

Maple Syrup Digest

Vol. 64 No. 3

September 2025



2025 NAMSC Conference in Port Huron, Michigan
Is it Really a Manganese Problem?

**The Forgotten Importance of Block Sugar to the 20th Century
Maple Industry**



The Newsletter of the North American Maple Syrup Council



MAPLE SYRUP DIGEST

Official publication of the North American Maple Syrup Council

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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.

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President's message

President's Message

As I write my final President's Message, I reflect upon the wonderful organization that is NAMSC. In its support of all maple producers across North America— commercial or artisan — regardless of location, scale of operation, NAMSC supports us working together to build this industry. Our unique endeavor in maple production is made better through sharing knowledge, resulting in the highest QUALITY product available.

I see this sharing of information repeatedly, as producers and their associations pass on their past successes and failures to new makers. Those joining the industry certainly benefit from this opportunity for learning from those who've gone before. Keeping in mind that a quality product is our industry's ultimate goal, we celebrate our producers' commitment — at all stages of their maple careers — to ensuring that consumers can obtain the very best quality maple products, wherever they happen to be in North America.

I cannot fail to acknowledge the incredible contribution NAMSC has made in directing funds to research and education. The financial support NAMSC has provided over recent years to these crucial areas is of incalculable value in advancing the maple industry. Furthermore, we producers are privileged to be able to count on this continued support going forward.

Ours is a burgeoning industry. We are so fortunate to participate in an industry where demand increases annually. We are blessed with the unusual challenge to produce a supply that can meet demand. As well, it is not every industry that can boast that its high-quality products will be sold at a fair price. We adhere to high standards, ensuring a degree of market acceptance that results in appropriate remuneration. The excellence of our product, and consumers' recognition of its value, set our industry apart.

As fall approaches it's time to get back into the bush. The fall offers an opportunity following the heat of this past summer to complete much needed maintenance, or to add additional taps.

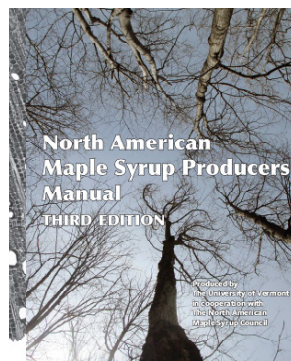
The adage is still true: " we make our money in the woods" . We work year-round, starting with collecting sap. Following the "making season", we tackle the tasks that sustain our trees, taking advantage of time to mend, adjust and improve our operations. This is the work we do — most often with pleasure and satisfaction — so that we are able to produce the best quality syrup possible.

Michigan will host the International Maple Conference in Port Huron, October 22-25, 2025. This is one of our industry's most effective forums for

sharing knowledge. Please consider taking part! It will provide a rewarding opportunity to expand your knowledge, and improve your operation — and to forge relationships among colleagues in the industry. I can guarantee you will take away some new skill or information that will enhance your maple endeavors. I look forward to seeing both old acquaintances and making new ones in Port Huron this fall. See you there!

Brian Bainborough

**Order the 3rd edition of the
North American Maple Syrup
Producers Manual at:
www.mapleresearch.org/ordermanual**



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Cover: Maple View Farm, North Branch,, MI

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Great Lakes! Great Maple!

2025 North American Maple Syrup Conference

Conference - October 22nd to October 25th, 2025

Grading School - October 21st & October 22nd, 2025

On behalf of the North American Maple Syrup Council and Michigan Maple Syrup Association they would like to invite you to join us at our Annual Meeting/Trade Show.

The event will be held at the Blue Water Convention Center located in Port Huron, Michigan. Port Huron sits on the St Clair River, which is the border between Ontario Canada and Michigan. This location is approximately 1.5 hours via I-94 from Detroit Metropolitan Airport or approximately 1 hour via I-69 from Flint Bishop International Airport.

We will be staying at the Double Tree by Hilton, Port Huron, Michigan - Blue Water Convention Center www.porthuron.doubletree.com To save money on your room rate you can book your room now - be sure and tell them you are attending the NAMSC Convention by using Group Code: MSC!

Highlights of the event are; Quilt Raffle – Silent Auction - Trade Show – Antique Display – All Day Tours – Taste of Michigan Buffet – Syrup & Confectionary Contest – Photo Contest – Companion Tours – Technical Sessions.

October 23, 2025 All Day tours – Visit 3 Sugar Bushes, the USS Edson at the Saginaw Valley Naval Ship Museum and lunch

October 24, 2025 Companion tour: Start your day off visiting the Museum & shop at Pewabic Pottery. It was founded in 1903 and is one of the oldest continually operating potteries in the country, You will have time to both view the amazing pottery and shop for some to take home with you. Leaving Pewabic Pottery we will travel to Grosse Pointe Shores where you can experience the historic family home of Edsel Ford, the only son of Henry Ford, and his wife, Eleanor.

October 25, 2025 Companion tour: Travel to Frankenmuth where you can spend the morning visiting the unique shops in downtown Frankenmuth as well as the River Shoppes. After a delicious Frankenmuth Bavarian Inn Chicken Buffet lunch at the Bavarian Inn Lodge we'll then travel to Bronner's Christmas Wonderland.

For more information go to michigan-maple.org which includes all contest guidelines

NAMSC 2025 Conference Schedule

Tuesday October 21, 2025

9:00 AM - 5:15 PM
Grading School

Wednesday October 22, 2025

8:00 AM - 2:30 PM Grading School
6:30 AM - 6:00 PM Registration Desk
Open
8:00 AM - 11:00 AM NAMSC Committee meetings
11:00 AM - 3:00 PM NAMSC Preliminary Delegate Meeting
1:00 PM - 3:00 PM River Cruise Lunch
5:00 PM - 7:00 PM River Cruise with hors d'oeuvres

Thursday October 23, 2025

6:00 AM - 8:00 AM Breakfast
6:30 AM - 6:00 PM Registration Desk
8:00 AM - 3:00 PM Trade Show Setup
8:00 AM - 5:00 PM All Day Tours t
3:00 PM - 5:00 PM Trade Show, Silent Auction & Vendor Passport Game Begins
6:00 PM - 7:00 PM Social Hour
7:00 - 9:00 PM Taste of Michigan Buffet & Entertainment

Friday October 24, 2025

6:00 AM - 8:00 AM Breakfast
6:30 AM - 6:00 PM Registration Desk
Open
8:00 AM - 5:30 PM Companion tour - Ford House
8:00 AM - 9:30 AM NAMSC Annual meeting
8:00 AM - 5:00 PM Trade Show
8:00 AM - 5:00 PM Silent Auction
10:00 AM - 10:50 AM Tech Session

11:00 AM - 11:50 AM Tech Session
12:00 PM - 1:00 PM Lunch
1:00 PM - 2:30 PM Free Time - Visit Vendors & Auction
2:30 PM 3:20 PM Tech Session
3:30 PM - 4:20 PM Tech Session
6:00 PM - 7:00 PM Social Hour
7:00 PM - 8:00 PM Buffet Dinner

