

# Perceived Impacts of Outdoor Recreation on the Summit of Cascade Mountain, New York « AJES

## Introduction

Mountain summits are often popular destinations for outdoor recreation. However, this popularity can lead to two important management issues. First, outdoor recreation can cause environmental impacts such as destruction of groundcover vegetation and soil compaction and erosion. These impacts can be especially severe on mountain summits due to their inherently fragile character (Hammitt and Cole 1998; Monz 2000b). Second, high levels of recreation use can also degrade the quality of the visitor experience through crowding and the aesthetic implications of the ecological impacts noted above (Manning 2011).

This paper reports on outdoor recreation on the summit of Cascade Mountain (Cascade) in the Adirondack Park. Cascade is one of the most popular mountain summits in this area. The primary study method was a survey of hikers to the summit conducted in the summer and fall of 2008. The survey explored the extent to which visitors noticed environmental impacts caused by outdoor recreation, the severity of these impacts and perceived level of crowding. Information on previous visits to Cascade was also collected.

## Background Information on Recreation-Related Research

### *Perceptions of Environmental Impacts*

A small group of studies has focused on visitor perceptions of environmental impacts caused by recreation use. An early review of this literature suggested that visitors' perceptions of recreational impacts tend to be limited (Lucas 1979). With the exception of litter, visitors rarely complained about site conditions and usually rated the environmental conditions of recreation sites as "good" or better. This appears true for impacts on campsites and trails, as well as other resource impacts such as water pollution and wildlife disturbance. A study in the Boundary Waters Canoe Area, MN, for example, found that campers seldom commented on campsite impacts other than litter, and that there was no correlation between visitor ratings of campsite physical conditions and expert ratings of the severity of environmental impacts (Merriam and Smith 1974). Hikers in the Selway-Bitterroot Wilderness Area, ID/MT, reported that they were highly satisfied with trail conditions, despite the fact that some trails were severely eroded (Helgath 1975). Only 1% of floaters on the Pine River in the Manistee National Forest, MI, were concerned with streambank erosion (which was prominent), while 4% listed viewing and enjoying eroded banks as the high point of their trip; litter was far and away the most objectionable environmental condition reported by users (Solomon and Hansen 1972). The only impact reported by more than 50% of visitors to roaded forest lands in the Pacific Northwest was litter (Downing and Clark 1976). Finally, only one in four campers viewed vegetation impacts as a problem at four heavily used developed campgrounds in Pennsylvania (Moeller et al. 1974).

Two other studies generally corroborate these findings. One study reviewed visitor perceptions of environmental impacts at three Indiana state park campgrounds that were subject to varying levels of impact (Knudson and Curry 1981). The majority of campers rated ground cover conditions as

“satisfactory” to “excellent,” even in areas where over three-fourths of the campsites were 100% bare or disturbed. Even the minority of respondents who rated ground cover “poor” or below reported that these conditions did not affect their enjoyment of the area. Moreover, two-thirds of respondents did not notice damage to trees or shrubs even though such damage was extensive in several areas. A study of river recreation surveyed floaters on several southeastern rivers regarding their perceptions of five environmental impacts (Hammit and McDonald 1983). Experience level of respondents was positively related to perceptions of impacts, but a large majority of floaters, even those classified as having high experience, failed to notice or report any of the five impacts studied.

More recent research suggests that visitors may be becoming more perceptive of recreation-related environmental impacts. Increasing recreation use may be causing greater levels of environmental impacts, and visitors may be more sensitive to an array of environmental issues associated with ecotourism and the “greening” of outdoor recreation more broadly. For example, visitors to several U.S. national park areas (Acadia National Park, ME, Yosemite National Park, CA, and Boston Harbor Islands National Recreation Area, MA) were able to differentiate among a range of environmental conditions on trails and at campsites and identified “thresholds” beyond which additional environmental impact was judged unacceptable (Manning et al. 2004). A survey of visitors to the Mission Mountains Wilderness, MT found that many respondents noticed recreation-related impacts at campsites and that this reduced the quality of their experience, as well as their opinions of wilderness managers (Flood and McAvoy 2000).

