TRENDS IN THE TEMPORAL DISTRIBUTION OF PARK USE[1]

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The purpose of this paper is to examine trends in the temporal distribution of park use. Plots of daily attendance data trace changes in temporal use distributions over time. A use concentration index quantifies and reduces to a single numerical indicator the degree of unevenness of recreation attendance data. The percent of total annual use accounted for by selected time periods is also examined.

INTRODUCTION

Trends in outdoor recreation are normally monitored on some aggregated level, usually on an annual basis. Participation in hunting and fishing, for example, is commonly monitored through yearly license sales, while snowmobiling and trailbiking activity is measured by annual registrations, and use of parks, forests, and campgrounds is most often reported in visits or visitor days per year. Monitoring of recreation activity at this aggregated level is highly useful in identifying long-term trends in participation and the relative popularity of various outdoor recreation activities, but disregards the manner in which recreation activity is distributed over the reporting period. Paradoxically, it is the typically uneven manner in which recreation participation is distributed over time which presents one of the most pervasive problems in outdoor recreation management.

In the classic case, park and recreation sites open for "the season" on Memorial Day weekend and close on Labor Day. The result is a full year's use condensed into little more than three months. Even within this "season" use may be skewed toward weekends and holidays resulting in a marked "peaking" phenomenon. There are a number of significant problems associated with this typical use distribution pattern. First, to satisfy demand, recreation facilities and services must be developed at a scale to meet peak loads. These facilities and services may go largely unused at most other times, resulting in inefficient resource use. Second, the social carrying capacity of recreation areas may be unnecessarily exceeded by peak loads through crowding and increased potential for conflicting uses. Third, there is preliminary evidence that even ecological carrying capacity may be unduly taxed by excessively concentrated visitor use (Lime 1972). Finally, periodic peaking of recreation use presents substantial administrative problems, particularly with respect to personnel scheduling.

While this peaking problem in outdoor recreation has been recognized for some time (Clawson and Knetsch 1966), there have been few efforts aimed at its systematic study. This is apparently due to the prevailing attitude among recreation planners, managers, and researchers that the temporal patterns of outdoor recreation use are determined by factors which are viewed as largely uncontrollable. Such factors include weather and societal work and leisure patterns. It is the purpose of this paper to report on a cooperative study recently undertaken by the University of Vermont and the Northeastern Forest Experiment Station which seeks to examine trends in the temporal distribution of park use in order to more fully understand this problem. The ultimate objective of this study is to suggest methods by which the use of park and recreation areas may be more evenly distributed over time.

METHODS AND ANALYSIS

The first phase of this study was to develop techniques to quantify the temporal distribution of selected outdoor recreation activities. Development of appropriate measurement techniques is needed to facilitate trend analysis. Three approaches to measurement have been developed to date. The remainder of this section of the paper describes these three measurement techniques, and their application to two data series. One data series traces daily attendance at forty Vermont State Park campgrounds from 1977 to 1979, while

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the other traces daily campground occupancy at one New Hampshire State Park from 1971 to 1977.

Plotting of Attendance Data

A series of computer programs were developed which graphically plot occupancy data at park and recreation areas. In Figure 1, use of four Vermont State Park campgrounds are plotted as a percentage of peak use by day. The significance of these plots is that they illustrate the peaking phenomenon in a clear and often dramatic way, and indicate visually where use redistribution efforts are needed.

Also of significance is the variety of use distributions represented in Figure 1. Daily plots for all Vermont State Park campgrounds in 1977 could be grouped into the four general types illustrated in Figure 1. Elmore State Park represents a moderately uneven distribution of use, showing consistent weekend and holiday peaking while weekdays during July and August average approximately 50 percent of maximum attendance. Townshend State Park illustrates extreme weekend peaking, while Button Bay State Park illustrates consistent holiday peaking. Lake St. Catherine State Park illustrates a relatively even distribution of use, with campground occupancy remaining above 80 percent through the months of July and August.

