Maple Syrup Digest

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Tapping Stained Wood

Identifying Invasive Plants

Hydrometer Maintenance

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.

President's Note

Greetings maple people,

At the writing of this message, I have just returned from a 3-day trade show in Hershey, PA – the Mid-Atlantic Fruit and Vegetable conference. A fully live, and in person show with educational sessions and a large trade show. Vendor booths were sold out, and attendance was good. What a relief! I tested negative for COVID this morning, too!

This gives me hope for a top notch, well attended conference in La Crosse this fall. Please sign up as soon as you get the information, to allow the organizers to plan accordingly. It is very stressful to be the host and wring your hands wondering if the show will be a success or a bust. Let's all make it a success by attending, socializing with our fellow producers and industry partners and learning from our research people. And don't forget to save some of your best 2022 syrup and maple confections for the international judging. The more the better!

NAMSC has had a couple of delegate meetings with some good discussion on topics like securing more funding for research, and how local associations can attract and retain members. We've also had a great exchange of ideas for association fundraising efforts. Some really great ideas for educational projects were floated and we are working on possibly standardizing a Maple 101 program for all to use for prospective members or anyone who is wishing to learn the basics. Remember, NAMSC is about making quality maple products and all maple sold should reach these standards – we're working on developing tools to help everyone do just that.

Winton is settling in to his new position as Executive Director and, as expected, is hitting the ground running. More on that later.

It seems that the jug shortage situation is going to be ongoing for a while yet, hitting especially hard this upcoming season. Try to keep an open mind and explore some alternatives to get you by. You're not the only one having this problem. The most important thing is what is in your containers!

The delegates will meet in person in Croghan, NY in May, with a Zoom option. I am looking forward to seeing some of you there. I will be driving from Western MA – if anyone wishes to carpool, please contact me.

Tapping has already started south of here and will soon be happening all over the "Maple Belt." I wish you all a safe and productive season. As we know, "there are no two seasons the same, and none that we want to repeat!"

Best wishes,

Howard Boyden, President, NAMSC

In this issue...

Seeking Photos and Articles

We're alwats looking for good maple photos and articles for the *Digest*. Send to: mapledigest@gmail.com.

Cover: Albert Lynde of Guilford, VT gathers sap with a team of oxen in April 1960.

Reduced Sap Yields When Tapping Into Non-Conductive Wood

Mark Isselhardt, Maple Specialist, University of Vermont Extension

Trees such as sugar maple (Acer saccharum) use xylem tissue to transport massive amounts of water during the growing season as part of photosynthesis. Tapping maple trees involves drilling into this conductive wood (CW) in order to gain access to the sugar enriched sap. The tapping process represents a wound to the tree also stimulates the trees wound response mechanism (Chapeskie et al. 2006). This mechanism is the same for any injury to the tree including but not limited to; ice storm or wind damage, animal damage as well as mechanical damage associated with tree harvesting activities. The wound response system is commonly referred to as CODIT or Compartmentalization Of Decay In Trees (a term formalized by US Forest Service researcher Alex Shigo).

The CODIT model relies on two key facts about tree physiology. First, trees are highly compartmented plants and are therefore designed to reduce the likelihood of infection from spreading from compartment to compartment (Shigo and Marx 1977). Another way of saying this is that trees are structured with internal barriers designed to reduce the free movement colonizing microorganisms. This is considered a passive process. Second, when trees are wounded the injury stimulates the tree to “compartmentalize” or wall off the wound so as to avoid systemic infection and decay. This is an active process, whereby trees devote some of their stored nonstructural carbohydrates to the creation of protective chemical compounds which include the staining familiar to anyone who has seen boards or firewood cut from tapped maple trees. The stained area of wood around a taphole is rendered nonconductive (NCW) to liquid passage (this includes during the growing season as part of photosynthesis or during the sap collection period of late winter/early spring). The area of NCW typically does not extend much wider than the taphole itself but much more above and below.

Because of this, the annual collection of maple sap requires new tapholes be drilled each year. The process of tapping demands that the individual drilling the hole decides where best to place the new taphole, often with limited information about what lies beneath the bark. There is a tremendous amount of variability in terms of the volume of NCW generated by tapping. On average the volume is about 50 times the volume of the taphole itself but has been observed to be nearly 200 times the size of the taphole and as little as 15 times the size of the taphole (van den Berg 2020).

Sugarmakers know that tapping into areas of nonconductive wood will likely result in reduced sap yields. However, tubing systems obscure the sap produc-

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tion of any individual tree and spreads the losses of sap associated with hitting stained wood over all trees in a given sugarbush. This in part explains why the magnitude of the reduction in sap yield is not well understood.

According to a recent survey of more than 300 maple producers in the northeast United States, nonconductive wood was hit during tapping on average 4.5% of the time and the responses ranged from 0-41% of the time (UVM Extension 2019 unpublished). Previous research has explored factors that impact the likelihood of tapping into NCW. Significant factors include but are not limited to; dropline length, taphole diameter, tapping intensity (number of taps/tree) and stem growth (van den Berg and Perkins 2014). Other work touched on the relationship between the amount of conductive wood exposed while tapping and yields (Wilmot et al. 2007). But to date, there has been no direct investigation as to the relationship between the percent of NCW is intercepted while tapping and sap yield. The present study sought to understand the relationship between the amount of NCW in a given tap how and the amount of sap collected, as well as understanding if other factors (sap sweetness) might impact total yields between treatments.

