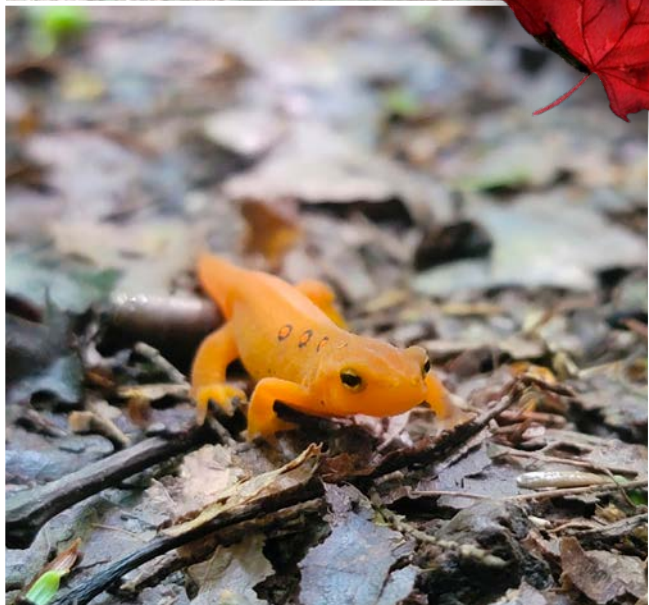


MORE THAN SYRUP



Supporting
Biodiversity
in Your
Sugarbush

VERMONT ORGANIC FARMERS
AUDUBON VERMONT

Maple sugaring is one of Vermont's most culturally and economically significant traditions. This sweet endeavor enriches our communities and strengthens our economy. It brings people together, connects us to the land, provides employment opportunities, and contributes to our tourism industry. Maple sugaring also preserves our working landscape and keeps forests intact. When good practices are followed, sugarbush management can create healthy ecosystems and encourage biodiversity. To better support Vermont's maple industry and forested ecosystems, Vermont Organic Farmers (VOF) and Audubon Vermont have created this best practices guide to provide sugar makers with information on how to manage their woods with the goal of improving biodiversity. Reading this document will help you understand why biodiversity is important, what it looks like, and what management practices promote biodiversity in the forest. We hope this guide will serve as a trusted resource on your path to improving the health and resilience of your sugarbush.



**INTRODUCTION
TO FOREST
BIODIVERSITY / 3**

BEST PRACTICES / 5

**INDICATORS OF
SUGARBUSH
BIODIVERSITY / 10**

CASE STUDIES / 14

RESOURCES / 20



INTRODUCTION TO FOREST BIODIVERSITY



WHAT IS BIODIVERSITY?

Biodiversity (or biological diversity) refers to the variety of life on Earth. It encompasses living organisms at all scales—plants, animals, fungi, and microorganisms—and the ecosystems they inhabit. Biodiversity can also include genetic diversity, or the biological variation that occurs within a species. More than that, it covers the full range of processes, such as nutrient cycling, carbon and nitrogen fixation, pollination, and beneficial predation. This diversity is crucial for the functioning and resilience of ecosystems, as well as for supporting ecosystem services that contribute to human well-being, such as clean air and water, pollination, natural pest and disease suppression, and climate regulation.



Ultimately, viable maple syrup production, now and in the future, can best be realized by promoting diversity in the sugarbush today.

Among the greatest threats to biodiversity are habitat degradation and loss, climate change, pollution, invasive species, and overexploitation.

WHY IS BIODIVERSITY VALUABLE?

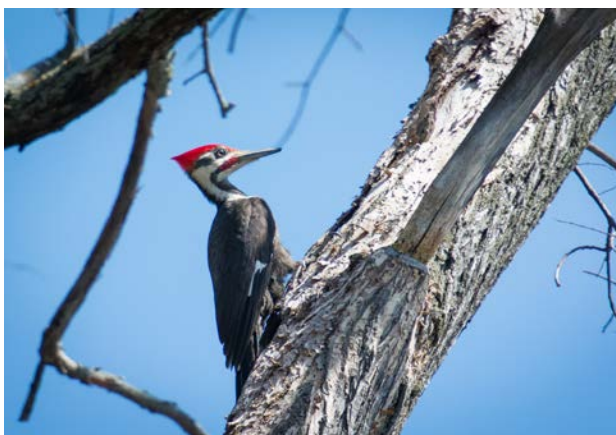
Sugarbush biodiversity fosters resilience. Forests with greater diversity are more resilient to disturbances caused by pests, disease, and climate change. Forests with a variety of species and genetic variation can better adapt to shifting conditions. Each species has a unique niche and plays a unique role within an ecosystem. If one species declines, another with similar traits may be able to step in and play a similar role, thereby maintaining the function of the ecosystem in the face of change. For sugar makers, biodiversity is important because the success of your business depends on the resilience of your forest.

Awareness of biodiversity is increasing amongst consumers. Many consumers are choosing to support businesses that protect and support natural resources. Demonstrating your commitment to promoting forest health and biodiversity will help your products stand out in the marketplace and give your business a competitive advantage.