Saturday October 25, 2025

6:00 AM - 8:00 AM Breakfast
6:30 AM - 6:00 PM Registration Desk
Open
6:30 AM - 8:15 AM Syrup/Confections Contest Entry Deadline
8:00 AM - 4:00 PM Trade Show
8:30 AM - 5:00 PM Companion tour - Frankenmuth
9:00 AM - 9:50 AM Tech Session
10:00 AM - 10:50 AM Tech Session
11:00 AM - 11:50 AM Tech Session
12:00 PM - 1:00 PM Lunch
1:30 PM - 2:20 PM Tech Session
2:30 PM - 3:20 PM Tech Session
8:00 AM - 4:00 PM Vendor Passport Deadline
8:00 AM - 5:00 PM Silent Auction
5:00 PM Silent Auction Ends
6:00 PM - 7:00 PM Social Hour
7:00 PM - 9:30 PM Banquet, Awards, Auctions & Drawings



Friday October 24 th

10-10:50. The nature of “natural” vacuum - A new comprehensive guide for the design and operation of 3/16 tubing systems.

Presenter: Abby van den Berg

11-11:50. Advancing Indigenous Sugar Bush Tradition

Presenter: William Derouin

2:30-3:20. Effective Chemical Use, Safety Handling, and Disposal for Maple Production

Presenter: Jason Lilley

3:30 – 4:20. Sticky situation: Evaluating potential use of systemic insecticides to protect trees used for syrup production from spotted lanternfly or other pests

Presenter: Timothy R. Harrison, Deborah G. McCullough, Jesse A. Randall and Phillip A. Lewis

St Claire Room

10-10:50. Expanding Demand: U.S. Consumer Preferences for Maple Syrup

Presenter: Mark Cannella

11-11:50. Consumer Acceptability of All Four Grade A Maple Syrup Types

Presenter: Mary Ellen Camire

2:30-3:20. Views from Both Sides of the Coin: A Look at the Results from Ohio Producer and Consumer Surveys

Presenter: Sayeed Mehood

3:30 – 4:20. New Sensor Technologies – From the Sugarbush to the Sugarhouse

Presenter: Stephan Warnat

ryling values of traditional sugaring.

10-10:50. Life cycle carbon footprint analysis and improvement strategies

for US maple syrup production

Presenter: Geoff Lewis

11-11:50. Evidence for a gradually advancing sugaring season

Presenter: Tim Rademacher

2:30-3:20. Alternative Method for Chilling Maple Sap

Presenter: Adam Wild

3:30 – 4:20. More Than Syrup: Supporting biodiversity in your sugarbush

Presenter: Steve Hagenbuch

Saturday October 25 th

Riverview Room

9-9:50. Chemical composition of maple syrup from different species

Presenter: Luc Lagace

10-10:50 New Sensor Technologies – From the Sugarbush to the Sugarhouse

Presenter: Stephan Warnat

11-11:50. Defoamer residues in maple syrup

Presenter: Nathalie Martin

1-1:50. Early prediction of maple syrup quality using carbon dynamics spectroscopy

Presenter: Matthew Kaproth

2-2:50. Discussion: How a Program Can Help You Make Maple More Sustainable & Marketable

Presenter: Kelsey Jennings

Saturday October 25 th

St Claire Room

9-9:50. Maple Sustainability Indicators- Combining economics, environment, and producer well

being to evaluate the maple sector.

Presenter: Mark Cannella

10-10:50. Key Factors Influencing Profitability and Competitiveness of US Maple Syrup

Producers

Presenter: Mary Ellen Camire

11-11:50. Patterns and Consequences of Non-conductive Wood Formation in Sugar Maple and

other Syrup Producing Species

Presenter: Matthew Vadeboncoeur

1-1:50 Maple Microbiology 101 - sap, sap lines, and distillates

Presenter: Qian Wang

9-9:50. Sap to Survivors: Maple Water as a Functional Hydration Beverage for Cancer Survivors:

Chemical Composition and User Preference Results in a USDA-Funded Study

Presenter: David Victorso

11-11:50. Sugarbush management in Vermont: investigating sustainability of a growing Non-Timber Forest Product sector

Presenter: Kathleen Stutzman

1-1:50. Effects of Crop Tree Release on Maple Growth Rates, Sap Characteristics, and Forest Regeneration

Presenter: Gabriel Karns

2-2:50 Talk Packer panel

Presenter: TBD

Preentation topics, speakers and times are subject to change

Go to michiganmaple.org for any updates to the schuedule.



Newbegin Maple Syrup - Matt Newbegin, Clifford Mi.

International Maple Grading School

Two Days of In-Person Lectures and Hands-On Exercises

The 2025 class will be held in Port Huron, Michigan prior to the North American Maple Syrup Council (NAMSC) 2025 Conference.

October 21-22, 2025

The International Maple Grading School is for maple producers, bulk syrup buyers, state inspectors, and others needing to accurately grade maple syrup or judge maple product entries at fairs and contests. Quality control issues are also addressed. This school provides a strong scientific base combined with intensive hands-on exercises. This approach enables participants to learn how to grade or judge maple products with confidence. The registration costs include lunch, take home grading tools, and print resources.

Agenda:

Day 1:

9:00-9:30 a.m. – Refreshments and Sign-in

9:30-10:30 a.m. – Introductions and Review of Agenda

10:30-11:15 a.m. – Hands-on Grading Exercises (Five Stations)

11:15 a.m.-12:15 p.m. – State and Federal Regulations, IMSI Uniform Grading Standards, Chemical Safety, FSMA, Lead Prop 65 and Terroir

12:15-1:00 p.m. – Lunch (Provided)

1:00-1:30 p.m. – Viscosity: Lecture and Exercise

1:30-2:30 p.m. – Density: Lecture and Exercise

2:30-3:30 p.m. – Color: Lecture and Exercise

3:30-4:00 p.m. – Clarity and Filtering

4:00-4:45 p.m. – Map of Maple, Flavor Profiles, Standard Flavors

4:45-5:15 p.m. – Review, Questions, Preview of Tomorrow's Agenda

5:15 p.m. – Adjourn/Dinner on your own

Day 2:

8:00-8:30 a.m. – Refreshments

8:30-9:00 a.m. – Off Flavors Lecture

9:00-10:00 a.m. – Flavor Exercise

10:00-10:15 a.m. – Break

10:15-10:45 a.m. – Judging Maple Products Lecture

10:45-11:45 a.m. – Judging Exercise, Break into Groups

11:45-12:30 p.m. – Lunch (Provided)

12:30-2:30 p.m. – Final Grading Exercise, Discussion, Evaluation

Register at:

<https://extension.umaine.edu/maple-grading-school/upcoming-schools/annual-international-school/>



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Welcome to the MMSA...

Merrie Hammel

Great Lakes! Great Maple! The planning committee for the 2025 NAMSC Annual Meeting has been hard at work preparing for this year's October meeting. The members of the committee come from around the state of Michigan and are very representative of the membership of the Michigan Maple Syrup Association.