This variety of use distributions suggests that the peaking problem may be subject to remedy to some degree through appropriate planning and management. It is likely that some characteristics of either the recreation site or the attendant user groups result in this diversity of attendance patterns. If these characteristics can be identified, then they can be incorporated into planning and management decisions aimed at evening out the distribution of recreation use over time.

Finally, plots of daily attendance data can be used to trace changes in temporal use distributions over time. Figure 2, for example, illustrates a change toward more even distribution of use at Button Bay State Park from 1978 to 1979.

Use Concentration Index

While plots of daily attendance data are a useful graphic measure of recreation use distribution patterns, a more quantitative measure is also needed. For this purpose, the concept of a use concentration index was adopted. The use concentration index was first introduced by Stankey et al. (1976) and applied in a spatial dimension to wilderness recreation use patterns. The purpose of the index was to measure the extent to which wilderness trail systems are used in an uneven fashion; that is, some trail segments are used heavily while other trail segments remain relatively unused. By substitututing the days of a recreation season for miles of trail, the use concentration index can be applied to the temporal dimension as well.

The advantage of the use concentration index is that it quantifies and reduces to a single numerical indicator the degree of unevenness of recreation attendance data. Using data from Elmore State Park (Figure 3), the cumulative percent of use of the campground is graphed by the cumulative percent of days in the season. The days of the season are ranked and graphed in descending order of use, and use is accumulated starting with the day most used. The 45-degree diagonal represents an even distribution of use (e.g. 50 percent of all days account for 50 percent of all use), while the curve plots the actual distribution of use (e.g. 50 percent of all days account for nearly 80 percent of all use). The use concentration index is based on the area between the curve and the 45-degree diagonal as a proportion of the total area above the 45-degree diagonal. The index may take values from 0 (perfectly even distribution) to 1 (perfectly uneven distribution). In the graph for Elmore State Park, the shaded area between the 45-degree diagonal and the curve represents 35 percent of the total area above the diagonal. Therefore, the use concentration index equals .35.

As with the daily plots of attendance, a series of computer programs were prepared to draft and calculate the use concentration index. When applied to both data series, use concentration index values ranged from .12 to .45. This range of values again demonstrates, as with the daily plots of attendance, considerable diversity in the evenness of use distributions among parks.

Index values provide a convenient way to monitor trends in the temporal distribution of recreation use. Figure 4, for example, traces changes in the use concentration index for inland and waterfront campsites at Pawtuckaway State Park, New Hampshire, from 1971 to 1977. One might have hypothesized that recent gasoline prices and supplies would encourage fewer camping trips, but of longer duration, and that this would contribute to more evenly distributed recreation use. Figure 4 indicates that this is not the case, however, at least for Pawtuckaway State Park, and that, in fact, the trend is toward more unevenly distributed use. These results might be explained by speculating that higher gasoline costs and shortages are eliminating some groups of recreationists from the camping market, and the most likely group to be eliminated is those who must travel greater distances to the park. Since it is also the group that is most likely to stay longer (through the mid-week) at the park, their absence from the park is likely to contribute toward more marked weekend peaking.

