

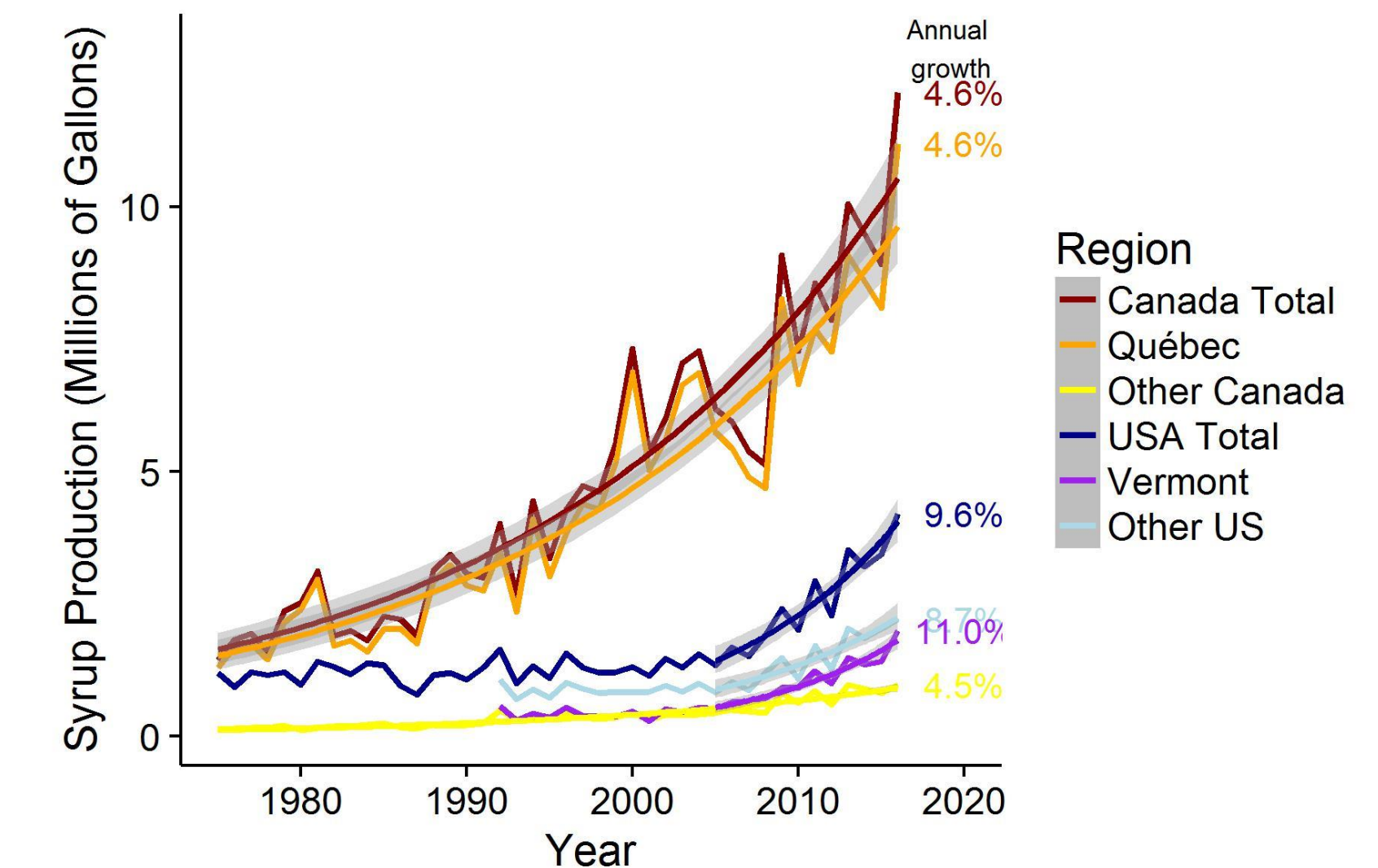
Maple syrup in a changing climate

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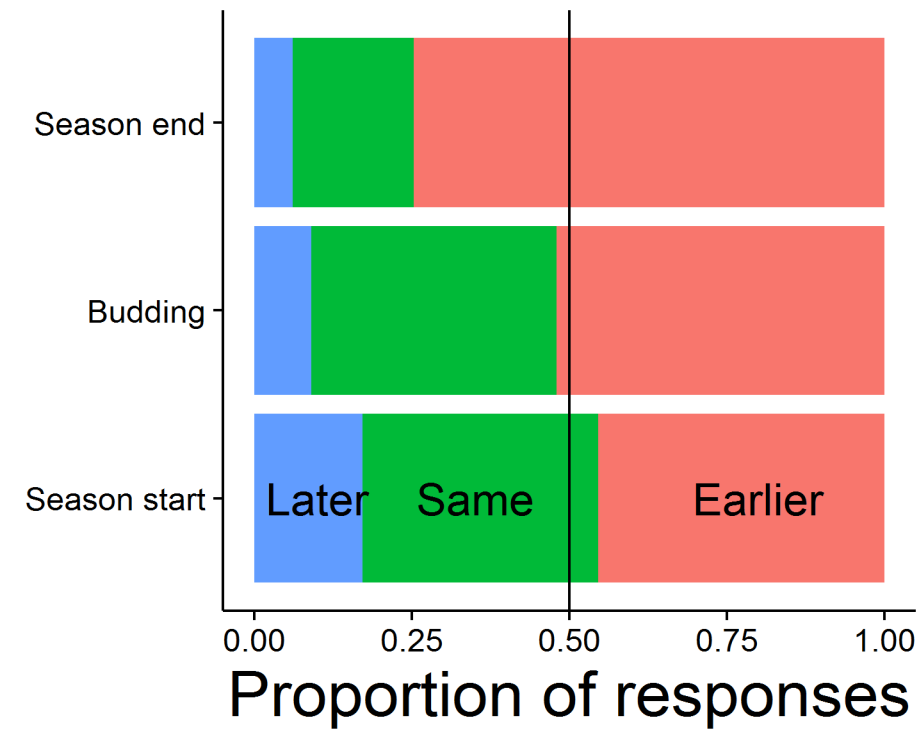
Maple Syrup and Climate Change.

Despite its exceptional cultural and economic importance, the sustainability of sugar maple and its iconic use for maple syrup remain uncertain. Tapping the sap of maple