HOW CAN YOUR SUGARBUSH SUPPORT BIODIVERSITY?

Maple production is well-suited to addressing a number of the main threats to biodiversity. Sugaring keeps forest as forest, thereby preventing the loss of habitat and sustainable sap harvesting does not inherently lead to overexploitation of the forest resource. However, a sole focus on any one management objective, such as sap production, can have unintended consequences if other forest values are disregarded. Thoughtful sugarbush management can improve habitat, increase resilience to climate change and other stressors, remove invasive species, and promote clean water.

Organic and bird-friendly maple producers are required to promote ecological balance and support biodiversity in their sugarbush. Aside from being required, promoting biodiversity can benefit your sugarbush by improving forest health and functioning. Diversity in plants, animals, and trees contribute to nutrient cycling, soil formation, pest and disease control, and overall forest resilience, all of which are crucial for the long-term productivity of the sugarbush.



On most operations, opportunities exist to accommodate the needs of local species with only minor changes to activities. Many sugarmakers are already contributing to biodiversity with some of their practices.

YOUR SUGARBUSH IS NOT AN ISLAND

Imagine your sugarbush not as an island but as part of the larger interconnected landscape. Visualize the neighboring habitats beyond the borders of your forest—fields, meadows, rivers, wetlands, and other forest types. Recognize that these adjacent habitats are not separate entities but integral parts of the same interconnected ecosystem. Think about how wildlife, seeds, and pollen moves between different habitats, including your sugarbush, and the importance of maintaining habitat connectivity to support healthy wildlife populations and promote genetic diversity. Consider how management practices within your sugarbush can complement habitat conditions within the greater landscape. What can you offer in your forest that neighboring parcels do not?

BEST PRACTICES



CONTROL INTERFERING VEGETATION

Interfering plants are either native or introduced invasive plants that interfere with achieving forest management objectives. Examples of introduced interfering plants that may be found in a sugarbush include multiflora rose, common and glossy buckthorn, bush honeysuckle, and Japanese barberry. Native plants that may be described as interfering vegetation include American beech suckers and hay-scented fern.

It should be noted however that in many

places American beech and hay-scented fern can coexist with other plants and not interfere with regeneration efforts. As native species they play important ecological roles. American beech trees are of great value to wildlife, with beechnuts being an important food source for a wide variety of species from black bear to blue jays. When compounded with other forest stressors however, such as excessive deer browse or poor quality soils, these native plants can make it difficult to achieve management objectives.

For maple producers, interfering plants may complicate the ability to collect sap. Interfering plants can impede efforts to establish seedlings of maple and other desirable tree species—the future sugarbush.

Strategies and techniques to control interfering plants depend on the species, its abundance, how thoroughly the maple producer wants to control the plant, and the producer's use of herbicides or organic strategies. Regardless of the strategies used, when dealing with large populations of interfering vegetation it is best to start from the edges and work in. Doing so will reduce the chance of the population expanding.

As one of the greatest threats to biodiversity, knowing if you have an issue with introduced invasive plants, and then taking steps to mitigate their impacts, is one of the most important sugarbush management actions that can be taken.



Pro Tip Regularly monitor for interfering vegetation in the sugarbush to allow for “early detection, rapid response.” Dealing with low levels of interfering vegetation today helps prevent an even bigger and more costly problem in the future. The timing of pulling taps may coincide well with keeping an eye out for introduced invasive plants. Many of these species develop leaves earlier in the growing season than native vegetation, making them much easier to observe.



REGENERATE THE FUTURE FOREST

Sugar maple can be a long-lived tree, capable of reaching 300 to 400 years of age. Mature and maturing (~>40 yr old) trees are essential to a sugaring operation as they are the trees that can be sustainably tapped today. Tending those trees can ensure their long-term health and vigor. As an industry that relies on a natural ecosystem to be viable, it should not be overlooked to consider both the short and long-term future of the forest so the next generation of maple producers has a resource available to them. It is therefore essential to plan for regenerating the forest and following up with implementation at the appropriate time.

Maple producers can assess if there are patches of unproductive and/or unhealthy maples and other species as well as identify areas where seedlings or small saplings have already become established in the forest understory. Prioritize regeneration efforts, or the establishment and/or promotion of young trees that will become the next forest, in these areas using ecologically-based forest management treatments. Enough trees should be cut in a regeneration harvest to

allow sufficient sunlight to reach the forest floor. Generally patch sizes of 0.1 to 0.75 acres are sufficient and vigorous trees within the patch can be retained. If non-native plants exist in the harvest area, it is important to treat them prior to opening the canopy. An overabundance of deer, which feed on young trees, can be a significant impediment to successful regeneration. Seedlings should be protected from deer by leaving the tops of harvested trees lying on the forest floor. These tops should be left high and as they naturally lie rather than the common lopping to a height of <2 ft for aesthetic reasons.

