Maple Syrup Digest

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February 2017



Climate and Sugarbush Detecting Off-Flavors





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Greetings from your President



ore and more, it seems that our lives are dictated by Ldeadlines, critical issues, swell deals needing to be acted upon immediately, never ending political frays, as well as the rush of our everyday activity. Then, of course, at this time of year, our maple seasons are about to commence, which brings an added measure of urgency and industry. With holidays and annual meetings now behind us, I have spent a fair amount of time reflecting on the future of the North American Maple Syrup Council and in particular, the "value" of each member's half pint/236 ml membership investment in the organization. I am aware that for some producers, this four dollar assessment presents a burden, but I would like us all to look at what the NAMSC or for that matter, the IMSL truly represents.

In no particular order, nor with any completeness or priority suggested, I would offer that these two organizations are a collaboration focused globally on the maple syrup industry. We are the only non-governmental amalgamated collective voice for all regions producing maple products in North America. Clearly some provinces and states are exemplary leaders and producers of syrup, while others are very small, perhaps new to organized associations or are geographically 'out on the edge' of the Acer saccharum range. Regard-

less, each regional group is enhanced by the interaction with others and the maple commodity is strengthened by the sum of the individual producers and their local organizations.

Six thousand voices command significantly more attention nationally and internationally than the recognition of dozens or even hundreds of producers. Important attributes like product and commodity brand recognition, critical attention to specific food safety, nutritional benefits, forest stand research, manufacturing and equipment innovation and the like are all enhanced and supported by industry-wide recognition. (I just returned from judging the maple division of the Pennsylvania Farm Show where I had an opportunity to observe several historical displays. Looking at the 1958 Willits Maple Sirup Producers Manual shows just how far we have come in this industry, especially the recognition given by pioneers like C. Willits, J. Marvin, F. Winch and P. Robbins, each of whom credited progress by interstate collaboration.)

In addition to maple research, value added product development, and sugarbush and tree health considerations, the Council provides an all-important forum for discussions dealing with all manner of cross border trade, marketing, and international policy and regulation. Again, the benefit of the collective voice of producers as well as geographic provinces and states often dictates industry outcomes. The annual gathering of the Council provides each member organization an important

President: continued on page 7





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venue for information transfer in a setting where face-to-face discussion and negotiation is supported. Print (Council members receive the Maple Digest at a reduced rate), electronic, and the various forms of social media have aided exchange of ideas, but our very old industry still seems to benefit from the equally old 'cross-table' form of discussion.

Each of you ought to weigh the benefit derived from your participation in this collaborative Council membership. Further, I would ask that you reach out to your organization's delegate as they endeavor to represent each of you in this international industry-wide forum. When your ideas, insights, suggestions and concerns are transferred to the Council, we all benefit. Future articles will consider the significant other contributions afforded for international institutional and extension research, education, as well as opportunities for innovation, product development and equipment design.

Now, as the temperatures at this writing hover in the zero range, tubing needing final repair, and sugarhouses to ready, we can only look to the weather forecasters to signal the important call to begin tapping. Having said that, by the time you read these pages, the 2017 maple season will have begun. On behalf of the Directors and Officers of the Council we convey our best wishes for a safe and productive harvest.

Kind regards, Eric Randall, NAMSC President



Cover photo: Spring comes to Browns Corner, Franklin, VT. Photo by Pam Greene, Franklin, VT.

Omission: Last issue's cover photo caption failed to point out that the sugarmaker pictured was Jacques Couture of Westfield, VT.

February 2017

Research: Tapping

3/16" Tubing Research Results from The Uihlein Forest

Michael Farrell, Director, The Uihlein Forest, Cornell University

There has been a lot of interest in 3/16" tubing systems over the past several years. Tim Wilmot's research on this novel concept has caused a lot of producers to rethink how they install new tubing systems or renovate their existing sugarbushes. Despite a lot of in-depth research reports and successful stories from sugarmakers who have used 3/16" systems, there still remains skepticism and questions among producers who are reluctant to switch away from 5/16" systems.

It should be obvious that using 3/16" will always be better in a gravity-based system, yet there is no consensus as to whether or not it is an improvement when using vacuum pumps. In 2016, the Uihlein Forest received funding from the Northern NY Agricultural Development Program to conduct research and extension on using 3/16" tubing systems under vacuum. This article describes our research results from the past year and outlines future directions.

At the Uihlein Forest in Lake Placid, we installed twelve 30-gallon canisters in our existing sugarbush. These were strategically placed near the end of mainlines to allow 17-33 taps flow in to each canister. Six of the canisters had two 3/16" lines going in to each, with an average of 8.5 to 13 taps per lateral line. The other six canisters had 1" mainlines with regular 5/16" tubing and an average of ~3 taps per lateral line.

The canisters for our research were custom made by Lapierre to be able to be placed in an existing tubing system,

measure sap volume, and then release the sap into the mainline without ever interrupting vacuum to the tapholes. The regular mainline goes to the bottom of the canister and a "dryline" tees off the mainline to go to the top of the canister. We normally have the valve shut on the bottom of the canister to allow sap to collect in the canister, and the vacuum is supplied at the top of the canister via the "dryline." There is a tee at the bottom of the canister that allows us to let the sap flow in to a graduated cylinder on the side of the canister and measure the volume before we open the valve to let it flow down the mainline. Once all the sap is measured and emptied, we close the valves and let it fill up again.

Though it is generally not advisable to make any conclusions based on one year of data, in the interest of getting the initial results to producers and meeting reporting requirements for NNY Agricultural Development Program (who funded this project), we have decided to release the initial results now. While there was some expected variation among the different tubing lines, the 3/16" tubing systems provided an average of 19.5 gallons of sap per taphole whereas the 5/16" lines produced 18.5 gallons of sap per tap. It's worth noting that this is not statistically significant, meaning that the difference could be due to chance rather than something that would cause inherent differences in how the systems perform.

Although the average yields between the 3/16" and 5/16" tubing sys-

tems were not statistically significant, it is worth noting that the top four producing lines were all 3/16" systems. We did have two 3/16" systems that did not fare so well (thus bringing down our average), but there may be explanations for these discrepancies. The lowest yielding 3/16" systems were found on lines with less ideal conditions for sap flow. In fact, our worst line was at the very top of the sugarbush where we have more significant dieback issues. Thus, the lower sap yield may have been due more to tree health than the type of tubing. Our second worst performing 3/16 line was in an area of the sugarbush that is more of a flat plateau and had only a few feet of elevation gain within the collection area. This area would not be considered an ideal area for 3/16" tubing, but we put one there anyway just to have at least one area with 3/16" on relatively flat ground.

In 2016, all of the 3/16 and 5/16 tubing was brand new. One of the concerns with 3/16 tubing is how it holds up over time. We will continue to measure and monitor sap volumes for several years to determine how yields change as the systems become more contaminated. We will simply use the "dry clean" method of pulling taps under vacuum, as that seems to be the most commonly used cleaning method in the maple industry today. If the 3/16" becomes more contaminated and plugs up, that will become evident in the years ahead. Being able to continue to measure sap volume over time will be an important step towards determining if using 3/16" tubing under vacuum is an advisable recommendation. Unfortunately, it is too early to tell at this point since the technology is so new.

Although the results from the re-

search at the Uihlein Forest cannot be used to providing concluding evidence, it is worth noting how we are already using the information gathered in our own experiments and those completed by other researchers. Although I am concerned that 3/16" tubing could experience difficulties over time, at this stage the benefits of installing 3/16" tubing are so great (lower installation costs and potentially higher vacuum) that we will likely be switching out the majority of our 5,500 tap tubing system to 3/16" in the next year. This is a decision that I will leave to the next director, but my recommendations are to switch out two of our systems (80% of the taps) and leave one system as a control. After all, we rely on syrup income as a main part of our budget and strive to make the most we possibly can while conducting applied research. The tubing system is mostly more than 10 years old now and the lateral lines should be replaced, so we will be using 3/16" on a much larger scale in the years ahead.

A separate but related part of our research involved measuring the difference in vacuum levels when using 5/16" droplines vs. 3/16" droplines in a typical vacuum-enhanced tubing system. We were able to obtain some 5/16" x 5/16" x 3/16" tees and collaborated with Paul Smiths College to install them in their sugarbush. The vacuum levels generally hovered close to 20", so there was definitely room for improvement in bringing additional vacuum to the taphole. We simply put one regular 5/16" tee with a vacuum gauge at the same height of the taphole and located that right next to a 3/16" dropline that also has a tee within it for a vacuum gauge. Thus, the vacuum levels were being measured directly next to each other, at the same height. The only dif-

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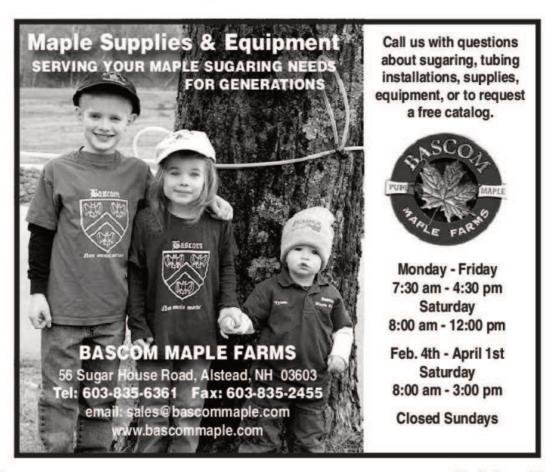
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ference is that one was using 5/16" tubing and the other 3/16" tubing. Most of the droplines were 36" but we also experimented with some longer ones (up to 72").

In all circumstances, the vacuum levels on the 3/16" droplines were significantly higher than the 5/16" lines. That is the incredible thing about 3/16" tubing - the vacuum within in a line can be enhanced by only a few feet of additional vertical drop created in the dropline. The theoretical maximum vacuum enhancement is .88" for every foot of elevation gain, and the longer the dropline, the greater the enhancement. Thus, simply replacing droplines in an existing 5/16" tubing system with 5/16" x 5/16" x 3/16" Tees may result in significant increases in yield. You will gain the benefits of a new dropline as

well as enhanced vacuum from the vertical fall through 3/16" tubing. The older your droplines, and the lower your vacuum level is to begin with, the greater the benefit will be. If you are already achieving 27" or more of vacuum throughout your sugarbush, then there would likely be no improvement from making this change.

