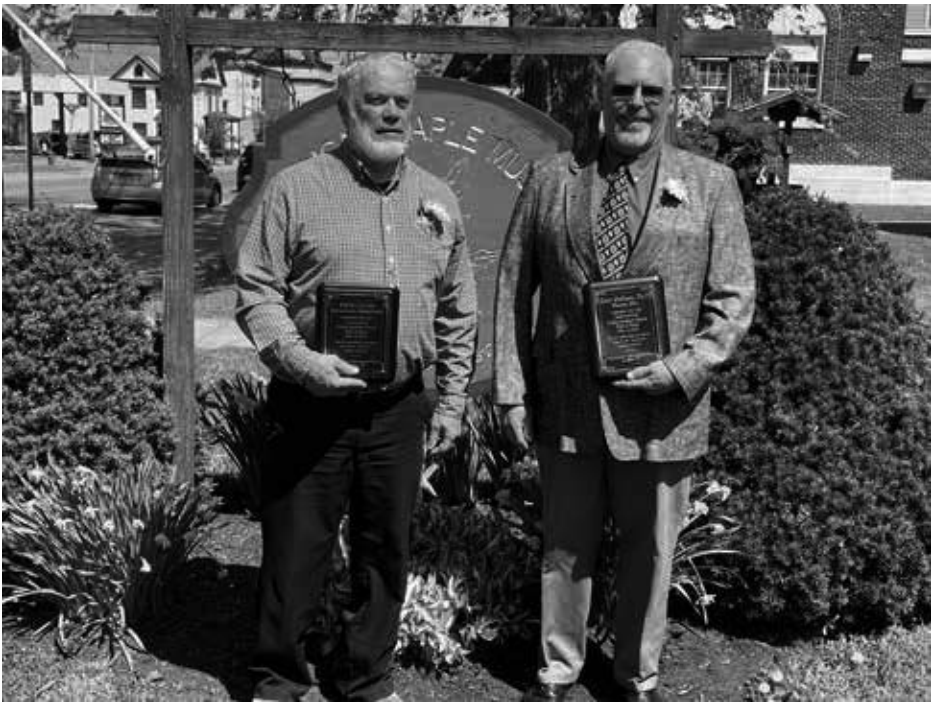
Maple Syrup Digest

Vol. 61, No. 2 June 2022

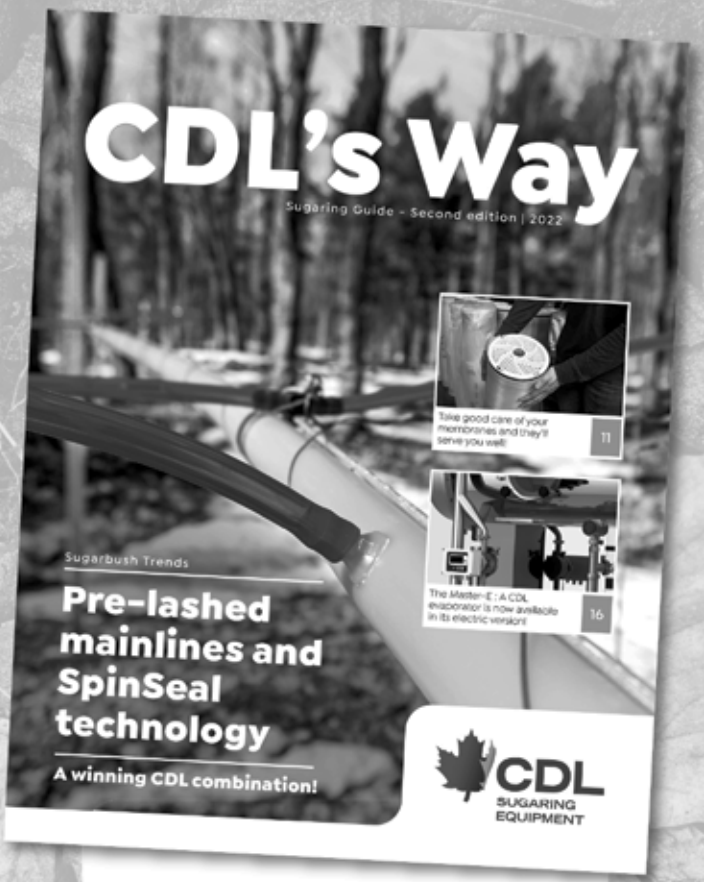


Sap Exudation

Controling Invasive Plants

Season Reports

The Newsletter of the North American Maple Syrup Council



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MAPLE SYRUP DIGEST

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NAMSC's Mission is to be a leading advocate and resource for maple associations and their members, working to ensure that sugarmakers have the tools and support needed to sustainably produce high quality products.

NAMSC's Vision is for all sugarmakers to consistently and sustainably produce high quality maple products.

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President's Note

Greetings, maple people!

As I pen this message, I feel like I am treading water and getting short of breath. What a busy time of year! Sugaring is all cleaned up, Christmas trees are planted, next year's sugar-wood is mostly split and stacked.

Our season here in Western MA was a season of extremes. I started taping February 13 and did the last boil on April 2, netting 936 gallons from 3,500 taps. All gravity tubing (mostly 3/16" on steep slopes). Huge temperature swings and the wind and storms that come with them was the order of this season.

I did take time out of the rat race to visit the Maple Hall of fame in Croghan NY last month for our Council meeting and Maple Hall of Fame induction. It's a long ride but it was great to finally see the museum and actually have some face-to-face time with fellow sugarmakers.

Speaking of face-to-face time be sure to sign up for our annual meeting in LaCrosse this October! I am so looking forward to greeting you all there, and hearing how you have weathered the last two years.

I am especially happy to welcome the Vermont Maple Sugar Makers Association back to the North American Maple Syrup Council!

My other job (manufacturing, importing, and selling equipment for fruit and vegetable growers and forestry management professionals) has me traveling to Slovenia in early July, to visit the manufacturers of some of that equipment. The first thing that I discovered was that, during the two years of not traveling, my passport had expired. Still waiting for the new one! I'm sure that there will be other stumbling blocks along the way. Supply chains are built on relationships, and I am happy to be renewing some of these relationships that have been let slide during the COVID times. We have all suffered from the breakdown of supply chains. Things will get better but it will be a long haul.

We are currently reviewing the NAMSC bylaws and hope to have recommended changes ready for a vote in October.

The market for maple seems to remain strong for now. Let's all do our best to keep it rolling through these weird and troubled times, by keeping a good variety of high-quality maple products in attractive containers on the shelves, whereever people shop.

Hoping to see you all in October.

Remember, "Make Maple a staple!"

Howard Boyden, President, NAMSC

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In this issue...

Seeking Photos and Articles

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Cover: Steve Childs and Dr. Gary Graham, 2022 Inductees into the American Maple Hall of Fame.

ANNUAL MAPLE AUCTION

Support maple research and education!

The NAMSC Research and Education Fund has made grants of more than $1 million over the last several decades, catalyzing research and education that benefits all producers and has contributed to the growth and success of the industry. Each year the annual international maple conference hosts a fundraiser to support the Fund.

This year. the Wisconsin Maple Syrup Producers Association is in need of auction items for the for the silent auction to benefit the Fund. The silent auction will be held at the 2022 International Maple Conference on October 26-29. Auction donations can be items – crafts, tools, antiques, etc. – or services – bed and breakfast stays, consulting, etc. If you have something you would like to donate to the auction, please contact Vicky Adamski, auction co-chair at 715-219-1690 or 715-623-6853. Items can be dropped at the conference or shipped to Vicky Adamski, W10923 Winter Rd. Antigo, WI 54409 before October 22.

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More information at wismaple.org/2022

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Exudation Pressure in Maple Trees: Comparing Simulations with Experiments

John M. Stockie, Department of Mathematics, Simon Fraser University, Burnaby, BC
Abby K. van den Berg, Timothy D. Perkins, and Timothy R. Wilmot, Proctor Maple Research Center, University of Vermont, Underhill, VT
Mark Isselhardt, Maple Specialist, University of Vermont Extension

Exudation is the process whereby certain trees such as maple, birch and walnut can generate a large positive pressure in stems or roots during months when the tree is leafless and mostly dormant and temperatures fluctuate above and below freezing. This exudation pressure is especially pronounced in sugar maple (Acer saccharum) and is what causes sap to flow from a tap hole so steadily and in such large quantities during the sap harvest season. For more than a century, numerous studies have attempted to explain the essential biophysical processes underlying sap exudation, but it was only in the series of papers [2,3,6,7,11] that the first complete mathematical model was developed. Apart from the mathematical results in these papers, this modelling work has also provided new insights into the detailed mechanisms that cause sugar maples to exude so profusely. A concise (mathlight) overview of an earlier version of the model has already appeared in the Digest [5]. This article aims to provide an update on more recent modelling efforts in combination with experimental measurements from red/sugar maple trees at the University of Vermont Proctor Maple Research Center that validate the model results.