Methods

Tapping

The experiment was conducted at the University of Vermont, Proctor Maple Research Center, Underhill, Vermont during the 2018 and 2019 seasons. Twenty previously tapped sugar maple trees were measured for diameter at breast height (dbh or 4.5′ above ground) and divided into two equal groups: trees intentionally tapped into stained, nonconductive wood (NCW); and tapholes drilled into, clean, conductive wood (CW).

A new 5/16″ diameter maple tapping-specific tapping bit was used each year. All trees were tapped on the same day, February 26 (2018) and February 19 (2019). Each tree received a single, 5/16″ taphole drilled to a depth of 1.5″. Tapholes were drilled within 45 degrees of the same cardinal direction (2018-East, 2019-South). A new, 5/16″ white MaxFlow spout (CDL USA) was used for all tapholes. Trees receiving the NCW treatment were tapped 1″ directly above an existing taphole. Trees in the control or conductive wood (CW) group were tapped according to best practices to avoid existing tapholes. All wood chips and bark produced during drilling was collected for each tree through the use of a plastic apron held below the taphole. Wood chips and bark were placed in individual sample vials, immediately frozen and saved for subsequent lab analysis.

Sap collection

Each sample tree was connected its own 3/16″ tubing line with industry standard fittings. The sap from each tree was collected a separate 12″x36″ PVC chamber. Liquid depth was measured regularly throughout the season with a metal yard stick. Depth was converted to volume and reported in US gallons. Each sap measurement included a measurement of sap sweetness with a digital refractometer (Misco) and reported as ^{0}Brix. The sum of all sap collected is reported as well as the "syrup equivalent" which was calculated based on the updated "Jones Rule of 87.1" (Perkins & Isselhardt 2013).

Wood tissue analysis

Wood tissue collected from each taphole was processed in the lab. Sample fragments were visually inspected with a dissecting microscope and sorted into one of three categories; conductive wood, nonconductive wood, and bark. When a particular fragment held more than one type of tissue a razorblade was used. Wood chip mass was measured using a precision lab balance. Average wood chip mass for both CW and NCW was recorded for all sample trees. The percent NCW was compared with total syrup production (pounds of syrup equivalent) for 2018 and 2019.

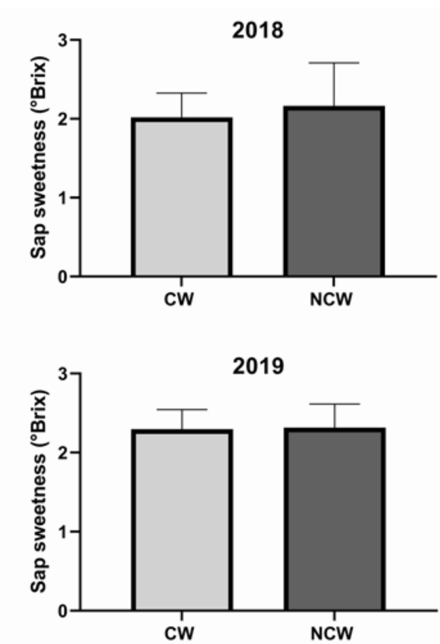

Figure 1: Average sap sweetness from trees tapped into conductive (CW, n=10) and nonconductive (NCW, n=7) wood during the 2018 and 2019 maple season

Statistical analysis

Statistical analyses were performed using Prism 9.2 for Windows (GraphPad Software LLC) to examine differences in sap volume and sap sugar concentration between trees with tapholes drilled into CW and NCW respectively. A simple linear regression was also used to examine the relationship between the percentage of NCW and syrup equivalent produced from a given taphole.

Results

Trees in each treatment group had similar average diameters; NCW 11.6" dbh and CW 11.4" dbh.

In 2018, the first year of the experiment, all ten trees tapped in the CW or control treatment produced tapholes with no stained wood (NCW). Three of the ten trees receiving the NCW treatment failed to produce evidence that the taphole intersected with any NCW and given that the purpose of the experiment was to define the impact on sap yield of tapholes drilled into nonconductive wood, they were therefore removed from subsequent analysis. In the second year, 2019, all NCW tapholes hit some amount of stained wood.

The sap collected from trees with NCW tapholes was not different in terms of sweetness than that of sap col-

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lected from trees with only CW tapholes in either 2018 or 2019. In 2018 the mean ^{0}Brix for CW treatment was 2.0 with a range from 1.6 to 2.6. This compared to sap collected from NCW tapholes with a mean value of 2.16 and a range from 1.4 to 2.8. The results were similar in 2019 although both treatments saw higher average levels of sap sweetness. In 2019 sap collected from CW tapholes had an average sweetness of 2.29 and a range from 1.8 to 2.6. This was similar to the average sap sweetness in tapholes drilled into NCW which had an average sweetness of 2.31 and a range of 1.9-2.9 respectively (Figure 1).

Sap volumes were significantly lower in the NCW treatment compared to the CW treatment in both 2018 and 2019. The average amount of sap collected from CW tapholes in 2018 was 26.9 gallons (±3.43) compared to just 6.8 gallons (±3.59) from the NCW treatment. In 2019 the average amount of sap collected from CW tapholes was 18.3 gallons (±2.74) compared to 8.8 gallons (±2.14) in the NCW treatment (Figure 2). Greater variability in sap production was observed trees in CW treatment in 2019 compared to 2018. Although no stained wood was observed in any CW tapholes there could be other variables that influenced yield in those trees.

