



Maple syrup producers across the Midwest have noticed changes in their sugarbushes in recent years, such as earlier tapping seasons and the arrival of new invasive and competing plant species and forest pests. We expect these and other changes to continue in the coming decades. By being flexible and adaptable, you can be a good steward of the land, ensuring that your sugarbush thrives for many years into the future.

This sugarbush adaptation guide provides descriptions of current and future environmental challenges along with concrete actions you can take to address them. The challenges are interrelated, so you'll likely want to focus on several of them together rather than considering each separately.

Think of this as a "menu" of choices. Whether you're just starting out or have decades of experience, whether you tap a handful of trees or thousands, you can adopt the strategies that make the most sense for your operation. The menu is not comprehensive—your firsthand knowledge of your sugarbush may give you additional adaptation ideas. Find links to resources related to each section of the menu at maple.extension.wisc.edu/adaptation-menu.

Earlier Tapping Seasons

On average, tapping seasons are starting earlier now than they did a few decades ago. The exact timing, which has always been somewhat variable, is becoming even more unpredictable. These trends will continue.

What you can do:

- Begin watching the forecast earlier in the year and be prepared to tap trees sooner than in the past.
- Consider using a tubing system if you don't already. It's more sanitary than buckets and bags, so you can tap earlier without sacrificing late-season sap. Bacterial growth will still cause sap yields to gradually decline by the end of the season, but this loss will be much smaller than it would be with buckets or bags.
- Practice good sanitation habits to get a higher yield. Clean your tubing in the late fall and use new, sterile spouts each year (or use sterilizable stainless steel spouts).
- Once the syrup season begins, run your vacuum system (if you have one) anytime the temperature is above freezing.

More Deer Browsing

Deer populations are rising in many parts of the Midwest, which means that deer browsing is hindering forest regeneration. Deer browsing does not threaten mature maple trees, but deer do sometimes damage tubing systems.

What you can do:

- If you want to encourage maple regeneration in an area of your sugarbush, build a deer enclosure to keep out the deer. This will give your saplings a better chance of growing.
- When harvesting timber, create a slash wall out of slash and low-value tree tops to keep out the deer and protect your tubing. Or, rather than building a full slash wall, you could create smaller physical barriers using tree tops or slash to protect young trees.
- If you have a small sugarbush with light to moderate deer browsing, apply a food-safe deer repellent spray—but keep in mind that this will not completely eliminate browsing, and you may need to reapply the repellent once or twice in a season.
- During deer hunting season, encourage people to come hunt in or near your sugarbush.



Reduced Winter Snowpack & Increased Spring Frost

As winters get warmer, you can expect less snowpack on the ground. Without this insulation, trees with shallow roots such as sugar maples could be injured when their roots freeze. Later in the season, early spring warmth may cause trees to break bud before the last frost, which raises the risk of frost damage. Milder winters also shorten the reliable operating season for forest management.

What you can do:

- Monitor the health of your woods closely. Reducing the other stresses on your trees will make them more resilient to damage from freezing temperatures.
- Work with a forester to create a forest management plan for your sugarbush.
- If you notice unhealthy trees in your woods, contact a state forest health specialist to diagnose the causes. Then work with your forester to address the issue.
- When scheduling forest management activities, consider ground conditions (frozen or dry is best) instead of relying only on calendar dates. By doing this and following other best practices for forest management, you can reduce soil damage and erosion.

Changes in Soil Composition

Sugar maples require nutrient-rich, moderately moist soils. Earthworms are great for composting and gardening, but they harm Midwestern forests and are not native here. By eating leaf litter and mixing the layers of forest soil, earthworms deplete it of nutrients, which causes tree branches to die from the tips backward (dieback) and makes it harder for maple seeds to start growing. Earthworms also cause the soil to dry out faster and precipitation to run off, exacerbating the effects of drought and extreme rainfall. Additionally, acid rain in recent decades has made the soil more acidic in many forests. Acidic soil and the associated lack of calcium can harm sugar maples by making canopies less vigorous and causing branches and seedlings to die.

