

Camping Impact Management at Isle Royale National Park: An Evaluation of Visitor Activity Containment Policies From the Perspective of Social Conditions

Tracy A. Farrell
Jeffrey L. Marion

Abstract—A survey of backcountry and wilderness campsites at Isle Royale National Park reveals that the park's policies for managing visitor impacts have been remarkably effective in limiting the areal extent of camping-related disturbance. However, the dense spatial arrangement of designated campsites within backcountry campgrounds has also contributed to problems with visitor crowding and conflict. Only 9% of the sites had no other sites visible, while 22% had three or more other sites visible. Mean intersite distance was only 76 feet, and 34% of the sites are within 50 feet of another site. Visitor education programs and selected relocation of sites could reduce these social problems.

National Park Service legal mandates and administrative policies prescribe a management paradox for administering recreational use in backcountry and wilderness areas. Park staff are charged with managing naturally functioning ecosystems and processes substantially free from human influence, yet these protected areas must also be managed for recreational visitation. Even low levels of hiking or camping activity have been shown by research to cause substantial degradation to vegetation and soils (Cole 1995). Camping-related impacts are an even greater concern in federally designated wilderness areas, which direct managers to maintain resource conditions that are "untrammelled by man...protected and managed so as to preserve its natural conditions" (16 USC 1131-1136).

However, managers must recognize that some camping impacts are inevitable with wilderness visitation. The challenge is to minimize the number of campsites and the extent and severity of impact at each site. As described in this paper, Isle Royale National Park (ISRO) represents one of the best examples of camping activity containment for minimizing camping impacts in wilderness areas. Activity containment policies seek to reduce recreation impacts by spatially concentrating visitor activities to limit the area of resource disturbance. ISRO park managers have accomplished this by carefully locating and constructing designated campsites

to sustain heavy camping visitation while limiting associated resource impacts.

Although ISRO's visitor activity containment policies have successfully limited the areal extent of camping disturbance, high campsite densities have contributed to social problems of visitor crowding and conflict. The Wilderness Act specifies that wilderness areas should offer "outstanding opportunities for solitude or a primitive and unconfined type of recreation" (16 USC 1131-1136). This paper examines this social "visitor experience" mandate relative to wilderness camping, as illustrated with data from the ISRO campsite survey.

Solitude at the Wilderness Campsite

Camping activities represent a significant component of the overall wilderness experience. The majority of a wilderness area visit may occur on the campsite, where parties interact with each other and the environment, cook, eat, sleep and engage in other spiritual or contemplative activities. The campsite itself represents a temporary home within the wilderness, where visitors perceive the existence of territorial boundaries isolating them from other people. Therefore, visitors are often less tolerant of contact with other visitors on or around their campsites than they are on common use areas like trails (Cole and others 1987) or destination areas (Cole and others 1997). The number of parties, group size and type of user group also affect visitor perceptions of acceptable numbers of encounters with other visitors on campsites (Roggenbuck and others 1993). For example, more people or certain types of groups may make more noise. In addition, different activity groups, such as non motorized and motorized users, may exhibit incompatible camping behaviors. In response to unwanted encounters in camping areas, visitors may engage in avoidance behavior, either by selecting campsites farther away from other occupied campsites or by choosing a more heavily screened campsite (Lee 1977).

Wilderness managers can directly or indirectly influence social settings and opportunities for camping solitude through their camping management policies, site selection criteria, site management practices and visitor education messages. Dispersed camping policies, for example, permit visitors to select camping areas or sites that potentially increase opportunities for solitude. However, management experience and research studies have shown that dispersal policies are

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Tracy A. Farrell, Doctoral Candidate, Virginia Tech, Dept. of Forestry, e-mail: tfarrell@vt.edu. Jeffrey L. Marion, USGS Patuxent Wildlife Research Center, Virginia Tech Cooperative Park Studies Unit, Dept. of Forestry, Blacksburg, VA, 24061 U.S.A., e-mail: cpsu@vt.edu

generally ineffective, often because visitors fail to disperse very far from trails, other campsites or popular attraction features (Leung and Marion, in press). For example, a survey of backcountry and wilderness campsites at Shenandoah National Park found a large number of campsites ($n = 768$), two-thirds of which were illegal according to the park's dispersed camping regulations (Williams and Marion 1995). Conversely, containment camping policies, such as designated site camping, can restrict visitor freedom and may create or exacerbate problems with crowding and conflict.