Background on Exudation

Past observations of sugar maple trees clearly demonstrate that stem pressure builds up during the sap harvest season over periods when temperatures oscillate above and below the freezing point, and specifically after freeze and thaw events. Tree physiologists proposed three mechanisms that could account for the build-up in pressure observed in maples [4,8]:

I. A purely physical freeze-thaw mechanism, in which gas trapped within certain sapwood cells is compressed as the sap freezes, while a subsequent thawing cycle releases the trapped gas to expand and repressurize the sap.

II. An osmotic process, in which semipermeable cell membranes give rise to a sugar concentration difference that in turn induces an osmotic pressure.

III. A biological process, in which some temperature-induced response from living cells triggers a build-up in sap pressure.

Based on an extensive review of the literature, Améglio and co-authors concluded that "no existing single model explains all of the winter xylem pressure data" [1]. This

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suggested that either some combination of sap exudation mechanisms was required, or else some new explanation remained to be identified.

Milburn and O'Malley [8] were the first to propose a physical mechanism (based on i) which is closely tied to the special anatomical properties of maple sapwood. They were inspired by the observation that sapwood in deciduous trees like maple can be separated into two main cell types: vessels that are filled with sap; and (libriform) fibers that are filled with gas (see Figure 1a). During a freezing event, they hypothesized that liquid is drawn via a process called cryostatic suction from vessels into gas-filled fibers where it freezes, causing an ice layer to form on fiber walls that in turn compresses the gas trapped inside. When temperatures subsequently rise above freezing, this process reverses, releasing the trapped gas to re-pressurize the vessel sap.

A decade later, Tyree [9] argued that it is also essential to account for the selective permeability of the fiber/vessel wall, which contains pores so tiny that they permit water to pass through but prevent passage of sugar molecules. As a result, the liquid taken up by the fibers consists of pure water

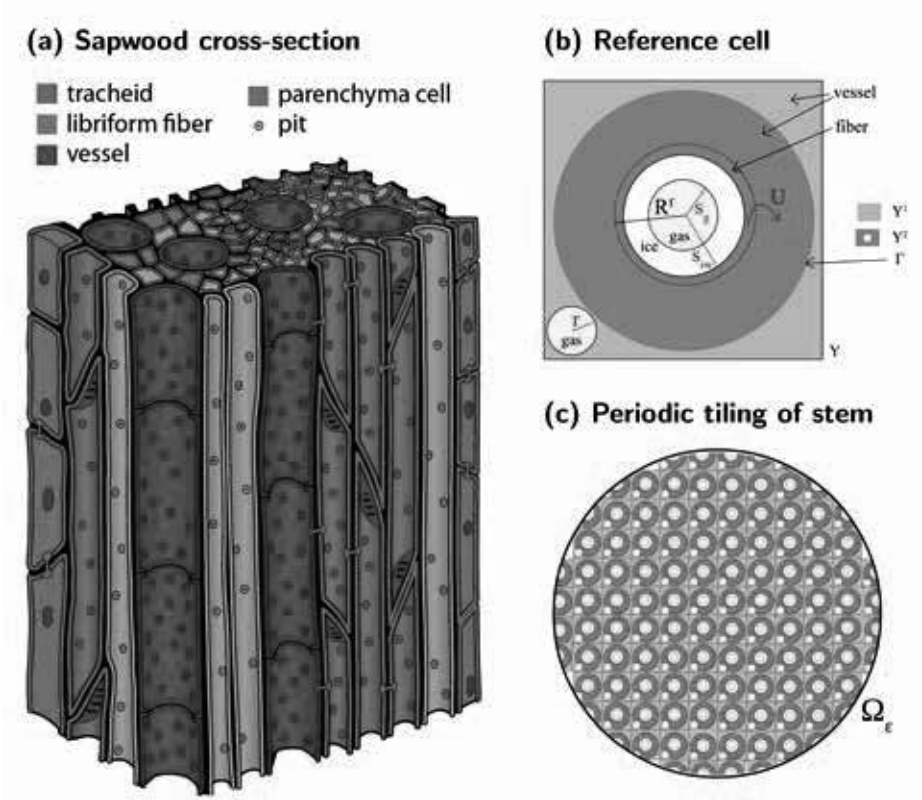

Figure 1. (a) Cut-away view of maple sapwood, showing vessels, surrounded by fibers. (b) Reference cell, showing a single vessel (with gas and liquid sap) and fiber (with ice layer enclosing trapped gas). (c) Stem cross-section tiled by copies of reference cell.

rather than sugary sap, which means that an osmotic pressure difference can be sustained between fiber and vessel (mechanism ii). Moreover, Tyree argued that the pressure in fibers/vessels can be high enough that dissolution of gas bubbles suspended in the sap must also be included (for a readable explanation of this process, refer to the short article by Tyree [10]). Despite these steps toward developing a working hypothesis for sap exudation, there has been no attempt until recently to formulate a set of mathematical equations that captures the physical processes behind this expanded Milburn-O'Malley mechanism.

Summary of the Mathematical Model

Sap exudation is a prototypical example of a multiscale problem, in the sense that different processes occur on widely differing spatial scales. All processes related to phase change and liquid/gas transport occur on the scale of microns and are largely determined by the cellular microstructure. Also, temperature differences on this microscopic scale are small enough that they can be approximated with a simple linear spatial dependence. In contrast, temperature variations on the macroscopic (or stem) scale are more complex, so that the full conservation equation for heat energy must be applied to properly capture release of latent heat during freeze/thaw cycles. Because of this separation in spatial scales, exudation is said to have an inherently "two-scale" nature, and the governing equations for processes on the micro- and macroscopic scales must be formulated separately.

Our mathematical model is therefore constructed in terms of three components:

1. *A microscale model for cellular processes*: which captures the Milburn-O'Malley freeze/thaw mechanism. This assumes a simplified "reference cell" in which a cylindrical fiber (with circular cross-section shown in Figure 1b) is surrounded by a reservoir of sap corresponding to the vessel. Gas is incorporated into both fiber and vessel as a circular bubble. Ice formation always begins in fibers because the freezing point of the pure water in the fibers is roughly 0.29°F (0.16oC) higher than that of the vessels (owing to sugar dissolved in the vessel sap).

2. *A macroscale model for stem temperature*: wherein transport of heat throughout the tree stem is driven by external variations in the ambient (air) temperature.

3. *Coupling between the micro- and macroscale models:* By tiling the stem with a periodic array of copies of the reference cell (see Figure 1c), the solution to the microscale problem can be averaged in a mathematically rigorous way to properly capture the contribution from latent heat of phase change to the stem temperature. This "careful averaging" procedure that couples the two scales comes is a practical application of results from homogenization theory [6,7].

The resulting mathematical problem consists of a nonlinear system of differential-algebraic equations, which have a "nice" structure that allows them to be implemented using standard solvers available in the Matlab® software package.

Sap Exudation: continued on page 13

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Sap Exudation: continued from page 11

Comparing maple experiments with numerical simulations

We now present a sample comparison between experimentally measured pressure and temperature data and corresponding numerical simulations of the sap exudation model. The experimental tree was a 14 inches (36 cm) DBH red maple [TP1] located in the sugarbush at the University of Vermont Proctor Maple Research Center in Underhill, Vermont. Air temperatures were measured using a type-T thermocouple located on the stem at a height of 4 feet (1.2 m). Pressure measurements were taken with an Omega PX-26-030GV pressure sensor connected to a standard nylon spout inserted into a tap hole with diameter 7/16 inch (1.1 cm) to a depth of 2 inches (5 cm). Both temperature and pressure sensors were measured with a Campbell Scientific 23X datalogger and data were recorded at 15 minute intervals.

Simulations are displayed along with measured data in Figure 2 as plots of temperature and measured/computed stem pressure versus time. The first thing to note is that most thawing events (at times when temperature rises above the melting point, T = 0°C) correspond to a spike or rapid increase in stem pressure for both simulations and experiments. Similarly, freezing events (when T falls below 0) are followed shortly after by a steep drop in pressure. The peak value of the pressure spikes is captured closely by the model, as is the gradual rate of decrease in pressure that follows each spike. There are a few exceptions such as the "weak" freeze/thaw events over the first seven days, but otherwise the correspondence is remarkably close. Similar results for other red and sugar maple trees are reported in the paper [11]. These results suggest that the model is capable of capturing the essential physical processes that underlie the build-up of exudation pressure in maple trees.