The historian of the Association traced its origins back to 1961. Those early meetings were described as gatherings of producers at which Michigan State University extension agents conducted clinics or institutes in the latest methods of producing maple syrup. They were held at various sites in both the lower and upper peninsulas. Evidently, the mid-Michigan meetings became the focal point as that was when the first available newsletter (1976) stated a crowd of two hundred-fifteen producers, suppliers and others gathered at Camp Kettenun Center, Tustin. There was a growing interest in maple syrup. Subsequent yearly meetings have been held in Grayling, Clare, and since 2015, Mt. Pleasant.

These January winter meetings have become a time of learning, shopping in the vendors area, and sharing experiences as only maple syrup producers can do! Speakers from the research universities in Maine, Vermont, New Hampshire, and New York have brought the latest best practices to Michigan and their efforts have been much appreciated. Later in the year,

members gather in the colorful fall woods for Fall Tours, where 4-6 sugar-bushes a year host mini-tours of their operations. Memories are made; the caravan of cars was stopped on a country road for a cattle drive to cross in the UP, visiting St. Joe Island, Ontario, east of Sault Ste. Marie, to learn about steam-driven evaporators (and pudding stones), and visiting Jesse Randall's new MSU research station near Escanaba.

It was exciting when the Michigan Association hosted the international meetings in Lansing in 1996 and in Frankenmuth in 2011. Again, conversations and break-out sessions prompted MMSA members to organize Michigan Maple Weekend tours (2013). We had learned the tours were both popular and profitable in the New England states. The Vermontville Maple Syrup Festival and the Shepherd Maple Syrup Festival are both events that also spread the word of Michigan's maple products. At the coming October meeting, northeast Michigan producers will be hoping to learn from others who have experienced ice storm damage as happened here in March. It was a devastating ten days but the members of the MMSA shared chainsaws, other equipment and many man-hours to salvage tubing, clear trails and attempt to get production up and going again. There are a lot of good reasons to belong to a maple syrup association: education, camaraderie, representation for the industry, and support in times of need.

**2025 North American Maple Syrup Council
66th Annual Conference
Great Lakes! Great Maple!
October 22 – 25, 2025
Double Tree by Hilton, Port Huron, Michigan
Blue Water Convention Center
CONFERENCE REGISTRATION FORM**

	Before 9/1	Before 9/20	After 9/20
Full Registration Includes all workshops and presentations, trade show, program book and the following: Thursday all day tour; Welcome to Michigan Buffet; Thursday, Friday, Saturday breakfast; Friday and Saturday lunch; and Friday dinner	\$475 #_____	\$500 #_____	\$550 #_____
Friday One Day Only Registration Includes trade show, meetings, tech sessions, breakfast, lunch and program book *Dinner is extra	#_____	\$125	\$150
Saturday One Day Only Registration Includes trade show, tech sessions, breakfast, lunch and program book *Banquet is extra	#_____	\$125	\$150
Saturday Evening Banquet Banquet will be buffet style with choices of beef, maple glazed salmon and chicken	#_____	\$85	\$90
Friday Companion Tour Tour of Pawabic Pottery and historic family home of Edsel Ford – tour includes lunch. Indicate lunch choice: Chicken salad croissant #____ Turkey sandwich #____ or Roasted vegetable wrap #____	#_____	\$85	\$90
Saturday Companion Tour Spend a day in Frankenmuth; downtown shops and visit to Bronner's Christmas Wonderland – tour includes lunch	#_____	\$65	\$70
Wednesday Optional Riverboat Cruise Cruise from 1:00-3:00 PM and includes lunch; cash bar available	#_____	\$80	\$85
Wednesday Optional Riverboat Cruise Cruise from 5:00-7:00 PM and includes heavy hors d'oeuvres; cash bar available	#_____	\$90	\$95

No cancellation refunds after October 1st

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Is it Really a Manganese Problem?

Méridie Gagnon and Luc Lagacé

Centre de recherche, de développement et de transfert technologique acéricole inc. (Centre ACER),

During the 2025 sugaring season in Quebec, many maple syrup producers experienced what has been called a “manganese problem.” Around the third week of March, the phones were ringing constantly in the maple syrup advisory offices. For a few days, producers reported difficulty concentrating maple sap and needed to wash their reverse osmosis (RO) membranes more frequently. This issue was accompanied by a reddish color of the RO soap solution (Figure 1). Maple sap and syrup could also show a pinkish to reddish hues, and similar pigmentation was visible on felt hats and filter papers (Figure 2).'

For many producers, this was the first time they had encountered this phenomenon. For others who had seen it before, the intensity was unprecedented

unprecedented. In the field, many attributed the issue to a high concentration of manganese (Mn) in the sap, possibly linked to particular winter thaw conditions. But is it really a manganese problem? At Centre ACER, we were intrigued by this question.

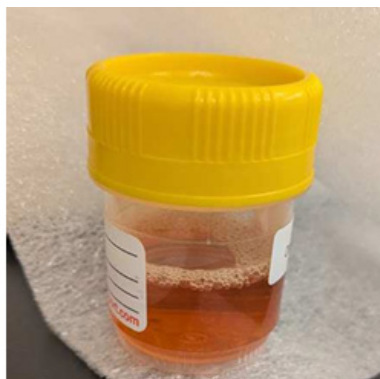


Figure 1. Reverse osmosis membrane soap solution.

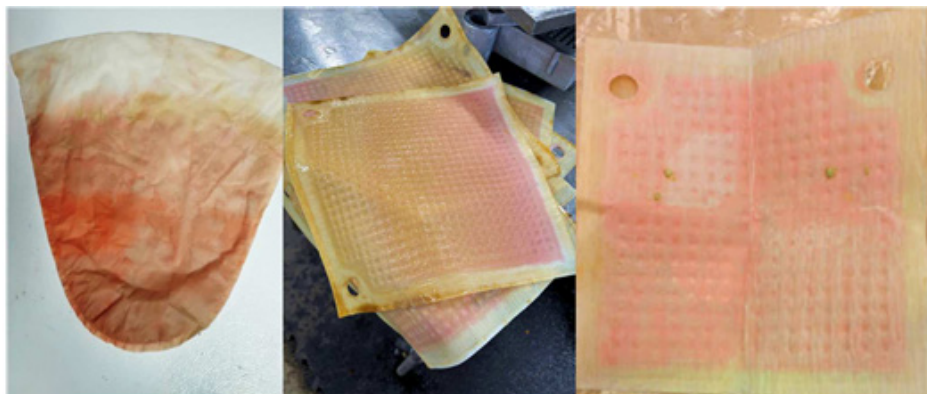


Figure 2. Felt hat and filter papers with a red and pink coloration.

