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Stephen G. Saupe

College of Saint Benedict and Saint John's University, ssaupe@csbsju.edu

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Maple Syrup: St. John's Sweetest Springtime Tradition

by

Stephen G. Saupe
Biology Department
College of St. Benedict/St. John's University
Collegetown, MN 56321

Abstract: *St. John's is the home of one of Minnesota's oldest maple syrup operations. The monks began making syrup in 1942 and have continued roughly every other spring until the present. Currently, the operation is jointly run by the Abbey and St. John's Arboretum and it is one of the few maple syrup operations associated with a Minnesota college or university. The process by which maple syrup is made at St. John's differs little from the procedures begun more than 60 years ago. In spring, sugar maple trees are tapped, sap is collected, and then it is boiled in the sugar house to produce syrup. Historically speaking, each year St. John's installs about 1400 taps, collects more than 10,000 gallons of sap, and makes about 250 gallons of syrup. The best sap flow occurs from mid-March to mid-April. On average, the trees produce sap for a period of 22.5 days with a sugar content of 2.2%.*

Introduction

Making maple syrup in the springtime has been a tradition at St. John's since 1942 when Father Wendelin Leutmer and his crew tapped 150 trees, collected 1440 gallons of maple sap and boiled it down to produce 45 gallons of syrup (Saupe, 2006). From this modest beginning, the monks and their friends have kept alive this practice for the past 64 years making St. John's one of the oldest maple syrup operations in Minnesota. The syrup-makers must have been pleased with the success of their first season of syrup-making and apparently began planning for the future. Their enthusiasm must have been obvious, especially to a reporter for *The Record* (Mertz, 1942) who accurately predicted at the end of this first season that, "there is evidence that an eventual syrup industry [at St. John's] is in the offing." Indeed, since that first year St. John's has made syrup every second or third year, depending upon when they needed to replenish their syrup supplies (Saupe, 2006). On average, syrup has been made every other year (average = 2.1 years). However, since 2002 the process has been an annual event (Saupe, 2006).

A Benedictine Tradition

In *The Rule*, St. Benedict extolled the virtues of community, worship, work, and stewardship. As you would expect, these values have always been at the heart of syrup-making at St. John's. A reporter for *The Record* noted that "The maple syrup harvest seems to typify the cooperative spirit that helps to make the monastery self-supporting in as many ways as possible" (Mason, 1951). Benedictine stewardship is clearly seen in the long tradition of syrup-making and the care with which the monks have nurtured the "sugar bush," or grove of sugar maple (*Acer saccharum*) trees, that provide sap. In recognition of their careful stewardship of the sugar bush and the rest of their forested land, Saint John's has been certified as "well-managed" by SmartWood using the international standards of the Forest Stewardship Council (Kroll, 2002). Making maple-syrup is a labor-intensive process and traditionally many members of the monastic community have come together to work and pray in the sugar bush and sugar house. It was not surprising for 60 monks and their friends to join together to make syrup (Anon, 1994). And in a true

Benedictine fashion, syrup-making has always been an egalitarian effort. As Father Paul Schwietz stated, "It's a community project...All the monks from the top to the novices work" (Armon, 1988).

One current member of the monastery deserves special recognition for his work in the sugar bush, Brother Walter Kieffer (Fig 1). He has been involved with syrup-making at St. John's in one way or another since he was a student at St. John's Preparatory School beginning in 1962 (Geissler, 2003). In fact, he has participated in nearly 70% of all the syrup-making seasons in St. John's history and served as the leader or boss for many of those years (Saupe, 2006). In recent years Brother Walter has been busy with other responsibilities. As a consequence, in 2001 Abbot John Klassen asked the St. John's Arboretum to take joint responsibility for the maple syrup operation and appointed John Geissler and me as the first lay syrup bosses in St. John's history. Our role was to assist Brother Walter and to run the operation in his absence. John left St. John's in 2004 but was replaced by Sarah Gainey and Bill and Linda Mock who currently serve jointly with me as the syrup bosses.