Findings from other studies have been mixed. For example, open-ended interviews with campers in the Mt. Jefferson Wilderness, OR found that most groups reported noticing recreational impacts to groundcover vegetation (75%), soil (52%), and trees (51%) (Farrell and Marion 2001; White et al. 2001). However, these impacts were judged by over 70% of groups as positive in nature because they facilitated camping (e.g., offered a cleared area to pitch a tent). A survey of climbers in the Adirondack Park, NY found that respondents objected to some recreational impacts (e.g., damage to trees as a result of poor rock climbing practices) but not others (e.g., multiple or social trails) (Monz 2000a). A survey of hikers in a natural area in Canada found that several types of impacts (e.g., litter, plant and tree damage, fire rings, trail erosion and widening) had a negative effect on four dimensions of the recreation experience (Lynn and Brown 2003). And a study of divers in the Caribbean found that most respondents accurately perceived differences in ecological conditions at dive sites (e.g., fish species richness, live coral cover) and that such attributes affected dive enjoyment (Uyarra 2009).

### *Perceived Crowding*

There has been long-standing interest in perceived crowding in outdoor recreation (Manning 2011). An early conceptual analysis suggested that “When too many people use the same area, some traditional wildland values are lost” (Wagar 1964). This was illustrated with a series of hypothetical relationships between crowding and a number of motivations inherent in outdoor recreation, such as solitude, freedom of choice, and self-reliance.

Over the past several decades, crowding has become one of the most frequently studied issues in outdoor recreation. A single-item, nine-point measure of perceived crowding has been widely adopted, and this has allowed direct comparisons across studies, areas, and time (Heberlein and Vaske 1977). This measure is anchored at “not-at-all-crowded” and “extremely crowded”. Findings using this measure of perceived crowding have been compiled in several comparative and meta analyses (Arnberger and Mann 2008; Shelby et al. 1989; Shelby and Vaske 2007; Vaske and Shelby

2008). Data derived from the nine-point crowding scale are often treated by dichotomizing the scale into values 1 and 2 (not-at-all-crowded) and scale values 3 through 9 (some degree of crowding). The most recent and comprehensive analysis takes this approach in reporting perceived crowding from 181 studies representing 615 outdoor recreation locations and 85,451 respondents (Vaske and Shelby 2008). Study findings suggest that 25% of study locations and activities are judged by respondents to be over-crowded.

Perceived crowding has also been found to be a normative concept (Manning 2011; Manning et al. 2000). For example, perceived crowding can be influenced by not only the number of other visitors encountered, but by the characteristics of those encountered (e.g., recreation activity), the temporal or spatial context of encounters (e.g., at a trailhead or deep within a wilderness area), and the characteristics of recreation visitors (e.g., level of experience).

### *Visitor Experience*

The amount of experience acquired at recreation settings is often referred to in the outdoor recreation literature as experience use history (EUH). This construct is based on the idea that as visitors gain experience, they build knowledge and become more perceptive of recreation conditions (Manning 2011). For example, a study of river floaters examined the relationship between EUH and attitudes toward recreation management, and found that more experienced respondents expressed greater concern over environmental conditions than floaters with less experience (Hammit and McDonald 1983). The concept of EUH has wide-ranging applications that have helped to theoretically and empirically test visitors' levels of stress and coping related to recreational impacts (Schuster et al. 2003), recreation specialization (Bryan 1977), place attachment (White et al. 2008), crowding (Budruk et al. 2008), motivations for recreation (Williams et al. 1990) and visitor satisfaction (Johnson and Dawson 2004).