A forester should be consulted to determine the most appropriate regeneration techniques and timeframe for each particular situation. When and where possible, regeneration treatments are best implemented during dry or frozen ground conditions and avoided during the forest bird nesting season, typically May–mid-July.



Pro Tip Synchronize the location and timing of regeneration activities with planned changes of tubing and mainline whenever possible. It is likely that some unhealthy and/or less vigorous maple trees should be harvested to ensure regeneration goals.



CAREFULLY LAY OUT WOODS ROADS AND TRAILS

While tree boles and crowns are often the focus of attention for maple producers (i.e. “looking up”), leaf litter, soils, and tree root systems (i.e. “looking down”) should not be overlooked. Leaf litter and mineral soil provide the germination substrate for sugar maple seeds. Roots anchor the tree, pull water from the ground, and extract nutrients necessary for tree survival.

Damage to soils and roots by mechanized equipment, such as tractors, skidders, and ATVs, can cause irreparable damage. Grazing of

livestock in a sugarbush can also cause long-term damage to root systems and soils and significantly reduce forest floor biodiversity.

It is far easier and less costly to prevent a problem now than to fix it later. Although sugarbush access is critical during the production season, minimize the number of trails and position them in areas that are stable, dry, and on gentler slopes. Avoid building new trails through streams and other wet areas and consider rerouting existing wet trails to drier locations. Use as small a machine as possible that is safe and effective, and add high floatation tires or tracks if practical. Design new and update existing roads and trails with appropriate water diversion and dispersion features such as water bars. Consult Vermont’s Acceptable Management Practices (AMPs) for guidance. When designing and installing tubing systems, consider doing so in ways that minimize conflicts with large mammal movements, thereby maintaining habitat connectivity. One way to do this is in areas where there is evidence of heavy wildlife use, is to install tubing systems at a height that easily permits wildlife travel underneath.

Pro Tip Scout out locations for developing woods roads and trails during dry periods. Areas that are wet even without recent rainfall are the priority areas to avoid.



SUPPORT VEGETATIVE DIVERSITY IN ALL FOREST LAYERS

Your sugarbush will generally be healthier, support greater biodiversity, and be more resilient to stressors if there is a variety of tree, shrub, and other plant species. Increased tree species diversity in sugarbushes significantly reduces the presence and impact of sugar maple insect pests and disease.

When thinning a sugarbush to provide more growing space to desirable trees, avoid the temptation of creating a monoculture by removing all species besides sugar and red maple. Providing adequate space and resources to keep a maple tree healthy may be best accomplished by cutting another maple. Yes, it is okay to cut a maple tree! A maple with a small crown, forked stem, or stem damage from eutypella canker or sugar maple borer will not be as productive or long-lived as trees without these characteristics.

Non-maple tree species can promote the health of maples. For example basswood supports soil enrichment by bringing calcium and magnesium from deep in the soil to the surface where it is then deposited in leaf litter making it more readily available to other plant species. Retaining softwoods such as hemlock, spruce, and pine supports biodiversity by

providing habitat for certain species of wildlife. Some bird species, such as Black-throated Green Warbler and Blue-headed Vireo, achieve higher abundance in forests containing conifers. These same areas also provide better winter thermal cover and protection from the wind for year-round resident bird species than pure hardwood forests do.

When cutting trees in the sugarbush, set a target for the main canopy to be no more than 75% sugar maple as measured by basal area, a common forestry measurement.¹ Consideration of vegetative diversity should also extend to herbaceous plants that may support native pollinators as well as midstory and understory forest layers as these will ultimately comprise the future forest canopy.

Pro Tip Red maple counts toward tree species diversity, but should not be the only other species to encourage in the sugarbush.



MAINTAIN CURRENT AND RECRUIT FUTURE DEADWOOD

Standing dead trees (snags) and logs and branches on the forest floor are components of a healthy forest. Live trees with natural or excavated cavities are also important as nesting and denning sites. Maple producers spend a lot of time in the forest and an overabundance of snags can present a safety hazard. Similarly, when snags fall in a sugarbush they often land on the tubing system. Keeping all this in mind, it is recommended to retain current and plan for the future recruitment of standing dead trees in

1. To learn more about basal area and how to measure it visit blogs.clemson.edu/fnr/2024/04/22/basal-area-what-it-means-and-how-to-measure-it/

untapped areas of the sugarbush and/or as far from the tubing system as possible in order to reduce safety and damage concerns.

Once snags have fallen to the forest floor they provide coarse woody material. This downed woody material provides protective cover for



salamanders and a wide array of invertebrates. Large logs serve as drumming display sites for Ruffed Grouse. In addition a “messy” forest floor with abundant downed wood helps to slow, spread, and sink water during heavy rainfall events.

For the greatest biodiversity benefit, all tops of felled trees (material <4” in diameter) should be left in the forest.

Pro Tip Retaining as many old, larger diameter maples as possible to serve as “legacy trees,” meaning they will never be cut, is one strategy for recruiting future snags, cavity trees, and coarse woody material, as well as ensuring an abundant seed stock.