trees for syrup, 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 United States¹. While U.S. maple syrup production has increased at a rate of 8-10% annually in the past 15 years³, climate change adds uncertainty to its long term sustainability.

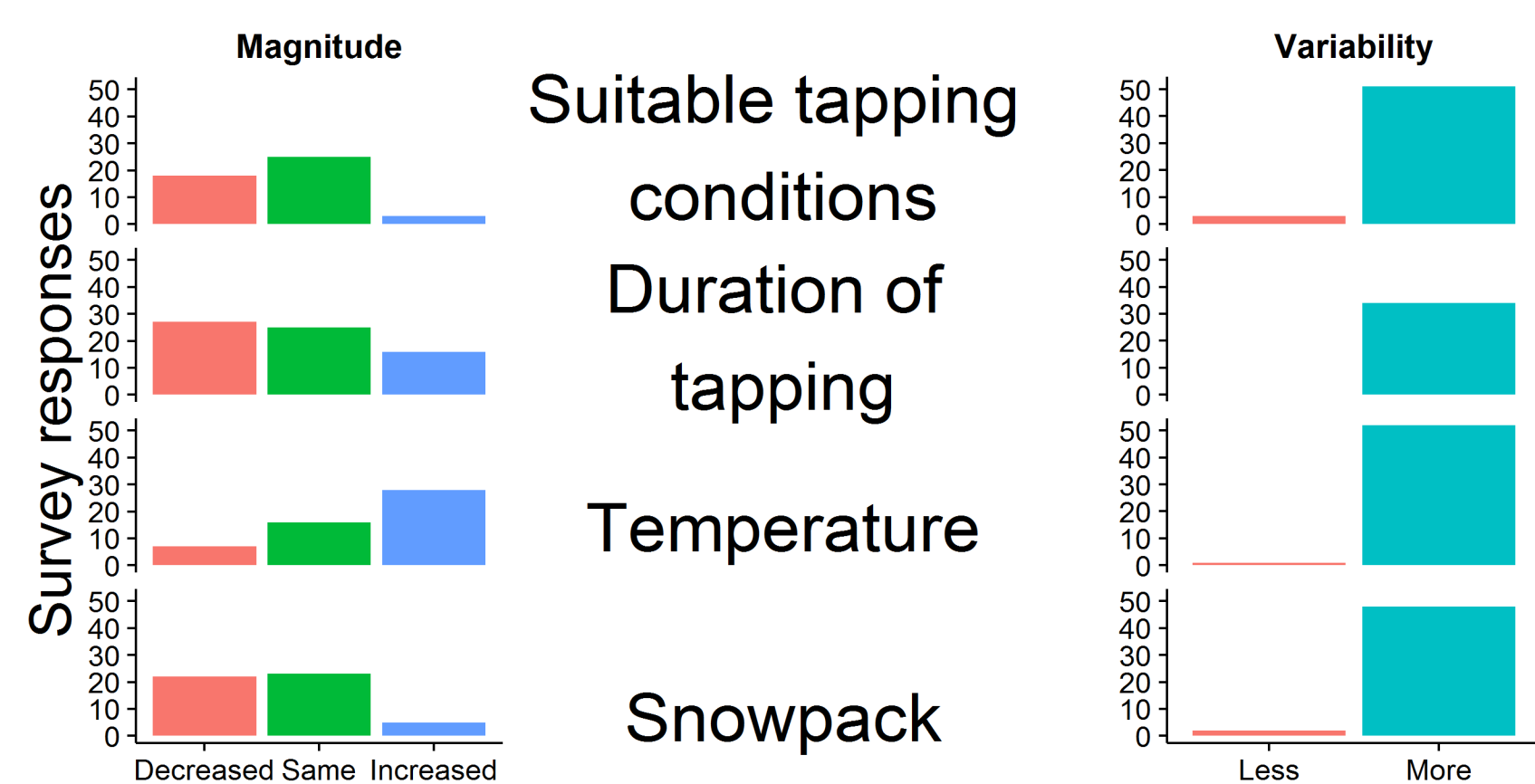


Maple syrup producer's perception of and response to climate variability and change.

