Thirteen Years of Monitoring Campsite Conditions in Prince William Sound, Alaska

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Introduction

Since 1995, the authors and their colleagues have studied changes in resource conditions at 205 campsites in western Prince William Sound, Alaska. Located in south central Alaska, Prince William Sound has over 4,000 km of shoreline, with road access to two towns: Whittier and Valdez. Multiple land managers, including the United States Department of Agriculture Chugach National Forest, the State of Alaska, and private native corporations manage the land surrounding Prince William Sound and its intertidal areas. The 800,000 ha Nellie Juan Wilderness Study Area encompasses the western half of Prince William Sound. Recreational use of Prince William Sound has risen substantially since the early 1990s (Twardock and Monz 2000) with a probable further increase of use since the opening of the Whittier tunnel (formerly rail only) to vehicle traffic in 2000.

Using standard campsite assessment methodology (Marion 1995), with minor ecosystem specific modifications, individual sites have been assessed one to five times between 1995 and 2008 for parameters including vegetation loss, root exposure, damage to trees, stumps, trash, fire rings, signs of human waste, trails, and site size. Each site was also assigned an overall condition class. Average changes in parameters studied between 1995 and 2007 are compared to data collected in 2008. Preliminary findings suggest that while some sites have shown dramatic changes, on average, condition class, an aggregate rating of resource condition, has remained stable, if not declined. Transient impacts, such as trash and fire rings, have declined, while non-transient impacts, such as tree damage and root exposure, have increased. The number of sites with signs of human waste has increased.

History and methodology

In 1995 the National Outdoor Leadership School's (NOLS's) Research program and Alaska branch proposed and initiated a study to catalog recreational impacts in western Prince William Sound. Using methodology developed by Jeff Marion and David Cole, then–NOLS research scientist Chris Monz, Alaska Pacific University (APU) instructor Paul Twardock, and others did an initial assessment of 40 sites. Over the summers of 1996 and 1998, and those of 1999–2001 and 2004–2008, an additional 165 sites were visited.

Each site was measured using a standard campsite monitoring methodology (Marion 1995), with some ecosystem-specific modifications (Kehoe 2002). Sites were originally located using information from guides and charter boat operators, and by kayaking the

shoreline, stopping at each beach with potential camping. If a site had measurable vegetation loss, the site was assigned a number, then parameter data and site measurements were recorded. Latitude and longitude (lat/long) were recorded for each site sporadically until 2007. In 2007 and 2008 all site lat/long were recorded with a geographic positioning system (GPS), in degree decimals, with an accuracy of 3–9 m using World Geodetic System 1984 datum (WSG 84). For all sites with measurable vegetation loss, a radial transect was completed, using a center point that was marked with a buried metal pin and dog tag with the site number. Sites without measurable vegetation loss were assigned an identifier with the last two digits of the year, and a letter (e.g., 08-A). Pictures of the site were taken, and maps of the site and its location were drawn on the data sheet. On subsequent visits, the site was relocated using latitude and longitude where available, pictures, and maps. The center point was then relocated using an electronic pin detector, and the site was re-measured and re-evaluated. For each visit, a condition class was assigned according to study specific definitions, as defined in the monitoring protocol. A condition class 0 has potential camping, but shows no sign of vegetation loss. A condition class 5 has significant vegetation loss and soil erosion. Site area was calculated from the radial transect data using a spreadsheet program developed by Jeffrey Marion. Sites with a condition class "0" were assigned a site area of "0" as typically no vegetation loss was observed. Some sites were given a condition class in the range of 1–5, but did not have a recorded measurement, possibly due to campers occupying the site. In these cases no site measurement was recorded. Data entry was checked for accuracy, by randomly sampling 10% of the data sheets.

