

Maple Syrup

More than Hanging a Bucket on a Tree



by Metta Winter



“**W**ith maple syrup, the story’s the same as potato chips,” says Stephen Childs ’75, MS ’76, referring to what makes the pale color and delicate flavor of light amber grade so highly prized. What it all boils down to is glucose.

If there’s too much glucose in the sap—or the spuds—the product ends up so brown it won’t pass a taste test. That’s why New York State’s 1550 syrup producers keep a sharp eye on the thermometer as spring approaches.

Temperatures alternating above and below freezing throw the “on” switch to start a tree’s liquid nutrients “running” up from the ground. And ideal weather—freezing nights followed by sunny days between 38 to 39 degrees F—is needed to keep the sap flowing while safeguarding its naturally occurring sucrose. Sudden temperature spikes can spell disaster. A hot day or two causes yeast and bacteria to multiply, thereby breaking down sucrose into its constituents: glucose and fructose.

“When you boil sucrose, it doesn’t darken, but when you boil glucose, it darkens like crazy and can deepen the flavor beyond a point that no one will eat,” explains Childs, the New York State extension maple specialist who’s been around maple sugaring since childhood, gathering sap with his grandmother.

A quest for technologies to temper the consequences of Mother Nature’s vagaries is but one of the reasons the 550-member New York State Maple Producers Association asked the

From Xerox Executive to Maple Syrup Producer



Chuck Winship recently won the "I Love My NY Farmer Contest" sponsored by NY Farms! in the New York specialties category.

“I can still remember coming down the hill into Ithaca, it was blowing and cold and ugly, and I was doing the monkey mind, talking to myself: ‘What am I doing this for? It’s stupid! Go to school? I don’t have to go to school!’” recalls Chuck Winship of that day in January of 1998 when, recently retired and at the age of 55, he was about to become a student again. “Now when I come down that hill it just feels great. I am coming home!”

Winship had taken a chance on the outcome of his own personal “vision quest.” And got a lot more than he had bargained for.

For 33 years, Winship had been part of the management team at Xerox Corporation, overseeing engineers who created products that are benchmarks in the industry today. It was, he says, a great ride, a time when innovation boomed.

When it was time to move to the next phase of his life, Winship turned to the Native American practice for discovering direction in life by spending solitary time in nature with just a jug of water and a journal, listening to himself.

“What came when I was sitting in those woods outside of Syracuse was to go back to Cornell for a degree,” Winship says. “After that, everything just fell into place.”

As he tells it, living in grad housing and sharing classes with men and women younger than his own children was exhilarating.

Faculty in the Department of Natural Resources helped him put together a program in forestry, ecology, entrepreneurship, and farm product marketing by drawing on courses across the college, as well as those in the Johnson Graduate School of Management.

Now he owns a 220-acre farm—“a prime piece of property, second to none, that I got for next to nothing; that’s fate again”—a thriving maple syrup business tapping 2,300 trees this year. He is also a partner in cutting-edge agroforestry research, wrote the grant that funded development of a new maple product (see sidebar on maple cream), and is chairman of the Cornell Maple Advisory Committee.

“What I’ve done all my life is be ahead of the curve,” says Winship of Sugarbush Hollow, the business that now pays the bills, although not quite in the style of his executive days. The Cornell Maple Advisory Committee, which brings Cornell expertise and producers together, harnesses his energy behind a movement to put New York maple products on the map as prominently as are the state’s wines.

“We want people to realize there’s a great wholesome maple syrup product made in this state and to get more farmers involved,” Winship says. “We haven’t begun to tap the potential of which we’re capable.” No pun intended.

Never one to dodge a fight, Winship is right in the middle of the debate over whether to install 1.5 megawatt windmills in his out-of-the-way part of Livingston County. (His own land stands 2,200 feet above sea level.) At town meetings, Winship finds himself an informed participant, thanks to an understanding of this new energy source he had gained in an agricultural and biological engineering courses taught by Lou Albright '62, MS '65, PhD '72.

“Cornell’s impact on me wasn’t just in maple syrup,” Winship says, “but in a whole host of things that are topical issues today. Thank you, Cornell.”

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college to ramp up its 50-year-old Cornell Maple Program. New York State maple syrup is in demand. In 2004, producers boiled 10.7 million gallons of sap into 255,000 gallons of syrup, a 21 percent increase in production over the year before. They sold every last drop. And they want to sell a lot more, with 22 million consumers on their doorstep.

“One of the great frustrations is that we sit next to the largest market in the United States, yet can’t seem to get to it while the Canadians can,” says Childs, referring to the New York maple industry’s leading competitors.

