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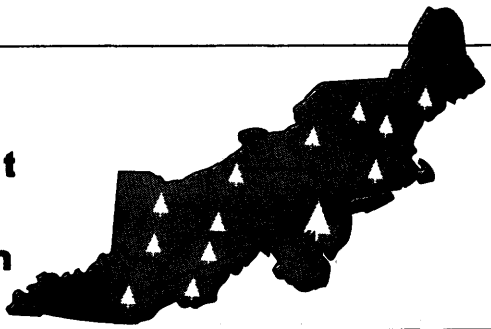

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VEGETATIVE CHANGES AT ADIRONDACK CAMPGROUNDS 1964 to 1969

Abstract.—The vegetation on campsites in the Adirondacks was measured and mapped, and changes in vegetation on the sites were studied from 1964 to 1969. Results indicate that well-maintained sites deteriorated little during the study period.

Picture in your mind the perfect tent site: partial shading from the afternoon sun, a variety of trees and shrubs providing a screen from other tent sites, and little or no drainage problem. Now let's put 100 families on that tent site during the course of a summer, so that it accommodates about 400 camper-days per season. How do you suppose that tent site would look 5 years from now or 10 years from now?

This case study in the Adirondack Forest Preserve of New York revealed very little physical site deterioration on well-maintained tent sites. Results of this study may be helpful to campground managers throughout the Northeast. If managers anticipate some changes in vegetation, they can take steps to see that the quality of their campgrounds is maintained.

STUDY PROCEDURE

In 1964, Shafer and Thompson *(8)* took measurements of 32 physical site characteristics at each of 210 tent sites scattered throughout 25 campgrounds in the Adirondack Forest Preserve. A map of each tent site was drawn to identify the relative positions of the fireplace, four dominant trees within a 50-foot radius of the fireplace, and the dominant tree of that group.

Table 1.—*Campgrounds studied in the Adirondack Forest Preserve of New York State*

Campground	Tent sites studied	Average annual use per tent site 1964-69
	No.	*Camper-days*
1. Rollins Pond	6	330
2. Wilmington Notch	5	663
3. Lake Eaton	2	301
4. Lewey Lake	6	283
5. Eagle Point	4	455
6. Rogers Rock	7	373
7. Glen Islands	6	324
8. Hearthstone Point	10	484
9. Northampton Beach	3	464

In 1969, 5 years later, 8 of the original site characteristics were measured on 49 tent sites at 9 of the campgrounds (table 1). Measurements were taken during July and August in both 1964 and 1969 to minimize error due to weather conditions or variation in use patterns. The variables that were remeasured are:

1. Overstory density of all trees—as measured with a spherical densiometer *(10)*. This instrument is accurate to within ± 2 percent of the actual overstory density.
2. Vertical component of aesthetic screen—as measured with a pantallometer *(7)*. This instrument is accurate to within ± 5 percent.
3. Lateral component of aesthetic screen—also measured with a pantallometer.
4. Average d.b.h. of four dominant trees—measured to the nearest 1/10 inch with a diameter tape.
5. Height of the dominant tree—measured to the nearest foot with an Abney level.
6. Number of white birch stems per tent site; minimum height—20 feet.
7. Number of softwood stems per tent site; minimum height—20 feet.
8. Number of hardwood stems per tent site; minimum height—20 feet.

In addition, field crews took off-site measurements at six of the nine campgrounds during the 1969 field work. Each set of off-site measurements consisted of the height of four dominant trees and the d.b.h. of one-half the number of trees measured at the campground. If a campground had seven tent sites where 28 trees were remeasured, a nearby

off-site area of similar slope, aspect, soil, and vegetation characteristics was located. The field crew marked the center of that off-site area with a stake driven into the ground. Then the positions, heights, and diameters of four dominant trees were recorded. Finally the positions and diameters of an additional 10 nearby trees in the dominant and codominant classes were recorded.

Tree growth between 1969 and 1974 at the off-site areas will be compared to tree growth between 1969 and 1974 at the campgrounds. The off-site data will be used as a control since little or no recreational activity should have occurred there.

RESULTS

Overstory Density

Overstory density consists of the vegetation over a tent site. It was measured as a percent of the total amount of vegetation that could provide shade. Overstory density increased an average of 3 percent between 1964 and 1969. On an individual basis, tent sites with the greatest increase in overstory density (30 to 50 percent) were well stocked with vigorously growing (4- to 15-inch d.b.h.) white pine and white birch trees. These two species are native to the Adirondack region and should be expected to grow well.

