Maple Syrup Digest

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Vermont's Career Development Event
Maple Sugar Trouble Shooting
Bird Friendly Maple Syrup

The Newsletter of the North American Maple Syrup Council

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 message

Well, we seem to have the earliest Maple Season ever upon us. I know I was able to tap a month earlier than ever. The snowshoes never moved from the wall, as there was very little snow in the bush this year.

As a group, we are making the first agricultural crop of the year. That said, please, let's strive to make the highest quality syrup possible. As many have heard me say selfishly, "If you make great syrup it only helps me!" And it's true. If we all produce quality syrup, everyone benefits.

At our last delegate meeting held on January 17, 2024, attendees unanimously accepted the PPAQ into membership on the Council, to represent the province of Quebec. Quebec's participation brings the Council to seventeen members, including all four Maple producing provinces, and thirteen Maple producing states. Pennsylvania made a motion for Quebec to host the International Conference in 2027, which will be followed with Pennsylvania hosting the Conference in 2028. Welcome back, Quebec to the Council!

At this same meeting, a search committee for a permanent ED, with a tentative timeframe, was proposed and approved by the delegates. The committee consists of David Briggs, Helen Thomas, Alison Hope, Jim Adamski, and Co-Chairs Stu Peterson and Brian Bainborough, with the assistance of Bill Corwin. This committee has already met in January and February.

Maine will be hosting the International Conference this fall in Portland, Maine from October 21st to 24th; they reported that things are on track and that registration will be available by summer.

Last fall, in 2023, Massachusetts hosted a successful International Conference. A huge congratulations and a thank you to the Massachusetts Board; they made the generous decision to match the auction proceeds, making a total $6,000 donation to NAMSC. This gesture is a great example of how the entire association benefits from those groups who acknowledge the value of the Council when they take on the enormous task of hosting the conference.

The next delegate meeting is May 10th in Croghan, NY. This will be held in conjunction with the Hall of Fame ceremony the following day, inducting Stu Peterson (Minnesota) and Yves Bous (Quebec) into the Hall. Everyone is encouraged to attend either day or both.

NAMSC's Education Committee is looking at ways to expand the criteria for the grant process, to include more collaboration between associations and industry in applications. This development is similar to the work Ontario did with the University of Maine a few years ago.

Brian

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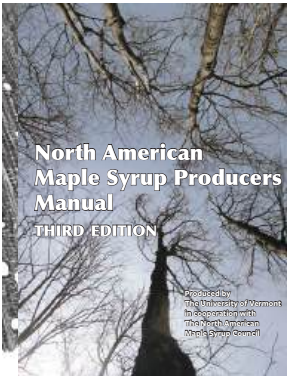

In this issue...

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The International Maple Museum Centre
NAMSC Semi Annual Meeting
and Maple Hall of Fame Induction Ceremony
Friday, May 10 and Saturday, May 11th, 2024

Inductees Stu Peterson (Minnesota) and Yves Bois (Quebec).

NAMSC Semi Annual Meeting will be held on May 10, 2024 at the International Maple Museum Centre on May 10, 2024 from 3 p.m. - 6:00 p.m inconjunction with the Maple Hall of Fame Induction Ceremony on Saturday, May 11th 2024 Stu Peterson (Minnesota) and Yves Bois (Quebec) will be inducted into the Maple Hall of Fame.

This is a momentous occasion for these individuals and one of the highest accolades that they can receive in the maple industry. Please come out and join the International Maple Museum Centre as they celebrate this event.

There will be a Pancake Breakfast from 6:30 am - 9:00 am, followed by the Induction Ceremony at 9:30 am and then a luncheon to start at 11:30 am.

International Maple Museum Centre
9756 State Route 812
Croghan, NY 13327
(315) 346-1107

info@maplemuseumcentre.org

Participation in the NASS Maple Survey.

Jean Lamontagne IMSI

Theresa Baroun NAMSC

Our maple industry needs more accurate production reporting. The maple syrup production numbers and taps reported by NASS are much lower than the actual maple production because there aren't a sufficient number of producers responding. This is a problem. It makes our industry look very small, and stagnant whereas it is of considerable size and growing. This is a disadvantage for producers compared to other farming industries competing for limited private and public funding and research grants and it makes borrowing costs more expensive.

Please make sure to fill out the survey when you get it. If you have not received NASS surveys, please sign up to be counted by going to the NASS homepage (www.nass.usda.gov) and clicking on the "be counted" button at the bottom of the page. Or go directly to **https://www.agcounts.usda.gov/.** Or for more information or assistance with the survey, producers can call the NASS Northeastern Field Office at (800) 498-1518. The new survey is now really easy to fill out and as usual, it's completely confidential with no exceptions and serves only in aggregate. Please let's help each other by filling it out!

The IMSI worked with NASS to improve the survey – to see how it has changed click **https://www.nass.usda.gov/Statistics_by_State/New_England_includes/Publications/Current_News_Release/2023/2023-Maple-Syrup-Survey-Announcement.pdf**

NAMSC IS IN SEARCH OF AN EXECUTIVE DIRECTOR

Watch your email, June Maple Digest, and NAMSC website for more information as it becomes available.

Vermont's Maple Career Development Event

Mark Isselhardt, University of Vermont Extension Maple Specialist
Lynn Wolfe, Shelburne Farms Maple Educator

Any who has been involved with Future Farmers of American (FFA) will recognize the term Career Development Event or CDE as they are more commonly known. CDE's are events that challenge high school age participants "to develop critical thinking skills and effective decision-making skills, foster teamwork and promote communication while recognizing the value of ethical competition and individual achievement." There are CDE's covering many aspects of career and technical education such as dairy management, agricultural soil grading, business management, forestry/natural resources, public speaking and more. Until 2019, there was no statewide CDE devoted to testing the knowledge and skills needed to produce high quality, pure maple syrup.

In 2019 a University of Vermont graduate student and Shelburne Farms employee, Lynn Wolfe, developed the framework for the first of its kind maple CDE. Wolfe also wrote a condensed "mini-manual" for instructors to use when teaching students about the latest in maple technology. UVM Extension Specialist, Mark Isselhardt, worked with Wolfe to bring modern, research-based knowledge to instructors and ultimately high school students. University of Vermont Extension and

Shelburne Farms then partnered with Vermont Future Farmers of America and Natural Resources and Agriculture instructors at Vermont's Career, Technical Education Centers to host the first maple CDE. The Maple CDE has continued to take place each year, including a fully remove version during COVID and has drawn students from across Vermont's network of Career and Technology Centers and now over 150 students from over 10 schools have participated in at least one CDE.

May 19th, 2023 marked the fourth Vermont Maple CDE. The 2023 CDE took place at the Vermont Technical College farm and sugarbush in Randolph Center, Vermont. A total of fifty-three students were registered from eight different schools. Individual students took part in four areas: Syrup grading, Tapping Skills, Maple Tools/Fittings and General Knowledge. In addition to the individual skills portion of the event, several schools fielded teams for the Team Event. The Team Event challenged groups of 3-5 students to properly install a 5/16" lateral line, connected to three trees and then connected to a mainline in thirty minutes or less. Students were given tubing, fittings, tools and a flagged area of the sugarbush in which to work but no specific instructions about how to do the

installation. When the lateral line had been installed the students could introduce water to the end tree in the system to show that it would in fact conduct sap. Judges would then judge each installation and applying deductions based on mistakes observed (fittings not installed correctly, lateral lines not "tight, straight and downhill", garbage left on the ground, etc.). Students were also asked to accurately measure the diameter of each tapped tree, using a diameter tape, to the closest 0.1".

Schools that produce syrup as part of their curriculum were invited to submit samples into a student syrup competition. Each sample was judged for the basics of color, clarity, density and flavor, the same as if it were entered in a county, state or international maple contest. Four total tries from two schools were submitted to the contest. In general, there was improvement from the previous year when none of the samples met the minimum standards. This year two of the four total samples were acceptable. Of the two entries that were rejected one missed the mark in color, clarity and flavor while the second missed on account of an off-flavor. While disappointing to hear your entire didn't measure up, it's an important lesson for these young sugar makers that syrup quality matters and attention to detail is critical to making pure maple syrup. Perhaps the goal of this program is best summed up by a quote from an instructor at the 2022 Vermont Maple CDE… "(the CDE) is something all students should be doing if they are in tech center or other school, this type of experiential learning is invaluable."