Photo credit: Thérèse Turcotte and Centre ACER

Manganese is a mineral naturally present in maple sap, and RO systems —when functioning optimally— can retain about 99% of it (van den Berg et al., 2019). Studies have shown no significant differences in Mn content between maple syrup of different grades (Gad et al., 2021), but Nimalartne et al. (2020) observed that it was highly variable across seasons and sugarbushes. Mn concentrations were found to be higher in Canada's maritime provinces compared to Ontario and Québec and were comparable to levels found in U.S. states such as New York, Vermont, Massachusetts, and New Hampshire (Nimalaratne et al., 2020).

In the van den Berg et al. (2019) study, the sap concentration factor significantly influenced the discrepancy between the actual and projected Mn concentrations. At higher concentration levels, more Mn was found in the concentrate than expected, suggesting possible changes in the interaction between Mn (or Mn-containing compounds) and RO membranes. If confirmed, such interactions could impact RO performance at high concentrations, making it essential to understand the underlying mechanisms.

Beyond van den Berg's work, to our knowledge, there are no published studies in the maple syrup sector clearly linking Mn to membrane fouling or the reddish-pink coloration observed in concentrate, syrup, and soap solution. So where does the manganese hypothesis come from? We believe it stems from reports in the drinking water sector, where brown or black water has been associated with elevated Mn levels (Du et al., 2017; Wisconsin Department of Natural Resources

n.d.). In water treatment, scientific evidence shows that Mn can contribute to membrane fouling in ultrafiltration systems (Choo et al., 2005; Dashtban Kenari and Barbeau, 2016; Du et al., 2017; Tang et al., 2021). Dissolved Mn (Mn^{2+}) can oxidize to form MnO_2 , which precipitates and can accumulate on membrane surfaces. In drinking water treatment, Mn is sometimes intentionally oxidized with chlorine to facilitate removal. A similar oxidation process may explain the red coloration seen when soap (sodium hydroxide) is used during RO cleaning.

In 2023, we conducted an exploratory study to assess Mn levels in sap samples from producers who reported this issue. However, the results showed that the Mn concentrations in those samples were not particularly high. We considered that the samples may not have been representative—none displayed the pink or red tint—or that the problem may not be solely due to Mn levels.

In the field of membrane filtration, microorganisms are a common cause of membrane fouling, a phenomenon known as biofouling (Gule et al., 2016). Since the so-called "manganese problem" often follows a winter thaw, we hypothesize that warmer conditions may promote microbial growth in sap, including microorganisms that produce red pigments. During concentration, microbial biomass may accumulate on membrane surfaces. The scientific literature shows that certain bacteria, such as *Pseudomonas* species, can produce reddish-brown pigments like pyorubin and pyomelanin and are known to form biofilms that can clog membranes (Fujimori et al.,

1996). Molds from the genus *Aspergillus* also produce pyomelanin (Chiu et al., 2006). Furthermore, in ongoing studies at Centre ACER, we have isolated pink and red-pigmented yeasts and molds from the maple syrup production environment (Figure 3). These findings underscore the need to explore the microbiological angle more thoroughly.

For the 2025 sugaring season, we launched a broader sampling campaign, with the invaluable support of both private and Québec government (MAPAQ) maple advisors. This time, we included more producers and requested not only concentrated sap samples but also syrup and soap

solution. We also asked producers to collect samples both during the problematic period and after the situation had returned to normal. Mineral content and microbial analyses are currently underway, as we continue to seek the answer to the question:

“Is it really a manganese problem?”

This project is made in collaboration with maple advisors of the Quebec Ministry of Agriculture, Fisheries and Food (MAPAQ) and financially supported by the Sustainable Canadian Agricultural Partnership, an agreement between federal, provincial and territorial governments.

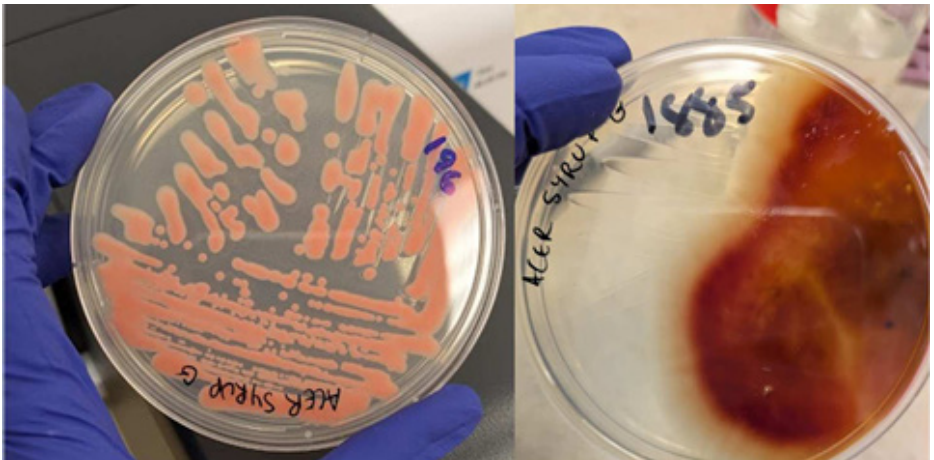


Figure 3. Microbial strains isolated from the maple syrup production environment.

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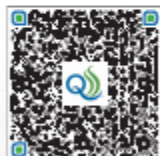
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Analysis of Minnesota State Fair Goers. Ability to Visually Discriminate Between Different Maple Syrup Color Grades

**Stephen G. Saupe, emeritus professor
College of St. Benedict/St. John's University
Biology Department**

The flavor intensity of maple syrup is correlated with its color – the darker the color, the stronger the flavor. For this reason, maple syrup grades are based on both color and flavor. The four USDA (2015) grades of maple syrup are: Golden syrup with a delicate flavor (Golden/Delicate), Amber syrup with a rich flavor (Amber/Rich), Dark syrup with a robust flavor (Dark/Robust), and Very Dark syrup with a strong flavor (Very Dark/Strong). This grading system allows a consumer to predictably purchase syrup that suits their taste preference.

Since flavor and color are correlated, color is used as the proxy for grading maple syrup. Producers measure syrup color in two major ways (Isselhardt, et al., 2022), which may give discrepant results (Chabot and Childs, 2006). The visual grading method compares the syrup to be graded with a series of colored standards. Perhaps the most common standards used are caramel-colored glycerin solutions. When held up to a light source, if the syrup sample is lighter in color than the Amber/Rich color standard, then it is a Golden/Delicate syrup. If the sample is equal to, or darker, in color than the Amber/Rich color standard, but lighter in color than the Dark/Robust standard, it would be

an Amber/Rich syrup. And so on.

The second way to determine color grade is to measure the light transmittance through the sample using an optical instrument called a photometer. In this method, syrup is placed in a glass sample tube called a cuvette. The photometer sends light with a wavelength of 560 nm through the cuvette and measures the percentage of light that is passed, or transmitted (%T), through the sample (Isselhardt, et al., 2022). The darker the syrup, the less light that is transmitted. Thus, a Golden/Delicate syrup, which is the lightest color has the greatest transmittance of light (%T >75), while the other classes are progressively darker and transmit less light (Amber/Rich: 74.9 – 50 %T; Dark/Robust: 49.9 – 25 %T; Very Dark/Strong: <25 %T).