Study Area

Isle Royale National Park, established in 1940, is located in the northwest corner of Lake Superior, 73 miles from Houghton, Michigan, and 22 miles from Grand Portage, Minnesota. The Park's terrain was formed by glaciers and includes exposed rocky ridges interspersed by numerous ponds and streams. One of the primary attractions and features of interest in the Park are its moose and wolf populations, but the island also supports many other wildlife and fish species (USDI 1994). Approximately 99% of the Park's land area is designated as wilderness. Because ISRO is managed as a wilderness area, pets and wheeled vehicles are prohibited in the Park, and no motorized vessels can travel on the inland lakes, with motorized boating permitted only on Lake Superior. The area was also designated as an International Biosphere Reserve in 1980.

The Park is open from mid-April until the end of October, with transportation from the mainland available by boat or floatplane. In 1996, the Park received approximately 13,000 visitors, with 54% primarily engaged in hiking, 31% in power boating, 9% in canoeing, 3% in sailing and 3% in kayaking (ISRO 1996). Backcountry visitation has been steadily increasing and, at over 50,000 overnights/year, ranks 10th among National Park Service (NPS) units (USDI 1996a). More importantly, ISRO has the highest number of backcountry overnights of all NPS units when figured on a per acre basis and considering that the Park is closed for half of each year.

Camping Policies and Regulations

Park camping policies and regulations require that visitors camp only at one of 36 designated campgrounds, which are accessed by hiking trails and/or boats. Campgrounds contain a combination of three-sided shelters, individual campsites or group campsites. Larger groups (7-10 individuals) must specify and adhere to an itinerary and camp only at group campsites; groups of six or fewer may use either shelters or individual sites on a first-come first-served basis. If a campground is full, visitors are advised to find alternate campgrounds or double up with other parties, as long as they do not exceed the site capacities. To reduce problems with crowding and conflict, visitors are also advised to use equipment with natural colors and to avoid unnecessary noise and other disruptive activities.

Methods

Conditions on all designated wilderness and non wilderness campsites were assessed during the summer of 1996. Elements of photographic, condition class and multi-indicator measurement-based approaches were combined for campsite inventory and impact assessments (Farrell and Marion 1998). This approach emphasizes field procedures that are efficiently applied yet yield reliable campsite condition measurements for a variety of campsite attributes. Inventory attributes included distance to nearest other campsite, distance to campground trail, number of other sites visible, site visibility from campground trail, site visibility from formal park trail, vegetation type, percent canopy cover and type of site use. Impact attributes included percent vegetative cover onsite and offsite, percent exposed soil, number of damaged trees onsite, number of tree stumps onsite, total campsite area, number of fire sites and number of human waste sites. A comprehensive procedural manual was developed to guide present and future field staff in taking consistent measurements.

Results and Discussion

Within the Park's 36 campgrounds, survey staff located and assessed 244 sites, including 113 individual campsites, 43 group campsites, and 88 shelters (hereafter referred to as sites). Site distribution between wilderness and non wilderness is approximately equal: 116 (48%) campsites and shelters are in wilderness and 128 (52%) are in non wilderness.

Campgrounds are located primarily around the island's perimeter. A principal advantage of this spatial arrangement is that it concentrates visitor activities, reducing human presence in large areas of the island's interior. Resource protection is enhanced by reducing wildlife habitat fragmentation and minimizing potential interference with wolves, moose and other wildlife. Site clustering also increases the efficiency of maintenance and visitor contact/enforcement activities and the provision of facilities like boat docks. However, site clustering also has negative aspects. While visitors have ample opportunities for experiencing solitude while hiking, the large number and close proximity of sites in many backcountry campgrounds reduces opportunities for solitude while camping. Site clustering gives visitors fewer options for designing alternative itineraries and less flexibility in altering travel plans while in the backcountry.