Our future plans at the Uihlein Forest also include replacing the droplines in the 5/16" tubing system that will not receive new 3/16" laterals. It is cheaper and easier to simply replace droplines than an entire tubing system, so we will do that and monitor the yields over time. If you aren't ready to make the jump to entirely renovating your tubing system with 3/16", you may try just switching out your droplines by using 5/16" x 5/16" x 3/16" tees.



Production: Sugarbush Management

Managing for a Healthy Sugarbush in a Changing Climate

Jared Nunery, Orleans County Forester, Vermont Department of Forests, Parks and Recreation

evere and "wonky" weather is becoming the new normal. It is common to hear the word "new record extreme" used by meteorologists as you listen to the weather report. A recent study conducted by Yale University and George Mason University found that 85% of Americans reported experiencing extreme weather in 2012 and 2013 (Leiserowitz et al., 2013). In Vermont, over the last 50 years we have experienced a 2 degree F temperature increase in the summer months, and a 4.5 degree F temperature increase during the winter months (Betts, 2010). Temperature is only one of numerous changes we are witnessing. As seen in Figure 1, data from the Vermont Department of Forests, Parks & Recreation (FPR) documented both spring bud break (initial leaf emergence) and full

leaf-out occurring earlier than historic averages. Earlier bud break increases the length of the growing season, but may make buds vulnerable to frost damage.

Documented earlier bud break than the previous 20 years has been coupled with a later end to the sugar maple growing season over the last decade (Figure 2).

Beyond changes in the amount of time a deciduous tree such as sugar maple is actively growing during the summer months, we are also seeing changes that can impact these trees while they are dormant during winter months. In the last five years in Vermont we have seen a reduction of more than 50% in the number of days with greater than one inch of snow cover on

the ground. Deep snow provides a thermal blanket, protecting roots from sub-zero temperatures that can negatively impact delicate roots buried beneath the forest floor.

few of the numerous changes we are experiencing today. Climate scientists use his-Climate: continued on page 13

These are just a

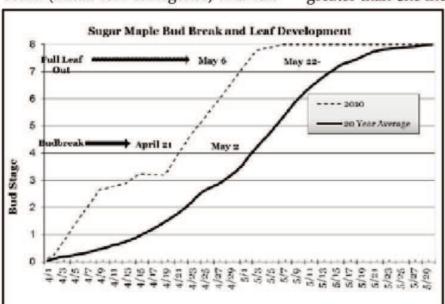
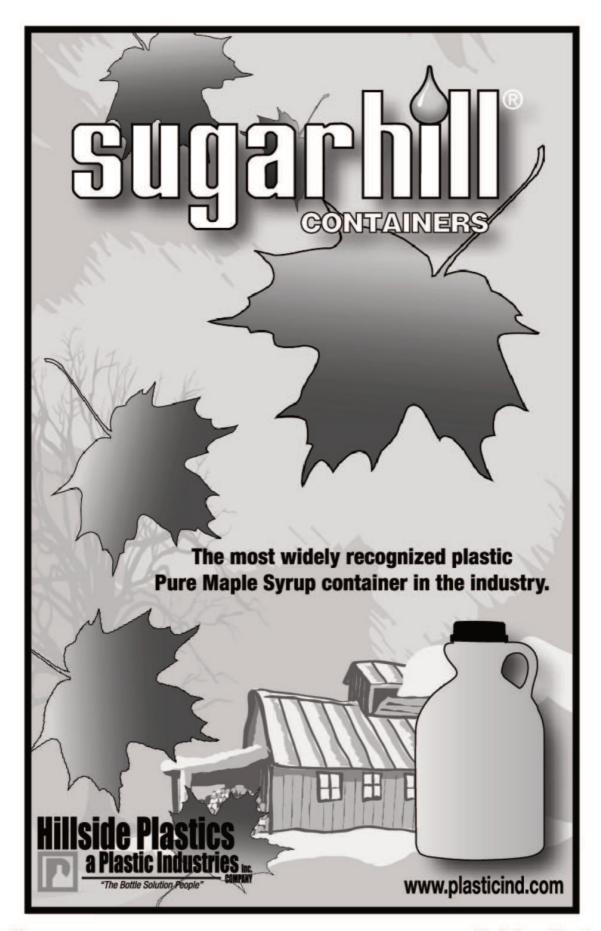


Figure 1: Data from the Vermont Department of Forests, Parks and Recreation, Forest Insect and Disease Conditions in Vermont, 2010, showing sugar maple bud break compared to the 20-year historic average.

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toric data combined with predictive climate models to better understand what we might expect in years to come. These climate projections provide us with invaluable insight into what we should expect, and how we can prepare for future changes. Continued increase in the average/mean global temperature doesn't necessarily mean it will be warmer in all places. What we can expect is more extreme weather in the form of more frequent and intense weather events. Last summer northern Vermont experienced wind damage, heavy rains, and drought conditions. In addition, this region experienced damage from heavy snow and ice during the previous two winters. These are the types of events predicted to be more regular in the Northeastern US in the years to come, so we should expect and prepare for them.

What does this all mean for your sugarbush, and what can you do as a manager? A great start is to read Peter Smallidge's article in the October 2016 Maple Syrup Digest titled "Maintaining a Healthy Sugarbush." The word "healthy" could be substituted for "resilient," which is a term often used by foresters and land managers to describe management strategies in a changing climate. Resilience is the ability of a sugarbush to be stressed, respond, and recover from the disturbance - like stretching out a rubber band and then letting it return to the original shape. Vigorous trees, and a diversity of both forest species and structure (see below) create resilience.

Maples did not evolve in a monoculture of only maple groves, and so when they exist in this condition they

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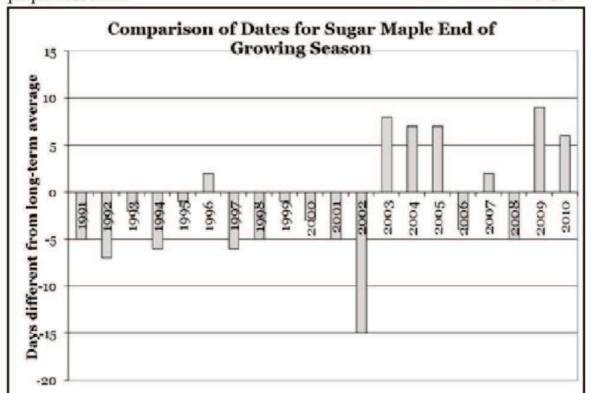


Figure 2: Data from the Vermont Department of Forests, Parks and Recreation, Forest Insect and Disease Conditions in Vermont, 2010, showing the relative end of the sugar maple growing season to the long-term average end of season date. Positive difference correspondence to later end of the growing season.

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are more vulnerable and less resilient. This vulnerability is primarily to pests and pathogens, as monocultures are essentially all-you-can-eat buffets for the pests and pathogens that negatively impact maple trees. Research has shown that maintaining at least 25% stocking (number of mature trees) in non-sugar maple can decrease the impact of pear thrips. During last summer, in northern Vermont we experienced the first year of likely a multi-year outbreak of forest tent caterpillar, a native defoliator of hardwoods, especially sugar maple. Observations from anyone who walked through those sugarbushes that were defoliated will validate the greater the proportion of sugar maple in the sugarbush, the greater the proportion of canopy defoliated. The defoliation event last summer was coupled with a moderate drought, creating a compounding stress on the defoliated trees, and further decreasing their resilience.

The proverbial camel's back was never broken by only one straw, but rather the cumulative weight of many straws combined. The same is true for trees; short of a chainsaw it is rarely one thing that causes a tree to die. We start to see mortality when stressors are compounded such as repeated defoliations and drought conditions. One of the greatest impacts a manager can have on creating a resilient forest is through maintaining tree vigor. This is achieved through regular thinning, and culling structurally weak trees (i.e. weak notches, sugar maple borer impacted trees, etc.). When thinning in a sugarbush, allocating sunlight to the most vigorous and healthy trees assures that these trees are more likely to respond to whatever mother nature throws at them. Further, keeping a diverse mix of species in your sugarbush will not only decrease the "all-youcan-eat buffet" effect, but also provide habitat for beneficial predators such as cuckoos, which feed on the forest tent caterpillar. Diversity is not limited to species, but also is true for the structure within your sugarbush.

Forests (and sugarbushes are a forest) have architecture just like our houses. Some are simple, are some are incredibly complex (think of the work of Solomon Guggenheim and Frank Lloyd Wright). Structural diversity in a forest means gaps in the canopy that allow sunlight to penetrate to the forest floor, establishing young seedlings and creating a sub-canopy of less than five feet high - a perfect place for nesting insectivores such as black-throated blue warblers and invertebrate eating wood thrush that every maple producer should be happy to see in their sugarbush. Structural diversity also includes standing dead trees which attract cavity creators (think woodpeckers in search of insect larvae that are impacting your trees), which in turn attracts cavity nesters (think insect eating birds). Structural diversity also includes having some dead trees on the forest floor, which cycle nutrients back to the soil and retain soil moisture, providing refugia for invertebrates especially during dry summer months. By creating a diverse structure, you are essentially installing a security system for your sugarbush, on call 24/7, providing surveillance and protection from a variety of tree pests and weather extremes.