FFA programs in other maple producing states have taken notice and have either held their own maple CDE or are planning to do so in the near future. This positive development means that it is likely only a short time before a national maple CDE can take place. The benefits for all involved are numerous including allowing instructors to learn how each other's programs are run, providing students with a venue to showcase their knowledge and fostering communication and learning between the next generation of maple producers.

Consider adding these test questions if space allows but certainly not required

Test your knowledge with these sample questions:

1. Removing trees adjacent to crop trees but below the main canopy…

a. Will help increase the growth in crop trees

b. Will increase the sugar content of crop trees sap

c. Have little to no effect on the remaining crop trees

d. Can help eliminate threats from invasive species

2. What is NOT considered a primary factor influencing total yield of sap?

a. Vacuum

b. Tubing sanitation

c. Tree size

d. Elevation

3. Each inch of Hg increase in vacuum results in how much increase in yield?

a. 100%

b. 50-60%

c. 5-7%

d. 1-2%

Answers

1: c

2: d

3: c

THE UNIVERSITY OF VERMONT

Seeking an Associate or Full Professor of Plant Biology and Scientific Director of the Proctor Maple Research Center

Associate or Full Professor of Plant Biology and Scientific Director of the Proctor Maple Research Center The College of Agriculture and Life Sciences and the Department of Plant Biology at the University of Vermont (UVM) invites applications for the position of Scientific Director of the Proctor Maple Research Center (PMRC) at the rank of Associate or Full Professor, starting August 2024. We seek an accomplished researcher with the creative vision to help guide the research direction of the PMRC, sustain and grow its use as a cutting-edge research facility for forest tree biology and maple syrup production, and enhance the capabilities of the Center by attracting research faculty, visiting scientists, and graduate students. This is a 9-month 1.0 FTE position with an underlying tenured faculty position in the Department of Plant Biology.

The Proctor Maple Research Center is a field research station and functioning sugaring operation, located in Underhill, VT about 45 minutes from the UVM main campus in Burlington. As the world's premier research facility on the science of maple sugar production, the PMRC contributes through research, demonstration, and education to the practical and scholarly knowledge required for the success and sustainability of the maple industry. Basic research at PMRC has shed light on tree sap flow physiology, tree health under global change, and the chemistry of sap and syrup, while applied research has produced new techniques for sap collection and processing for improving syrup quality while investigating the sustainability of high yield practices on the long-term health of trees. The PMRC also serves as a field classroom for students and scientists across multiple disciplines, as well as a source of research-based best practices and outreach to the international community of maple syrup producers and stakeholders, offering technical scientific guidance, outreach presentations, and tours.

For the Scientific Director, we seek an innovative and experienced researcher with a nationally or internationally recognized research program grounded in the basic science of tree biology, with clear potential for translational application to maple health, sap, and/or syrup production. Examples of potential research areas include, but are not limited to, tree physiology, forest ecology, tree responses to global change, systems biology, or other fundamental areas important to tree and forest ecosystem health. We are particularly interested in candidates who are highly collaborativ

tive and will foster an at the PMRC that engages with multiple researchers working across themes of forest tree biology and global change and will help grow the breadth of research hosted at the PMRC. The Scientific Director will oversee a program that includes both basic research on tree biology/ecology and applied research on maple sap and/or syrup production. The Scientific Director will also work closely with the Administrative and Outreach Director to coordinate activities at the PMRC as well as to engage with stakeholders.
As part of their role guiding the scientific direction of the PMRC, we expect the Scientific Director will maintain an active lab group, including mentoring graduate and undergraduate student researchers. While the primary duty station will be at the PMRC, there is additional lab and office space available on the UVM main campus to support the candidate's lab group and encourage interactions and collaborations within the department and the broader UVM community. Teaching duties include 1 or 2 courses per year, including an introductory course in maple science and an upperlevel undergraduate or graduate course in the applicant's area of expertise. Service will be split between outreach to the maple community and service to the College and University in support of its land-grant mission. '

Qualifications:

Candidates must possess an earned doctorate in plant biology, biology, forestry, ecology, or a related discipline. The successful candidate will have scholarly accomplishments that demonstrate an active and nationally or internationally recognized research program with a sustained record of publications and extramural funding. The Scientific Director will be a committed teacher with the capacity to teach and mentor students at the graduate and undergraduate level. Candidates should have experience building and fostering the development of collaborative teams, with a demonstrated commitment to promoting inclusive practices. The successful candidate is expected to qualify for the rank of Associate Professor or Full Professor at the University of Vermont.The University of Vermont is especially interested in candidates who can contribute to the diversity and inclusive excellence of the academic community through their teaching, service, and research, scholarship, and/or creative arts. We are an educationally purposeful community seeking to prepare students to be accountable leaders in a diverse and changing world. Members of the University of Vermont community embrace and advance the values of Our Common Ground: Openness, Respect, Responsibility, Integrity, Innovation, and Justice. The successful candidate will demonstrate a strong commitment to the ideals of accessibility, inclusiveness, and academic excellence as reflected in the tenets of Our Common Ground.

Required Materials:
Applications must be submitted online at www.uvmjobs.com to Position # 00026926. Applicants must provide:

1. A cover letter articulating the's for candidate's vision for guiding the scientific direction of the PMRC and how their background and accomplishments prepare them for this position.

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2. A current C.V. detailing publications, internal and external funding, teaching, and service activities.

3. A maximum 3-page combined Research and Teaching Statement

4. A maximum 1-page statement that discusses the candidate's skills, experiences, and commitment to inclusive excellence in their teaching and mentoring activities, and ways in which past or future activities could help foster diverse, inclusive, and collaborative teams that aspire to the tenets of Our Common Ground.

5. Names and (e-mail) addresses of at least three references who may be contacted after the initial application review.

The review of applications will begin March 05, 2024, with applications submitted after this date reviewed on a rolling basis until the posting is closed. Start date is flexible, with an anticipated start in August 2024. Salary will be made at a level appropriate to the successful applicant's qualifications and experience. For further information about this position, please contact: Dr. Stephen Keller, Search Committee Chair (Stephen.Keller@uvm.edu) or Sarah Goodrich, Plant Biology Department

(Sarah.Goodrich@uvm.edu).

The University of Vermont (UVM) is a land-grant university and the state's flagship institution for research, teaching, and extension, known for its commitment to research excellence in the environment, climate change, and planetary health. UVM's main campus is situated along the shores of Lake Champlain – part of the UNESCO-designated Champlain-Adirondack Biosphere Reserve. The city of Burlington is known for its high quality of life, excellent schools, thriving art and music scene, and. abundant outdoor recreational opportunities. The Proctor Maple Research Center is part of the Department of Plant Biology in the College of Agriculture and Life Science (CALS), with a mission to deliver collaborative, transformative research, academics, and outreach that create critical thinkers and problem solvers to build resilient, sustainable, inclusive, and healthy communities and environments.

CALS has approximately 120 faculty across academic units and Extension, serving approximately 1,400 undergraduate and 170 graduate students (M.S. and Ph.D.), and is home to UVM Extension and the Agricultural Experiment Station dedicated to providing scientific service in support of UVM's land-grant mission. In addition to PMRC, CALS is also home to the newly established USDA-ARS Food Systems Research Center, the UVM Greenhouses, the Pringle Herbarium, the Entomology Research Lab, the Paul Miller Research Complex, and the Horticulture Research and Education Center. UVM's facilities also

encompass a network of Research Forests and Natural Areas for scientific research, teaching, and outreach activities. Abundant opportunities exist at UVM for collaboration in areas of forest tree research, including with faculty and students in UVM's Rubenstein School of the Environment and Natural Resources, the Forest Ecosystem Monitoring Cooperative, and the US Forest Service Northern Research Station. The University of Vermont is an Equal Opportunity/Affirmative Action Employer.

All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, disability, protected veteran status, or any other category legally protected by federal or state law. The University encourages applications from all individuals who will contribute to the diversity and excellence of the institution.