Habitat Feature	Good	Better
Snags and Cavity Trees	2 or more per acre >10” dbh*	6 or more per acre; 1 tree >18” dbh*; 2 trees >16” dbh*
Coarse Woody Material >16 ft long	3–5 trees per acre >18” diameter; 10 trees >14” diameter	8–10 trees per acre >20” diameter

* dbh = diameter at breast height, as measured 4½ ft. off ground

INDICATORS OF SUGARBUSH BIODIVERSITY



DIVERSE PLANT COMMUNITY

Definition The combinations and proportions of native trees and other plant species in a particular area of forest. Native plants are plants that grow naturally in a specific region or ecosystem, and have evolved over time to adapt to the local climate, soil, and other plants and animals.

Importance to biodiversity Different tree species provide different types of habitat for other plant, animal, and fungal species and

influence other trees in the area. Maintaining a diversity of native trees has the potential to reduce susceptibility to forest stressors such as insects and disease given the likelihood that some species are not vulnerable to those impacts. For example forest tent caterpillars, a native defoliating insect, targets sugar maple but avoids red maple. Oak species host some of the highest numbers of native insects. Herbaceous plants, such as wildflowers, are critical for supporting pollinating insects and other wildlife species.

What to look for $\geq 25\%$ of the sugarbush is maintained as non-sugar maple as measured by basal area, a common forestry measurement.²

Best practices



2. Parker, B., M. Skinner, D. Tobi. 2013. *Ecological management for sustained maple forest health and productivity*. The University of Vermont, Entomology Research Laboratory, Burlington, VT



Control
interfering
vegetation



Regenerate
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forest



Carefully lay
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roads and trails



Support vegetative
diversity in all
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Maintain current
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deadwood



STRUCTURAL COMPLEXITY

Definition The extent to which vegetation is layered within a given area of the forest. It includes the distribution of trees and other plants with varying heights, diameters, and crown characteristics, as well as trees of the same species but of different ages and sizes.

Importance to biodiversity Structural complexity provides a range of habitats used by different organisms. Sugarbushes with greater structural complexity will generally support a greater array of plant and animal species compared to forests in which most of the vegetation is concentrated in one layer.

What to look for Vegetation growing within three distinct layers; understory (0–6 ft in height), midstory (6–30 ft in height), and overstory (>30 ft in height). What not to look for? A “park-like” sugarbush.³

Best practices



3. Hagenbuch, S. et al. 2012. *Managing Your Woods with Birds in Mind: A Vermont Landowner's Guide*. Audubon Vermont and the Vermont Department of Forests, Parks, and Recreation



STANDING DEAD TREES (SNAGS) AND CAVITY TREES

Definition Snags are standing dead trees. Cavity trees are live or dead trees with existing cavities (hollow areas) such as those excavated by birds or developing through decay.

Importance to biodiversity Standing dead wood and cavity trees provide habitat for microorganisms, fungi, insects, and a large variety of birds and other wildlife. Larger diameter trees (>20” diameter at breast height [dbh]) provide greater biodiversity values than smaller diameter (<10” dbh) trees. The bigger the tree, the larger the cavities that can be formed and subsequently the larger the wildlife species that can use them.

What to look for At least six snag and/or cavity trees per acre, with one tree >18” dbh and two >16” dbh.⁴

Best practice



4. Hagenbuch, S. et al. 2012. *Managing Your Woods with Birds in Mind: A Vermont Landowner's Guide*. Audubon Vermont and the Vermont Department of Forests, Parks, and Recreation



Control interfering vegetation



Regenerate the future forest



Carefully lay out woods roads and trails



Support vegetative diversity in all forest layers



Maintain current and recruit future deadwood



COARSE AND FINE WOODY MATERIAL

Definition Logs (coarse material) and branches/limbs (fine material) on the forest floor in all stages of decay.

Importance to biodiversity Downed woody material on the forest floor provides important shelter, foraging, perching and displaying sites for a wide variety of birds, mammals, reptiles, insects, and amphibians. It can also create a uniquely valuable germination site for trees, shrubs, and other plants as well as supporting fungi. Fine woody material can help prevent deer from browsing tree seedlings and small saplings. Over time downed woody material contributes nutrients back into forest soils and increases the ability of soils to absorb and retain moisture.

What to look for 8–10 trees >20” dbh per acre for coarse woody material;⁵ all tops (material <4” diameter) of harvested trees left in the forest.

Best practice



5. D’Amato, A. and P. Catanzaro. 2022. *Restoring old-growth characteristics to New England’s and New York’s Forests*. The University of Vermont and Amherst: University of Massachusetts



WELL-DEVELOPED LEAF LITTER AND SOIL STRUCTURE

Definition Leaf litter is dead plant material (leaves, needles, and twigs) on the forest floor that has fallen from trees, shrubs and other plants. Soils are a mixture of sediment, organic material, water, and air which is constantly forming from the weathering of rock and the accumulation of leaf litter.