Beyond resilience, maple producers must also be prepared to adapt. Learning how to adapt starts with monitoring, and there are no better monitors than maple producers. While working in your sugarbush in the spring time,

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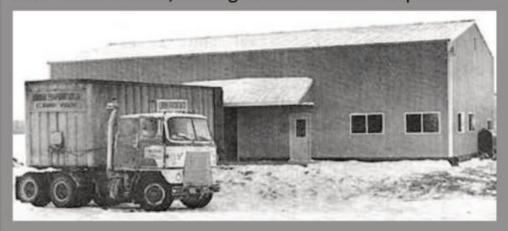


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Climate: continued from page 15

watch the leaves as they emerge. Are the leaves misshaped (signs of frost damage or pear thrips)? During the growing season keep an eye out for telltale signs of defoliating insects (circular holes of maple leaf cutter or tiny shards of leaves on the forest floor from forest tent caterpillar feeding). If a defoliation occurs during the summer, pay attention to the weather. If defoliation occurs early in the growing season, the trees will likely leaf out again. If you notice that stressors are starting to compound (defoliation and drought stress on portions of the sugarbush with thin, vulnerable soils), you can respond by delaying any thinning in these areas for at least two years following the end of the defoliation event, and conservatively tapping (one tap per tree, no trees tapped smaller than 10" in diameter at 4.5 feet high off the ground) or not tapping at all those trees that are most stressed the spring following the compounded stress events.

Finally, access in a working sugarbush is critical, and this is achieved through woods roads. Getting back to the sage advice of our climate scientists, in the Northeastern US we are likely to experience more deluges during the summer months, where we receive a tremendous amount of rain in a short period. Having proper drainage on all woods roads is not only good for the streams that any runoff might drain into, but good drainage also keeps your roads in place, prevents washouts and the formation of impassible areas preventing access to your sugarbush. Welldesigned roads shed water at regular intervals to prevent erosion before it can happen. Numerous cost share and technical assistance programs are available in many areas for landowners interested in improving their woods roads. Contacting your consulting forester or an extension forester (County Forester in Vermont) is a great first step in understanding the wealth of resources available to help you as a landowner.

We are living in a rapidly changing climate. Given everything described above, it is now more important than ever to be thinking first and foremost about the health of your sugarbush. The next time you walk in your woods, stop and look around. How does the canopy look? What does the forest floor look like, do you see the seedlings that your descendants will be tapping some day? What do you hear, can you hear the bird calls of your security system at work? What species of trees do you see - do you need to diversify an allyou-can-eat buffet? How do your roads look, will they hold up to the next five inches-in-an-hour rain storm? Slowing down and asking these questions is the first step in creating a resilient sugarbush.

Acknowledgments: Louis Bushey and Sandy Wilmot of the Vermont Department of Forests, Parks and Recreation both provided valuable review and comments of this article.

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Research: Tree Health

Acid Rain and Sugar Maple Decline Paul G. Schaberg, USDA Forest Service, Northern Research Station

Acid Rain and Cation Depletion

Through the increased combustion of fossil fuels, humans have dramatically increased pollutant additions of sulfur and nitrogen into the atmosphere where it combines with water to form sulfuric and nitric acids. creating acid rain (Driscoll et al. 2001). Incoming acid rain has various impacts on human and natural systems, including the accelerated degradation of built infrastructure (e.g., buildings, bridges and monuments). However, the most pervasive influence of acid rain is that it disrupts nutrient cycling within ecosystems, speeding the loss of beneficial cations (positively charged elements like calcium (Ca), magnesium (Mg) and potassium (K)) and mobilizing potentially toxic ones like aluminum (Al). In forests, nutrient levels reflect the balance of inputs to the system (e.g., through atmospheric deposition, soil cation

exchange, and mineral weathering of underlying rock) and plant uptake and nutrient exports (e.g., via leaching loss and harvesting).

Inputs of acid deposition disrupt this natural balance and leads to a net loss of cations through acid-induced leaching (Figure 1). Although this increased leaching removes many cations, losses of most plant-essential cations (e.g., Mg and K) are limited because they can be reabsorbed back into stems before leaf senescence in the fall. In contrast, Ca is not mobile in the phloem and cannot be reabsorbed into stems, so all foliar Ca is lost when leaves are shed and this Ca is vulnerable to leaching loss as leaves decay (Schaberg et al. 2010). Protracted Ca leaching from soils and litter can lead to the net Ca depletion and the development of tree Ca deficiencies (Schaberg et al. 2010).

Calcium Depletion as a Unique Threat

Not only is Ca more vulnerable to leaching loss and soil depletion, Ca deficiencies are particularly damaging to trees Ca-dependent because physiology is so crucial to maintaining tree health and productivity. There are two basic functions of Ca in plants: 1) to enhance structural integrity (of cell walls and membranes) and 2) as a signaling agent that helps cells regulate carbon metabolism and stress response.

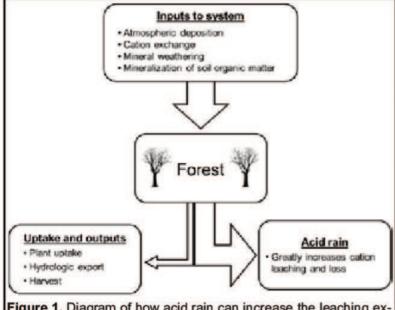


Figure 1. Diagram of how acid rain can increase the leaching export of base cations (especially Ca) from forests so that natural nutrient cycling is disrupted and net Ca depletion occurs.

It is this second function that acid raininduced Ca depletion likely disrupts the most. Deficiencies of Ca impair cellular stress response systems and make trees more vulnerable to damage and decline following exposure to stresses that would otherwise not have been consequential (Schaberg et al. 2001). The combined action of acid rain-induced Ca deficiencies that impair stress response (a predisposing factor) followed by exposure to environmental stress (e.g., drought or insect defoliation-inciting factors) then result in exaggerated tree injury and decline (Schaberg et al. 2001, 2010). Evidence that Ca depletion predisposes trees to decline following exposure to other environmental stresses comes from studies of numerous species in locations around the world where acid rain has become a modern threat (Schaberg et al. 2010).

However, one of the best-studied examples of this is the decline of sugar maple (Acer saccharum Marsh.) trees in northeastern North America.

Sugar Maple Decline as a Case Study

Sugar maple decline has been documented throughout parts of the northeastern United States and adjacent Canada over many recent decades (Schaberg et al. 2010). This decline has been characterized by two primary symptoms: crown dieback and woody growth declines. This decline is consistently associated with both cation (most

notably Ca) deficiencies and with an array of secondary environmental stresses (e.g., freezing injury, drought and insect defoliation – depending on the year and location) (e.g., Horsley et al. 2002, Long et al. 2009). This integration of predisposing and inciting factors forms an overall model of the causes of sugar maple decline (Figure 2), and established a testable hypothesis that has been used to evaluate the consistency of decline factors across the landscape and design experiments to evaluate if Ca addition could reverse decline.

Evidence from Native Stands and Experiments

Numerous studies have shown that declining sugar maple stands are characterized by having reduced foliar Ca nutrition (e.g., see reviews in Schaberg

Acid Raid: continued on page 20

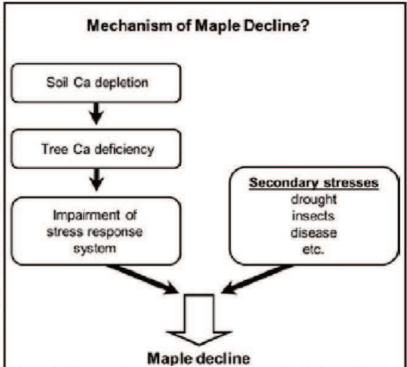


Figure 2. Proposed mechanism of sugar maple decline. This depicts how Ca deficiency can suppress stress response systems and predispose trees to decline following exposure to stress factors reported to contribute to sugar maple decline in the eastern United States and Canada (Schaberg et al. 2001, 2010).

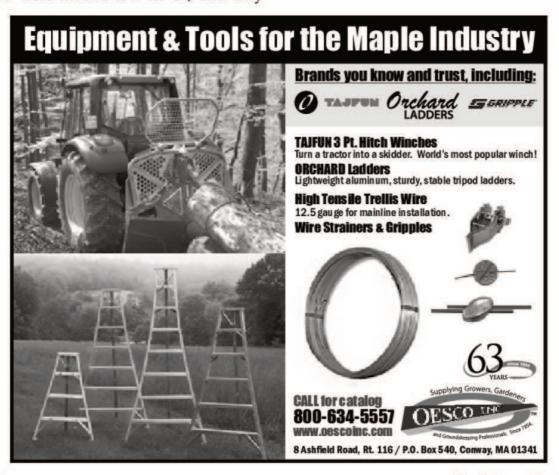
February 2017

Acid Raid: continued from page 19

et al. 2001, 2010). However, because declining trees are also expected to have reduced transpiration (the source of Ca to leaves), then it becomes unclear whether foliar Ca deficiency is a likely cause or unintended consequence of maple decline. To better distinguish foliar Ca deficiency as a cause or consequence of decline, Schaberg et al. (2006) sampled soil and foliar nutrition, and crown health and woody growth of sugar maple trees in 14 stands in Vermont that were predicted to have differing soil Ca levels based on the chemical composition of the bedrock geology that is the foundation for soil development (Schaberg et al. 2006). Sites were chosen based on predicted Ca status with no prior information on levels of sugar maple decline. Sites predicted to have diminished Ca status were indeed low in Ca, and they

exhibited poorer crown condition and reduced woody growth relative to sites where Ca was more available (Schaberg et al. 2006). Although this experiment showed that Ca deficiency was more likely a cause rather than a side-effect of sugar maple decline, more convincing demonstration of the causative influence of Ca depletion on sugar maple decline involved manipulation experiments in which decline symptoms were reversed following the addition of Ca lost through acid rain-induced leaching.

