



Supporting Sustainable Management of Private Woodlands

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Maintaining a Healthy Sugarbush

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A sugarbush is a special type of woodland. Woodlands include a complex mixture of natural processes and attributes such as soil type, elevation, tree species, types of wildlife, history of use, tree age and more. Foresters can help maple producers gain an in-depth understanding of these factors to achieve a healthy and productivity sugarbush, but there are several steps a maple producer can take on their own.

Three principles should guide the way a maple producer looks at a sugarbush. These principles apply to all woodlands. First, managing the sugarbush to produce a specific product, in this case sap, is really about managing which plants receive sunlight. Sunlight feeds the leaves which make sugar, which of course is needed for high quality sap. Second, trees are biological organisms, similar in some respects to a tomato plant, a cow, or a human being. Biological organisms are born, grow and eventually senesce. They also respond to stressors in their environment, and their vigor determines how well they respond. Third, as trees get larger they require more space. Because trees can't move as they get crowded, some trees will die as the sugarbush matures.

With these principles in mind, a reasonable goal for a sugarbush is to make sure that trees of good vigor and potential longevity have adequate sunlight, stress events are minimized, and the effects of crowding are controlled by the owner who selects which trees remain. Following are a few actions that maple producers can take to help keep their sugarbush healthy and productive.

1. Monitor crown health. The leafy part of the tree, the crown, is perhaps the most important part of the tree to monitor. Be alert to evidence of unhealthy crowns. Symptoms of poor crown health may include dead branches in the upper part of the crown, poor leaf color during the growing season, unusually small leaves, or a transparent crown (Figure 1). There will always be a couple trees in a sugarbush with poor crown health, but if several trees show these symptoms a problem exists. A symptom tells you a problem exists, but it doesn't usually



Figure 1. The crown of this sugar maple showed high levels of crown dieback. The soils were too shallow for good sugar maple growth. Dieback occurred after a heavy thinning that was followed by a late May frost and then defoliation by gypsy moth and forest tent caterpillar. Accumulated stresses are difficult for a tree to endure.

identify the problem. Crown health may decline as a result of root problems, such as compaction from machinery. Repeated injury to the crown can also reduce health because of stress on energy resources in the roots; for example when defoliation coincides with drought. Crown problems often result in less sugar production and lower yields the following sap season. In extreme cases, minimize or avoid tapping to allow trees to recover a healthy crown. Unfortunately, the causes of unhealthy crowns often can be difficult to change. Some of the following actions also help maintain good crown health.

2. Assess competition for light among trees. Trees need light to grow. Although sugar maple is tolerant of shade, it doesn't thrive in shade. Maple producers need their trees to thrive, not just survive. The appropriate stocking, that is the number of trees of a given size per acre, is a numeric index of competition for resources, specifically light. There are also visual indications of too much competition for light. First, if the upper canopy, collectively the crowns of the tall trees, is closed and doesn't allow sunlight through there may be too much competition for light. If the canopy is closed and some trees have rounded crowns yet other crowns are flattened on two or more sides, there is likely too much competition (Figure 2). If the maple trees produce seeds, but there are no seedlings, there is either too much shade or too many deer. Before taking action, visual cues to competition should be assessed by a forester who will measure stocking. In many cases the state forestry agency can provide a public forester to do the assessment. These foresters are pre-paid...your tax dollars at work. If competition is high, thinning around the best trees will ensure they have enough light to continue to thrive. Look for resources on Crop Tree Management to guide the selection of trees to cut and those to leave. Woodlot and sugar-bush thinning webinars are archived at www.youtube.com/ForestConnect.



Figure 2. The tree in the center of the picture is shorter than the tree to the left, and has a smaller crown. The tree on the left is winning in the contest for light, but the shorter tree is still having a negative impact.



Figure 3. Ferns and beech are native species, but can form dense thickets that complicate production for maple producers. The canopy may be vigorous and healthy maple, but the understory portends future problems.

3. Look for interfering plants. Interfering plants are either native or non-native (AKA "invasive"), and interfere with something the owner wants to accomplish. Examples of interfering plants include multiflora rose, ferns, beech, striped maple, bush honeysuckle, and many more (Figure 3). For maple

producers, interfering plants may complicate access for tubing or buckets. Interfering plants may also impede efforts to establish young desirable maple seedlings. In some areas, deer pressure is high and they browse desired plants. This browsing gives a growth advantage to the interfering plants that deer don't browse. Strategies and techniques to control interfering plants depends on the problem plant, its abundance, how thoroughly the maple producer wants to control the plant, and if the producer will use herbicides or organic strategies. The author's website includes numerous resources to help control interfering plants.