Importance to biodiversity Leaf litter and soils are fundamental to healthy, functioning forest ecosystems. They provide critical habitat characteristics for ground nesting birds, insects, amphibians, and fungi, and support soil stability for retention of nutrients and water. Healthy and well-developed soils are essential for the development of all forest vegetation.

What to look for Leaf litter and soil layers that are not compacted and/or eroded and without signs of rutting. Signs of compacted soils may include slow water infiltration, ponding of water, and high levels of surface runoff leading to erosion. Strive to maintain deep leaf litter and well-drained, loose soils.

Best practice



Control interfering vegetation



Regenerate the future forest



Carefully lay out woods roads and trails



Support vegetative diversity in all forest layers



Maintain current and recruit future deadwood



FUNCTIONAL HYDROLOGY

Definition The distribution, movement, and storage of water on and below the forest floor, including surface runoff and absorption into the ground. It may include features such as temporary and permanent streams, rivers, wetlands, vernal pools, and seeps and springs.

Importance to biodiversity Hydrologic features provide unique habitat to a diversity of species, from aquatic organisms to birds that may nest along their edges. Well-functioning hydrologic features (wetlands, streams, seeps, etc.) can help to slow down the flow of water leading to better absorption into the soil, improve water quality by filtering runoff, and reduce downstream impacts.

What to look for Streams that are able to move within their floodplain unimpeded by human activities and fallen trees and other vegetation are present within stream channels. There is little to no evidence of equipment (tractor, ATV, etc.) traveling through hydrologic features. When unavoidable, appropriate structures and precautions are in place to minimize disturbance and all Acceptable Management Practices (AMPs) are being followed.

Best practice



HABITAT CONNECTIVITY

Definition Areas of suitable connected habitat that allow movement and dispersal of wildlife, plants, fungi, and microorganisms at multiple scales.

Importance to biodiversity Habitat connectivity allows species to move around to locate suitable habitat as environmental conditions change. Supports the ability of individuals of the same species to interact across the landscape, preventing fragmented, possibly less viable, populations and even local extinctions.

What to look for In the sugarbush, look for signs of heavily used wildlife travel corridors, such as abundant tracks and scat (droppings) as well as worn paths. In mixed forested and open landscapes, hedgerows and other tree cover is maintained between forest blocks. In all landscapes, riparian corridors exist in their natural condition.

Best practices



Control interfering vegetation



Regenerate the future forest



Carefully lay out woods roads and trails



Support vegetative diversity in all forest layers



Maintain current and recruit future deadwood

CASE STUDIES



The following case studies highlight a few of the maple producers who are certified organic by Vermont Organic Farmers and recognized bird-friendly by Audubon Vermont. They include both large and medium-scale sugaring operations as well as a sap only business. Managing for biodiversity in the sugarbush is not a “one and done” activity. It requires playing the long game. Actions taken today will have near and long-term benefits to forest health, bird habitat, and overall biodiversity.

BACKWOODS ALCHEMY



Location Enosburg, Vermont

Property 138 acres

Sugarbush 74 acres

Taps 6,200

Forest Management Practices Crop Tree Release and Mast Tree Release

Biodiversity Best Practices



Partners Audubon Vermont, Cold Hollow to Canada (CHC), Natural Resources Conservation Service (NRCS), Vermont Organic Farmers (VOF)



Control interfering vegetation



Regenerate the future forest



Carefully lay out woods roads and trails



Support vegetative diversity in all forest layers



Maintain current and recruit future deadwood

Meet the producers

Located in Enosburg, Joanne and Richard Carr and their family have been operating Backwoods Alchemy since 2006. They started out by selling sap with 3,900 taps and have since expanded their operation to 6,200 taps. They began boiling in 2014, using a reverse osmosis (RO) system and heating their evaporator with wood pellets. The Backwoods Alchemy sugarbush is adjacent to a large and unfragmented forest block, stretching over 40,000 acres in Northwestern Vermont, which provides important habitat and connectivity for wildlife in the region.

Backwoods Alchemy is certified organic through Vermont Organic Farmers (VOF), and they participate in the Bird-Friendly Maple (BFM) program with Audubon Vermont. While organic certification provides a small premium for the sale of their syrup, their participation in these programs is mainly driven by a desire to be good stewards of the land and to support the long-term sustainability of their business.

Biodiversity practices in the sugarbush

The overstory of Backwoods Alchemy's sugarbush is approximately 66% sugar maple and 14% red maple, with a mix of ash, beech, butternut, ironwood, hemlock, and white pine among other species. Their long-term goals are to keep at least 25% of the canopy in non-sugar maples. In addition to releasing prime maples for sap production, management has retained high-quality non-maples, like yellow birch, and released mast species, including apple and black cherry. The release of mast species often takes place in the margins of the sugarbush, where it is easier to justify cutting maples, rather than in the heart of the production area. These practices are vital to meeting their species diversity goals, reducing the threat of potentially damaging pathogens and forest insects such as forest tent caterpillars and



providing habitat for a wide range of species.

