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IMPACT OF 15 YEARS OF USE ON SOME CAMPSITES
IN THE BOUNDARY WATERS CANOE AREA*

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ABSTRACT

Eight campsites in Minnesota's Boundary Waters Canoe Area Wilderness previously studied from 1968-1972, were remeasured in 1981. Measurements included change in soil compaction; bare soil area not vegetated, number of dead trees, and total site size. The birch-aspen sites were impacted most; the red pine and spruce sites, least.

tent location, and wilderness box latrine. Some had picnic tables. Twice yearly, the effects on soils, vegetation, and site size were measured and mapped. Some sites had previous use and others were altered or closed during the study. Through visitor registration, nearly complete use data were obtained for 23 locations.

Five measures of user impact were combined into an impact rating system for each site and for six cover types. These measures were bare soil, loss of ground vegetation, soil compaction (using a penetrometer), dead trees or trees with exposed roots, and increase in original (spring 1968) site size. The indicators of impact were coded with values of 1 to 5 (Table 1) which were then averaged to give overall impact stage value. It is, of course, possible to expand the system using other scales.

Minnesota's Boundary Waters Canoe Area Wilderness (BWCAW) of 1,084,105 acres is heavily used (1,078,767 visitor days in 1980). The campsites designated for use by the administering Forest Service, USDA, are particularly impacted by visitation. During July, 1981, eight campsites, previously studied over five seasons (1968-1972) were remeasured to monitor changes. Since the original study, a new permit system (1976) and the passage in 1978 of the Boundary Water Canoe Area Wilderness Act (U.S. Congress 1978) have affected changes in entry point numbers and modes of travel. Some study sites once on motor routes are now on canoe-only routes.

Results indicated that human impact was greatest the first two years and then impact leveled off. Where soil and water conditions were not limiting and there were few alternative campsite choices, key sites could be kept open. Thus, self-defeating closure and rotation could be avoided (Merriam et al. 1973).

Original Study (1968-1972) and 1974 Study

Under a cooperative aid grant to the University of Minnesota, College of Forestry from the North Central Forest Experiment Station, Forest Service, USDA, 33 wilderness campsites in the northeastern portion of the BWCAW were studied for five years (1968-1972) to determine impact of visitor use. All were developed in 1967 by the Forest Service under its criteria. Each site has a firegrate,

In 1975, five of the campsites were remeasured using the same procedures as the 1968-1972 study. Use data were not available since registration was discontinued in 1972. Earlier results were generally confirmed with heavy use sites continuing to show increases in soil compaction, bare soil, and site size. Light use sites showed few changes and increased shrub growth (Merriam and Smith 1975).

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1981 Study

During the period July 7 to 11, 1981, the authors remeasured eight study sites using the same procedures followed between 1968 and 1972. As in 1974, no use information was available since site registration was discontinued in 1972. Site locations and cover types were as follows:

Study Site No.	Lake	Cover Type	Amount of Use (1968-1972)	Route
3 ^{1/}	Newfound	Birch-aspen	Heavy ^{2/}	Main Travel
6 ^{1/}	Newfound	Birch-aspen	Light ^{2/}	Route Moose
9	Birch	Birch-aspen	Heavy ^{2/}	Lake Chain
27 ^{1/}	Smoke	Spruce	Light	Secondary Route
28 ^{1/}	Burnt	Spruce	Medium	Out of Sawbill Lake
34	Seagull	Red Pine	Heavy	Main Travel End
35	Saganaga	Red Pine	Medium	of Gunflint
36	Seagull	Red Pine	Medium	Trail

^{1/}Site also restudied in 1974.

^{2/}Currently, Forest Service managers rate sites 3 and 6 as "moderate" use (occupied 20-40 nights/year) and site 9 as "heavy" use (occupied more than 60 nights/year).

Results and Discussion

Table 2 shows the study results. The results may have useful implications for BWCAW managers and may be helpful for the more detailed study now in process by Jeffrey Marion, graduate research assistant in the College of Forestry.

Impact stage values have not increased markedly over the years. This is partly because of the way the stage system was developed. Also, in 1981, only dead trees on the original site were tallied compared to earlier when those with exposed roots (not necessarily an indication of dying trees) were also included. This change produced a lower overall stage value, even though the number of dead trees went up in 1981.

Compared to late summer 1972 dead tree counts on birch-aspen (except #6) sites show the greatest increase in 1981. Birch-aspen sites also expanded the most, perhaps because of their open understories. Spruce and red pine sites decreased in size, except Site 27 where an opening was made in the understory vegetation for lake access. Still, Site 27 was smaller in 1981 than in 1974.

