

# Maple Syrup: Climate change impacts on production and adaptation strategies

Funded by the Northeast Climate Adaptation Science Center

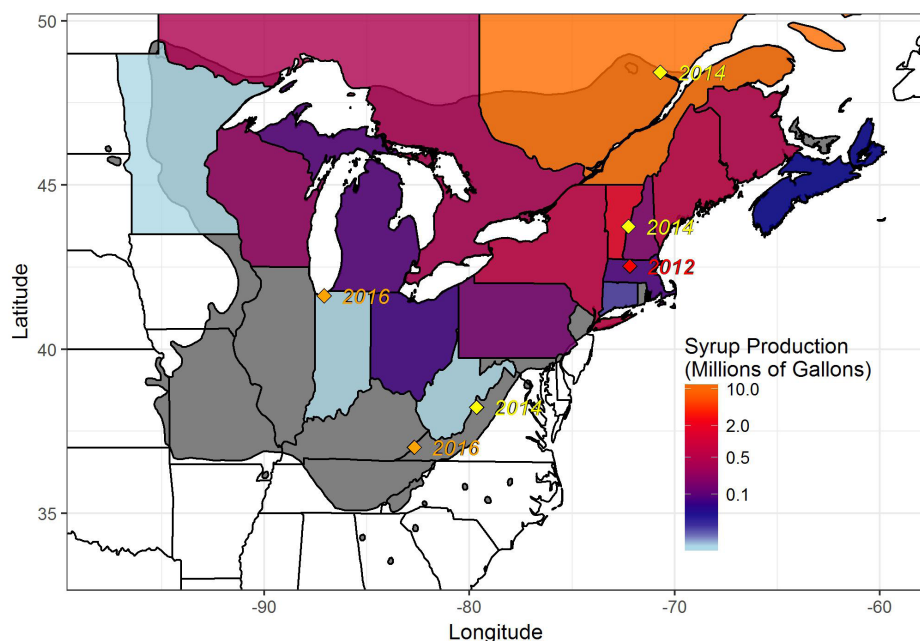


Photo: Josh Rapp



Josh Rapp testing the sap from a sugar maple. Photo: Dash Donnelly

**Maple syrup** is a major cultural resource in the Northeast and Midwest U.S. — one with a strong link to climate. The **sugar maple tree's** distribution is affected by high temperatures, low rainfall, and unseasonable variation in the onset of spring warming events. **Researchers at the NE CASC** are working with **partners at ACERnet** to supply maple sap harvesters, foresters, and landscape-scale conservation organizations with information on what to expect and how to adapt.



## Acer Climate and Socio-Ecological Research Network (ACERnet)

<http://blogs.umass.edu/acernet/>

**ACERnet**, an on-line resource and research network, was formed to centralize information on the impacts of climate on sugar maple (genus *Acer*) and suggested adaptation strategies. The ACERnet research team is monitoring sap flow at sites across sugar maples' range, **from Virginia to Quebec**, to understand how climate effects sap flow, sugar content, and chemical composition, which together influence the quality and quantity of maple syrup produced.

## Why it Matters

The cultural and economic importance of sugar maple trees is nearly unrivaled among eastern North America tree species. Sugar maple lumber commands a premium price, its foliage supports a seasonal tourist industry, and it is widely planted both within and beyond its natural range as a shade tree. Tapping maple trees for sap, one of the few wild-harvested agricultural products remaining in North America, has long been a part of the cultural fabric of the Northeastern and Midwestern US.



*Mike Puffenbarger is the owner of Southernmost Maple, a family-operated Virginia business. He supplies data on sugar content, sap volume and sap samples for the ACERnet project. Compared with all the other study sites, their syrup has the highest antioxidant/phenolic content and, according to others, is the best tasting, too!*

Photo: Ryan Huish

### Some of the ways climate will impact sugar maple:

- **Availability of trees to tap**  
Suitable habitat for the sugar maple tree has been predicted to decline in much of its U.S. range by 2100.
- **Tree health**  
Reduced snow pack during the winter can cause root die-back and reduced shoot growth, and more frequent spring frost can negatively impact trees that respond to warmer temperatures by breaking bud earlier. Growth declines in mature trees in recent decades may be related to rising temperatures.
- **Tapping season characteristics**  
Maple syrup producers are already reporting that the tapping season is starting earlier with a shorter duration and becoming more variable.
- **Climate change effects on sap quality**  
Sap quality is determined by its sugar content, mineral profile, and secondary metabolite chemicals that create the distinct taste of maple syrup and impart its health attributes. Climate change is hypothesized to influence these aspects of sugar maple.

### Here is how resources managers can apply these results:

Maple producers are implementing a variety of management strategies that may help buffer the industry from the negative effects of climate change.

- Diversifying species tapped including red maple and birch.
- Adopting technological advancements including improved vacuum tubing, spouts, and processing technology.
- Finding new markets for increased demand.
- Product innovation and marketing different attributes of maple.
- Expanding maple production to untapped forest areas and cultivating plantations.
- Alleviating other environmental stressors including effects of acid rain and pests to decrease the effects of climate change.
- Environmental modification including diversifying maple stands.

*"Our Tribe is interested in ways to adapt. We are doing some assisted migration plantings to make our forests more resilient to climate change."*

-Noah Jansen of the Little Traverse Bay Bands of Odawa Indians

The NE CASC project, "**Climate Effects on the Culture and Ecology of Sugar Maple**", is led by Kristina Stinson of UMass, Amherst and Toni Lyn Morelli with the USGS/ NE CASC.

### Research partners include:

Joshua Rapp (UMass, Amherst);  
Ryan Huish (The University of Virginia's College at Wise);  
David Lutz (Dartmouth University);  
& Selena Ahmed (Montana State University)



Selena Ahmed, right, examines a sample of maple sap recently harvested and prepared for testing with Rocio Rivas, research assistant and lab manager. MSU Photo by Adrian Sanchez-Gonzalez

### Next Steps

ACERnet is linking variability in climate to changes in sap flow, sugar content, and chemistry at sites across the sugar maple range to help understand how climate change is and may further impact maple sap quality and syrup production. They are working with maple producers to validate the effectiveness of climate adaptation approaches to increase the sustainability of maple production in the face of global change.

**Improving the Way Climate Science Informs Management** The Northeast Climate Adaptation Science Center works with natural and cultural resource managers in the Northeast and Midwest regions to apply future climate scenarios to decision making and co-produce information and tools for climate change adaptation. The NE CASC is supported by the Department of the Interior and managed by the USGS National Climate Adaptation Science Center.



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