The average syrup equivalent was calculated for both treatments. In 2018, trees in the CW treatment yielded .43 (± 0.04) gallons of syrup per tap whereas trees in the NCW treatment yielded 0.23 (± 0.06) gallons of syrup equivalent. In 2019, trees in the CW treatment yielded .47 (± 0.02) gallons of syrup per tap whereas trees in the NCW treatment yielded 0.23 (±0.02) gallons of syrup equivalent.

By combining the syrup equivalent data with wood chip mass data it is possible to compare the amount of NCW in a taphole with the amount of syrup produced (Figure 3). A strongly negative, linear relationship was observed between the amount of NCW intercepted by the taphole and the amount of syrup equivalent produced. The simple linear regression of the 2018 data resulted in an r2=0.882. In other words, the amount of stained wood in a taphole explained roughly 88% of the syrup equivalent produced. In 2019 the amount of stained wood in a taphole explained roughly 74% (r2=0.742) of the

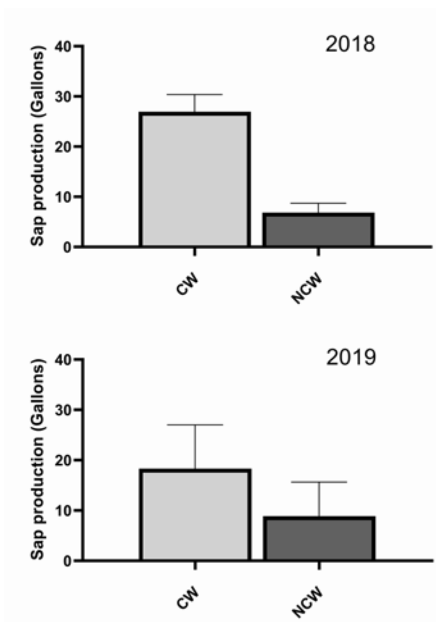

Figure 2: Average total sap production (US gallons) from trees tapped into conductive (CW, n=10) and nonconductive (NCW, n=10) wood during the 2018 and 2019 maple season.

syrup equivalent produced.

Discussion

The results show a strongly negative linear relationship between the amount of NCW intercepted while tapping and the amount of sap loss in a given season. If a taphole hits 50% stained wood a sugarmaker can expect at least a 50% less sap from that taphole. This study did not investigate at what point a new hole should be drilled given a certain amount of stain. This decision would be not only based on the cost associated with loss of sap production but also the impact on the sustainability of adding more NCW (van den Berg et al. 2021). If a new taphole is drilled and only produces dry, soft and stained wood chips, the tapping bit has hit not just NCW but a column of decayed wood. There are likely other signs of decay and the tree should be considered for removal during the next round of forest management activity or allowed to remain and provide structural diversity but removed from the sap collection system.

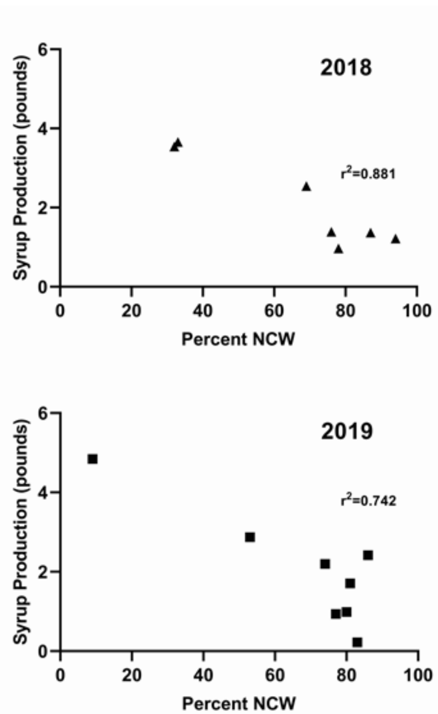

Figure 3: Relationship between syrup production (syrup equivalent calculated from sap volume and sweetness) and percent of nonconductive (NCW) wood in a taphole (NCW chip mass/CW chip mass).

The size of the stained column of nonconductive wood is variable and the orientation of the column can deviate greatly from vertical. This point was made clear when in 2018, nearly a third of the tapholes drilled just 1" above an existing taphole failed to produce any stained wood chips. This finding highlights the importance of taking time when considering taphole placement and calls into question the long term success of applying a strict tapping pattern. Sugarmakers should monitor the amount of NCW intercepted while drilling tapholes and at the very least keep track of the number of times stained wood is hit. The results suggest that practices that help reduce the likelihood of hitting NCW such as utilizing the entire tapping band, tapping below the lateral line, drilling as far away from previous years taphole, and above all else taking time to avoid hitting stained wood, can have a significant impact on syrup yields.

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Managing 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

Many maple producers have some invasive plants on their property. Invasive plants are alien or exotic species that significantly limit economic or ecological opportunities. Not all exotic plants – think corn and apples – cause economic or ecological problems. Interfering plants, a more general term than invasive, includes native species that interfere with an owner's objectives.

