources such as the federal government will likely continue to be unstable and subject to the political climate, resulting in a movement by management agencies to a 'user-pays' system.

The shift toward a service orientation in public resource management brings with it an increased concern for facets of management that had been much less necessary in years past, including agency marketing and customer satisfaction. Managers are now being increasingly asked to find ways to better meet the needs and desires of present or potential visitors. Thus, in a similar vein to private recreation providers, public agencies are asking the question, 'how can we best serve our customers?'

While there exists numerous evaluative and marketing tools to help managers answer this question, a commonly used tool in resource management has been the Importance-Performance (I/P) analysis. I/P is designed to measure customer satisfaction with products or services comprised of many dimensions, or multiple attributes. First developed in the field of marketing by Martilla & James (1977), it has since been applied to a number of park and recreation management issues, including satisfaction with visitor centers (Mengak, Dottavio, & O'Leary, 1986), state park cabins (Hollenhorst, Olson, & Fortney, 1992), and acceptable wilderness conditions (Hollenhorst & Gardner, 1994).

Importance-Performance Analysis

The I/P framework measures customer satisfaction by combining two essential elements of satisfaction into one model: importance, or what one deems to be essential in order to have a satisfying experience; and performance, which is what one actually does get from the experience. As mentioned previously, the model investigates satisfaction on an attribute-specific basis, rather than on a global level. Visitors are asked, generally on a 5-point scale, the importance and performance of certain aspects of their experience, such as 'well-maintained trails' or 'information on conditions or hazards.' Thus, by inquiring about the importance and performance of specific aspects of the recreation experience, the investigator is able to take into account how much visitors value certain aspects of the experience when making marketing or resource allocation decisions. Clearly, an attribute which a visitor rates highly for importance yet poorly for actual performance should be given more attention than the ones the visitor feels are not important to the enjoyment of their recreation experience.

The Importance-Performance framework plots visitor responses (generally in the form of mean values) on a four-quadrant grid, with importance on the vertical axis and performance on the horizontal axis (Figure 1). Four quadrants are created, and each is given a corresponding outcome strategy. The four quadrants and their resulting strategies are the following: Quadrant I, titled "Concentrate Here," recommends developing new outcome strategies for the attributes in this quadrant. Quadrant II, titled 'Low Priority,' suggests that little effort should be focused toward the attributes in this quadrant as the visitor has little concern for these attributes. Quadrant III, titled 'Possible Overkill,' suggests that efforts toward these attributes can be reduced. Finally, Quadrant IV, called "Keep up the Good Work," recommends keeping whatever strategy is already in place for these attributes. The strategies provided in I/P reflect its foundation in marketing, however alternative strategies that reflect other desired outcomes, such as a more suitable resource allocation, are easily applied to I/P.

I m p o r t a n c e	Quadrant I 'Concentrate Here'	Quadrant IV 'Keep Up the Good Work'
	Quadrant II 'Low Priority'	Quadrant III 'Possible Overkill'
	Performance	

Figure 1. Importance-Performance framework (Martilla & James, 1977).

The main advantages to the *I/P* framework are its clear presentation and ease of interpretation. (1) Its grid format makes it easy for managers to interpret data to make decisions. (2) The framework appears to measure the accepted components of a marketing definition of satisfaction; that satisfaction is a state felt by a person who has experienced a performance that has fulfilled his or her expectations (Kotler, 1982). Taking this definition one step further, an experience that has met expectations that are considered highly important should correspondingly be highly satisfying. (3) The *I/P* framework is a useful way to interpret information collected from the users rather than from the managers for decision making. As Washburne and Cole (1985) have discussed, customers and managers often have different perceptions of recreation setting needs and preferences. Therefore, when making decisions regarding customer satisfaction, the customers themselves are the best group to indicate their own needs and preferences.

Limitations of *I/P* Model

While the aforementioned reasons make *I/P* a popular tool among managers, concerns have been raised surrounding the validity of the *I/P* framework. One concern in particular will be focused on in this paper: the lack of statistical analysis in the current *I/P* approach (Hammit, Bixler, & Noe, 1996). Many previous studies in park and recreation have followed the *I/P* method with little attention given to the statistical power of the technique. For example, *I/P* analysis with sample sizes as small as thirteen or fourteen subjects has been reported (i.e. Gillespie, Kennedy, & Sobie, 1989). In general, this is too small a sample to support the findings with statistical analysis. Also, while correlation techniques have been applied to *I/P* with success (i.e. Crompton & Duray, 1985), the majority of applications of *I/P* use only the information provided by the mean ratings of the participants for analysis (i.e. Havitz, Twynam, & DeLorenzo, 1991).

The apparent simplicity of the four-quadrant model has some potentially dangerous drawbacks. For instance, the analysis tends to remove any quantitative differences between attributes falling within a particular quadrant. Attributes that fall a large distance (such as a value of +1.00 on a 5-point scale) from an axis are interpreted in the same manner as attributes that land extremely close to an axis (such as +0.05 on a 5-point scale). We need to be concerned about our practice of doing this because we may be reporting findings for differences of attributes falling close to the axes that do not truly exist. For example, if our axis is set at a value of 3.5 and our attribute has a value of 3.51, we really are categorizing this attribute with little confidence that it truly fits the category. The problem is, because the *I/P* model assigns a marketing strategy to every attribute, these borderline attributes may be given resources that they either do not need, or cannot be afforded to give. Clearly, to improve interpretation of attributes falling close to the axes, a method to identify significant differences between attribute mean values and the assigned value for the *I/P* axes is needed.

A second limitation of the use of mean values in *I/P* is that information is collapsed into and displayed as 'points' on the *I/P* chart. This is an adequate strategy to evaluate customer satisfaction in situations involving similar groups of visitors seeking the same benefits, as the group mean is a useful measure of central tendency when the variance of responses is low. However, in outdoor recreation, the assumption of homogeneity among users is up for debate. Indeed, similarities between users has given way to a more diversified customer based on demographics, activity interests, and benefits being sought (Ewert, 1998). As a result, use of the mean value may lead to our planning for Shafer's (1969) average camper who doesn't exist. With respect to *I/P*, recognition of user diversity is essential, as Vaske, Beaman, Stanley, and Grenier (1996) clearly demonstrated how ignoring user differences can lead to the application of inappropriate outcome strategies.

A Modified *I/P* Model

The modifications made to *I/P* in this paper attempt to respond to the two concerns discussed above by providing a way to compare values statistically, thus allowing for a valid comparison between attributes and axis values and between heterogeneous and homogeneous samples. This is accomplished through the incorporation of a confidence interval (C.I.) into the visual display. This modification thus alters the display of information from being a point to being a range of potential values for an attribute. Two statistical equations are worth discussing at this point. The first is the equation for the creation of a confidence interval:

$$C.I. = \text{mean} \pm t (\text{Standard Error}).$$

In the process of creating a confidence interval, a confidence level must be selected. While typically a 95% confidence level is used in social science statistics, the level chosen should be established based on the research objectives. In some situations, a 95% C.I. may in fact be too much confidence. Possibly managers would be pleased

to satisfy less than 95% of visitors, and may find that a lower C.I. such as 75% is more appropriate. The important point to make here is that the selection of the confidence level is arbitrary and justifications for a wide range of C.I.'s are possible. However, for this demonstration, a C.I. of 95% will be used. For a 95% C.I., the t value is 1.96; thus, our equation becomes:

$$95\% \text{ C.I.} = \text{mean} \pm 1.96 (\text{Standard Error of the Mean}).$$

The second equation to discuss, that of Standard Error of the Mean (S.E.), is the following:

$$\text{S.E.} = \text{standard deviation (s.d.)} / \sqrt{N}.$$

The incorporation of a measure of standard error adds two more pieces of information to the analysis for each attribute; the model now becomes sensitive to the amount of variance in responses (s.d.) and the number of respondents (N) in the sample. For example, a sample of 25 people with a mean value of 3.4 and a standard deviation of 2.0 will have an S.E. of 0.40. However, a sample with the same mean value (3.4) but with 100 respondents and a standard deviation of 1.5 will have an S.E. of 0.15.

For each attribute, the standard error can be calculated for both the importance and the performance value. When the S.E. is incorporated into the confidence interval and added to the data points on the I/P graph, the outcome is a 'crosspoint' in which the mean value is the center and two confidence intervals extend for both the importance and the performance axes (Figure 2). The ends of the crosspoints are joined to form an ellipse.

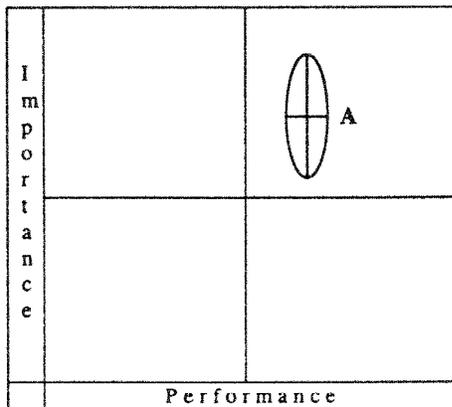


Figure 2. I/P chart with crosspoint and ellipse.

Interpretation of I/P

Two factors are worth discussing with respect to interpretation of the ellipse: its location and its size. With respect to location, significant and nonsignificant differences for attributes falling adjacent to the axes can be distinguished by whether or not the ellipse falls fully into an I/P quadrant. The assumption of the modification is that if the ellipse falls fully into one quadrant, such as for attribute A in Figure 2, it can be applied to the outcome strategies with confidence. In cases where the ellipse overlaps with the axes, interpretation becomes more

difficult. Which management strategy should be applied to it, or should it possibly be ignored? As with all decisions based on I/P analysis, the management objectives should guide the application of the results.

The following are three possible options for interpretation of the results: (1) Apply overlapping item to one of the four existing outcome strategies. As the main factor in decision making is often the availability of resources to carry out the decision, the concern then becomes one of whether or not to include the attribute in a resource-demanding quadrant such as "Concentrate Here." In situations (although rare!) where resources are plentiful, possibly all attributes that overlap into the "Concentrate Here" quadrant, even if the mean value falls in a different quadrant, could be assigned the "Concentrate Here" strategy. Conversely, occasions in which resources are scarce, attributes can be excluded from the "Concentrate Here" quadrant if they overlap an axis, and relocated to a different management strategy. (2) Exclude overlapping attributes from analysis. This option assumes that no strategy is better than a strategy that doesn't fit. This approach was first suggested by Hammit et al. (1996) as it removes an element of the risk associated with making a bad decision. It is also more conservative with respect to resource allocation, and may be a wise approach in a time of resource constraint. However, as one reviewer mentioned, the idea of exclusion to overlap seems dangerous due to the high level of subjectivity involved in the establishment of I/P objectives and visual display, including the choice of location of axes and the selection of the C.I. values. (3) Develop a new outcome strategy for overlapping items. It seems appropriate that if an attribute is unable to be clearly categorized into a quadrant, that the reasons behind the lack of clarity could be explored. Alternatives could include objectives such as 'explore further' with different methodological techniques or 'reexamine I/P framework,' in which weaknesses in the approach could be looked for, such as poor wording of questions.

The size of the ellipse provides important information to the manager, as it reflects a sample with a high range of possible responses to the survey item. As mentioned previously, with a diverse visiting population, it would be no surprise that certain items may reflect the different needs and desires of various user groups. Therefore, a large ellipse may hint at bimodality or other overlapping ranges of responses for an attribute. However, large variance may also be an indicator of lack of understanding of the questions presented to the visitor. In either case, further exploration of the attribute responses is needed.

I/P Issues

While not the specific intent of this paper, it is worth discussing briefly three issues surrounding the application of I/P that have a major effect on the ability of I/P to contribute to good decision making: axes placement, exclusion of visitor responses, and orientation of I/P surveys. The first issue, axis placement, has long been in the I/P discourse. Axis placement is crucial in I/P as

decisions are made concerning where attributes fall in the chart relative to the location of the axes. For example, an attribute may fall in one quadrant if the axes are placed at the middle of the scale (i.e. 3 on a 5-point Likert scale), a different quadrant if the axes are placed at the grand mean of the means for all responses, and even a third quadrant if the axes are placed at a selected 'cut-off' level for acceptability. Again, the decision to place an axes at a certain value is dependent on management objectives. Hollenhorst and Gardner (1994) suggested that use of a grand mean is appropriate when attributes are being examined for relative attribute relationships, and that set values such as middle of scales or 'cut-offs' are appropriate for criterion-based interpretation of responses.