4. Monitor tree diameter growth. Tree diameter growth is critical to maple syrup producers. Diameter growth is an index of crown health. Diameter growth also helps heal tap holes, add new wood for future tapping, and as a reservoir for sap. A tree may produce the same amount of wood each year, but the thickness, known as the diameter increment, will decrease because the wood is spread around a bigger tree. Tapping guidelines assume tree growth is sufficient to add new wood and prevent future tapping into columns of stain from prior tapping. "Pattern tapping" helps prevent tapping into a stain column, and so does adequate diameter growth. Producers should expect annual diameter increments of 1/8th to 1/10th of an inch for trees less than 16 inches, 1/10th to 1/12th of an inch per year for trees 16 to 20 inches, and 1/12th to 1/16" of an inch for larger trees. The actual growth necessary to provide a sufficient thickness of new wood depends on depth of tapping and the offset of the tapping pattern between years. "Band tapping" high versus low bands of the tree will reduce the expectation for diameter growth (but why would you strive for slower growing trees?). Annual measurements at the same position on the stem with a tape measure will reveal tree growth. Producers can place an aluminum nail in the tree at 12" high, and use a 3.5 ft stick to locate consistent height to annually measure diameter at breast height (dbh)(Figure 4). Measure a minimum of 30 to 40 trees, but at least one per acre. Just as producers should measure sugar concentration, so they need to measure tree diameter growth.

5. Consider tree age and longevity. Sugar maple can be a long-lived tree, with some trees reaching 300 to 400 years of age under ideal conditions. Under normal conditions, maple will likely have reduced production between 150 and 250 years of age. Maple producers



Figure 4. Repeated accurate diameter measurement of this white pine is simplified by a nail at approximately 12 inches above ground and a 3.5 ft stick.



Figure 5. Plastic fence hung on a single strand of high tensile wire on a bumper block, for small patch cuts, will help reduce the impact of deer on small seedlings.

could assess if there are patches of old or otherwise unproductive maples and regenerate a couple small patches every few years. Cutting within patches needs to be sufficiently intense to allow sunlight to the forest floor. Patches could be 0.25 to 0.75 acres, and vigorous trees within the patch could be retained. Young seedlings should be protected from deer by fencing (Figure 5) or dense continuous piles of brush around the perimeter. A forester can help assign vigor-ratings to trees, and producers can monitor sap production for individual trees. The location and timing of patch cuts should synchronize with planned changes of tubing and mainline.

6. Livestock. Historically many farm woodlots and sugarbushes allowed cattle and other livestock to free range. In these cases, grazing involved a perimeter fence and then free choice by the livestock. This continuous or set-stock grazing proved detrimental to the animals, the trees and the land where the stocking rate (same concept as for trees, see #2) was too high. Sustainable grazing is possible, but requires considerable work. Silvopasture is a deliberate process of integrating livestock into woodlands while also managing for nutritious forage plants. Management-intensive rotational grazing in small paddocks, with herd/flock movement daily ensures ample rest periods for the land and intensive, and restorative grazing of the forages (Figure 6). With careful planning, silvopasture practices can solve some interfering plant problems. Any plans for deliberate grazing should assure that root damage is avoided; pigs in particular can cause root damage through their tendency to “root.” The author’s website has several references and resources for silvopasture.

7. Avoid soil ruts and compaction. While tree crowns are perhaps the most important part of the tree for producers, tree roots tie for first place or a very close second place. The roots anchor the tree to the ground, pull water from the ground into the stem for sap, and feed the foliage. Damage to roots by tractors, skidders, or livestock can cause irreparable damage (Figure 7). It is easier to prevent a problem than fix a problem. Producers with buckets need to access the sugarbush, but they should limit the number of trails. In chronically damp or soggy areas, install corduroy with a continuous mat of small logs and poles to float the tractor. Use as small a machine as possible that is safe and effective, and add high flotation tires if practical. Other types of woods work should allow equipment



Figure 6. Small ruminants and poultry may be better suited to sugarbush silvopasture than cows and cattle. Each species has unique attributes that need consideration.



Figure 7. Ruts more than a couple inches deep will shear root, limit water and nutrient uptake, and expose the tree roots to infection. Some roads are necessary, but limit the extent of roads. In wet areas, invest some low value stems to make corduroy that will float equipment.

only during seasons when the ground is firm, usually summer, dry falls, and during cold winters. Repairing ruts with fill or corduroy may help avoid the need for a new trail and new damage in a new area, but this will not repair the damage to the roots.

8. Mixtures of species. Your sugarbush will generally be healthier and more resistant to stresses such as insect defoliation if there is a mixture of species. When thinning a sugarbush to provide more light to desired trees, avoid the temptation or outcome of a monoculture. Providing adequate sunlight to keep a thrifty maple healthy may be best accomplished by cutting...another maple...there, I said it, it is okay to cut a maple. Seriously though, most producers can look at a maple with a small crown, weak fork, or old scars from maple borers or tractors and know that tree is not productive or is otherwise risky (Figure 8). Bucket producers have the advantage of truly knowing a tree's productive capacity. Paint or mark a tree of low productivity during the season, and cut that tree later in the year when time permits. When cutting firewood or thinning, set a target for the main canopy to be about 75% sugar maple or red maple and 25% other species. These aren't hard numbers, but use them as a guideline.



Figure 8. Disease and damage can cause weak stems that are prone to failure. Trees like the one pictured should be removed to avoid complications during the season and free growing space for nearby maple trees.

Time is of course the biggest obstacle to maple producers working in their sugarbush. Start with the easy tasks, and keep a list of priorities. Use this list to guide a discussion with a forester from your state forestry agency or your consulting forester. Let them know your goal is a productive and healthy sugarbush. A forester can help you develop a plan and a schedule to optimize the use of your time. Finally, be safe in the woods; there are too many stories of maple producers hit by trees and crushed by tractors.

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For additional information on woodland management go to:

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