Several experiments have shown that treating soils with dolomitic lime (that adds Ca and Mg) can improve crown health and increase woody growth among declining sugar maples (e.g., Long et al. 1997). However, a more focused test of the influence of improved Ca nutrition can be achieved if only Ca



(and not Mg) is added to soils. Specific Ca-addition studies have been conducted at the Hubbard Brook Experimental Forest in New Hampshire at two spatial scales: 1) a plot-based study where Ca was added to a series of 40 m x 40 m forest patches, and 2) a large-scale study where Ca was added to an entire 11.8 ha watershed. For both experiments, Ca was added primarily as pelletized wollastonite (CaSiO3) at a level calculated to replace the Ca lost through decades of acid rain exposure. Comparative controls were adjacent to untreated forests at either a plot- or watershed-level for which Ca depletion from acid deposition was well documented. At the plot level, Ca addition improved a widerange of factors relative to trees on control plots, which included increased foliar Ca, greater foliar protection (i.e., antioxidant activity), improved crown health, improved reproduction (more flowers, seed,

and better germination), increased woody growth and improved stress sponse (Huggett et al. 2007, Halman et al. 2013). These last two factors are depicted in Figure 3. Here, Ca addition was associated with an increase in stem woody growth - but primarily only after the regional 1998 ice storm damaged the crowns of overtopping dominant trees and released the co-dominant and intermediate sugar maple trees measured (Huggett et al. 2007). Even the trees on untreated control plots showed some release following the ice storm, but the full growth potential for crown release was only recorded when trees also received supplemental Ca (Figure 3). Similar results were seen at the watershed scale where Ca addition was followed by increased foliar Ca, increased leaf area, improved crown health, greater wood production, reduced fine root biomass, and a shift in biomass from below to aboveground tissues (Battles et al. 2014, Fahey et al. 2016).

The Broader Landscape and your Sugarbush

Studies like the ones described above Acid Rain: continued on page 22

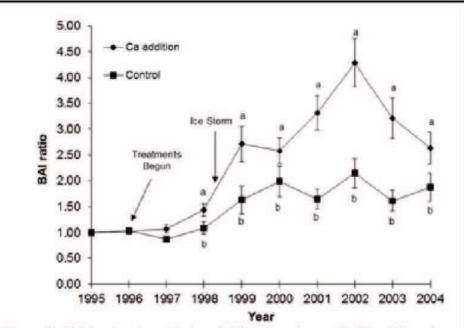


Figure 3. Calcium treatment-induced differences in growth (Basal Area Increment (BAI) for specific year relative to 1995 – the year before treatment began). The timing of treatment initiation and the 1998 regional ice storm (that damaged the crowns of dominant trees but released the co-dominant and intermediate trees examined here) are indicated. Treatment means with different lower case letters are statistically different (P < 0.05) based on ANOVA analyses. Data modified from Huggett et al. 2006.

Acid Rain: continued from page 21

have helped define how acid rain-induced Ca depletion predisposes sugar maple trees to decline. But not all sites are expected to be equally vulnerable to soil Ca depletion and tree decline. Sites that have Ca-poor soils and experience elevated inputs of acid rain are the most vulnerable to reductions in tree health and productivity. But how does one determine whether any particular forest site is at risk of acid rain-induced Ca depletion and tree decline? At least two methods are available and are used at different scales: 1) computer modeling of cation cycling relative to acid rain inputs to evaluate locations and patterns of risk over broad landscapes, and 2) nutritional assessment of smaller forest parcels to evaluate site-specific needs.

One solution to providing a more broadly applicable and spatially explicit estimate of the vulnerability of sites to acid deposition-induced Ca depletion is through the use of critical load exceedance models and associated maps. The critical load with respect to acid rain-induced Ca leaching is a quantitative estimate of the amount of pollution deposition below which there is no harmful effect (e.g., net Ca depletion; Schaberg et al. 2010). When a site's threshold for pollution loading (critical load) is subtracted from the estimated amount of incoming acid rain at that site, the exceedance of the critical load is determined. Sites with positive exceedance values are predicted to be vulnerable to pollution-induced reductions in health and productivity as Ca reserves are depleted over time. Although several specific critical load exceedance models exist, this general approach for identifying areas where acid deposition likely induces net Ca depletion and tree decline has been successfully tested for conifer and hardwood systems (Ouimet et al. 2001) including sugar maple stands (Watmough 2002).

If concerns exist about possible Ca depletion within individual forests, then site-specific nutritional assessments can be conducted. These assessments can range from the use of indicator plants as a qualitative guide of site fertility, to more quantitative measures of soil and foliar nutrition that are typically conducted by local agricultural testing laboratories (Wilmot and Perkins 2004).

Acknowledgements

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Sweet Signs Help with Marketing

Gary Graham, Ph.D., Ohio State University Extension

or most producers, making syrup is a lot easier than marketing it. However, if your marketing strategy relies entirely on a sign at the end of the driveway, it had better be a great sign. Research shows that signs, love them or hate them, are the most efficient and effective means of communication. They work 24 hours a day, 7 days a week, 365 days a year. They tell people who you are and what you are selling. Signs do not require direct attention like radio or TV ads do. Everyone looks at signs - even children notice and recognize them. If you have kids and have ever tried to drive by the golden arches of McDonalds or an ice cream shop you know what I mean. Even people who are sign naysayers have seen the impact of how a good sign brought them more business. How many times have you taken a side adventure while traveling to see something because of a sign that caught your attention?

Considering Americans travel over 3 trillion miles by automobile annually, you should think about effective signage to draw them to your sugarhouse. A sign will help people develop a memory of your business. If they remember and recognize your sign, they will find their way back faster. If you have your logo on your custom labels then that needs to be part of your signage. In the advertising world this is called branding. The more you brand your operation and products differently than the competition, the more you stand out.

Before you put up any sign you must check into the local regulations and restrictions. In many communities there are more regulations on signage than there are building codes. Never dig a hole for a sign without calling for a utility line marking. The cost of a sign will go up astronomically if you hit a fiber optic or other utility line. Using professionals in sign design is advisable. They should know local regulations and what will work best to promote you over others. They will also make sure things are spelled correctly, and can help you ensure that you're avoiding confusing messages.

Yes it's shocking, but there is a government office that studies signs and how they convey information to people. The United States Sign Council has a website with resources to determine sign size and placement to reach road travelers. For the best success follow the "CBS" rule of sign design: Clear, Brief, and Simple.

On average a sign has five to seven seconds to convey its message. The size of the sign needed is dependent upon the road and the posted speed limit, not the higher speed people drive. For example, 10" letters allow for 8.2 seconds of viewing at 25 miles per hour. At 55 miles per hour, the viewing time for 10" letters is just 3.7 seconds. Both of these scales are at a maximum of 300' between sign and reader. In short, the larger the letters the easier it is to read, and the more likely it is that it will be read. Bigger letters will require a larger sign. A larger the sign may involve more regulations and increased costs.

Signs will get you noticed if they are noticeable. Adding dimension to the sign helps, like if your sign is the shape of a sugar maple leaf, is painted on the side of an old sap tank, or includes

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Signs: continued from page 25

some brightly colored painted sap buckets on the signpost. A U.S. or state flag can help, but remember US flags must be illuminated at night. Lighting works well for drawing attention to the sign, but it is critical that you maintain the lights. If bulbs burn out the sign may convey a mixed message or a bad message. If the "S" of an illuminated Shell gas sign is burnt out, what does it read then?

Equipment dealers sell signs, and most carry signs with your state's name on it. These signs work well for at the end of the driveway if selling "farm gate" or from your home. However, if you put that sign up several intersections from your location with a direction arrow there is no guarantee visitors will get to you, especially if they pass other maple producers using the

same sign on the way to. The more you brand with your operation or family name or logo on signage, the more likely they will find you. If there are multiple producers on a road with the same last name (i.e. Miller) then it is critical to use the sugaring operation name so customers get to you.

Sometimes the less said the better. I've seen signs showing a stack of pancakes and a bottle of maple syrup with the only words being "Maple Syrup, 1 mile" and a directional arrow. That paints an immediate, clear image for the person passing by. With little wording they know that if they go 1 mile that direction they are going to find maple syrup. It is highly recommended you put the exact distance you are from the sign. If your sign says 1 mile then you better be 1 mile away and not 2 1/2 miles away, or people will give up and turn



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Example 1: Sign at an intersection and what was actually 2.3 miles down the road.

around disappointed.

Sorry, but if you live off a two track not much wider than a cow path you might think twice about pointing people to drive up your road. They may only get stuck and aggravated that you led them into a trap. Some folks don't appreciate a good coat of mud on their Mercedes Benz like we do on our old pickup trucks.

If you use an auto wrap, decals, bumper stickers or magnetic signs to promote your sugaring operation remember that if you wipe the mud off just the sign and the rest of the vehicle looks like it just came out of the swamp it sets a poor image of the quality of your product. If a vehicle with your sign promptly displayed on the sides is operated badly it could provide advertising you don't want.

The main points in my "Sugarhouse Aesthetics, What The People See" article in the February 2016 Maple Syrup Digest apply equally to signage. Signs along the road will get dirty. Keep them as clean as you can. For one, it makes them easier to read. Also, it sends a better image to the cleanliness of your operation and your product. Remember the public tastes with their eyes and nose as much as they do their mouth. Signage has a very good cost benefit ratio if done properly. A good sign will pay for itself in a short time and a bad sign will cost you money for a long time.

Author note: These articles are to be helpful for you to think about your operations while being practical and applicable to a broad range of producers. They are not intended to be judgmental. If you have suggestions for practical application articles you would like to see please contact me. I will not use names or specifics unless you ask me to use them. graham.124@osu.edu





Example 2: Sign at an intersection and what was actually 1.4 miles down the road.



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Ospro Sap Company Carroll, ME 207 738-2185

Backbone Mountain Maple Oakland, MD 301 616-1446

Leroy Burnham Watertown, NY 315 767-2845

Windsor Hill Sugar House Windsor, MA 413 684-1410 Research: Birch

Research Update on Birch Sap & Syrup Trials

Michael Farrell, Director, The Uihlein Forest, Cornell University

or the past several years we have been conducting research and extension on tapping birch trees for their sap and syrup production, and in 2015 we received funding from the Northern NY Agricultural Development Program and Cornell University's Agricultural Experiment Station to conduct additional trials. There are many aspects of birch tapping that are similar to maple and other aspects that are entirely different, and more research is necessary understand the nature of these differences and how to best make use of the birch resource. This article presents some of the lessons learned to date on some of the most frequently asked questions about tapping birch trees.

What is the average yield of sap & syrup per tap?