Two campgrounds had overstory density increases greater than 10 percent. Stocking of these campgrounds was 87 percent white birch and white pine. Both campgrounds had young vigorously growing trees on them that averaged 5.4 and 14.6 inches d.b.h. and 42 and 78 feet high, respectively.

Annual use of these two campgrounds was 373 and 464 camper-days per tent site. (A camper-day per tent site is one camper occupying a tent site for 1 day.) These use figures are similar to those of the other seven campgrounds studied. The average use for all 9 campgrounds was 408 camper days per tent site per year.

Three tent sites had large decreases in overstory density (29, 31, and 49 percent). Species composition was only 17 percent white birch and white pine. The average diameter of the trees measured was 17.5 inches, and the average height was 78 feet.

Four campgrounds accommodated an average of 516 camper-days per tent site per year. The other five campgrounds accommodated an average of 322 camper-days per tent site per year. The change in the overstory density in relation to use was as follows:

Average annual use per tent site (camper-days)	Average overstory density		Sample size (tent sites)
	1964 (percent)	1969 (percent)	
Over 400	74	75	22
Under 400	76	81	27

It would appear that use intensity of tent sites and change in overstory density are not strongly related.

Vertical Screening

Vertical screening (site characteristic 2) consists of tree trunks and other upright objects that contribute to privacy within a tent site. It was measured as a percent of the total possible. On the average for all tent sites, vertical screening increased 2 percent. This small difference may have occurred in the sample by chance, or in measurement error, because two people measuring the same site may differ by as much as 5 percent. None of the campgrounds had an average decrease in vertical screening, and only 10 of 49 tent sites had a decrease. The average decrease in vertical screening for the 10 tent sites was 3 percent. Again, this could have been due to measurement error.

The change in vertical screening in relation to use intensity was as follows:

Average annual use per tent site (camper-days)	Average vertical screening		Sample size (tent sites)
	1964 (percent)	1969 (percent)	
Over 400	15.5	19.0	22
Under 400	13.0	16.0	27

These data do not support the notion that there may be a relationship between high use and decrease in vertical screening.

Lateral Screening

Lateral screening consists of low-hanging branches and their leaves, bushes, shrubbery, and other low vegetation that provides the major portion of any privacy a tent site may offer. Lateral screening, like overstory density and vertical screening, is measured on a percent basis.

Average lateral screening decreased 5 percent during the study period; from 30 percent in 1964 to 25 percent in 1969. Although this decrease is not alarming and may have been naturally associated with the 3-percent increase in overstory density reported earlier, it may be part of a

Figure 1.—Vegetative screening around each tent site was one of the features mentioned most often as desirable in a survey of campers in the Adirondack forest preserve.

trend that could detract seriously from the amenities of the Adirondacks. "Vegetative screening around each tent site" was one of the features mentioned most often as desirable in a survey of campers in the Adirondack Forest Preserve *(9)* (fig. 1).

The loss in lateral screening is punctuated by the fact that, in 1964, 10 of the 49 tent sites were surrounded by 50 percent or more lateral screening. By 1969, only five of the tent sites were able to provide this kind of privacy. Eight of the nine *campgrounds* studied had a decrease in average lateral screening, while one showed no change. Nearly 70 percent of the individual *tent sites* revisited in 1969 had less lateral screening than they had in 1964 (fig. 2).

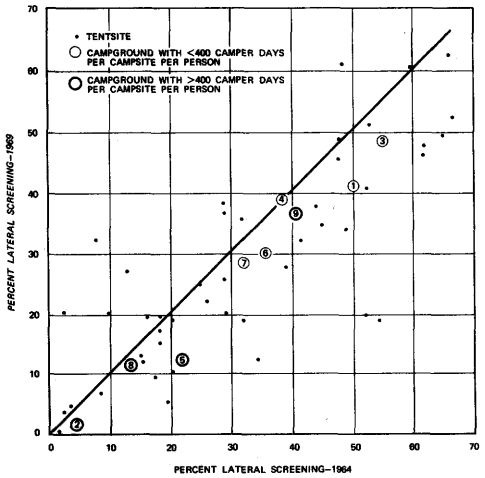

Figure 2.—Tent sites and campgrounds to the right of the diagonal line displayed a decrease in lateral screening between 1964 and 1969.

