Cornell University Cooperative Extension

Forest Connect

Supporting Sustainable Management of Private Woodlands

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Assessing a Maple Woods for Sap and Syrup Production

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Many woodland owners enjoy working their land with the intent of generating income. While timber harvesting is common, harvesting is episodic and may not be suitable for any given property at any point in time. Maple production is compatible with goals that include timber and firewood harvesting, and in some cases offers additional economic and personal opportunities for the owner. Woodland owners thinking about maple production will need to consider the characteristics of their property, and the characteristics of the section of woods where sap is collected, called the sugarbush (Figure 1).

Maple production, the collection and processing of maple sap into syrup or value-added products, can take one of three strategies. These strategies range from significant owner investment to no direct investment by the owner. With the greatest investment, the owner is the producer. As producer the owner installs a sap collection system (usually tubing, infrequently buckets for commercial production), a way to process the sap, and a plan to market the syrup and any related maple products. This strategy has the greatest investment and the greatest return. An intermediate strategy is for the owner to collect the sap and sell it to a nearby producer. The owner thus needs only to invest in the collection system and a manner or strategy to transport the sap. The least investment is for the owner to lease trees to a maple producer who does the work and pays the owner, usually, on a per tap basis. All these op-tions may allow the owner to take advantage of a reduction in land taxes through the agricul-tural district laws.

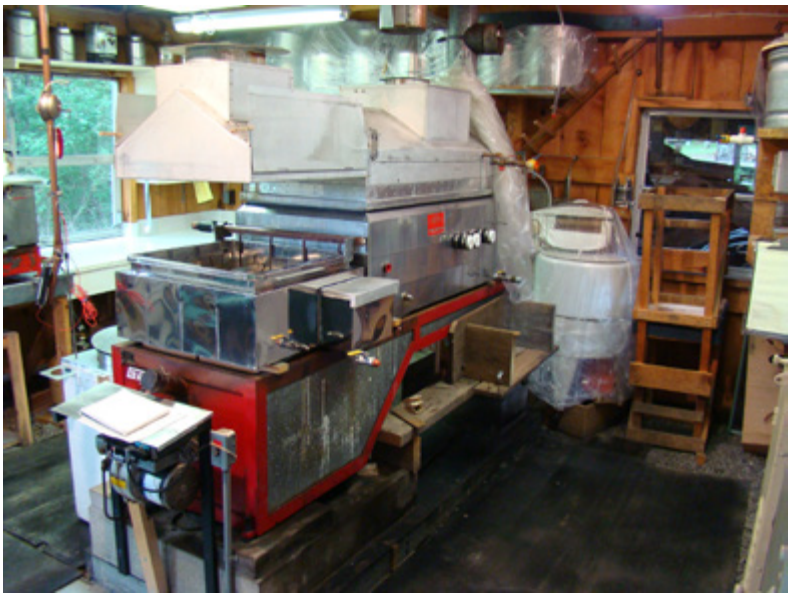

Figure 1. Modern maple production is still just boiling sap into syrup but involves an often involved process of highly engineered vacuum pumps, reverse osmosis, high efficiency evaporators and storage in controlled environments.

Before thinking about the specific attributes of the woods, an owner needs to consider several property-level conditions of their land and ownership objectives before venturing into maple production. The list is similar to the considerations that would be made before starting any new enterprise, and the full consideration is beyond the scope of this article. The owner should consider their proximity to a market, their ability to market products such as sap or syrup, whether they would accept tubing in their woods (which usually remains throughout the year, Figure 2), their willingness to make a multiyear commitment especially if they lease their trees, their availability and capacity to participate in a busy spring season, and their ability to finance some initial investment for supplies and equipment. Owners considering a maple enterprise should spend time with other producers and join the NY Maple Syrup Produces

Figure 2. Maple tubing is the standard approach for collecting sap for the commercial (and profitable) production of syrup. Tubing system designs allow for ease of access. Tubing usually remains in the woods throughout the year.

Association. They could also participate in the annual summer training called Cornell Maple Camp, announced at www.CornellMaple.com and usually held at Cornell's Arnot Forest near Ithaca.

The economics of maple versus timber can be either simple or complex. On the simple side of this consideration is a woods with maple trees that are mostly 10 to 16 inches in diameter. If the comparison is maple versus timber, these small-er trees can begin producing an annual return immediately, but might be a few decades from a timber revenue event. The net present value and collective revenue through time is in the favor of maple sap/syrup production. If the trees are 18 to 22 inches and high quality stems, the economics would likely favor timber. This isn't all or nothing, because the trees used for maple sap and eventually can be sold as "tap hole" maple logs to buyers with markets for specialty lumber (Figure 3). The complexity arrives because some owners with high-value timber trees are reluctant to harvest trees, they want to maintain a high canopy, or want an activity that is annual and binding across generations of the family. The analysis is further complicated because there will be greater and lesser value trees, and by adding the potential for increased revenue from maple value-added products such as maple cream, granulate maple sugar, maple candy, or maple cotton candy.