“The producers in Ontario and Quebec are such aggressive marketers that they are filling the growing demand in the United States virtually single handedly,” says Brian Chabot, a professor of ecology and evolutionary biology and director of the Cornell Maple Program.

New York is neck and neck with Maine in maple sales, but both are behind Vermont, the nation’s leader. (How much of the syrup sold in Vermont comes from Vermont’s trees is a matter of debate. What is clear is that in the past, Vermont has been a major importer—and then reseller—of New York syrup.)

Effective marketing starts with a consistently high-quality product made from a quick-to-spoil, weather-based raw material that’s only available in a critical two-month window—sometime between February and April. Producers asked Cornell’s help with one of their biggest problems: controlling the growth of yeast and bacteria in the sap as it flows through miles of 5/16-inch tubing that snakes from tree to tree through the sugarbush to the collecting tank. Chabot and Randy Worobo,



Peter Smallidge, extension forester and director of the Arnot Forest, taps a sugar maple where he will place a spile that connects to the tubing system for sap collection.

a microbiologist at the New York State Agricultural Experiment Station in Geneva, N.Y., designed a project to test the effectiveness of exposing the sap to ultraviolet light as a safe and effective means of microbial control. Worobo, an associate professor in the Department of Food Science and Technology, devised the UV unit to purify apple juice for the cider industry and is figuring out how to adapt the technology for use with maple sap.

Chabot has similarly involved other faculty from across the college to bring their research expertise to bear on a wide variety of maple industry problems. Associate professor of entomology Ann Hajek, a biological control specialist, is one. Hajek has set a group of her students to work on devising methods for controlling forest tent caterpillars—a naturally occurring pest of sugar maples which, during population explosions, defoliates acres of trees, rendering them unproductive for seasons at a time.

Robert Cooke, a professor of biological and environmental engineering, is another. Cooke is converting 15-years-worth of educational videos to electronic form, making them readily available to Cornell Cooperative Extension educators and maple producers over the Internet.

Wen-fei Uva MPS '93, PhD '99, a senior extension associate in the Department of Applied Economics and Management, is looking at how to adapt for the maple industry the marketing strategies she's developed for the state's fruit and vegetable producers.

From the Department of Natural Resources, assistant professor Steven Wolf and senior extension associate Louise Buck PhD '00, both experts in the sociological aspects of natural resource management, are particularly interested in how internal organization encourages the development of the natural resource industries. They've just started a project to compare how New York producers are organized to those in Vermont who have worked together so effectively that maple has become central to the state's image. Remember, the sugar maple is New York's state tree, too.

Brian Chabot



A group of school children get a tour of the Uihlein Sugar Maple Field Station, led by Michael Farrell. The Uihlein is the largest acreage in the world devoted to sugar maple research and extension. One longstanding project there, the Sugar Maple Tree Improvement Program, identifies and produces seed for trees with exceptionally high sugar content.

Childs joined the Maple Program full-time last October. A former owner of a farm-based business, Childs's job is to further the New York State Maple Producers Association's goal of increasing maple production and enhancing sales nationwide.

The New York maple industry is largely retail with producers in direct contact with their customers; so the question is how to take advantage of this unusually personal relationship. As an extension educator in Wyoming County (the number two county in maple production behind Lewis), Childs was influential in developing Maple Weekend, a statewide marketing scheme that both attracts consumers into the sugarhouses and, through the event's web site, links consumers directly to producers' online sales. Last year more than \$250,000 worth of maple product was sold on that single March weekend. Hits on the four-year-old web site (www.mapleweekend.com) now exceed 1.2 million.

Childs is also involved in creating and promoting new products. For more than a decade he encouraged the development of shelf-stable maple cream (see sidebar).

"Maple cotton—a spun candy that's 20 percent maple syrup—was a raging success at the New York State Fair last year, grossing \$6,000," says Childs, who, knowing it's a hard sell to get consumers to carry little jugs of syrup around all day, is thinking up other tasty treats to eat while strolling through the grounds. A maple wrap may be in the offing for next year.

A vigorous maple industry starts with a vigorous grove of sugar maples, known as a sugarbush. That's where Peter Smallidge, New York's state extension forester and director of the Arnot Teaching and Research Forest at Cornell comes in. Smallidge is responsible for conducting research on forest and sugarbush management and providing landowner education programs through the Cornell Cooperative Extension system to the state's 490,000 forest owners. (More than a dozen county agents—known as the Maple Team—offer maple schools and other landowner programs to producers in their areas.)

