

Tapping Into Spring

Hello, scientists!

The school district is excited that you're choosing to engage in authentic learning and learn firsthand why living in Interior Alaska is special. The hope of all educators is that our students will take a love of learning out of the classroom and into the world at large. As you participate in this birch sap tapping project, I hope you'll be curious about what you see and inspired to dig around and find answers to your questions, or even find more questions! As traditional classrooms are closed right now, this project is a perfect opportunity to keep thinking and growing. Have fun!

Melanie Hadaway

Executive Director of Teaching and Learning
Fairbanks North Star Borough School District

Dear birch tappers,

As a scientist, one of the most important things you can do is carefully observe and document your observations. So thank you very much for agreeing to be a citizen scientist participating in Tapping into Spring at home. The data you collect each day of the birch sap season is what drives this project. You may feel, as you're filling out your data sheet each day, that you're only providing information about the one tree you chose to tap. But in fact, you are one of three hundred citizen scientists who will be tapping trees in exactly the same way from Nenana to Salcha and many points between.

After the sap season is over, you'll be able to see your own 'dot' of information in relation to everyone else's—your piece of a bigger picture. Your contribution will help us understand the range of conditions affecting birch sap flow in the Middle Tanana Valley. This is the kind of work that's been going on in Fairbanks for over forty years, with scientists predicting when green-up will occur each spring. It's a unique record in all of North America, and not something done as a part of a well-funded research project. Instead, it has been each scientist's keen interest in their home that drove them to volunteer their time. Your sap data, superimposed on Fairbanks' green-up record, is the next step in documenting the seasonal round of biological activity in our part of the world. This wouldn't be possible without your dedication to the project!

Thank you,

Janice Dawe

Director, OneTree Alaska and K-20 STEAM Education
Institute of Agriculture, Natural Resources and Extension
University of Alaska Fairbanks

Tapping Instructions

What You'll Need

This kit includes:

- one 3-gallon or 5-gallon food-grade bucket and lid
- one all-purpose mixing container (either "HDX 1 Quart" or "1 Quart MEASURE-RIGHT")
- inside the mixing container, a Ziploc bag contains:
 - one spile (also called a tap or spout)
 - one 5/16" drill bit (wrapped in paper towel, secured with a rubber band)
 - one marker for marking the calibrations on your sap bucket with liter measurements
- one 4 oz. jar of birch syrup made in the OneTree Alaska STEM to STEAM Studio
 - the syrup is for a recipe you'll find in the kit, developed by Jill Marcotte for the Fairbanks Birch Sap Cooperative and OneTree

Additional recommended equipment:

- a cordless variable speed drill
- a mallet or hammer to help set the tap in the tree
- rubbing alcohol (70% isopropyl alcohol) to sterilize your drill bit before use
- a small brush or nutpick to clean wood shavings from the tap hole after you drill it

How to Select a Tree

- Select a birch tree that is at least 5 to 6 inches in diameter. Eight inches in diameter is preferred. Look for a tree with a section of clear, unscarred trunk without too much fungus growing on it.
- Look at the entire tree, including the canopy, to evaluate the tree's health. A healthy tree has a full canopy with buds and few injuries. If you don't see any buds, the tree didn't send water to those branches last year. If one side of the tree has a healthy crown and the other side does not, drill on the healthy side or find a different tree.
- If you're tapping a tree that has been tapped before, make sure to place your tap hole at least 6" to the side and 1" above or below the old hole. Over a period of years, you'll make a spiral pattern of tap holes going up the tree. We tap the same tree two years in a row, then let it rest for one to two years before tapping it again.

- Tapping does not usually harm the tree, but any open wound (like a tap hole) increases the chance that the tree may become diseased or infected, so we don't recommend tapping your favorite birch tree in the front yard!

What Taps Do and Storing Your Kit

The taps we use have three important functions:

1. Transfer sap from the tree into your bucket.
2. Support the weight of your 3- or 5-gallon bucket.
3. Create a seal around the hole to prevent leaking and keep fungi/bacteria out.