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Ask Proctor: Tiny Bubbles

Timothy D. Perkins, Research Professor
University of Vermont, Proctor Maple Research Center,
Underhill, Vermont

Maple producers using tubing often observe bubbles emerging from the tree within the spout or first few inches of tubing when the sap is running. If the spout is not seated properly, leaks may occur. These are most noticeable as rapidly moving streams of small or large bubbles. At other times, these are not leaks, however repeated or overly aggressive attempts at seating spouts to make the bubbles stop can create leaks that further attempts at spout seating will only make worse.

If they aren't leaks, what are those really tiny bubbles coming out of the tree? Where do these come from? Why do they seem to grow in size as they come out of the tree? How do we stop them?

Of course, as scientists there are several components to this answer filled with lots of details (and math, https://mapleresearch.org/search/?_sf_s=exudation), but to simplify things, most of the extremely small bubbles we see coming slowly out of the taphole into the tubing originate as dissolved gases in sap. Within the stem, expansion of air trapped within the fibers combined with gravity pushing down on the column of sap above the taphole creates stem pressure. These pressures can reach up to about 35-40 psig – about the same pressure as the air in your car tires. This pressure causes air within the stem to dissolve into the sap. This process is extremely important as it is the way in which maple stems fix and refill cavitated, non-functional vessels to maintain deep areas of functional sapwood. When sap that was at a relatively high pressure (35-40 psig) within the tree exits into a lower pressure tubing system(0 psig for gravity collection or up to -28" Hg under vacuum collection), the air that was dissolved in thesap comes out of solution to form bubbles. A miniscule bubble forming under pressure within the stem expands by a factor of about 3.4 times in volume when it exits the tree and reaches air pressure. If you have 25" Hg vacuum on the dropline, the bubble will expand over 4 times in volume as it exits the tree. Often these bubbles merge as they exit, forming trains of gas and liquid in the tubing system.

A good analogy is a soda. In an unopened can sitting in your fridge, the pressure is about 17 psig at a temperature of 34-37 deg F, but there are no bubbles. If you put the unopened can on the counter, the pressure inside the can will rise to about 36 psig as the temperature as the temperature reaches 70 deg F, but there are still no bubbles. If you open that can, whether straight from the fridge or after it sat on the counter, bubbles will form in response

to the lower pressure.

How do we stop the bubbles from forming? The short answer is, you don't. There is no way to prevent air coming out of the tree. The gases are naturally there dissolved in the liquid. The tree tissues produce some of these gases through their normal living processes (respiration). As air temperature goes up during the day, gas production also increases. As the pressure on the sap coming out of the taphole drops to air pressure or to the vacuum pressure in the tubing system, the bubbles will expand. These two factors (temperature rise and pressure drop) together result to bubble formation and expansion during maple sap flow. While this gas production from tapholes can contribute to reduced vacuum during hot spells, it really is only a problem if you diagnose the bubbles as leaks and attempt to fix them by overdriving the spouts.

Japan Sugaring

by Eric T. Jones
Oregon State University

In Japan, something wonderful has been taking root, maple sugaring. From Chichibu to Itoigawa on the island of Honshu, and from Sapporo to Kushiro on the island of Hokkaido, people are tapping their native maples to make syrup and other foods, sweet and otherwise. The most common maple tapped is Acer pictum subsp. mono, or what the Japanese call Itaya Kaede, the painted maple, or the indigenous Ainu call, Topeni, the milk tree.'

In summer 2023 I traveled to Japan as part of a team visiting traditional log-grown shiitake farmers. I went a week early to follow-up on some preliminary research I had done identifying a dozen different maple sugaring sites in Japan. I visited three villages by train and then met with Keiko Kuroda, professor emeritus at Kyoto University who did research on sap flow. Everyone I visited was welcoming and excited to make a connection with somebody else involved in sugaring research and development.

In the small town of Chichibu, Aiko Ihara started Maple Base, a business collaboration with a cooperative association of local maple tappers called the Chichibu Jyueki Seisan its Kyodo Kumiai. The association was formed as a project to help revitalize and create new forest industry in the area. They produce a highly varied line of artisan maple products including syrup, jelly, candy, vinegar, and maple water. The maple trees are usually tapped in February, but Maple Base attracts tourists throughout the year due to its location in a beautiful park in the hills above Chichibu. Maple Base is a sugarhouse, store, restaurant and educational facility that provides a full range of maple-based experiences.

Another exciting project around maple sugaring is in the Nechi district in the mountains above Itoigawa City. Here you will find Mr. Saito leading educational group tours to tap maple. The snow can be over 10′ deep in this area so tapping is done on snowshoes. Mr. Saito sees the growing disconnect between youth and nature as a serious problem in Japan so his mission is to use activities like maple sugaring and time in nature to help young Japanese connect with nature.

In both Chichibu and Nechi I sampled their syrup and in exchange I handed out samples of bigleaf

maple syrup, explaining like Japan, sugaring is largely a new phenomenon. While unmistakably maple syrup, the Japanese variety from Itaya Kaede exhibited a unique flavor profile distinct from sugar maple syrup and other maple types, such as bigleaf, Norway, bigtooth, and box elder.

Maple Base uses a Leader Evaporator they had shipped from Canada. Smoky Lake Maple told me this year they have shipped a couple of units to villages in Hokkaido. However, in general I saw almost no supplies like plastic spiles, tubing, and filter presses like we use here. Instead, I saw creative substitutes like the use of stainless steel pipe for taps. Japan, China, and Korea could all be new markets for maple equipment and a well-organized operation just outside of Tokyo like Maple Base could be a great place for an international dealership where small commercial and hobbyists could pick up the supplies they need.

Is Honshu the new Vermont and Hokkaido the new Quebec? No, at this time sugaring is largely a small enterprise ranging from small hobbyists to small commercial enterprises. Japan is working to reform ancient land tenure systems that can be a barrier to new entrepreneurs like maple sap-based businesses.

While the future may bring larger operations capable of supplying markets beyond their local communities, at present, small-scale community sugaring activities and media coverage play a vital role in fostering appreciation for real maple syrup and its culinary applications. Maple syrup can be seen as an ingredient in many processed products sold in grocery stores in Japan and a local sugaring industry will only fuel their love of maple.

If you are heading to Japan and want to find maple sugaring please email me and I'll happily share what I know, eric.t.jones@oregonstate.edu.

Maple Research & Outreach Professional Profiles

"Dr. Tim" Perkins

Tim Perkins was born and raised in the Northeast Kingdom of Vermont. As a youth, he, along with his seven siblings (5 brothers, 2 sisters) and father, helped on their grandfather's (and later Uncle's) farm in Westmore, Vermont. His chores included gathering sap from buckets, carrying firewood, and, of course, tasting syrup.

His interests from Elementary through High School revolved around all things science-related. Chemistry sets, microscopes, and anything that would lead to further observation and experimentation were favorite "toys." He copiously devoured any reading material he could get his hands on.

Due to his interests, in his Senior Year of High School, Tim was selected as only a handful of students to participate in the "Student Science Training Program" sponsored by the National Science Foundation and run by Dr. Charles and Marilyn Racine as part of the Center for Northern Studies in Wolcott, Vermont. This involved visiting different field sites around Vermont on Saturdays to learn about and conduct research on a wide variety of natural systems and processes. He graduated from High School as a National Merit Scholar Semi-finalist (top 4% of scorers on national PSAT) and Class Salutato-rian in 1979 and enrolled at the University of Vermont (UVM).

By the end of his first year of College, Tim chose a Self-Designed Major in Environmental Studies, specializing in Field Ecology. Due to his wide interests, he double-majored in Geology, and graduated in 1984 with two Bachelor of Arts Degrees (Environmental Studies and Geology).