The need and urgency to control invasive plants depend on the owner's long-term goals of the sugarbush, the plant species present, the vigor of trees in the sugarbush, and recent and near-term management activity. Not all invasive plants require an urgent response, but all should be identified, and their extent assessed. Ignoring invasive or interfering plants can have significant consequences. Most Cooperative Extension units, state and provincial natural resource agencies, and many nature-based organizations have extensive Internet resources on invasive plant identification and management.

The origin of our problem with many invasive plant species was their anticipated value for wildlife or landscape benefit which led to deliberate planting. The anticipated advantages have given way to a recognition of concerns. Invasive plants are seldom browsed by deer and reproduce, establish, and grow more effectively than most native species. As a result, the sugarbush or woodlot can become dominated by the invasive plant. Because most owners have multiple objectives for their property and those objectives often seek some diversity of plant species, domination by a single plant species becomes problematic.

The problems caused by an interfering plant depend on both the characteristics of the plant and the objectives of the owner. Many interfering plants have a physically obstructive nature, for example the bush honeysuckles, that restricts movement into an area. Others have plant structures, for example the thorns on multiflora rose, that are uncomfortable. Japanese barberry, also having thorns, provides favorable habitat for deer mice and a higher incidence of the pathogen that causes Lyme disease. Other invasive plants, such as garlic mustard, isn't visually or physically problematic but can alter soils in a way that restrict the mycorrhizal associations on roots of some plants. Thus, interfering plants can limit most of the common ownership objectives, such as aesthetics, biodiversity, access, and plant productivity.

Interfering plants become dominant because they are particularly successful in at least one of the stages of arrival, establishment, growth or reproduction. There are several distinct theories that describe how species might become

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dominant. All theories relate to single or combined success with producing and distributing seeds, gaining access to resources such as soil minerals or light, avoiding controls on their survival such as herbivory, or gaining some competitive advantage against native species. Controlling one species may simply allow success for another, so removal of the undesirable species may need to be coupled with deliberate establishment of desired plant species that can occupy the site. All efforts need regular monitoring to allow for adaptation to your management approach.

Identification of Invasive Plants Common in the Sugarbush

The history of introduction of invasive plants into the US is varied, but there are many examples of species that have become interfering after introduction in the middle 1800's. In most cases the introduction was intentional because of the expectation of a benefit for humans or wildlife. Following are several invasive shrub species common in many areas of the maple syrup producing region of North America.

Bush honeysuckle (*Lonicera spp*.) There are at least three species included in the cluster of invasive bush honeysuckle. These are identified by a multi-stem clump of hollow woody stems, simple opposite (paired) leaves that have smooth edges and a paired fleshy fruit that is red to orange depending on the species (Figure 1). They grow best in full sunlight but can be found in partial shade of the forest. They can be more than 8 feet tall and 8 feet wide. A non-problematic native species known as "bush (or fly) honeysuckle" (Diervilla lonicera) is less than 24 to 30 inches high. Its leaf margins are serrate or toothed (Figure 2), and its fruit is a dry capsule. Its stem is not hollow.

European buckthorn (*Rhamnus cathartica*) The European or common buckthorn has dark green and glossy foliage. The leaves are sub-opposite, meaning they are consistently paired with another leaf, but not directly opposing on the stem. The vein arrangement on the leaf is arcuate, meaning the leaf's veins all arch from the mid-

Figure 1: The three common invasive species in the genus *Lonicera* have paired opposite simple leaves, the leaf margin or edge is smooth, and have a double fleshy fruit.

Figure 2: The native bush or fly honeysuckle lacks a hollow stem, has paired leaves that have a toothed edge, and dry capsule as a fruit.

rib towards the edge but terminate as they approach the tip of the leaf (Figure 3). Many branches end in a thorn-like structure. It can be single-stemmed or two- or three-stemmed. The diameter of the trunk can be up to about 8 inches and height of 25 feet. The fruit is black and fleshy.

Garlic mustard (*Alliaria petiolata*) Garlic mustard is an herbaceous biennial plant commonly found in the forest understory, more so than in open habitats. As a biennial it lives for two years, the first year as a low rosette of leaves, and the second year with a flowering and fruiting stalk (Figure 4). This species doesn't cause an obvious or immediate concern for the maple producer, but by changing soil conditions through alteration of mycorrhizal relationships it may result in accumulated issues in the future.

Glossy buckthorn (*Frangula alnus*) The buckthorns originated in Europe, northern Africa and western Asia. Glossy buckthorn was formerly known

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Figure 3: European or common buckthorn has glossy dark green leaves with a toothed margin that are sub-opposite.

Figure 4: Garlic mustard in Pennsylvania. This herbaceous plant lives two years and can dominate the understory.

Figure 5: The bud on glossy buckthorn lacks scales present on European buckthorn, and edge of glossy buckthorn leaves lack the teeth present on European buckthorn.

Invasive Plants: continued from page 17

as *Rhamnus frangula* and is different but looks similar to the native alder-leaved buckthorn (*Rhamnus alnifolia*). Glossy buckthorn is a small shrub that is most common on moist soils, often near wetlands. Its leaves are often paired, but less opposite than for European buckthorn (Figure 5). Curiously it appears that the foliage is less glossy than that of European buckthorn. Glossy buckthorn can form clumps, and its stems are not as large as European buckthorn.