As with maple, the amount of sap and syrup you can expect per tap will vary tremendously from tree to tree and from year to year. On average, it appears that a birch tree will produce between 10 and 20 gallons of usable sap per tap. The amount can vary greatly depending on when the tap is placed and the weather conditions that spring. We don't yet have conclusive evidence regarding how the timing of tapping impacts overall yield, but there is concern that if you wait until the maple season is completely over before tapping birch trees that you could miss out on a substantial amount of early season sap flow (UVM is currently conducting research on this).

Although there is tremendous variation between trees and between sites,

the average yield seems to be about .1 gallons of syrup per tap. One of the biggest factors that determines the syrup yield is the sugar content of the sap. An average tree seems to produce about a gallon of sap per day, but the sugar content can be as low as 0.1 brix or as high as 1.2, with most trees yielding between .5 to .8 brix. As with maple, the weather conditions play an important role in sap yield, and overall production seems to be highly dependent on groundwater reserves. 2016 was a disastrous year for birch production throughout the northeast, as the extremely dry conditions during April and early May resulted in severely diminished sap flows.

What species of birch are best for sap and syrup production?

Our trials did not show any significant difference between different species of birch (yellow, paper, black) in terms of sap sugar concentration or volume. However, due to the relatively high sawtimber prices for yellow birch, if you have various species available for tapping, it would make more sense to tap the black birch and paper birch (which have relatively low sawlog values) and refrain from tapping any yellow birch that could potentially generate high value sawlogs. Nevertheless, if you are able to obtain decent yields and develop good markets for your birch sap and syrup, unless the yellow birch trees are prime veneer, tapping them will be more profitable than managing for timber production over the longterm.

Does vacuum boost yields?

None of our trials to date have shown

a benefit of adding vacuum to a tubing system in terms of increased yield. In fact, the trees with individual buckets or bags have produced the highest yields in nearly every trial so far. However, tubing systems do greatly reduce labor costs and adding vacuum does allow sap to flow through the tubing faster, thereby increasing sap quality.

Does the size of the spout matter?

Many birch syrup producers use 7/16" spouts and all indications point to the fact that larger spouts will produce more sap than smaller spouts. We had some trees tapped with 7/16" spouts, and those greatly outperformed 5/16" spouts. We also experimented with 3/16" microspouts, but these produced far less than 5/16" spouts at all locations. We were interested in trying the 3/16" microspouts due to concern over internal stain columns from 5/16" or 7/16" tapholes. The idea was to see if we could get similar yields of sap with a smaller hole, while doing less damage to the tree. The differences in yields between the 3/16" and 5/16" holes were so stark that we will not be repeating this experiment again. However, more research is necessary to determine how much more sap 7/16" spouts provide

over 5/16" with birch and the sustainability of using the larger spouts.

How does the birch syrup taste?

Birch syrup has a much different flavor profile than maple syrup and many sugarmakers do not like the taste of birch syrup. Yes, there is certainly plenty of off-flavored birch syrup out there, but there is also plenty of delicious, high quality birch syrup on the market as well. It's much easier to make a good tasting maple syrup, but with skill, patience, and the right equipment you can also make very good tasting birch syrup. At the 1st International Birch Sap & Syrup Conference in 2015 at Paul Smiths College, we had many producers bring some of their birch syrup for people to taste and the results were incredible. Birch syrup is often dark and strong flavored, but depending on the processing techniques, it can also have a lighter color and much more mild flavor. If you have written off birch syrup based on a bad experience in the past, I suggest giving it a second try. The University of Alaska and UVM are both currently conducting research on different processing techniques to determine optimum flavor development in birch syrup.

Make every tap count!

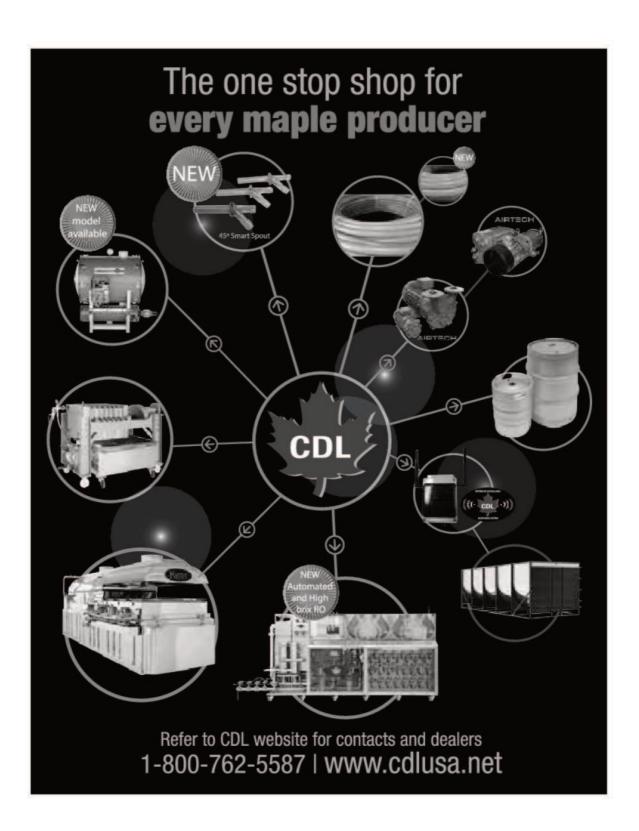
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Industry News: IMSI

International Maple Syrup Institute News

Dave Chapeskie R.P.F. Executive Director, IMSI

The International Maple Syrup Institute held their quarterly Board of Directors meeting on Friday January 6, 2017 at the Vernon-Sherrill-Verona High School in Verona New York. The following is an abbreviated record of some items discussed at the meeting.

Supply, Demand and Pricing for Maple Syrup

The Federation of Quebec Maple Syrup Producers and the Maple Industry Council (CIE) have negotiated a two year Marketing Ageement affecting sales of bulk syrup in Quebec. Agreed upon prices still must be negotiated every year. Before the terms of the agreement are finalized and become official, the agreement must be accepted by the Régie des marchés agricoles et alimentaires du Québec (Administrative Tribunal).

The most important highlight of this agreement is a status quo on prices in accordance with the new classification and grading system for maple syrup:

- Golden/Delicate Taste: \$2.95 CAN
- Amber and Rich Taste: \$2.94 CAN
- Dark and Robust Taste: \$2.85 CAN
- Very Dark: \$2.55 CAN
- Processing Grade: \$1.80 CAN

This status quo was made necessary due, in particular, to the following con-

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siderations:

- High inventories at the Federation warehouse (more than 82 million pounds, including 21 million pounds of Processing grade due to a record production year);
- Packers have larger inventories because of the higher production in 2016;
- The packers' margins are under pressure. To illustrate that, the value of Canadian exports went down \$.10 a pound between March and October 2016;
- Although exports are on the rise in Europe, statistics shows that they are declining in Japan, due to national economic problems in that country, and are steady in the United States, despite the exchange rate in favor of Canadian exporters;
- Federation Agency sales are up, from 106 Million pounds in 2015/2016 to 111 million pounds for 2016/2017, but this 5% growth is significantly lower than that achieved 3 years ago (15% in 2014/15); and
- US maple syrup exports to Canada rose from 4.4 million pounds to 7 million pounds in 2016.

Overall, international markets for maple syrup are good, but competition among packers is very strong, which puts pressure on their profit margins. At the same time, producers' revenues are very good and stable as bulk prices are fixed and costs of production might be lower than before. In the end, the price of maple syrup must be accepted by consumers to support continued expansion of the industry. In North America, current expan-

sion is estimated in the 6-7% per year range. The North American market for maple remains very important since it represents about 80% of sales. Efforts continue to market more maple syrup outside of North America, in Japan, the U.K., Germany, Brazil and India. Generally, the development of these markets is slow and expensive so that the North American marketplace will remain dominant and very important in the foreseeable future. The Canada-U.S. exchange rate and pending North American trade negotiations are highly unpredictable factors which could have a very significant affect on market performance over the next few years.

Ongoing marketing challenges include maintaining a sufficient supply of certified organic syrup from year-toyear and developing sufficient markets for processing grade syrup. In Quebec, at present the inventory of certified organic syrup has been exhausted.

Marketing Strategy for Pure Maple Products

The IMSI continues work towards development of a generic slogan and messaging, which is a high priority component of the IMSI's Marketing Implementation Plan which was accepted by both the IMSI and the NAMSC in 2016.

The IMSI Maple Slogan and Messaging Team met in Verona New York in advance of the IMSI's Board of Directors meeting. Dr. Michael Farrell from Cornell University shared the findings from consumer research which was conducted to help the Team in the development of an appropriate generic slogan and accompanying messaging for the maple industry. Taste was considered to be of paramount importance both to Anglophone and Francophone

consumers. IMSI and NAMSC members may obtain a copy of the survey findings from the IMSI's Executive Director.

As a next step, the IMSI Board of Directors has authorized follow-up consumer research to obtain additional consumer feedback on potential generic slogans for the North American maple industry. Once this research has been completed, the IMSI will be finalizing a draft of potential slogans and associated messaging which will be distributed to IMSI and NAMSC members for comment. The IMSI will then move to finalize the slogan and messaging so that it can be transferred throughout the maple industry, as

The IMSI is also assembling a team to assemble and package information intended to point out the green advantage of the maple industry to the public. The Federation of Quebec Maple Syrup Producers has completed some excellent work

well as to the media.

completed some excellent work already which is a very important reference for follow-up.

You may contact the IMSI's Executive Director, Dave Chapeskie, for additional information.

Misrepresentation of Maple in the Marketplace

The IMSI Board of Directors discussed where energies might best be directed in 2017 to help address the issue of maple misrepresentation in the marketplace. It was agreed that we need to continue to emphasize our position regarding misrepresentation with regulators at the federal and state/provincial level in the United States and Canada. This includes taking advantage of all

opportunities to input our position when regulatory amendments to product labelling provisions are being considered by governments. For example, the federal government in Canada is currently considering amendment to help address the issue.