Determining an appropriate measure of EUH has been explored in the outdoor recreation literature. A large body of work has considered this idea to be multidimensional, including measures of on-site experience and experience attained at comparable sites (McFarlane et al. 1998; Watson and Niccolucci 1992). Conversely, EUH also has been employed as a unidimensional construct specific to a particular area. For example, Schuster et al. (2003) examined how stress and coping processes were affected by experiences within a wilderness area in North Carolina. The authors tested the dimensionality of EUH and compared on-site and off-site experiences. Their results suggested that measures of on-site experiences could effectively capture the concept of EUH. In this light, EUH can be measured in terms of the number of previous visits to a recreation site, length of time spent at that site, and frequency of use (Backlund et al. 2006; Schreyer et al. 1984).

Experience use history can serve as a useful tool to segment visitors into user groups that range from low to high levels of experience (Petrick 2002; Schreyer et al. 1984). For example, Williams and Knopf (1990) used EUH to examine visitors' motivations to participate in river floating and found that recreationists with different levels of experience had varied reasons for engaging in recreational activities. Backlund et al. (2006) examined anglers with a spectrum of experience levels in western South Carolina and northern Georgia. The authors found that EUH, as measured by the frequency of use in the last 12 months, was more closely related to the perceived importance of substitute streams than EUH measured by number of years visiting.

### *Study Purpose*

The purpose of this study was to examine perceived impacts of outdoor recreation among visitors on the summit of Cascade in the High Peaks Wilderness Complex. This was explored through measures of perceived ecological impacts, visitor crowding, and EUH. It was hypothesized that more experienced visitors would be more perceptive of environmental degradation, more critical about their descriptions of the severity of recreational impacts, and more sensitive to crowding. In other words, experience was thought to be positively associated with several measures of impact to the visitor experience.

## **Methods**

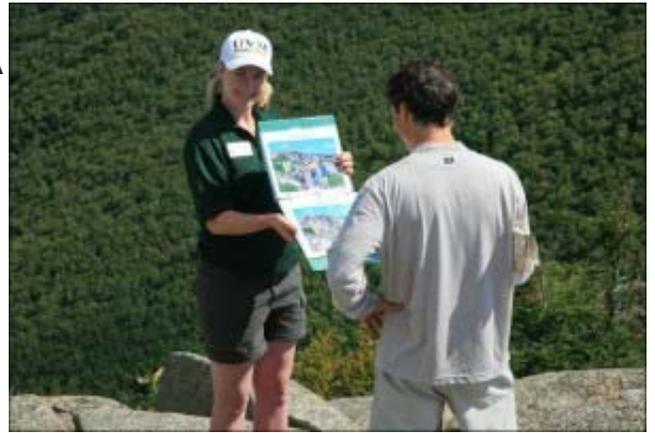
The data presented in this paper were part of a study that examined sustainable recreation across a spectrum of mountain summits in the Northern Forest. This larger program of research identified indicators and standards of quality in the Northern Forest region (Goonan et al. 2007). More specifically, this project examined visitors' preferences for resource, social, and management conditions, determined the tradeoffs visitors would be willing to make among a suite of indicators and standards of quality, and assessed ecological conditions at three mountain summits (van Riper 2009). A subset of the data collected from visitors on Cascade was used for the purposes of this paper.

Cascade is located in the Adirondack Park, which is a six million-acre protected area in upstate New York. The Adirondack Park provides residents and visitors with important opportunities for recreation. The area includes 46 mountain summits above 4,000 feet, a portion of which fall within the High Peaks Wilderness Complex. Cascade is situated on the northern edge of the Complex.

The trails to Cascade and the neighboring Porter Mountain are popular day hikes, considered among the easiest treks within the 46 High Peaks (those above 4,000 feet) in the Adirondack Park. The primary trail ascends 2,000 feet in 2.4 miles. The trailhead is easily accessible to the public, located adjacent to a major highway and in close proximity to several Adirondack communities including Lake Placid, Saranac Lake, and Keene. On a nice summer day, several hundred visitors can be seen on the peak's high elevation, bald summit.

