SUGARBUSH MANAGEMENT

FOREST STEWARDSHIP MANAGEMENT NOTE #20

Alpena-Montmorency Conservation District

INTRODUCTION

The first things that come to mind when people start thinking about maple sugaring are usually tapping trees and boiling sap. However, maple sugar producers should first give their attention the condition of their sugarbush, the woodland that produces the sap. A successful sugar maple operation depends on a good supply of sap which depends, in turn, on a healthy sugarbush.

This Note summarizes recommendations about various aspects of managing sugarbushes for healthy trees including stand selection, stand improvement, tapping methods, abiotic (non-living) disturbances, pests, and diseases. Sources of further information on these topics are listed.

SILVICULTURAL MANAGEMENT

1. STAND SELECTION - If a new sugarbush is to be developed and a choice of areas is available, the operator should consider three important factors: soil, slope, and aspect (compass direction the slope faces). Sugar maple grows best on moderately coarse-textured, moist, well-drained, deep soils (FSMN #4). Sugar maple is neither long-lived nor vigorous on wet or dry soils and is very sensitive to stresses under these conditions.

   The best soils for sugar maple tend to occur on mid-slopes (vs. ridges or valleys), but otherwise, the best slope depends on sap collection logistics. Relatively level ground is desirable for bucket operations, whereas, reasonably steep slopes are preferable for tubing system. Assuming suitable soil conditions, southeastern aspects are preferable, as they are warmer than north facing slopes but not as dry as southwest facing slopes.

2. PLANTATIONS - As sugar maples should not be tapped until they are at least 12 inches in diameter, most operations rely on established natural stands. However, information on establishing sugar maple plantations is available (#1,6,8).

3. STAND IMPROVEMENT - The largest volume of sugar-rich sap is produced by trees that are vigorous and fast growing, with large crowns (tops) well exposed to sunlight. Sap sweetness is primarily genetically controlled and can vary greatly among trees in a stand. Thus, improvement and thinning (FSMN #16) should focus on providing "sweet" trees with plenty of growing room. It is best to start thinning sugarbushes as soon as possible after the trees reach an average diameter of 2 to 4 inches. Regardless of tree size, however, the following steps for developing a sugarbush are recommended (#3):

STEP 1. Select the location of potential crop trees (the ones to be favored) at a spacing of 25 to 30 feet in all directions. This will result in a stocking of about 64 tree/acre. More detailed recommendations for spacing trees in a sugarbush are available for sapling stands (#7) and for stands of larger trees (#5,6). It is important to realize that proper tree spacing for sap production is much farther apart than for timber production as the objective of sugarbush management is to develop wide, deep crowns rather than long, clear trunks.

STEP 2. Find the tallest sugar maple with the widest and longest crowns at each of these locations. From among these, choose the ones with the fewest crown and stem injuries, deformities, or cankers (disease knobs). Mark the candidate trees with flagging tape.

STEP 3. Measure the sap-sugar content of the marked trees in the spring and select the one with the highest sap-sugar concentration at each location to be a crop tree. This requires placing a drop of sap on a refractometer. Refractometers cost over $200 dollars, but they are well worth it, if you hope to make a profit from sugaring. References #1,3, and 4 give details on field testing for sap sweetness.

STEP 4. Free the selected crop trees from competition by cutting any tree whose branches touch their crowns. This should be done gradually over a few years if removing all competing trees would create large openings in the canopy because sudden exposure can damage trees. Either leave or take all members of sugar maple sprout clumps (#2). Avoid felling trees and the use of vehicles in the stand during spring and early summer when sugar maple susceptibility to disease is high (#2).

Sugar maple should obviously dominate a sugarbush, but the presence of other tree species helps keep pests and diseases under control and a moderate number of non-maples should be retained. Removing understory brush, especially conifers, is generally beneficial as it tends to increase sap yields by reducing competition and increasing temperatures and it improves access.

STEP 5. Repeat stand improvement cuttings when the branches of surrounding trees once again touch the crowns of the crop trees. Eventually, only crop trees will remain.

STEP 6. When the sugarbush consists entirely of crop trees, inspect their condition annually and remove only diseased, badly damaged, or dead trees.