The St. John's Sugar Bush

The current sugar bush is located at the east end of the radio tower field, by the St. John's Preparatory School athletic fields. Prior to 1970, sugar maples near the current "Mount Carmel ski hill" were tapped. Although central Minnesota is near the north-western edge of the geographic range for sugar maple, hilly sites on campus that are underlain by glacial till provide an ideal refuge for these trees to thrive. The hills and moister conditions minimize the impact of periodic prairie fires and allow the fire-sensitive maples to predominate and out-compete oaks which prefer drier, mineral soils.

When the monks arrived in 1857 sugar maple trees were well established on campus. For example, we know that "[i]n the early [19]20's almost 100 acres of maple-basswood were cleared for pasture, and then later planted with conifers, by Br. Ansgar Niess" (Peterson & Schwietz, 2000). And writing about campus in 1934, Father Alexius Hoffmann, stated that "[l]arge areas were covered with sugar maple trees, which the Indians and early settlers held in some esteem. In spring they used to cut a horizontal gash into the trunk or bole and collected the sweet colorless sap, which was boiled in large pans over a fire and evaporated, leaving a deposit of soft sugar in the pans." With such a plentiful resource, a large-scale maple syrup operation on campus was probably inevitable.

The current sugar bush is approximately 29 acres. This stand, or group, of sugar maples trees is uneven-aged with the oldest trees about 130 years old (Peterson & Schwietz, 2000). The St. John's Arboretum staff under the guidance of Mr. Tom Kroll and assisted by Brother Walter Kieffer, are actively managing the sugar bush for optimal sap production. Sugar maples are thinned to allow the remaining individuals to develop a larger crown since evidence suggests that volume of sap and the concentration of sugar in the sap is positively correlated with the canopy size (Heiligmann *et al*, 1996a). In addition, any non-sugar maples are removed to provide more room for the sugar maples to grow and to make it easier to locate a sugar maple during tapping time. With the exception of a few American basswood (*Tilia americana*), red oak (*Quercus rubra*), white oak (*Quercus alba*), red maple (*Acer rubrum*) and ironwood (*Ostrya virginiana*), "[m]ost of the stand is now sugar maple, mostly 12 to 16 inches in diameter, but with a few trees up to 30

inches or larger (Peterson & Schwietz, 2000).” The most common shrub in the sugar bush is leatherwood (*Dirca palustris*).

Over the years, different sections of the sugar bush have been named – Peninsula, Hollow, Point, Horseshoe. Some areas are tapped annually especially those near the sugar house. Tapping in other sections of the sugar bush depends on the mood of the tappers, depth of snow cover, and the frequency of previous tapping of the site. Although trees can be tapped annually without any adverse effects, we have a surplus of tappable-trees and prefer to “rest” some areas of the sugar bush.

The St. John’s Sugar House

To make maple syrup, sap obtained from sugar maple trees is concentrated by boiling. The evaporator used to cook the sap into syrup is housed in a building called the ‘sugar house’ or ‘sugar shack.’ During the first season in spring 1942 there was no dedicated sugar house on campus. The maple sap was boiled down in open kettles in the woods and then finished in batches in steam kettles in the candle shop under the supervision of Brother Michael Hurth (Mertz, 1942; Armon, 1988). In the fall of that same year the monks began construction on the first permanent sugar house and it was ready for the 1943 syrup season (Anon, 1942). According to *The Record* (Albert, 1959), “Brother Philip Heitkemper, OSB ... built the present housing.” The sugar house was located near the ski hill about one-quarter mile from campus on the west side of the road leading to the footbridge.

The original sugar house was described as a “little green shed” or a “green shack” (Anon, 1948; Roche, 1954). There was a wood storage area at one end with a small loft over it where tired syrup-makers could nap during long nights of cooking. According to Brother Walter Kieffer, “the evaporator that was in use in ‘62 when I started was a 5 x 12’, two-pan unit” (see Fig 2). The two pans were linked by plumbing fittings so that the sap would move from one pan to the other in a continuous evaporation process. The sap entered on one side of the back pan (4’ long x 5’ wide) and the cooked syrup was drawn off from the other side. Brother Walter reports that “The back pan was much like our center pan today with a solid division at a mid-point and each side was baffled.” The front pan, which was 8’ long and 5’ across the stove, had four sections or channels through which sap flowed and was fluted, or flued, on the bottom to increase the surface area in contact with the heat of the fire.