Another issue worth considering is that of whether to include or exclude performance ratings for attributes by visitors who give low ratings for its importance. Similar to Hammit et al.'s (1996) exclusion of performance ratings from visitors who did not observe an attribute, should we also limit our interpretation of performance ratings to only those visitors who consider the attribute to be important? It seems intuitively logical that visitors who give low importance ratings to an attribute are likely not going to be the best judges of its performance, and that possibly we should consider developing outcome strategies geared toward those visitors who do see the attribute as important to their experience. This is clearly an issue that needs further exploration.

A final issue worth discussing with respect to interpretation of I/P information is the inherent orientation of I/P toward development - of attributes and of the recreation setting as a whole. The I/P format does not provide a place for respondents who are more satisfied with the absence than the presence of an attribute. For example, if an attribute such as 'well-maintained trails' falls into the "Concentrate Here" quadrant, the management objective becomes one of providing additional resources to upgrade trails and walkways. However, how does the visitor who considers the absence of well-maintained trails to be important respond to an I/P survey? Due to the skew toward development and improvement in I/P, a negative response is mapped into Quadrant II, where it is forced into a false proximity with observations that belong in that quadrant (Beaman, Vaske, & Stanley, 1999). However, the effects of these issues may be minimized through careful design of the I/P instrument. The provision of opportunities for visitors to express a desire for the absence as well as presence of an attribute, such as through the use of negative and positive endpoints for scales, will help us make better decisions when using I/P models (Schwarz, Knauper, Hippler, Noelle-Neumann, & Clark 1991).

Summary

In recreation resource management, our underlying goal when we collect information is to use it to make decisions that will contribute to the positive experience of our visitors. However, the processes of information collection and decision-making are fraught with trade-offs; we trade

time and expense for practicality of application and we trade complexity of interpretation for clarity of presentation. One of the reasons that I/P methods have been favored in research and practice is because in the trade-off equations, I/P seems to do fairly well. While it is apparent that there are multiple techniques that are able to interpret information in ways that possibly bring us closer to the truth, I/P has in its favor the element of presentation of information that makes it accessible for real decision-making.

The modification to I/P is an attempt to increase our chances of getting a little closer to the truth when using I/P without sacrificing its unique characteristics. The shift from the use of a point to an ellipse is to remind us that data points are often not true representations of visitor satisfactions, but that satisfactions vary based on visitor values, interests, and needs. As we work toward meeting our goal of customer satisfaction, we will be assisted through the use of methods that recognize diversity among our visitors.

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THE DESTRUCTION OF WILDLIFE HABITAT BY SUBURBAN SPRAWL AND THE MITIGATING EFFECTS OF LAND USE PLANNING

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Abstract: Throughout history, mankind has encroached on and destroyed wildlife habitat. The European settlers of the New World and succeeding generations have carried on the practice and have caused tremendous destruction of wildlife habitat. Sprawl and suburbanization are now responsible for the current decline. This kind of settlement causes fragmentation and creates patches of residual habitat, each with increased amount of edge, barriers, and corridors. Nuisance animals increase and preferred species decrease. To mitigate these effects, planning must be done on an ecosystem/regional basis, GIS must be utilized to provide up to date information and finally, public policy must be implemented based on the best possible information.

Introduction

Because mankind and wildlife share the environment, conflicts arise. Usually the wildlife is either driven off, killed or its habitat is destroyed. Now, sprawl, or the uncontrolled movement of mankind into the countryside is the principle cause of the destruction of wildlife habitat. This paper attempts to investigate sprawls' different effects on wildlife habitat and the mitigating efforts of land use planning. It is not designed to provide hard and fast answers to the problem of sprawl, but rather to cause the reader to recognize the dangers of sprawl and to raise questions. In order to understand why wildlife is thought of as 'inferior' to mankind, it is necessary to look back in history.

History of Human Land Use

Historically, mankind has set out to dominate the earth at the expense of all else and has done a good job of it. Since the development of agriculture, the natural vegetation cover of every continent except Antarctica has been extensively modified (Saunders et al 1991). This desire to dominate the earth can be traced to Biblical times. Genesis 1:26 states that man "...have dominion...over all the earth, and over every creeping thing that creepeth upon the earth." Also in Genesis 1:28 "...subdue it: and have dominion over...every living thing that moveth upon the earth" (Hill and Cheadle 1996). The beliefs that sprang from these passages created the mindset that everything on earth was provided for mankind to use. In the Middle ages, mankind imposed itself upon the European landscape with as much force as necessary to satisfy human needs (Sale 1991).

Medieval Europe (1200-1600 AD) was a wooden society using 60 to 80 million tons of wood a year (Sale 1991).

Wood provided all the basic needs of the people from fuel, to plows, houses, ships and all else in between. This woodcutting decimated the local forests and the wildlife habitats that were in those forests. Unlimited hunting was also a norm, there were no seasons or bag limits; it was kill as much as you could. In fact, mankind's treatment of animals was in the least cruel and harsh. The conquerors of the New World brought this attitude with them starting with Christopher Columbus in the Fifteenth Century (Sale 1991).

When Columbus arrived in the New World, the native Americans were hunting and changing the environment but they only impacted on a local level, using wildlife for subsistence (Worster 1993). Essentially, they were Stone Age people without the industrialized tools and weapons of the Europeans and were not able to exterminate wildlife to the same wholesale extent as the industrialized Europeans were (Worster 1993). Columbus and the Europeans who followed quickly changed all that. The attitude about wildlife that was formed in Europe was now forcefully brought into the New World and continues today (Sale 1991). Nature by itself is thought to be a wasteland and something to be conquered and used so that man can live in peace. "Humankind improved upon nature as *wasteland* was transformed into a *garden*" (emphasis mine, Whitney 1994). As human population has risen exponentially, animal extinctions have kept pace. This extinction curve is not linear; it matches the exponential curve of the human population growth (Stiling 1996).

Settlements and towns in the New World were built on the same principles as those in the Old World, with well-defined centers and farming rings around them (Sale 1991). The village center was encircled with houses where people lived leaving large tracts of wild land that surrounded the farm belts and each village. This wild land and the open farmland were prime wildlife habitat but the wildlife was hunted mercilessly (the transplanted European mindset), and cutting the forests continued to decimate the habitat (Whitney 1994).

The European population in the New World was not large enough at this time to cause the rapid spread we now know as urbanization (Weeks 1996). However, populations started to grow and the demand for food (both wild and domestic meat and agricultural products) also grew. Land was required to sustain the increased agricultural effort and the surrounding forests began to be cut down destroying the wildlife habitat. Due to their high visibility, mobility and economic importance, large mammals were among the first species to be affected by civilized man's penetration of the continent. "We live in an zoologically impoverished world, from which all the hugest, and fiercest, and strangest forms have recently disappeared" (Alfred Wallace 1876, cited in Whitney 1994). Losses of these large mammals such as grizzly bears (*Ursus horribilis*) and mountain lions (*Felix concolor*) were due in a small way to hunting, but in the most part to the loss of their habitat. The plow did what the gun could not (Whitney 1994).

As the population of the United States grew in the East and

expanded westward, more wildlife habitats were destroyed and fragmented with no consideration of the wildlife except as a source of food. The massive reduction in the American bison (*Bison bison*) populations as well as the extermination of the passenger pigeon (*Ectopistes migratorius*) are both examples of the original Old World mindset that was successfully transplanted to the New World (Worster 1993). Continued population growth caused urbanization and industrialization of the Eastern Seaboard, resulting in the destruction of most of the pre-colonial habitat. What was not destroyed was fragmented into smaller and smaller pieces (Whitney 1994).

The Current Conditions

Biophobia is a relatively new concept defined as "the culturally acquired urge to affiliate with technology, human artifacts and solely with human interests regarding the natural world" (Orr 1994). This is the attitude that looks at nature as something outside his or her personal realm that is to be enjoyed and then left behind when one returns to the comfortable home. In other words, to look (nature is permitted as a decoration) but not really touch or be touched. Our current urban environment that leads to suburbanization is the accepted way of life that has caused so much fragmentation of the landscape. It is widely recognized that fragmentation of the environment and particularly that of wildlife habitat leads to reduced species richness, one component of what we now call biodiversity (Primack 1993).

Sprawl And Suburbanization, Definition, Causes And Effects On Wildlife Habitat

Industrialization causes urbanization, which is the rapid and continuing redistribution of people from the countryside to the city and is the process by which urban areas expand (Weeks 1996). The industrialized urban areas create more jobs that in turn attract the people from the country. The city already has the necessary support services; it has workers and attracts more; it has good lines of communications; and it has technology. As technology develops, the number of people required to operate farms dramatically. The people who are no longer needed to produce food move to the cities. After time, the cities begin to deteriorate and the part of the population that can move now attempts to retreat into the countryside (Weeks 1996).

The trend over the past 30 years has been a movement out of the cities to the suburbs. As the suburbs become urban (strip malls, supermarkets), the exodus occurs once again from the suburbs to the country which in turn become suburbanized, then urbanized. The vicious sequence repeats itself until there is no country left (Weeks 1996). Homes are now located at a distance from services. Therefore, the customers are forced to drive to where the services are, requiring more and more use of the automobile (Cox 1997). The desire to get out of the cities to live in the countryside is the major culprit that causes fragmentation of our wildlife habitat. However, many of these people that move have a biophobic outlook on nature where they want to *look but not touch or be touched*

(emphasis mine, Orr 1994). For example, white-tailed deer (*Odocoileus virginianus*) are beautiful creatures to look at, but when one eats a prize yew (*Taxus canadensis*) that was lovingly planted and nurtured, the attitude towards those deer often becomes negative.

Sprawl, and the fragmentation and destruction of the landscape that results from it, is now the largest threat to wildlife habitat (Urquhart 1997). Sprawl fragments wildlife habitat into different patches, each containing new edges, and possibly leaving corridors that connect some of these patches together, or even barriers that prevent movement. The fragmentation of habitat into patches too small for adequate survival and reproduction can result in the extinction of some wildlife species. Fragmentation tends to reduce diversity and increase extinction rates (MacAurthur and Wilson 1967).

An unintended consequence of sprawl is the anthropocentric creation of so-called "nuisance" animals, that is, wildlife that have readily adapted to human effects and fragmentation. They have been successful and multiplied at a much greater rate than if left in an unfragmented landscape and have created new habitat dynamics. There is higher predation on other less well adapted animals and a greater interaction with humans. The anthropocentric viewpoint of a nuisance occurs when the adapted animal causes a decline of a human favored species or when the numbers are such that they conflict or interfere with human values. Examples of this are deer/automobile collisions, consumption of planted ornamentals and the spread of disease from animals to humans such as rabies and Lyme disease. Paradoxically though, humans are the direct cause of all this through fragmentation of the landscape.

Fragmentation of the Landscape and The Creation of Patches

Fragmentation is a reduction in the overall size of a habitat along with a simultaneous reduction in the contiguous size leaving a series of remnant vegetation patches surrounded by a matrix of different vegetation, open areas and/or land use (Andren 1994). Some characteristics of fragmented ecosystems are; reduction of the total habitat available (Saunders et al. 1991, Rolstad 1991); loss of habitat heterogeneity (Wilcove 1985); barriers (spaces between the patches) to dispersal (Wilcove 1985, Andren 1994); greater overall edge effect (Primack 1993). Fragmented landscapes or patches can be thought of as an 'island' of habitat surrounded by a hostile barrier, which is the area between the patches. The number of species in each fragment or island is positively correlated to the size of the island/fragment (Island-Biogeography theory) (MacAurthur and Wilson 1967). Fragmentation of habitat is the most serious threat to biodiversity and is the primary cause of the present extinction crisis (Noss 1987).

As landscape becomes more and more fragmented, a minimum viable threshold of survival may be reached (With and Crist 1995). Small changes in habitat size can trigger a response that is drastically out of proportion to the change. The critical minimum threshold depends on the

amount of connectivity (i.e. the ability of a species to successfully move between the patches). This ability depends on the species, interactions between other species, and the characteristics of the corridor that connects the habitat islands. Before the minimum viable threshold is met, the primary effect of fragmentation is the loss of habitat along with a generally linear loss of species richness and/or population size. Habitat specialists (animals with a small niche) with a limited dispersal capability have a lower threshold than highly mobile species who may still perceive the fragmented landscape as connected and they are still able to move between patches (With and Crist 1995). The decline in population size of a species is linear in relation to habitat loss, but when the minimum viable threshold of remaining habitat is reached, the loss will no longer be linear, it will be an exponential loss of population (Andren 1994).