There are advantages and disadvantages to each grading method. The photometric method provides a quick, accurate, and reproducible reading. One popular instrument is the Hanna Digital Maple Syrup Grader (HI759) that sells for about \$70. These instruments have an accuracy of +/- 4%, which means that a sample reading could potentially span two color grades. For example, a sample with a %T = 77 would

be a Golden/Delicate syrup; however, considering the 4% accuracy, the actual value could be as low as 73 %T, which would classify it as Amber/Rich. The measurements, like refractometer readings (Isselhardt and Perkins, 2014), can also be affected by the syrup turbidity (cloudiness).

The primary advantage of the visual comparator kits is that they are less expensive (about \$30). Unfortunately, the readings can be affected by background lighting and individual variations in color perception (Chabot and Childs, 2006 & 2007). For example, Ishihara et al (2001) document an age-related decline in ability to discriminate colors. Chabot and Childs (2007) also noted that different comparator kits can yield different results when analyzing the same sample. Since the liquid standards fade over time, the kits need to be periodically replaced. To minimize fading, the standards should be kept frozen when not in use. Comparator kits made with glass or plastic filters avoid the need for freezing and replacing standards, however, they are more expensive.

The purpose of this study was to determine the ability of an inexperienced individual to visually determine minor differences in maple syrup color grade. This information will then be used to provide an estimate of the accuracy of the visual grading method and potential factors that can influence visual grading methods.

Methods and Materials

Location: This study, the second in a series (Saupe, 2025), was conducted on August 27, 2021, from 2:30 – 9:00 PM, at the Minnesota State Fair. It was part of the University of Minnesota D2D (Driven-to-Discover) program. The program has a dedicated building on the east side of the Fair Grounds, which houses approximately half a dozen simultaneous research projects. The D2D program provides an ideal venue to collect data from a wide diversity of participants in a limited time period.

Participants: Participants were recruited from Fair-goers passing by the D2D building. Volunteers completed a Consent & Demographic form prior to participation. This study was approved by the Institutional Research Board (IRB) of the College of St. Benedict and Saint John's University. A total of 40 individuals participated in this study. Of these, nearly all were from Minnesota (85.0%), especially Hennepin (40.0%) and Ramsey (20.0%) counties. About three-quarters of the participants were female (72.5%) and 27.5% were male. The participants were highly educated; the large majority (82.5%) had education beyond high school including some college or a college degree (Associate's, Bachelor's, graduate, professional). The participants ranged from 19 – 69 years old. The mean age was 33.7.

Test Method: Syrup samples used for visual testing were made by diluting an Amber/Rich (%T=59) syrup with small amounts of bottled water. After thorough mixing, the light transmittance of the diluted samples was measured

using a Hanna Digital Maple Syrup Grader (HI759). The final light transmittance (%T) of the three samples used in this study were 53, 55 and 59 %T, respectively.

Participants were presented with a pair of maple samples and asked to identify which of the pair was darkest color. This was repeated with the remaining pairs. The pairs were presented in random order. The transmittance values of the pairs were: 53 vs. 55 %T, 55 vs. 59 %T, and 53 vs. 59 %T, which differed by 2, 4 and 6 %T, respectively. Values near 50 %T were chosen because they are near the transition between the Amber/Delicate and Dark/Robust grades of syrup. We selected differences of 2, 4, and 6 %T because our preliminary studies (Venables, 2017) showed that individuals could sometimes discriminate between samples that differed by only 2%T.

Results & Discussion

We hypothesized that individuals would be able to correctly identify the difference in color between two syrup samples with a similar transmittance. We further predicted that the smaller the difference in transmittance (%T) between the samples, the more difficult it would be for individuals to distinguish between them. Our results supported these hypotheses.

When participants were presented with two samples that differed by 6 %T units, nearly all (90%) of the participants were able to identify the darker (lower %T) of the two samples

(Figure 1). However, when the samples differed by only 2 %T, only 55% of the participants could pick the darker one. The ability of participants to select the darker of the two samples increased linearly with increasing difference in the transmittance of the samples and showed a strong correlation ($r^2 = 0.99$).

Based on the regression equation ($y = 8.75x + 36.667$), we calculate that 100% of participants should be able to distinguish between syrups that differ by 7.2 %T. This suggests that the accuracy of the visual method (± 7.2 %T) is lower than that of an optical method such as the Hanna Digital Grader (± 4 %T).

There was no difference (chi square $p > 0.7$) in the ability of males versus females to identify the darker of the syrups (data not shown). In general, other studies have also not shown clear evidence for difference in color vision in males and females (Murray et al, 2012).

Our results showed that age affected the ability of participants to discriminate between the most similar sample pairs. Those individuals who could distinguish between the sample pair that differed by the smallest amount (2 %T), were on average younger than those who could not do so (Figure 2). However, age had no effect on the ability of participants to identify the difference between sample pairs when the %T difference between the pairs was 4 units or greater.

This study has shown that comparator kits are inherently limited by our vision and age. We conclude that, when

possible, instrumental grading methods should be used for grading maple syrup because of the higher degree of accuracy and because the measurements are unaffected by individual variations in human vision. A practical significance of this study is that there should be some flexibility in maple grading, whether using instrumental or visual methods to allow for their range of accuracy (4-7%). Until more accurate methods of syrup grading are devised, the judge of a maple syrup contest (or maple syrup inspector) using a Hanna Digital meter or other photometric device should allow a range of values before disqualifying a syrup that has received a %T that may be slightly outside the USDA range for that grade, but is within the range of accuracy of the grading method applied.

Acknowledgements

This study was supported by funding from the College of St. Benedict/Saint John's University Undergraduate Research program and Admissions/Marketing department. We are grateful to Annie Hotop and the University of Minnesota D2D program for providing the opportunity to conduct this study. Thanks to Amy Saupe, Brigid Marks and Tessa Venables for preliminary studies, and CSB/SJU students Con Brady, Morgan Witt, and Allison Roe, who helped with this research. This report is the second in a series to describe the results of studies conducted at the 2021 Minnesota State Fair. The first in the series was published in the newsletter of the MN Maple Syrup Producers (Saupe, 2025)