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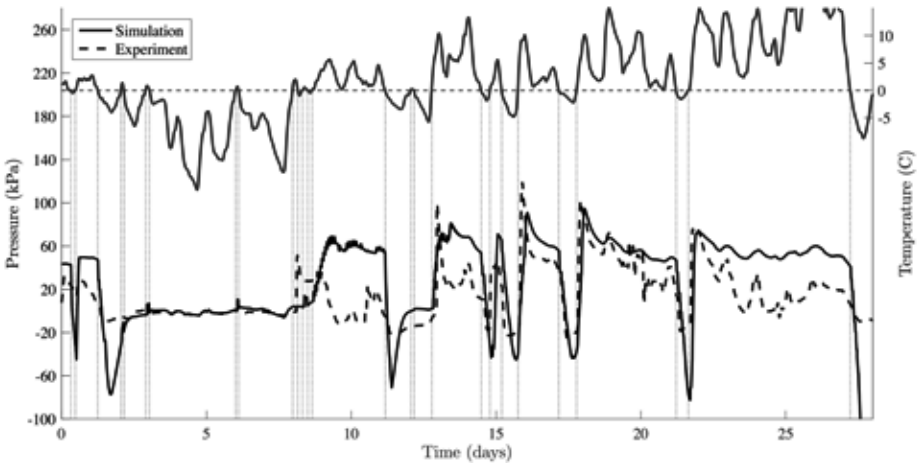

Figure 2. Comparison of experimental measurements and numerical simulations for a red maple tree, showing stem temperature (top) and pressure (bottom). Freeze and thaw events correspond to zero-crossings of the temperature and are highlighted with dotted vertical lines.

Sap Exudation: continued from page 13

Maple Trees Really Are Unique!

Besides our success in reproducing experimentally measured stem pressures, an important conclusion of this modelling study is pinpointing what precisely makes maples so unique among other tree species. In particular, the amazing ability of trees like red and sugar maple to exude sap derives from a unique combination of characteristics:

- High sap sugar content, which induces a freezing point depression of roughly 0.16°C within the sap that drives the entire pressure generation process.

- A wood cell anatomy with the special characteristic that libriform fibers are gas-filled and thus serve as a pressure storage reservoir.

- Selective permeability of the cell walls that separate fibers from vessels, which generates the osmotic pressure difference that in turn prevents gas bubbles suspended in the sap from completely dissolving.

Another insight relating specifically to the first point is that the phase change process driving sap exudation is restricted to a narrow thawing (or freezing) front that propagates into the stem on heating (or cooling), as pictured in Figure 3. This front consists of a very thin layer of sapwood cells at most 0.5 mm thick that is delineated by temperatures lying between -0.16°C and 0°C. The remainder of the stem is either in a fully thawed or fully frozen state, so that at any instant in time all of the real action behind sap exudation is taking place within this narrow circular band making up the freeze/thaw front region.

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Sap Exudation: continued from page 15

Current and Future Work

Efforts to validate the model with additional field measurements are underway as part of an effort to better calibrate model parameters. This includes comparisons with experimental data from other tree species such as birch and walnut that are also known to generate positive stem pressures. We are also investigating how to incorporate the starch-sugar conversion process (known as hydrolysis) within our pressure generation model, which will capture seasonal variations in sugar content. In the long term, our hope is that these model improvements will help us to better answer practical questions of interest to the maple syrup industry such as: What is an optimal number and location of tap holes for a given tree? How does vacuum pressure affect sap content within the stem? Or what might be the effect on sap yield of shifts in seasonal temperatures from climate change?

References

[1] T. Améglio et al. "Winter stem xylem pressure in walnut trees: effects of carbohydrates, cooling and freezing," Tree Physiology 21:387–394, 2001.

[2] M. Ceseri and J.M. Stockie. "A mathematical model of sap exudation in maple trees governed by ice melting, gas dissolution and osmosis", SIAM Journal on Applied Mathematics 73(2):649–676, 2013.

[3] M. Ceseri and J.M. Stockie. "A three-phase free boundary problem with melting ice and gas dissolution", European Journal of Applied Mathematics 25(4):449–480, 2014.

[4] D. Cirelli, R. Jagels and M.T. Tyree. "Toward an improved model of maple sap exudation: the location and role of osmotic barriers in sugar maple, butternut and white birch," Tree Physiology 28:1145–1155, 2008.

[5] I. Graf and J.M. Stockie. "A mathematical model for maple sap exudation," Maple Syrup Digest, 26A(4):15–19, December 2014.

[6] I. Graf, M. Ceseri and J.M. Stockie. "Multiscale model of a freeze-thaw process

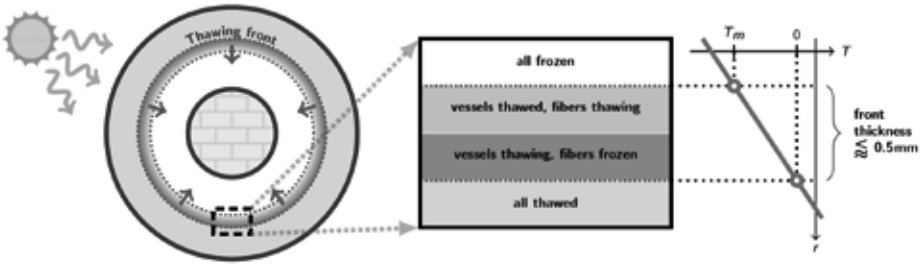

Figure 3. A thawing front driven by solar heating advances into the tree stem. The zoomed box depicts the transition from the inner region of sapwood in a completely frozen state to the outer thawed layer. This transition occurs over a thin annular ring that is determined by cells that have temperatures lying between the melting point of sap (Tm ≈ -0.16°C) and that for pure water (Tm = 0°C).

for tree sap exudation," Journal of the Royal Society Interface 12:20150665, 2015.

[7] I. Konrad, M.A. Peter and J.M. Stockie. "A two-scale Stefan problem arising in a model for tree sap exudation", IMA Journal of Applied Mathematics 82(4):726–762, 2017.

[8] J.A. Milburn and P.E.R. O'Malley. "Freeze-induced sap absorption in Acer pseudoplatanus: A possible mechanism," Canadian Journal of Botany 62(10):2101–2106, 1984.

[9] M.T. Tyree. "Maple sap exudation: How it happens," Maple Syrup Journal 4(1):10–11, 1984.

[10] M.T. Tyree. "The mechanism of maple sap exudation," in M. Terazawa et al. (eds.), Tree Sap: Proceedings of the 1st International Symposium on Sap Utilization, pages 37–45, Hokkaido University Press, 1995.

[11] M. Zarrinderakht, I. Konrad, T.R. Wilmot, T.D. Perkins, A. van den Berg and J.M. Stockie. "Experimental and computational comparison of freeze-thaw induced pressure generation in red and sugar maple," submitted to Tree Physiology.

Acknowledgements

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Management Strategies for Invasive Plants in the Sugarbush

Peter Smallidge, NYS Extension Forester and Director, Arnot Teaching and Research Forest, Department of Natural Resources, Cornell University Cooperative Extension

This is Part II: Identification of Invasive Plants Common in the Sugarbush appeared in the March Maple Syrup Digest.

Control of interfering plants in the sugarbush is guided by the principles of Forest Vegetation Management (FVM). FVM includes:

(1) statement of the desired outcome of the effort;

(2) positive identification of the interfering plant species and understanding its biology;

(3) inspection for the abundance of co-occurring desirable species that should be retained;

(4) consideration of any current or planned management activities, deer impacts and site conditions that might enhance or complicate restoration;

(5) an evaluation of the costs and logistics for all feasible treatment methods and modes (described below); and

(6) a selection and strategy for those plants desired on the site after treatment. Webinars about FVM are archived at http://www.youtube.com/ForestConnect.

For maple producers, the objective of FVM efforts might some combination of improved access to the woods, clearing along mainline and lateral lines for leak detection, or broad-scale clearing for hardwood regeneration. Clearing along tubing systems and for access is less onerous because the only need is to limit what is currently present. Regeneration requires limiting the invasive species abundance and ensuring desired species become established.

Many species of invasive plants are described as limiting forest regeneration, or the establishment of new plants of desired species. In some cases, invasive plants can limit desired plants by shading, providing cover for seed predators, changing soil chemistry, or causing dense root mats. In most situations, insufficient regeneration is the result of excessive deer browse impacts, and it is the deer that actually limit the successful regeneration of desired tree species. Deer, to the misfortune of maple producers, browse desired hardwood species while avoiding invasive plants. Because of the incessant browsing by deer on desired species, the invasive plants are favored and can dominate the sugarbush. Seldom is there a plant problem without there also being a deer problem.