Natural Resource Protection

Data from the 1996 assessment of camping impacts reveal the success of camping containment at ISRO from the perspective of natural resource protection. Conditions on 211 sites (86%) were quite acceptable, with condition class ratings of 1, 2, or 3. The majority of sites were rated class 3, characterized by extensive organic litter and/or vegetation disturbance but with soil exposed only in primary use areas. Soil was exposed more extensively on only 33 sites (14%) and no sites were rated class 5, characterized by obvious soil

erosion. Median campsite size was only 554 ft² (23 x 23 ft), with an average disturbed area of 3.8 ft² per annual overnight stay. Similar data from other wilderness and backcountry areas indicates that these numbers are exceptionally low (Farrell and Marion 1998). For example, median size for designated campsites at Great Smoky Mountains National Park is 1,039 ft², with an average of 5.7 ft² disturbed area per annual overnight stay (Marion and Leung 1997).

Median percent vegetation loss on sites was 61% (mean = 62%). Nearly 80% of the sites lost more than 80% of their estimated original cover; vegetation loss of this magnitude is common on designated campsites. Conversely, the areal extent of vegetation loss was relatively small; 170 campsites (70%) lost less than 500 ft², with another 88 sites (36%) losing less than 250 ft². Area of exposed soil was also relatively small, ranging from 6 to 1,906 ft², with a median of 159 ft². Nearly two-thirds of the sites (65%) had less than 250 ft² of exposed soil, with the majority (82%) under 500 ft².

The principal factors for ISRO's success in limiting the areal extent of camping-related resource disturbance are campsite location and design. ISRO campgrounds are generally located in gently sloping terrain, where visitor activities are naturally constrained to the limited areas of flat ground on campsites. Most campsites consist of one to three tent pads created through cut-and-fill work to provide gently outsloped terraces. These campsite construction practices provide strong visual cues to identify the intended use areas. Campsites in flatter terrain are commonly outlined with embedded logs along at least two sides. In addition, many of the sites have been colonized by trampling-resistant grasses, at least in peripheral use areas. The obvious change in vegetation composition, from grasses to herbs, provides another visual cue demarcating site boundaries. Statistical analyses reveal that site facilities, such as shelters and picnic tables, also help to concentrate use and impacts (Farrell and Marion 1998).

Maintaining Desired Social Conditions

Although successful from the perspective of natural resource protection, camping activity containment has contributed to social problems at ISRO campsites. A survey of ISRO backcountry visitors, conducted by the University of Minnesota Cooperative Park Studies Unit, revealed that visitors consider both crowding and conflict at campgrounds to be salient issues. Crowding-related problems included "Seeing too many other hikers in the campgrounds" (ranked 2nd out of 64 items), "Being able to find a vacant shelter" (ranked 4/64), "Seeing too many other watercraft on Lake Superior" (ranked 5/64), "Finding an available campsite" (ranked 6/64) and "Campsites or shelters too close together in campgrounds" (ranked 13/64). Conflict-related problems included "Too much motorboat noise" (ranked 1/64), "Motorboat noise in narrow harbors and bays" (ranked 3/64), and "Noisy people at campgrounds with docks" (ranked 9/64). While most visitors did not consider these issues a problem, they remain highly ranked among the extensive list of potential issues provided for visitor comment (Pierskalla and others 1996).

ISRO recently completed the final version of its General Management Plan, during the process of which raised the following camping management concerns:

Visitors with different recreational objectives often find themselves in conflict, primarily at campgrounds. Increasing visitation is resulting in resource impacts and in crowding of some campgrounds, docks and trails...some visitors complain that there are too few backcountry campsites on the island, and they are concerned about having to share campsites (USDI 1996b).

Our survey data confirmed and explained these issues and concerns, discussed here in terms of crowding and conflict, and carrying capacity.

Crowding and Conflict—Crowding and conflict are expressed in our data by number of other sites visible, intersite distance, distance to campground trail, site visibility from campground and formal trails and type of campsite user (hiker, non motorized and motorized boaters). Generally, the overall potential for camping solitude is higher for wilderness campsites (N = 116) than nonwilderness campsites (N = 128). However, a review of data for these selected indicators reveals that users are still likely to experience crowding and conflict at either wilderness or non wilderness campsites.

