

An Ecological Study of the Chellburg Forest

By

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The Indiana Dunes National Lakeshore sponsors an annual Sugar Maple Festival which draws 5,000 visitors per year on the average. Because of popularity of the festival and the opportunities for environmental education it affords, the Lakeshore hopes to continue the program for many years to come. However, the park staff is concerned about what effect continued tapping may have on the health of the sugar maples and whether there will be enough trees of large enough size to tap in future years. To answer the latter question, a structural and compositional study of the forest was initiated in June, 1983.

The primary goals were 1) to assess the size and vigor of the sugar maple population on the site, 2) to determine age-class relationships within the sugar maple population in order to predict the future status of the trees on the site, 3) to make quantitative measurements of other tree species in the forest, and finally, 4) to make management recommendations enabling park personnel to optimize the recreational, conservational, and educational resources of the forest in the future.

Forest Survey

A total of 36 woody species occurred in the plots established for the forest analysis, 27 reaching diameters at breast height (DBH) of at least 5 cm and the remainder occurring only as seedlings or saplings. Importance values, calculated from frequency and density data, revealed that sugar maple was the most important species followed by red oak, white ash, and slippery elm. However, red oak trees were by far the largest trees in the forest, with more than three times as many trees in the largest size class (over 50 cm diameter) as sugar maple. In the seedling and sapling size classes, sugar maple was the clear winner, with over four times the density of the next most frequent species.

There were very few young red oaks. The pattern of many relatively small sugar maples and relatively large red oaks suggests a successional sequence of red oak dominating and sugar maple gradually replacing it. The absence of many dead or dying sugar maples or a preponderance of suppressed trees indicates that the youthfulness of the sugar maple population is not due to a failure of the species to reach large size classes.

Sugar Maple Age/Size Class Distribution

We measured diameters and extracted tree ring cores from 92 sugar maples in the forest, all greater than 5 cm in diameter. We gleaned several useful pieces of information from the ages determined from tree ring counts (see chart).

We found that sugar maples were fairly well distributed across the different age intervals, ranging from 10 to 150 years old. The younger age classes were best represented, as would be expected in a healthy population which was reproducing successfully. A

number of the trees showed very low growth rates for their ages; those were likely suppressed due to low light availability. There were also a good number of trees exhibiting healthy sizes for their ages.

The relationship between size and age of the trees was quantified, demonstrating a good correlation between the two parameters. This enabled us to do several things: growth rates of the sugar maples were determined, and equations for estimating age from tree diameters and vice versa were calculated. These relationships, in turn, can be used to estimate the number of tappable trees in the forest as well as the predicted number of tappable trees in the future.

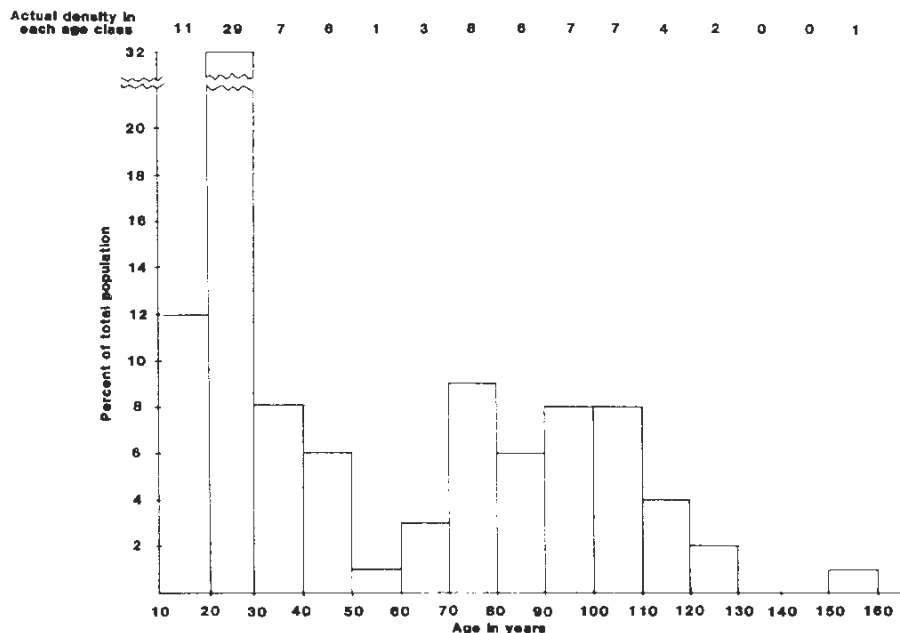
We estimate that the forest contains about 165 tappable sugar maple trees (the recommended diameter for tapping is 25 cm or more). Predicted numbers of tappable trees are 196 by the year 2000, and 250 by the year 2020. Naturally, the dynamics of the forest make such predictions approximate, but it looks as though sugar maples will certainly increase in importance, barring any disturbance or major changes.

Management Recommendations

Management objectives for the area include insur-

ing the health of the sugar maple population as well as preserving the integrity of the forest ecosystem and its aesthetic value. The results of this study indicate that the sugar maple is regenerating naturally and growing healthily in the area, and the stand should increase in numbers of individuals for some time. If it is decided that park personnel should try to improve the stand's maple sugar producing capacity, there are some steps that can be taken. Past research has shown that the best sap and sugar producers are those trees with the largest stem diameters and the broadest crown diameters. It would be advantageous, then, to encourage individual trees by selectively cutting trees around them, enhancing growth conditions for the targeted individuals. It has also been shown that size of trees accounts for only about one third of the variation in maple sugar production, and other factors such as genetic stock and soil conditions also affect production. The best strategy may be to let nature run its course, thus preserving the natural processes of the forest while maintaining an adequate sugar bush.

Dunevitz and Otto worked as Biological Technicians at the Lakeshore in the summer of 1983. Hiebert is Chief Scientist and Plant Ecologist at the Lakeshore.



Age distribution of sugar maples in 12 plots sampled. Bars represent the percent of total density in each age interval.



Park Ranger Jim Bull demonstrates the proper way to tap a sugar maple during the annual Sugar Maple Festival at the Indiana Dunes National Lakeshore.



A portion of the forest near the Chellburg Farm which is used as a "sugar bush."