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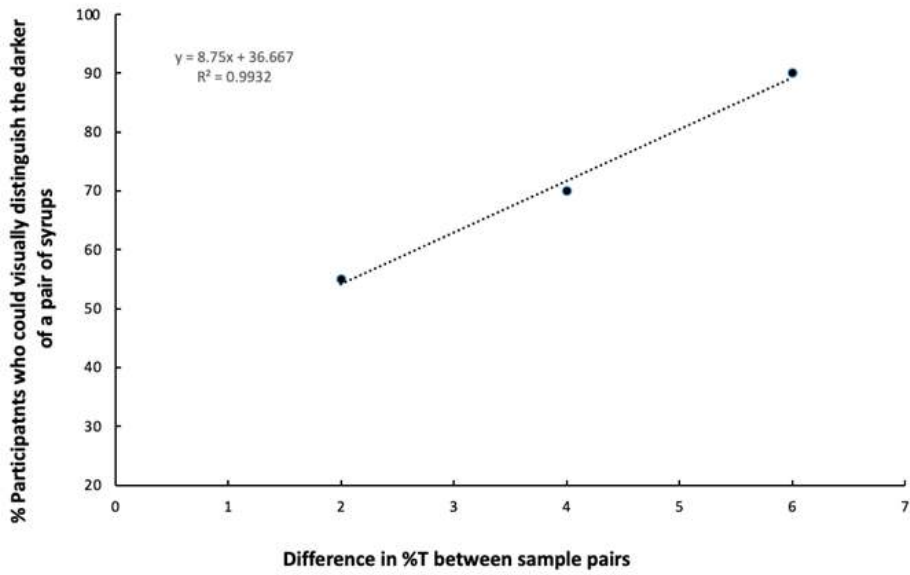


Figure 1. Graph showing the percentage of participants (n = 40) that could identify the darker of two Amber/Rich syrups when pairs differed in transmittance (%T) by 2, 4 or 6 units

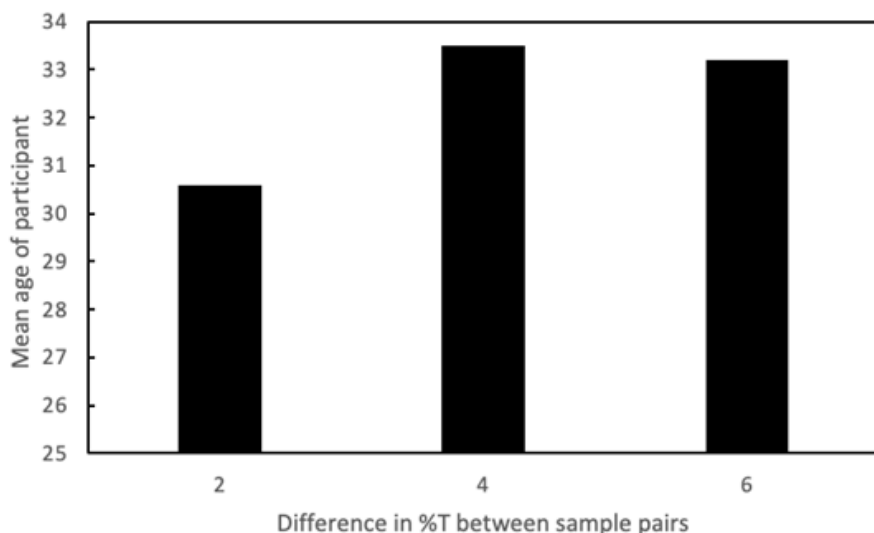
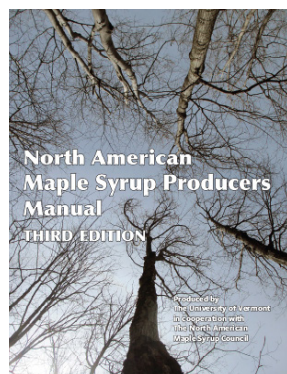


Figure 2. Graph showing the mean age of participants (n = 40) who could correctly identify the darker of two Amber/Rich syrups when the pairs differed in transmittance (%T) by 2, 4 or 6 units.

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The History of Maple Syrup: The Importance of the International Maple Museum Centre

**Museum Administrator Jennavieve Edwards
Museum Administrative Assistant Rachel Gould**

Maple syrup production is an art form that dates back years before any European set foot on North American soil and the International Maple Museum Centre is dedicated to preserving all of its history. Indigenous tribes, such as the Algonquin and the Iroquois, in the North Eastern part of what is now the United States were the first to discover the possibilities of a maple tree's sap. According to their oral tradition, Indigenous people observed the sap dripping from broken branches and tasted it, leading them to realize that it could be used as a sweetener in their foods. Additionally, there is a rather popular legend of a chief who threw his tomahawk into a maple tree, causing there to be a gash from which sap began to flow. He then collected and brought it home to his wife who used it to cook venison, causing the sap to boil and create syrup. In whichever version is true, they eventually started to collect this sap in hollowed out logs placed at the base of a tree which had a V-shaped cut in it to allow the sap to collect and flow out in one spot. These logs would then be brought back to their homes where they would heat stones in a fire before placing them inside the logs with the sap to boil it. A new display room in the museum actually houses a tree with a V-cut in it, demonstrating the original

form of tapping the tree. This very early version of maple syrup was called "Sinzibuckwud" by some tribes, which translates to "drawn from trees," reflecting its origin.

With the arrival of the Europeans many things were taken from the Indigenous people, among them, the collecting of maple sap. They took this tradition and altered it to fit their own needs. One of these alterations was how the sap was actually collected from the trees. The Indigenous people used the V-shaped cut in the trees but the Europeans began to drill holes in the trees and insert wooden spouts, much like we do today. The same display room mentioned above goes on to demonstrate this new form of tapping as well. This small change in the sap collecting process is something that has stuck around since the mid 1500's. They also switched from placing boiling rocks in carved out logs to boiling the sap in metal kettles. The introduction of metal by the Europeans was one of the main contributing factors to the evolution of maple syrup production. As time progressed, everything that had been made of wood was switched to a metal contraption.

By the early 1800's cast iron evaporators were introduced which improved

the efficiency of syrup production. The wooden taps that they put into trees also progressed into metal ones for more efficient collecting. By the mid 1800's evaporators were commercially available so that maple products could be mass produced. There are many different forms of these evaporators on exhibit at the museum. The original hollowed out log is one of these on display. There is also orange, from simple metal pans that would be boiled over a fire, to the cast iron ones of the 1800's, to the more current ones made mostly of stainless steel in the exhibit. There is an entire room dedicated to the advancement of just the evaporator so that people visiting can understand just how far the maple syrup industry has come in the last 400 years. Along with syrup, maple sugar was widely produced around this time. It was actually more common to make maple sugar than it was to make syrup, as it was easier to store and transport from place to place. The museum houses many of the block molds that would have been used to make the sugar blocks so they could be stored or sold. The reason maple sugar became so popular was because it is a natural product, meaning they did not have to import cane sugar from Europe for the states. This saved many people from heavy taxes and it helped develop the maple industry in the United States, boosting its own economy in the process.

In the 20th century the number of new developments skyrocketed as the pace of invention surged forward. Metal spouts, tubing systems, and vacuum pumps were among the new

developments that allowed for the maple industry to become even more efficient than it had been in the past. The metal prevented sap from seeping into the wood and spoiling or developing mold.

This meant that they could be reused for longer periods without issues and were easier to keep clean. Tubing went from tree to tree and collected in one point, with the help of a vacuuming system. This allowed for faster collection without debris getting into the buckets.