An article in *The Record* (Roche, 1954) stated that the pans were heated by “a 384 cubic foot furnace;” however, this figure is surely incorrect. Considering that the evaporator was 5 x 12 feet, it means that the firebox would have had to be over six feet tall, which it wasn’t (see Fig 3). According to Brother Walter the firebox had a grate on which the wood was placed that was three feet deep by five feet wide (15 square feet). “All of the wood...for the old cooker was cut at [a] 3’ foot length to fit the firebox.”

According to Brother Walter, the roof could be opened approximately a foot on either side of the peak to allow for steam to escape. As a result it’s not surprising that the sugar house was described as “[t]he only building on campus with half of the roof missing” and as a “roofless shanty” (Roche, 1954). This was essential because there originally was no cover over the evaporator pans which meant that the sugar house filled with steam while the sap was cooked. Even with the roof opened for ventilation, “when the operations in the woods are at their peak (boiling

off from 50-90 gallons per hour), it is impossible, according to Brother Julius, to see more than six inches through the steam" (Albert, 1959). The first solution to this problem was to build a framework of wood around the evaporator with a chute that lead to the roof opening. This was covered with plastic in an attempt to direct the steam out of the roof opening (Brother Walter Kieffer, personal communication). Although this improved the sauna-like conditions, the problem wasn't fully solved until a custom-built aluminum cover was installed over the pans which funnelled the steam to a 24 inch-diameter aluminum stack which was three feet above the roof.

In February of 1970 the original sugar house burned down. The origin of the fire is unknown. The following year on Homecoming Weekend in the fall, under the guidance of Father Sebastian Schramel, Father Fintan Bromenshenkel, Brother Marcellus Handorgan, and neighbor Ralph Meyer, construction began on a new sugar house (Armon, 1970). This building (see Fig's 4 & 5) which is approximately 16' x 26' (416 sq ft) was constructed in its current location by the radio tower fields. The Abbey decided to move the sugar house to this more remote location because of the close proximity to an abundance of sugar maple trees and so that it wouldn't be an eyesore in an especially well-travelled area of campus. Construction of the new sugar house was completed in time for the 1972 season. Like the original sugar house, the new building has a loft to provide space for storage and an occasional nap.

Overall the new sugar house was an adequate replacement for the original one with one major exception – loading wood into the firebox was a backbreaking job. In the original sugar house the floor in front of the stove was lower than the main floor (see Fig 3). As a result, to put wood into the original firebox the operator didn't have to bend over very far. To correct this design flaw, the new sugar house was renovated in 1996. Brother Walter, assisted by a variety of individuals including Eugene Eiyneck and Father Richard Eckroth (Anon, 1998), constructed an addition on the south side of the sugar house. The addition was cobbled together "using salvaged tin from the quad roof; timbers from a former Flyntown house; doors from the former kitchen refuse room; [and] glass blocks from the lumberyard" (Anon, 1998). The addition, which is approximately 10' x 18', provided space for wood storage, but more importantly, the floor of the addition was excavated 16 inches below the main floor to make it easier to load wood. However, since the firebox opened to the north-side of the sugar house, the evaporator had to be turned around to take advantage of the lowered floor to the south. Brother Walter enlisted a crew of football players and others to rotate the extremely heavy, cast-iron evaporator. To improve the daytime lighting, the addition included a large bank of windows above the door. According to Brother Walter an added bonus was that the "south facing doors also provided an ice free outside area which the north side did not, especially in the early part of the season."

The front pan was replaced at roughly the same time as the addition was built in 1996. Unfortunately, the replacement was six inches shorter than the original pan which left a gap that needed to be filled. A U-shaped piece of iron was wedged into this opening and it provides a platform for a "quick order grill" where pancakes have been made ever since. Two future improvements to the sugar house would be to add running water and electricity. Currently any water required for cleaning or other purposes must be hauled from the main campus. During the day, the only light inside the sugar house comes through the windows and open doors. Since we spend many nights in the sugar house we must use a gasoline-powered generator to provide a source of electricity for the lighting.

