

SUGARBUSH MANAGEMENT RESEARCH

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Most of the sugarbushes being tapped today developed from natural forest stands years before their present owners were born. Trees were plentiful then, and land could be purchased at low cost. Wood was the primary fuel for both

homes and sugaring operations, and unwanted trees in the sugarbush were removed as part of the annual wood-cutting process. The development of sugarbushes from natural stands was a "hit or miss" proposition.

Today land is expensive, labor costs are high, and few people use wood as a major fuel. The need for planned development of new sugarbushes is evident, but effective management guides are practically nonexistent. This has led us to begin research on factors important in the development of sugarbushes from forest stands and plantations. Our current program involves tree spacing, fertilization, and the effects of conifer understory on sap and sugar yields.

Tree Spacing

Most maple producers believe that a tree with a wide, fully developed crown gives the most and the sweetest sap. If full-crowned trees are the best, then we would like to have a sugarbush containing only open-grown trees, but with enough of them to completely utilize the area. With this in mind we made a region-wide survey of open-grown sugar maple trees to determine the relationship between crown diameter and tree diameter. From this information we calculated the num-



Figure 1. -- A 30 year-old sugarbush plantation near Hartland, Vermont. A total of 25 acres were planted on a 36-foot spacing, and the trees now average about 10 inches in diameter and are 36 feet tall. This bush was fertilized with hen manure for 8 years (1956-64) and has never been tapped.

ber of trees of a given size that would use all the growing space on an acre but still would allow all trees to develop maximum crowns.

There is some evidence that we may not need completely open-grown trees for maximum production. Therefore we are also making an intensive study to determine if trees that have been slightly crowded will give us greater total sugar yields per acre. Slight crowding may reduce yields per tree, but the additional trees resulting from closer spacing may increase total production per acre.

Information from these spacing studies will serve as a guide to the number of trees per acre for sugarbush stands. We have located a few sugar maple plantations that illustrate the development of open-grown trees from wide spacing (fig. 1). The potential yields from this type of sugarbush are not known; and unfortunately we will have to wait several years for the answer.

Fertilization

The use of fertilization to increase sap and sugar yields has received considerable interest; and some research has been done in Vermont, New York, and Ohio. Two years ago we established a large-scale study to determine the effects of lime and fertilizer on sap volumes, sugar contents, and tree growth. We do not have any definite results yet, but there are essentially three potential improvements that may result from fertilization.

- Increased sap-sugar content. Fertilization may increase sugar reserves and improve sap-sugar concentrations.
- Increased sap volume. The increased efficiency in plant life functions that may result from a greater supply of nutrients to the tree could increase sap volumes.
- Increased tree growth. If tree growth rate is increased, it would substantially reduce the time necessary to bring small sugarbush stands into production.

Fertilization may be one of the most important factors in the rapid and efficient development of sugarbushes of the future. The impact may be particularly beneficial when fertilization is used in combination with genetically superior seedlings.

Effects of Conifers

Conifers have long been considered undesirable in sugarbushes because it is believed that they reduce sap production by lowering temperatures in the sugarbush and causing a shorter sap-flow period. Sugarmakers may also have difficulty in collecting sap if the sugarbush contains many conifers.

Two years ago we began a study to find out how removing conifers from a sugarbush would affect sap and sugar yields. In general, we found that, after the

conifers were removed, sap volume went up but sugar content went down. We will continue this study until the trends stabilize so that we can suggest what the producer may expect if he removes conifers from his sugarbush.

The Future

The need for future work in sugarbush management is great.

- We need to know more about the characteristics of high-producing trees—their crown shape, bole size, and how much competition they can withstand from their neighbors.
- The potential economic benefits of combined sap and timber production need to be evaluated. Maple is a highly desirable furniture wood; and if management for sap and timber can be combined, the sap producer may be able to make more money from his land.
- In this era of high land and labor costs, we need to determine the size and number of trees per acre necessary to give the sugarmaker maximum sap production.
- The long-term effects of fertilization and the potential benefits of irrigation need to be investigated.

Research in sugarbush management will have to be intensified to meet the potential expansion of the maple industry made possible by the recent improvements in sap-production techniques. The time when we can depend on hit-or-miss development of sugarbushes from natural forest stands has passed. With technical advances in management and tree breeding, we should be able to establish sugarbushes with trees that will produce 50 or even 75 percent more than unmanaged sugarbushes.

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