If deer browsing is occurring, efforts that only control the invasive plants will fail to establish desired species. A simple field method to assess deer im-

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pacts was developed at Cornell University and is called AVID, or Assessing the Vegetative Impacts of Deer (http://AVIDdeer.com, plus on iphone and android app stores). Basically, producers put a numbered tag on 30 seedlings of desired species scattered in six clusters and annually measure their height. When average height growth of annually measured tagged seedlings is less than 10%, deer impacts are a potential concern (in addition to shade, soil compaction and other factors). Average annual height growth greater than 20% has less or no deer impact, or the species selected is not preferred by deer. Deer impact is possible even in areas with low hunter success or infrequent sighting of deer (Figure 9). Several methods of limiting deer impacts are possible, and recreational hunting is seldom sufficient.

Figure 9. The sugar maple seedling pictured was repeatedly browsed by deer. Annual height growth of regularly browse sugar maple is often less than 0.25 inches (1mm), resulting eventually in seedling death.

As described below, there are multiple approaches to treat or otherwise kill invasive plants that that the maple producer wants to control. The best treatment in one situation may not be best in another situation. The owner must consider whether they are willing to use herbicides. Organic-certified maple producers may not have that option. Producers seeking more information about the use of herbicides in the forest should look at the Forest Vegetation Management Handbook by Penn State University (https://extension.psu.edu/herbicides-and-forest-vegetation-management). Then, determine the number, species, presence of desirable species, time of year, equipment, finances and more. Because treatment options will change, maple producers should contact a local natural resource professional or Cooperative Extension, or search the internet for "manage invasive plants" for the current recommendations of control. Following are general principles.

Methods of treatment are typically either mechanical

(i.e., organic) or chemical. Both methods have advantages and disadvantages depending on the circumstances. Modes of treatment are either single-stem or broadcast. Single-stem treatments will isolate and treat a single stem of the interfering species. Broadcast treatments are applied to an area and all stems of all species present are affected (Figure 10). All treatments can be described by a method and mode, or an integration of methods and mode. For example, hand pulling is single-stem mechanical, and cut-stump is integrated because it involves cutting (mechanical) followed by an herbicide (chemical) treatment to the freshly cut stump.

Figure 10. Broadcast treatments, either chemical or mechanical, impact all plants in the area of the treatment. The choice for broadcast versus single-stem treatments depends on specific details of the property.

A third method is biological. No forest invasive plants have approved biocontrol agents, for example a predatory insect on a plant. However, some woodland owners have been successful using carefully managed intensive rotational grazing with cows, goats or sheep. While livestock might offer a single-use short duration treatment, it can also be integrated into the production of the property as silvopasture. Silvopasture is beneficial, but is not the historic practice of "putting cows in the woods" in that it requires considerable effort and expertise.

The selection of a broadcast versus single-stem treatment mode for woody interfering species depends on the number of stems per acre, plant height and the abundance of desirable species. If a relatively low number of desirable species are intermixed with the interfering species less than about 6 feet tall, or if the total number of stems to be treated requires too much labor, a broadcast treatment may be more appropriate. Many of the treatments described below will include specific product information, none of which should be considered to imply an endorsement.

Herbicides can be an efficient and effective tool, but involve additional considerations. The use of herbicides in New York requires that the name of the target plant species be explicitly included on the product label. Other states may be less restrictive. Chemical treatments are complicated by the fact that invasive species have only rela-

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tively recently been recognized in New York, and only a few herbicides list these species on the label. Fortunately, many labels are being adjusted to address invasive plants. Also, home remedies and off-label applications of an herbicide should not be used because they are unproven, have unknown environmental effects and are illegal. Herbicide treatments in general require extra care because it involves the use of a chemical, and specifically for species such as glossy buckthorn to ensure there is not movement of the herbicide into nearby classified wetlands. Research data is scant, but movement to wetlands would typically result from a saturating rain within 12 to 24 hours of the herbicide application.

Because of differences between states, no specific information on which herbicides to use is included here. The US EPA assigns authority of pesticide management to state natural resource agencies. Similar Canadian authorities exist. Each pesticide has a label which is a legal contract with the user. Each state provides access to pesticide labels for legal products. For example, in NY the labels can be obtained at http://www.dec.ny.gov/nyspad/products. The label is the law, and users are expected to have read and understand the label for the product approved for their state or province.

Broadcast chemical: A limited number of herbicides are appropriate or legal for broadcast spraying. Broadcast chemical treatments are typically a low dose applied to foliage during the growing season, but avoiding droughty conditions. All plants with exposed foliage are potentially impacted, so this treatment is appropriate only when undesired plants dominate and prospects for survival of any desired plant species are low.

Figure 11. Basal bark and injection treatments leave standing dead trees. This reduces the immediate debris, but the dead trees eventually fall.

Broadcast mechanical: Large equipment with rotary cutting heads are used for broadcast mechanical treatments. Examples include brushhogs, Fecon and Loftness Timber ax. Fecon and Loftness use a horizontal drum with grinder teeth (Fecon) or slicing blades (Loftness). These are useful to reduce the height of shrubby and low-

stature plants quickly and organically. However, most of those plants will sprout without additional treatment. Livestock with management-intensive rotational grazing can contain some sprouting, or a single-stem herbicide to stumps that sprout.

Single-stem chemical: Single-stem chemicals are either applied to a wound in the stem or in a solution that penetrates the bark and chemically girdles the tree. Hack-and-squirt and injection use a hatchet or cordless drill to expose wood inside the bark. The frequency of wounds depends on the concentration of the herbicide. Basal bark treatments use a chemical that mixes in either a petroleum or vegetable-base oil that carries the herbicide through the bark and then kills the vascular cambium and phloem tissue (Figure 11). Single-stem chemical treatments usually leave behind a standing dead tree that will fall at some point. An integrated variation of single-stem chemical is to cut the tree and then apply an appropriate herbicide to the freshly cut stump, known as "cut-stump" treatment.

Single-stem mechanical: This is any non-chemical treatment of individual stems. It might be pulling, grubbing, flame, brush saw, or chainsaw. An important feature of this type of treatment is to ensure safety for the operator, and to monitor the treated stems for resprouting. Note that pulling and grubbing can disturb the soil and may provide favorable seed germination conditions for other invasive plant species.

A fact sheet is available to help maple producers identify the variety of treatment options they can consider. The fact sheet can be found with an internet search for "Cornell Forest Vegetation Management Matrix."

2022 Maple Hall of Fame Inductee
Dr. Gary Graham

Dr. Gary Graham's journey to maple syrup production was not a direct path. Dr. Graham grew up in Ohio, on a 1,000-acre hog and grain farm, and worked as a mechanic for John Deere. His first taste of boiling syrup was visiting a high school friends' operation, and he was hooked. At the age of 27, Gary stopped turning wrenches and started turning the pages of college books. He graduated in 1993 with a Bachelor of Arts degree in Secondary Education from the University of Akron. Then in 1995 he completed his Masters of Science degree in Environmental Sciences and Resource Conservation from Miami University of Ohio. At this point Gary started working for Ohio State University Extension. Gary finished his Ph.D. in Natural Resources from The Ohio State University in 2005 and was appointed to the Ohio State faculty in 2007.

Dr. Graham's service to the Ohio and international maple industry started in 2001 with his appointment as the maple syrup specialist for OSU Extension. He organized the annual 3-day "Ohio Maple Days" workshops and multiple other maple programs across Ohio. He has conducted a maple hydrometer accuracy checking program adopted from Henry Marckres, of Vermont, for over 20 years in Ohio and at other states' meetings he was invited to present at. He served the Ohio Maple Producers Association board of directors as newsletter editor, ex-officio director and filled in as a delegate. Dr. Graham has published numerous peer-reviewed journal articles and contributed to the past two editions of the North American Maple Producers Manual. His presentations have taken him across Ohio and throughout the Maple regions of the United States and Canada. He confesses "the best part about my job is getting to meet and work with producers all across North America."

Dr. Graham has offered many educational sessions at the annual NAMSC event. He represented Ohio as a delegate when needed, served as chair of the newsletter committee, and helped organize the maple specialist meetings held as part of the yearly conferences. He received grants from the research fund and worked with other maple specialists to judge the maple contest held at the international meetings. NAMSC made Dr. Graham an Associate Member in 2003 and a life member in 2014. In 2014, he was awarded the Richard G Hass Distinguished Service Award. He has also served as a maple consultant of the IMSI Advisory Board, and as a delegate at yearly meetings.

2022 Maple Hall of Fame Inductee
Stephen Childs

Maple training started very early for Stephen Childs, helping Grandma Jones gather sap from about 20 trees. The sap was delivered to a neighboring maple producer for boiling.

