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## **The perfect tree**

The annual gathering of the sweet sap of the sugar maple has always been a powerful symbol of this time of transition between winter and spring. Accordingly, a visit to the sugar bush is a wonderful way to witness spring's arrival.

The sugar maple is the perfect tree, characterized not only by its first-rate wood but also by its symmetry and colour. Like all maples, every bud, leaf and twig have an identical partner growing on the opposite side of the branch, unless, of course, it has been broken off. Even the tree's winged fruits are paired together in a U shape. By early May, the trees are shrouded in a pastel cloak of thousands of yellow flowers that soon fall and cover sidewalks, driveways and roadsides in floral confetti. And, come October, the scintillating oranges and yellows of the leaves set city streets and country vistas ablaze like no other tree can do. However, in March, our attention turns to the maple's delectable sap and syrup.

As with all trees, the sap of the sugar maple is a mixture of water and minerals taken up from the ground and sugar that has been stored in the wood. Although sap is present in the tree all year long, it is only sweet enough to make into syrup for a few weeks each spring. To understand the whole process, we have to go back to last summer. Chlorophyll, the magical green pigment of the leaves, uses energy from the sun to convert carbon dioxide and water into sugar and oxygen through the process of photosynthesis. The sugar is converted into starch and serves as the tree's food reserve to fuel growth. Excess starch is stored in the wood and, over the course of the winter, converted to sucrose. As spring approaches, the sucrose dissolves into the sap to be used to fuel the tree's spring growth. A good sap year therefore depends to a large extent on the growing conditions of the previous summer.

The sugar content of sugar maple sap is generally two to three percent but can be as high as seven. Although other maples, such as the red and the silver, can also be tapped, their sap is not nearly as sweet, nor does it have as pleasing a flavour. Amino acids in the sap of the sugar maple give the syrup its distinctive taste.

Sap collection proceeds in fits and starts depending on the vagaries of the weather. It can last from a week to nearly a month. In order to have strong sap flows, a suitable temperature cycle of warm days (2 to 7C) and cool nights (-4 to -6C) must develop. When the days are warm, pressure in the trees increases. This causes a sap flow from all directions - not just from the roots up but also from the upper branches down. As long as the tree's internal pressure is greater than the atmospheric pressure outside, the sap will move. The sap flows through an area of the outer tree trunk called sapwood, where actively growing cells conduct water and minerals from the roots to the branches. In order to gather the sap, a hole about 8 cm long is made in sapwood and a metal tap is inserted. The hole can be thought of as a "leak" in the tree to which sap flows.

At night, when the temperature drops to below freezing, the tree's internal pressure becomes less than the surrounding air pressure. Suction develops and water and minerals are sucked up into the tree by the roots. The tree is essentially recharging itself, allowing for sap to flow during the next warm period.

To produce high quality syrup, the sap must be boiled down as soon as possible after it is taken from the tree. Consequently, it is common for sugar makers to be up all night boiling sap, especially if the "run" is strong. It generally takes 30 to 40 litres of sap to produce one litre of

syrup. As soon as the buds begin to expand and open, the sap becomes off-flavoured or “buddy” and is no longer gathered.

Humans aren’t the only ones interested in maple sap and syrup. Red squirrels have long known about the maple’s sweet secret. If you visit a sugar bush, watch for signs of squirrel activity such as tiny incisions in the limbs, dripping sap or hanging “sapicles”. Using their sharp incisors, squirrels will puncture the bark of maple branches in order to initiate a sap flow. By doing so, they are actually harvesting maple syrup. After the water in the sap has had time to evaporate, dark streaks are left behind on the bark which can be as high as 55 percent in sugar concentration. The squirrels return to these streaks to lap up their sweet reward.

Flowing sap attracts a variety of insects and birds. On warm days, you may see noctuid moths and butterflies such as the mourning cloak. Because tree sap is one of the mourning cloak’s main sources of food, it’s an advantage for these butterflies to arise so early from hibernation. Mourning cloaks can sometimes be seen lapping up sap oozing from the stumps of trees that have been cut down over the winter.

Yellow-bellied sapsuckers, a migratory woodpecker that arrives back in the Kawarthas in April, will often drill a series of horizontal, pit-like holes in the bark of maples, birches, hemlocks and other trees. The sapsuckers then feed on insects that are attracted to the sweet liquid seeping from the drillings. These birds will also dine on the sap itself, hence their name. When early May rolls around, ruby-throated hummingbirds, too, will visit sapsucker holes for both sap and insects.

It’s hard not to worry about the future of the sugar maple, a tree that provides humans and the rest of the natural world with so much. Maples, like so many of our trees, are under assault on multiple fronts. From gypsy moths, acid rain and increased solar radiation as a result of ozone depletion, to the threat of climate change and Asian longhorned beetles, we can only hope they will be able to withstand the onslaught.

What to watch for this week:

In early spring, half-crazed cardinals and robins often peck at or fly up against windows in an attempt to drive the “invader” - their reflected image - out of their nesting territory. Fortunately, after a few weeks, hormonal changes will make the birds less aggressive, and they soon forget the problem.

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