What you can do:

- Test your soil composition and acidity—start by contacting your local USDA Natural Resources Conservation Service office. The University of Wisconsin Soil and Forage Lab and the University of Minnesota Soil Testing Laboratory will also analyze soil samples. The results will help you know which tree species are most likely to thrive in your woods.
- If your soil is too acidic or lacks nutrients, consider applying lime or fertilizer to the soil. Maple producers in Canada have applied lime by hand, with a mechanical spreader, or from the air. Some companies offer wheeled mechanical spreaders for sugarbushes that can be pulled by tractors or all-terrain vehicles.
- Before traveling between woods, clean your boots and gear and power-wash the undercarriage of your vehicle to get rid of dirt and debris that could hide earthworm cocoons. When fishing, never discard worms in the environment. And avoid moving soil when transplanting plants. These steps will help slow the spread of earthworms. Once in a forest, earthworms are very difficult to eliminate.
- Look for earthworms in your sugarbush. If you see bare mineral soil with not much leaf litter—a sign that earthworms are abundant—take extra care to avoid spreading dirt and debris to other woods.



TAP RED MAPLES

Tapping red maples in addition to sugar maples is a great way to make your operation more resilient. Red maples are expected to flourish in the Midwest in the coming decades. Compared to sugar maples, they can tolerate a wider range of moisture conditions and don't need as nutrient-rich soil. Red maples with deep, wide crowns can be just as good for sugarmaking as sugar maples. This is true even though red maples sometimes bud out earlier in the spring than sugar maples. On the other hand, red maples are less valuable for timber than sugar maples, so talk with a forester about the pros and cons of encouraging red maples in your sugarbush.



More Invasive Species

Changes in weather patterns are making conditions more favorable for invasive species (including plants, animals, and diseases) that might compete with or damage your maple trees. These species are often spread by human activity.

What you can do:

- Learn how to identify and manage invasive species.
- Learn how to manage or remove buckthorn and garlic mustard, common plants that interfere with maple regeneration.
- Pay attention to nationwide trends on non-local species—some species might cause trouble in other regions before arriving in the Upper Midwest.
- If you notice an invasive species in your woods, take photos, note the date and location, and contact your local Extension agent or state forester to report the sighting.
- Before traveling between woods, clean your boots and gear and power-wash the undercarriage of your vehicle to get rid of dirt and debris, which might hide insects and eggs. This will help slow the spread of unwanted species.

More strategies to build resilience in your woods:

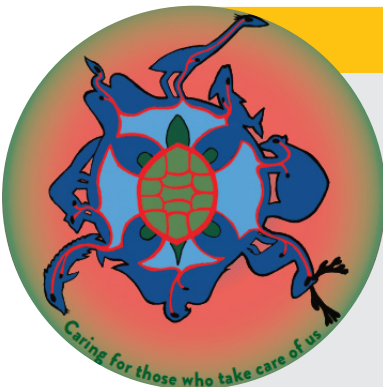
- Monitor the health of your woods closely. Healthy trees are more likely to be resilient against insects, diseases, droughts, and floods.
- Encourage a diversity of species, ages, sizes, and spacing. Eliminating all non-maple trees would leave your sugarbush vulnerable to invasive species, drought, floods, and other stresses.

More Drought & Extreme Rainfall

In the Midwest, annual precipitation is increasing—but it is becoming more concentrated in heavy rainfall events. Coupled with longer summer growing seasons, this means that drought conditions may become more common. Heavy rains tend to run off rather than replenishing soil moisture, and flooding creates imbalances in soil nutrients. All these issues could stress your trees.

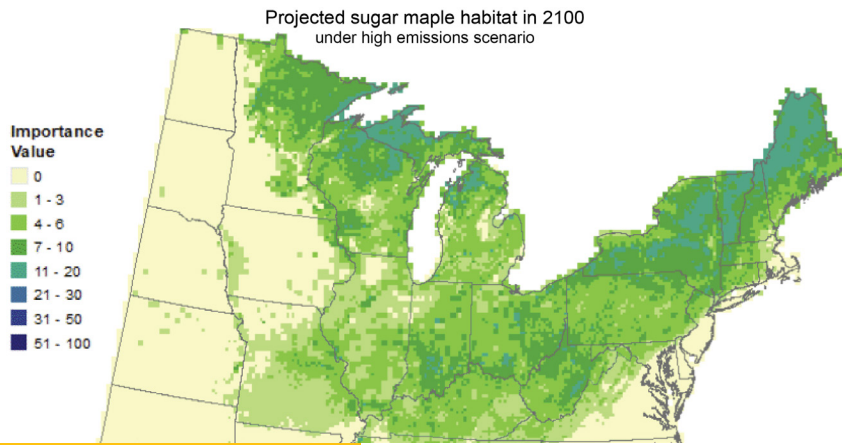
What you can do:

- In consultation with a forester, thin your stand to give your trees space to grow deep, wide crowns, which will increase your typical sap sugar content.
- If you have dead or dying trees that are crowding your tapping trees, remove some of the dead or dying trees to give your tapping trees space to grow vigorously. Keep in mind, though, that standing dead trees provide valuable habitat for birds and other wildlife.
- Manage the risk of floods and erosion by following best management practices when building and maintaining roads, trails, and culverts in your sugarbush.
- Learn how to manage flood damage to trees.



INDIGENOUS WISDOM

Many Indigenous communities in the Upper Midwest have engaged in sugarmaking since long before the arrival of Europeans. Tribal Nations here recognize plants and animals as teachers and have adapted proactively whenever environmental conditions have changed. *Dibaginjigaadeg Anishinaabe Ezhitwaad: A Tribal Climate Adaptation Menu*—a tool created by a diverse team of Tribal, intertribal, and non-tribal partners which uses Indigenous culture, language, history, and perspectives to guide climate adaptation for Tribal communities and their partner entities—contains adaptation strategies and approaches related to maple, many of which are similar to those found here. Explore it at forestadaptation.org/tribal-climate-adaptation-menu.



Shifts in Sugar Maple Habitat

The range of the sugar maple is expected to gradually move northward during this century. Along the southern edge of the range, tapping sugar maples will likely become impractical in a few decades. Along the northern edge of the range, sugar maples may benefit from the changes and grow in new places. In the central latitudes of the range, sugar maple populations might experience more stress. In northern Wisconsin, Minnesota, and Michigan, sugar maple trees are expected to fare well.

What you can do:

- If you have variations in microclimate on your land, focus on tapping the trees in the cooler areas.
- Decades from now, you may want to focus on tapping the trees on north-facing slopes, where temperatures will rise more slowly than on south-facing slopes.

Lower Sap Sugar Content

Summers now tend to be hotter than in the past. After a particularly hot summer, the sugar content of the following season's sap may be lower than usual.

What you can do:

- Take an energy self-assessment to determine how you can make your operation more energy-efficient, which will lessen the financial impact of lower sap sugar content on your operation.
- Use reverse osmosis to increase the sugar concentration of your sap before boiling it.
- Use a pre-heater or a more energy-efficient evaporator to save on fuel costs and boiling time.
- In consultation with a forester, thin your stand to give your trees space to grow deep, wide crowns. Trees with more vigorous crowns and wider trunks typically yield a higher sap sugar content and sap volume, though you will still see variability from tree to tree and even from day to day.
- Practice good sanitation habits to get a higher yield. Use new, sterile spouts each year (or use sterilizable stainless steel spouts).
- If you use gravity tubing, upgrade to a vacuum tubing system, which can double your sap yield.
- Tap more trees to increase your overall yield of syrup.
- Make value-added products like maple cream or maple candy in addition to syrup. Product diversification allows you to make more income per unit of sap, which will help your finances in low-yield years.

NEED ASSISTANCE?

Foresters (both at your state DNR and employed privately) can provide technical assistance to help you balance complex sugarbush health issues and keep your sugarmaking sustainable in the long term. For financial assistance to purchase reverse osmosis, upgrade equipment, or implement new forest management practices, ask your forester about cost-share programs run by the USDA Natural Resources Conservation Service or state agencies.



Extension
UNIVERSITY OF WISCONSIN-MADISON

Follow the Wisconsin Extension Maple Program on social media and subscribe to our newsletter.

f @UWMadisonExtMaple
 @UWMadisonExtMaple
 maple.extension.wisc.edu