Portions of the current-day sugarbush are part of a historic sugarbush that was pastured and subsequently abandoned about 50 years ago. This has created a forest with a more complex and varied structure, replete with large, decadent sugar maples. These veteran trees are significant sources of large cavities that over time will become large snags and then downed woody material which provide critical forest habitat and structure. Past land use has also facilitated the development of a robust understory and midstory, comprised of maple, ash, black cherry, and yellow birch. Maintaining this mix of species and forest structure over time will support wildlife habitat and vegetative diversity in all layers of the forest.

Their target for the sugarbush is to retain and recruit 4 or more snag/cavity trees per acre with at least one tree greater than 24" dbh, along with 3 to 5 downed logs greater than 18"

dbh and 10 greater than 14" dbh per acre, all at least 16' long. As tubing limits access to the sugarbush, much of what falls in the woods stays on site. It is necessary both to maintain current levels of deadwood and to retain trees that can develop into large snags and downed wood over time.

Property-wide, management has focused on creating wildlife habitat through the generation of early successional forest, keeping meadows open via brush hogging, and softening edges between forest and open areas to increase their utility for wildlife species. The forest access network has also been improved through the installation of water bars to prevent erosion. Several of these activities were facilitated through the NRCS EQIP program.

By working with their consulting forester and county forester and participating in the Cold Hollow to Canada partnership and the Natural Resources Conservation Service Environmental Quality Incentives Program (EQIP) program, they have connected with valuable support and resources, including educational programming and cost-share funding.

Why manage for biodiversity?

Managing for biodiversity in their sugarbush is important to the Carrs to ensure a healthy forest that is less susceptible to damage from insects and pathogens. Keeping a greater diversity of tree species and sizes provides a better opportunity for the forest to stay sound and replenish itself, especially as they anticipate the decline of species like ash in the near future. It also ensures a more hospitable environment for many species of wildlife, including the bears, owls, and bobcats that they've come across in the woods.

BRANON FAMILY MAPLE



Location Fairfield, Vermont

Property 617 acres

Sugarbush ~425 acres

Taps 20,000

Forest Management Practices Commercial and non-commercial improvement cuts and Crop Tree Release

Biodiversity Best Practices



Partners Audubon Vermont, Natural Resources Conservation Service (NRCS), Vermont Land Trust (VLT), Vermont Organic Farmers (VOF)

Meet the producers

Tom and Cecile Branon are part of a rich history of sugaring on their home farm in Fairfield, Vermont. In fact, Tom is the fourth generation of his family to tend to and work in these woods, a tradition the Branons have passed on to their children and grandchildren. There are approximately



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20,000 taps on their home property, and they've expanded to a larger network of properties tapped by the Branon Family. They use a reverse osmosis system and fuel their evaporator with oil. This property is conserved with the Vermont Land Trust and provides essential interior forest habitat and wildlife connectivity.

The Branons find that participation in Audubon Vermont's Bird-Friendly Maple (BFM) program and their organic certification through Vermont Organic Farmers (VOF) aligns with their desire to be good stewards of their land. It is a way to share with consumers the pride they take in their operations and reflect their belief that in taking good care of the land, it can then reciprocate and take good care of us.

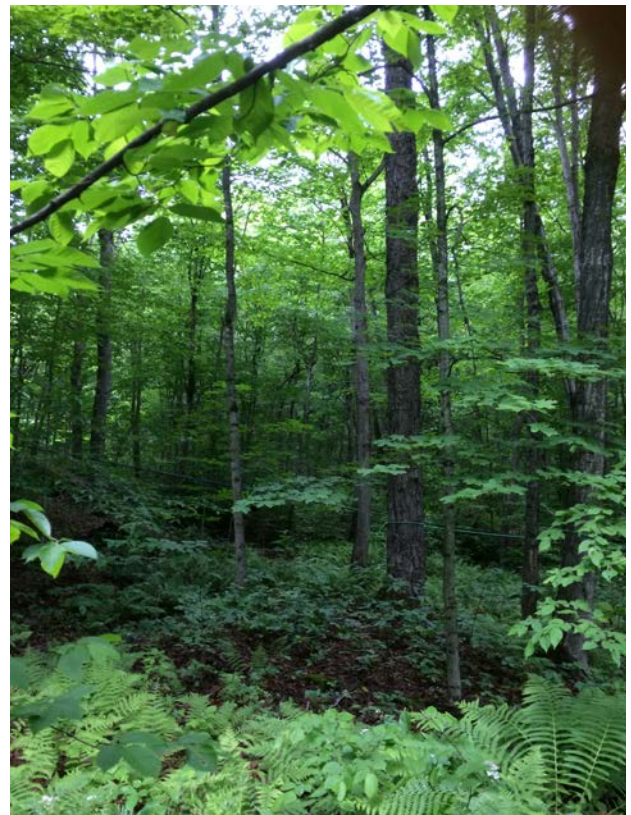
Biodiversity practices in the sugarbush

The sugarbush on the home farm extends across four stands, with about 65% of the canopy in red maple and 21% in sugar maple, with pockets of eastern hemlock and eastern white pine, along with a scattering of white ash, American basswood, and black cherry among many other species. Previous management focused on removing mature and low-quality trees, especially hardwoods to supply firewood. However, this practice has slowed since the Branons transitioned to oil-fired evaporators. Some improvement cutting has taken place in the understory as well, removing low-quality poles and releasing high-quality sugar maple poles. The Branons aim to retain two snags per acre. Low-quality trees that fall in the woods are generally left to rot, adding to downed woody material pools. This management, along with past land use history as a pastured sugarbush, has allowed the development of a more complex and variable uneven-age structure in the main sugarbush area, including decadent legacy maple trees from earlier versions of the sugarbush. The structural and species diversity this forest

provides is important for wildlife habitat.