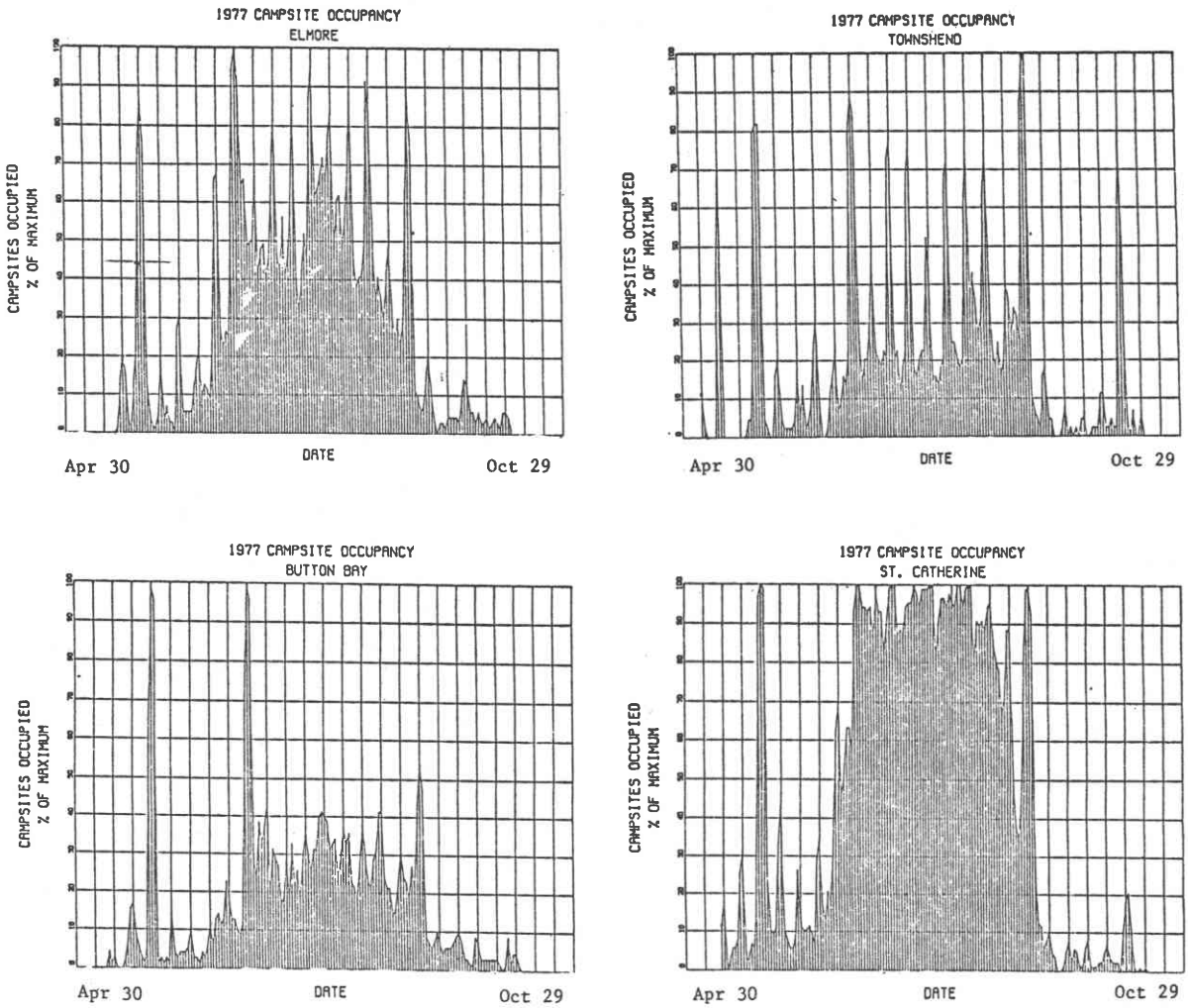


FIGURE 1.--Campsites occupied (percent of maximum) by day for four Vermont State Parks in 1977.

FIGURE 2.--Campsites occupied (percent of maximum) by day for Button Bay State Park (Vermont) in 1978 and 1979.