The extinction rate also depends on patch size and increases as the area gets smaller. Area alone accounts for most of the variation in species numbers and is correlated with environmental diversity (MacArthur and Wilson 1967). As fragmentation continues and habitats get smaller, generally the time to extinction decreases (Quinn and Hastings 1987, Kareiva and Wennerger 1995). The species that survive are those that can adapt to the new edges and smaller habitats. Genetic consequences of fragmentation may be inbreeding and decreased genetic variation of local populations, leading to eventual extinction (Noss 1987).

After a patch is isolated, four factors govern the decline or rise in species in those patches as identified in Saunders et al. (1991). 1.) Time since the patch was isolated. When the patch is first isolated, all the original species remain. However, as time goes on, those species requiring the original vegetation, large ranges and low densities will disappear (species relaxation). On the other hand, the number of species can also increase by the invasion of edge tolerant species (anthropocentrically classified as nuisance animals). 2.) The distance from other patches, which affect dispersal rates. 3.) The connectiveness of the patches or whether or not corridors between the patches exist. Corridors enhance biotic movement, and provide extra forage. 4.) How the surrounding landscape has been changed. If there are many fragments, there will be more edge and thus more edge species (generalist predators) and therefore more predation on the original inhabitants.

The fragmentation impact of one new home is surprising. One house with its driveway, grassy area, well and septic system doesn't physically cover that much of the land. However, it will affect up to three acres because of new edges, new drainage patterns and new barriers. If the house is on a 6-acre lot, three of the 6 acres will be influenced. A large minimum residential size lot (1 - 10 acres) will cause this effect to be dispersed over wide areas. For example, in a 60-acre landscape that is fragmented into 6-acre lots, fully 30 of those acres will be affected (R Bryan in Moore 1997).

Fragmentation and The Creation of Edge

Perhaps the most detrimental effect of fragmentation is the creation of edges. An edge is a junction, either a well-defined boundary or a transition zone where plant and animal communities can blend into each other (Yahner 1988). There are two types of edges; an inherent transitional edge based on geology and geography such as the timberline at high elevations, and an abrupt induced or man-made edge that is a result of land use. Living in the edge are abundant generalist predators and competitors that affect songbirds and mammals negatively.

The amount of edge and the residual undisturbed interior that is created when a forest landscape is fragmented is surprising. The actual shape of the patches dictates the amount of edge created. For example, long and narrow patches have more edge area than do those of a square or circular patch. Assuming square patches and an edge effect of 300 meters, a patch size of 75 acres is all edge. A patch size of 150 acres has only 13 acres of remaining interior and a patch size of 300 acres has only 76 acres of interior habitat (Brindle and Baker undated). This edge effect can be devastating in terms of increased predation. Interior bird species might hesitate to even enter an edge (Van Dorp and Opdam 1987).

Fragmentation and The Creation of Barriers

Barriers prevent or inhibit movement between patches. They include roads, open areas, driveways, urban or suburban developments and can lead to reduced immigration and differential dispersal mechanisms to mammals and birds (MacArthur and Wilson 1967, Van Dorp and Opdam 1987).

Roads are the most common and create an ever-finer mesh of barriers to dispersal. Habitat is destroyed during construction, they cause edge effects in the resulting patches and edge species displace the original species (Mader 1984). There is an increase of roadside emissions such as noise, dust, headlighting effects, exhaust, and increased salinity by salt treatments in the winter, which attracts large herbivores to the road edge for salt licks where they may become road kill. A divided highway that is 90 meters wide may pose a barrier to movement equal to a water barrier that is 180 meters wide. Roads interfere with the natural exchange and dynamics of species by migration (Mader 1984). Roads can also be used by edge species (who can adapt to the roadsides) as corridors for their movements and subsequent dispersal. Most importantly though, the roads provide an avenue for automobiles to be used in order to promote sprawl starting the vicious circle again (Box and Forbes 1992, Weeks 1996).

Fragmentation Sometimes Leaves Corridors That Connect Patches

The destruction caused by edges may be mitigated somewhat by creating or leaving natural movement corridors that connect patches together. When patches are connected in some way, the connecting entity is called a corridor and to be effective, it should be the same type of habitat as the patches it connects (Simberloff et al 1992).

Connectivity is vital. Corridors can facilitate unimpeded movement of species between patches, but if there is not enough connectivity, movement may be inhibited (Forman and Godron 1981, Taylor et al 1993). The width of a corridor is quite important. Small mammals require corridors 200 ft wide and large animals require them to be at least 300 ft wide (Brindle and Baker undated). Corridors can be either natural (intrinsic) because of incomplete fragmentation or manmade (extrinsic) corridors to connect patches that were previously isolated (Tiebout and Anderson 1997). They prevent the isolation of species, and therefore, forestall inbreeding depression and the eventual extinction that would indirectly result from inbreeding (Simberloff and Cox 1987).

However, there are six major disadvantages to corridors in an otherwise fragmented landscape: 1. They can provide direct routes for catastrophes such as fire or diseases. 2. They facilitate the spread of nuisance or edge species. 3. They enable introduced species to move from patch to patch. 4. They can increase wildlife exposure to man that may lead to increased poaching. 5. There is more contact with domestic animals that could spread disease. 6. There is more exposure to both domestic and wild predators such as cats (*Felis domestica*) and raccoons (*Procyon lotor*) (Simberloff and Cox 1987).

Effect of Fragmentation on Wildlife Species

These physical changes in the landscape affect wildlife populations, habitat and human values. Two basic things happen; there is an increase in wildlife adapted to the new landscape and who may become, from a human value standpoint, nuisances. Secondly, there is a corresponding decrease in the number of wildlife species that need large areas of interior habitat to survive. These species are generally the anthropocentrically preferred species such as songbirds and mammals like the moose (*Alces alces*) and bobcat (*Lynx rufus*).

Increase of Nuisance Animals

Fragmentation leads to an increase in nuisance animals such as white-tailed deer, raccoons, blue jays (*Cyanocitta cristata*), crows (*Corvus brachyrhynchos*), skunks (*Mephitis mephitis*), common grackle (*Quiscalus quiscula*), cowbirds (*Molothrus bonariensis*), gray squirrels (*Sciurus carolinensis*) and red squirrels (*Tamias ciurini*), to name a few. These nuisance animals can transmit diseases such as Lyme disease and rabies to humans and have caused the populations of anthropocentrically desirable species to decline.

The increased edge area in patches may increase the carrying capacity for generalist predators, open field competitors or nest parasites that interact with forest interior birds in the form of elevated nest predation, brood parasitism or hole-nesting competition with edge species (Rolstad 1991). High predation rates on songbirds are found in small patches with large amounts of edge. Predators such as the blue jay, American crow and the common grackle are all edge species (Wilcove 1985). Therefore, there is more predation pressure on anthropocentrically desirable species such as songbirds

(Wilcove 1985, Yahner 1988). Also, in newly developed (read sprawl) areas household pets, especially cats, which are extremely efficient and fearsome predators, eliminate resident birds and small mammals (Moore 1997).

The crow and the blue jay have adapted so well to edges that their numbers have dramatically increased throughout the US. These generalist predators seek out any eggs they can find and decimate egg populations. The predation rates on eggs increase as distance from the edge decreases (Andren and Angelstam 1988). The predation by the crow is confined to the edge itself, but ravens (*Corvus corax*) and jays, which live in the edge, tended to rob nests in the interior of the patch (Angelstam 1986). Because of these higher predation rates, there is lower reproduction success in small habitats. Songbirds that nest near or on the ground suffer higher predation rates than those that nest in bushes or trees. As fragmentation continues into ever-smaller pieces in suburban areas, even higher predation pressure occurs (Andren and Angelstam 1988, Wilcove 1985). In these areas the crow, blue jay, grackle, raccoon and gray squirrel have adapted extremely well and can decimate songbird populations (Wilcove 1985).

Raccoons are omnivorous and are adaptable to a variety of habitats. The destruction of traditional denning sites in old growth forests by land development caused the raccoon to become semi-domesticated and scavenge for food in garbage cans, landfills and dumps near humans (Rupprecht and Smith 1994). Since 1930, the US raccoon population has grown 15 to 20 fold and they are the most frequently reported nuisance animals. The concentrations of these animals around large, regularly replenished food sources along with an abundance of nearby denning sites probably has contributed most to the spread of rabies through increased raccoon to raccoon contact (Rupprecht and Smith 1994).

The white-tailed deer has adapted so well to fragmentation of the landscape that the size of deer herds is actually larger in the area between patches than in dense (non-fragmented) terrain thus creating an abnormally high population, which then leads to the deer becoming a nuisance animal (Hirth 1977). Their favorite winter browse is Canada yew, Eastern hemlock (*Tsuga canadensis*) and white cedar (*Thuja occidentalis*), ornamentals that are planted around houses. The deer will continue to browse on them year after year until the trees and shrubs cannot survive any longer because of their slow growth (Hirth 1977, Alverson 1988). In addition to consuming planted yard ornamentals, the deer also carry the deer tick (*Ixodes scapularis*), which in turn carries the spirochete *Borrelia burgdorferi*, which causes Lyme disease in humans (Brandt 1997). The threat of Lyme disease is very real. Deer can have hundreds of ticks on each ear and anywhere between 25% and 50% of them are infected with the spirochete (Brandt, 1997). If left untreated in humans long enough, Lyme disease can damage the central nervous system. After suffering nausea, fever, night sweats and arthritis like pain in the joints with the accompanying treatment of heavy doses of antibiotics for long periods, humans tend to change their thinking and classify the deer as nuisances. It's estimated that there are

over 16,000 cases of Lyme disease reported nationwide each year (Brandt 1997). Other nuisance effects of white-tailed deer are the million car/deer collisions that cost millions of dollars in automobile repair and have been the cause of the more than 200 human fatalities that occur each year (Brandt 1997). Ironically though, most people consider the white-tailed deer as an attractive species. Only when the true cost in human suffering and the dollar cost in replacing ornamentals and automobiles is added up does the deer become a nuisance.

Decrease of Preferred Species

Fragmentation of the forest creates non-forest habitat. It may cause a local songbird population to become extinct if fragment size is less than a threshold value set by the minimum size territory requirements of the species (Angelstam 1986, Rolstad 1991). In a study done in Illinois, 80% of the observed songbird pairs lost eggs to predators while 66% of the remainder raised cowbird eggs rather than their own. Overall, only 7% of the songbirds observed successfully reproduced (Primack 1993). In another study, the number of nests that suffered predation in large undivided tracts was only 2%, in rural areas it was 47.5% and in suburban areas 70.5% (Brindle and Baker undated). Nest construction is also a factor with cavity type nests that are hidden in holes in trees suffering less predation while the open cup type nests sustain higher predation (Wilcove 1985). However, these trees are the very ones removed during landscaping, leading to a reduction of adequate 'holes' in which to nest (Rolstad 1991).

As a result of fragmentation, song sparrows (*Melospiza georgiana*), wood thrush (*Hylocichla mustelina*), veery (*Catharus fuscescens*), and the pileated woodpecker (*Dryocopus pileatus*) typically are driven from what used to be the interior forest. Grassland birds such as the eastern meadowlark (*Sturnella magna*), upland sandpiper (*Bartramia longicauda*), and bobolink (*Dolichonyx oryzivorus*) are, in turn driven from their type of habitat that will be cleared for house lots (Moore 1997).

A good example of a species impacted by fragmentation is the piping plover (*Charadrius melodus*), which is both a Federal and State of Maine Endangered species. They nest in the open beach dune systems on the Maine seacoast (Moore 1997, Calhoun 1997). At most, the State of Maine originally had only about 30 miles of open beach dune systems suitable for nesting. Due to human encroachment and fragmentation, there are now only 6 miles of suitable nesting dune systems left. Protective measures have not been adequate to protect the nesting sites and the species continues to decline (Moore 1997).