Common buckthorn (*Rhamnus cathartica*), a non-native invasive species (NNIS), is present in two areas of the property. Management has focused on mechanical removal, ie. digging the plant up, and monitoring for reappearance. Organic standards limit the use of pesticides. NNIS represent a serious threat to high-quality wildlife habitat, forest regeneration, and forest diversity. Treatment can be costly and labor intensive, making it prudent to tackle this issue early and be vigilant for reappearance or new populations.

The Branons have also been working with NRCS Environmental Quality Incentives Program (EQIP) to improve their road network. They have been ditching, grading, and building up forest roads to maintain their access and prepare for the more intense rain events Vermont has been experiencing. Road washouts are costly, disrupt access, and can negatively impact water quality and aquatic habitats.



Consulting foresters and NRCS programs have been useful resources, providing expertise and cost-share funding for improvement work. They also find that the overlap of standards between Vermont's "Current Use" program, BFM, and VOF organic certification makes it simpler to meet their requirements and do good work in the woods. While the paperwork isn't always a joy, a quick phone call usually gets things sorted.

Why manage for biodiversity?

It is important to the Branons to remember that the woods that provide delicious maple syrup are also home to many species of wildlife. They treasure their woods and work hard to maintain the health of the forest and the habitat it provides. They want to manage their woods to provide a high-quality product while maintaining forest health and preparing for what the future may hold.



MEADOWSEND TIMBERLANDS LTD.



Location Washington, Vermont

Property 1,524 acres

Sugarbush 327 acres

Taps 19,300

Forest Management Practices Crop Tree Release and Group Selection

Biodiversity Best Practices



Partners Audubon Vermont, Natural Resources Conservation Service (NRCS), Vermont Organic Farmers (VOF), Vermont Tree Farm Program

Meet the producers

Meadowsend Timberlands Ltd. started tapping their sugarbush on Duplissey Hill in Washington, Vermont, in 2018. Previous management of the sugarbush area was timber-focused, but now they have 19,300 taps across 327 acres, use a reverse osmosis system, and sell sap to Collins Maple, LLC. The forest has a history of agricultural use stretching back to the early 1800s, although more recently it was conserved using a Forest Legacy Easement in 2009 which prevents



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development and ensures continued forest management and public access. This property provides important interior forest habitat and landscape connectivity.

Meadowsend Timberlands sugarbush is certified organic by Vermont Organic Farmers (VOF) and they participate in Audubon Vermont's Bird-Friendly Maple (BFM) program. By and large, their management already aligned with the standards of these programs, making enrollment easy. They appreciate the premium paid for organic certified sap and were especially interested in the educational opportunities that these programs present.

Biodiversity practices in the sugarbush

Meadowsend Timberlands sugarbush is located on high-quality soils and the overstory is comprised of 75% sugar maple, 8% yellow birch, and 5% eastern hemlock, with fewer amounts of white ash, American beech, and red spruce. Interspersed are inaccessible pockets of steep ledge and patches of softwoods. Portions of the

sugarbush about wetlands and open land. Their goal is to maintain 25–30% of the overstory in non-sugar maple.

For Meadowsend Timberland, biodiversity functions on a variety of scales. At the tree level, they are thinking about managing for a variety of species, and at the stand level, they're working to create a range of age classes and structural components, like snags and softwood inclusions. At the property level, they're considering how management in adjacent stands impacts the sugarbush, as well as the connectivity and functionality of wildlife habitat and ecosystem services across the landscape.

Previous management used crop tree release to release high-quality stems and group selection to promote regeneration pockets within the stand. Future management will coincide with tubing replacement to remove high-risk stems. Some of this treatment will occur in small groups to facilitate regeneration and favor non-sugar maple species, including cherry, yellow birch, and red spruce. These pockets of regeneration will continue to diversify the forest, and reduce the threat from forest insects and pathogens. They contribute to patchiness, providing a range of tree sizes and ages available across the stand and its vertical structure, enhancing wildlife habitat, and supporting the forests' ability to respond to novel and unanticipated changes resulting from climate change.

Their goal is to retain and recruit at least 2 snag/cavity trees and 4 downed logs per acre. Where snags are lacking, girdling will be used to create them. Management will also leave decadent and declining large maples to naturally develop into large standing dead and downed material over time. Trees that fall between entries can be left as downed logs and future harvesting activities will also leave downed logs, increasing and maintaining



desired densities and contributing to available wildlife habitat, forest structural complexity, and nutrient cycling.