From 1977 to 1986, Steve worked for ten maple seasons with Hillcrest Homestead in Allegany County, NY doing the sugarbush work for 1,200 buckets and 1,200 taps on tubing. He also did many years of backyard maple production ranging from 12 to 150 taps. From 1986 to 2004, he was employed by Cornell Cooperative Extension of Wyoming County as an Extension Educator in Agriculture, where program responsibilities included maple production and forestry. From 2004 to September of 2020, Steve was employed by Cornell University as the New York State Maple Extension Specialist working from campus and the Arnot Forest.

Steve always placed a high priority on improving maple grading and syrup quality research and extension. This led to the development of the Maple Grading Notebook, a variety of research and marketing testing projects and numerous grading and syrup quality workshops.

He also focused on improving the quality and handling efficiency of maple value-added products as well as developing instructions for new maple products. This included researching and introducing the use of the common diabetic meter to test syrup to estimate its likely success in making a certain value-added product. Through Steve's research, he had a hand in numerous new or improved products, including maple soft drinks, maple gummies, 100% maple suckers, maple meringues, and fermented maple products.

Throughout his time at Cornell, Steve placed a high priority on research for improving sap yield and information relevant to tubing sap collection systems. He also developed many educational materials for youth.

Steve has published a variety of extension articles on many maple related topics in many publications, and managed many grants from a variety of sources to fund the maple specialist position. He presented over 1,300 sessions at maple schools, maple conferences, workshops, dealer open houses, county and regional Extension meetings, Maple Camp and county and regional association meetings on all aspects of maple production.

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2022 Season Reports from NAMSC Members

Indiana

The 2022 season was better here in Indiana. The season got going the first week of February and wrapped up the third week of March. The more northern producers fared better than those in the south. The greatest difference was that the southern region was much drier than the northern, and snow was absent in central Indiana last year. February temperatures were fairly normal this year and a lot of syrup was made. March brought a week of above normal warmth followed by a week of freezing temps. A substantial warm up and a great run came the third week - the last of the season. Sugaring temperatures returned in late March and well into April as we cleaned up.

2022 Maple Weekend was March 13 and 14. Saturday the was quite possibly the most miserable day of the winter. It was blustery with freezing temperatures, and wind chills at 0 degrees or below. Despite this the public came out for the event. A record fifteen camps opened their doors to visitors this year.

Indiana has received Acer Grant funding to revive a once great syrup and sugar producing industry here. Purdue University is working with us to develop a new All Indiana Maple website. A production survey is currently being distributed throughout Indiana to all sugarmakers. A consumer survey is being prepared for distribution this summer. Based on these findings a marketing plan and a production plan will be implemented. Four field days are planned this year to help sugarbush owners with invasives, timber management and energy efficiency in the sugarhouse.

IMSA members gathered May 21 at Harris Sugarbush, west central, for canning day. This is the day we gather to bottle syrup for the Indiana State Fair where Purdue Alumni operate the Pioneer Village, a living history demonstration village. The Indiana Maple Syrup Association has a volunteer-run sugarshack in the village where we sell maple products for our largest fundraising event.

Maine

For some producers production this year in Maine was some of the best they had ever seen. Sugar contents of average to above average coupled with seasonable weather proved to be a great combination. Southern and coastal areas reported an average season with a week of warm weather that cut the season short. There were no blockbuster days – just a steady season. Northern parts of the state reported an above average to an all-time record season with some producers reporting making over 7 pounds per tap. Temperatures in the north were cold to start then it got very warm and producers were around ¼ crop, but then froze up hard for several days. Once it warmed back up it was like starting the season all over again with huge sap runs. Flavor was great across the state with many reporting lots of dark syrup.

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Maine Maple Sunday Weekend was a record for every producer that participated. Being one of the first events of the year has its benefits, and thanks to Association and producer marketing crowds were large and excited to be outside. Many reported that there was very little product left on the shelf at the end of the weekend.

Maine Maple Sunday started as a Sunday only event and has now grown to a weekend for many producers. With a turnout like we had this year I see a maple month becoming the norm sooner rather than later. Some producers are already opening their doors for multiple weekends or an entire month to spread the crowds, with different events each weekend. These producers are reporting sales that have exceeded their expectations and grow every year.

Maine will once again host a fall event in October on Columbus Day weekend. Maine Maple Fall Fest was a success for the second year in a row and participating producers are looking to grow the event. Maine still has a lot of tourists in the state that are looking for something to do, and visiting a sugar house is at the top of many lists.

Massachusetts

Here in Massachusetts it's probably time to retire the phrase "that was a weird season." Long gone are the years of consistent weather patterns and "normal" sap runs. And even here in our small state, the reports from producers for the 2022 season ranged from "blockbuster" to "what season?"

and everything in between. A few hundred feet of elevation or even a few dozen miles of distance north-south made all of the difference.

The Massachusetts Season Kickoff was held at Grand Maple Farms in New Braintree.

The weather, of course, was the main talking point. Deep freeze didn't really settle in until late – well after the new year – and snow cover was limited. February had a few days in the 60s, as did March (it even topped 70 degrees in a few places in March). And in between there were many days where the temperatures were stagnant, right around what's needed for a good run, but not fluctuating enough over the course of 24 hours to cause the needed pressure change.

Most producers were tapped by mid-February, and a few caught runs late that month. Runs in March came in fits and starts, and a few producers in northern towns and at higher elevations didn't fully wrap up until early April. Most reported that they made more syrup than in 2021, but were still below average production levels. Low sugar content and the aforementioned weather challenges were the designated culprits.

Our season kickoff brought many elected and appointed state officials to Grand Maple Farms in New Braintree, where we fit more people than was reasonable into the Schur family's beautiful sugarhouse and tapped the first tree. Later in the season we hosted two tours in Western MA, one for state officials and one for Congressman Jim McGovern and other federal representatives. These tours are great opportunities for sugarmakers to educate policymakers about the industry, and encourage them to make public investments and develop policies that support our work

Michigan

After cancelling our Fall tour in both 2020 and 2021 and holding our 2021 annual meeting virtually, we finally met in person for our annual meeting in January 2022. We had more than 150 people in attendance for several education sessions on Saturday and a roundtable discussion on Friday evening. Friday is a great networking session where our producers are able to share, ask questions and offer suggestions to

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each other. They always find out they are not alone in facing a particular issue, and there is usually a solution for every problem.

Education sessions offered were a beginner session, advanced tubing and vacuum, year-end cleaning, and shipping products, along with rules, regulation and best practices.

Michael Walters from Michigan State University's Department of Forestry shared problems regenerating sugar maple stands in Michigan and offered some solutions.

Also back this year was our syrup contest, with 34 syrup entries in all four grades, six candy and three cream entries. We all like to show off our products and this gives a perfect chance for our producers. Our Best of Show for 2022 went to Newbegin Maple Syrup.

Hydrometer testing was provided for our members for the first time this year. We've talked about for a few years and it finally was scheduled. We didn't have many take advantage of it for the first year, however it will remain something we offer again next year.

Currently we are planning our Fall tour where we will visit member sugar bushes in northern Michigan. This gives a chance to see others operations, as we're all too busy during the season. We go to different areas of the state each year for our Fall tour and try to offer 5-6 sugarbushes to tour. Occasionally there are fewer stops on the schedule as the operations are spread out farther, and sometime more if the operations are clustered close together.

Crop yields for the 2022 season were all over the place in Michigan. Southwestern Michigan had below average crop with a short season. However, they had a higher average sugar content than some areas that had higher than normal crop yield.

Southeast had above average yield with an average sugar content of 3.1%. Central Michigan had an average crop with sugar content of 2.1%. Many producers in the Northeast and Northwest had above average crops – best year ever for some, although average sugar content was 1.9%. The Thumb area had mostly dark syrup with an average crop. I didn't get any reports from the UP although I did hear that many had a great season.

Minnesota

Maple production in MN varied from poor to great. Makers in the southern part of the state generally fared poorer than those in the north. Southern makers were done by the end of March with a short season and low production numbers. This is mostly due to lack of snow cover in that part of the state. Those in the central part of the state did better, with good sugar numbers in the 2.5% to 3% range and a season that lasted about normal but ended rather late in mid- to late-April. Those farther north reported lots of snow cover all winter, better than average sugar content, and a longer than normal season, high yield, with some producers still finishing up late batches

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into the first week of May. Some even reported their best season ever or best in many years.

The Minnesota Maple Syrup Producers Association scheduled its first in-person members meeting since 2019 on May 21 in Litchfield. During the meeting we discussed results of a recent member survey and also changes to our articles of incorporation as a result of the pandemic.

New Brunswick

The maple season in New Brunswick was close to average. There was moderate snowfall in the south and huge amounts in the north. The heavy snow in the north made for a later start to the season and many producers had to shovel out lines.

