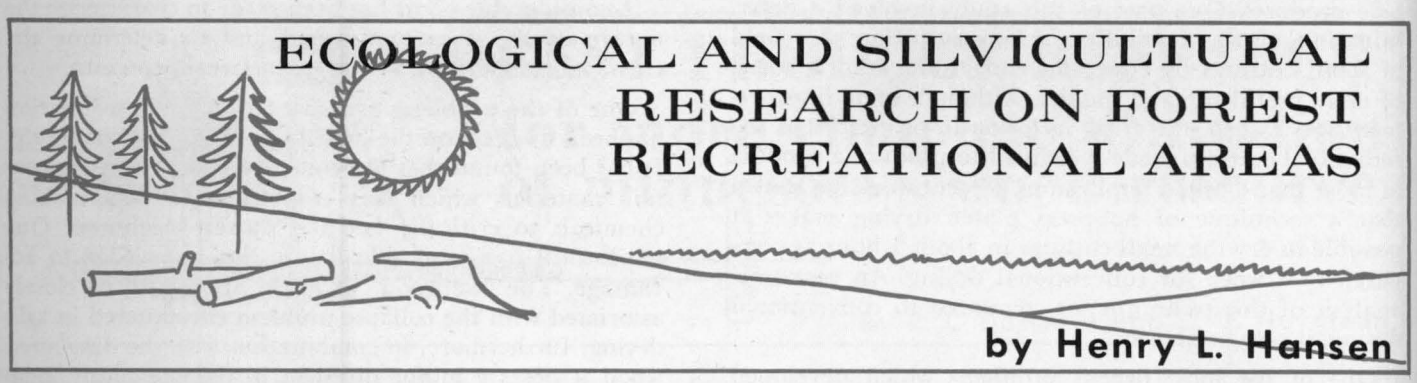

ECOLOGICAL AND SILVICULTURAL RESEARCH ON FOREST RECREATIONAL AREAS

by Henry L. Hansen

OVER THE PAST several hundred years men have accumulated a considerable background of knowledge about the culture of forest trees for timber production as well as that of individual trees for city park purposes.

There is, however, an intermediate type of area, best described perhaps as a forest-park, where recreation is the major use and on which research into the problems of vegetational management is largely in a pioneering stage. Some of these areas have been set aside to preserve certain features of the native vegetation for the enjoyment and education of future generations. Others have been recognized as having outstanding values for recreational use of a more active nature. The Boundary Waters Canoe Area on the Minnesota-Canadian border is a prime example of the latter type of area.

It has become increasingly apparent that simply setting aside such areas is not always a guarantee that the desired values which the area was set aside to preserve will in fact be perpetuated.

The forest community is a dynamic system, reacting and interacting with such elements of the environment as the climate, soil, and other physical factors, and animal and other biological components as well, A product of these responses is what ecologists refer to as "succession" – the pattern or trend of change the vegetation undergoes in response to its environment and to internal competition between the various species present or invading the area.

Thus it is possible, and in fact is very common, that vegetation on an area changes over a period of years as a result of purely natural forces with or without man's interference.

Research has been conducted at Itasca State Park by the School of Forestry to study these patterns of successional change. This park, Minnesota's largest and one of the finest state parks in the country, was set aside by legislation passed in 1891 to perpetuate the primeval forest on the headwaters of the Mississippi River. Since then so many Minnesotans and out-of-state visitors have enjoyed the aesthetic and recreational attractions of the park that in recent years the annual number of unit visits has exceeded a million.

Research decisively documents the fact that the stately stands of old growth red or Norway pine which formed the main attraction in the native scenery are disappearing as a result of successional processes (see table). The preponderance of mature and overmature stands is striking, and it is obvious that the area in young stands is totally inadequate to replace what is lost as the overmature trees die or are blown down by periodic storms.

Area in acres by age classes

Forest type	Over-mature*	Ma-ture†	Young‡	Total
Red pine	2,537	2,908	293	5,738
White pine	739	108	...	847

*Trees over 200 years old with an average life expectancy of 25 years.
†Trees mostly 90 to 150 years old.
‡Trees mostly 50 to 75 years old.

The reasons for this projected disappearance of red pine as a major tree species in Itasca Park stem from the nature of seedbed and other conditions required before the tree successfully reproduces. These conditions are found primarily on freshly burned areas. In other words, in order for a young stand of red pine to follow an old stand when it dies or blows down, seed from the old trees must fall on a fresh or recently burned area or on an area on which similar conditions have been created artificially. Because the park has been protected against fire since its creation, relatively few acres on which red pine could reproduce have burned.

Some idea of the accelerating seriousness of this situation is evident from the increasing trend in the rate at which the old pine trees died or blew down during the period from 1941 to 1955 (figure 1).

In the absence of permitted burning by wild fires, which is unthinkable on a recreational area of this sort, some alternative must be found if the red pines are to be perpetuated. The School of Forestry research program is attempting to develop alternative red pine reproduction treatments that will be least objectionable aesthetically to park users.

Another aspect of the management of the Itasca Park forest to perpetuate its pine stands has to do with the interactions of the deer herd and the vegetation. During the many years that the park was a game refuge on which hunting was prohibited the deer herd build up to concentrations far above those consistent with the available supply of food. A consequence of the pressures of the large deer herd on the native vegetation was that small red pines available to the deer yet normally only slightly browsed by deer were totally eliminated by browsing. Fortunately, in 1945 the legislature at the urgence of the Department of Conservation made

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it possible to reduce the deer population by hunting.