Habitat fragmentation is a major factor that reduces distribution and abundance of wildlife species on broad geographic areas. Some songbird species have shown a long-term decline in numbers. Large mobile carnivores such as the mountain lion, Black bears (*Ursus americanus*) and others have been drastically reduced because of the fragmentation of their habitat (Yahner 1988). The ever-increasing fragmentation of the northern landscape has

apparently set the southern distribution limits of the snowshoe hare (*Lepus americanus*) (Andren and Angelstam 1988).

Mitigating Fragmentation by Rural Development Through Land Use Planning

The indiscriminant growth of sprawl will cause a decline in species richness, a decline in songbirds, a decline in animals that require a large unbroken tract for their range such as bears, bobcats and moose. It also means that there will be a corresponding increase in the numbers of nuisance animals such as raccoons, skunks, jays, crows and deer. These "new" animals now prey on the original inhabitants, eat gardens, destroy planted ornamentals and spread disease to humans such as rabies and Lyme disease. This is an enormous impact on both the wildlife and the humans that jointly share the biosphere. The previous discussion of some of the problems associated with fragmentation of the landscape by humans and the subsequent destruction of wildlife habitat has painted a gloomy picture, but all is not lost. There are ways to lessen the impact of humans on animal habitat through wise land use planning and still allow human expansion.

There are three steps in this process. The first is to change land use planning to a regional or ecosystem level instead of being based on political borders. Secondly, we must make use of the technological tools that are now available such as satellite imagery, digital demographic information, vegetative and wildlife inventories and geological studies. These can be combined into a single computerized digital system known as the Geographic Information System (GIS). Finally, the analyses from regional planning ideas and output from any technical assets must be synthesized into public policy decisions. These political decisions will determine the fate of sprawl and at the same time, the fate of wildlife.

Regional/Ecosystem Approach

Because humans have created a matrix of patches that knows no political boundaries, an integrated approach is needed to look at things as an ecosystem as a whole (organism to species and communities to ecosystems) instead of a collection of separate biotic and legal entities (Saunders et al. 1991, Primack 1995). The significant advantages of regional assessments are the ability to monitor the major processes occurring in the region such as fragmentation and isolation of the habitat patches and to be able to integrate corridors and/or areas where the fragment islands are close enough together so that wildlife movement can take place between them (Franklin 1993). Other factors in regional assessments are species distribution and behavior, abundance, habitat quality and size, cover, and water quality (Ludwig 1995, Jurgens 1993). By looking at the whole rather than at separate pieces, the rigid policies and practices that now govern local land use planning would change (Primack 1995). Most importantly though, regional evaluations recognize that *humans are a part of the ecosystem and human values shape management goals* (Emphasis mine, Primack 1995).

Regional land use planning provides an opportunity to unite landowners, resource managers, policy makers, and the public to distinguish the maximum amount of habitat fragmentation that can safely occur without significant harm to that habitat while at the same time maintaining biodiversity. It combines the study of ecological theory, hierarchy theory, landscape planning and problem solving integration (Barrett and Peles 1994). However, there will be controversy. To effectively plan at the regional level, the power of the municipalities must be reduced (Scott 1997). We must look at the region as a whole to get the big picture. The only way this will work is to guide development through incentives and as a last resort, regulations. Plans must be made and hard choices taken (Scott 1997).

Geographic Information Systems

Geographic Information Systems (GIS) visually portray the landscape through computer imagery and mapping. It is able to combine satellite input of vegetation types, species distribution (from ground analysis), protected areas and demographic information into a digital overlay system that can be projected on topographic maps of the actual landscape (Scott et al. 1993, Weeks 1996). The resulting map integrates and clearly indicates the importance and influence of fragmentation. It will show any decreased amount of habitat areas, the re-dispersal of any remaining wildlife and any gaps in protection in relation to the habitat and wildlife distribution within the landscape (Jurgens 1993, Primack 1995). Information may be manipulated to present few or many combined overlays on one output map. Using combined overlays, GIS mapping is able to indicate the human manipulation of the landscape (O'Neill et al. 1988).

Mathematical models using GIS input can be used to rank the landscape habitats based on value both to humans and wildlife and are able to identify the most valuable and critical habitats (Rossi and Kuitunen 1996). These models can assess potential risk to future landscapes poised by man and can be used to predict a species decline, increase or stabilization due to habitat loss or fragmentation (Schumaker 1996, White et al. 1997). They can also be useful to develop and engage local support in land use planning based on the need to retain wildlife habitat and ultimately biodiversity (White et al. 1997). Gap analysis projects future land use patterns (fragmentation) and compares them to the present wildlife habitat and specific species characteristics. The result is a product that analyses the impact of future land use on the wildlife habitat and wildlife (Primack 1995, Scott et al. 1993, White et al. 1997).

Public Policy

There are voluntary methods and incentives to preserve wildlife habitat along with the enactment of regulations or town ordinances. Through the combination of these two factors, hard choices must be made and then public policy decisions taken and implemented (Scott 1977). The only way to accomplish this process is to educate the public of the consequences of sprawl (Cook 1997). I believe that this can happen by publicizing fragmentation's detrimental

effects on wildlife which is the reduction of favored species and the corresponding increase of the nuisance species and the spread of disease to man.

Voluntary Solutions

The voluntary approach to land management is much more palatable than rules and ordinances because people are part of the process and fully involved from the start. The following are some of the things that can easily be done without resorting to new ordinances. Private citizens may give legal easements to permanently protect habitat. Direct purchases of land by conservation organizations or towns can also occur. Property tax valuation should be set at the current use of the land, not potential uses (Patterns of Development Task Force 1997). Because it is easier to coax and convince through the pocket book than it is to persuade aesthetically and for the need to retain biodiversity, incentives (tax structures) and cooperative agreements are far more effective than regulations (Moore 1997, Cook 1997).

Road construction can be accomplished with minimal impact on wildlife by planning roads to go around instead of through sensitive wildlife habitats. Where it is necessary to go through habitats, install bridges over and tunnels under the habitat, rather than cuts and fills to leave necessary movement corridors that enhance connectivity between patches.

Revival of the downtown shopping districts will need tax incentives to keep the businesses from moving to the suburbs and creating strip malls (Cook 1997). Changes in state tax structure on schools and roads are also important. School funding must allow for easier renovations of existing in-town schools rather than to allow the building of new schools out of town. In Maine, paradoxically, it's easier to get state funding for new schools rather than renovating the existing school (Maine Policy Review 1997). Out of town schools creates the need for bussing, using more resources. Road funding must emphasize improvements and enhancements to existing roads instead of new construction. Other innovative methods are to create green spaces in the form of parks and trails within the urban areas. Some towns have created low impact non-motorized solutions such as bike trails, walking paths and cross-country ski paths that lead from the center of the town to the undeveloped areas outside of town (Cook 1997). Investment should be towards making cities more livable to keep the people there, i.e. making them not want to move (Scott 1997).

Regulations

If voluntary solutions do not work, then the governing bodies must take the hard decisions and change zoning ordinances to restrict the use or even deny access to sensitive habitat. Land use must directed towards the best possible land for that particular use (Patterns of Development Task Force 1997, Primack 1995). Above all, communities must be designed for people, not automobiles (Cox 1997).

"Open space" developments are housing developments or projects whose houses are on small lots clustered closely together, all surrounded by a network of aesthetic and functional unfragmented open spaces (Arendt 1989). Access to and views of permanently protected open space, farmland, forest and wildlife habitat offset the smaller sized lot. By doing this, cluster housing will have much less impact on the habitat and will sustain much more habitat than a single house on a large lot does (Condon 1997, Arendt 1989). The idea of low density created by large (1 – 10 acre) minimum sized lot zoning is a fallacy because it consumes huge amounts of habitat.

Other regulatory methods encourage growth in reasonably sized and shaped growth areas. In these designated growth areas, minimum lot size must be reduced to less than one acre making it more attractive to build there rather than in the countryside (Brindle and Baker undated). Sewer and water should be provided by the municipality rather than having separate wells and septic systems in those areas. Integrate multi-use in the growth areas so that low impact industry is allowed in residential districts and does not have to consume open space (Brindle and Baker undated).

Discouraging incompatible development in rural areas is the other side of the regulatory coin. Create farm and forestry zones with a minimum lot size much larger than 10 acres (Condon 1997). Require that the property tax valuations reflect actual use, not the highest potential use. Allocate and limit the numbers of building permits in rural zones or establish growth rate caps. If subdivisions are allowed, require extremely large (10 – 40 acre) minimum lot size, cluster housing and a large percentage of the developed area to be declared permanent open space (Condon 1997, Brindle and Baker undated).

To insure that growth does not occur in strips along roads, restrict development on major roads; i.e. have a large road frontage requirement in order to reduce the access to the numbered highway system. Limit town capitol improvements in rural areas; i.e. do not pave dirt roads as paving makes automobile access easier, inviting sprawl.

If all else fails, make the new rural owners pay for all of the increased cost in services and do not pass on any increases to those already there (Cook 1997). This means that the cost of all of the new services (utility poles, power lines, roads, road maintenance) needed to service the new residents would be borne only by those new residents and not the taxpayer pool at large (Cook 1997).

Conclusion

The United States has the most ecologically diverse landscape in the world (Mangun 1995). However, because of the current rate of human population growth (expansion is inevitable but sprawl is not), these diverse systems are now severely threatened. Until this threat is recognized, destruction of the habitat will continue. Ultimately *human values* will decide the fate of wildlife habitat and therefore biodiversity. Some of the hard choices may be based on a triage system; save only what can be saved and accept the

loss of a few (Mangun 1995). When the landscape is fragmented, it forever changes the face of the landscape and its wild inhabitants. New, less desirable species (to the human point of view) displace the old and can become nuisances to the humans; the larger animals and those that require large amounts of space will disappear. The general biodiversity of the area will be vastly diminished. The larger the unfragmented area is, the more diversity there is. If we don't recognize this and plan intelligently keeping wildlife in mind all the bears and moose will be replaced by squirrels, skunks and raccoons.

New inhabitants in a housing area may think the sight of an occasional raccoon or deer is cute. When these same animals spread disease to humans and eat the planted ornamentals, they have become a nuisance that we inadvertently created. Where did all the songbirds go? Those cute little blue jays at the back yard bird feeder ate their eggs. Only when the total costs to wildlife and humans are itemized and analyzed in layman's terms, will the true impact be recognized.

I believe that there is an immediate need to recognize what happens to the wildlife because of human encroachment. It is generally known that large animals 'go away' or 'disappear' when we build in an area. The need is to educate people that these large animals may not really have a place to 'go away' to, so they die or the local population disappears or the species goes extinct.

In order to rouse the population to enact ordinances to control sprawl, a common rally point must be used and popularized. It must be one that will get attention, and regrettably, my experience has shown that the fastest way to get attention is in a way that negatively affects human values. In my opinion, the nuisance animal concept would be one to capitalize on. This principle of nuisance animals can be exploited in two ways to show the true effects; that sprawl created those nuisance animals and they are detrimental to human values. Townspeople would have to be educated about the hazards of the nuisance animals, realize they destroy other valued wildlife, spread disease to humans and, most importantly, are in fact caused by the fragmentation of wildlife habitat by humans.

"Sprawl is urgent. It's probably the issue that's going to determine the fate of wildlife in the next century" (K Elowe cited in Moore 1997).

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VISITOR PERCEPTIONS OF PERSONAL SECURITY AND CRIME AT OUTDOOR RECREATION AREAS: CONTEMPORARY ISSUES AT US ARMY CORPS OF ENGINEERS LAKES AND ALONG THE APPALACHIAN TRAIL

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Abstract. This pilot study focuses on visitors' perceptions of security at outdoor recreation areas at several US Army Corps of Engineers recreation areas and along the Appalachian Trail. Of specific interest is the difference noted in the perception of security between users of the Corps lakes, which are staffed by rangers and law enforcement officers, and the perceptions of Appalachian Trail users where contact with any rangers or law enforcement officers is unlikely. Preliminary analysis of the pilot study data show that Appalachian Trail users perceive overall higher levels of crime and have less contact with any staff, yet are more satisfied with the level of assistance that they received from law enforcement officers. Differences between different visitor characteristics and socio-demographic variables are examined, demonstrating a high degree of disparity in the perceptions of security of males and females.