The southern region season started around early- to mid-March and went on until early- to mid-April. Many in the south saw huge production, some seeing the best season they have ever had. The syrup was mostly in the Golden to Amber grades with very little Dark and Very Dark produced. The previous summer saw a good mixture of rain and sun giving the trees a great growing season. Temperatures during the season saw a very cool to a gradual warm up giving ideal conditions for sap to run. The sugar content was double that of last season, and this helped produce a bumper crop for most.

The north, however, saw a much different year. Snow was heavy giving a later than normal start to the season

for most. Lines had to be shovelled and when the season did finally start some good flows were experienced by most. The sugar content was again much higher than last year and the syrup quality was again in the Golden to Amber range. Some producers boiled into the first of May. Most saw a good to average season experiencing a provincial average of around 5 lbs per tap.

Prices seem to be slightly higher this year and many of our bulk producers will even receive above average for their production. Most of the province's syrup is shipped out in bulk but more and more seems to be going to value-added products each year.

New Hampshire

While the 2021 sugaring season seemed to be the same no matter where you were making syrup in New Hampshire, 2022's crop was very dependent on location and temperature.

While a few producers caught some early January runs, most tapped In February and were done tapping by the 18th. Most first runs were reported from between February 12 to February 22, the latest first run reported was March 7. Last boil of the year ranged from March 20 to April 13.

Production varied greatly dependent on location. Many producers reported an excellent year, some the best year ever, while a third of our reporters noted a drop in production, ranging from 18% to 30% less than last year. At least two producers noted very localized but intense squirrel damage as a contributing factor in production loss.

The majority of the crop was graded Amber, with Dark a distant second. Only a small amount of Very Dark was reported but a good amount of Golden was produced, primarily in the northern regions of the state.

In the southern part of the state, March temperatures warmed with 50's and 60's reported between the 15th and 18th with no freeze at night. When temperatures dropped to a more favorable range, high winds kept production figures down and brought the season to an early halt.

New York

By most metrics, the 2022 maple season started out slowly, with extreme February cold and heavier than normal snow in most parts of the State. For much of the last decade, January tapping and early runs in Western and Central New York had become normal, but not so this season. A small amount of syrup was produced from low sugar content sap in February.

For most parts of the State, the syrup season really didn't get underway until early March, and most areas reported low volume runs until late in the month. Also reported across the region was lower than normal sap sugar content, especially early in the season. Many producers struggled with sap lower than 2 degrees Brix for much of the season.

Similar to reports out of Pennsylvania and Ohio, the southern regions of New York ended their season with any-

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where from fifty percent to three quarters of a crop. Sadly, the trend seems to exhibit those dreaded (five to eight day) spikes of 60-70 degree temperatures that bring on off-flavored syrup, followed by a too late return to normal sugar season temperatures.

The more northern sugarbushes as well as those from the Catskills and Adirondack fared much better, with most producers reporting better than average (4.5-7 lbs/tap) crops. Also reported was an abundance of Golden and Amber syrup and lesser amounts of Dark and Very Dark. Duration of season is hard to report for a State as climatically diverse as New York, but summarily we have heard about 20 days in the south up to five weeks in the high peaks regions of northern New York, comparable to northern Maine and Quebec.

Markets seem strong and with the assistance of the New York State Maple Producers Association, smaller retail producers are being assisted with a project to make labels available. The shortage of consumer packaging was a focus for the Association and these labels are now being offered as a member benefit. The State Association organized its 27th annual Maple Weekend activities after two years of pandemic limited open sugarhouses, with nearly 160 participants. Even with restrictions and social distancing in place, visitation and participation reports were excellent.

Nova Scotia

Another maple season has come and gone. By all accounts, at least that I have heard, it was a very good season. Yields were good. In a few operations, the yields were the best ever. In most other operations, they were near to being the best. Syrup quality was very good also, and was consistently good throughout the season. The sap tended to be stronger in terms of sugar content than in recent years.

It is too early perhaps to say how the marketing of the undoubtedly good production is going to turn out. Demand, at this point, does seem to be strong.

I heard from many producers during the 2022 season, like during most seasons, that there were challenges. For example, there were at least a few sugar-woods that received damage to the trees and to the tubing from the ice-storm in early February. In those woods, producers faced a lot of extra cleanup and repairs.

Producers tapped and ready to collect and process sap in February had an unusual problem. February sap plugged the RO machines rapidly and often. Apparently it was caused by a higher mineral content in the sap, something that happens once every ten to fifteen years. This year, thankfully, it only lasted for a few days.

Certain producers had concerns about having enough barrels and containers in which to put the abundant amount of syrup being made. This is both a good problem and a bad problem to have. Also, as happened in good maple seasons in the past, some producers ran out of wood to fire evaporators before the sap stopped flowing. Another common problem, and one that we need to address quickly, is the lack of good reliable labor to work in our sugar woods.

It is great that the yields and the quality were both good, but it is no doubt nice also to have the producing season behind us. It was quite intense with few breaks. Now is the time to assess what went right, what could have been better, and what we can do to improve things and make our operations more productive in the future.

The two years leading up to this year's producing season has, to say the least, been challenging for the Maple Producers' Association of Nova Scotia (MPANS). COVID did not allow us to meet as a group either at fall tours or for our annual meetings. Virtual is better than nothing, but is not the same as in-person. MPANS did accomplish some things, however, such as updating our strategic plan. As well, Perennia Food and Agriculture Inc. together with MPANS developed and began implementing some extension projects with strong education and outreach components.

Ohio

I suppose if you had to select one word that would describe maple syrup production in NE Ohio over the last five years it would be "change." Traditionally, maple trees are tapped on Presidents' Day and the season runs until April. In the last five years producers have been tapping trees earlier – in some cases, the last week of January – and have been boiling a large percentage of their syrup in February. In most cases by the time the Maple Festival gets here, the season is a distant memory. Seasons like 2020 will be remembered for excellent production, while 2021 will be remember as a below average year. It is really hard to categorize the 2022 season. In Ohio, it was not a one-size-fits-all season.

The first reports that reached my desk were that the 2022 season in Ohio was a bust. A half crop at best, and for some that was true. For others, it was not the case at all. It all came down to location and timing. In parts of the state that you would expect a poor crop in a bad year, a full crop was produced. In areas where producers traditionally navigate Mother Nature's obstacle course, the result was less than favorable. Again, it all depended on the location of the sugarbush and when they started and when they finished.

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In Ohio, the 2022 season turned back the clock to a more traditional start. After a very cold and snowy February the majority of the producers tapped within a week of Presidents' Day. The 2022 season was also a very intense season. The majority of the syrup was made over a very short period of time between March 1 and St. Patrick's Day. Heavy snows in February, and heaver rain the first part of March, resulted in an abundance of moisture in the woods. Two things happen when you have excessive amounts of precipitation. It translates into large volumes of sap, and it can contribute to lower-than-normal sugar content in the sap. In 2022, that certainly was the case. A 60 to 1 sap to syrup ratio, was not uncommon. Producers also reported that the niter had an uncharacteristic red cast that was hard to filter.

For the majority of Ohio sugarmakers, the season ended on March 17. A few of the more adventuresome producers hung in until the last major freeze of the season on March 25. The syrup that was produced at that time was light in color, in many cases Amber or Golden. The flavor, however, was not representative of the color.

2022 will be remembered as the continuation of the La Nina weather patterns. It will also be remembered as another short season with big runs and low sap sugar. If you were lucky, you had an average year. However, for most, 2022 was a disappointing season.

Ontario

2022 brought about its fair share of odd early-season weather, but over the course of the season, producers on vacuum were delighted by bumper and even record-setting yields compared to 2021.

The 2022 season started in the second week of February in early-flow regions of Southwestern Ontario, and ended in the first week of May for the northernmost regions. In Algoma, many producers did not start the season until early April. The season ranged from 5-7 weeks long for producers on vacuum. By contrast, some had less than two weeks of maple weather in 2021.

Producers on vacuum reported making 100-150% of an average year's crop. However, those on gravity lines and buckets reported a less successful season, with some on par with last year. There was a brief but intense warm period in mid-March that stopped syrup production for a number of bucket operations in the southwest. A province-wide cold snap in the last week of March extended the season into April. The large crop this year was mostly due to this long cold snap that led to massive flows in the first week of April.

Unusual filtration issues were present in significant numbers this year. The beginning of the season saw dark and murky sugar sand, which is normal for some producers. Less normal was the reported thin coating of slime in lieu of normal sugar sand that bogged down filtration efforts for a number of producers in the late season.

Most producers in Ontario are raising prices this year for bulk and bottled sales. This is due to a number of factors,

including the shortage from last year and increased bottle and fuel costs this year. Folks are also reporting difficulty sourcing equipment and longer wait times due to COVID.