Decision-making within the Adirondack Park is partially guided by the High Peaks Unit Management Plan. This document was developed by the primary management agency for Cascade, the New York Department of Environmental Conservation, to help protect the wilderness character of the High Peaks region (Porter et al. 2010). In addition to providing a set of guidelines concerning ecologically sensitive resources such as alpine vegetation, bodies of water, wetlands, and forests, a portion of the plan focuses on the social and ecological dimensions of visitor use. More specifically, the plan directs attention to potential conflicts and environmental degradation caused by large groups of visitors using trails and campsites.

This paper addresses several related concerns surrounding visitor use within the High Peaks region. A survey of visitors to Cascade was conducted in the summer and fall of 2008. Survey questionnaires were administered to a representative sample of visitors on the summit of Cascade and on several occasions at the trailhead to the summit. Survey dates were stratified by day of the week (weekend vs. weekday) and time of the day (a.m. vs p.m.). During the sample periods, visitors were approached by a trained survey administrator and asked to complete the study questionnaire. One adult visitor was selected from each group by identifying the person with the most recent birthday. All encounters were recorded in an on-site contact log, along with the time, date, survey ID, group size, group type, gender of the respondent, number of children present, and the reason for refusal if applicable. At the onset of the survey, the administrator gave instructions on how to complete the questionnaire and provided the respondent with a nine-page questionnaire.



This paper drew on three constructs to examine the visitor experience on Cascade, including perceived environmental impacts, visitor crowding, and EUH. First, visitors' perceptions of environmental impacts were assessed by asking respondents "Did you notice any damage to soils and/or vegetation on the summit of this mountain due to people walking off designated trails?" If respondents noticed degradation, they were asked to characterize the damage as "slight," "moderate," or "severe." Second, perceived crowding was measured using the nine-point crowding scale described earlier ranging from 1, "not at all crowded," to 9 "extremely crowded." Finally, EUH was measured with two survey items that assessed the number of visits made to Cascade in the previous 12 months and the number of years passed since the respondent's first visit. A score was created for each survey respondent by calculating the average of the two measures (Hammit et al. 2004). This score indicated the level of EUH among survey respondents such that higher values indicated greater experience.

Data analysis involved two phases that assessed perceived impacts of outdoor recreation. First, descriptive statistics assessed perceived environmental impacts, visitor crowding and EUH. Second, analytical procedures tested the effect of EUH on perceived outdoor recreation impacts. More specifically, ordinary least squares regression analyses were employed to test the relationships between the dependent variables of perceived environmental impact and visitor crowding, and the independent variable of EUH.

## Results

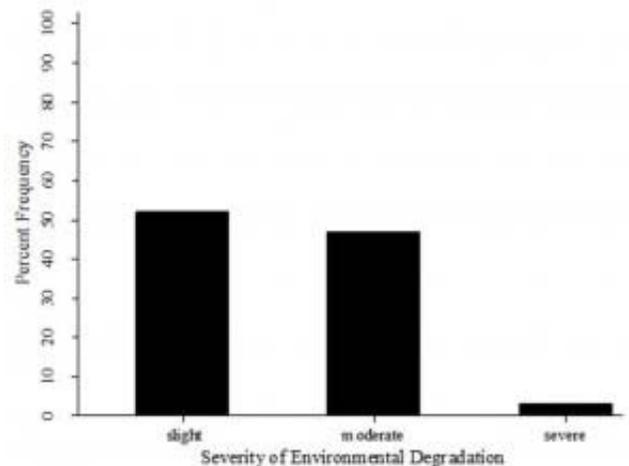
A response rate of 88% was achieved, resulting in 198 completed questionnaires. Non-response bias was assessed for respondents and non-respondents using socio-demographic information collected in on-site contact logs. No significant differences were found between the two groups in terms of personal group size and gender [1].

The average length of time that visitors spent on the summit of Cascade was approximately an hour and a half (82 minutes), the average group size was between three and four people, and the majority (87%) hiked to the summit with friends and/or family group types. The majority of visitors were well-educated, over 30 years of age, Caucasian, male, and living in the U.S. When asked which racial

and ethnic groups respondents identified with, the majority was white, 3% American Indian or Alaska Native, 1% Black or African American, 3% Asian, and a small portion identified with a Hispanic or Latino ethnicity. Nearly three-quarters of visitors were from the U.S. and of the remaining respondents who reported their country of residence, most were from Canada. Just over half of all visitors were from New York.