Our taps are hookless and act to hang the bucket securely on the tree. The taps in your kit have been washed, rinsed, and sterilized in alcohol. Make sure to get all the debris and wood shavings out of the spile at the end of the season. Then wash, rinse, sterilize, and dry. Put the whole kit away in a cool, dry place; wrapping it in plastic is best. You'll be ready to go the next tapping season.

Tapping Your Tree

1. Choose your spot
 - Sap flows vertically, so you want to find a healthy spot on the trunk of the tree that doesn't have any injuries or knots directly above or below it. Check the north side of the tree first. Hanging the sap bucket on the shady north side of the tree will help the sap stay cool in the warming spring sun.
 - Keep tap holes at least 6" from old branch scars and other wounds. Try to avoid decayed or discolored wood. Healthy wood will leave light-colored wood shavings on your drill bit. If your drill comes out with brown sawdust, abandon that tap hole.
2. Prepare your drill
 - Sterilize a 5/16 inch drill bit using 70% isopropyl alcohol. It is important to use a sharp bit and to keep the bit as clean as possible.
 - Mark your drill 1" to 1.5" from the end so you don't drill further into the tree.
3. Drill your tapping hole
 - Drill at a comfortable height for lifting your bucket off each day at sap collection time; 3' to 4' up is sufficient. Angle the tap hole up (but no more than <math><10^\circ</math>) so that gravity assists the sap in flowing out of the hole.
 - Make the hole as quickly as possible, without stopping the drill or allowing it to spin excessively in the hole (start drill, in-out, stop drill). Get any leftover wood shavings out of the hole before you secure the spile. You can use the drill bit, a small sturdy stick, tweezers, etc.

4. Secure the tap
 - You will not need to use excessive force to secure the spile. Gently tap it with a hammer and watch it sink in. When it becomes harder to tap with your hammer, stop. You want your spile to be secure, but not jammed against the back wall of the hole. If you're concerned that it's against the back wall, pull it out slightly.
5. Hang the bucket
 - Now hang your bucket and place the lid on top. If your lid has a hole in it, cover it with tape to keep rain out.
6. Monitor your tree
 - Sometimes you'll notice a little sap leaking out from your tap hole right after you've drilled it. That's normal, and it should stop after an hour or so. If it is still leaking the next day, you can give the spout another gentle tap or two.
 - Come back the next day to check the bucket. You will need to check it at the same time daily. If you notice your bucket filling to the brim, empty it twice a day. Record how much sap you get over each 24-hour period.

Collecting Sap: Best Practices

- Fresh sap is high-quality sap, so collect sap every day.
- Filter the sap to remove bugs, dirt, twigs, etc. (Note: Each time you handle the sap, it is helpful to run it through a cheesecloth, coffee filter, paper towels, or clean white material. In addition to sugar, sap has minerals in it that settle out each time it's heated and cooled.)
- Process each bucket of sap within 24 hours, if possible, to prevent the natural fermentation of the sap from introducing unusual flavors into the syrup. If you can't process the sap right away, keep it cool until you're ready to work with it further.
- Sap should be clear, with no color—just like water! If, later in the sap season, your sap turns cloudy, check to see if it tastes good. If it makes you "burpy," that indicates the presence of yeast, and you might not want to use it. If there is a tinge of yellow, but it's mostly clear, also do a taste test. Do you like the taste? This is your sap, and at the end of the day it's your call. However, if your sap is cloudy AND yellow, toss it!

From Birch Sap to Syrup

Sap fresh from the tree is only 1% sugar (or 1° Brix). It tastes like water but is just a bit sweeter. You can drink your sap if you don't want to boil it into syrup. If you decide to make syrup, you'll be concentrating the sugar in the sap by evaporating the water. (Finished syrup has 68–70% sugar or 68–70° Brix. If you have a sap hydrometer and want to measure your Brix, please contact OneTree Alaska for further instruction.)