COVID restrictions lifted across the province in time for a few in-person maple syrup events and festivals to proceed. After two years of silence, events reported record crowds showing up and lineups curving around buildings! People were hungry for maple syrup and the seasonal celebration it represented.

Despite 2022 being an excellent crop year, producers are feeling the impacts of climate change in all aspects of their production. It's more important than ever to learn how to manage for healthy forests, and to read signs of stress from pests, drought, temperatures and poor soil conditions. It's not possible to control the weather, but producers can have a hand in making their woodlots healthy and resilient for the years to come.

Pennsylvania

When asking producers to describe this past season, the word used most was "Weird."

In the center of the state the season was short but not as short as last year, with average syrup yields. The entire state reported average to less than average yields. A syrup buyer commented that there was more off-flavored syrup

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than normal but they thought that it was a normal year's harvest.

One producer that I talked with made slightly more syrup than his typical year but his neighbor had one of their worst seasons ever. I heard several producers say "worse than last year" but nobody said best year ever.

On a positive note, everyone was enthused that our tours and open houses were back and a lot of people were attending. Syrup sales have been through the roof.

I am hoping that we are all able to put the last two seasons behind us and forget about them, except for the lessons learned of course. Maybe we should tear those pages out of our journal the next time we need paper to start our fires.

Hope everyone has a great between-syrup-season vacation.

Vermont

Although official numbers haven't been released, it is pretty evident that the 2022 season was a big success. After a dismal 2021 season, sugarmakers in every corner of Vermont spoke of great sap flows and sugar content that stayed above 2% for a majority of the season. Thanks to a season that ran from late February to mid-April, a lot of producers reported a crop that landed some-

where between average and one for the record book.

On March 7, the Governor's Tree Tapping event took place at the University of Vermont's Proctor Maple Research Center Center (PMRC), which is celebrating its 75th Anniversary. Before the ceremonial tapping, Governor Phil Scott noted "With the strong brand recognition of Vermont maple comes a responsibility to keep our standards at the highest level, and our maple producers have been doing that for decades with the help of the Proctor Maple Research Center."

Another highlight of the season was the return of Maple Open House Weekend. After a two year hiatus, a second weekend was added this year to allow more participation from producers and more opportunities for maple fans to visit multiple sugarhouses to learn, taste, and explore firsthand how Vermont maple syrup and other maple products are made. Anecdotes indicated strong visitation numbers and sales.

Vermont Governor Phil Scott tapped the state's first tree on March 7.

Outside of the sugarhouse and sugarbush, the staff and board of the Vermont Sugar Makers' Association (VMSMA) have been busy working on grant applications since last summer. Thanks to that hard work, VMSMA has secured several grants including federal funding ($637,000 over 5 years) to support its Sugarhouse Certification Program. This funding and the resulting program updates will be a huge benefit for Vermont maple for years to come. This federal funding will ensure a path to success and sustainability for VMSMA's Sugarhouse Certification Program. Federal funding will make a tangible, long-term contribution to how the Certification Program directly benefits Vermont's maple producers. Among other benefits, this funding will allow for the creation of a matching grant program for maple producers to upgrade equipment based on the results of onsite Certification work as well as ensure that the Vermont maple industry continues to make consistently high-quality products that comply with state and federal food safety regulations.

West Virginia

The 2022 maple season was a repeat of the 2021 season. Temperatures in November and December were above average, and this had some producers

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tapping by the middle of January. Once again, January brought cold temperatures, and these conditions continued into the first ten days of February with very little maple syrup being produced during this time, even in the warmer areas of the state.

In most areas of the state, the sap flowed strong starting February 10 through the end of the month. The temperatures were good for sap flows most of these days, with producers making 50 to 70 percent of their crop. Then came March, and once again the season ended quickly. Producers in the warmer areas finished in February and did not attempt to produce in March. Sap flows in most areas stopped by the third or fourth of the month and the next ten days brought well above average temperatures to all the state. Producers with high vacuum were able to get through these days and still produce when more productive temperatures returned the middle of the month.

The statewide average was between two to three pounds per tap, and overall about 80% of a normal crop. Some producers had average or slightly above average sugar content, while others reported below average sugar content. A lot of the state's crop is produced in March and after a great start in February, the average would have been 100% crop if the conditions in February could have continued the first 10 to 14 days in March. Most producers reported the crop was darker than normal with a lot of dark syrup produced during the 2022 season. Some off-flavored syrup was produced after the ten days of above average temperatures during the first half of March.

While the 2022 season was well below average for most, most producers in the warmer climates of the state reported an average crop like the 2021 season. As we look forward to 2023 with great hope and anticipation of a better crop, we are also very thankful we surpassed the 60% to 70% crop produced in 2021.

Wisconsin

The 2022 Wisconsin maple syrup season started in mid-March for most producers. The cold fall and lack of snow early in the winter led to some frost issues in the south and western side of the state. The later spring and lack of sunshine made for a slow start to the season. Temperatures were 10 to 15 degrees below average for parts of the season for most of the state. The dramatic swings in the weather were very noticeable this year with heavy rain in the southern part of the state and two mid-season ice storms across central Wisconsin. The cold temperatures and lack of sunshine made it easier to make very high-quality syrup. The sugar content rebounded very nicely compared to the 2021 season with sugars over the 2 brix level.

The southern third of the state had a very good crop. Warmer weather conditions thawed the ground and started the season off very quickly. Production in this area of the state was very slow-paced in mid-March, with the majority of the crop being made in April. Large runs allowed producers to make a lot of syrup in a very short period of time. Syrup quality was excellent with

most of the syrup being in the Golden and Amber grades. Production in the southern third of the state concluded for most by the third week of April.

The central part of the state made a full crop with producers on high vacuum making about 5.5 lbs. per tap. The production season started in mid-March for most producers in this area. Sugar content made a very nice comeback as well with brix readings around 2.2 for most of the season. Syrup quality was excellent because of the cold north wind and every other day snow storms. Most of the syrup that was made was in the Golden category with producers making as much as 75% of the crop in the golden color category. The snow cover held on until the third week of April when the season concluded for most producers in this area. This region also experienced some large runs of sap for a few days during the season with as much as 35% of the crop being made in 3 days.

The northern third of the state started just a few days after central Wisconsin. The early season snow that the northern third of the state received meant very little frost in the woods. Cool temperatures, persistent north winds and very good snow cover brought a late start to the season. The northern section of the state made the majority of their syrup in April. The cool temperatures and lack of sunshine made it very easy to make Golden syrup.

Overall, the production in the state of Wisconsin was average to slightly above. With the season starting later and the sugar better that 2021 the majority of the syrup that was made was in the Golden and Amber grades.

The Wisconsin Maple Syrup Producers Association had a very busy year, with many activities. The Wisconsin Maple Syrup Producers Winter Institute and Trade Show was held January 14 and 15 in Marshfield, Wisconsin. The event was held in person and had clinics and speakers Friday evening and Saturday.

The next stop for the Wisconsin Association was the Roth Sugar Bush open house which was February 3-5. Then the Association participated in the maple weekend at the Wisconsin Farm Discovery center March 11-12, followed by the annual first tree tapping March 19 at Leafy Grove Sugarbush near Merrill. Finally, the Association attended the Phelps Maple Festival April 2 to promote the Association and the benefits of being a member.

Our annual meeting was May 7 at Hotel Marshfield, both in-person and virtual. This event was the annual business meeting and syrup judging for the Wisconsin Association.

The Wisconsin Association will be at the Wisconsin State Fair August 4-14 selling Wisconsin maple products and promoting the maple industry. We will also be at the Marshfield Maple Festival September 17-18.

The Wisconsin Association would also like to remind everyone of the 2022 International Maple Conference October 26-29 2022 in La Crosse, Wisconsin. We look forward to seeing everyone there.

WMSPA Honors Joe and Barbara Polak

Joe and Barbara Polak from Merrill, WI were named Honorary Life Members at the Wisconsin Maple Syrup Producer's Association (WMSPA) annual meeting on May 7.

Joe Polak was born in 1952 into a northern Wisconsin family that has always been very involved in outdoor activities. He has made maple syrup his entire life and operates Maple Hollow, a maple syrup and equipment sales business with his wife Barbara. His father, John, was a farmer and logger. His mother, Lena, was a cook in a logging camp and helped on the farm.

Polak Brothers Sawmill started Merrill, WI in 1889. At that time Joe's grandfather owned and operated a sawmill, cider press and maple syrup operation. The mill passed to his father, John, and two uncles and closed in 1971. The maple syrup operation passed to his father at that time. Joe worked for his dad and purchased the business from him in 1985 and added maple equipment sales at that time.