The number of other sites visible from each campsite or shelter ranged from zero to six, with a mean of 1.8. Only 22 (9%) of the sites have no other sites visible, while 19 sites (8%) have four or more other visible sites (table 1). Three or more sites are visible from 46 (36%) of the nonwilderness sites, compared to only eight (7%) of the wilderness sites. For more than half of the wilderness sites, one or no sites are visible, compared to only one-third of the nonwilderness sites.

Intersite distance ranges from 0 to 334 feet, with a mean of 76 feet. In agreement with intersite visibility findings, intersite distances in wilderness areas range from 0 to 334 feet with a mean of 82 feet; in non wilderness areas, mean distance to the nearest other site is 71 feet. However, in wilderness areas, nearly one-third (27%) of campsites are within 50 feet of each other, while nearly three-quarters (73%) are within 100 feet of each other (table 1).

Distance to campground trail ranges from 0 to 352 feet with a mean of 64. The majority of sites (83%) were within 100 feet of a campground trail (table 1). In nonwilderness, campground trail distance was shorter (0 to 42 feet with a mean of 55 feet) than in wilderness (0 to 352 feet with a mean of 73 feet). However, within wilderness, 77% of the campsites are still within 100 feet of the campground trail.

Most sites (218, 89%) are visible from the campground trail (table 1). Of the 116 wilderness sites, 98 (85%) are visible from campground trails. Of the 128 nonwilderness sites, 120 (94%) are visible.

Conversely, a majority of sites are not visible from formal park trails (123 sites, 56%) (table 1). In wilderness, 38 sites (33%) are visible from formal park trails compared to 57 sites (45%) in nonwilderness.

Compared to other backcountry and wilderness areas, ISRO campsites are more densely packed together, with closer proximity and greater site intervisibility. For example, within the Jefferson National Forest, 59% of wilderness

Table 1—Number and percent of nonwilderness and wilderness campsites for indicators of social conditions.

Social indicators	Nonwilderness campsites (N = 128)		Wilderness campsites (N = 116)	
	Number	Percent	Number	Percent
Other sites visible (#)				
0	8	6	14	12
1	34	27	52	45
2	40	31	42	36
3	28	22	7	6
•4	18	14	1	1
Distance to nearest other site (ft)				
0-50	51	40	31	27
51-100	55	43	53	46
101-150	13	10	21	18
151-200	4	3	7	6
>200	5	4	4	3
Distance to campground trail (ft)				
0-50	76	59	58	50
51-100	38	30	31	27
101-150	6	5	12	10
151-200	3	2	6	5
>200	5	4	9	8
Site visibility from campground trail				
Yes	120	94	98	85
No	8	6	18	15
Site visibility from formal trail				
Yes	57	45	38	33
No	70	54	53	46
Missing data	1	1	25	21

campsites have no other campsites visible, compared to only 12% at ISRO (Leung and Marion 1995). Similarly, 64% of backcountry campsites at Big Bend National Park and 21% of backcountry campsites at Great Smoky Mountains National Park have no other campsites visible (Williams and Marion 1997; Marion and Leung 1997).

Visitors have different expectations and behaviors that may lead to conflict between user groups, such as kayakers and motorboat users. A common method for addressing the problem of conflicting uses is to spatially separate different user groups. However, most of Isle Royale campgrounds may be easily accessed by water using canoes, kayaks and motorized boats and by land via hiking trails. Multiple access by boats and by trail is the most common access category (136 sites, 56%). In addition, wilderness boundaries stop at the shoreline, so visitors traveling by motorboat can easily access wilderness campsites. One-quarter of the wilderness sites (N = 30) are accessible by motorboats. At ISRO, a variety of different user groups must share common campgrounds, which lack clear distinctions between groups that may have incompatible behaviors, such as motorized and nonmotorized users.

Carrying Capacity—Visitor crowding and conflict problems at ISRO are further confounded by increasing use. Backcountry visitation has risen 37% over the past decade. Campground occupancy data indicates that most campground capacities (number of groups vs. number of campground sites) are exceeded on one or more nights each year, forcing groups to double up on campsites or create illegal

sites. Ten campgrounds exceeded their capacities (according to permit data) on more than 20 nights in 1995 (ISRO 1996).