While there still is a need to walk through the woods and check the lines to insure that there are no leaks or problems with the attachment to the trees, it has reduced the frequency in which one needs to walk to gather buckets and do checks on their progress. It also prevented the physical strain of needing to take the buckets off the trees and pour the sap into a storage vat, as the newer vacuum system brings all the sap to the vat instead. While all these new developments sped up the pace of collection, there were also advancements in the boiling process. In the 1970's reverse osmosis technology was introduced to the maple industry. This technology removed some of the water from the sap previous to boiling, increasing the sugar content and reducing the moisture, greatly reducing boiling times.

Many of these practices are still being improved upon today! There are now apps and other technological systems that have been created that can monitor the sap lines and boiling systems to even further reduce the amount of physical labor that is re-

quired of people. This has led to producers having more time to become inventive with the products that can be created using maple. In the present day, maple-infused products can range from edible things like candy and whiskey to skincare items. The museum's gift shop actually sells many of these items. Locally made syrup, candies, spreads, and soaps are all available for purchase, most of which are infused with maple. Along with products, festivals are held across the United States and Canada celebrating the tradition of making maple syrup. Maple Weekend is one of the biggest events hosted at the museum with pancake breakfasts, tours and demonstrations happening the last two weekends in March. These traditions are especially important in Canada where almost 70% of the world's maple syrup is produced. The museum has many Canadian inductees in its Hall of Fame due to the large percentage of people there that participate in the ma

-ple industry. The Hall of Fame is where people who have made substantial contributions to the maple industry are honored. It has had two people added to it every year since the museum's opening in 1977. Each May, inductees and their families join the community for a pancake breakfast and official induction ceremony.

While there are some issues that have begun to threaten the maple syrup industry, specifically climate change, there have also been many advancements in sustainable practices, such as forest management and the development of organic certification, to ensure that syrup is produced to the highest quality and in the most eco-friendly way possible. The International Maple Museum Centre hopes to protect this tradition for as long as it can, making the history of maple syrup available for anyone to learn.



Looking for International Maple Hall of Fame, NAMSC Special Recognition Award and Richard G. Hass Distinguished Service Award Nominations

International Maple Hall of Fame Nominations Open

The selection committee of the International Maple Hall of Fame (HofF) induction honor has opened up the nomination process for inductees into the 2026 HofF. Normally 2 inductees are honored.

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- Post humous nominations will be considered on a case by case basis but are discouraged.

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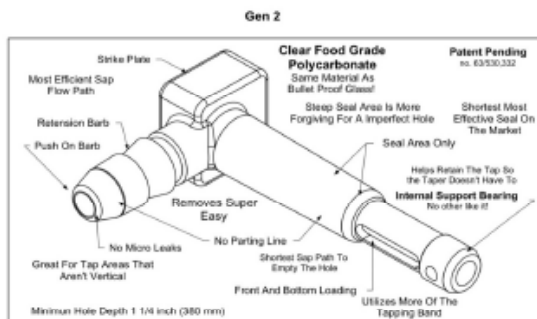
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The Forgotten Importance of Block Sugar to the 20th Century Maple Industry

By Matthew M. Thomas

Today's maple industry is primarily focused on producing maple syrup for bottling and consumption in liquid form in consumer-friendly sizes and packages. It is commonly known that before maple syrup became a popular consumable, maple sugar in a cake or granulated form was the primary product of the sugarbush. What is less well understood is that 75 to 100 years ago between one third and one half of all the maple production in North America was reprocessed and sold as block sugar. So, what was block sugar and why was it important?

As the name implies, large rectangular blocks of pure maple sugar were formed by boiling maple syrup to a very thick consistency that could be poured into molds to cool and hardened into hard dry blocks (Figure 1). There was no standard weight or dimension of the blocks, with each manufacturer establishing their own block format, possibly in coordination with the needs of select customers. In general, the blocks weighed around 60 to 70 pounds and were formed in wax paper lined wooden boxes or heavy cardboard containers (Figure 2).

Forming maple syrup into block sugar was a way to transport maple products to consumers that employed maple sugar in making blended syrups and in

flavoring other products, most notably in the tobacco industry. It is not exactly clear who was the first to convert maple sugar and syrup into block sugar but it was George Cary and his Cary Maple Sugar Company in St. Johnsbury, Vermont that made block sugar an industry standard in the first half of the twentieth century.

In making block sugar, syrup was generally reduced to 93% sugar and 7% water, substantially reducing the weight and creating a harder and drier product that could easily be formed into blocks of more convenient sizes and shapes for shipping by rail and truck. Transport in block form also freed up barrels for use in liquid syrup transport and storage.

One article from 1952 described how the Cary Maple Sugar Company made their block sugar, stating that commercial grade syrup was heated to around 250 degrees for a half an hour while being continually stirred. The syrup was then poured into open wood boxes, hardening for a half hour, before taking another 10-12 hours to fully cool (Figure 3). Sherb Doubleday, one time owner of American Maple Products in Newport, Vermont described a similar process, adding that first, barrels of syrup were poured into large ground level tanks where the different syrups were blended, then heated to facilitate clari-

fication with a large filter press.

Using a high-pressure steam boiler, the syrup was further heated in a tank that could hold 2000 lbs. of syrup with constant stirring. Thickened syrup was dispensed into paper lined cardboard boxes to cool and set.

In the late 1880s, Geroge Cary stumbled upon the idea of using maple sugar as a flavoring ingredient in the making of chewing tobacco. The tobacco industry was already using cane sugar, but Cary convinced tobacco makers to try maple sugar instead. The tobacco makers were impressed and in a short time Cary became a maple sugar broker buying millions of pounds of maple sugar and shipping it to tobacco makers. It was said that at its height, the Cary company controlled 90% of the world's maple sugar at the beginning of the twentieth century.

When processing tobacco, maple sugar was used as a flavoring added to create the perfect balance of acidity and sugar. For making chewing tobacco, tobacco leaves were dipped in a sugar-rich solution known as "sugar sauce" then dried to the desired moisture level. Similar processes were used for preparing tobacco for cigarettes which, after blending and cutting, may also be subject to a secondary "casing fluid" where a chemical solution containing sugar was sprayed on the tobacco to create the preferred moisture level and flavor profile. With the invention and growth in popularity in the 19-teens of cigarettes made from blended tobacco, the need for and use of maple sugar a

as a flavoring agent increased exponentially.

Data from 1939 shows that 48 million pounds of sugar were used in the tobacco industry. Of that, 39.7 million was cane and beet sugar, 7.2 million was maple sugar, and less than a million was corn syrup, indicating that, while maple sugar was an important ingredient for tobacco processing, cane and beet sugar were being used in much greater amounts. Of that 7.2 million pounds of maple sugar, 5.9 million went into cigarettes, and 1.3 million into chewing tobacco.

