

Silviculture, and Why it Belongs in a Sugarbush

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I sat down to write this article at Yale-Myers Forest in a 1700's farmhouse, flanked by two sugar maples from a similar era. Today is frozen and typical of a January day in New England, but the weekend will bring 60 degrees F here in Connecticut, along with heavy rain. No doubt the house and the maples have seen their share of changes in the land and climate

We are seeing new challenges for our maples and their offspring. Invasive species, climate change, poor forest management, and other factors are all serious threats to the productivity of harvesting maple sugar in the decades to come. However, there are things we can do to protect the tradition of maple sugaring in our regions. Silviculture is our primary tool.

First off, let's tackle the climate change question. The question is not whether climate change is occurring or not – it is, and I expect the maple producers reading this have already realized this through changes in their tapping season. The question is – what will climate change mean for the future of sugar maples? News articles and scientific papers have used the threat of sugar maple loss due to climate change as a scare tactic to get people to care about climate change. NO MORE MAPLE SYRUP! they say.

However, the science behind these claims is more nuanced than simply predicting the presence or absence of sugar maple in its current range. Climate predictions showing range shifts for tree species are at a broad scale and should not be interpreted as 100% movements of ecosystems north. The

intent of these models was to look at landscape level changes and habitat suitability, not the presence or absence of a species.

Regional changes in climate are happening now, but the effects of these changes on the long-term presence of sugar maple will be very site-specific. Species will be lost from some sites within a region, but may persist or even expand on other sites in that same region. Sugar maple is expected to be lost from some sites in its current range, but to persist on others. Red maple is predicted to persist and expand on more sites than it is lost from. What will actually happen is unpredictable but these trends give us some direction.

A key to understanding forest ecology is to understand that the species that exist on a site are there for two reasons: 1) they found an opportunity to establish, and 2) they out-competed other species for that space. Species regularly exist on sites that are not optimal for their growth. White pine is an excellent example. It grows best on well-drained fertile sites, but it can also be found on a hummock in a bog because it was able to find a competitive edge to establish on that hummock.

What this mean for sugar maple in a time of climate change is that we have an opportunity now to manage our sugarwoods and provide them the opportunity to establish new maples and the ability to outcompete other species, even if climate is pushing the stand in a new direction. Silviculture is the means for which we find the tools to make this happen. Silviculture is the art and science of controlling the establishment,

growth, composition, health, and quality of forests to meet the diverse needs and values of landowners and society. Simply put, it is applied forest ecology. Silviculture is best understood by breaking it down into tending operations and regeneration systems.

Tending operations focus on growing trees that already exist in the woods, such as thinning out trees for the benefit of others to have more space. Regeneration systems are methods by which trees are removed in order to provide a desired amount of light to allow new trees to be established. The timing and amount of light allowed in, as it relates to site quality and seed sources, will determine which species are able to regenerate.

Most sugarmakers will thin out their woods to favor maples prior to setting up tubing systems. However, this is often a one-time treatment when it should be seen as a process to repeat. If we think about trees as a barn full of dairy cows with a limited amount of hay that can fit in that barn, then we can understand how trees need space to thrive. Barn = sugarbush, cows = trees, hay = fixed amount of sunlight. If the barn is full of calves, then we can

feed about 10x the number of calves off that hay than we would mature cows. However, as those calves grow older they get bigger and need more hay. If we do not remove some of those calves, then all of the calves in the barn will be underfed. However, we can increase the growth of our best calves by removing those that are underperforming. We need to do this multiple times until the calves become mature cows and at their production maximum. At that time we

might think about getting some more calves.

Although this is a simplified analogy, the same is true for trees in our sugarwoods. We need to give room to the best trees by removing the underperforming ones. The added benefit of tend-



An estimated 300 year old maple on the author's farm in Union, CT. The overstory of this former sugarbush is dying out while the understory is dominated by barberry and heavy deer browse. It'll take some work, but this site is overdue for some regeneration treatments.

ing our woods is that the trees we leave behind will be healthier and better able to withstand stresses that may result from climate, disease, and harvesting sugar. These trees will also develop larger crowns and produce more sap with higher sugar contents – it's a win-win. The caveat is that we ensure any harvesting which occurs in our woods does not cause damage to the trees we're leaving behind – especially by driving all over their roots. What is not effective is leaving underperforming

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maples in a sugarbush simply because they provide another tap. This low productivity “tap” is detracting from your production because it is likely reducing the productivity and growth of your better trees. Don’t tap the small stuff – either give it room to grow or remove it to give its neighbor room to grow.

Diversity in your woods is important for ecosystem function and preventing insect outbreaks. One winner in the models of forest change with climate is red (soft, swamp) maple. Red maple has a native range from Florida to New Brunswick and is a steady winner in changing forests. It is very flexible in its ability to adapt to different sites but rarely dominates a site long-term. It’s

no secret that red maple makes great syrup and it is something we should pay more mind to as we manage sugarbushes for the future.

Regenerating our sugarbushes is critical for ensuring their longevity in a time of change. But not all forests need to have regeneration present all of the time. Healthy, young stands of maple should be tended and allowed to grow, as it may be 100 years or more before they’re in need of regenerating. However, older woods where the mature trees are starting to fade out or suffering from heavy damage should have steps taken to regenerate them. This will become even more important as droughts and storms resulting from

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climate change start to erode our over-mature stands of trees.

This is where the work comes in, as forest regeneration faces many challenges. Invasive plants such as Japanese barberry out-compete maple regeneration and might need to be removed prior to providing an understory more light. American beech acts in a similar way, but recent studies indicate that the relationship between beech and sugar maple might also be strongly tied to calcium content (and/or pH) of the forest soils, so sometimes we're fighting to get rid of beech to favor sugar maple on a site where beech competes best. White-tailed deer complicate all of these dynamics in that they favor invasive shrubs and beech by preferentially browsing on maples. Hunting deer is fun but rarely effective enough to lower a deer population to a level in which regenerating maples becomes easy. Deer protection of seedlings or large-scale regeneration treatments that overwhelm a local deer population are needed to effectively deal with browse pressure. In spite of these challenges, sugarmakers need to think about regenerating portions of their woods today so their children's children have something to tap.

Key points to keep in mind

1. Climate change should not be ignored and poses a significant challenge to the maple industry.
2. We can influence the future of our sugarwoods through proactive management.
3. Silviculture is a means by which sugarmakers can provide maples with competitive advantages and opportunities in a changing climate.
4. Stop tapping the small trees. Either give them room to grow or remove them in favor of their neighbor.
5. Trees with room to grow yield more sugar and can better withstand the stresses posed by climate change.
6. Red (soft, swamp) maple is a survivor and we should pay it more mind.
7. Today's regeneration will be tomorrow's forest.



The dense crowns and heavy competition in this sugarbush in New York indicate that it's in need of a thinning. Favoring the best trees will keep the stand productive and able to withstand future stresses.