Sap to Syrup – St. John’s Style

The process by which St. John’s makes maple syrup has changed little since the original efforts by Father Wendelin and crew. In early March (average date - March 11) we tap the trees by drilling a hole with a 7/16th inch drill-bit mounted on a modified chainsaw body. The holes are drilled about two inches into the sapwood of the tree at a slight upward angle and then a specialized tube called a spile or tap is hammered into the hole. Historically speaking, St. John’s installs an average of 1397 spiles per season though since 2000 we’ve put out less than half this number. The largest number of taps that we ever installed was 3700 during the 1974 season.

As late as 1985 (unpublished syrup journal) St. John’s put a paraformaldehyde tablet into the taphole to prevent mold and bacteria from plugging the opening and reducing sap flow (Fuchs, 1968; Anon, 1978). However, studies have shown that this is not a healthy option for either tree (or syrup-eater) so the tablets are no longer available (Heiligmann *et al*, 1996b). Consequently, St. John’s abandoned this practice long ago.

A vessel to collect the sap is then hung on the spile. Through the years, St. John’s has used many different types of collecting vessels. Tin pails were originally used but these were replaced by four-gallon, plastic foodservice buckets that were collected from the Refectory and by “sap sacks” which are plastic bags mounted in an aluminum holder. The sap sacks have the advantage of being translucent which allows UV-rich sunlight to help sanitize the sap. The bags also make it easy to see when they need to be emptied. Originally the sap sacks were washed at the end of the season but the ones used in recent years are discarded which, though environmentally unfriendly, saves lots of cleanup time.

One drawback with the sap sacks is that squirrels may damage considerable numbers of them. Squirrels have learned that the bags contain a sweet liquid and that they can nibble the corner to get a drink. During some years, the squirrels destroy large number of bags. For example, in 1982 Brother Arnold Jirik reported in his daily syrup log (unpublished) that squirrels had damaged 500 bags. To minimize this problem the squirrels were sometimes culled as was noted by a reporter for *The Record* (Fuchs, 1968) who stated that the ... “local community of squirrels in Colledgeville has been nibbling on these plastic sacks causing problems for Brother Marcellus and the whole crew. Consequently, the squirrel population of St. John’s has been dwindling rapidly.” Unfortunately, neither shooting squirrels nor coating the bags with a peppery film (Durken, 1994), nor putting out small cakes of salt (Ojeda-Zapata, 1990) have been completely successful. In addition to ruining our collecting sacks, squirrels have damaged significant numbers of sugar maple trees throughout the St. John’s Arboretum (Brogan, 2006). Looking for a sweet meal, the squirrels strip the bark off the trees to expose the sweet inner bark and sap-containing xylem (Fig 6).

Once the vessels fill with sap the crew, with each member carrying two five-gallon pails, heads into the woods to collect it. Typically the first day that there is enough sap to collect is March 19. The vessels on the trees are emptied into the pails. Once the pails are as full as the individual can carry they are transported and dumped into 55-gallon barrels. Most of the barrels in current use were a gift from the Gluek Brewing Company, Cold Spring (MN). The barrels are placed along trails in the sugar bush where the sap is temporarily-stored until it can be pumped into a 175-gallon tank mounted on a wagon that is pulled by a tractor. According to

Brother Stephen Thell, who was involved with syruping since its inception (Anon, 1988), "We used to collect it [sap] with horses" (Armon, 1988). The tractor returns the sap to the sugar house where it is off-loaded by gravity into stainless steel holding tanks that sit above the sugar house. The current holding tanks were donated to St. John's by Dave Strand, Marcel Gapinski, and Roger and Jean Schabel in 2004. On an average collecting day, about 820 gallons of sap are gathered. The most sap that was ever collected on a single day was in 1972 when 2800 gallons were hauled in from the field which required 16 trips with the tractor! On average, we expect to collect a total of approximately 7.5 gallons of sap for each tap and in an average year we collect sap on 12.6 different days.