TAPPING

1. TAPHOLE SPACING - Trees can be tapped annually for many decades if done properly, but improper tapping can cause serious damage and reduce sap yields. Proper tapping consists of limiting the number of tap holes, properly locating them, and using tapping techniques that minimize damage. Tapping guidelines have become more conservative in recent years. To maintain healthy trees, use the following guidelines (#3):

Tree Diameter In. at 4.5 ft.	No. Taps per Tree
0.0 - 11.9	0
12.0 - 17.9	1
18.0 or more	2

Care must be taken to space the tapholes so that no new hole is drilled closer than 6 inches horizontally, or 2 feet vertically, from an old, open taphole. If a tree is not healthy or vigorous, if a tree is damaged, or if old tapholes did not close within 2-3 years, the tapping of that trees should be reduced or suspended.

2. TAPPING TECHNIQUE - The proper technique for drilling includes: drilling holes 2.5 inches deep or less, angling the holes slightly upward so they will drain, using a sharp bit, and not drilling when the bark or wood is frozen. Care must be taken not to drive spouts in too far as this can split the bark and result in large wounds. Paraformaldehyde, sometimes used to increase sap flow late in the season, should be avoided as it often leads to more decay of treated trees (#3). Remove all spouts soon after sap flow stops.

ABIOTIC (NONLIVING) DISTURBANCES

To avoid injuries that can lead to decay, loss of vigor, and lower sap yields, follow these practices:

- Avoid heavy thinning as this may contribute to winter sunscald; thinnings should be light and frequent.
- Locate roads carefully to avoid damaging crop trees, including their roots (#2).
- Avoid using vehicles in the sugarbush when moist soil leads to rutting as this damages roots and soil structure; try to restrict operations to periods when the soil is dry or frozen.
- If pruning is done, cut branches so a bark ridge collar is left rather than cutting flush to the trunk.

BIOTIC (LIVING) DISTURBANCES

1. INSECT PESTS - Several types of defoliating insects can be a serious problem for sugar maples, so operators must monitor their sugarbushes throughout the growing season. Outbreaks rarely appear within a single year. Rather, defoliators typically reach damaging levels only after 2-3 years of favorable conditions. Operators should be alert to the light defoliation and unusual abundances of caterpillars and moths that often occur 1-2 years before major outbreaks. If these early warning signs are observed, a specialist should be consulted and treatment options considered, including spraying synthetic organic or microbial ("Bt") insecticides. Consult Reference #3 for excellent photographs and descriptions of sugar maple insect pests.

2. DISEASES - Collectively, diseases (mostly fungi) probably cause more losses to sugar maple than all other destructive agents. Many of the important diseases are facilitated by wounds, so wound prevention must be a priority (#2). Maintaining tree vigor through moderate thinning, suppression of severe defoliation, and proper tapping will also help avoid disease problems. Consult Reference #3 for excellent photographs and descriptions of sugar maple diseases.

REFERENCES

FSMN #'s refer to other Forest Stewardship Management Notes in this series.

#1 Carl, C.M., Jr., et al. 1982. Sugar maple research: Sap production, processing, and marketing of maple syrup. USDA Forest Service GTR NE-72.
#2 Houston, D.R. 1993. Recognizing and managing sapstreak disease of sugar maple. USDA Forest Service RP NE-675.
#3 Houston, D.R., et al. 1990. Sugarbush management: A guide to maintaining tree health. USDA Forest Service GTR NE-129.
#4 Laing, F.M. and D.B. Howard. 1990. Sap sweetness consistency vs. growth rate in young sugar maples. Northern Journal of Applied Forestry 7:5-9.
#5 Lancaster, K.F., et al. 1974. A silvicultural guide for developing a sugarbush. USDA Forest Service Research Paper NE-286.
#6 Smith, H.C. and C.B. Gibbs. 1970. A guide to sugarbush stocking based on the crown diameter/D.b.h. relationship of open-grown sugar maples. USDA Forest Service Research Paper NE-171.
#7 Voorhis, N.G. 1986. Sugarbush management in young stands: Effects of crop tree thinning. Northern Journal of Applied Forestry 3:106-108.
#8 Yawney, H.W. and C.M. Carl, Jr. 1970. A sugar maple planting study in Vermont. USDA Forest Service Research Paper NE-175.

RESOURCES

Organizations:

Michigan Maple Syrup Producers Association
Rt. 1, Baatz Rd.
Maple City, MI 49664

Wisconsin Maple Syrup Producer's Council
Aniwa, WI 54408

Equipment Suppliers (for refractometers):

Grape's Sugar Bush, Rt. 2, Box 54, Holcombe, WI 54745

Grimm Co., Inc., Box 130, Rutland, VT 05701

Leader Evaporator Co., Inc., 25 Stowell St., St. Albans, VT 05478

Reynolds Sugar Bush, Aniwa, WI 54408

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