Multiflora rose (*Rosa multiflora*) Multiflora rose is one of the more common invasive forest plants. The leaves are compound, meaning multiple leaflets on a single leaf stem. At the base of the leaf stem are fringed brackets known as stipules. Thorns are prominent on the stem and are recurved, meaning the thorn points backwards on the stem (Figure 6). Stems are green or slightly woody with age. Multi-stemmed clumps can be more than 8 feet wide, and 8 feet tall if free standings. Clumps can twine up trees for greater height. Fruit is red, round, and dry with multiple seeds.

Vines – (*Vitis spp, Persicaria perfoliate, Celastrus orbiculatus*) In young forests, vines may occupy and interfere with the growth of maple and other desired species. Vine species in the maple producing region might include grape vine, mile-a-minute, bittersweet, and perhaps others particularly to the southern regions. Vines are problematic because they can overtop the desired hardwood and shade its foliage, but also create a matrix of stem to collect snow and ice that can weight and snap the crown of the tree (Figure 7).

In addition to these common invaders, other species to be alert for include tree-of-heaven, stilt grass, privet, mile-a-minute, swallow wort, burning bush, barberry, autumn olive, Russian olive, and others. This list seems overwhelming, and on some properties it is, but other areas have relatively few. Areas

Figure 6: Multiflora rose can be a shrubby bush or twining vine. The compound leaves usually have seven leaflets, a fringed stipule where the leaf connects to the stem, and recurved spines. The fruit ripens red, has a round leathery shell and multiple seeds.

Figure 7: Grape vines (pictured) and other vines can create a webbing in young forests that shade the trees and collect snow or ice that damage tree crowns.

that have been in continuous forest cover seem to have less abundance of invasive plants.

Part II, Management Strategies for Invasive Plants in the Sugarbush, will appear in the June issue.

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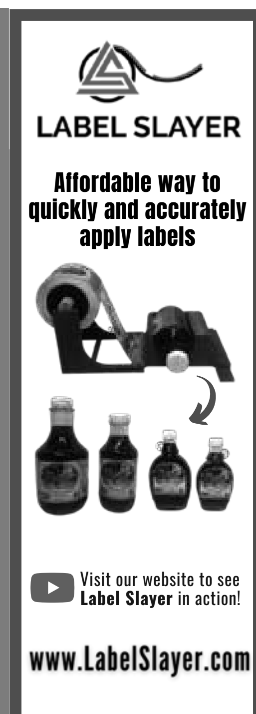

Why and How to Check your Hydrometer's Accuracy

Tom McCrumm

Hydrometers are a critical tool for making high-quality, legal-density maple syrup. A $20 to $30 investment in an accurate hydrometer can yield a valuable return in income for the producer.

Using an inaccurate hydrometer which reads <u>high</u> will have you packing syrup which is actually below proper density. This low-density syrup can spoil and ferment making it pretty much worthless. Additionally, you are apt to lose customers when they find your syrup to be thin and moldy. It also reflects poorly on the whole maple industry.

If your hydrometer reads <u>low</u> then you will be packing syrup which is over-density. The extra sugar in over-density syrup will eventually form sugar crystals in the bottom of a container. You may lose a customer this way as well if they think you have added sugar to your maple syrup, or the customer may think there is broken glass in their syrup jug. And you'll be losing money, since you'll have boiled off several gallons that you could have sold!

Automatic-draw off devices are a great tool, but their accuracy should be confirmed with an accurate hydrometer. If buying or selling sap with an inaccurate sap hydrometer, either the buyer or seller is losing potential income.

When to Test Hydrometers

Anytime and often is the best answer. At your annual association meetings, maple schools, and summer tours. Producers should get into the habit of having hydrometers checked for accuracy at least annually. A state or provincial maple association could obtain everything needed for checking hydrometers for approximately $600 or less and test member's hydrometers at every function they have as a service to their members. See "Developing a Hydrometer Accuracy Checking Program for Maple Syrup Producer Associations" at https://mapleresearch.org/pub/hydrocheck-2/.

Visually Inspect Hydrometers Before Testing

If you don't have access to a hydrometer testing program, many hydrometer issues can be detected by a thorough visual inspection of your own hydrometers. Hydrometers crusted with calcium scale or dried sugar have extra weight, causing them to sink lower in your test cup and to read higher than they should for correct density syrup. This means your syrup may actually be a bit lower density than what your hydrometer shows. This crusted hydrometer may read 66 Brix when in reality the syrup may be 65 Brix or lower. If a hydrometer is crusted with a calcium scale or niter or syrup residue, it is im-

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portant to clean thoroughly before use. Vinegar, or the product CLR (Calcium, Lime, Rust Remover) and a Teflon pan cleaning pad will aid in removal of calcium scale and niter. Heavily crusted or scratched hydrometers should be replaced.

With the aid of a bright light, closely inspect the hydrometer tip on the weighted bottom with a magnifying glass to check for cracks or missing glass. Cracked or missing glass on the tip allows moisture to find its way into the bowl adding weight and causing it to read heavy. Do not use a hydrometer with cracked or missing glass on the tip, it should be discarded. This is when you'll be glad you have a second hydrometer.