Initially, Cary was shipping sugar in all manner of packaging, from boxes and wood tubs to burlap bags in which it came to him. What Cary liked best was the hard sugar that was being made in the Beauce region in Québec. Cary felt that Vermont sugar was put up too soft and would drain, ferment, sour, and mold due to a high moisture content. Cary told sugarmakers to cook their sugar to 240 degrees to make it dry and hard, which was what he needed to re-pack and transport by rail. Cary also paid a lower amount for sugar packed in reused containers like old butter tubs and cottolene pails. He preferred to buy sugar packed in new clean wooden pails and tubs. Cary learned that buyers would pay 4 to 5 cents a pound more for the drier Beauce-style sugar, so Cary shifted to melting the sugar and cooking it to 258 degrees in steam jacketed kettles and began forming the sugar into large hard blocks of sugar in wooden boxes.

To make the thousands of boxes needed for his block sugar, Cary even set up his own saw mill and box factory adjacent to his St. Johnsbury factory. Cary branded his block sugar "Highland Sugar", named after the name of his Highland Farm and sugarbush located in North Danville, just outside of St. Johnsbury. As late as 1915, the Cary company was buying only sugar and not syrup, but by the later teens, Cary began buying syrup as well as sugar. With this shift to buying syrup, the Cary Company adopted the metal barrel for transport and shipment of maple syrup. Because of Cary's influence and market control, responsibility for the introduction and adoption of metal barrels by the maple industry can safely be attributed to the Cary Company.

The Cary Company was the largest buyer and seller of maple sugar for the first part of the twentieth century, but it was by no means the only packing company dealing in block sugar. This became even more true following the bankruptcy and reorganization of the Cary Company in 1931, which opened the door for a number of new and existing packing businesses in the United States and Canada to grab a greater amount of the block sugar market.

Besides the already mentioned Cary Company, maple packing companies such as United Maple Products (Burlington, Vermont and Granby, Quebec), American Maple Products (Newport, Vermont), Québec Maple Products (Lennoxville, Québec), A.M. Bolduc and Sons (St. Victor-Québec), and the Citadelle Cooperative (Plessisville, -

Québec) were all heavily engaged in the block sugar trade, with block sugar making up a considerable amount of their business.

In 1926, it was estimated that one third of the maple crop went into making syrups and tobacco products, one third was sold directly from producers to consumers, and one third sold to packers for bottling and resale. Reports from the 1930s suggested that as much as 40 percent of the maple production of Canada was sold to US tobacco processors. Frank Rees, manager of United Maple Products in Burlington, estimated in 1947 that his company converted 10 percent of the syrup they purchased into maple candies, 40 percent into bottled table syrups, and the remaining 50 percent into block sugar. Through the 1940s and into the 1950s the tobacco industry's demand for maple sugar was in decline. By 1956 the tobacco market had essentially disappeared.

However, it was not just the tobacco industry that was using block maple sugar. The blended syrup makers were also buying large quantities of maple syrup. One blended syrup executive reported in 1950 that the blended syrup makers were buying about 28 percent of the total maple syrup produced in the United States and Canada combined. Over the years the blended syrup industry also began to reduce the amount of maple it was using, while shifting from buying block sugar to barrel syrup, before phasing it out completely. For example, the formula for Log Cabin Syrup went from 25% pure maple syrup in the first part of the twentieth century to 15% in

the 1930s, 10.5% in the 1960s, 3% in the early 1970s, 2% in 1979 and eventually to zero percent by the 2000s. Today, only one company, Bolduc and Sons out of Quebec, is known to still produce bulk sugar, and that is exclusively made for shipment to See's Candies, a 100-year-old San Francisco-based candy company. During the first half of the twentieth century, a significant portion of the output of sugarbushes was not going into the bottling of pure maple syrup for sale to the consumer but instead was used in the processing of tobacco and the blended table syrup. I

It might be said that the assistance of the blended syrup and tobacco industries were instrumental in the ability of the maple industry to find its footing in transitioning from producing a low valued household commodity of maple sugar of the 19th century to the high valued specialty condiment of maple syrup of today.

Dr. Matthew M. Thomas is a maple industry historian. You can read more maple history articles like this on his website, www.maplesyruphistory.com.



Figure 1: Pouring thickened super-heated maple syrup into block sugar molds at the Cary Maple Sugar Company plant in the 1930s.



Figure 2: Jacketed steam kettles alongside stacks of block sugar at the Citadelle Cooperative plant in Plessisville, Québec.

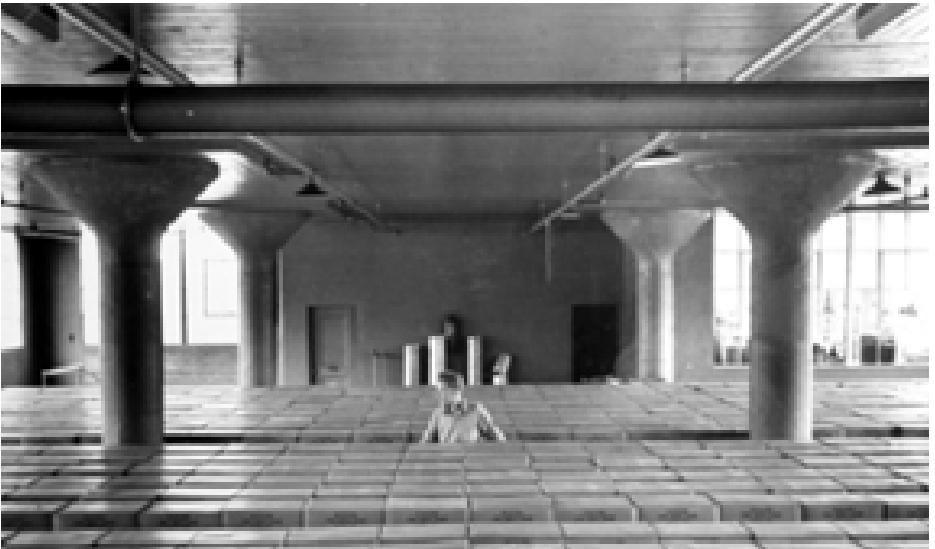


Figure 3: Hundreds of paper lined wood boxes of block sugar in a cooling room at the Cary Maple Sugar Company plant in St. Johnsbury, Vermont.

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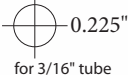
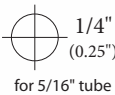
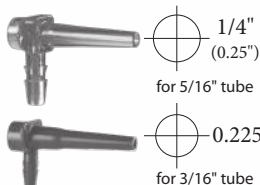
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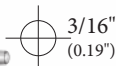
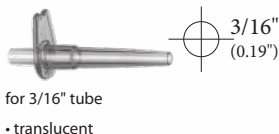
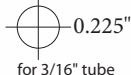
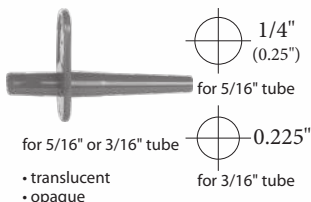


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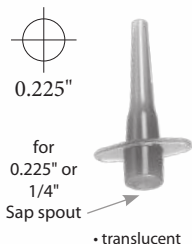
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