

MN 4610 WFRN-254

replacement COPY 2



# Minnesota Forestry Research Notes

No. 254

January 15, 1975

Newly Established Campsites in the Boundary Waters Canoe Area  
Restudy of Selected Sites - 1974

L. C. Merriam, Jr. and C. K. Smith<sup>1/</sup>

Minnesota's Boundary Waters Canoe Area (BWCA) of over 1,000,000 acres of land in the Superior National Forest is managed under provisions of the Wilderness Act of 1964. It is one of the heaviest used wilderness areas in the United States and had over 168,000 visitors in 1973. During July, 1974, selected BWCA campsites, monitored since their development, were remeasured.

## Original Study (1968-1972)

Thirty-three wilderness campsites in the northeastern portion of the BWCA were studied for 5 years (1968-1972) to determine impact of visitor use. All were developed in 1967 by the U. S. Forest Service under its criteria. Twice yearly, the effects on soils, vegetation, and site size were measured and mapped. Water quality was checked in 1970 at on-site (landing) and control points. 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. Physical measurement indicators for new campsites were combined into a 5-stage impact rating system for six cover types. Photographs were taken from permanent points at each time of measurement.

Results indicated the combination of impact changes (stage) tends to level off and that many of these changes come in the first 2 years. Where soil and water conditions are not limiting and there are few alternative campsite choices, key location sites could be kept open. Thus, self-defeating closure and rotation could be avoided. Results were reported in Bulletin 511 (Forestry Series 14) of the University of Minnesota Agricultural Experiment Station.

## 1974 Study

During the week of July 12-16, 1974, five of the study campsites were restudied by the authors using the same measurement procedures utilized in the 1968-72 study. (Use data since fall, 1972, was not available.) The site locations and types were as follows:

<sup>1/</sup> Professor and Instructor, College of Forestry, University of Minnesota.

Study Site No.	Lake	Forest Type	Amount of Use (1968-72)		
3	Newfound	Aspen-birch	Heavy	)	On Main
6	Newfound	Aspen-birch	Light	:	Travel
7	Newfound	Birch-fir	Medium	)	Route - Moose Lake Chain
27	Smoke	Spruce	Light	)	Secondary
28	Burnt	Spruce	Medium	)	Route - out of Sawbill Lake

Results of the Study are shown in the Table.

Since we have no actual knowledge of the amount of use, we can only estimate the amount of impact the sites have had since fall 1972. However, as indicated in the Table, the increase in stage value is probably related to use zones. For example, the birch sites are all on Newfound Lake, near a major travel route and increased the most in stage value. One of the spruce sites on light travel routes actually recovered in stage value.

The overall increase in stage value on the birch sites is due, basically, to increased soil compaction, bare soil, and site expansion, in that order. Although the heavy-use area soil compaction reading was the maximum of 4.5 tons/sq. ft. on all of these sites, it still had not increased significantly past the levels of Spring, 1970. However, this result must be tempered with the following qualifications:

1. The sample size was too small to make any real inferences from the 1974 data.
2. The measurement was taken a full month later than the comparable 1970 or 1972 measurements, thereby including some "natural" compaction due to seasonal drying.

The two spruce-fir sites had surprisingly stable stage values. Site 27 showed no change. Soil compaction remained low here due to a thick organic mat (approx. 4.0:) over most of the site. This mat consisted of natural litter and chips from wood chopping. The heavy organic matter covering accounts for the low amount of bare soil on sites 27 and 28 and allows continued tree vigor on these sites, where most of the roots have been exposed for nearly as long as the sites have been used (See Fig. 1). Exposed roots may be less important than previously thought.

### Discussion

In general, these sites show the leveling off or adjustment to human use suggested by Merriam et al. (1973) and Magill (1970). A continuing trend is that sites tend to be redesigned by the public to their needs along lines of least resistance (e.g. open understory). This suggests, again, the need to carefully design sites with an understanding of their expansion probability. Sites with poor landings, closed canopies and hence insect problems, will be less used (e.g. Site #6). We observed, once more, that the open, rocky landing sites were being heavily used as compared to those with more woody closed cover.

Additionally, shrubs continue to play an important role in preventing expansion and in actual contraction of site area (site number 28) (Fig. 1). Previous ideas about the "hardening" of sites with transplanted shrubs appear to be substantiated by this observation. Another method of hardening is the introduction of wood chip mulch to many sites. This appears to be a natural process in the spruce-fir type, but is noticeably lacking in the aspen-birch type. The practice of mulching sites would promote tree vigor, while minimizing soil compaction and bare soil.

Overall, the possibilities of more careful site design, shrub transplantation, and wood-chip mulching appear to give the wilderness administration more management options than previously thought. Sites can be rehabilitated while still in use. Other sites could be closed and abandoned.

It would be advisable to restudy these sites, and perhaps others of the original 33, in two years. In the meantime, the following procedure for campsite use impact study could be helpful to forest managers. For problem sites, area expansion and increase in area without vegetation could be mapped and measured. Photographs of trees particularly from just off site (lakeside) could give indications of crown condition and tree vigor. Use amounts of main traveled routes could be tallied by USFS patrols. Water quality samples could be taken at landings for laboratory analysis. Results could be combined in terms of accepted standards for evaluation.

#### References

- Goeckermann, K. 1972. Physical change on newly established wilderness campsites. College of Forestry, University of Minnesota. Unpublished Master's Paper. 44 pp.
- Magill, A. W. 1970. Five California Campgrounds -- Conditions Improve After 5 Years' Recreational Use. USFS Res. Paper. PSW62. 18 pp.
- Merriam, L. C., Jr., C. K. Smith, et al. 1973. Newly developed campsites in the Boundary Waters Canoe Area. A study of 5 years' use. University of Minnesota Agric. Exp. Station. Bulletin 511 (Forestry Series 14). 27 p.

Table 1. Stage Components and Change 1972-74 BWCA Campsites

Site # Type	Stage		% Bare Soil		Heavy Use Compaction		% Non-vegetated		% Trees Dying and Exposed Roots		% Increase in Original Site Size		Use Level
	1974	1972	1974	1972	1974	1972	1974	1972	1974	1972	1974	1972	
3 Birch	4.6	4.0	33.0	14.9	4.5	4.1	123.0	122.6	85.7	85.7	54.0	47.7	High
6 Birch	4.2	4.0	32.2	13.1	4.5	3.5	118.3	123.7	66.7	63.3	46.9	74.5	Low
7 Birch	4.4	4.0	27.3	24.8	4.5	3.1	193.3	162.5	78.6	78.6	150.3	96.6	Medium
27 S-F	3.4	3.4	16.1	15.1	1.4	1.7	137.3	124.2	75.0	71.5	61.8	51.7	Low
28 S-F	3.8	4.0	11.4	11.4	3.6	3.2	116.3	119.5	85.0	90.0	45.4	56.8	Medium

Fig. 1 Site #27 - Smoke Lake



1968 - Beginning of Study



1974 - Despite Exposed Roots,  
Trees Vigorous with Duff  
Layer. Loss of Trees at  
Fire Grate Upper Left

Site #28 - Burnt Lake

8-24-70



1970 - Change on Site  
After Two Seasons



1974 - Shrub Recovery in  
Background of Site