Background

A safe and secure environment is necessary for visitors to outdoor recreation areas and park personnel alike. Unfortunately, reports of violent crimes have been highlighted in recent news reports across the nation, with particular attention given to nine murders (including two double homicides), attempted murders and rapes committed along the Appalachian Trail since 1974. Additionally, the 1998 murder of a National Park Service ranger in the Shenandoah National Park has raised the awareness of such crimes to virtually all park-goers. This study reports the results of a pilot study conducted at three US Army Corps of Engineer-managed lakes located near Huntington, West Virginia, one Corps-managed area near Portland, Oregon, and along the Appalachian Trail.

In a study of perceived safety and security problems at Somerville Lake, Texas (US Army Corps of Engineers),

Fletcher (1983) found that perceived safety and security problems negatively affected users' enjoyment of parks. The study also noted the site specificity of perceived safety and security problems, with significantly higher levels of concern at non-fee areas in comparison with the fee areas at the same lake. This was partially explained by the degree of supervision at the fee areas, where access was restricted by a staffed entrance/exit. In several different studies, researchers found that 30-35% of visitors were *not* able to say that they felt safe in the park that they were visiting (Godbey and Blazey, 1983, Westover, 1986, Whyte, 1995).

In a recent study, Ibitayo and Virden (1996) sought to compare the perceptions of park managers with those of park visitors regarding deviant behavior in urban parks. Given a twenty-one item list (items such as theft, vandalism, noise/loud music, parking violations, drug use, and so forth) park managers consistently rated the items much higher in terms of security problems than the visitors. Essentially, visitors perceived low levels of depreciative behavior, while park managers perceived much higher levels of deviant behavior. This study also showed that frequent visitors perceived significantly higher levels of depreciative behavior than did infrequent users. Suren and Stiefvater (1997) focused on administrative strategies to combat socially depreciative behavior in parks and recreation agencies. In a survey of almost 60 park and recreation administrators, 53 percent noted vandalism as a problem, 42 percent mentioned alcohol and drug use, and 37 percent suggested hanging out as a problem.

This pilot study was conducted in 1998 with the purpose of attempting to ascertain visitors' perception of crime in two outdoor recreation environments, US Army Corps of Engineers lakes in West Virginia/Kentucky and Oregon/Washington, and the Appalachian Trail (A.T.). The A.T., a unit of the National Park Service, is a linear footpath, running over 2100 miles from Maine to Georgia. The A.T. crosses through 14 eastern states, and encompasses over 250,000 acres of mountain terrain. Trail hikers were given the opportunity to fill out a one-page survey when they stopped at the Appalachian Trail Conference's (ATC) headquarters building in Harpers Ferry, West Virginia, a popular stop-off point located at about the midway point on the A.T. The ATC is a nonprofit organization dedicated to the preservation of the trail and its resources. The US Army Corps of Engineers maintains operational control of 463 lakes, rivers, and wetlands across 40 states, and is one of the nation's largest recreation providers. The Corps of Engineers visitors were interviewed through face-to-face interviews at recreation sites along the shores of three Corps-managed lakes in West Virginia and Kentucky and in the Columbia River Gorge on the border of Oregon and Washington.

This study compares the responses of visitors to similar questions at both Appalachian Trail and Corps of Engineers recreation areas. Visitors at each of the recreation locations were asked to answer several questions about their perceptions of security and crime during the Summer 1998 recreation season (n=848). User responses to variables such as satisfaction with security at the recreation site,

ranger assistance, whether they had encountered crimes, whether they had heard of crimes at the recreation areas, and other associated variables were measured. Independent variables for the study were gender, age, employment status, education level, distance from recreation area, visibility of ranger or law enforcement patrols and location of recreation area.

Results

The first table focuses on the baseline question of an individual's perception of security while at the recreation area. Table 1 shows that users of the Appalachian Trail were more likely to indicate that they were very safe (76%) than Corps lake users (60% very safe). Over one-third (37%) of the Corps lake visitors noted that they were reasonably safe, compared to just under one-quarter (24%) of the AT users. Of interest in this table is the finding that

a small minority (4%) of Corps lake visitors felt that they were somewhat unsafe or very unsafe, while no A.T. users (0%) reported that they were less than reasonably safe. This finding was unexpected. The researchers expected Corps lakes users to feel more safe, since most of the lakes have some sort of roving security patrols, such as ranger or local law enforcement officers, in contrast with the A.T. that has few people on patrol.

The differences between males and females regarding perception of safety and security are also noted in Table 1, with more males reporting that they felt very safe than females both along the A.T. and at ACOE lake recreation areas. There was a larger disparity between the perceptions of males and females along the A.T. than was noted at the ACOE lakes. There was little difference between the males and females in the lower categories of somewhat unsafe and very unsafe at the ACOE lakes.

Table 1. Perception of safety/security

Perception of Safety/security	Appalachian Trail	ACOE Lakes	A.T. Males	A.T. Females	ACOE Lake Males	ACOE Lake Females
Very safe	76%	60%	79%	65%	62%	57%
Reasonably safe	24%	37%	21%	35%	35%	40%
Somewhat unsafe	0%	3%	0%	0%	3%	4%
Very unsafe	0%	1%	0%	0%	1%	0%

Table 2 shows the results of whether visitors encountered a security problem along the Appalachian Trail or at the ACOE lake recreation areas over the past year. Overall, A.T. visitors were more likely to have encountered some sort of security problem while recreating along the trail

(9%) than were ACOE users (2%). Similarly, there were greater differences between the females (6% encountered a problem) and males (2% encountered a problem) than at the ACOE lakes, where just 2% of both males and females encountered a problem.

Table 2. Encountered a security problem within the past year

Encountered a Security Problem	Appalachian Trail	ACOE Lakes	A.T. Males	A.T. Females	ACOE Lake Males	ACOE Lake Females
Yes	9%	2%	10%	6%	2%	2%
No	91%	98%	90%	94%	98%	98%

Related to the notion of actually encountering a security problem is the issue of hearing about a crime or crimes committed along the A.T. or at one of the ACOE recreation areas. Table 3 highlights the differences between the two distinctly different recreation environments. Clearly, the A.T. users were much more likely (69%) than ACOE recreation users (9%) to have heard of a crime that had

been committed. Distinct differences were also noted between males and females along the A.T. (80% of females had heard of a crime committed, compared to only 64% of males). There was little difference in the perceptions at the ACOE lakes, with less than 10% of males and females hearing of a crime committed within the past year.

Table 3. Heard of a security problem within the past year

Heard of a Security Problem	Appalachian Trail	ACOE Lakes	A.T. Males	A.T. Females	ACOE Lake Males	ACOE Lake Females
Yes	69%	9%	64%	80%	9%	9%
No	31%	91%	36%	20%	91%	91%

Table 4 indicates the proportion of visitors along the A.T. and at ACOE recreation areas who had some sort of contact with a law enforcement officer while they were recreating. Once again, distinct differences were noted between the two user groups. While virtually no A.T. users (1%) had any sort of contact with law enforcement officers, one-quarter (25%) of ACOE users had some sort of law

enforcement contact while at the recreation area. Females at the ACOE lakes were slightly more likely to report some sort of contact with a law enforcement officer than males. The proportion of A.T. visitors who reported any form of contact was not sufficient to be included in the gender analysis of Table 4.

Table 4. Contact with law enforcement officers

Contact with a law enforcement officer	Appalachian Trail	ACOE Lakes	A.T. Males	A.T. Females	ACOE Lake Males	ACOE Lake Females
Yes	1%	25%	---	---	22%	28%
No	99%	75%	---	---	78%	72%

Table 5 reports the degree of satisfaction with the assistance received from the law enforcement officers. Interestingly, the A.T. users reported a higher degree of satisfaction than ACOE users regarding satisfaction with assistance received from law enforcement officers. This is surprising because of the great degree of difference between the number of A.T. users who encountered some

sort of contact compared to ACOE visitors, and relates to the concept of understanding users' expectations about the visibility of law enforcement officers at recreation areas. Little difference was noted in the satisfaction levels by males and females at the ACOE lakes, and, once again, not enough A.T. users experienced a contact with a law enforcement officers to make a gender comparison.

Table 5. Satisfaction with assistance received

Satisfaction with assistance	Appalachian Trail	ACOE Lakes	A.T. Males	A.T. Females	ACOE Lake Males	ACOE Lake Females
Very satisfied	66%	58%	---	---	58%	58%
Reasonably satisfied	31%	38%	---	---	37%	38%
Somewhat dissatisfied	3%	3%	---	---	2%	3%
Very dissatisfied	3%	1%	---	---	2%	0%

Conclusions and implications

Perhaps the most important finding of this pilot study is that the A.T. visitors reported overall higher levels of safety and security, while reporting less contacts with law enforcement officers. Following this trend, A.T. users also reported higher degrees of satisfaction with the assistance provided by law enforcement officers, while reporting much less contact. Although it is important to note that these preliminary data are the results of a pilot study, the implications to managers are important. The expectations of users regarding the degree of law enforcement contact desired must be understood by managers. When recreationists desire solitude, or simply want to enjoy a recreation experience with family members or friends, they may not wish to have contact with law enforcement officers, and the lack of contact may actually result in a higher quality experience.

The Appalachian Trail recreationists present themselves as a user group that is very different than the ACOE lake recreationist when it comes to security issues. ACOE visitors consistently showed lower levels of security problem encounters, situations where they heard about security problems, and even satisfaction with the assistance received from law enforcement officers. The ACOE lake

users, conversely, reported higher levels of contacts with law enforcement officers, and this contact did not appear to increase their overall perception of security at the lake.

The differences between males and females, as well, were stronger for A.T. visitors than for ACOE visitors. While ACOE visitors reported similar results in nearly all categories in this study, A.T. users reported distinctly different responses depending on gender. Males reported higher perceptions of security overall, and were more likely to have encountered a security problem in the past year. Females, however, were more likely to have heard about a security problem on the trail in the past year. This is important to managers because the perception of criminal activity at a recreation area, whether the crime was real or not, may lead to a decreased perception of security, as noted in this pilot study.

Overall, when different user groups are queried about crime and security, quite different responses are noted. Once specific user groups' perceptions of crime and security issues are understood, managers can attempt to inform or educate users about the risks associated with a specific recreation area. ACOE recreation areas, with 462 dams, levies, wetlands and other multi-purpose water-related projects in 40 separate states, represent an enormous

amount of recreation visitation and shoreline acreage, and the perceptions and statistical accounting of crimes at these areas must be understood as well. The Appalachian Trail, traversing through 14 states and literally hundreds of counties, townships, towns, and other jurisdictions is a unique geographic feature that warrants further study. This pilot study focused on hikers who had traversed over half of the trail (through hikers), which is only one segment of A.T. users. An ongoing visitor use study of A.T. users queries all different user groups (day hikers, weekend or week hikers, through hikers, etc.) about their perceptions of security on and near the A.T., and will allow us to study the subject of security along the A.T. in much more depth.

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WEATHER RELATED LIABILITY IN OUTDOOR RECREATION

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Abstract: Weather related accidents have traditionally been considered as "Acts of God." Case law is starting to change that perception to a more situational context. A recent national survey on the laws, regulations, and operating procedures public agencies and organizations utilize to warn outdoor recreationists and sports participants of severe weather conditions revealed that only a few of the surveyed organizations have formal visitor warning procedures. While there are few statutory or regulatory requirements the courts have increasingly awarded damages to plaintiffs in weather related cases.

Introduction

The research survey utilized a mailed questionnaire to the state offices of the Division of State Parks (or equivalent outdoor recreation unit) for each state, U.S. Forest Service regional offices, National Park Service regional offices, and the national offices of the National Camping Association.

The surveyed organizations represent thousands of campgrounds operated by both agencies and concessionaires and includes most of the major providers of campgrounds in the United States. The study indicated that there is an apparent inconsistency between what agencies and organizations believe they are providing and what they are actually providing regarding weather warnings. Some categories of severe weather forecasting (i.e. hurricanes, flooding, extreme temperature) provide a much longer time

period between the damaging event and the warning forecast. While weather warnings are available for tornadoes and severe thunderstorms, the warning period is much shorter and the legal risk may increase.