Summary of data

Each site's parameters and size were summarized using Microsoft Excel. Every parameter was averaged per year, except human waste. For human waste, the number, and percent of sites per year, with signs of waste are reported. Forty-two sites were visited once, 122 sites 2 times, 35 sites 3 times, 3 sites 4 times, and 3 sites 5 times, for a total of 205 sites. Fourteen new sites were visited in 2008, leaving 28 old sites that were not revisited in 2008. Most old sites not revisited either could not be relocated, were occupied by campers, or time and weather prevented us from revisiting them. Table 1 summarizes the work between 1995 and 2007.

In 2008, 183 sites were visited, of which 18 were new. The 165 revisited sites account for 86% of the 191 sites visited between 1995 and 2007. Table 2 summarizes the 2008 findings.

Analysis of 2008 compared to 1995–2007

Comparing the 1995–2007 data to the 2008 data, most parameters have remained stable when viewed as categories. For example tree damage and root exposure are categorized as 0 = none/slight, 1 = moderate, 2 = severe. However when parameters are averaged, changes have occurred. For instance tree damage for the 1995–2007 period, and 2008 is none to slight category. However average tree damage did increased from .53 (1995–2007) to .63 (2008), an 18.9% increase. Root exposure also increased from .28 to .43, a 53.6% increase. The number of tree stumps increased from 1.19 per site to 1.67 per site, a 40.3% increase.

Total number of visits	238 visits of 191 sites
Condition class	2.55
Vegetation cover inside site	2.61 (6-25%)
Vegetation cover outside site	4.71 (51-75%)
Mineral soil exposure	3.04 (26-50%)
Tree damage	.53 (None/slight)
Root exposure	.28 (None/slight)
# of tree stumps	1.19
# of trails leaving the site	1.90
# of fire sites	.39
Litter/trash	1.38 (None)
Number of sites with human waste	17 (7% of total visited sites)
Site size (square meters)	47.48

Table 1. Data summary, 1995 to 2007.

Total number of visits	183 sites
Condition class	2.30
Vegetation cover inside site	3.49 (26-50%)
Vegetation cover outside site	5.64 (76-95%)
Mineral soil exposure	2.63 (6-25%)
Tree damage	.63 (None/slight)
Root exposure	.43 (None/slight)
# of tree stumps	1.67
# of trails leaving the site	1.83
# of fire sites	.18
Litter/trash	1.12 (None)
Number of sites with human waste	15 (8% of total visited sites)
Site size (square meters)	50.20

Table 2. Data summary, 2008.

The number of trails leaving sites decreased slightly from 1.90 to 1.83, a 3.7% decrease. The number of fire sites also decreased from .39 to .18, a 53.8% decrease. Litter/trash decreased from 1.38 to 1.12., a 20.3% decrease. Sites with signs of human waste increased from 7% to 8% of sites visited, a 14.3% increase. Average site area has increased from 47.48 to 50.20 square meters, a 5.7% increase. Finally, average condition class has declined from an 2.55 to 2.30, a 9.8% decrease.

An initial analysis also compared condition class, site size, and vegetation loss for 97 sites, with a minimum of 4 years between measurements (Table 3). Condition class declined from 3.3 to 2.7, with a paired t-test showing a p value of .001. Site size increased from 46.5 square meters to 57 square meters, with a p value of .305. Vegetation loss was 79.8 percent, compared to off site vegetation loss of 55.9 percent, with p value of .021. Though site size and vegetation loss are not considered significant, they do indicate a potential trend.

Impact parameter	Primary assessment	Secondary assessment	T value	P value
RCL (%)	79.8	55.9	2.39	.021
Condition class	3.3	2.7	3.4	.001
Site area (square meters)	46.5	57.0	-1.03	.305

Table 3. Change in campsite conditions over a minimum of four years: An examination of change in conditions on 97 campsites during a minimum of a 4-year period for selected impact parameters.