"Maple production keeps the forest as a forest and keeps the forest a working forest," Smallidge points out. "We want to make sure maple producers know how to keep their forests healthy."

Henry Uihlein

Henry Uihlein saw his first Adirondack sugar shack at the age of seven. "That was at Long Lake back in 1903," he recalled. "I can remember the men explaining to me how they bored holes in trees and then white water ran out. From that they made the maple syrup."

Twenty years later, he was doing the same thing himself on land his father had bought near Lake Placid.

These boyhood experiences, Uihlein said, whetted his appetite to someday become a maple syrup producer himself. That dream came true in 1941 when Uihlein and his wife, Mildred, bought the land near Lake Placid that became known as Heaven Hill Farm. "I wasn't interested in becoming a farmer, but I had made up my mind that I was going to make maple syrup.

"We cut logs from trees on the property to build a modern sugarhouse, tapping 500 maple trees the first year. It was a real family affair. I did all the boiling and preliminary filtering and Mrs. Uihlein did the final filtering and the bottling and canning. Of course, I had help from Cornell in building the sugarhouse and getting the project underway; it was Cornell people who really taught me how to make maple syrup." He turned over the business and 200 acres of prime sugarbush to the college in 1965.

Uihlein's first brush with the college wasn't because of maple syrup, however. He was bound for Cornell to study medicine when, in 1915, he contracted tuberculosis and moved to Lake Placid. Cured four years later, he stayed on in the Adirondacks becoming an avid promoter of amateur speed skating and other winter sports. Uihlein was influential in bringing the Winter Olympic Games to Lake Placid in 1932. He served on the Olympic committee in 1980.

During the 1920s and 1930s, Uihlein had returned to New York City, where he grew up, and become a director in the family-owned business, the Joseph Schlitz Brewing Co. of Milwaukee. He served as a director for 32 years and was named the only Honorary Life director of the company. Uihlein became a farmer, too, in the end, raising premier Jersey breeding stock. He spent his winters in Indian Wells, California, and the rest of the year at Heaven Hill Farm. Uihlein died in 1997 at the age of 101.

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Brian Chabot

Michael Farrell, northern New York maple specialist, processes sap in the sugarhouse at the Uihlein Sugar Maple Field Station in Lake Placid, N.Y.

The 4,000-acre Arnot is one of the few facilities in the United States where research is conducted on sugarbush management. High on Smallidge's research agenda is evaluating different intensities of thinning to optimize overall productivity.

"We know small, healthy trees respond well to release, it's like giving vitamins to a kid," says Smallidge of cutting surrounding trees to maximize available sunlight to the biggest and best-quality trees. The judgment calls get more complex as a forest grows. It's known that some trees have to be cut down or they'll all suffer, yet there's no research data on how many trees to cut and when to cut trees as they reach certain diameters.

"Every time you cut down a sugar maple tree, you are taking away a tap hole that represents \$10 worth of product every year," Smallidge explains. "If you cut a 15-inch tree, you are losing a major producer, so when will you recover the cost of that tree through the increased productivity of the remaining trees? We just don't know."

Smallidge involves producers—whose sugarbushes range from the commercial minimum of 100 taps to as many as 30,000—in his research, testing different protocols on small parcels of their land. It gives him a chance to replicate research in

different soils and growing conditions and to build strong landowner relationships.

He also has to field year-by-year questions, such as consulting with individual owners on which trees to tap after an explosion of forest tent caterpillars.

Smallidge also supervises producer and public demonstrations of production technology at the recently renovated facility located in the Arnot's 40-acre sugarbush. The sugarhouse processes sap drawn from 2,700 taps through a state-of-the-art high-vacuum, pumped collection system, which even draws sap uphill from trees on hillsides down below.

One promising technology is reverse osmosis—similar to what's used to extract salt from sea water—which increases the sucrose concentration in the sap from roughly 2 percent when it comes out of the tree to 6 to 12 percent. New York State Department of Agriculture and Markets requires that syrup for retail sale must be 66 percent sugar, so much more water must still be boiled off on an evaporator.

"If you can go from 2 percent to 10 percent before the sap enters the evaporator you are starting five times ahead," Smallidge says.

Smallidge also teaches Cornell undergraduates who use the Arnot when they take his course Forest Management and Maple Syrup

Production and supervises summer interns conducting maple-related research.