In the summer of 1983, Tim took a summer position as a research assistant for the "Acid Rain" lab run by Dr. Hubert Vogelmann and Dr. Richard Klein. This job entailed researching the high-elevation red spruce forest on Camels Hump, Vermont, to describe and understand the impacts of acid deposition induced forest decline. He was hired as a technician in the "Acid Rain" lab upon graduation. As part of this job, he was able to take graduate credits and received a Master of Science Degree in Botany in 1988. The original plan to leave UVM to pursue a Ph.D. elsewhere, but life events (family illness) persuaded him to stay and pursue a doctorate (Ph.D.) in Forest Physiological Ecology (the study of tree function in the environment), which he received in January 1991. While arranging a post-Doctoral position in another state, his Ph.D. advisor and head of the lab

fell ill and convinced Dr. Perkins to remain for "another year or two" until the situation stabilized. During that time, Dr. Perkins started writing and receiving grants to fund his independent research on the mechanisms of winter injury to red spruce foliage (caused by acid deposition). In the spring of 1996, as his time at UVM was again nearing its end, Dr. Mel Tyree, the Director of the UVM Proctor Maple Research Center (PMRC) at the time accepted a position as Director of the U.S. Forest Service Station in Burlington, Vermont. Tim was asked to serve as Interim Director of UVM PMRC until a search could be completed. The search never quite materialized, and in 1999, Dr. Perkins was appointed the permanent Director of UVM PMRC.

Tim's early research in the maple world focused on the sources lead in maple syrup and also on the effects of fertilization/liming on tree nutrition and maple syrup production. Over time, his interests moved more into sap flow dynamics in trees and tubing systems and delineating the influences of various collection practices on sap production. Nearly a dozen years were spent examining the impacts of taphole, spout and dropline sanitation on sap yield and production economics. This work led to the development of the Leader/H2O Check-valve spout and adapter. Most recently, his work includes the development and testing of the Middle Valley Maple Arc-Barb Spout and fittings among other innovations.

During his time as Director, UVM PMRC grew from about 1,200 taps to about 6,500 taps, focusing on high yield sap production. As a consequence of this, the previous average syrup production of 0.3 gal/tap doubled to its current 20-year average of 0.59 gal/tap. UVM PMRC also began providing syrup to the dining halls at UVM over that time. Pure maple syrup is now the default option on campus (you have to ask if you want the "other stuff"). In addition, along with Dr. Abby van den Berg and Mark Isselhardt, the construction of the Maple Processing Research Facility at UVM PMRC was completed and several years of testing on the effects of air injection and reverse osmosis concentration was conducted in up to four evaporators processing sap simultaneously.

Dr. Perkins was promoted to full Research Professor of Plant Biology in 2010. Over the course of his career, he has had 45 peer-reviewed publications, written 150+ maple industry publications, done hundreds of print and broadcast interviews, and given several hundred invited presentations. He holds (with co-inventors) six patents. Tim was a contributing editor to the Second (2006) and lead editor and contributor to the Third (2022) Editions of the North American Maple Syrup Producers Manual. He has served on a number of position search, grant review, and project review panels for UVM, State, National, and International organizations and chaired or served on several maple industry committees and task forces. . He has served as a science advisor to the Vermont Maple

Sugar Makers Association, Vermont Maple Industry Council (now Committee), the North American Maple Syrup Council, and the International Maple Syrup Institute. He is a Life Member of the North American Maple Syrup Council.

Tim has received over 68 competitive grants during his career, and was instrumental in working with the Vermont Congressional Delegation to conceptualize and develop what became the U.S.D.A. ACER ACCESS Grant Program, providing funds for research and education of maple producers in the U.S.

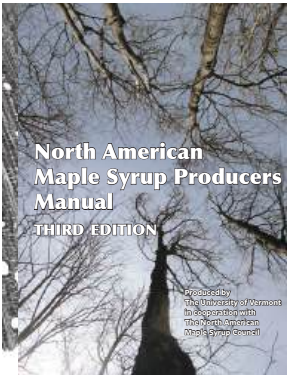
During his early years on the faculty at UVM Tim taught several courses, but most of his interaction with students was through research. He employed or served as science advisor for several dozen students and graduate students, very often with their projects being translated into published works. Dr. Perkins was awarded the Maple Person of the Year in 2003 by the Vermont Maple Industry Council, the Award of Exceptional Merit in 2007 by the Association of Natural Resources Extension Professionals, the Golden Maple Leaf Award in 2008 by the International Maple Syrup Institute, the Sumner H. Williams Award (President's Cup) by the Vermont Maple Industry in 2011, the Richard G. Haas Distinguished Service Award by the North American Maple Syrup Council in 2013, the President's Award by the International Maple Syrup Institute in 2018 and the Richard G. Haas Distinguished Service Award by the North American Maple Syrup Council in 2022. He was inducted into the Maple Hall of Fame at the International Maple Museum Centre in Croghan, NY, in 2021, the UVM Ventures Inventor Hall of Fame in 2011 and given the UVM Innovations IMPACT Award in 2023.

In the middle of this, Tim and his wife, Anita (married nearly 42 years) served as coaches, school coordinators, board members, trainers, tournament coordinators, and directors of the Vermont Odyssey of the Mind Program and International Odyssey of the Mind Program as volunteers for over 17 yrs. For over a dozen of those years they planned and coordinated trainings and activities which served hundreds of coaches and students and involved training and coordinating over 100 volunteer judges and officials. The annual Vermont State Tournament was attended by over a thousand spectators and participants. Considering that Tim does maple research and Anita is an accountant, and that the busy time for Odyssey of the Mind falls mainly from January through May, with a huge State Tournament in mid-March and International Odyssey of the Mind World Finals in May, saying they were busy each spring during that time is a huge understatement.

Dr. Perkins stepped down as UVM PMRC Director and retired in June 2023, but returned to UVM in a part-time, remote position to help finish up some ongoing projects during the search for a replacement. He currently resides in South Lyon, Michigan, close to his daughter, son-in-law, and two young grandchildren.

Order the 3rd edition of the North American Maple Syrup Producers Manual at:

www.mapleresearch.org/ordermanual



Ask Proctor: Why Isn't Sap Yield from a Tree the Same Every Year?

Timothy D. Perkins, Research Professor

University of Vermont, Proctor Maple Research Center,

Underhill, Vermont

We occasionally hear the question: "Even if the season is late or short, shouldn't there be the same amount of sap produced during the time that does run than there would have been if it were longerseason or happened at 'the usual' time?"

To state this question in other terms, "Isn't a maple tree just a reservoir with a certain amount of sap init that will run out of the taphole in the spring until all the sap in the tree is fully drained?"

The short answer is no. While sap yield is related to tree size to some extent, the amount of sap produced each season varies depending upon several factors. This line of thinking stems from themistaken assumption that trees are a simple vessel that is full of sap, and that tapping drains all of the sap out of the tree over the course of the spring season until it is empty. In reality, maple trees and springtime sap flow are considerably more complicated than that.

To keep things as simple as possible we will ignore the differences in the amount of sap we collect due to the various methods used (gravity, vacuum, bags, buckets, tubing, spout size and taphole depth,sanitation of spouts/ drops) and focus just on what happens in the tree.

It is important to recognize that sap moves in trees in response to gradients in pressure. These gradients form due to gravity (head pressure), osmotic pressure (due to sugars in the sap), and gas expansion (bubbles in the wood expanding and contracting due to temperature changes). Because of maple wood anatomy, most liquid flow occurs primarily in a vertical (up and down) direction. While side-to-side movement can and does occur, it happens at a rate about 10X more slowly than it does vertically.

Sap flows out from the tree during periods in the spring (or fall) when the wood temperature rises above freezing. During any one flow period, sap will continue to flow from tapholes until either: there is a freeze, the pressures within the tree fall to the same level as atmospheric pressure (or to the pressure within the tubing system if under vacuum), or there is no available moisture in the soil to be taken up.

During a short thaw, or if the tree only partially thaws (this is more common early in the season), not all the avail-

able sap will exit the tree. One side of the tree can be producing sap while the other side or deeper within the tree remains frozen.

During extended thaws which are more common later in theseason, sap flow may eventually cease if collecting by gravity, but continue on tubing with high vacuum.