In the OneTree kitchen, we're lucky to have equipment that handles birch sap delicately and reduces time on the flame. The most important step occurs before the sap is boiled, when it's

run through a reverse osmosis unit to squeeze out about 85% of the water in the fresh sap. This greatly reduces the amount of time the sap needs to be boiled and produces a lighter-colored and more delicately flavored finished product.

After reverse osmosis, sap is boiled hard to begin the caramelization process in a large, shallow stainless steel pan called an evaporator. Evaporators have dimensions that maximize the surface-area-to-volume ratio of the liquid being processed. This helps speed evaporative rate. After about an hour of hard boiling, we use either electric, wood, or steam heat to finish the evaporation process. We find these the best ways to guard against scorching.

Ideally, the entire process of converting a batch of sap to syrup can be carried out in one day, and we try to process all sap within two days of it being harvested. If we can't keep up with the rate of sap intake, we freeze the sap for later processing.

You may not have our commercial equipment, but you can still make excellent birch syrup at home! Below are two methods of evaporating sap to syrup. Choose whichever suits the equipment you have on hand best.

Two-Stage Evaporation Process

Boil the sap in a stainless steel pot, or an enamel pot, over a wood, gas, or electric heat source. If you have a pot big enough, bring around 4 liters of fresh sap to a full, rolling boil. It will take one to two hours to boil down. Make sure to use a big pot that is no more than 3/4 full. The sap can overflow when it starts to boil, and sugar water is hot, sticky, and can burn you!

Put the heat on the highest setting to get started. When the sap first begins to boil, you may notice that it smells like baked bread. The longer the sap boils, the sweeter it smells. As the water evaporates, the concentrate will begin to take on an amber color.

Continue to boil the sap until there's very little liquid in your pot. The goal is to remove 80% to 90% of the water. Watch it closely, as evaporation happens quickly when the liquid gets low. As a precaution, turn off the heat when there is one inch of liquid left in your pot to keep from scorching your syrup. Take your batch off the heat and transfer it to a closed glass or plastic container. Once it's cool, store it in your refrigerator overnight.

Repeat the same process the next day with another 4 liters or so of fresh sap (or less if your tree isn't producing that much). At the end of the day, cool your sap concentrate and combine it with your sap concentrate from the day before. Keep boiling a new batch every day.

After collecting three to four days' worth of sap concentrate in your refrigerator, it's time for the second phase of the evaporation process. You can carry out this phase in a crockpot. Put the concentrate in the crockpot with the lid off, set it at low, and let it slowly evaporate. Or you can use a pan on the stovetop for this second phase. Add the concentrate to your pan, about half to 3/4 full, and bring it to a simmer. Keep it just below boiling and watch it like a hawk!

When there's only one inch of sap concentrate left in your crockpot or your pan, turn off the heat. Let the liquid cool. Dip a spoon in the liquid, and let a full spoonful drip back into the pot. Is the liquid getting thicker and darker? How does it taste? Is it syrup yet? You're the syrup maker! To get the texture and flavor you want, you may need to cook it down a bit more.