It was agreed that the IMSI will move to acknowledge and reward, through media exposure, companies that have moved or are moving to incorporate more pure maple products into their recipes and are striving not to misrepresent pure maple products. This can be done through letter communications to companies identified by our mem-

bers, media exposure and perhaps other methods.

It was also agreed that the IMSI will exert leadership in taking our message directly to consumers using social media such as Facebook and Twitter. The IMSI will be developing a plan outlining how best to approach this with the goal of putting it in

place in 2017-18. An important consideration will be to identify appropriate industry partnerships and mechanisms with the IMSI members and others to help make this happen.

Please contact the IMSI's Executive Director and/or an IMSI Director representative if you have suggestions regarding companies that deserve recognition for utilizing pure maple products such as maple syrup and maple sugar in their products, and also ideas regarding how we might best utilize social media in helping address the maple misrepresentation question.



IMSI: continued from page 35

Nutritional Labelling – Proposed Harmonization and FDA Definition of "Added Sugar"

Current nutritional labeling maple syrup is quite variable so there would be a significant advantage to having harmonized labelling specifications ready for the roll out of the new Harmonization requirements. FDA would set one standard for industry application in the United States, removing inconsistencies and some confusion associated with existing labels. In 2016, the IMSI facilitated the work of a team of Maple Quality Assurance Specialists employed by maple packers and maple researchers from both Canada and the United States, with the aim of coming up with standardized nutritional label specifications. A draft harmonized nutritional label for use in the United States and possibly internationally was developed In October. The IMSI forwarded the proposed draft label to both the FDA and Health Canada. No input has been received to date on this proposal from either FDA or Health Canada. Since a harmonized Nutrients Facts Panel should be aligned with government compliance requirements, we remain hopeful that we will receive a response from federal government officials in both countries in the first quarter of 2017.

In 2016, serious concern was expressed by IMSI members regarding the FDA's requirement for "Added Sugar" to be placed on the label of maple syrup in the United States once the new FDA rules are effective. The IMSI established a team, led by Emma Marvin, Co-Owner of Butternut Mountain Farm, to work on addressing this issue. In October, the IMSI Task Team met by teleconference with FDA officials and

presented several options which would address concerns regarding the "Added Sugar" line. The IMSI and the National Honey Board (NHB) were advised that the FDA would be offering a resolution to the problem taking into account IMSI and NHB suggestions, and that their offering would be introduced officially in 2017 through a public consultation process. The IMSI is preparing for further dialogue with FDA once related public consultation has been announced. There is some informal indication that the deadline for compliance with the FDA's new NFP requirements may be extended to 2019 as part of this process.

Health Canada is currently seeking input on proposed labeling amendments to the Nutritional Facts Panel as well as a Front-of-Package Proposal intended to red-flag sugar content in food products, including maple syrup and honey. The IMSI will be providing Health Canada with input regarding the Front-of-Package labelling proposal in collaboration with the CIE. Individual Canadian IMSI members will be encouraged to provide input on the proposed Front-of-Package labelling as well. The IMSI will also be providing a position on other Health Canada regulatory amendments pertinent to labelling.

IMSI Annual Awards

Nominations are now open for the 2017 Lynn Reynolds and Golden Maple Leaf Awards and Nominations should be submitted to the IMSI's Executive Director by August 31st, 2017.

Production: Quality Control

Identifying and Preventing Maple Syrup Off-Flavors

Henry J. Marckres, Consumer Protection Chief and Maple Specialist, State of Vermont

aple syrup has a unique flavor that sets it apart from other Aspecialty foods. It's characteristic for exhibiting different subtle flavors depending on when it was produced, where it was produced, and, at times, how it was produced make it a product that everyone, regardless of their taste preferences, can enjoy. However, this characteristic also makes syrup flavor susceptible to flavors that are not considered typical. These offflavors can occur anywhere from the tree to the containers. Not only do production methods affect the flavor, but Mother Nature has a hand in it too. Following are some common off-flavors that have been encountered, their likely causes, and ways to avoid these problems.

Chlorine (Sodium). Historically, a solution of chlorine and water was used to clean sap tubing systems. Often, these systems were not rinsed afterward, leaving a sodium residue inside the tubing. Sap running the next season would "scrub" the tubing, putting varying amounts of sodium into the finished syrup. It is recommended that only water be used in cleaning tubing to avoid the problem. A chlorine offflavor often destroys the maple flavor of the product. A significant watering of the tongue will be noted. Depending on the amount of sodium present, theproduct may have a salty flavor.

Detergents. The only detergents that should be used in syrup production are ones that are approved for food use and approved specifically

for maple. Producers have often used products that are designed for home use, damaging the flavor of the finished product. People also submit samples of syrup for contests in used glass jars that have retained a soapy flavor. A detergent flavor in syrup may taste soapy, or have a perfume odor or flavor, depending on the type of detergent used and if any rinsing was done.

Rust Preventative Paints. In the past, many producers painted the inside of galvanized sap buckets and holding tanks to prolong their useable life. Usually a rust preventative paint was used, often containing a fish oil base. This type of paint should never be used on any surface that is in direct contact with sap or syrup. There are very few products acceptable for food contact surfaces and most require a specific application process and an extensive drying time. The flavor derived from this material may have an oily taste and feel on the tongue, similar to cod liver oil. It is especially prevalent if the paint was not cured completely before using the bucket or tank.

Metallic. This off-flavor usually is the result of prolonged storage in metal syrup cans or storing bulk syrup in poor quality metal barrels. Always check the interior condition of galvanized and epoxy coated barrels and do not use any with obvious rust or cracked epoxy. The recommendation for metal syrup cans is to only pack what will be sold in a three month period. A metallic offflavor affects the sides of the tongue, a sharp feeling that almost feels like your tongue is going to water, but it doesn't. It may affect your teeth like biting a piece of tin foil. If the exposure has been prolonged, the product may have a greenish tinge to it and it may taste "tinny."

Plastic. The type of material that causes this off-flavor is most often a nonfood grade plastic or a plastic not meant for exposure to hot syrup. Using the wrong type of pail to move syrup from the evaporator to the filter or packaging syrup in containers not designed for hot filling creates a bitter flavor or a flavor that tastes the way some plastics smell.

Filters. There are several off-flavors that can be attributed to the way filters are manufactured or the methods used to clean and store them:

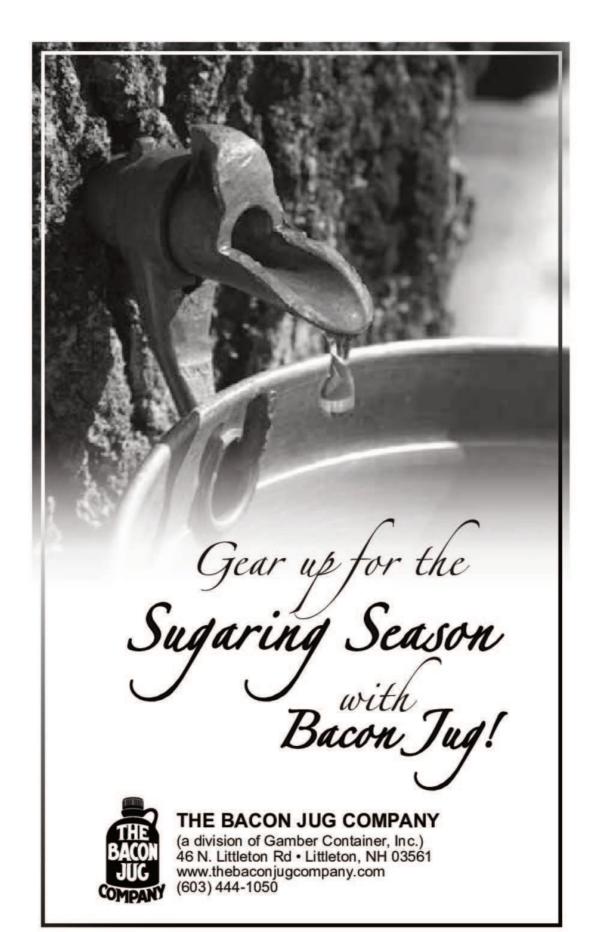
New filters: These are the type of fil-

ters that use the weight of the syrup to filter, usually a hat or cone type or flat filter. During the manufacturing process, these filters pick up and retain a slight chemical odor and flavor. Before use, they should be boiled in clear water and dried thoroughly. If not, they impart a chemical flavor to the syrup.

Previously used filters: Once used, filters should never be washed with any detergent, as they may pick up detergent residue in the fibers. After the season is over, filters should be washed in water and dried thoroughly before storing in a dry location free of contaminating odors. Filters not dried thoroughly will mold, creating musty off-flavor when hot syrup is filtered through them the next season. Never store filters with mothballs, as this will create a chemical off-flavor that tingles in the mouth and on the tongue.

Off-Flavors continued on page 41





Off-Flavors: continued from page 39

Defoamers - Many different products are used to reduce the foaming of the boiling sap during evaporation. Commercially available vegetable fat derivatives, either liquid or powdered, butter, milk, or vegetable oil are often used. Only a small amount is needed to control foaming and using too much will create an off-flavor in the syrup. A defoamer off-flavor may taste like whatever was used for defoamer and have an oily or waxy feel on the roof of the mouth and on the tongue.

Chemicals. The technology used in producing syrup today often requires the use of powerful cleaners and preservatives. It is very important to follow the manufacturer's recommendations carefully and rinse thoroughly before continued use. A chemical off-flavor will affect the entire mouth and may get more objectionable with breathing in and out. The off-flavor usually relates to the smell of the chemical used.

Lubricants and Fuels. Care should be taken to avoid contamination of the sap or syrup from exhaust fumes or improperly operating equipment. Also, only food grade lubricants should be used in any pumps or equipment that comes in contact with sap or syrup. Off-flavors attributed to this type of contamination will taste just like the contaminant smells. Often a strong odor in the product will be a sign of an off-flavor present.