Another desirable tree species, the eastern white pine, was found to have a set of characteristics making its role in the park's future forest questionable. Studies of the ecology of this species indicate that seeds from the old trees are, unlike those of the red pine, capable of germinating successfully and of establishing themselves for a period of approximately 3 to 6 years, after which it suffers heavy mortality. However, this species has been hard hit by an introduced disease, the white pine blister rust which is particularly virulent on seedlings and young trees. While effective yet economically feasible control measures remain to be developed, some success has been had by eliminating the currants and gooseberries which constitute the alternate hosts required by the rust organism to complete its life cycle.

The white pine is also a preferred deer browse species and as such was eliminated in seedling and sapling sizes from the park forest during the pre-1945 game refuge era. The remarkable response of this species after the release from the tremendously heavy deer browsing pressure of the pre-1945 period is seen in figure 2.

These figures relate the trend in abundance of white pine seedlings under a jack pine stand in which conditions were favorable for the germination of the white pine. They represent annual counts on plots beginning in 1947, only 2 years after the deer herd pressure was reduced. The increase in numbers of white pine seedlings built up to a peak in 1954. Since that time there has been a decline in numbers resulting from competition among the crowded seedlings themselves, from attrition due to deer and snowshoe hare browsing, and from the white pine blister rust.

In this example of research on the problems of recreational forest areas, systematic descriptive studies first established that a set of problems was associated with perpetuation of the aesthetically desirable red and white pines. Then basic studies of an ecological nature helped to explain why these species were not reproducing successfully and suggested what conditions needed to be changed to insure reproduction.

The third stage of research is silvicultural in nature, and will involve the testing of various combinations of controlled burning, the use of herbicides to remove competition from brush and herbaceous species, seeding, planting, and other possible treatments to insure the reproduction of these pines which the park was created to perpetuate. This type of research has just recently been initiated, and it will be several years before the results can be evaluated.

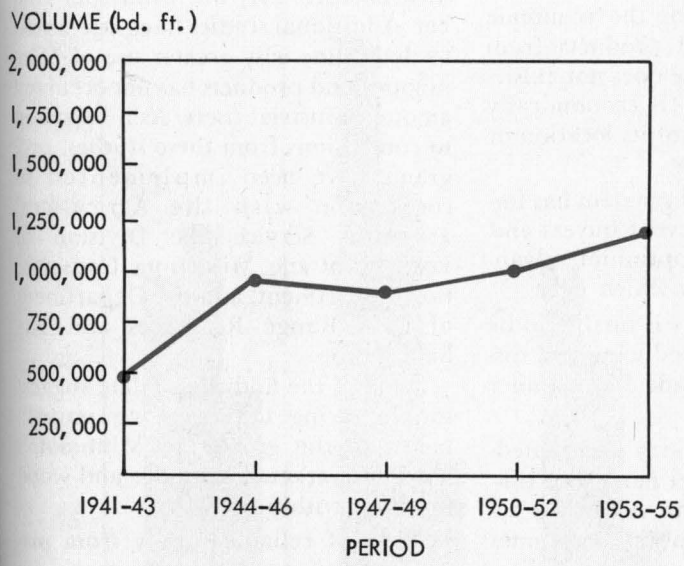

Figure 1. Summary of volumes of old-growth pine timber salvaged as dead or down trees at Itasca State Park from 1941 to 1955. Data from Minnesota Department of Conservation, Division of Forestry, timber salvage sales records.

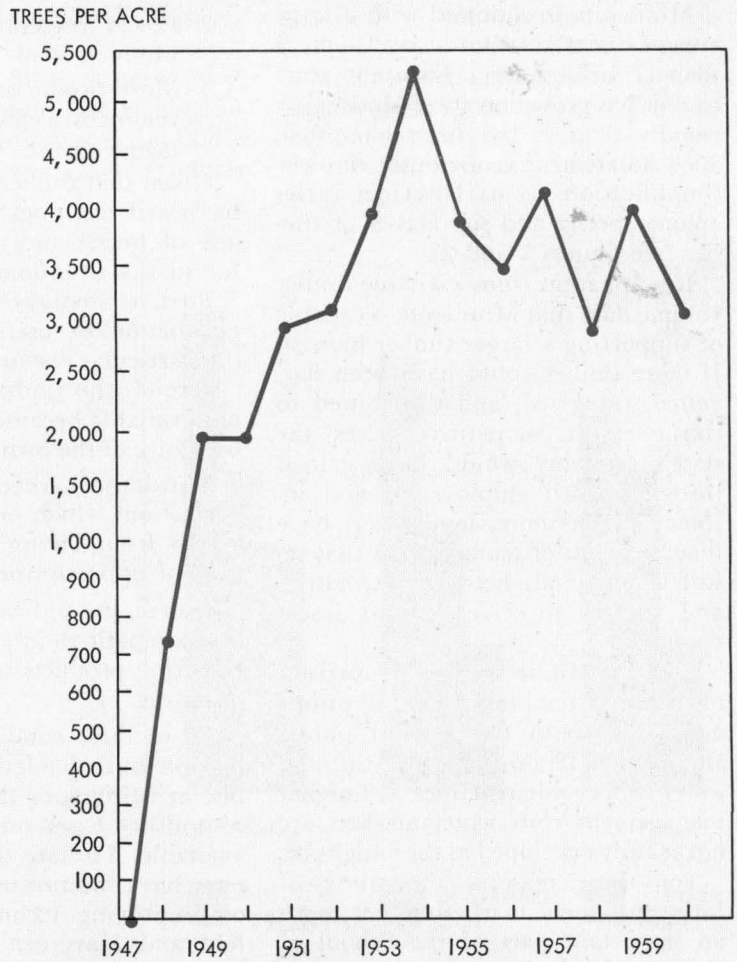

Figure 2. White pine reproduction established under a jack pine overstory in Itasca State Park following reduction of the deer herd in 1945. "Trees per acre" includes seedlings older than 4 years.