Evaporating Sap Entirely in Crockpot

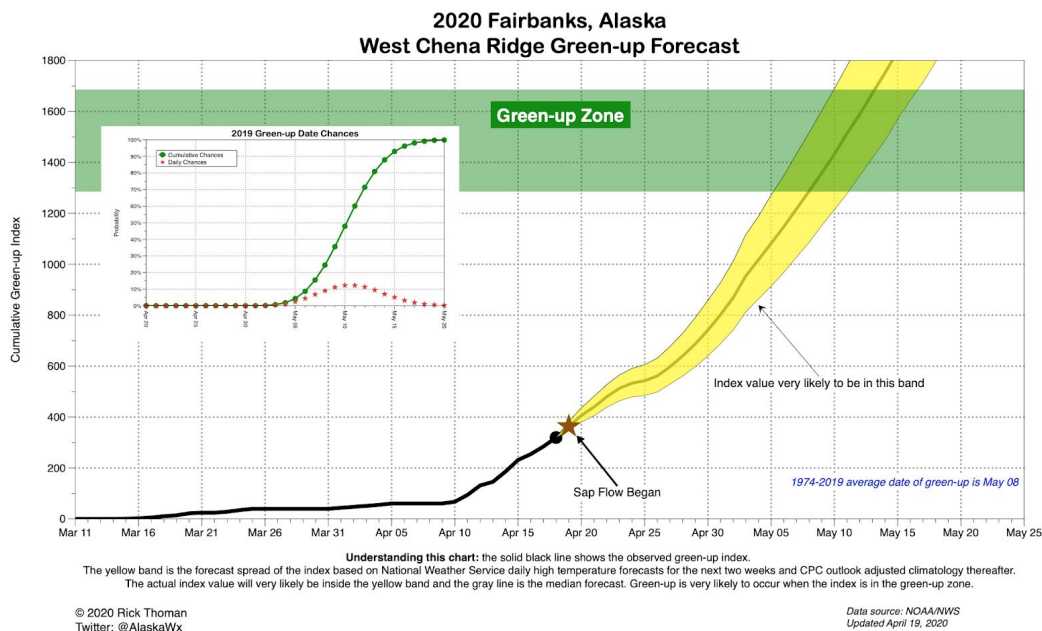
You can also process the sap entirely in a crockpot. Here are Julie Kaufman's notes about that process:

- We started tapping two trees in mid-April of 2018, and the flow lasted around a week. At the height of the flow, the buckets were filling up in less than 24 hours. We used a medium-sized crockpot to reduce the sap. The crockpot was set on low with the lid off.
- This process went on 24/7 throughout the tapping season, and we refilled the crockpot daily as the sap reduced. I'm guessing that in total we were able to harvest and process around 25 gallons of sap, and we ended up with about two pints of syrup, which was delicious!

Know When to Set and Remove Your Taps

It's all about degree days, the accumulation of maximum daily temperature units above the base temperature of 32°F, starting on March 1! This section will be developed in the coming days, and we'll send it to you electronically. Up through today, we've needed all the time we had to gather the components and build the kits in time for you to get them before the start of the tapping season. But here is the most current forecast from Rick Thoman for both green-up and the start of the sap season (the probable start of sap flow will occur between April 17–24).

The sap season generally lasts two to three weeks, depending on the weather. As soon as the sap starts flowing, you can drink, boil, or share your bucketsful of delicious birch sap. Enjoy!



Nutty Oat Shortbread



- 3 c plain rolled oats
- 1 c roasted almonds or unsweetened coconut shreds
- 1/2 c melted butter
- 1/2 c granulated sugar
- 1/2 c birch syrup
- 3/4 t salt

1. Heat oven to 350°F and grease an 8-inch square pan.
2. In a blender or food processor, grind oats and nuts/coconut into a coarse flour. (A few unground oats are perfectly fine.) In a mixing bowl, mix the coarse flour with salt, then add the butter, sugar, and syrup. Stir until combined, then press firmly into the prepared pan. Cover with foil and bake for 20–25 minutes, until the edges are browned.
3. Immediately cut into pieces. Leave in the pan until cool enough to handle, then remove to cool completely on a rack. Serve at room temperature.

Note: If you have friends with dietary restrictions, this recipe is pretty flexible. By replacing the almonds or coconut with plain oats, and replacing the butter with a dairy-free margarine, this is an easy nut-free, dairy-free, gluten-free, vegan-friendly treat.

Note: A half batch of this pressed thinly into the bottom of a pie pan makes an excellent gluten-free graham-style pie crust. Bake at 425°F under foil for 10 minutes or until it begins to brown.

This recipe is from A Forest in the Kitchen, a cookbook all about the delicious uses of birch products, written in collaboration between OneTree and Jill Marcotte. Jill is an enthusiastic home cook slowly turning her property into a small farm. Along with her three Pearl Creek Puffins, she thrives on a steady diet of books and what-if questions.