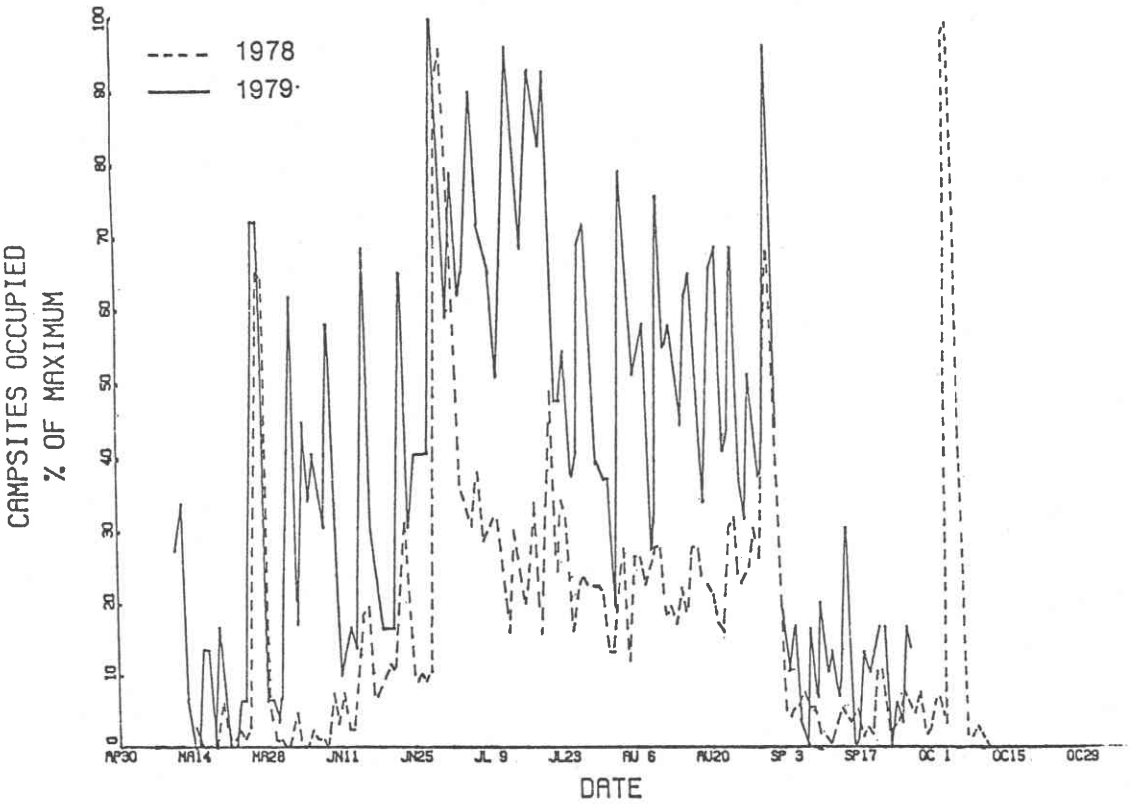
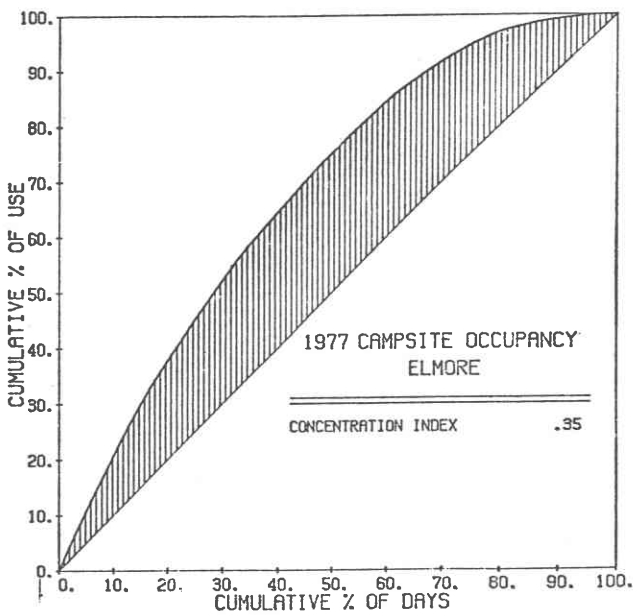


FIGURE 3.--Use concentration index for Elmore State Park (Vermont) in 1977.