Some sites showed a decrease in the amount of bare soil as a result of build-up (Sites 27, 28) and increased vegetation (Site 28). The decrease in bare soil was probably the result of decreasing use (less use was observed on Site 28 in 1974 also). Site 9 on Birch Lake, which had the highest impact stage value in 1972, continued to

show the impact of heavy use. It is near Carp Portage and is one of the few open sites on a lake bisected by the boundary between the U.S. and Canada. It has been greatly expanded (824% of original site); 74% of the original trees were dead; non-vegetated area was 869% of the original site; and soil compaction and bare soil were at maximum values. Yet, people apparently find it a useful campsite.

It appears that red pine may be more resistant to the impact of campsite use than the other species observed. For one reason, it is longer lived than the other species in the BWCAW.

There are many limitations on the results of our 1981 BWCAW campsite study. Only 8 sites were measured. There are no data on campsite use to which impact can be related. Measurements were made in July, a month later than in 1972, allowing some "natural" compaction by seasonal drying. (Sites studied in 1974 also were measured in July.) Finally, stage values were calculated in a slightly different way in that we only included dead trees and not trees with exposed roots in one component.

These limited results suggest that visitors expand sites readily, especially where there is an open understory (Merriam, et al. 1980). Users also cut trees on sites. If the same designated sites are to be used for many years, entry permit orientation could well include stronger warnings (including fines) about campsite use and protection. Perhaps the birch-aspen locations should be evaluated more carefully before being used as campsites.

LITERATURE CITED

- Merriam, L.C., Jr., C.K. Smith, D.E. Miller, Ching Tiao Huang, J.C. Tappeiner II, Kent Goeckerman, J.A. Bloemendal, and T.M. Costello. 1973. Newly developed campsites in the Boundary Waters Canoe Area. A study of five years use. Minnesota Agricultural Experiment Station Bulletin 511 (Forestry Series No. 14). 27 p.
- Merriam, L.C., Jr. and C.K. Smith. 1975. Newly established campsites in the Boundary Waters Canoe Area - restudy of selected sites - 1974. Minnesota Forestry Research Notes 254. 4 p.
- Merriam, L.C., R.F. Peterson, and T.B. Knopp. 1980. Changes in Boundary Waters camping places - reflections over fourteen years. *Naturalist* 31:28-31.
- U.S. Congress, 1978. An act to designate the Boundary Waters Canoe Area Wilderness, to establish the Boundary Waters Canoe area Mining Protection Area, and for other purposes. Public Law 495, 95th Congress, 2nd Session.

Table 1. Campsite use impact classification, Boundary Waters Canoe Area, Minnesota.

Code Value ^{1/}	Measurements				
	Percent of Original Site Bare Soil	Area Without Undergrowth (%) ^{2/}	Early Summer Soil Compaction In Heavy Use Area (tons/square foot)	Percent of Original Site Trees 1-inch DBH or More, Dead or having Exposed roots	Percent Increase In Site Size
1	0	0-19	0-1.9	0-19	0-9
2	0.001-9	20-49	2.0-2.9	20-39	10-29
3	10-29	50-79	2.0-3.9	40-59	30-49
4	30-59	80-109	4.0-4.4	60-79	50-69
5	60-100	110+	4.5+	80-100	70+

^{1/} Add the code value of all measurements used (3 or more). The average code value score determines the impact value.

^{2/} Computed as 100x (total area without ground cover) ÷ (total area of original site).

Table 2. Stage values and measurements of user impact, 1972 and 1981 - selected BWCAW campsites.

Site Number Cover Type	Impact Stage Value		% Original Site-Bare Soil		Area Without Undergrowth ^b (%)		Soil Compaction tons/sq.ft.		% Original Site Trees Dead		% Increase in Original Site Size	
	1972	1981	1972	1981	1972	1981	1972	1981	1972 ^c	1981	1972	1981
3 Birch-Aspen	4.0	4.2	14.9	41	122.6	129	4.1	4.5	3	40	47.7	69
6 Birch-Aspen	4.0	4.2	13.1	74	123.7	204	3.5	4.4	5	29	74.5	120
9 Birch-Aspen	4.8	4.8	86.1	150	609.1	869	4.5	4.5	22	74	577.2	824
27 Spruce	3.6	3.0	15.1	0	124.2	153	1.7	2.2	24	29	51.7	57
28 Spruce	4.0	3.6	11.4	0	119.9	77	3.2	4.0	23	57	56.8	18
^a 34 Red Pine	Site closed 1972		--	--	--	--	--	--	8	33	11.9	Closed
35 Red Pine	3.6	3.8	6.2	6	108.5	197	4.1	4.5	24	34	141.4	136
^a 36 Red Pine	--	--	--	--	--	--	--	--	9	23	58.8	58

^a 1972 stage value not computed.

^b See Table 1, footnote 2.

^c 1972 percents also included trees with exposed roots.