A simple way to think about it is as a paper cup that starts out completely filled with ice. If you poke a pinhole near the bottom, no liquid runs out – it is all frozen. If you put the cup of ice on your counter, it will start to melt from the outside in and liquid will begin to flow out of the pinhole akin to sap exudingfrom a taphole. The rate and amount of liquid that flows out depends upon how long the thawing-happens. A short thaw produces only a little puddle (small amount of sap) near the cup. A long thaw produces a bigger puddle (a lot of sap produced). But to confuse things more, thawing doesn't always happen at the same rate. Sometimes it can be quite cold in the house and the ice will melt slowly (slow sap flow). At other times you're sitting out by your pool and the sun is shining on the cup and the ice melts quickly (rapid sap flow).

Next, we add yet another complication. The glass might be occasionally put back into the freezer and the liquid refreezes, but at the same time, imagine that water is added to the container as that freezing happens. This refilling several times over the season in trees as well. When the temperature falls toright around freezing, the gas bubbles in the wood contract, creating pressure in the tree which falls below atmospheric pressure (vacuum or suction) and water is pulled into the tree through the roots.

There is yet another factor – sometimes we're able to add just a little water to the glass (as in a fast freeze with just modest uptake of soil water into the tree) and at other times we are able to fill the glass completely (a slow freeze and complete uptake of soil water into the tree).

Taken together, the number, intensity, and duration of thaws produce several sap variable flow events that occur in a season. This is combined with the number and rate of transitions from above-to-below freezing temperatures affecting water uptake dynamics and the amount of sap available for subsequentexudation events from tree stems. Thus, the amount of sap that is produced by any one tree in a season varies considerably depending upon the way the spring plays out. In other words, Mother Nature has a big influence on the amount of sap maple producers collect during a season.

MARK YOUR CALENDERS 2024 NAMSC Maple Syrup Conference in Portland, Maine Oct.21-24, 2024 Watch www.mainemaple-producers.com for more information as it becomes available!!!!

Maple Sugar Troubleshooting

Catherine Belisle, Ph.D., 2023
Cornell Maple Program
Cornell University, Dept. of Natural Resources and the Environment

Maple sugar is a versatile product with distinct maple flavor. It is produced by boilingsyrup to a set temperature followed by stirring the heated solution until it crystalizes intoa granulated or brown sugar consistency. Multiple factors influence the quality of maplesugar. This bulletin provides guidelines for addressing issues commonly encounteredduring and after the production of maple sugar, including moisture content, granulation size, and flavor formation. For maple sugar production details, please refer to the Crystallization and Granulated Maple Sugar chapters in the New York State Maple-Confections Notebook, available on the Cornell Maple Program website.

Background

Maple syrup contains 66 – 68.9% sugars, the majority of which is sucrose, an easily crystallizable sugar. When sucrose is exposed to microorganisms (yeast and bacteria),heat, acids (e.g. tartaric or citric), or the invertase enzyme, it hydrolyzes or splits into the invert sugars, glucose and fructose (Fig. 1).

Invert sugars act as crystal inhibitors and help retain moisture in food products. Glucose inhibits crystallization by physically preventing sucrose molecules from associating. Meanwhile, fructose is highly hygroscopic; it absorbs moisture more quickly and to agreater extent than glucose or sucrose (Bhandari and Hartel, 2002). When invert sugars are present, a slowed or inhibited crystallization should be expected. It is recommended to use syrup with <0.5% invert sugars for granulated sugar consistency or <4% invert sugars for brown sugar consistency. Invert sugar levels can be measured using a glucosemeter. Guidelines are available in the New York State Maple Confections Notebook and in the video: "How to Test Invert Sugar Levels in Maple Syrup" on the Cornell Maple Program YouTube channel. For reference, granulated sugar contains 99% sucrose, 0.015% invert sugars, 0.02% moisture, and 0.01% inorganic compounds. Meanwhile, light and dark brown sugars contain less sucrose (89 and 87.9%), and higher levels of invert sugars (4.2 and 4.6%), moisture (2.7 and 2.8%), and inorganic matter (1.4 and 1.7%), respectively (Hartel et al.,2018).

Amorphous or **glass sugars** are sugars that are immobilized and unable to crystalize due to limited water (<15%) in the sugar solution (Hartel et al., 2011). Hard candies and lollipops are commercially produced amorphous sugars. Amorphous sugars appear in

granulated sugar production as sugar clumps formed in response to rapid cooling or slow agitation. They are unstable and dissolve more readily than a sugar crystal. However, the chemical nature of these sugars allows flavors to be dispersed throughout the confection, compared to crystalized sugars where the flavor is only on the surface.

Moisture in Sugar

Moisture or water content is influenced by the production environment, invert sugar levels, and finishing temperature (the highest temperature syrup is boiled to). To reduce excess moisture in the final product, produce sugar in a 20 – 65% relative humidity (RH) environment, use maple syrup with <2% invert sugar, and select a finishing temperature of 50 – 55 °F above the boiling point of water (ABPW). '

Relative humidity. It is expressed as the percent of moisture in the air relative to the total amount of moisture the air can hold at its current temperature. Maple sugar production requires moisture removal from the syrup during boiling followed by a release of moisture in the form of steam during stirring. If sugar is produced in a high RH environment, the moisture removal is slowed. High moisture in the air hinders the release of the moisture in sugars during stirring. Maintain a RH of 20 – 65% during production. Fans and dehumidifiers can aid in moisture removal.

Invert sugar levels. Sugars produced from syrups with high invert levels (>2%) will absorb more moisture than those produced with lower invert sugar levels (<2%). Invert sugars, particularly fructose, will hold and continue to draw in moisture during storage.

Finishing temperature. The higher the finishing temperature, the lower the water content. A finishing temperature of 50 – 55 °F ABPW is recommended for producing a sugar with <3% moisture. Lower finishing temperatures are used for confections with more moisture. For instance, the maple candy finishing temperatures range from 28 – 34 °F ABPW and result in an estimated 11 – 14% moisture (Belisle, 2022; Childs, 2007). Boiling to a higher finishing temperature can result in increased levels of amorphous sugars and scorch flavors.

Consistency in Granulation Size Granulation size is dependent on production conditions, invert sugar levels, seeding, and stirring temperature, speed, and duration. To reduce clumps in the final product, producesugar in a 20 – 65% RH environment, use maple syrup with <2% invert sugars, seed the sugar solution, and allow the sugar solution to cool before stirring. Relative humidity. High moisture in the air slows the conversion of sugar to its crystalline form, which can lead to larger granules of sugar. As noted in the previous section, maintain a RH of 20 – 65% during sugar production. Use fans and dehumidifiers as needed.

Invert sugar levels. As invert sugar level increases, stirring time increases (Bhandari and Hartel, 2002). When

stirring the sugar solution, sugar crystals are physically arranging into a crystal lattice. Invert sugars prevent sucrose molecules from forming a lattice. To form sugar crystals with high invert sugar syrup, the solution will need to be stirred longer (Bhandari and Hartel, 2002) and increased clumping may occur.

Seeding. Seeding is the process of adding sugar crystals of an ideal size to an uncrystalized solution. Stir the sugar crystal "seeds" into the solution to initiate crystallization. To accomplish this, add maple sugar with the desired crystallization size to the heated sugar solution immediately before or at the start of stirring. Approximately 1 – 2 tablespoons per gallon of syrup used is sufficient. This is crucial when producing sugar from higher invert sugar syrup (2 – 4%), but can be helpful in all sugar batches.

Stirring temperature. For consistently small sugar crystals, quickly cool the sugar solution to 180 – 200 °F. This is the optimal temperature range for crystallization when syrups are heated to 50 – 55 °F ABPW, according to the phase/state diagram (Hartel et al., 2011). This temperature range is cool enough to allow sugars to come out of the sugar solution and warm enough to allow the sugars to physically interact and crystalize. When the sugar solution is <140 °F, amorphous sugar will form. Inversely, when the sugar solution is >200 °F, a small number of sugar crystals form; these sugar crystals continue to grow as the sugar solution cools, resulting in large sugar granules.

Stirring speed and duration. When stirring, sugar crystals form and moisture is released in the form of steam (Fig. 2). To optimize this process, stir the sugar solution at a medium to high speed. Stirring too slowly can reduce moisture release and result in a higher volume of sugar clumps. Stir the sugar solution for 10 – 15 minutes for a 2-gallon batch, or until the sugar is no longer releasing heat.