High campsite occupancy rates indicate a number of potential problems. First, visitors who arrive at a full campground are more likely to be tempted to camp illegally, particularly if they are unable or unwilling to travel farther to another campground. Second, those who share campsites, as recommended by Park staff, degrade their experience and may contribute to site expansion. Third, visitors camping in full campgrounds may feel crowded or experience greater conflict. Interactions with others and noise levels are generally higher with higher densities of people, and the sense of being on a remote wilderness island is lost.

Management Recommendations and Conclusions

ISRO's visitor activity containment policies have been successful in limiting the areal extent of camping disturbance. However, high campsite densities have contributed to social problems of visitor crowding and conflict, which are further compounded by carrying capacity issues. Park managers and planners may wish to reexamine the current distribution of campsites and campgrounds as they affect current or desired visitor distribution patterns.

Relevant management recommendations to address social problems include the following: (1) visitor education programs encouraging visitors to select designated campsites

that are farthest away from currently occupied sites, (2) selected site relocations applying site selection techniques to increase intersite distances and (3) creating additional campsites within preexisting campgrounds located out of sight and at least 100 feet from existing sites. Carrying capacity concerns present a more difficult challenge. Options include (1) setting travel zone quotas to shift visitation in time or space to force a better match between the distribution of visitors and existing campsites, (2) constructing additional campsites in areas with perpetual shortages, or (3) limiting total visitation.

Visitor education programs like *Leave No Trace* have been developed to help managers prevent or reduce resource and social impacts. A park brochure could be developed to address specific camping management concerns like promoting solitude. Park staff could also remind visitors to select campsites that are farthest away from other parties.

In addition, standards for intersite visibility and distances should be considered to reduce the potential for crowding and conflict within wilderness. Examples include campsites not visible or at least 150 feet from formal park trails, intersite campsite distances of at least 50 feet and no more than one other site visible. Site selection criteria could then be applied by managers to select campsites that promote visitor solitude and close or discourage use of other campsites.

Creating additional campsites would reduce the potential for both crowding and conflict. Conflict problems at some existing campgrounds could be resolved by designating them for specific user types, such as campgrounds restricted to hikers or campgrounds restricted to powerboaters. This may necessitate the creation of additional campgrounds for the alternate use type.

Altering visitor distribution through time or space can address carrying capacity concerns. For example, in the Boundary Waters Canoe Area Wilderness (BWCAW), entry point quotas based on visitor travel models are used to maintain site occupancy rates of 60-85% in each travel zone. ISRO has relatively few backcountry entry points, and access to some is more difficult due to constraints on the frequency and timing of ferry boats. However, the BWCAW approach may still be feasible if boating schedules and access points could be altered to improve visitor distribution patterns relative to available campsites. This option allows visitors the freedom to travel where and when they want, a benefit which is largely offset by the "cost" of a greater area of disturbance associated with campground sites that go unused each night.

Additional campsites could also be constructed at campgrounds with overcapacity problems. Alternately, new campgrounds might be established in the vicinity of overcrowded campgrounds. The construction of new campsites or campgrounds would alleviate current and future overcrowding, but would also increase the area of disturbance associated with camping activities, and does not address concerns of future overcrowding.

Constructing additional sites to accommodate ever-increasing demand has been the traditional response of ISRO managers. However, it is appropriate to question this policy as it permits a potentially never-ending process of recreation expansion into previously undisturbed areas. Given the limited land area on the island and the sensitive issue of

fragmentation of wolf habitat, such a policy is ultimately non sustainable. Thus, limitation of backcountry visitation will ultimately need to be considered.

National Park Service backcountry and wilderness areas are administered under dual legal mandates that require managers to achieve an acceptable balance between resource protection and recreation provision. Some degree of environmental degradation is inevitable where recreational visitation is permitted. Managers are challenged to develop recreation resource management policies that can sustain both high quality recreational experiences and environmental conditions. Although ISRO has effectively minimized natural resource impacts via camping concentration, social problems like crowding, conflict and carrying capacity concerns require additional management actions to improve the quality of the visitor experience.

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