Musty. This off-flavor can become present in the syrup in two ways: from putting hot syrup through filters that contain mold spores, or from poorly sealed containers. The musty off-flavor tastes yeasty or moldy and usually has a moldy odor. It is most noticeable on the back of the tongue and in the throat.

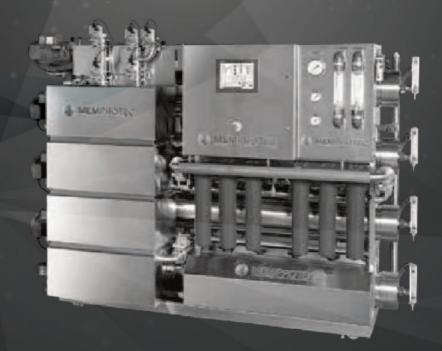
Ferment. Fermented syrup usually develops from one of two problems with the product. If syrup has not been boiled enough to concentrate the correct amount of sugar, then the syrup may work like apple cider. At times, we find correct density syrup fermented and that is usually from syrup stored in barrels that have not been properly cleaned. Even barrels that have been previously steam cleaned may have moisture in them that have revealed yeast, mold, and bacteria in great numbers. Syrup that is fermented will have a sickening sweet flavor, at times a honey like similarity. Depending on the type of ferment, it may have an alcoholic or fruity taste. Severe ferment may have a foamy appearance.

Sour Sap. As the weather warms near the end of the sugaring season, sap left in a tank begins to warm, basically beginning to spoil the sap. Syrup made from this sap has a ropy appearance when poured. The flavor is very sour and leaves a slimy coating on the roof of the mouth and tongue.

Burnt Niter. When sap is boiled, minerals that are in the raw sap precipitate out of the solution and form niter that collects in the compartment in the front pan where the syrup is being drawn off. To prevent this from becoming a problem, the producer switches draw-off sides as needed, or changes front pans if the evaporator is constructed in that manner. If this is not done, a build up occurs in the pan, creating a combination off-flavor. The syrup will have a burned taste from the niter rising off the front pan and the syrup burning, and it will also have a niter flavor, which has a slightly fizzy affect like baking soda on the tongue.



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Off-Flavors: continued from page 41

Scorch. This off-flavor is a burned flavor in the syrup with a very strong bite on the tongue and in the throat. Operating the evaporator with too low a level of product in the front pan actually burns the syrup.

Earthy Flavor. Tapping into punky wood, dark colored or stained areas in the tree, or cracked wood produces syrup with this off-flavor. The flavor tastes and smells like garden soil. Care should be taken while tapping to avoid the potential for this problem.

Mother Nature Off Flavors. The resource itself, the maple tree, and the environment contribute to the next two off flavors. Even though they are naturally occurring, they damage the normal maple flavor and are considered unacceptable in maple syrup.

Metabolism. This is an off-flavor that is attributed to changes in the metabolism of the tree due to a warming of temperatures. This can be present at any time during the sugaring season, from the first run on. Usually a change to colder temperatures reverses its effect on the finished syrup. This is mostly speculation from working with syrup for many years and research is being done to determine the exact cause of this problem. A metabolism off-flavor robs the product of most of its maple flavor. The resulting flavor has been described as woody, peanut butter, or popcorn. An almost cardboard like flavor may be present. A chocolaty smell may be detected.

Buddv. Buddy syrup is usually produced during the late season, depending on the weather conditions present. The tree begins to produce buds, and the sap takes on a distinctive quality that is transferred into the syrup.

Usually the production of this type of syrup signals the end of sugaring for the season. Buddy syrup usually tastes chocolaty, almost a Tootsie Roll-type flavor. If very strong, it may take on a bitter chocolate characteristic. An odor of chocolate may be present, but not always. Breathing in and out normally intensifies the flavor.

Work Cited

Marckres, H. J., et al Maple Quality Control Puts the Accent on Flavor, Vermont Department of Agriculture, 1986.

Contribute to the Digest

We're always looking updates news from provinand state associations. producers. and businesses, as calendar items. photos, and ideas articles. Send submissions to editor@maplesyrupdigest.org.

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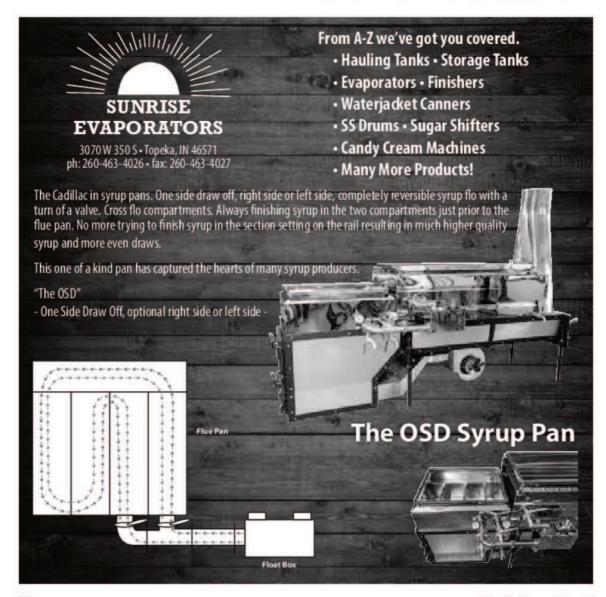
Indiana's Second Maple Weekend Experience the Sap-toSyrup Process in Sugar Camps Statewide

Indiana's second annual Maple Weekend will open sugar camps around the state so guests can see how trees are tapped, how sap gets to the sugar house and how it becomes syrup and other maple products.

The Indiana Maple Syrup Association (IMSA) will host Maple Weekend,

Sat. and Sun., March 11 and 12, 2017. In its 2016 inaugural year, the event involved 12 syrup producers in nine Indiana counties. The full Maple Weekend schedule, with locations and hours, will be posted on the IMSA website, at www.IndianaMapleSyrup.org.

Indiana is the southwesternmost state to belong to the North American Maple Syrup Council, and because spring's warmth causes sap to flow, it flows here first. Maple Weekend will be an outdoor activity to beat cabin fever, one that encourages guests to meet Indiana syrup producers, see where food comes from, how it is produced, and to



learn the difference and value between maple and pancake syrup.

"Maple Weekend is an opportunity for people to see what we do and how we do it, and to increase awareness of Indiana maple products," said Dave Hamilton, president of the Indiana Maple Syrup Association and past president of the North American Maple Syrup Council. Based in New Castle, Hamilton is the second in a four-generation syrup-making business started by his father-in-law. Sugar making in Indiana tends to be a family tradition, with many in the third, fourth and fifth

generation of the activity.

The event will involve sugar makers with sugar camps able to accommodate visitors, however most venues will be rustic, and all will be muddy due to the spring thaw impacting the ground as much as the sap flow. "Guests should dress appropriately for an outdoor, spring event and expect an eye-opening experience," Hamilton said. "Sugar making is a lot of fun for anyone who enjoys being outdoors in the early spring, and we encourage guests to visit two or three sugar camps in their area."

Sap prices

Sap Sugar

2.7%

2.8%

2.9%

3%

\$ 0.35

\$ 0.36

\$ 0.37

\$ 0.38

\$ 0.36

\$ 0.38

\$ 0.39

\$ 0.40

\$ 0.38

\$ 0.39

\$ 0.41

\$ 0.42

\$ 0.40

\$ 0.43

\$ 0.44

\$ 0.41 \$ 0.43

This table presents suggested prices per gallon for a maple producer to purchase sap. The variables that affect sap prices in this table are sap sugar content and bulk syrup price. It assumes that the sap buyer is paying the seller 50% of the bulk syrup price. You can download a spreadsheet to calculate sap prices based on different variables at http://blogs.cornell.edu/cornellmaple/buying-and-selling-sap/

Bulk Syrup Price (\$/1b)

	4 2.00	4	4	4	4 2, IU	4 400	Ψ 2.00	4 -11 0	- L.OO	A 2.20	4 0.00
1%	\$ 0.13	\$ 0.13	\$ 0.14	\$ 0.15	\$ 0.15	\$ 0.16	\$ 0.17	\$ 0.17	\$ 0.18	\$ 0.19	\$ 0.19
1.1%	\$ 0.14	\$ 0.15	\$ 0.15	\$ 0.16	\$ 0.17	\$ 0.18	\$ 0.18	\$ 0.19	\$ 0.20	\$ 0.20	\$ 0.21
1.2%	\$ 0.15	\$ 0.16	\$ 0.17	\$ 0.18	\$ 0.18	\$ 0.19	\$ 0.20	\$ 0.21	\$ 0.21	\$ 0.22	\$ 0.23
1.3%	\$ 0.17	\$ 0.17	\$ 0.18	\$ 0.19	\$ 0.20	\$ 0.21	\$ 0.22	\$ 0.22	\$ 0.23	\$ 0.24	\$ 0.25
1.4%	\$ 0.18	\$ 0.19	\$ 0.20	\$ 0.21	\$ 0.21	\$ 0.22	\$ 0.23	\$ 0.24	\$ 0.25	\$ 0.26	\$ 0.27
1.5%	\$ 0.19	\$ 0.20	\$ 0.21	\$ 0.22	\$ 0.23	\$ 0.24	\$ 0.25	\$ 0.26	\$ 0.27	\$ 0.28	\$ 0.29
1.6%	\$ 0.20	\$ 0.21	\$ 0.23	\$ 0.24	\$ 0.25	\$ 0.26	\$ 0.27	\$ 0.28	\$ 0.29	\$ 0.30	\$ 0.31
1.7%	\$ 0.22	\$ 0.23	\$ 0.24	\$ 0.25	\$ 0.26	\$ 0.27	\$ 0.28	\$ 0.29	\$ 0.30	\$ 0.32	\$ 0.33
1.8%	\$ 0.23	\$ 0.24	\$ 0.25	\$ 0.26	\$ 0.28	\$ 0.29	\$ 0.30	\$ 0.31	\$ 0.32	\$ 0.33	\$ 0.35
1.9%	\$ 0.24	\$ 0.26	\$ 0.27	\$ 0.28	\$ 0.29	\$ 0.30	\$ 0.32	\$ 0.33	\$ 0.34	\$ 0.35	\$ 0.36
2%	\$ 0.26	\$ 0.27	\$ 0.28	\$ 0.29	\$ 0.31	\$ 0.32	\$ 0.33	\$ 0.35	\$ 0.36	\$ 0.37	\$ 0.38
2.1%	\$ 0.27	\$ 0.28	\$ 0.30	\$ 0.31	\$ 0.32	\$ 0.34	\$ 0.35	\$ 0.36	\$ 0.38	\$ 0.39	\$ 0.40
2.2%	\$ 0.28	\$ 0.30	\$ 0.31	\$ 0.32	\$ 0.34	\$ 0.35	\$ 0.37	\$ 0.38	\$ 0.39	\$ 0.41	\$ 0.42
2.3%	\$ 0.29	\$ 0.31	\$ 0.32	\$ 0.34	\$ 0.35	\$ 0.37	\$ 0.38	\$ 0.40	\$ 0.41	\$ 0.43	\$ 0.44
2.4%	\$ 0.31	\$ 0.32	\$ 0.34	\$ 0.35	\$ 0.37	\$ 0.38	\$ 0.40	\$ 0.41	\$ 0.43	\$ 0.45	\$ 0.46
2.5%	\$ 0.32	\$ 0.34	\$ 0.35	\$ 0.37	\$ 0.38	\$ 0.40	\$ 0.42	\$ 0.43	\$ 0.45	\$ 0.46	\$ 0.48
2.6%	\$ 0.33	\$ 0.35	\$ 0.37	\$ 0.38	\$ 0.40	\$ 0.42	\$ 0.43	\$ 0.45	\$ 0.47	\$ 0.48	\$ 0.50