Flavor Formation

Flavor of maple sugar is determined by the initial syrup qual ity and the production process. To increase flavor of maple sugar, use a darker grade of syrup with up to 4% invert sugar levels, or heat the syrup solution slowly to allow sucrose inversion to occur.

Equipment. Maple syrup is prone to excessive boiling at approximately 219 – 245 °F. Use 1/8 teaspoon of defoamer to prevent boiling over. To reduce hot spots, evenly distribute heat, and slow sucrose inversion, boil syrup on an induction stove top, in a copper pot, aluminum pot, steam kettle, or in a vacuum chamber. To avoid further inversion and degradation of the invert sugars into various flavor compounds, boil the sugar solution quickly.

Invert sugars. During boiling, caramelization and Maillard reactions occur. Caramelization is the degradation of sugars in response to heat, while the Maillard reaction is a process in which amino acids and reducing sugars (fructose and glucose) react and undergo multiple steps to produce flavor

r compounds. In both circumstances, sucrose is hydrolyzed or split into invert sugars and then either continues to degrade into multiple flavor compounds (caramelization) or reacts with amino acids to form flavor compounds (Maillard reaction). Flavors perceived from these compounds include caramel, cooked, roasted, sweet, burnt, pungent, and nutty, among others (van Boekel, 2006). To intensify flavors, start with higher invert sugar syrup (2 – 4%) and heat the syrup slowly to allow the caramelization and Maillard reactions to occur and form flavor compounds. One factor to consider is that as desirable flavor compounds form, undesirable flavors can also form.

Scorching occurs when sugar is exposed to high temperatures for an extended period of time. Scorch flavor compounds are byproducts of invert sugar degradation. During production, the sugars and flavor compounds can continue to react with the heat and amino acids to form acids that impart sour, fruity (Knol et al., 2010), and burnt flavors, among others (Chen et al., 2021). Flavor development is complex, and literature on scorch flavors is limited. To prevent scorching, use equipment that will reduce hot spots and stir the syrup solution during heating.

Post-Production Processing

Drying. To reduce condensation and clumping, allow the sugar to cool prior to packaging. Immediately following sugar production, sift or spread the sugar onto a thin, flat surface. Allow the sugar to cool and dry at 50 – 70 °F and <65% RH for 1 to 24 hours. Stir the sugar periodically during drying.

Storage Considerations. To extend the shelf-life of sugar, store between 20 – 65% RH. When exposed to <20% RH, sugar can lose moisture; inversely, at higher RH (>65%), sugar can accumulate moisture, leading to clumping (Fig. 3). In high moisture sugars, similar to brown sugar, consider storing between 40 – 65% RH or adding a humidity control in the packaging. Humidity controls must be approved for food use and may include moist fired clay or humidity control packets. Store sugar in moderate (polyethylene terephthalate (PETE or PET)) or high (e.g. polyethylene (PP), glass) moisture barrier packaging containers to prevent moisture exchange with the environment. USDA

Grade Standards

Sugar from sugar cane and sugar beets are sold voluntarily following USDA grade standards that include granule sizes for granulated sugar and powdered sugar (USDA, 2015). No guidelines are available for brown sugar or maple sugar granulation size. Producers may choose to separate sugars using U.S. Standard test sieve sizes. Examples are shown in Fig. 4

Acknowledgements

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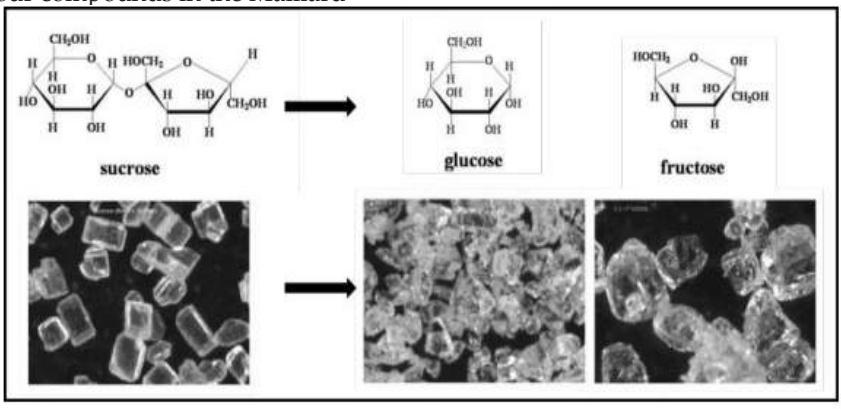

Figure 1. Molecular structures and crystalline images of sucrose, glucose, and fructose (Kweon et al., 2009).

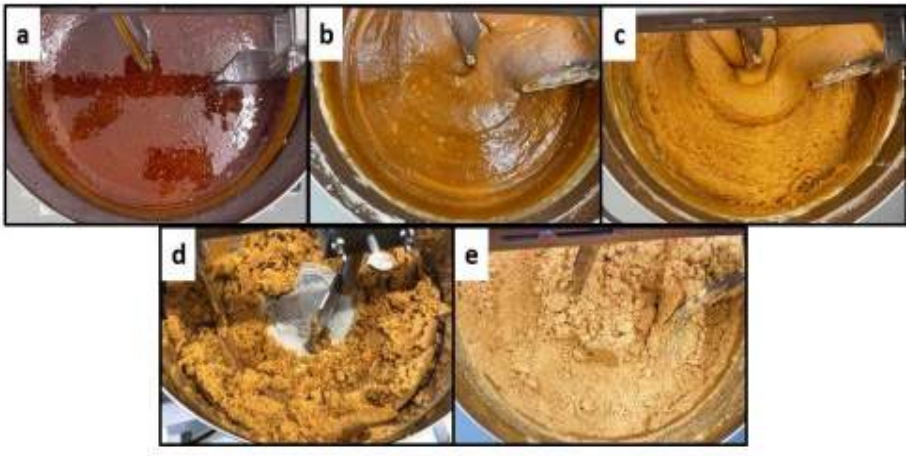

Figure 2. Crystallization of maple syrup into sugar during agitation (a to e).

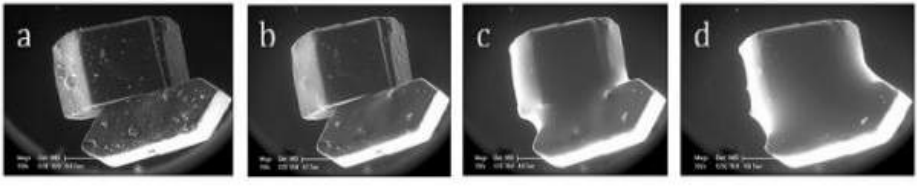

Figure 3. Sucrose crystal dissolution over time (a to d) in a 65 – 93% RH environment (with permission Samain et al., 2017).

ACER Grant-Funded Maple Research Project Seeks Producers as Collaborators

Life cycle carbon footprint analysis and improvement strategies for US maple syrup production

The University of Michigan Center for Sustainable Systems began this USDA ACER research project in the fall of 2022. The goals of this project are to support producers as they seek to improve energy efficiency and reduce emissions associated with producing maple syrup. While most producers strive to be as efficient as possible to keep their costs low, knowledge is limited on which production practices have the greatest impact on greenhouse gas emissions (GHGs). This project will develop a web-based calculator based on real-world process data that producers can use to estimate their own energy and GHG emissions per gallon of syrup produced, as well as providing recommendations on how they can reduce these impacts.

To assist us in building this calculator, we are seeking producers who are interested in joining our current group of research collaborators by providing data on their sugaring operations over the 2023 season as well as the next two seasons (spring 2024 and 2025). The calculator will be directly based on the data shared with us by producers, and while your data won't be provided to us anonymously, we will not be sharing or publishing your operational data with anyone. We are looking for producers of all sizes, locations, and production practices (including sap collection method, whether vacuum and RO are used, evaporator fuel type and efficiency features, etc.). In addition to data on processing sap into syrup, including pre-season prep and post-season clean-up, we are interested in your off-season sugarbush activities (road and sap collection infrastructure maintenance, brush clearing, liming/fertilizing, etc.).These data will be assembled into a life-cycle inventory of syrup production that will be the heart of the calculator, and will also allow us to provide feedback on other impacts, such as water use and waste generated. We are planning to provide each participating producer with their own life cycle inventory results based on the data they provide on their operations, as well as a printable certificate identifying the producer as a research collaborator and provider of data for each season they share data.

