

Sugarbush thinning – strategies for improved tree health and sap sugar production

Peter J. Smallidge. 2010 (revised from 2005). Cornell University Cooperative Extension Department of Natural Resources, Ithaca, NY.
pjs23@cornell.edu 607-592-3640

January 2010



There are many old farm woodlots with a history of maple syrup production and countless more acres where sugar maple dominates and could be put into annual syrup production. There are some well established principles, but the specific answers will depend on the details of your property. The specifics that will vary from your property to others include the length of time until you tap, your production goals at the outset, the current density of trees, health and vigor of the old trees, and the number of smaller trees.

Before going into the technical information, let me share some resources. First, the Cornell Maple Program includes a statewide network of Cornell University Cooperative Extension Educators who can help in many aspects of sugarbush management and know of specific educational resources. You can find a maple team member on the web at www.CornellMaple.info Also, several DEC foresters and private sector foresters have experience managing sugarbushes. Find one who has this experience and invite them to your property.

What's the target?

All management activities have an objective or target. With sugarbush management a goal is to produce abundant sap with high sugar content. Trees that have large diameter crowns and a high percentage of the length of the tree's stem in live crown have better sap quantity and quality. These crown dimensions influence the annual production of new wood, the sap wood, and that influences sap quantity and quality. The quantity and quality of sap influences the efficiency and productivity of the operation. Weather will strongly influence what happens in any given year because of the need for freezing nights and sunny days to help the sap run.

Under ideal growing conditions, a sugar maple crown might be 50 - 60 feet in diameter and 80% of the stem height as live crown. In a forest, crown diameter and live crown ratio are half as much. Management in a forested sugarbush strives to increase crown dimensions while maintaining large healthy trees. Typically, competition among trees for sunlight limits crown growth. As trees get older and larger, our ability to influence crown dimensions and maybe to influence sap characteristics decline. We have our greatest influence with management on smaller trees. Thus, management to encourage and maintain full crown dimension should begin when trees are 6 to 10" in diameter. Starting management with smaller diameter trees will allow even greater control over crown dimensions. Allowing a sugarbush to stagnate and close into a dense canopy can have negative long-term impacts on future syrup production.

Knowing Your Needs

The first step, as with all woodlot management tasks, is to know exactly what you want and when you want it. Then, you can determine if your resource can suit your objectives. If not, you can refine your objectives before beginning any activity. A forester can help you evaluate the compatibility of your needs and objectives with your resources.

Because the sugarbush in question is intended for use in retirement, it is important to know the timeline to retirement. While you may in fact need to thin the sugarbush, you want to make sure you retain enough trees to achieve your production goals at the time you retire. A five year horizon will mean retaining more of the old, presumably less thrifty trees. A twenty year horizon will give you a chance to favor the growth of the smaller and younger trees. With 20 years of ample sunlight on good soils, the 10 to 12" diameter trees could be several

inches larger and very productive. Thus, with more time you might thin more aggressively in the older trees, but never too aggressively. You need to retain enough stems to produce the desired sap quantity for boiling.

Knowing Your Resource

The first step is to determine the current density of stems in the sugarbush because density will influence the sunlight available for growth. A dense sugarbush will have limited understory development, no brambles, and mortality of lower branches of the large trees. You can also use an increment borer to determine the growth rate. You should try to minimally attain diameter growth of 1/8th inch per year on 10 inch trees; 1/10th inch per year on 12 inch trees, and 1/12th inch per year on 16 inch trees. Thus, your 18" tree is growing almost 2" in diameter per decade and your 10" tree is growing almost 4 inches per decade. These growth rates will allow you to follow maple syrup tapping guidelines and help ensure a vigorous tree. As you assess the density of stems, pay close attention to the presence of diseased or stressed trees, especially those which might fall or otherwise not be productive for sugar. Tree health matches tree density as important criteria to evaluate sugarbushes when planning for future production.

If the canopy is fully closed, then some trees are not getting adequate light and the growth of most trees is compromised. Competition for light will limit diameter growth and thus decrease sugar concentration which in turn reduces syrup production. You will want to thin down to a density of trees that retains good production per acre (number of taps) but that provides sufficient light to give ample growth of trees. The specific number of trees to retain depends on the size of the trees. Details of thinning regimes are beyond what can be discussed here. In general though, you would seldom want to remove more than 1/4 to 1/3 of the basal area during any single harvest. In the first thinning of an unmanaged stand the "losers" are often easy to select. In managed stands, it becomes increasingly difficult to select trees for cutting if you have left the best trees each time.

Making the Cut

Once you decide that thinning is necessary, the process to select trees to remove from the canopy could follow one of two paths. Use area-wide thinning if your woodlot has a relatively high percentage of good growing stock. Use crop tree management if the growing stock in your woodlot is relatively sparse and widely scattered. With area-wide thinning selection criteria for a sugarbush should focus on removing: (1) trees that are unhealthy, diseased or otherwise unlikely to survive more than ten years, (2) undesirable species and species of poor quality, (3) sugar maple with evidence of significant disease or insect damage, (4) sugar maple with mechanical defects such as broken crowns, and (5) crowded sugar maple with retention of those trees having the highest relative sugar content. Retaining about 25% of the stems as species other than sugar maple can reduce the likelihood of insect defoliation. With crop tree management, focus on reducing competition to sugar maples with stems that are free from insect and disease and that have vigorous crowns. You will want to remove competitors from at least two side of the crop tree to give the crown full freedom to grow. The goal is to provide at least 4 to 6 feet of space between adjacent crowns. Subsequent thinning should free additional sides of these crop trees. If you are trying to select between two otherwise equal trees, sugar content of the sap is a good tie breaker.

The quantity of syrup you wish to produce when you start will influence how aggressively you should thin. If you don't have specific production goals and there is reasonable stocking of the smaller stems, a more aggressive thinning of the larger trees would help ensure you maintain vigorous growth of the smaller stems.

With either approach to thinning, you might want to retain some high value trees of other species if they are located on good soils and not competing with sugar maple that have good form and quality. You can culture these to become sawlogs and supplement future income. Your willingness to retain other species depends on the specifics of your objectives.

Do not necessarily try to make the sugarbush a pure stand of sugar maple. Most sugarbushes aren't big enough to impact the landscape or other ecosystem process if they are a monoculture. However, there is enough soil variation in most sugarbushes to allow some diversification that favors other species on thin dry or poorly drained areas. Sugar maple performs best on well drained productive soils. Other species will do better on wetter

or dryer soils. The variety of trees will benefit a variety of wildlife, simplify the task of keeping your maples healthy, and improve the aesthetic of your sugarbush.

Final Thoughts

Use great caution in cutting the larger trees. It isn't the tree stem you are felling it is a large crown you are trying to squeeze down among your residual stems. Cut smaller diameter undesirable stems first to help open gaps to allow the larger crowns room to drop. Hone your skills in directional felling with Level I and II in Game of Logging.

The crown of a tree is the best predictor of sap sugar concentration and sap quantity. Open grown trees, or trees with ample sunlight will develop the best crown.

File: 00828



A dense sugarbush can have a beautiful “cathedral” look, but high density has negative effects on tree growth and vigor.

File: 03035



A variety of insects and diseases and reduce the strength of stems and may reduce sugar concentration. Trees with these conditions should be removed from the sugarbush.

File: 01049