Working with USDA organic and NRCS programs has provided important support, especially as Meadowsend was starting up their sugaring operation. They've appreciated the opportunities to learn, collaborate, and educate that have resulted from their participation in BFM and organic certification.

Why manage for biodiversity?

Meadowsend Timberland prioritizes sustainability, forest health, and ecosystem function, so managing for biodiversity is crucial to their mission. As Ryan Kilborn, their Northern Regional Forester, says, there are very few people who don't enjoy listening to songbirds in the spring, so it's an easy way to relate with folks about the woods and open the door to discuss the benefits of management actions for wildlife and forest health. They've also found that it is valuable to cut low-quality trees,

including maples, in the sugarbush. For them, having fewer trees with more growing space has maintained or increased sap potential with less infrastructure to keep up while requiring fewer workers, especially chasing leaks. They've also focused on tapping below the lateral to minimize impacts to the bottom log and keep their options open in the future. While a heavy snowfall can present some issues, they haven't seen any decline in their production.



RESOURCES



Audubon Vermont is a state program of the National Audubon Society. For more than 100 years, Audubon Vermont has protected birds, wildlife and their habitat through engaging people of all ages in education, conservation, stewardship and action. Their Healthy Forests programs, including Bird-Friendly Maple, provide technical assistance and educational resources for forest management with birds in mind.

vt.audubon.org

Vermont Organic Farmers LLC (VOF) is the USDA accredited certification program owned by NOFA-VT. VOF believes that organic production enhances soil, plant, animal, and human health to protect the environment for current and future generations. Organic certification is needed to verify these production practices and to ensure that organic products are produced with integrity and transparency. VOF provides consumers with a process and label they can trust.

vermontorganic.org

The **Natural Resources Conservation Service (NRCS)** in Vermont aims to conserve Vermont's soil, water, air, and other natural resources. NRCS delivers conservation solutions to agricultural producers and landowners implementing voluntary conservation on working lands to help feed a growing world.

nrcs.usda.gov/conservation-basics/conservation-by-state/vermont

The **Proctor Maple Research Center (PMRC)** at the University of Vermont is the oldest maple research center in the world. Established in 1947 by Governor Mortimer Proctor it performs scientific research of maple and strives to inform sugar producers and enhance maple syrup production across the globe.

uvm.edu/cals/proctor-maple-research-center

The **UVM Extension Forestry Program** provides science-based information on forest ecology and management to landowners, professionals, and the public.

uvm.edu/extension/forestry

The **UVM Extension Maple Program** supports maple producers by providing research-based educational solutions for maintaining sustainable operations with above-average yields of high-quality syrup.

uvm.edu/extension/agriculture/maple

Vermont Coverts is a peer-to-peer community of landowners, professionals and others learning from and supporting each other to enhance wildlife habitats through sound forest management.

vtcoverts.org/index.html

Vermont Department of Forests, Parks, and Recreation (FPR) is responsible for the conservation and management of Vermont's forest resources, the operation and maintenance of the State Park system, and the promotion and support of outdoor recreation for Vermonters and our visitors.

fpr.vermont.gov

List of Vermont County Foresters: fpr.vermont.gov/forest/list-vermont-county-foresters

Finding a Consulting Forester: fpr.vermont.gov/finding-consulting-forester

Formed in 1893, **Vermont Maple Sugar Makers Association (VMSMA)** is one of the oldest agricultural organizations in the United States. The Association is made up of Vermont maple sugar makers, maple packers, equipment manufacturers and other industry leaders who are dedicated to producing the highest quality maple syrup found anywhere in the world.

vermontmaple.org/about-us

Vermont Woodlands Association (VWA) is a 501(c)(3) nonprofit corporation whose mission is to educate and advocate for the practices of productive stewardship, use, and enjoyment of Vermont's woodlands. VWA achieves its mission by delivering programs for landowners, the public, and policy makers that support forest health, forest economy, wildlife habitat, recreation, and enjoyment of forests for today and for generations to come.

vermontwoodlands.org

Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont

fpr.vermont.gov/forest/managing-your-woodlands/acceptable-management-practices

Identification of Pests, Diseases & Invasives

vtinvasives.org

vtfishandwildlife.com/learn-more/landowner-resources/liep-invasive-species-program/terrestrial-invasive-plant-resources



Audubon

VERMONT



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PHOTOS

Skyler Kardell, Audubon Photography
Awards: p. 1 upper right, p. 3 top

Steve Hagenbuch: *p. 1 center left, p. 5 top, p. 6-9, p. 11 left, p. 12, p. 17*

L. Enders/USFWS: *p. 1 lower left, p. 10 top*

Tom Rogers: *p. 3 bottom, p. 4*

Elizabeth Spinney/VT FPR: *p. 5 bottom*

Nick Sibley: *p. 11 right*

Sam Blair: *p. 13 left*

Summit Maple: *p. 21*