Since the start of the project, we've constructed a life cycle inventory model that contains emissions and energy data on fuel processing and combustion, as well as on vehicle and equipment production and operation. This model will be used to process the data that producers share with us on their maple operations. We enrolled 39 producers and packers as research collaborators who are sharing data on. their operations with us. Of the collaborating producers, 8 were small (less than 1,000 taps), 18 were medium (1,000 – 10,000 taps), 9 were larger (greater than 10,000 taps)

Geographically, 10 are in NY, 10 in VT, 5 in MI, 4 in WV and ON, with one each in WI, MN, NH, IL, OH, and KY. Given the wide variety of practices used by sugarmakers, we'd like significantly more producers (of all sizes and locations) to participate in order to more accurately capture this variability in our analysis. We are also currently characterizing the distribution network for maple syrup and compiling potential strategies for reducing impact from syrup production.

We will set up information sessions on zoom or phone to discuss the data collection process with interested produers and processors and to answer your questions about the project. Producers or processors who attend one of these sessions and then provide data on their operations will be entered into a drawing for a cash prize for each year they provide data. If you'd like to hear more about participating in this project, please send an email to Geoff Lewis (glewis@umich.edu) with the subject-line Maple syrup research. We're looking forward to working with you on this project!

Bird-friendly maple syrup boosts Vermont forest diversity & resilience

by Nina Foster

A relatively new program in Vermont is helping both maple syrup-producing farms and their customers to improve forest habitat preferred by a diversity of bird species.

Launched in 2014, the Bird-Friendly Maple Project furnishes a logo to qualifying farms for use on their products, if they can demonstrate that the forests where they tap sugar maple trees contain a diversity of trees and shrubs, which improves the woodlands' structure and foraging and nesting opportunities for birds.

Creating a biologically diverse farm is a major tenet of the sustainable agriculture technique of agroecology, because it leads to greater resilience and health of the farm, its farmers and its wildlife.

Maple syrup operations included in the program cover 7,284 hectares (18,000 acres) of forests via 90 participating farms as the program is now being replicated in New York, Massachusetts and Maine.

WOODSTOCK, Vermont — As the sun rises, the ethereal song of a wood thrush echoes through Bourdon Maple Farm's 55-hectare (135-acre) forest in Woodstock. A bright scarlet tanager wings about the canopy as hungry yellow-bellied sapsuckers drill into tree bark.

At the height of maple sugaring season, birds provide a comforting soundtrack for the farm's head of operations, sales and marketing, Meg Emmons.

"A lot of times, the birds are my only company out here in the woods," she said, smiling at a nearby black-capped chickadee. But the forest's most vocal residents are also some of its most vulnerable.

Forest birds thrive in diverse habitats that consist of young, middle-aged and old growth trees. Most trees in New England, however, are uniformly middle-aged after regrowth following widespread clearing for agriculture in the 1800s. Modern development pressure continues to convert woodlands into residential areas, parking lots and other unforested landscapes, further reducing the amount of habitat available.

As a result, many forest bird populations have plummeted. Wood thrush populations, for instance, more than halved in 50 years due to forest loss that increased nest exposure to predators and parasites. Vermont's Wildlife Action Plan identifies it as a high priority "species of greatest conservation need."

Responding to change

Recent technological advances have resulted in an explosion of the maple syrup industry over the past 15 years in the United States and Canada. But with the growth of production comes the temptation to favor sugar maple (Acer saccharum) trees at the expense of other tree species in the "sugarbush," as a stand of tapped sugar maples is called..

Some maple producers operate with an "I tend to the trees I tap" mentality, prioritizing maples and minimizing competition among maple trees and other vegetation. But removing too many non-maple trees puts the health of the entire forest, and hence the sugar maples themselves, at risk. In extreme cases, producers remove all non-maples growing beneath the forest canopy. The eponymous owner of Bourdon Maple Farm, Don Bourdon, once met a producer who regularly cleared his woods with a lawn mower, cutting any species seemingly getting in the way of his maples' success. But when maples surpass 90% of the sugarbush composition, producers have effectively created a monoculture, experts say.

Calling a sugarbush a monoculture may sound strange, as the term is usually reserved for industrial agriculture, such as giant fields of corn, soy or wheat that now occupy what used to be diversified forests or prairies. By comparison, monocultures in the maple industry are less common and less harmful — sugarbushes tend to keep the forest intact, which is far better than clearing it to plant annual crops — but growing trees in a monoculture still limits the forest's ability to support wildlife and withstand ecological disturbances.

Encouraging a diversity of species in tended fields or forests is a major tenet of agroecology, which treats agriculture more like a functioning ecosystem than a food factory. Encompassing an array of techniques from organic farming to integrated pest management and agroforestry, agroecology is also a top climate solution since it sequesters carbon from the atmosphere, as the Intergovernmental Panel on Climate Change stated in 2022.

Along with a decline in crop or tree diversity, the diversity and abundance of birds decrease when, as in the case of maple monocultures, sugar maple trees exceed 75% of a forest. So, the conservation nonprofit Audubon Vermont focused on developing a solution and worked with the Vermont Maple Sugar Makers' Association and the Vermont Department of Forests, Parks and Recreation to launch the Bird-Friendly Maple Project in 2014. The program celebrates producers who safeguard and enhance forest bird habitats and provides a label that customers can look for when buying syrup.

For a maple producer to earn the bird-friendly label, they must commit to a management plan that ensures a future sugarbush composition of no more than 75% sugar maples. In addition to enriching tree species diversity, bird-friendly producers must improve the structural complexity of their

sugarbush with management objectives that aim to have vegetation covering at least 25% of the forest's understory (the zone comprising the first 5 feet above the forest floor, where flowers, ferns and shrubs are likely to grow) and its midstory (trees and shrubs standing between 5 and 30 feet in height). Eventually, participating farms' sugarbushes should look like a wall of green in summer, with vegetation providing optimal nesting and foraging opportunities from the ground to the forest canopy.

"A messy forest is a little harder to work in. As a sugar maker, it can be difficult to walk out and tap your trees if you're working through brambles and snags — but it's good for the wildlife," said Aaron Wightman, lifelong maple producer and co-director of the Cornell Maple Program, where researchers also explore additional sugarbush diversification efforts such as growing nutrient-rich forest products like berries and nuts under the forest canopy, and the harvesting of alternative tree syrups. "Retaining at least 25% non-maple species and creating structural diversity in a sugarbush are powerful strategies for bolstering the populations of birds and other forest species," Wightman told Mongabay.

Investing in diversity

With diversity comes resilience. In addition to better supporting wildlife, a bird-friendly forest is less susceptible to threats including pests, disease and extreme weather events, owing to a diverse community of trees and because birds are voracious predators that eat many bugs that may damage trees or spread tree diseases.

Audubon Vermont conservation biologist Steve Hagenbuch compares diversifying a sugarbush to navigating the stock market. "If you put all of your funds in one account, and something bad happens to that account, you're in trouble. But if you diversify your portfolio and you have it spread out, then you can handle something negative hitting one part of your investment," he said.

In August, Audubon Vermont, along with the Vermont Center for Ecostudies and the University of Vermont (UVM), wrapped up a study launched in 2020 to quantify how forest bird communities respond to different habitat characteristics in actively managed sugarbushes. The data will be used to update and refine the Bird-Friendly Maple Project's sugarbush management guidelines.

Preliminary results gathered in 2020 and 2021 from field surveys of breeding birds, foliage- and litter-dwelling arthropods and vegetation across 14 active sugarbushes in Vermont — nine of which were enrolled in the Bird-Friendly Maple Project — suggest that the program's current management guidelines need little modification. Cultivating diverse vegetation and structure in a sugarbush allows the landscape to better meet the needs of a wider range of forest birds, supporting bird diversity and abundance. For example, increases in low woody

vegetation and sapling richness were linked to a significant increase in the abundance of three species that prefer to nest in saplings and shrubs: mourning warblers (Geothlypis philadelphia), chestnut-sided warblers (Setophaga pensylvanica) and black-throated blue warblers (Setophaga caerulescens).