When adequate sap has been collected, it is cooked into syrup. Cooking is necessary to concentrate the sugar in the sap to produce syrup. It is a well-established fact that sugar maple sap straight from the tree has a sugar concentration of roughly 2.0%. In fact, the average sugar concentration of St. John's trees is 2.2%, though individual trees at St. John's have a sugar content of up to 8.3% (Nunnink, 2004). Since finished syrup has a final concentration of approximately 66% sugar (Koelling *et al.*, 1996), the excess water is removed by the boiling process. The general rule of thumb is that it takes 40 gallons of sap to make one gallon of syrup, or in other words, the sap/syrup ratio is 40-to-one or simply 40. As expected, the average sap/syrup ratio for St. John's over the years is 40.2.

The sap flows by gravity from the holding tanks into the evaporator. The current St. John's evaporator is large – it is four feet wide by 16 feet long. The new evaporator is similar to the original one in that it is also a continuous-flow system and it is comprised of separate pans that are linked by plumbing adaptors. The pans sit in a cast iron frame. One difference is that the current evaporator has three pans rather than two. The firebox where the wood is loaded is at one end of the evaporator and is approximately 4 x 4 x 4 feet in dimension. The chimney is at the opposite end. As the wood is burned in the firebox, the hot air and gasses run the length of the evaporator, up and out the chimney at the far end. The firebox gets so hot that welder's gloves and a face shield are required to load wood. The pan directly over the firebox is called the syrup pan and it is here that most of the water boils off because it is hottest region of the evaporator. The middle pan, which is the smallest of the three and has a flat bottom, is called the finishing pan because this is where the nearly finished syrup is removed. The last or back pan is called the sap pan, because fresh sap from the holding tank enters this pan. The bottoms of both the syrup and sap pans are fluted which increases their surface area for more efficient heat transfer and quicker sap cooking. The evaporator is a continuous-flow system. Fresh sap enters at one end and nearly finished syrup comes out at the other. The advantage of this system is that it minimizes cooking time for the syrup which increases the overall quality. To understand how the continuous flow system works envision the flow of sap as a snake. The head of the snake enters the sap pan and winds its way through the evaporator. As it does it is continually being cooked and becoming more and more concentrated. By the time the head reaches the finishing pan it has been cooked to syrup while the parts entering are still fresh sap.

The depth of the sap over the pans is continuously monitored as it cooks. If it is too shallow, then the sap could boil away too quickly and we risk burning the syrup, and worse, destroying the pans because they will buckle and melt from the high temperatures. On the other hand, if the sap is too deep in the pans it takes too long to cook and the quality of the syrup will be lower. An automatic float valve, similar to the one in a toilet tank, is used to regulate the sap level. We typically run

the evaporator with about 1.5 - 2 inches of sap over the pans; this provides a nice balance between syrup quality and worrying about destroying the pans.

The progress of the cooking in the evaporator is constantly monitored using a hydrometer. The hydrometer, which looks like a thermometer with a fattened base, is placed in an elongated cylinder and hot sap/syrup is added. The height at which the hydrometer floats is calibrated in density units of either Brix or Baumé (Koelling *et al*, 1996). Finished syrup must have a density of 66° Brix or 35.6° Baumé at 68 F°; hot syrup has a density of 32° Baumé. The hydrometer used at St. John's is calibrated in degrees Baumé. Most commercial syrup makers use temperature to determine when the syrup has been cooked. Finished syrup boils at 7.1° F above the boiling point of water (Heiligmann & Staats, 1996). In 2003 St. John's also began to use temperature to monitor syrup status after Mr. John Kroll (Long Prairie, MN) loaned the operation a syrup thermometer. The thermometer is mounted in the evaporator so that the temperature of the syrup is continuously displayed. One drawback with this method is that since the boiling point is related to the barometric pressure, the thermometer must be calibrated at least daily. To calibrate the thermometer we use the hydrometer whereas most operators remove the thermometer and simply put it into boiling water.

We draw the syrup off the evaporator before it is fully cooked. The reason that we need to remove the syrup from the evaporator before it is finished is because it would be too easy to overcook and burn it. The nearly-finished syrup is drained into an eight-gallon milk can. The syrup is filtered as it is transferred to the milk can to remove the "sugar sand" which precipitates during the cooking process. The syrup is double-filtered through two cone-shaped filters, one made of Orlon that sits inside a woollen one. The sugar sand, which typically has a pasty brownish appearance, eventually plugs up the filters so that they need to be changed frequently and cleaned (affectionately called "doing the diapers"). The sugar sand is a mixture of insoluble materials, including calcium malate, which form from the interaction of the trace components of the sap during the boiling process. If the sugar sand is not removed it would form a gritty precipitate that no one would want on their pancakes or ice cream.