February 2017 45

\$ 0.41

\$ 0.45

\$ 0.46 | \$ 0.48

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\$ 0.56

\$ 0.58



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Tips for Welcoming Sugarhouse Visitors on Maple Weekend (or any time)

When getting ready for maple weekend, or for any time that you're welcoming customers to your sugarhouse, here are a few things to keep in mind.

Getting the word out

Promote yourself. Use Facebook, email lists, press releases to local newspapers, calls to your local chamber of commerce or other community organizations, and other methods to let people know that you'll be open for Maple Weekend. Invite your local town and state officials to stop by, as well as your local reporters.

Connect with other sugarhouses nearby and encourage visitors to stop by more than one sugarhouse by highlighting the different things each one has to offer.

Have large, clear signs at the end of your driveway and, if possible, at nearby intersections. Be sure to have complete directions on your website.

Sugarhouse

Be at your sugarhouse when you say you will be. Even if you're not boiling, customers will see your hours listed and may show up at any time within that window. If they arrive to find a locked sugarhouse they're not going to have a good impression of sugaramakers.

Be available by phone. Your phone and email address are in your listing, so customers may contact you in advance with questions. If you can't be by your phone or check your email, set up your voicemail or an auto-responder on your email to let people know that you'll get back to them soon, and that you're open as advertised for the weekend.

Clean your sugarhouse. Yes, visitors love the rustic feel of some sugarhouses, but we are making a food product and they will notice rusty equipment, cobwebs, dust, oily clothes, or other unsanitary conditions. Those impressions will hurt your sales, and hurt the overall impression of the industry.

Wear something that identifies you as the owner, and have your family, staff, and volunteers do the same, so that visitors know who to direct their questions to.

Pay attention to your visitors. Greet people as they enter your sugar-house, so they feel welcome.

Have something going on. If there's no sap, consider boiling water in your evaporator. Or make candy or cream, can syrup, or offer a cooking demonstration. Or offer a tapping demonstration.

Display antique sugarmaking equipment.

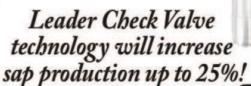
Offer tours of your operation, including your sugarbush, at set times. Include the sales area in your tours, and offer explanations of each product.

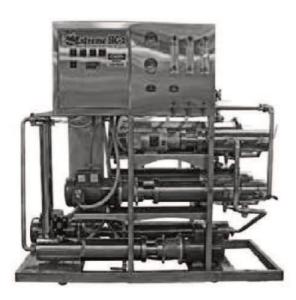
Consider some activities for children, such as a simple scavenger hunt, or coloring books.

Make some simple signs to hang near pieces of equipment explaining what they are used for. Sometimes you may be so busy that you can't answer

Visitors: continued on page 49







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Visitors: continued from page 47

everyone's questions at once.

Mark walking paths clearly, and remove as much snow and ice as possible. Use salt, sand, and wood chips on paths to ensure that your visitors can walk safely from their cars to the sugarhouse.

Mark parking areas clearly, to avoid having to pull visitors' cars out of ditches, and clear the snow and ice well. If you have staff or volunteers to direct drivers in the parking lot, that's even better.

Mark off areas in the sugarhouse that are off-limits to visitors, or that are particularly dangerous due to heat, etc. If you're concerned about liability, talk to your insurance agent in advance to make sure you have the proper coverage.

Have adequate lighting so visitors can see everything clearly.

Have some seating available for elderly visitors.

Have a restroom available, if possible.

Products

Offer a wide range of products. If you don't make candy or cream, consider buying wholesale product from a neighboring farm to sell.

Offer samples of all of your products. People who taste what you have for sale are far more likely to make purchases.

Demonstrate some examples of the versatility of maple syrup, like maple tea, maple milk, maple soda, maple lemonade, maple popcorn, etc.

Hang signs with allergen warnings. Even if you're only selling pure maple products, a sign that explains there are no allergens in pure maple syrup can be helpful.

Make sure to have business cards or brochures for customers to take home, so they remember where to go when they run out of the maple products they buy.

Offer literature with recipes and nutrition information for maple products.

Have a sign-in sheet and collect email addresses.

New Video Resources

The University of Vermont Extension has created the first two in a series of videos on grading fundamentals.

"Flavor" and "Density" are available at http://www.uvm.edu/extension/agriculture/maple_publications_media, and "Color" and "Clarity" videos will soon be added to the collection. NAMSC is supporting these videos with a grant.

Each video features a presentation from Maple Specialist Mark Isselhardt offering practical information about how to properly evaluate and grade maple syrup.





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Sugarmakers Count! Participate in the 2017 U.S. Census of Ag...

Dear U.S. Sugarmakers,

The U.S. Department of Agriculture's National Agricultural Statistics Service (NASS) is preparing the mail list for the 2017 Census of Agriculture. The Census of Agriculture is the leading source of facts and figures about American agriculture. Conducted every five years, the Census provides a detailed picture of U.S. farms and ranches and the people who operate them. It is the only source of uniform, comprehensive agricultural data for every state and county in the United States.

I am asking for your help to make the 2017 Census of Agriculture as accurate as possible. A major challenge is having a list of farmers that is as complete as possible, especially with so many new farmers. If you have never received a Census of Agriculture or survey questionnaire from NASS then we may not have you on our farm list. Please take a couple minutes and provide NASS your contact information athttps://www.agcounts.usda.gov/cgibin/counts/.

Even if you do not think of yourself as a farmer or rancher, your operation is a farm if it meets the Census of Agriculture definition – an operation that sold or normally would have sold \$1,000 or more of agricultural products in a year. If you own or rent agricultural land, grow vegetables, grow horticultural or floricultural products, have fruit or nut trees, cattle, horses, poultry, hogs, bees, aquaculture products, or consider yourself a farmer or rancher, we need to hear from you.

All individual information provided

to NASS is confidential and only used for statistical purposes. In accordance with the Confidential Information Protection provisions of Title V, Subtitle A, Public Law 107-347 and other applicable Federal laws, your responses will be kept confidential and will not be disclosed in identifiable form to anyone other than employees or agents. By law, every employee and agent has taken an oath and is subject to a jail term, a fine, or both if he or she willfully discloses ANY identifiable information about you or your operation.

If you have previously received a Census of Agriculture or survey questionnaire from NASS then you will be receiving you 2017 Census of Agriculture questionnaire in late December 2017 or January 2018. Your cooperation is appreciated.

Sincerely,

Gary R. Keough, State Statistician
USDA | National Ag Statistics Service
Field Operations | New England Field
Office
53 Pleasant St. Room 3450

... And in NASS

Concord, NH 03301

The annual USDA survey of sugarmakers, conducted shortly after the season ends, is critical to understanding the scale of our industry and advocating for the research and support it deserves. Information submitted is confidential, and is not shared with any other government agency. If you want to be included, see http://goo.gl/sGRhsm.

North American Maple Syrup Council Research Fund

The NAMSC Research Fund funds research that supports and advances the maple industry. In recent years we have given tens of thousands of dollars to projects that have developed innovative practices and technologies, helped deepen our understanding of the science of sugarmaking, and promoted the products we all make.

You can make a difference!

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The NAMSC Research Fund is a non-profit, volunteer committee of the North American Maple Syrup Council, Inc.



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2017 Annual Meeting & Maple Conference Four Points by Sheraton Hotel Lévis, Québec

October 23 to 25, 2017



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Maple Season Events Around the Sugaring Region

Maine

www.mainemapleproducers.com March 26: Maple Sunday

Massachusetts

www.massmaple.org

March 3: Season Kickoff Event, Westhampton

March 18-19: Maple Weekend

New Hampshire

www.nhmapleproducers.com March 25-26: Maple Weekend

New York

www.nysmaple.com March 18-19, 25-26: Maple Weekends

West Virginia

facebook.com/wvmaplesyrup March 18: Mountain State Maple Day May 20: West Virginia Maple Syrup Producers Association Annual Meeting, Weston

Wisconsin

www.wismaple.org

March 1: Annual first tree tapping, Spring Valley

May 13: Annual meeting, Neillsville

Vermont

www.vermontmaple.org March 25-26: Maple Weekend

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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. Those funds helps us promote the maple industry and support our members. Planned giving like this is a way for you to show your support for the maple syrup industry for many years to come. It's a simple process.

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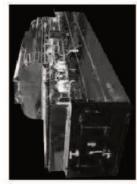


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