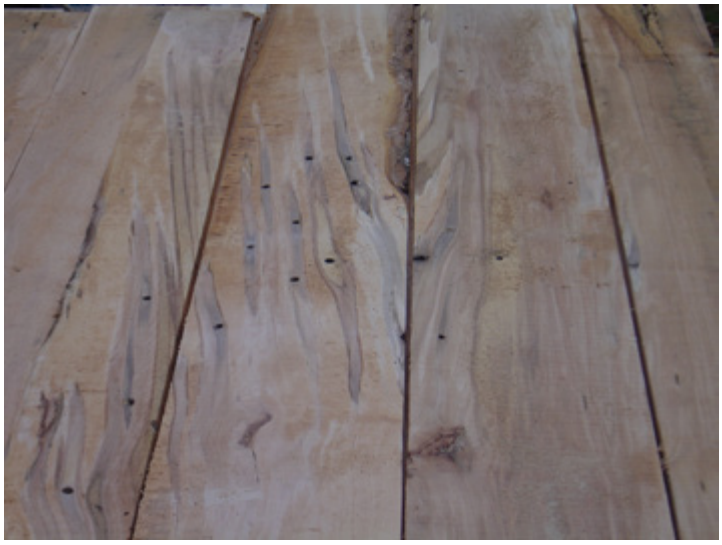

Figure 3. Lumber made from previously tapped trees is called "tap hole maple" and used in specialty wood products such as tables, cabinets, wainscoting, and picture frames.

Having considered the broad questions of whether to begin a maple enterprise, there are several characteristics of your woods that will help you identify the best place to begin, or which section of your property to avoid. The assessment is done in one stand, or section of your woods that is distinct from other sections of your woods; the

stand is analogous to a farmer's field. Sugarbush stand criteria presented here are based on a fact sheet called "Assessing the commercial potential of a site for maple sap collection." This is available in the "downloadable publications" section on www.CornellMaple.com While intended to inform potentially commercial producers, the nine assessment criteria will help producers of any scale.

Figure 4. Maple producers attending Cornell Maple Camp learned how to use an angle gauge to estimate the number of tapable trees. The abundance of tap trees per acre influences efficiency.

The number of taps per acre will influence efficiency, and thus cost of collecting sap. The easiest way to estimate the number of taps per acre is to use a point sample with an angle gauge (Figure 4). Using the angle gauge, as described in the assessment guide, provides the owner with a rigorous method to know how many 10 inch diameter (the minimum tapping size) and larger maple trees exist. The owner can keep track of red and sugar maple, both of which can produce delicious syrup. In areas with few maples, it may be possible to thin the woods and accelerate the growth of the smaller maples so that more will reach the minimum diameter.

Soils are important as they influence the growth of trees, the types of trees, and the ability of the trees to respond to stressors. Sugar maple grows best on soils that are fertile, moist and well-drained. Red maple has a broader range of acceptable soils. Owners can use the USDA NRCS web soil survey to learn about their soils. A fact sheet about woodland soils is available at www.ForestConnect.info via the link to popular publications. Unfortunately, if the soils aren't good for maples, there are few options for remediation. Don't try to force a maple to grow on a soil where it doesn't belong.

Figure 5. Good roads are an asset. Bad roads are a headache. Work with professionals to install roads that allow for ease of access in as many seasons as possible. Roads are an investment that pay long-term dividends.

The health and quality of trees is likely a combination of soils and past activities in your woods. Tree crowns should be evaluated to ensure there are fine branches and that the upper branches are thriving. Stems should be free of significant defect that would compromise their structural integrity and lead to premature stem breakage. Damage to the root flare or root zone could indicate root decay, greater sensitivity to drought, and lowered resilience to defoliation. A forester can advise an owner on management practices that will enhance the vigor of trees in their woods.

The location of the production woods relative to the collection site impacts the efficiency of moving sap. Eventually the sap must be transported or moved from the sugarbush to a collection point. The ideal condition is the sugarbush located immediately uphill from collection tank, and next to the sugarhouse where the sap is processed. If the sugarbush is remote from the collection site, the sap must be moved through tubing or in a tank on wheels. Poor access can be improved by building a new road to the sugarbush or installing an effective tubing system to move large quantities of sap.