Research Methodology

A nation-wide weather warning survey was conducted by Professor Bruce Hronek of the Department of Recreation and Park Administration at Indiana University. The survey was directed at the National, Regional or State offices of some of the major outdoor resource managing agency in the United States. The survey focused on obtaining information regarding the statutory requirements organizations have in providing weather warning; what organizations have self-imposed through written operational procedures; and, if they have warning procedures, what methods are employed to inform the visitor of severe weather. The survey was intended to determine if a national trend or standard exists related to severe weather warnings.

The research survey utilized a mailed questionnaire to the state offices of the Division of State Parks (or equivalent outdoor recreation managing unit) for each state, the U.S. Forest Service regional offices, the National Park Service regional offices, and the national office of the National Camping Association. A month after the initial request for information, a follow-up mailing was sent to those who did not respond. In September a final telephone inquiry was made to the six units who failed to respond to the mailings.

The surveyed organizations represent thousands of campgrounds operated by both agencies and concessionaires. and includes most of the major providers of campgrounds in the United States. Each individual respondent (state, region, or national office) represents an extensive network of camping facilities. A single respondent may represent as many as 200 or more individual campgrounds with varying numbers of camping sites in each campground.

Table 1. Response Rate Summary

Organization	# of Units Surveyed	# of Units Responding	% of Units Responding
State Parks (State Offices)	50	9	98.0
National Park Service (Regional Offices)	10	10	100
U.S. Forest Service (Regional Offices)	9	9	100
National Camping Association (Non-Public National Office)	1	1	100
Total	70	69	98.6

Response To Survey Questions:

Question 1. Do you know of any statutes requiring your organization to warn the campground visitor of severe weather?

Results: 68 no (98.6%), 1 yes (1.4%)

All respondents except the State of Rhode Island and Michigan stated there were no laws (statutes) requiring them to provide weather warnings. While Rhode Island indicated their answer was yes, they had no written operating procedures. Their detailed notation indicated that they used the state's Emergency Management Agency to warn campground visitors.

Table 2 Questionnaire Summary (Questions 1 & 2)

Question:	Number YES	Percent YES	Number NO	Percent NO
1. Do you know of any statutes requiring your organization to warn the campground visitor or severe weather?	2	2.9	67	97.1
2. Does your organization have written operational procedures that recommend that visitors be warned of severe weather conditions?	23	33.3	46	66.7

Question 2. Does your organization have written operational procedures (internal manuals handbooks, instruction etc) that recommends or directs visitors be warned of severe weather conditions?

Results: 23 yes (33.3 %), 46 no, (66.7%)

Of the 23 responding yes, 17 (73.9 %) indicated that not all the units (parks, campgrounds, etc.) in their jurisdiction had weather related operational procedures. Only part of the areas, frequently coastal areas or those particularly subject to weather related events such as tornados, floods,

fires etc., have operational warning systems. Some respondents who marked no to question 2 indicated that while they did not have weather warning operational procedures they may warn visitors if they knew of severe weather conditions.

Question 3. If your regulations or procedures warn visitors of severe weather conditions, what type of systems do you use?
Results: The twenty three respondents, who indicated they had operational procedures, stated they use the following methods to warn visitors of severe weather conditions:

Table 3 Visitor Weather Warning Methodology

Methods Used to Warn Visitor	Number of Respondents Using Method	Percent of Respondents Using Method
Personal Contact	23	100
Bulletin Boards	17	73.9
Public Radio (visitor responsible to monitor)	16	69.6
Audio Warnings - alarm, siren, etc	8	34.8
Signs	2	8.7

Interpreting the Data

There is an apparent inconsistency in what campground managing agencies and organizations headquarters believe they are providing and what they are actually providing regarding weather warnings. Contact with field personnel indicates that, because of a number of factors, most campground owners and managers cannot provide visitor warning of quickly developing severe weather occurrences. This is generally the result of manpower limitations, remoteness of unmanned camping facilities, number of occupied units in campground, campers engaged in activities outside their camping site (hiking trails, swimming, sight-seeing, etc.); and campground personnel management duties that limit the monitoring of telephone and radio broadcasts on a continual basis.

Weather warning related to hurricanes, extreme temperatures, broad area flooding can be forecast many hours if not days ahead, allowing adequate warning for outdoor recreation users. Exceptions to the opportunity to warn would apply to wilderness users, hikers, boaters, and others without radio or other public media contact in remote locations. Because of the lead time available, the public can be adequately warned regarding specific categories of predicted weather events such as hurricanes and broad area flooding.

The National Weather Service (Meteorologist in Charge, National Weather Service, Indianapolis Indiana) indicates that the primary means of warning the public of severe weather conditions is through weather radio, the weather wire, and the national weather warning system. Meteorologists indicate that lead time between issuing of weather warnings for tornados or high winds and the occurrence of the event is normally between 0 and 20 minutes. Frequently the first warning is given after the event occurs and is recognized on weather radar or reported by a severe weather spotter.

Some categories of severe weather forecasting provide a much longer time period between the damaging event and the warning. Hurricanes, and broad area flooding can usually be predicted many hours if not days in advance of the event. Special or severe weather statements provide additional information between the issuance of a watch and a warning. Weather watches just relate to tornados, floods, and severe thunderstorms. Severe thunderstorms warnings are issued when damaging winds and large hail are expected; but lightning is not expected. Lightning information may be noted in special weather statements, but is not included in watches and warnings.

The National Weather Service anticipates that when weather watches are issued, people will go about their daily activities but monitor radios for further updates and possible warnings. Radars, in many cases, have the unique characteristics of being able to distinguish tornados and straight line wind conditions a short period of time before they occur.

A common defense for weather related accidents has generally been that the occurrence was an "Acts of God". This is used when there is an obvious unforeseeable,

intervening force of nature. Severe weather can also be considered an "emergency" situation. People representing agencies and organizations under emergency conditions cannot reasonably be held to the same conduct as on who has had full opportunity to reflect, even when it appears that they made the wrong decision. Under emergency conditions, a persons choice may be mistaken and yet prudent., and thus ,without negligent intent or a perceived duty of care .

Selected Weather Related Cases:

Schieler v. United States 642 F.Supp. 1310 (E.D. Cal 1986)
Plaintiff was injured as a result of being struck with lightning in Sequoia National Park. The plaintiff was standing on top of Moro Rock when the accident occurred. The plaintiff argued that he should have been warned of the dangers of lightning in the area, that there was thunderstorms predicted, and the Park Service failed to provide safety devices (lightning rods) to ground the observation area. The court ruled in favor of the defendant stating the discretionary function of the federal agency applies to decisions of this nature met the discretionary function exception to the FTC because the decisions was "made pursuant to the activities and decisions of the Park Services in carrying out the Congressionally mandated mission of the Park."

Picardo v. North Patchogue Medford Youth Athletic Association., Inc. 172 A.D.2d 814; 569 N.Y.S.2d 186 (1991) Supreme Court of New York, Appellate Division, Second Department. Plaintiff's decedent was struck by lightning on a baseball field while playing for the defendant's team. The plaintiff claimed that the defendant "allowed a baseball game to continue when threatening weather became apparent" The defendant asked for summary judgement claiming the decedent was 19 years old at the time of his death and he elected to play baseball in weather conditions which were readily apparent, thunder was heard, and lightning was seen. The trial court rejected the defendant's request for summary judgement. The defendant appealed. The appeals court reverred the order of the trial court and granted the defendant a motion for summary judgement based upon the fact there was no compulsion or economic interest to continue to play in obvious threatening weather.

Chimino v. Town of Hemstead 488 N.Y.S.2d 68 Supreme Court, App. Div. 2d 1985. Plaintiff was injured as a result of being struck by a wave at a beach area managed by the Town of Hemstead in the state of New York. The plaintiff alleged that the City was negligent not to warn him of the wave conditions or they should have closed the beach. The courts ruled that the City had no duty to warn the plaintiff or close the beach because of weather and wave conditions was obvious to the users.

McAuliffe v. Town of New Windsor 577 N.Y.S.2d 942 (A.D. 1991) Plaintiff, age 16, was injured on the town's beach as a result of being struck by lightning while playing volleyball on the beach. Plaintiff claimed that the defendant was negligent in their supervision of the beach. The plaintiff had heard the warning to get out of the water but claimed he did not hear the warning to take cover. The appeals court determined that the Town of New Windsor did not have a

duty "to specifically warn McAuliffe against the danger of lightning."

Dykema v. Gus Macker Enterprises, Inc 492 N.W.2d (1992) Plaintiff was attending a basketball tournament as a spectator. He paid no entrance or admission fee. While running toward a shelter the plaintiff was struck and injured by a lightning storm blown tree limb. The plaintiff claimed that a special relationship existed and Gus Macker Enterprises had a duty to protect their patrons. The defendant claimed that no special relationship existed because the plaintiff was not there for business purposes, he did not pay a fee, he was able to see the changing weather, and the plaintiff did not entrust himself to the control and protection of the defendant. The Appeals court ruled that the "defendant was under no duty to warn plaintiff of the approaching thunderstorm.

Weather Related Cases:

Lightning

Bier v. City of New Philadelphia 11 Ohio St.3d 134, 464 N.E.2d 147 (1984) Supreme Court of Ohio; Lightning Strikes metal picnic shelter causing death and injury. Lack of lightning protection contributed to plaintiffs injuries.

McAuliffe v. Town of New Windsor 577 N.Y.S.2d 942 (1991) Supreme Court of New York, Appellate Division, Third Department; The obligation of beach recreation personnel to warn people to "take cover" during thunderstorm.

Wave (Ocean)

Stresmpkowski v. Borough of Mansquan 208 N.J. Super. 328, 506 A.2d 5 (1986) Supreme Court of New Jersey, Appellate Division; Swimmer struck by wave off public beach.

Cimino v. Town of Hempstead 488 N.Y.S.2d 68 (1985) Supreme Court, Appellate Division, 2nd Department; Town has no duty to warn bather/swimmer of wave activity.

Flash Flood

Ducy v. United States 713 F.2d 504 (1983) United States Court of Appeals, 9th Circuit; National Park Service Recreation Landowner Liability Defense for flash flood in National Recreation Area.

Other Weather Related Cases:

Fuhrer v. Gearhart By the Sea, 79 Or. App. 550, 719 P.2d 1305, 734 P.2d 1349, (1987) app'd Or App., 742 P.2d 58 (1987).

Cutler v. Jacksonville Beach, 489 S.2d 129 (Fla 1986)
Geffen v. County of Los Angeles 242 Cal. Rptr. 105 (1988)

Harmon v. U.S. 532 F.2d 699 (1975)

Christon v. Kankakee Valley Boat Club, 152 Ill App.d 202, 504 N.E.2d 263 (1987)

MOUNTAIN BICYCLISTS' BEHAVIOR IN SOCIAL TRAIL ETIQUETTE SITUATIONS

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Abstract: Mountain bicyclist organizations and land management agencies have promoted trail etiquette guidelines in attempts to reduce social and environmental impacts on multiple-use trails. The purpose of this study was to unobtrusively examine mountain bicyclists' behavior in two social trail etiquette situations: yielding behavior and speed traveled. A secondary purpose was to create a scale for testing yielding behavior. Results indicated that significant differences existed in yielding behavior based on gender, and three equipment indicators of behavior. Significant differences were present in speed traveled for gender, estimated age categories, and six equipment indicators. The yielding scale offers a more precise measurement of yielding behavior of mountain bicyclists than methods employed previously.

Introduction

The growing popularity of mountain biking during the 1980s and 1990s throughout the United States has created one of the more recent recreation resource management issues facing managers of multiple use trail systems. Perceived social and environmental impacts have surfaced in various locales (Moore, 1994). In some areas, recreational conflicts and resource degradation have pitted recreation users against each other with battle lines drawn in board meetings, on the trails, as editorials in local newspapers, and in popular magazines (Hendricks, 1997). In other regions, conflicts have been minimal and cooperation has been extensive between mountain bikers, hikers, and equestrians.

Attempts to control the impact of mountain biking have included site closures, new regulations, and educational campaigns. Among the most accepted and widespread educational efforts are trail etiquette guidelines published, distributed, and communicated by various land management agencies and bicycle organizations. For example, the International Mountain Bicycling Association (IMBA) recommends that bicyclists (a) ride open trails

only, (b) leave no trace, (c) control the bicycle, (d) always yield, (e) never spook animals, and (f) plan ahead.