To allow for comparisons between very different climates and soils, the college opened a second maple teaching and research facility in the Uihlein Forest outside of Lake Placid in 1965. With 3,800 taps on 240 acres, the Uihlein Sugar Maple Field Station is the largest acreage in the world devoted to sugar maple research and extension. During the past 40 years, research at Uihlein has addressed a wide range of issues. One is maximizing the efficiency of collection methods to reduce the size of the tap hole—hence minimize damage to the trees. A tiny metal micro-spout just 3 mm in diameter is the latest under evaluation. (We certainly have come a long way since the times when Native Americans gashed the bark with a broad ax to allow the sap to flow freely.)

Another longstanding project at the Uihlein is the Sugar Maple Tree Improvement Program. Begun in 1983 in cooperation with the U.S. Forest Service, it is now the lead test site for identifying and producing seed for trees with exceptionally high sugar content, in some cases as high as 12 percent. Propagation techniques perfected at Uihlein produce cuttings that flower and seed in the year they are rooted. In the wild it would take 20 years.

Research at the Uihlein has also evaluated tree shelters, one of the latest devices to enhance the survival rate of newly planted seedlings. These shelters protect the seedlings from browsing by deer and other herbivores while also providing a favorable micro-climate for superior growth.

Five years ago, six test plots of wild ginseng—the state’s foremost agroforestry product with high income potential to maple syrup producers—were added to evaluate the plant’s survival under four different hardwood species. Other research projects relating to agroforestry and specialty forest products are planned for the future.

From the beginning, the Uihlein has been the site of producer education programs from advances in sugarbush management to the latest collection and production technol-

ogy. With a \$200,000 facility renovation planned and the arrival, in January, of Michael Farrell as the new, full-time, northern New York maple specialist, increased educational activities will soon attract more of the public as well. For not only is the Uihlein located in proximity to the state’s 10 northern counties (where over half of the syrup is made), it’s also just outside Lake Placid, a prime Adirondack tourist destination.

“We want to use people’s love of maple as leverage to teach them broader environmental education concepts,” says Barbara Knuth, chair of the Department of Natural Resources in which the Maple Program resides. “The program offers a way to show how a healthy stand of maple trees contributes to a healthy forest landscape and the importance of that landscape as a natural resource for the state.”

Farrell, an experienced environmental educator, plans to develop a nature trail that teaches about the sugarbush as well as other aspects of forest and wildlife management. He also expects to draw in more young people by involving 4-H and FFA groups in propagating sweet trees—genetically superior sugar maple seedlings that contain 4 to 6 percent sugar content in their sap.

“Many of these groups have their own greenhouses, and we can provide them with seed or cuttings so they could grow them up into two-year-old seedlings,” Farrell says. “Historically, the demand has far outpaced our production capacity, so involving youth in this process will help bridge the supply gap while simultaneously establishing relationships between the current and future maple producers.”

Even so, Farrell is quick to add that you don’t have to be a commercial producer to buy a few Uihlein-bred seedlings. Not only are maples beautiful landscape trees, but these sweet trees can also lead to a satisfying hobby, 40 years down the line.

“If you’re just graduating and want to do sugaring in your retirement,” Farrell says. “Now’s the time to plant those trees.”

CU Research Makes Maple Syrup the Cream of the Crop



Cornell microbiologist Randy Worobo and food scientist Olga Padilla-Zakour MS '88, PhD '91 of Cornell's New York State Agricultural Experiment Station in Geneva, N.Y., have increased the shelf life and quality of maple cream, the smooth-textured spread made by heating syrup to high temperatures, then rapidly cooling the cooked syrup followed by stirring. Maple cream offers the rich flavor of maple syrup in a form that can be drizzled over ice cream, licked off the spoon, or spread on toast, bagels, muffins, or pancakes.

Padilla-Zakour and Worobo, both associate professors in the Department of Food Science and Technology, devised ways to produce maple cream that has a creamier texture and lasts up to six months. To prevent the formation of surface mold, the researchers added a food preservative, potassium sorbate, at a low concentration of 500 parts per million. To address the issue of separation, 10 percent of the maple syrup undergoes the process of inverting the sugar from sucrose to glucose and fructose by the addition of the natural enzyme invertase.

The result is a maple cream or maple spread that lasts longer, retains the same flavor, and possesses a creamier texture.

Good manufacturing practices for shelf-stable maple cream could increase production and marketing by 10 percent, resulting in an additional \$1.6 million per year in revenue for maple producers. For consumers, it adds value to what is already a naturally sweet product.

Nate Abbott



The Cornell University Agricultural Experiment Station (CUAES) has been a strong supporter of the Maple Program's research efforts, especially since 1994, providing the program with federal Hatch and McIntire-Stennis Act grants on several projects.

To learn more about maple sugaring and the Cornell Maple Program, go to www.maple.dnr.cornell.edu and www.mapleweekend.com.