The cooking of the syrup is completed on a propane-fired gas stove for better control. The syrup is cooked in batches that average 8.4 gallons. It takes about 2.5 hours to finish a batch of syrup on the finishing stove. Like the evaporator, the syrup in the finishing stove is continually monitored with the hydrometer. If the syrup is cooked too much then crystals may form in the syrup during storage and if it is not cooked enough it can spoil. The finished syrup is filtered again to remove any additional sugar sand that may have precipitated and then the syrup is bottled in gallon jugs. In an average season, St. John's makes 250 gallons of syrup. The most syrup ever produced at St. John's is 560 gallons during the 1985 season. To make this much syrup requires cooking around the clock for multiple days (Albert, 1959). Since 2002 the seasonal syrup production is lower (103.3 gallons), primarily because many fewer taps have been installed. On average, at St. John's we expect to make nearly a quart (0.76 quarts) of syrup per tap.

The maple season typically lasts 22.5 days from the first to the last sap collection. The earliest we've ever collected sap is 26 February (in 1999) and the latest is April 22 (in 1996). Once the weather warms up and the trees stop producing sap we "pull the plug" on the operation. We remove the taps from the

trees, drain the residue in the evaporator, clean everything thoroughly, and pack it all away until the next season.

The Fate of St. John's Maple Syrup

So what happens to all of the maple syrup? The syrup is neither sold in the bookstore nor available in the student Refectory, partly because students in the past preferred artificial syrup (Saupe, 2006). Most of the maple syrup that is made at St. John's goes to the monastery where it is used in the Abbey dining room or rebottled in pint containers to be given to friends of the Abbey (Durken, 2002). Volunteers who help the syrup-makers also receive a sample of St. John's 'liquid gold.' Of course, anyone is welcome to visit the operation in the spring and sample some pancakes and hot syrup straight from the evaporator or to attend one of our Maple Syrup Festivals and enjoy a maple syrup sundae. You can be confident that the syrup is of the highest quality – not just because it was made with special care by the monks and friends of St. John's, but also because our operation is licensed for public consumption by the State of Minnesota.

Magical Moments

In typical Benedictine fashion, syrup-makers have always welcomed visitors to participate in the process or simply to watch and share a pancake and fresh syrup straight from the evaporator. Rita Lange, wife of emeritus professor of mathematics John Lange, is credited with providing the inspiration and batter for the first pancakes to be cooked directly on the evaporator (Durken, 1996). You, too, are invited to join the St. John's syrup-makers as they carry on this long-standing springtime tradition. And we can guarantee that if you join us late some evening, with the full moon shining above and the smoke and steam from the evaporator wafting toward heaven, that you, too, will experience the magic that makes St. John's such a special place (Fig 7).

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Figure Legends

Figure 1. Deacon Walter Kieffer, O.S.B. is one of the maple-syrup makers at St. John's who has been involved with the operation for many years. He is pictured in front of the wood shed near the maple sugar house where a SmartWood certification sign is hung. Image by Stephen Saupe.



Figure 2. Brother Marcellus Handorgan testing the progress of the maple sap cooking in 1966. This image shows the inside of the original sugar house. Image by permission of St. John's Abbey Archives.



Figure 3. Brother John Anderl putting a log in the firebox of the evaporator in the original sugar house in 1955. Note that the stove is elevated about 16 inches. Image by permission of St. John's Abbey Archives.



Figure 4. This image from March 1972 shows the north side of the newly constructed sugar house. Image by permission of St. John's Abbey Archives.



Figure 5. This is a south view of the new sugar house before the addition was constructed in 1996. Image by permission of St. John's Abbey Archives.



Figure 6. Squirrels have stripped the bark from many young sugar maple trees in the St. John's Arboretum.



Figure 7. The sugar house and wood shed look spectacular on a clear autumn day (2005). Image by Stephen Saupe