Even with the development of extensive educational efforts little is known about actual adherence to trail etiquette and the behavior of mountain bicyclists in multiple-use trail settings. The few mountain bike studies conducted specifically related to trail etiquette have also raised issues, yet to be addressed. In previous research, mountain bicyclists indicated that etiquette should be followed (e.g. Chavez, 1997a), yet an unobtrusive study of mountain bicyclists observed that behavior is often contrary to the espoused etiquette (Ramthun & Ruddell, 1992). Furthermore, actual etiquette may be conditional or situational based on resources and the behavior of others (Hendricks & Ruddell, 1995; Ruddell & Hendricks, 1997) and conflict perceptions may vary according to experience (Chavez, 1997a) or activity orientation (Watson, Asp, Walsh, & Kulla, 1997). Social conflict trail etiquette situations remain an issue for land managers (Chavez, 1996, 1997b).

The purpose of this study was to unobtrusively examine mountain bicyclists' behavior in two social trail etiquette situations: yielding behavior and speed traveled. A secondary purpose was to create a scale for testing yielding behavior. Potential equipment indicators of mountain bicyclists behavior were also examined.

Methods

Subjects in the study were 188 mountain bicyclists riding on a multiple-use protection road (dirt, fire road) on Mt. Tamalpais in Marin County California on selected days and randomly chosen times during June and August, 1998. Mt. Tamalpais is recognized, as the "birthplace" of mountain biking and 20 years following the first mountain bike riders on the mountain, recreational conflict remains a serious concern for land managers. The Marin Municipal Water District (MMWD) maintains similar trail etiquette guidelines to those suggested by IMBA. MMWD asks bicyclists to stop and wait for equestrians and hikers to pass or signal the bicyclists through, recommends announcing a presence by ringing a bell or saying hello, and to slow down and pass with care. They also enforce a 15 mph speed limit and a 5 mph speed limit when passing others and on a blind turn.

Independent variables identified by field observations were gender, estimated age categories, and potential equipment indicators of behavior (dichotomous variable, equipment observed or not observed). Estimated age categories were 18-25, 26-35, 36-45, 46-55, and 56 and above. Equipment indicators observed were gloves, riding jersey, riding shorts, sport glasses, helmet, hydration pack, riding shoes, and clipless pedals. The dependent variables were yielding behavior when approaching two hikers and speed. Measures for the dependent variables were taken unobtrusively as follows: (a) yielding was rated on a 9-point behavior anchored rating scale with three general categories no yield, marginal yield, and superior yield; (b) speed was calculated with a radar gun to determine miles per hour the bicyclist was traveling. A scale was developed

for speed with 0 being any speed at the speed limit (15 mph) or below and a point on the scale for each mile per hour over the speed limit. This procedure was developed due to a limitation of the radar gun which was unable to record speed for individuals traveling at a slow speed (11 mph and under) or who stopped and started in the area where speed was recorded. A research assistant with the radar gun was located to the side of the protection road where it was unlikely that bicyclists would see this individual. For the independent variable observations and to record the yielding behavior two researchers hiked up the protection road side by side not giving any verbal or non-verbal indication that they would yield to an oncoming bicyclist. The bicyclists could see the hikers within approximately 25 meters. Following contact with a bicyclist the researchers maintained their original position on the trail in preparation for other bicyclists. The interrater reliability coefficient for the yielding scale was .97.

Data analysis involved a one-way analysis of variance procedure for the estimated age categories and a t-test for gender (male/female) and equipment indicators (observed or not observed). Estimated age categories were collapsed to 18-35, 36-45, and 46 and above because few subjects were observed that were 18-25 or 56 and above. A separate analysis was conducted for the speed and yielding dependent variables.

Results

Results of the study indicated that there was a significant negative correlation (-.32) between yielding behavior and speed traveled. The overall mean score for yielding was 3.13 (slightly above no yield, exemplified by eye contact only). Females yielding mean score (3.53, between no yield with eye contact only and a marginal yield with a positive verbal response on the scale) was significantly higher than males (2.95, a no yield, indicating eye contact only). There were no differences in yielding behavior among the estimated age groups $F(2, 170) = .77, p < .465$. Equipment indicators with significant differences between those with the equipment and those without were hydration pack, clipless pedals, and riding shoes indicating that those with the equipment were less likely to yield. Subjects with equipment indicators had lower mean scores than those without for all equipment except a helmet (see Table 1).

The mean speed traveled for all subjects 12 mph and above was 17.53 ($n=164$). Speed traveled was not readable for 24 (12.8%) of the subjects. Nearly 60% of the subjects were traveling over the 15 mph speed limit (see Table 2). When using the mph scale the mean score was 2.65. The males mean score (3.13) was significantly greater than the females score (1.76). The 18-35 age group was traveling

significantly faster than the 36-45 age group, $F(2, 170) = 3.95, p < .021$. Significant differences in equipment indicators were gloves, jersey, sport glasses, clipless pedals, riding shoes, and riding shorts. In all cases the subjects wearing the equipment were traveling at a higher rate of speed (see Table 3).

Discussion

In this locale, etiquette violations persist in spite of long-term managerial strategies and practices that have attempted to reduce user conflicts and violations related to trail use behavior. Based on the results of this study acceptable yielding behavior is nearly non-existent and speed traveled is an additional concern. This follows more than 20 years of various management practices by the MMWD and others on Mt. Tamalpais. Practices have included informational outposts, the formation of a volunteer bicyclist organization, published etiquette guidelines and bicycle trail maps, fines of up to \$200.00 for speeding violations, speed enforcement with a radar gun, posted signs, and meetings between concerned parties and land managers (Edger, 1997). Indirect management and educational strategies have diminished in recent years; it may be time for land managers and mountain bicyclist advocates to reinvest energy in these efforts.

The results offer support for the use of a yielding scale that is a more precise measurement than previously utilized techniques relying on a dichotomous variable of observing or not observing appropriate trail etiquette (i.e. Ramthun & Ruddell, 1992). The scale provides a standardized measure for recording trail etiquette behavior in a variety of inter and intra-group scenarios. For example, the scale could be used for mountain bicyclists yielding behavior with other bicyclists and equestrians in addition to the situation examined in this study. The scale may also be appropriate for single track trail situations and would allow for a comparison between single track and protection road yielding behavior and uphill/downhill scenarios.

The results also demonstrate the need for recreation researchers to employ triangulation techniques and to examine criterion validity for traditional survey research methods. Self-reported yielding behavior in surveys has generally shown more favorable results than reported here.

In this study, the examination of equipment indicators of behavior proved fruitful in segmenting individuals who were more likely to commit etiquette violations. Bicyclists with the presence of specialized equipment were especially apparent traveling at a faster rate of speed than individuals without the equipment. Equipment has long been studied as a component of recreation

Table 1. Yielding Behavior

Variable	n	Mean	SD	F/t-value	P
Overall sample	173	3.13	1.46		
<i>Gender</i>					
Male	119	2.95	1.38		
Female	54	3.53*	1.57	.016	-2.42
<i>Age Groups</i>					
Age 18-35	98	3.18	1.54		
Age 36-45	45	3.22	1.51		
Age 46+	30	2.83	1.09	.769	.465
<i>Equipment Indicator</i>					
No gloves	77	3.37	1.56		
Gloves	96	2.94	1.36	1.92	.056
No helmet	25	3.08	1.58		
Helmet	148	3.14	1.45	-.20	.846
No hydration pack	149	3.22	1.49		
Hydration pack	24	2.60*	1.15	2.32	.026
No jersey	107	3.27	1.45		
Jersey	66	2.92	1.47	1.53	.127
No sport glasses	126	3.21	1.44		
Sport glasses	47	2.93	1.52	1.14	.256
No clipless pedals	134	3.28	1.49		
Clipless pedals	39	2.62*	1.27	2.55	.012
No riding shoes	125	3.32	1.55		
Riding shoes	48	2.66**	1.09	3.14	.002
No riding shorts	46	3.18	1.39		
Riding shorts	127	3.11	1.49	.28	.780

Note. F-test is for age groups, others are t-tests

* $p < .05$

** $p < .01$

Table 2. Speed Frequencies

MPH	n	Percent	Cumulative %
No reading	24	12.8	12.8
12	12	6.4	19.1
13	17	9.0	28.2
14	14	7.4	35.6
15	16	8.5	44.1
16	18	9.6	53.7
17	8	4.3	58.0
18	13	6.9	64.9
19	20	10.6	75.5
20	10	5.3	80.9
21	10	5.3	86.2
22	10	5.3	91.5
23	3	1.6	93.1
24	5	2.7	95.7
25	3	1.6	97.3
26	0	0.0	97.3
27	0	0.0	97.3
28	3	1.6	98.9
29	2	1.1	100.0

Note. Speed limit is 15 mph, 5 mph when passing and on a blind turn

Table 3. Speed Behavior

Variable	n	Mean	SD	F/t-value	P
Overall mph	164	17.53	3.93		
Scale mph	188	2.65	3.32		
Gender					
Male	124	3.13	3.51		
Female	58	1.76**	2.62	2.94	.004
Age Groups					
Age 18-35	98	3.25 ^a	3.71		
Age 36-45	45	1.82 ^a	2.63	3.95	.021
Age 46+	30	1.87	2.53		
Equipment Indicator					
No Gloves	84	1.98	2.74		
Gloves	96	3.27**	3.63	-2.75	.007
No helmet	29	2.14	2.25		
Helmet	154	2.78	3.47	-1.28	.207
No hydration pack	158	2.68	3.39		
Hydration pack	25	2.68	2.76	.00	.997
No jersey	114	1.86	2.29		
Jersey	69	4.03**	4.19	-3.96	.001
No sport glasses	135	2.12	2.56		
Sport glasses	48	4.25**	4.50	-3.11	.003
No clipless pedals	140	2.09	2.67		
Clipless pedals	43	4.60**	4.34	-3.60	.001
No riding shoes	133	2.15	2.68		
Riding shoes	50	4.08**	4.30	-2.96	.004
No riding shorts	49	1.86	2.54		
Riding shorts	134	2.98*	3.51	-2.37	.019

Note. F-test is for age groups; others are t-tests

* $p < .05$

** $p < .01$

^a indicates significant difference $p < .05$ between these two groups, post-hoc Tukey procedure

specialization (Bryan, 1977) and has continued as a critical element of recreation specialization conceptualization and theory (i.e. Ditton & Loomis, 1992). This preliminary analysis of equipment as an indicator of bicyclists' behavior indicates that the concept of recreation specialization and its multi-dimensional aspects such as commitment, involvement, and skill development may be useful for segmenting mountain bicyclists.

Gender and to a limited degree age estimates were also useful in determining etiquette violations. With the lapse in time since educational efforts on Mt. Tamalpais have been stressed, a new segment of riders may have matured. Younger bicyclists may not have been reached with the previous campaigns and are potentially unintentional or uninformed violators (Gramann & Vander Stoep, 1987) of trail etiquette. Women and men yielding and speed differences support the need to understand women and men in their leisure pursuits and behavior as suggested in previous literature (e.g. Henderson, 1994, 1996) and to extend the analysis within the mountain biking activity

beyond a simple variable for segmenting users. This would require an investigation within other paradigms of inquiry and with additional research methods.

By identifying groups of users who are more likely to commit etiquette violations, land managers and bicycling organizations can develop messages that appeal to the priorities of those groups. Additionally, confirmatory and further research into the phenomenon of equipment indicators within mountain biking will be an important step in understanding the motivation and preferred experiences that lead to these etiquette violations.

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DISTINCTIONS BETWEEN PERMITTED AND NON-PERMITTED REGISTERED SNOWMOBILERS

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Abstract: In a study of winter 1996-97 Michigan snowmobiling, it was estimated that nearly one third of Michigan registered snowmobiles did not possess a mandatory trail permit for public land operation. This had potentially serious funding and law enforcement implications. In response to manager concerns, a follow up mail questionnaire study of registrants was conducted to better understand why individuals would have a valid, 3-year Michigan snowmobile registration and not purchase an annual trail permit. Respondents with registered, non-permitted snowmobiles reported that many were not used during the 1996-97 winter season because they were a spare machine, non-functional or the respondent lacked time for snowmobiling. Others reported using their machines only on private property or solely in support for ice fishing, which is an exception to the public land trail permit mandate. In addition, it appears there are many expired or duplicate registrations in the state's data base, leading to an overestimate of registered snowmobiles.