The presence of roads and topographic features influences the ease of tubing installation, work during sap season, and work during the off season (Figure 5). The owner/producer will spend considerable time in the

sugarbush during the season, and in the off-season. Road access improves efficiency, simplifies the transport of tools and supplies, and increases the likelihood that the owner will monitor the condition of the sugarbush and the operation of the tubing system. Poor trails and roads can be resolved, perhaps, with a forest harvest that plans for a road and trail network that considers future maple sap collection.

The presence of electricity will determine whether you can easily run a vacuum pump, need to add an electricity source or will use buckets. The value of electricity is the potential to use an artificial vacuum system. Vacuum systems increase sap yield by about 5% for each inch of vacuum (measured as inches of Hg). Thus, a well-designed and maintained system with vacuum operating at 20 inches of Hg can expect to double the yield of sap compared to a conventional system, and with no health consequence to the tree. Without electricity, the owner could use and maintain a generator. In a remote sugarbush without electricity the owner can use tubing with a gravity flow, or buckets.

The topography of the area, particularly the steepness and the direction of slope, impacts the ease of tubing installation, if sap runs to or away from collection, and the potential for natural vacuum. Sap runs downhill, but steep hills are only fun in one direction. Tubing systems operate best when the tubing is tight, straight and downhill. Gentle slopes of 3 to 15% slopes are comfortable to work on with tubing, but more challenging with buckets. Recent technology has emphasized the use of smaller 3/16th inch diameter tubing (traditional tubing is 5/16th inch diameter). However, research at Cornell's Arnot Forest and in Vermont is finding some problems related to plugging of the smaller diameter. When the 3/16th inch tubing works, it can create a natural vacuum and save the expense of electricity and an artificial vacuum pump.

Canopy closure and competition among trees for light will influence tree growth rates, taphole closure, future sugar production, and tree vigor (Figure 6). At the core of maple production is realizing that the tree is the factory. The tree uses and requires sunlight to photosynthesize and create sugar that is in the sap. When trees compete for sunlight they are less efficient at making sugar. A forester can assess the amount of competition among trees for sunlight, and write a prescription for thinning to increase the growth, and thus vigor, of the maple trees.

Figure 6. Maple trees need sunlight to make sugar, and for sufficient growth to remain vigorous. Closed canopies, as shown, result in competition among trees for light and reduced growth for all trees.

Interfering plants, native and non-native, can become sufficiently dense as to complicate your work in the woods and the collection of sap. A variety of native and non-native plants can become sufficiently abundant as to make access into the woods difficult or restrict the regeneration of desired tree species. The solution to managing interfering plants depends on the problem plant and the objectives of the owner. Several webinars on this subject are archived at www.youtube.com/ForestConnect.

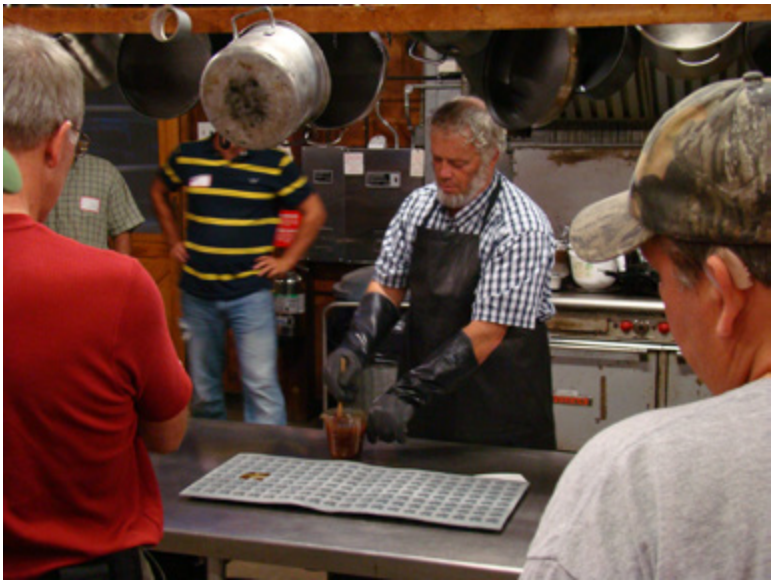

Figure 7. Maple products can bring high values. The value-added products can sell for 3 to 8 times the equivalent value of syrup. Participants at Cornell's Maple Camp learn how to make maple candy.

Maple production requires a commitment of space, and perhaps time if you're the producer, but the pay-off can be rewarding (Figure 7). The process connects you to the land and can bind that connection across generations. Enter the process with understanding, real-ism, and the spirit of America's oldest agricul-tural venture.

For additional information on woodland management go to:
www.ForestConnect.com & www.CornellForestConnect.ning.com

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