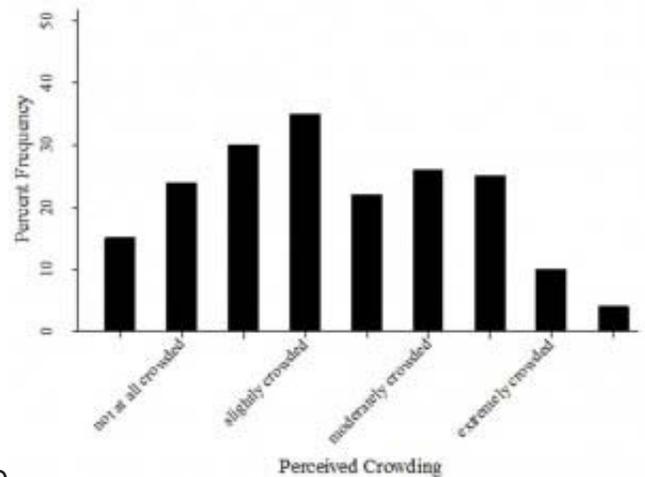
Half (50%) of respondents reported noticing environmental impacts to soil and/or vegetation. Of the respondents who did perceive such impacts, just over half (51%) reported this damage as “slight”, just under half (46%) reported “moderate” damage, and a small percentage (3%) reported “severe” damage (Figure 1). The average score of visitors’ perceived levels of environmental degradation was 1.52 on a scale that ranged from 1 to 3.

Figure 1. Frequency distribution for perceived environmental degradation (n = 193).



Overall, respondents felt relatively crowded on the summit of Cascade, reporting a mean value of 4.5 on the perceived crowding scale (Figure 2). A strong majority (79%) reported at least some degree of crowding.

Figure 2. Frequency distribution for perceived crowding (n = 193).



Over one-third (36%) of visitors had previously been to the summit and the majority (77%) of those visits had occurred prior to the previous 12 months. On average, respondents had been visiting for approximately four years. The average value of the EUH score among survey respondents was 0.78 on a scale that ranged from 0 to 1.

Figure 3. Frequency distribution for mean score for EUH (n=190).

The relationships between EUH and perceived impacts of outdoor recreation involved two bivariate regression analyses. The first regression examined the effect of EUH on visitors’ perceived levels of environmental impact. Results indicated a significantly positive relationship, in that as EUH increased, visitors rated impacts as more severe [2].

The second regression tested the effect of EUH on perceived crowding. Findings suggested that as visitors gained experience, their perceptions of crowding did not increase to a statistically significant degree [3].

## Discussion

The summit of Cascade is one of the most easily accessible and popular of the 46 four thousand foot

mountains in the Adirondack Park. Consequently, there has been growing concern over impacts to fragile soils and vegetation and crowding. This survey of visitors to the summit of Cascade in the summer and fall of 2008 found that about half of visitors noticed environmental damage on the summit due to visitor use. Of course, the converse of this finding is that about half did not notice such damage. Of the visitors who noticed environmental impact on the summit, about half judged this impact to be “slight.”



These findings are in stark contrast to more objective measures of environmental conditions. The visitor survey reported in this paper is part of a larger study on Cascade that included an environmental assessment of the summit area (Goonan 2009). This portion of the study found extensive informal trail networks caused by visitors walking off trails, and this has led to large areas of trampled vegetation and compacted and eroded soils. Therefore, we must conclude that most visitors to Cascade are not highly perceptive of the impacts they are causing and that self-reports of outdoor recreation visitors are probably not a reliable measure of environmental conditions.