Using a magnifying glass, inspect the glue dots on the paper to see if they are loose. Also check the accuracy verification thread or wax dot (if it has one) to confirm they are intact. Look down the hydrometer stem, a straight line will be observed on the paper. If the line is not straight and has a twist to it, then one of the glue dots has loosened and the paper twist makes the hydrometer unusable. Papers with a twist can read slightly inaccurate (1⁄2 to 3⁄4 °Brix) to greatly inaccurate (2+ °Brix) depending on the severity of the twist. If both glue points have loosened paper shift happens (up or down). Hydrometers will read light if paper shifts up or heavy if paper shifts down.

Suggestions for Visual Hydrometer Inspection

- Calcium scale – scale should be cleaned off before checking. It adds extra weight giving a false reading.

- Cracked or missing glass anywhere – do not use. Hydrometer should be discarded due to possible inaccuracy and potential glass contamination in syrup.

- Twisted paper, even a slight twist – do not use. It will get worse with time and can give a false reading of several Brix/Baume

- Do not attempt to read the hydrometer with the error built-in. Factored incorrectly, the error would be doubled leading to making under- or over-density syrup.

- Always check a newly purchased hydrometer. It is rare, but brand-new hydrometers can become inaccurate during shipping.

A Final Reminder

Producers should always have a minimum of two hydrometers. One always seems to break when needed the most. Not having a backup hydrometer can lead to off-density issues and will cost you money. Always use two hydrometers. Floating both at the same time to assure they are reading the same is good practice. If one starts reading off, it is detected right away, not after drums or containers develop problems with fermented syrup or sugar crystals. This is when a 3rd hydrometer is handy - you will always have two to compare to each other, plus a spare if needed. A third hydrometer is also handy when your neighboring sugarmaker drops and breaks his only hydrometer in the middle of a big boil and needs to borrow one.

North American Maple Syrup Council

Update on Activities

Delegates to the North American Maple Syrup Council have been busy since October's annual meeting, working on a range of projects and meeting regularly to share ideas and resources that help us all support and sustain the maple industry and each other.

The Council has held two roundtable discussions with delegates and member association leaders. In December we met to discuss association operations and share ideas and opportunities for promoting stability and building capacity of our organizations. We talked about strategies for member attraction and retention, how each of our organizations work to boost the visibility of our individual sugarmaker members, and where there are opportunities to leverage relationships with other organizations that can help us all do our work better.

In January we discussed strategies for outreach and promotion, such as shared advertising, events like maple weekend, and online directories hosted by associations. It's impressive to see the creative ideas that such small organizations manage to implement with very limited resources! We also talked about how we're all dealing with the challenges brought on by the jug shortage.

Committees have been busy as well. The conference committee has met a few times with the host committee planning this October's conference in Wisconsin. This event's offerings will be significantly expanded from past years', with opportunities to learn about a range of topics that go beyond maple production. For more details and registration information, see https://wismaple.org/2022. The education committee is discussing ideas around supporting associations with resources for running beginners' workshops and educational outreach materials that sugarmakers can distribute to customers. Work on the 3rd edition of the North American Maple Syrup Producers Manual continues, with final edits underway now. And mapleresearch.org is updated regularly with new articles, videos, and other resources to help producers make high-quality products.

Finally, we are working to build support for the Research and Education fund. The Fund has given out more than a million dollars to support research that benefits all producers, and demand for grants is increasing. Producers, equipment dealers, and others are encouraged to support the Fund, either through a penny-per-container contribution, or through regular donations. Contact Executive Director Winton Pitcoff at mapledigest@gmail.com for more information.

Delegates will next meet at the North American Maple Syrup Hall of Fame induction ceremony in Croghan, NY, on May 13. We take a break from meetings during the sugaring season so that everyone can focus on their operations. We hope everyone has a great season!

Annual international maple conference and NAMSC meetings

Maplin' on the Mississippi

October 26-29, 2022 • La Crosse, Wisconsin

Come spend three days with hundreds of maple producers from all over the region at the annual international maple conference, trade show, educational workshops, auction, NAMSC meetings, and more!

Events begin with the Taste of WI Banquet on Wednesday night October 26th. The following day includes the NAMSC annual meeting, with area tours on the 28th. Saturday the 29th features a full day of research and educational seminars, and concludes with an awards and appreciation banquet. A two-day grading school follows the conference, on the 30th and 31st.

More information at wismaple.org/2022

Hope to see you all in La Crosse!

Reserve your hotel rooms today at the Radisson in La Crosse, 200 Haborview Plaza, La Crosse, WI, (608)784-6680
Visit wismaple.org/2022 for hotel options and updated hotel registration and information.

A Look at Early 19th Century Beginnings for Flat Pans and Sugarhouses

Matthew M. Thomas

Fans and enthusiasts of maple industry history are often interested in the details of the beginnings of various methods and technology. Questions like, "When was the evaporator first introduced?" or "How were trees tapped before power drills and metal spouts?" Unfortunately, specific answers to these sorts of questions can be elusive, and the further back in time we go the more difficult it becomes to know precisely when or by whom the use of some tool, equipment, or method first happened. Which is not to say we should not always keep looking for answers that might refine or correct what we know.

In the case of the question of when did sugar and syrup makers start to use sugarhouses, the most common answer is in the 1850s and 1860s when the maple industry introduced and adopted commercially-produced patented baffled and flued evaporators. Sugarmakers located their evaporators inside purpose-built structures to protect their boiling rigs and themselves from the elements while improving the cleanliness and efficiency of their operation.