Impact parameter	Primary assessment	Secondary assessment	T value	P value
RCL (%)	95.1	61.6	1.95	0.05
Condition class	3.6	2.8	3.54	0.001
Site area (square meters)	42	52.9	-1.68	0.09

Table 4. Change in campsite conditions after 12–13 years: An examination of change in conditions on 56 campsites during a 12–13-year period for selected impact parameters.

Additionally a similar analysis compared condition class, site size, and vegetation loss for 56 sites with a12 and 13 years between measurements (Table 4). Condition class declined from 3.6 to 2.8, with a paired t-test showing a *p* value of .001. Site size increased 42.0 square meters to 52.9 square meters, with a *p* value of .09. Vegetation loss was 95.1 percent compared to off site vegetation loss of 61.6 percent, with a *p* value of .05. These results do show significance, and indicate a trend of increasing site size, increasing vegetation coverage in sites, and a decreasing condition class.

In 2004, we also started to informally look for invasive plant species. In 2008, we found our first invasive, pineapple weed (*Matricaria discoidea*), at the Shoup Bay Kittiwake rookery, 11 miles from Valdez. An opportunity exists to address the issue of invasives before they become widespread in Alaska. Educational efforts, such as encouraging users to rinse their gear with fresh water before embarking on their trips might discourage the introduction of invasives.

Discussion

Previous studies indicate that once initial impacts occur to vegetation, little additional change occurs with increased use (Hammitt and Cole 1998). The result of this study generally confirms that conclusion. The small drop in average condition class is countered by an increase in average site size. Since condition class is primarily determined by the amount of vegetation loss on site compared to off site, and not site size, this is not surprising. The decrease in condition class could be caused by shorter trip lengths by outfitters and guides, preventing them from reaching more distant sites. Furthermore, the hardening of sites by land managers probably focuses use, potentially decreasing use on nearby sites. When a site is not used, the Sound's abundant rainfall and temperate climate potentially encourage rapid re-vegetation. Transient impacts such as trash and fire rings have decreased, potentially from the efforts of land managers and educators to encourage Leave No Trace camping practices. Non-transient impacts such as tree damage, tree stumps, and root exposure have increased. Two possible causes are increased beach erosion exposing roots near high tide, and

increased soil compaction. The increase in tree stumps reflects the durability of stumps and possibility of the increase of users with the ability and interest in felling trees. The increase of number of sites with signs of human waste confirms anecdotal reports. One potential reason is the change of Leave No Trace coastal practices, that stopped the practice of inter-tidal disposal, and encouraged upland disposal in shallow cat-holes. The increase in site size could indicate larger groups, or at least groups with more tents, using the sites.

Future studies should re-evaluate sites at a three- to five-year interval, and survey for invasive plants. Other studies should attempt to quantify the amount and distribution of use, and re-vegetation rates. With the initial assessments, and the work done in 2008, it is now possible to conduct a systematic monitoring of recreational impacts in Prince William Sound.

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References

AKEPIC [Alaska Exotic Plant Information Clearinghouse]. 2005. *Invasive Species of Alaska*. Anchorage, Alaska: Alaska Association of Conservation Districts Publications.

Hammitt, W.E., and D.N. Cole. 1987. *Wildland Recreation: Ecology and Management*. New York: John Wiley.

Kehoe, S. 2002. *Campsite and Monitoring Program for Prince William Sound, a Procedural Manual.* Lander, Wyo.: National Outdoor Leadership School.

Marion, Jeffrey L. 1995. Capabilities and management utility of recreation impact monitoring programs. *Environmental Management* 19:5, 763–771.

Twardock, P., and C. Monz. 2000. Recreational kayak visitor use, distribution, and financial value of beaches in Western Prince William Sound, Alaska, between 1987 and 1998. In *Wilderness Science in a Time of Change Conference, Volume 5: Wilderness Ecosystems, Threats, and Management,* comps. D.N. Cole, S.F. McCool, W.T. Borrie, J. O'Laughlin. Rocky Mountain Research Station. Fort Collins, Colo.: USFS, 175–180.