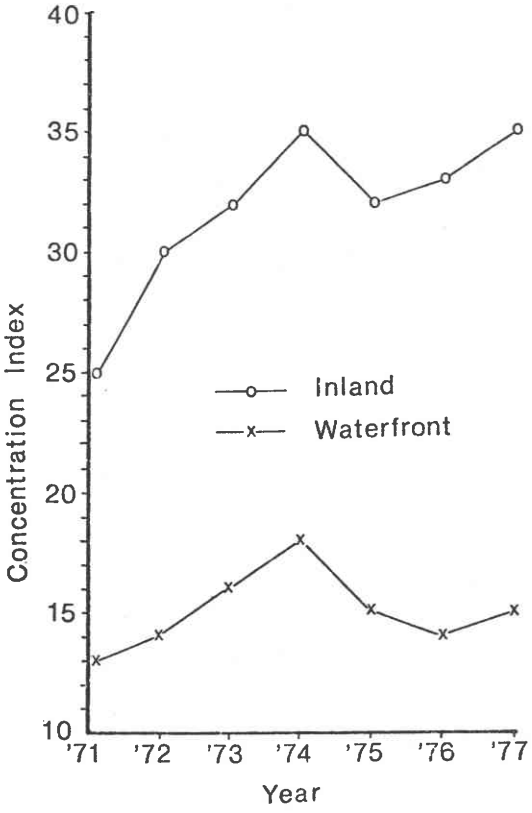


FIGURE 4.--Trends in use concentration index for inland and waterfront campsites for Pawtuckaway State Park (New Hampshire) from 1971 through 1977.

The use concentration index also has considerable potential in contributing to an understanding of why some parks have more even distribution of use than others. When the index is used as a dependent variable in regression analysis, a variety of park characteristics may be examined as independent variables and statistically tested as to their relationship with use distribution patterns. Examples of such park characteristics which might be hypothesized as explaining some of the variation in use concentration index values include distance from population centers, number of campsites, size of park, type and number of recreation activities, and miles of shoreline.

Percent of Use

A third measure of the temporal distribution of recreation use involves calculation of the percent of total annual use accounted for by selected time periods. For example, the percent of total use accounted for by each day of the week provides a measure of how evenly recreation use is distributed over the average week. The bar graph in Figure 5 illustrates the average distribution of use over the days of the week for Button Bay State Park in 1977. The unevenness of the distribution is readily apparent.

Such percentages may also be monitored over time to determine if weekly recreation use patterns are becoming more or less evenly distributed. Figure 6 indicates a trend toward more even distribution of use over the days of the week for Button Bay State Park when examined from 1977 to to 1979. Tuesday, Wednesday, and Thursday account for relatively larger percentages of total annual use, while Friday, Saturday, and Sunday account for declining percentages of total use.