Looking back to the 1700s and the first half of the 1800s, boiling operations were most often described and illustrated as being outdoors in large iron kettles suspended over open-air fires. In some cases, a small open-sided shed was built to provide shelter for the workers and visitors, but not to protect the boiling set up. That leaves the question of the intermediary technology and method of using large iron flat pans set on more permanent brick or stone and mortar arches. Did sugarmakers build sugarhouses to protect their flat pans, and when exactly did they start to use flat pans? A closer examination of historic accounts brings answers to these questions into focus.

Taking those questions in reverse, dating the introduction of flat pans has never been easy, and the knowledge that a more rapid heating and evaporation could be achieved by a large flat pan rather than a narrow and deep kettle was not exactly unique to sugarmakers. Most early flat pans were fabricated by a local metal worker or stove maker or were made at home, limiting the amount of advertising and documentation to find in the historic record. Overall, it was fairly well understood that flat pans were increasingly used and replaced kettles through the 1840s and 1850s. It turns out that examination of newspapers from the early 1800s shows that, in certain areas, flat pans were being adopted much earlier.

As early as 1822, newspapers in New York and Maryland reported that Moses Mather of Fairfield, New York (15 miles east of Utica) operated a maple sugar operation in Herkimer County that featured a single sugar

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camp with four, 9 foot by 12 foot sheet iron flat pans, 12 inches deep, resting on walled arches.[1] Sap from 2,000 pails was gathered to make 6,000 pounds of maple sugar (equivalent to 750 gallons of syrup). Mather did not have a sugarhouse to protect his flat pans and at the end of the season, he simply turned them over until it was time to boil again the following spring. Reading an account of the sophisticated use of an array of flat pans on this scale suggests that Mather had probably been using flat pans for a number of years and others in the region were likely also aware of and doing the same. Into the 1830s and 1840s one can find further reports and descriptions of the use of sheet iron flat pans set on arches by sugarmakers in other states.

Review of historic newspaper accounts has further led to the discovery of an even more remarkable account, also from New York. In the spring of 1827, the 2,000 tree sugarbush and boiling enterprise of a Mr. Adams from near the village of Bloomfield in Ontario County (southeast of Rochester) was described in the following detail:

> *The place where the sap is boiled is a frame building the size of a small farm house, and situated on a side hill to be somewhat similar to a three story building. The sap is drawn on a level with the chamber or third story and emptied in a trough. It is carried by tubes to a large cistern in the second story, and drawn from them into boilers in the lower story. These boilers are two sheet iron pans similar to those used in manufacturing salt, nine feet long and three feet wide containing nine barrels each. They are shallow and evapo-*

rate the watery particles very fast.[2]

As astonishing as it is to see the description of a sugarhouse from 1827, with its wise placement on the hillside to use the aid of gravity and multiple levels for moving sap, one is immediately left to wonder what exactly did the structure look like in comparison to the traditional image and features of the iconic sugarhouse? Did it have a cupola for release of steam? What about a metal flue stack or brick chimney for smoke and ash? Sadly, in the era before photography, we have limited methods and opportunities for the documentation of the appearance of such early sugarhouses.

Once again consulting old newspapers has revealed what may be one of the earliest renditions of a purpose-built sugarhouse of wood frame construction, complete with a cupola and chimney. In this case, the sugarhouse of Lyman Hall of Shelburne, Vermont was illustrated in a January 1847 edition of The Cultivator, a progressive farmers newspaper published out of Albany, New York. In addition to the drawing shown in the accompanying figure, the sugarhouse included a brick arch for a pair of 5½'x9' flat pans and a double-flued brick chimney. As the article notes, "the building is ventilated at the top by a door which is managed by means of a pulley."[3]

As shown here, with careful and persistent searching of historic documents, research continues to refine and better define our understanding of the timing of events in maple history. In some cases, the results might even surprise us.

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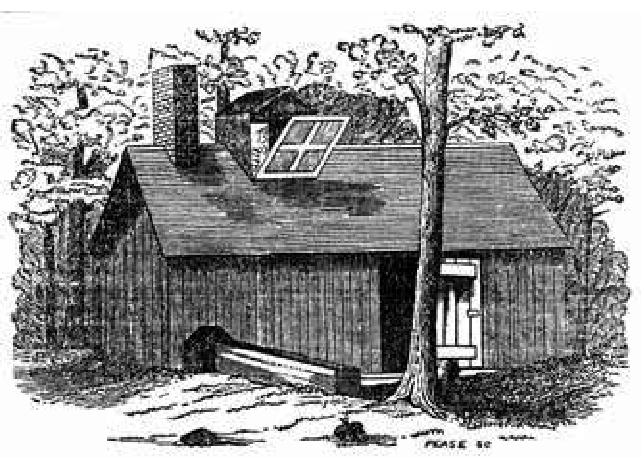
[1] Maple Sugar," Herkimer People's Friend, May 29, 1822; "Maple Sugar," Maryland Gazette, August 1, 1822.

[2] "Maple Sugar Manufactory," New York Statesman, March 22, 1827.

[3] "Manufacture of Maple Sugar," The Cultivator, January 1847, vol. 4, no. 1, p. 24-25.



MANUFACTURE OF MAPLE SUGAR.

Illustration from 1847 issue of *The Cultivator* showing the sugarhouse of Lyman Hall of Shelburne, Vermont. One of the earliest visual renditions of a modern-style frame sugarhouse.