Introduction

In Michigan, residents are required by the Michigan Snowmobile Law (Public Act 74 of 1968 as amended) to register their snowmobiles with the Secretary of State in order to operate them on public lands, frozen waters and the shoulders of county roads (should the county permit such operation). Registrations have a three year life. Non-residents are permitted to use their snowmobiles on Michigan's public lands, waters, and shoulders of county roads so long as they possess a current registration from Michigan or from their state or country of origin. In addition to registration, Michigan Public Act 99 of 1994 mandated that all snowmobiles operated on public lands, frozen waters and road rights of way since winter 1994-95, regardless of the owner's state or country of residency, must possess an annual Michigan snowmobile trail permit. The only exceptions are when the machine in question is used on frozen waters for the sole purpose of supporting ice fishing. This 1994 law did not effect snowmobiling on private lands, where a trail permit is not required.

In 1997, a comprehensive study of Michigan snowmobiling use and users during winter 1996-97 was conducted with those who had purchased Michigan snowmobile trail permits (Nelson et al. 1998). One key finding from this study was that a significant proportion of the Michigan registered snowmobiles did not possess a snowmobile trail permit. The Michigan Secretary of State reported approximately 219,000 snowmobiles registered during winter 1996-97. For that same winter, the Michigan Department of Natural Resources Forest Management Division (DNR - FMD) reported 212,000 snowmobile trail permits were sold. Based upon the study results, it was estimated that 140,000 Michigan registered snowmobiles and 72,000 machines registered in other states possessed snowmobile trail permits, leaving 79,000 Michigan registered snowmobiles without trail permits.

Management Concerns

This number of Michigan registered snowmobiles lacking trail permits was of financial and enforcement concern to the DNR. First, funding for snowmobile trail management is primarily generated through snowmobile trail permit fees and state sales taxes on gasoline used in snowmobiles. DNR-FMD is the state's snowmobile trail program manager. While funding for Michigan's past snowmobile program had lagged slightly behind its management needs, recent program shifts coupled with increased snowmobiling participation had exacerbated trail funding shortfalls.

One reason for shortfalls was legislative direction to establish partnerships between DNR - FMD and non-profit clubs and associations. Partners would meet on the ground snowmobile trail development and maintenance responsibilities through a grants program administered by DNR - FMD. However, this has resulted in the need for significant new financial resources to properly equip grant sponsors, provide cash reimbursements for sponsor expenses and administer the program. The program is state wide, covering a 5,900 mile plus trail system that goes far beyond the borders of the state forest system. As a result of these increased expenses, less money has been available to conduct off season maintenance of the trail system, such as fall grading to insure a smooth trail going into the winter. In addition, expanding numbers of machines and intensifying use facilitated by technology advancements, tourism promotion and more available winter services, has necessitated greater routine maintenance and in-season grooming, thus increasing those expenses.

The intensifying use has correspondingly lead to a congested trail system (Nelson et al. 1998). As a result, development of new trails and connections to towns and other trails, has become a top priority in Michigan, especially as communities recognize the financial benefits of snowmobiling (Stynes et al. 1998). However, the expansion of the trail system also requires more funding. Michigan's designated snowmobile trail system is 25% on state forests, 25% on national forests and 50% on private lands, including some owned by forest products and utility corporations. On non-industrial private lands, annual leases

are used to secure the trail for public use. Each year, some of the leases are withdrawn, necessitating expensive trail rerouting. Costs include planning, landowner contact, preparing and executing leases, updates of maps, etc. However, these private lands, especially adjacent to towns or where a band of inholdings in a public forest might cause a break in a trail, are critical. Near towns they provide legal gateways for snowmobilers to safely access services such as lodging, gasoline and restaurants, promoting economic benefits from snowmobiling.

A final factor in the funding shortfall has been overestimation of potential trail permit sales. When the trail permit system was initiated, it was estimated that essentially all Michigan registered machines would have a trail permit plus another 80,000 non-resident machines registered elsewhere. However, the highest number of trail permits that have been sold at the time of the study was 219,300. Consequently, anticipated revenue has not been realized.

Enforcement concerns were centered on compliance with permit mandates. The DNR Law Enforcement Division (DNR – LED) had primary responsibility for snowmobile law enforcement on public lands and frozen waters. Due to increases in the number of personal injury and fatal snowmobile accidents through the 1990s, more snowmobile law enforcement was undertaken for winter 1995-96 and 1996-97 by the DNR – LED. With these additional enforcement efforts, how could there be a high level of non-compliance with trail permit mandates?

A review of citations written by DNR – LED and officer field reports revealed few citations for permit violations and relatively high levels of trail permit compliance. The most common violations were illegal operation on a roadway by permitted machines. Other potential explanations were that non-permitted, Michigan registered snowmobiles were not being used, were only used on private lands or that registration records were inaccurate. All of these factors might provide some explanation of the high number of Michigan registered snowmobiles that do not possess trail permits. However, no information was available to answer these questions.

Study Objectives

In response to DNR concerns, a follow-up study to the initial snowmobile trail permit holder study was proposed. The overall goal was to better understand situations where an individual would have a valid Michigan snowmobile registration and not purchase an annual trail permit. The specific objectives of this study were to:

1. Characterize Michigan registered snowmobiles without trail permits and compare them to machines with trail permits.
2. Characterize the use of Michigan registered snowmobiles without trail permits and compare it to the use of permitted machines.
3. Characterize the users of Michigan registered snowmobiles without trail permits and compare

them to the users of permitted machines.

4. Assess why a trail permit was not purchased for non-permitted machines.

Study Methods

A mail questionnaire was used to elicit information from Michigan snowmobile registrants. In order to make comparisons between the permitted machines from the 1996-97 study, a sample of snowmobile registrants was selected from all snowmobile registrations that were valid during some or all of winter 1996-97 (November 1, 1996 - March 31, 1997). The list was obtained from the Michigan Secretary of State. Names and addresses of those who had requested the Secretary of State not to release their information were deleted by the Secretary of State prior to providing the list to the researchers. These deleted names totaled less than 500.

The list contained 275,280 registrations with renewal dates from the year 1997 through the year 2000 that were potentially valid during winter 1996-97. From this population, 2,200 names were selected in a systematic sample with a random start after the list had been sorted to eliminate duplicate names and snowmobiles owned by public entities and private corporations.

The mail questionnaire was designed by the authors, reviewed by DNR personnel from LED and FMD and by the Michigan State University Committee on Research Involving Human Subjects. After one round of revisions based on the review, the 2 page instrument was finalized and printed. The first mailing of the questionnaire was done on May 4, 1998 by first class mail. The second, to those who had not responded to the first, was sent by certified mail on June 12, 1998. It was accompanied by a revised cover letter. The cutoff date for responses was August 31, 1998.

Study Results

Of the 2,200 registrants sampled, 90 had invalid addresses. Of the 2,110 valid addresses, 1,149 (54.4%) provided a usable response. Of those, 38 (3.3%) no longer owned any snowmobiles. Hence, 1,111 fit the definition of owning one or more Michigan registered snowmobiles. In total, these 1,111 registrants owned 2,455 snowmobiles, or 2.21 snowmobiles per registrant. Of the 1,111 registrants, 227 (20.4%) had one or more machines without a winter 1996-97 trail permit. Of those 2,455 machines, 364 (14.8%) did not have a winter 1996-97 trail permit. The rest of the paper presents the responses of those individuals who reported owning one or more Michigan registered snowmobiles without a trail permit and contrasts them to the previous study of use and users of machines with trail permits (Nelson et al. 1998).

Those with one or more non-permitted snowmobiles were likely to own slightly more machines per household than those with only permitted snowmobiles (2.42 vs. 2.21). Non-permitted machines were much different than the

permitted machines. Non-permitted machines were, on average, much older (1981 vs. 1992), less powerful (394 cc vs. 516 cc), and used less gasoline during the winter of 1996-97 (8 gallons vs. 71 gallons) as they were driven a shorter mean distance (80 miles vs. 810 miles). Only slightly more than half (52%) of the non-permitted, registered machines were used during winter 1996-97.

For those who did not use a non-permitted machine, when asked in an open-ended format why, poor snowmobiling conditions, lack of time, the machine being inoperable and that it was an extra machine were the most frequent responses (Table 1). Health reasons and not residing in Michigan during the winter were less frequently cited.

Table 1. Most important reasons Michigan registered snowmobile without trail sticker was not used during the winter of 1996-1997.^a

Reason	Percentage
Poor snow or ice conditions	20.5
Too busy to snowmobile	19.9
Machine inoperable	17.0
Extra machine that was not needed	16.5
Lost interest in snowmobiling	6.8
Older unreliable machine or antique	6.8
Machine for sale	5.1
Health and age	4.0
Do not reside in Michigan during winter months	2.8
Other	0.6
Total	100.0

a. Open ended question.

Non-permitted machines, including those with no use, averaged 7.6 days of use during winter 1996-97. Of this, 68% was where snowmobiling was the principal activity and 32% was where use supported of another activity, primarily ice fishing. This contrasts to permitted Michigan registered machines, including those with no use, during winter 1996-97. They averaged 25.1 days of use, of which 93.5% was principally snowmobiling and 6.5% was in support of another activity, primarily ice fishing (Nelson et al. 1998).

Non-permitted machines that were used during winter 1996-97 were most frequently used on land owned by the operator or a member of his/her household (Table 2). Coupled with use on frozen lakes or waterways (for ice fishing), this accounted for over 3/4 of non-permitted machine use days. Slightly more than 12% of use days were on public trails and road shoulders, which would be classified as illegal. Hence, about 88% of the reported user days of non-permitted, Michigan registered machines were legal.

Table 2. Distribution of machine days for Michigan registered snowmobiles without trail permits during winter of 1996-1997.^a

Location	Percentage
Land owned by my household	45.0
Frozen lakes or waterways	30.8
Private land of a friend or relative	9.8
Public trails (trails marked with orange diamonds)	7.2
Public road shoulders	5.9
Private club or association land	1.2
Total ^b	99.9

a. Machine day is the use of the snowmobile by one or more persons for any portion of a day for snowmobiling or support of another activity such as ice fishing.

b. Total may not add up to 100.0% due to rounding.

When respondents were asked why they did not purchase a trail permit for the registered, non-permitted machines used in winter 1996-97, use solely on private property was the most commonly cited reason (Table 3). Other

frequently cited reasons were the cost of the permit, not using the public trail system and solely using the machine as a support vehicle for ice fishing.

Table 3. Most important reason why Michigan registered snowmobiles used during the winter of 1996-1997 did not have a trail permit.

Reason	Percentage
Machine used only on private land or lakes	22.3
Cost of permit	21.2
Do not ride trails, trails too dangerous	18.4
Machines used only for ice fishing	11.1
Limited time to snowmobile	6.7
Old non dependable machine not used much	6.7
Poor winter conditions to warrant purchase	6.1
Poor trails and trail maintenance	3.9
Machine only used for racing or other special events	1.7
Other	1.6
Total	100.0

Management Implications

The survey data indicated that 1 in 5 Michigan snowmobile registrants owns one or more non-permitted machines and that about 1 in 7 Michigan registered machines does not have a trail permit. Thus, about 40,000 of the estimated 80,000 non-permitted, Michigan registered machines can be explained by this data. One explanation for the remaining 40,000 machines, is that expired registrations were not purged in a timely manner and are characterized as valid after their expiration. A brief examination of the data base found a number of such instances. In addition, the survey results revealed that 3.3% of the respondents no longer owned snowmobiles, further indicating that some of the remaining non-permitted registrations may be duplicates, kept on file after the machine has changed hands. Lastly, there were a few respondents that had never owned snowmobiles, let alone had them registered, so inaccuracies in the names and addresses of registration records may also contribute to accounting for the rest of the non-permitted snowmobiles.

Based on the survey responses, concerns about the widespread illegal use of non-permitted machines on public lands, trails and road rights of way appear unfounded. Since these registered, non-permitted snowmobiles are typically much smaller, older and less used than permitted machines, it is logical that their use is primarily confined to the legal uses of riding on private property and support for ice fishing. Further, almost half the registered machines without trail permits were not used during the 1996-97 winter season.

For the future, more cooperation is needed among snowmobile trail, law enforcement and registration managers. Accurate data, the timely sharing of information and better knowledge of use and users prior to revenue projections from new user fees would improve program functioning and budgetary accuracy.

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