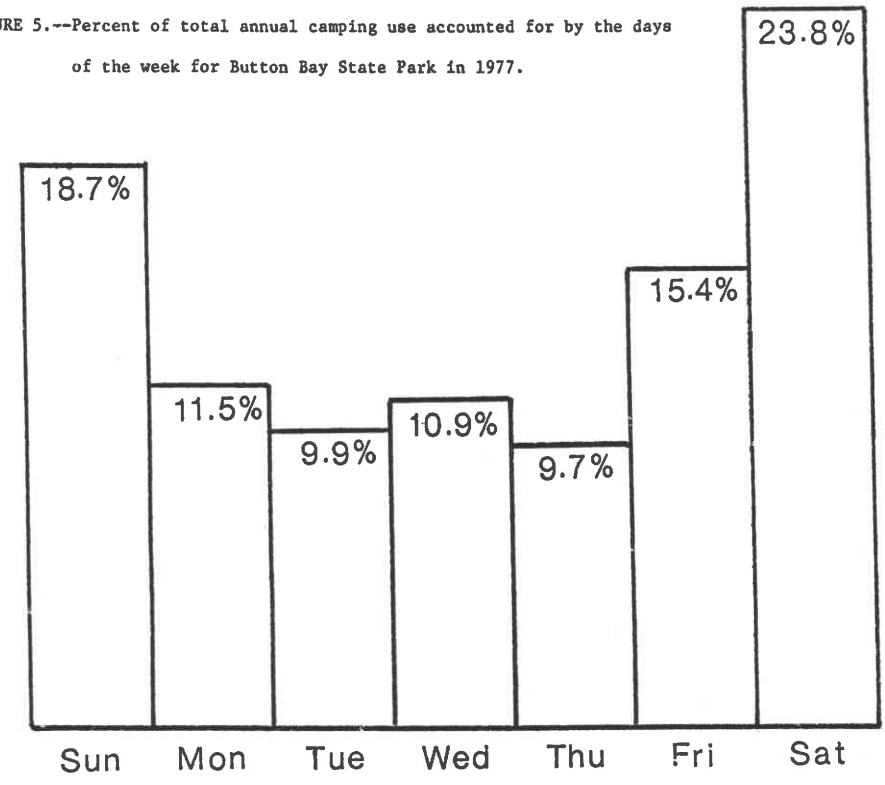
A similar graph was prepared for Pawtuckaway State Park (inland campsites) to trace trends in weekly use distributions from 1971 through 1977 (Figure 7). While trends are not as readily apparent in this case, there appears to be a tendency toward Friday and Saturday accounting for relatively larger percentages of total annual use, and thus for weekly use patterns becoming more unevenly distributed. It is interesting to note in Figure 7 the dramatic changes in the percent of use accounted for by Friday and Sunday in 1974. One might hypothesize that such a change might have been caused by Sunday closings of gasoline stations, encouraging weekend park users to camp Saturday and Sunday nights rather than Friday and Saturday nights in order to purchase gasoline for the return trip home on Monday mornings when gasoline stations reopened.

The percent of total annual use accounted for by seasons might also be an important measure of temporal recreation use patterns. The percent of use accounted for by the summer (Memorial Day weekend to Labor Day), spring (prior to Memorial Day weekend), and fall (after Labor Day) seasons for Elmore State Park from 1977 to 1979 is shown in Figure 8. While the summer season accounts for the largest percentage of total campground use, this percentage appears to be declining with a trend toward an increasing percentage of use during the fall season. Trends toward increasing percentages of total annual use for the fall and spring seasons have also been found for Michigan State Park campgrounds by Stynes and Rottmann (1979).

FURTHER RESEARCH

The three techniques described above -- plots of daily attendance data, the use concentration index, and calculation of the percent of use accounted for by selected time periods -- have proven useful in measuring the temporal distribution of recreation and tracing trends in these distributions over time. These measurement techniques will be applied more widely as additional data series become available so that we might investigate a wide variety of recreation sites and activities, and continue to monitor trends in the future.

FIGURE 5.--Percent of total annual camping use accounted for by the days of the week for Button Bay State Park in 1977.



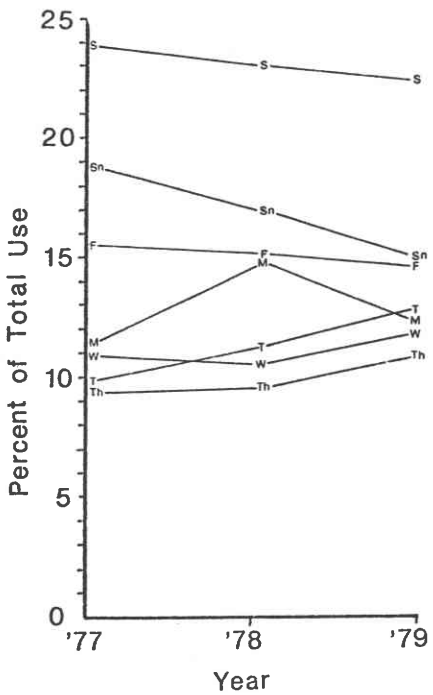


FIGURE 6.--Trends in the percent of total annual camping use accounted for by the days of the week for Button Bay State Park from 1977 through 1979.