2021 Acer Access and Development Program Grant Awards

Below is brief information about the 11 projects granted $5.4 million from the USDA's Acer grant program in 2021. For more information, please visit the grant program's website: https://www.ams.usda.gov/acer

Indiana
Purdue University

An in-depth survey of both supply and demand of the industry is needed to develop an integrated marketing strategy, which can be used to increase consumer awareness and consumption in the Midwest.

Michigan
Michigan State University

This project will utilize a partnership between a major land grant institution's research and demonstration center at Michigan State University's Forest Innovation Center with a focus on enhancing maple syrup production and value-added products and a local craft distillery to evaluate the potential use of late season and post season maple sap in the creation of 100% pure maple distillate products.

Missouri
University of Missouri

To establish and expand a regional maple syrup industry, this project responds to current needs and circumstances with a multifaceted approach, targeting maple-rich areas and connecting farmers, forest-landowners, and natural resources professionals to create an informed maple network.

Montana
Montana State University

Project objectives are to: i) quantify microbial load and diversity throughout different types of production processes; ii) assess the impact of particular microorganisms on sap sugar inversion; iii) determine which disinfection practices provide the best sterilization of re-used sap lines; iv) investigate the potential for microbial sensor technology to translate past, current, and future laboratory research into in situ measurement networks; and v) interact with and educate producers on all microbial aspects of maple syrup production, including developing online educational content based on frequently asked questions (FAQs) and in-person meetings.

New Jersey
Stockton University

Our research seeks to develop a sustainable sugaring industry in southern New Jersey through a community-oriented strategy.

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Grants: continued from page 31

Utah
Utah State University

The overall goal of this project is to spark the development of a robust maple syrup industry in the Intermountain West.

Vermont
University of Vermont

This project will collate, compile, and develop resources on the economic and environmental benefits of operating sap-only enterprises.

Vermont Agency of Agriculture Food and Markets

VAAFM's project is focused on consumer connection through agritourism, innovative consumer engagement strategies, and an increased digital media presence.

Washington
University of Washington

This project is a joint effort between three research universities in Washington and Oregon (University of Washington, Washington State University, and Oregon State University) to facilitate community sugaring and develop improved techniques adapted to PNW weather conditions.

Wisconsin
University of Wisconsin

This project will advance the knowledge and readiness of Wisconsin's woodland owners to engage in, or expand, sustainable maple-sugaring activities, will build the science-based educational resources available to professionals to better serve landowners, and will engage our tribal communities to better understand their educational resource needs around maple syrup production.

West Virginia
Future Generations University

Enriching Maple in Appalachia will work across Maryland, Virginia, and West Virginia to promote research, education, and natural resource management to advance profitable maple enterprises.

In Memoriam: Karl Evans

Karl Evans, President of the Ohio Maple Producers Association, passed away on December 15, 2021. Karl was owner of May Hill Maple farm in Orwell, and operated a Leader dealership.

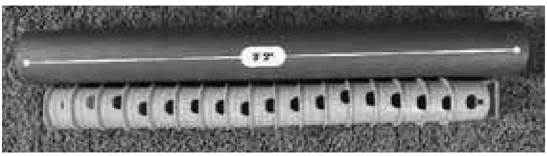
Along with his work with the Association, Karl represented Ohio as a Delegate to NAMSC, and lent support to develop the OSU Mansfield Maple Program. His guidance and advice will be missed.

Karl will be remembered most for the straightforward and honest advice that he gave to his fellow sugar makers.

Amadorable Tote-Em Sap Sack Holders

You've seen our new food grade, polypropylene, sap sack holders. We will now show you one of the best features of this new product! Storage!

A Sugarbush often needs great organization to be successful. Previous designs were flawed in the area of convenient storage and organization. Metal 2 piece sap sack holders or homemade PVC designs are difficult to organize and store.



The Amadorable Tote-Em Sap Sack Holder will help solve these problems. They are stackable, allowing you to fit many units in one nice, compact storage container of your choice.

3′x4″ tubing (PVC or cardboard for example) would allow for 17 Tote-Ems. When expanding to accommodate the larger operation, 5′x4′′ PVC tubing would allow about 32 Tote-Ems, and 10′ would accommodate about 67 Tote-Ems. PVC is tough and is able to be stored from almost any direction- vertical, horizontal, at an angle, the possibilities are almost endless!

If you like 27 Gal. plastic totes, you can fit roughly 176 Tote-Ems. A 2′ cubed box (2′x2′x2′) will store 396 Tote-Ems easily.

When the season is over, there is no worry if there is any extra moisture in storage, The Amadorable Tote-Em Sap Sack Holder won't rust!!

Amadorable Tote-Ems
John Sandberg

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NORTH AMERICAN MAPLE SYRUP COUNCIL

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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WANTED: Maple Syrup Memorabilia. Old maple syrup tin cans, bottles, taps, spouts, spiles, packing labels, brochures, signs, maple candy molds and other related maple syrup industry items. Also Back issues of the Maple Syrup Digest (1962 - #4, 1963 - #4, 1964 - #1, 1968 - #1, 1970 - #1, 1975 - #3, 2010 - #4, 2019 - #4, Contact, Don Bell at 203-268-7380 or thedbells@msn.com.

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