The decrease in lateral screening is further emphasized by the loss of tree stems per tent site (site characteristics 6, 7, and 8). Even though trees included in these measurements had to be over 20 feet tall, their lower branches made significant contributions to lateral screening. The loss in stems per tent site in relation to use-intensity was as follows:

Average annual use per tent site (camper-days)	*Average No. stems per tent site*			
	1964 (No.)	*1969 (No.)*	*Loss (percent)*	*Sample size (tent sites)*
Over 400	42	17	59.5	22
Under 400	29	13	59.2	27

These data do not show a relationship between intensity of use and the loss in number of stems per tent site.

Tree Diameter and Height

Diameter growth of the trees remeasured at each tent site averaged about 1/10 inch per year (table 2). By most standards, this is a fairly slow growth rate. It was apparently uninfluenced by use. Lightly and heavily used campgrounds had equal changes in d.b.h. measurements. On the average, diameters increased about ½ inch between 1964 and 1969.

The height growth of the dominant tree remeasured at each tent site averaged less than ½ foot between 1964 and 1969. But measurement precision is suspect for this characteristic. The 1969 height measurements of the live dominant tree on each tent site ranged from —18 feet to +22 feet around the 1964 height measurements. Even double and triple

Table 2.—*Species composition and growth of trees*

Species	Composition[1]	D.b.h. growth 1964 to 1969
	Percent	*Inch*
White pine	33	0.6
White birch	15	.5
Eastern hemlock	12	.4
Hard maple	7	.5
Red pine	6	.2
Soft maple	5	.7
Red spruce	5	.2
Red oak	5	.4
Others	12	—

[1]The four dominant trees measured at each tent site are represented in this column; 33 percent of the trees measured were white pine, 15 percent were white birch, etc.

checks of some tree heights resulted in illogical differences between 1964 and 1969 measurements.

DISCUSSION

From a manager's standpoint, none of the variables measured deteriorated appreciably. In fact, overstory density and the vertical component of aesthetic screening increased slightly during the 5-year period. The lateral components of aesthetic screening—composed of shrubs, bushes, and low hanging branches—decreased by only 5 percent between 1964 and 1969. Although this characteristic should be watched closely during the next 5-year period, it would be incorrect to conclude that tent sites in the Adirondack Forest Preserve are in danger of losing the seclusion they have previously supplied.

Overall results are in somewhat close agreement to a similar study conducted in California between 1961 and 1966. Magill *(5)* found a general improvement in the condition of the campground vegetation. The improvement was interpreted as an "adjustment" to recreational use and was attributed to barriers placed in the campgrounds and to abundant precipitation.

Ground-cover response to recreational use was studied over a 3-year period at a campground in Pennsylvania. In that study, LaPage *(4)* found that the average percent ground cover, although of different species composition than the original, had begun to increase after the original species had experienced an initial drastic decrease; another apparent "adjustment" to recreation pressure.

Wagar *(11)* showed that recreation pressure caused ground cover to deteriorate rapidly at first; but, after the early loss, the rate of deterioration was very slow, even with increased pressure. He concluded that "large changes in use may cause only small changes in damage on the highly-developed areas where use is already heavy." Of course, this conclusion would not be applicable to very fragile soils or to steep slopes *(2, 6)*.

Considering the diameters, heights, and species that were measured in this study, we see no major vegetative changes that can be directly related to the levels of recreational use at the campgrounds. Comparison of on-site and off-site measurements in 1974 should shed more light on this.

It would be difficult to accurately compare campers' opinions about the aesthetic appeal of the campgrounds in 1964 and 1969. There may be a different breed of camper, or the camper may have changed his

tastes about what is or is not aesthetically appealing. But the brief evidence presented here leads us to believe that:

1. Established tent sites, well-stocked with native species, should not deteriorate very rapidly.
2. Tent sites given normal maintenance (kept clean and safe) should not lose their aesthetic attractions.
3. Occasional plantings of shade-tolerant trees and shrubs should help maintain the present level of vegetative screening around tent sites in the Adirondacks.
4. Levels of present use-intensity (about 400 camper-days per tent site per year) do not appear to be detrimental to the factors that contribute to the aesthetic qualities of the campgrounds studied.

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