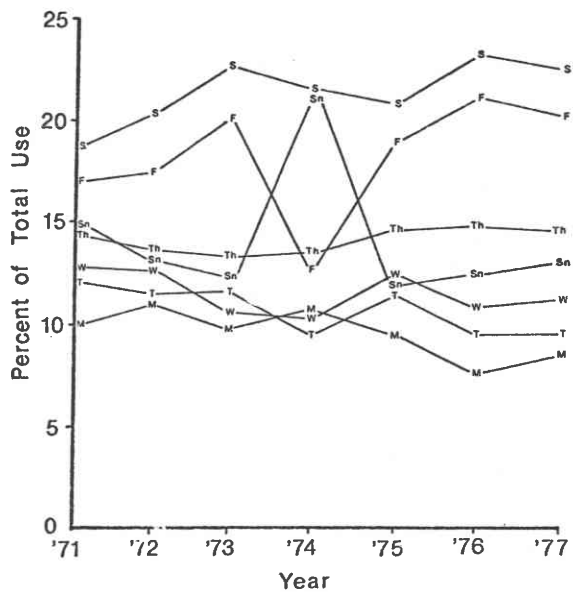


FIGURE 7.--Trends in the percent of total annual camping use accounted for by the days of the week for inland campsites of Pawtuckaway State Park from 1971 through 1979.

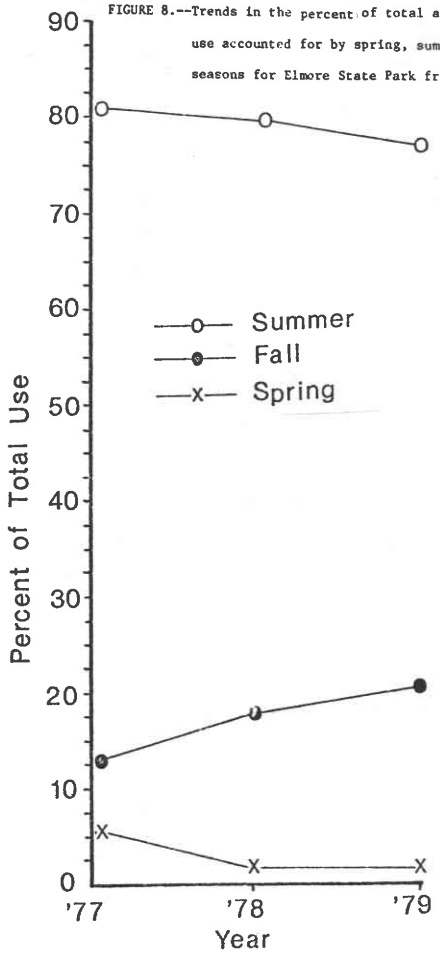


FIGURE 8.--Trends in the percent of total annual camping use accounted for by spring, summer, and fall seasons for Elmore State Park from 1977 through 1979.

A second phase of research will be aimed at explaining why there are substantial differences in the evenness of use distributions among park sites. As noted earlier, the use concentration index provides a convenient dependent variable from which regression analysis may help explain the relationship between park site characteristics and recreation use distributions.

A third phase of research will involve an analysis of recreation users to explore and evaluate selected management and marketing strategies designed to redistribute recreation use more evenly. A random selection of peak and off-peak users will be interviewed at recreation sites and a comparative analysis will be done to identify target markets for redistribution efforts. Both peak and off-peak users will be analyzed with regard to socioeconomic characteristics, stage in family life cycle, work and leisure patterns, recreation motivations and satisfactions, and response to proposed management/marketing efforts such as differential fees, changes in site development level, recreation activities and facilities offered, and dissemination of information on conditions of crowding.

It is hoped that these three phases of research will lead ultimately to a series of suggested recreation planning, management, and marketing guidelines that might be used to reduce the peaking phenomenon in outdoor recreation and result in more even distribution patterns.

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