Nature Guides

The Sap is Rising!

Early March

Note: Spring's coming, but it's not here yet...as you can tell from all the recent snow! We'll spend a lot of this month searching for signs of spring, which, particularly early in the month, many not be all that obvious. It also rolls out across our province at different times, so I may mention events a bit early to catch our southernmost readers. It will officially be here in Ontario (Spring Equinox) on March 20 at 1:32PM (DST), except in the far northwest. Consider having a celebration!

Top R4R Picks

Resources for extending the learning

Five Minute Fieldtrips

Elementary, Middle

See"Make A Tree" and "Be A Tree"

Featured Event: The Sap is Rising!

Nothing seems to unify Canadians around spring in the outdoors more than maple syrup season, which by mid-month or sooner should be in full swing in many parts of Ontario, including the GTA and other areas (go to the lower left column on the GTA page for other regions).

Maple syrup was first collected by Native Americans and has been appreciated for a long time:

> There is in some parts of New England a kind of tree...whose juice that weeps out of its incision, if it be permitted slowly to exhale away the excess moisture, doth congeal into a sweet and saccharine substance.
>
> Robert Boyle
> *Philosophical Works* (1663)

But how does it work? Why does sap "rise" at this particular time of year in this particular kind of tree? To answer this question, we first must review the parts of a tree, in particular the xylem and the phloem. The phloem is a thin layer of living cells just under the bark that carry sugars down from the leaves to the rest of the tree. The xylem is a wider band of sapwood just inside the cambium that carries water, nitrogen and minerals up the tree, pulled along by the gentle tug of evaporation as water leaves the leaf pores.

But two things are very different in the spring: it's the xylem that contains the sugary sap, not the phloem, and there is no way, with the leaves missing, to 'pull' it up the trunk. In addition, root pressure is not involved – pieces of living Sugar Maple stem by themselves, standing in water, can be made to create sap flow.

What does happen is linked directly to this specific time of year, when nights fall below freezing and days warm above it. Take away either of those conditions, and sap does not rise. What happens is this. First, in the fall, sugars are transported down into the stems and converted to starch. In the spring, during the warm days, living cells convert that starch into sugar. They also generate carbon dioxide gas. This gas diffuses into the xylem. As the temperature cools,

the gas dissolves, lowering the pressure and pulling the sugary water from the living cells into xylem. This water is replaced from adjacent cells, which form a conveyor belt for water down to the roots. As night comes and the temperature drops further, water freezes along the inside walls of the xylem and in between its cells. The remaining gas is compressed and locked in this ice. With morning, things warm, the gases expand and force the now liquid sap out of the trunk or stem and into the tap. As the day cools in the afternoon, the process repeats itself. For more details, go here or here. The process stops when the temperature remains above freezing and the buds begin to open.

Only a few trees besides Sugar Maples contain the correct cell structure to produce this kind of temperature-related pressure, and include Butternut. If you're from the northwest and feel like you've missed out on a childhood tradition, pout not -- syrup can also be made from birch trees , but the sap flow comes later in Spring and is dependent on root pressure.

Red Squirrels discovered this process long before we did. They will nip at a twig to start the flow, then go away for a day or so to allow some water to evaporate and the sugars condense before coming back to consume the thicker sap. It may have been observation of this behaviour by indigenous peoples that led to their development of the syrup-making process.

Related lesson plans can be found at the bottom of this page.

Other Happenings:

- March is a month of weather extremes. Keep track of temperature highs and lows, and compare the amount of snow received to the amount of rain (1 cm of snow is roughly equivalent to 1 mm of rain). Here, temperatures can range over 50^0C. Test out the folk wisdom that if March "comes in like a lion", it "goes out like a lamb", and vice versa.
- The birds are returning, led by American Robins and male Red-winged Blackbirds (female). Not only mark the first Red-wing, but check out where they are and what they do. Do they go straight to the cattails? When do males begin to call? Where do they go in bad weather?
- Robins have already been seen in southwestern Ontario. New arrivals are brighter and perkier than any overwintering birds, but when do you know that *your* Robins have arrived? The best way is to listen for their breeding call, which males will only use to establish and hold their territories, often early in the morning. Of six different Robin calls, only two are territorial. Report the first Robin you hear to the Journey North website.
- Migrating ducks will be returning to almost any stretch of open water. Early in the month, look for Bufflehead (female). Hooded and Common Merganser and Common Goldeneyes will return too, though some also overwinter in southern Ontario. Get ready and brush up on your waterfowl ID skills.
- If you haven't already repaired and clean out any nest boxes, it's time to get to it before nesting activities begins.
- American Crows are already pairing and searching out nesting sites. Males will fluff up their body feathers and bow repeatedly to the female. Also keep an eye out for flying pairs, and stick carrying. Do you have any pairs around your school? Nests are generally built high up in evergreen trees.
- This is the best month of the year for owl calls. Great Horned (now nesting), Eastern Screech- and Barred Owls will vocalize, and will be joined by Northern Saw-whets passing through on migration. Great Horned Owls don't build nests, but rather use abandoned nests of other large birds, e.g. Osprey. Here's the adventure of one displaced hatchling.
- One of the first smells of spring (and much better smelling than skunk) comes from Balsam Poplar buds, where protective resin is softening in the warming sun. Find some, pinch the buds gently, then smell your fingers. Red and Silver Maples will also begin flowering shortly.
- Taking up where his grey cousins left off, the male Red Squirrel can be seen chasing females through the trees. Chipmunks may also pop up, shaking off the effects of their long, on-again off-again, winter's nap. Food is not the issue. Mating is.
- Ice out, another rite of spring linked to biodiversity, will occur sometime during March on local lakes, ponds and streams. Mark the date of your local water body for future reference, and report the information to IceWatch.