Personal Reflections about Tapping into Spring

Barbara Sivin

Education Specialist BEST | Fairbanks North Star Borough School District

I've been involved with the OneTree program for many years; I love to introduce my students to the magic of the birch forest. The forest and surrounding area take on new meaning when the students learn about and interact with the trees throughout the seasons. They become connected to the trees, stewards of the forest. The look on their faces when they see that first bit of birch water in the bucket and taste their first mouthful of sweetness is priceless.

Karin Robinett

CyberLynx Homeschool and Correspondence Program

I have had the pleasure of working with OneTree Alaska on several occasions. I'm excited for my students to tap birch trees for many reasons. They will be outside doing real life learning in nature, beyond the limits of a textbook. They will be collecting and interpreting data. They will have the opportunity to make observations and to create and test theories. And...my favorite yet...they will be able to enjoy a local, natural, minimally processed, delicious sweetener.

CyberLynx students from Eielson Air Force Base to Nenana and everywhere in between are participating in this opportunity. There are kindergarteners through tenth graders participating. I am grateful for this opportunity that reaches far and wide through communities and ages.

Chris Carlson

Pearl Creek Elementary, 4th Grade Teacher & The Pearl Creek Birch Tapping Teachers

Pearl Creek Elementary is located in a forest of birch and spruce trees, and every year our students take part in this wonderful outdoor learning opportunity that helps emphasize the importance of natural resources, sustainability, and using the scientific method to turn data into useful information. In recent years, this outdoor activity has been a memorable school-wide activity that has instilled a sense of community and provided a learning opportunity in applied science. This year, we have over fifty participants, some from almost every classroom. Get ready to TAP THAT SAP!

Liz Kane

Anne Wien Elementary, First Grade Teacher

I am blessed to be the teacher of twenty-three first grade scientists at Anne Wien Elementary. I had planned to spend hours outside observing and noticing and wondering about the changes

taking place in the natural world as we say goodbye to winter and welcome spring. I am so thankful my students will have this opportunity to witness up close the awakening of the trees through participation in this project. I have never tapped a tree and I have to admit to being pretty excited myself to witness the running of the sap—and sampling it too!

Susan Kerndt

Boreal Sun Charter School, Fifth Grade Teacher

My class has been tapping birch trees with Jan's program since they were in third grade. They love going out into the woods and watching the drip-drip-drip of the sap when it gets flowing, and best of all, they love to drink the sap fresh from the tree. They call it their spring tonic! The best thing about this project is that the students learn so much about their environment. They learn about the structure of the birch tree and trees in general and about what the sap really does for the tree. They learn as they observe the spring changing all around them, because they go out each day and watch. They learn about the cooking process as they watch the water evaporate out of sap and turn into the golden color of syrup. And oh...to watch their faces as they taste the sweet juice of all their efforts is worth every moment.

Marlene McDermott

Watershed Charter School, Kindergarten

As a kindergarten teacher at Watershed, I have been lucky to have worked with Jan Dawe at OneTree since we opened the school in the fall of 2009. In addition to many other OneTree projects and citizen science opportunities, we have always chosen to be part of the birch tree project, Tapping Into Spring. For my students, it is the culmination of a year of learning about plants, more specifically the birch trees in our school neighborhood. Every year when school begins, our kindergarten class chooses a couple of nearby birch trees to study throughout the year. In addition to weekly visits to the trees, we do observations, make measurements, and study their phenology. This spring, sadly, my students are not at school, and yet we have been talking about and awaiting this project all year. I am excited that many of my students' families have chosen to take part in this birch tapping opportunity!

Ronda Schlumbohm

Salcha Elementary, Second Grade

I teach in a rural school south of Fairbanks. Salcha is surrounded by the boreal forest, and it has always been a priority to teach children what types of plants they see on the trails around the school and in their backyards. I strongly believe it is imperative that I teach about how important the ecosystem is in Alaska, because I want children to grow up and not take it for granted. These children will become the stewards of our great land.

Studying trees helps me personally because it gives me an outlet to reach children with a true citizen science opportunity. So far, I have been surprised and happy about how far my reach has gone. From Salcha to Fairbanks, people are asking questions!