However, we also conclude that visitors may be growing more perceptive of environmental impacts associated with outdoor recreation. This is consistent with the literature described at the beginning of this paper. Early studies in outdoor recreation found that visitors reported seeing little environmental impacts associated with outdoor recreation, but more recent studies have found that visitors are more perceptive of this issue. This may be due to increasing levels of outdoor recreation and the cumulative impacts associated with it. It may also be due to visitors who have gained more experience in outdoor recreation and who have become increasingly sensitive to associated environmental impacts. Our study findings – that there is a statistically significant positive relationship between experience and perceived environmental impacts of outdoor recreation – offer evidence for the latter hypothesis.

Visitors to Cascade are perceptive of crowding. Nearly all respondents reported some level of perceived crowding and the average crowding score of 4.5 (on the nine point response scale) is relatively high when compared to studies elsewhere (Vaske and Shelby 2008). By definition, visitor reports of perceived crowding are a probably a reliable report of at least one dimension of the quality of the visitor experience. No relationship between experience and perceived crowding was found in this study. The relatively high level of perceived crowding on Cascade may be especially troubling given that several studies have shown that visitors who feel too crowded cope with this by a process of “displacement” (Kuentzel and Heberlein 1992; Manning and Valliere 2001). Spatial displacement means that visitors may choose not to return to Cascade because it does not provide the type of experience they wish, while temporal displacement means the visitors may choose to hike on Cascade only during off-peak periods. Visitors who are displaced are replaced by visitors who are less sensitive to crowding, and this process can result in fewer opportunities for recreation experiences characterized by some degree of solitude.

High levels of environmental impact and perceived crowding at Cascade suggest that more intensive management of outdoor recreation is needed. There are several management approaches that might be used (Manning 2011). For example, the number of visitors to Cascade might be limited by

might be used (Manning 2011). For example, the number of visitors to Cascade might be limited by appropriately sizing trailhead parking. Visitor education programs might be used to sensitize hikers to the impacts they cause when walking off trail and encourage them to stay on designated trails. Trails and viewing areas might be “hardened” by a higher level of maintenance, surfacing with rocks and other materials, or installation of scree walls or other barriers on the margins of trails and related areas.

Contemporary approaches to park and outdoor recreation management employ a management-by-objectives framework in which management objectives and associated indicators and standards are formulated (Stankey et al. 1986; National Park Service 1997; Manning 2001; Manning 2007). Management objects might prescribe what level of resource protection should be maintained on the summit of Cascade and what type of visitor experience should be provided? Indicators and standards are then developed as measurable, manageable proxies for these objectives. For example, an indicator for resource conditions might be the percentage reduction of natural vegetation and a standard might be no more than 10 percent. An indicator for social conditions might be the number of visitors at one time on the summit and a standard might be no more than 30. Once management objectives and associated indicators and standards have been formulated, indicators are monitored and management actions are taken to maintain standards.

## **Conclusion**

The accessibility and popularity of Cascade has led to resource and social impacts in the form of trampled vegetation, soil compaction and erosion, and perceived crowding. Visitors are more sensitive to crowding than environmental impacts. Cascade should probably be managed more intensively to address resource and social impacts. Management should be guided by a management-by-objectives framework and might best be incorporated into the five-year review and revision of the High Peaks Wilderness Management Plan.

## **Notes**

1. There were no significant differences between respondents and non-respondents based on group size ( $F = 0.62$ ,  $df = 10$ ,  $p = 0.797$ ) and gender (chi-square = 0.602,  $df = 1$ ,  $p = 0.438$ ).
2. Results from bivariate regression analysis of EUH on perceived environmental impact ( $n=101$ ): Coefficient = 0.902 (SE = 0.27); t-value = 3.32 (significant at  $p$ -value < 0.01); adj-R2 = 0.091 (significant at  $f$ -value < 0.05); Root MSE = 0.532.
3. Results from bivariate regression analysis of EUH on perceived crowding ( $n=189$ ): Coefficient = 1.802 (SE = 0.90); t-value = 1.82 (significant at  $p$ -value < 0.01); adj-R2 = 0.012 (significant at  $f$ -value < 0.05); Root MSE = 2.102.

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