Joe graduated from the University of Wisconsin-Madison in 1975 with a Bachelor of Science degree in Elementary Education and taught for one year before his father's illness brought him home to help with the maple syrup business. Joe's dad was the principal salesman and deliveryman until his retirement. A new sales room and canning facility was built in 1998 right next to the old location. New websites and online stores were started at that time.

Barbara was born and raised in Sonoma, California. She received her elementary teachers degree from the University of California-Sonoma State College and taught 3rd grade for 10 years before moving to Wisconsin in 1981. After moving to Wisconsin, she became a waitress and hostess at local supper clubs and worked with Joe at Maple Hollow. She continues to work at Maple Hollow and is the treasurer for the local cemetery association.

Joe and Barbara Polak with WMSPA President Steve Anderson.

Joe is a member of WMSPA and has been president, vice

president, director and editor of the newsletter. He has held the position of Secretary-Treasurer of the North American Maple Syrup Council since 2003. His educational background has been a great help promoting pure maple syrup and giving many educational seminars and classes.

In 1996 Joe and Barbara received the Master Agriculturist Award from the Wisconsin Agriculturist Organization and in 1999 they were awarded producer of the Year by WMSPA. In 2020, Joe was inducted into the International Maple Museum Center Hall of Fame. For Joe being outdoors is still preferable to being at a desk. Using his chainsaw and splitting maul is his recreation and therapy.

Quebec reports record season

A survey of Quebec maple producers reports that the 2022 harvest was more than 211 million pounds of syrup, far greater than the previous record season of 175 million pounds, set in 2020. That averages to a yield of 4.26 pounds per tap in 2022.

Québec Maple Syrup Producers' announcement also said that sales are also at record highs, with 180.2 million pounds of maple syrup sold in 2021, an increase of 22% over the previous year. Canada exported 160.78 million pounds of that total.

U.S. Crop Production Report

Released June 10, 2022, by the National Agricultural Statistics Service (NASS), Agricultural Statistics Board, United States Department of Agriculture (USDA).

Maple Syrup Taps, Yield, and Production - States and United States: 2020 - 2022

	Number of taps			Yield per tap			Production		
	2020	2021	2022	2020	2021	2022	2020	2021	2022
	(1,000 taps)	*(1,000 taps)*	*(1,000 taps)*	*(gallons)*	*(gallons)*	*(gallons)*	*(1,000 gallons)*	*(1,000 gallons)*	*(1,000 gallons)*
Maine	1,970	1,960	1,970	0.299	0.262	0.341	590	514	672
New Hampshire	530	530	540	0.291	0.240	0.309	154	127	167
New York	2,800	2,900	2,900	0.287	0.223	0.291	804	647	845
Pennsylvania	740	745	750	0.241	0.226	0.219	178	168	164
Vermont	5,700	6,500	6,650	0.342	0.269	0.383	1,950	1,750	2,550
United States	13,090	14,085	14,300	0.314	0.264	0.352	4,111	3,721	5,028

Maple Syrup Price and Value - States and United States: 2020 - 2022

[Blank data cells indicate estimation period has not yet begun]

	Average price per gallon			Value of production		
	2020	2021	2022 [1]	2020	2021	2022 [1]
	(dollars)	*(dollars)*	*(dollars)*	*(1,000 dollars)*	*(1,000 dollars)*	*(1,000 dollars)*
Maine	34.90	38.60	(NA)	20,591	19,840	(NA)
New Hampshire	52.10	64.90	(NA)	8,023	8,242	(NA)
New York	34.40	37.80	(NA)	27,658	24,457	(NA)
Pennsylvania	38.40	36.20	(NA)	6,835	6,082	(NA)
Vermont	27.00	32.00	(NA)	52,650	56,000	(NA)
United States	32.00	35.90	(NA)	131,731	133,648	(NA)

(NA) Not available.

[1] Price and value for 2022 will be published in Crop Production released June 2023.

For more data see https://release.nass.usda.gov/reports/crop0622.pdf.

Maple Syrup Price by Type of Sale and Size of Container - States: 2020 - 2021

	Gallon		Half Gallon		Quart		Pint		Half pint	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
	(dollars)	*(dollars)*	*(dollars)*	*(dollars)*	*(dollars)*	*(dollars)*	*(dollars)*	*(dollars)*	*(dollars)*	*(dollars)*
Retail										
Maine	53.00	61.40	31.20	32.70	19.20	18.10	10.20	10.60	6.70	6.50
New Hampshire	58.00	65.50	31.70	35.10	18.60	19.90	10.70	11.40	(D)	7.50
New York	48.10	45.60	27.60	25.20	16.60	17.00	10.60	9.60	7.10	5.70
Pennsylvania	43.60	41.30	25.50	24.30	15.70	14.20	9.60	8.85	5.60	5.00
Vermont	45.50	46.30	25.10	27.80	15.60	16.20	9.30	11.40	6.10	7.10
Wholesale										
Maine	46.20	48.30	(D)	24.80	13.70	14.50	7.80	7.90	4.80	(D)
New Hampshire	45.50	48.20	(D)	28.80	12.70	14.20	6.90	8.25	4.10	(D)
New York	40.60	41.50	23.30	23.80	13.80	14.10	9.40	9.10	5.70	4.60
Pennsylvania	40.50	39.80	18.80	20.30	11.20	13.40	6.20	7.90	3.40	4.40
Vermont	40.20	37.90	22.80	22.30	12.70	13.80	6.30	8.50	3.80	5.10

(D) Withheld to avoid disclosing data for individual operations.

Maple Syrup Bulk Price - States: 2020 - 2021

	Bulk all grades		Bulk all grades	
	2020	2021	2020	2021
	(dollars per pound)	*(dollars per pound)*	*(dollars per gallon)*	*(dollars per gallon)*
Maine	2.26	3.20	24.90	35.10
New Hampshire	2.05	2.40	22.60	26.40
New York	2.10	2.40	23.50	26.70
Pennsylvania	2.21	2.50	24.40	27.60
Vermont	2.15	2.60	23.80	28.30

International Maple Syrup Institute News

The IMSI Statistics Committee is currently collaborating with the United States Department of Agriculture's National Agricultural Statistics Service (NASS) to improve the maple survey design and to increase participation. Having a more accurate record of the US maple crop is important for the industry. The current underreporting of the economic value of maple production puts all producers, packers, and equipment manufacturers at a competitive disadvantage compared to other businesses and industries that are competing in the same pool of capital and public funds. Under-reporting also diminishes industry's ability to influence supportive public policy decisions at every level of government as well as benefiting from economic development programs. Essentially it reduces our power to influence.

The IMSI is working with the Food and Drug Administration (FDA) and the Canadian Food Inspection Agency (CFIA) to modify and harmonize the maple syrup Standard of Identity (SOI). A "standard of identity" specifically defines properties, features, and specific requirements to which a food product must conform to be identified by a specific name (e.g., maple syrup). The current maple syrup standard is not up to date and allows for additives that are not used in pure maple syrup and does not precisely describe the current filtration process with regards to soluble solids in maple syrup. It's important for our maple SOI to be accurate because it protects the integrity of 'Pure Maple Syrup' in the marketplace. Demand for maple syrup depends on the consumer's confidence in the purity of maple syrup and having a consistent, recurring positive experience eating maple syrup. The SOI provides a formal regulatory definition that precludes the sale of adulterated maple syrup. For example, selling a product named/called maple syrup that is cut with other substances or sweeteners. The SOI allows us to take strong remedial or legal action with a fraudulent manufacturer.

The IMSI provides an active member-based forum to foster collaboration and advance ideas to develop the maple industry. The IMSI acts on behalf of all of us on issues affecting our commercial interests. Please consider joining the IMSI - contact us at maplesyrupinstituteimsi@gmail.com.

In Memoriam: Gordon Gowen

Gordon H. Gowen, of Acworth, New Hampshire died March 24, 2022, at the age of 95. Gordon was a leader in local and national agriculture for most of his life. After graduating from Cornell's Ag School, he returned to his hometown to expand his father's farm, transforming it into one of the most modern and progressive dairy and maple farms in the region at that time. Gordon was involved in numerous agricultural organizations over many decades, and he proudly served as president of the New Hampshire State Farm Bureau for many years, and as president of the North American Maple Council.

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Visit mapleresearch.org, a curated collection of research papers, articles, videos, and tools, representing the most current and scientifically accurate information for maple production, to help all producers make the best products possible using the most current and most sustainable practices.

Please Consider Including NAMSC in Your Estate Plan

The North American Maple Syrup Council has received a number of generous bequests from sugarmakers who wanted to ensure that the important work of our organization can carry on.

Contact your attorney for information on how to revise your will, or your financial institution, plan administrator, or life insurance agent for the procedures required to revise your beneficiary designations.

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