Leaf litter depth proved to be one of a few especially important habitat features that benefit all forest birds. Many bird species rely on this rich carpet of organic material, whether for searching out insects and seeds, snagging twigs and leaves to build nests or camouflaging themselves among the debris to avoid nearby predators. Nonnative earthworms, however, can deplete this valuable leaf litter layer. Audubon Vermont will likely incorporate additional requirements into their bird-friendly management guidelines based on the study's findings, such as paying attention to the presence and distribution of earthworms in the sugarbush.

UVM researchers gathered additional field data in 2022 and 2023 and continue to build upon the study's evaluation of bird-friendly management practices. Liza Morse, a UVM Ph.D. candidate whose dissertation investigates the link between maple sugaring and sugarbush biodiversity and resilience, assisted with all four years of data collection and plans to interview participating sugar makers about their specific management approaches.

Getting with the program

Bourdon Maple Farm's Meg Emmons first reached out to Hagenbuch in late 2021 when she noticed the Bird-Friendly Maple Project logo on other producers' websites. After conducting a thorough analysis of their 10,000-tap operation the following spring, Hagenbuch concluded that to be recognized by the program, they simply needed to add a bird-friendly focus to the forest management plan they had already been following for four decades.

Their forest is a work in progress — sugar maples still account for about 90% of the larger trees in the sugarbush — but their commitment to diversification earned their bird-friendly title. After all, maple producers work in "forest time," meaning it takes years, even decades, to achieve change.

Emmons and Bourdon support birds and the rest of their forest ecosystem by thinning sugar maple density in their woods, fighting invasive plants like honeysuckle to encourage growth of native species, and leaving dead trees on the ground or standing upright for hole-nesting birds like woodpeckers to use. Between May and mid-July, they avoid thinning trees and other practices that could disturb birds during their nesting season.

While walking through the sugarbush, Emmons spotted a long, thick tree branch that had fallen on some tapping equipment. "We'll leave that for the birds," she said as she tossed it aside.

Mr. Bourdon is just one of 90 Vermont maple producers who enthusiastically joined the Bird-Friendly Maple Project, which is now being replicated in New York, Massachusetts and Maine. Across all participating sugarbushes, there are now approximately 7,284 hectares (18,000 acres) of forest managed with birds in mind, thanks to the program.

And birds aren't the only winners. Bird-friendly producers can brand their products with the program's label showcasing the scarlet tanager (Piranga olivacea), a species that's one of the effort's big beneficiaries. This attractive logo is a visual recognition of their sustainable maple operations and attracts new customers and business opportunities

For Bourdon and Emmons, the label presents an exciting opportunity to keep up with the resurgence of interest in local, sustainable food products and to educate their customers about conservation efforts in maple production. On sugarbush tours, they distribute a maple bingo game with a prompt that encourages kids (and adults) to look and listen for birds. Emmons has met birders who are thrilled to learn that maple syrup producers like them are playing an active role in supporting wild bird populations.

"People really value it," said Emmons. "They're supporting environmentally friendly products and causes through socially conscious shopping."

Bourdon summed up the value and necessity of harvesting products from healthy forest ecosystems in one simple phrase.

"Although boiling happens in the sugarhouse, maple syrup is really made in the woods."

Bourdon Maple Farm's flora exhibits a diversity of levels, from the forest floor to its mid-story and canopy. Image courtesy of Meg Emmons/Bourdon Maple Farm.

Don Bourdon and Meg Emmons of Bourdon Maple Farm. Image by Nina Foster for Mongabay.
Wood thrush. Image courtesy of Michael Parr / American Bird Conservancy.

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NNY Tree Syrups Research Update to Be Presented March 13 in Chazy, March 20 in Lowville

Northern New York. Research focused on growing the tree syrup industry in Northern New York will be among the Northern New York Agricultural Development Program (NNYADP) research updates to be presented on Wednesday, March 13, 2024, at the Joseph C. Burke Education and Research Center at Miner Institute, 586 Ridge Road, Chazy, NY; and on Wednesday, March 20, 2024, at the Cornell Cooperative Extension (CCE) of Lewis County Education Center, 7395 East Road, Lowville, NY. The hours for each meetings are 10 a.m. to 12:30 p.m. Attendance is free; however, registration is requested for either date by contacting Cornell Cooperative Extension at 315-376-5270.

At each meeting, Uihlein Maple Research Forest Director Adam Wild will share information on how a warming climate creates new challenges for sugarmarkers and how tapping into other-than-maple tree species for syrup production can increase maple producers and landowners' economic potential.

Maple production in Northern New York has increased in recent years in part due to increasing demand, research, and equipment innovations. Beyond maple, tapping into other tree syrups can increase landowners' economic potential," says Wild.

Research funded by the farmer-driven NNYADP is progressively building real-world, field-tested, data-based foundations that help agricultural producers across the six-county northern region of New York and statewide to manage and adapt to the complex mix of factors that influences farm sustainability and agricultural environmental stewardship. Each of the NNYADP Research Update Meetings will include additional speakers presenting the latest data and information on dairy, crops, agricultural tile drainage and farm stewardship, apple and other horticultural projects' results.

Funding for the Northern New York Agricultural Development Program is supported by the New York State Legislature through the New York State Assembly and administrated by the New York State Department of Agriculture and Markets. Learn more at www.nnyagdev.org.

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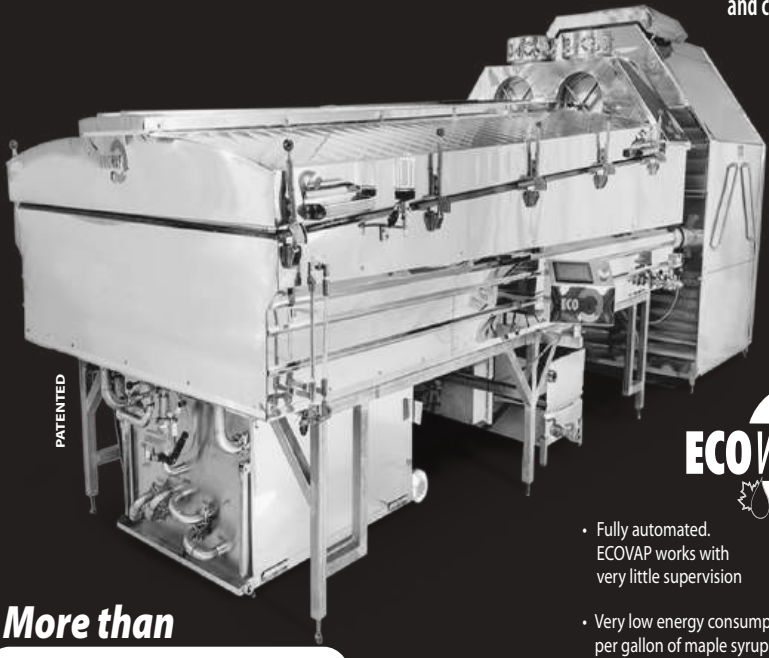

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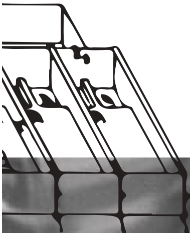

Support the Maple Research that Supports you!

Every time you set a tap, fire your evaporator, or put syrup into bottles, you are benefitting from research that helped us all learn how to do these things better. Much of that research has been supported by the North American Maple Syrup Council's Research and Education Fund. The Fund has given out more than $1 million in grants in the last 35 years, catalyzing the research that has helped the maple industry grow and thrive.

The fund gets its resources from industry stakeholders – equipment manufacturers, producer associations, dealers, and individual producers. Alliance Partners commit to making annual contributions that help assure the long-term sustainability of the Fund.

If you're interested in becoming an Alliance Partner, or in making a one-time donation to the fund, contact NAMSC Executive Director Theresa Baroun at mapledigest@gmail.com, or Treasurer Joe Polak at joe.maplehollow@frontier.com.

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