OneTree Alaska Birch Sap Crew

Sayako Kanie

Graduate Student, University of Alaska, Fairbanks

My name is Kanie, and I'm a graduate student working with OneTree Alaska. Thank you all for joining OneTree's Birch Sap Cooperative this year. Welcome back to those who tap birch every season, and congratulations to those who will be tapping for the first time! I was thrilled when I heard that this year's Birch Sap Cooperative would be special, with everyone from a wider area in the Interior and K-12 citizen scientists all on the same team.

When I came to the University of Alaska Fairbanks and encountered OneTree Alaska, I was honestly naturally inspired* by authentic birch stands and tasty sap. I wished to work on a big project like this, seeking birch sap's possibilities as an educational inspiration, while building a scientific database about Interior Alaska white birch sap flow. Long story short, I decided instead to work in the OneTree research garden in the T-field on campus for my master's thesis and am successfully graduating this semester, thanks to everybody's support! Although I am graduating, I can still work with Interior Alaska white birch and OneTree Alaska this season, even if remotely, and support the creation of the citizen science database. I am excited to work with birch trees and the people who love them once again.

* "Naturally Inspiring" is the motto of the University of Alaska Fairbanks!

Chelsea Brown

Citizen Science

Hello, sap lovers, my name is Chelsea and I graduated from UAF in 2018. My passion lies in animal science, wildlife, and marine biology. I'm really excited the sap season could go forward during this difficult time. I'm a part of this sap cooperative because I appreciate the commensalistic* relationships we can have with nature. The relationship we have with wildlife around us is just like the relationships we build in our communities. With respect, we can all thrive. I understand the importance of community even more after returning from China, where I was teaching English. In a country where I thought I would be all alone, I found many expats in similar positions and, as a group, we encouraged each other every day. I hope this cooperative can be that to many during COVID-19. Tapping is fun and interactive, and there is so much to learn from our birch trees. Let's learn and experience together!

* Commensalism is a type of relationship between two living organisms in which one organism benefits from the other without harming it. A commensal species benefits from another species by obtaining locomotion, shelter, food, or support from the host species, which (for the most part) neither benefits nor is harmed. (Wikipedia)

Shaun Johnson

Sugar Master

Planet! Plan it! Plant it! I asked a crow once if I should plant trees. The crow said, "Caw." So I still don't really know, but from watching Jan care for her baby trees in the OneTree studio, it seems like a pretty good idea.

Pearson Brodie

Co-Sugar Master

Born and raised in Kodiak, I have always had a strong connection to the forest, the ocean and the wilderness/nature that flourishes here in Alaska. I came to Fairbanks to study chemistry at the University of Alaska Fairbanks. I chose chemistry because I wanted to better understand the fundamentals of the world around us. I first started volunteering with OneTree Alaska in 2017 and was named the Co-Head "Sugar Master" by the spring of 2018. In just a short amount of time, my skills and involvement have made me a valuable asset when it comes to processing sap and making syrup. I've also helped with educational workshops and various other technical work around the studio. Every year I return to Fairbanks for the sap season in the spring. With the chemical knowledge I've acquired at UAF, I've been able to improve OneTree's syrup-making methods. I would have never expected to be using my degree to work with sugar!

Seva and Maria Romanov

Owners and Operators, Royal Brew Kombucha | Participants, Fairbanks Birch Sap Cooperative

Hello, fellow tappers! This is our second season of tapping birch trees, and a little over a year since we were first introduced to OneTree. We have had a busy winter of research & development for our business. Just as COVID-19 has affected many other Alaskan businesses, it has affected ours too. We had originally hoped to debut our kombucha the beginning of May, but we are now uncertain when the official debut date will be. Even with the setbacks, we are excited that the sap cooperative is able to proceed in a limited fashion. In this time of crisis, community collaboration is needed more than ever. OneTree continues to encourage and maintain these important community connections during these hard times. We look forward to continuing our collaboration with OneTree. Happy tapping!