Maple sap flows in the late winter when the right combination of freezing nights and warm days occurs. Because specific climate conditions are necessary for sap flow, maple syrup producers are well attuned to the local climate and many families have tapping season records going back generations. ACERnet is surveying producers to tap this traditional ecological knowledge.



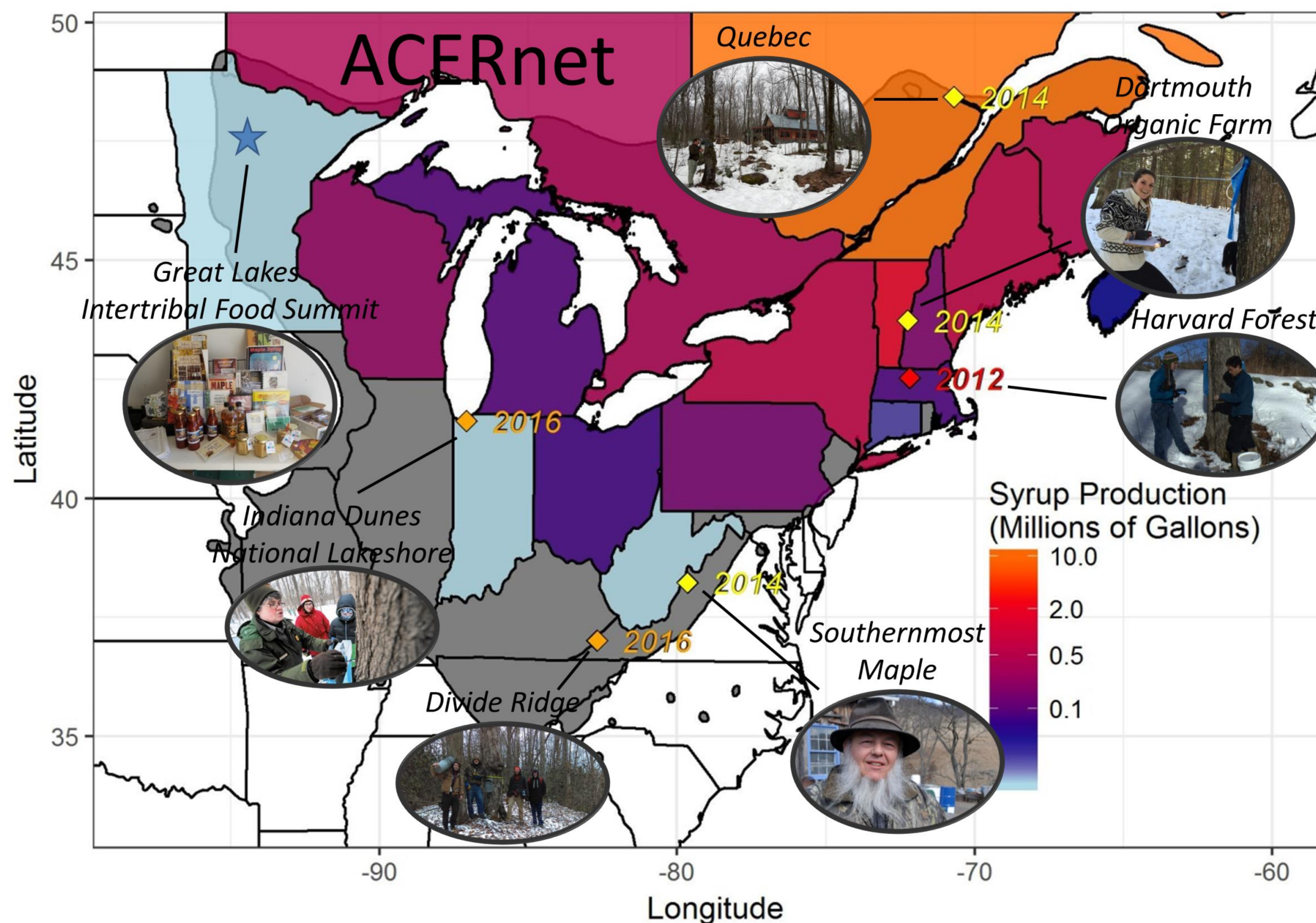
Maple producers report the tapping season is shifting earlier and good conditions for sap flow are becoming more erratic.



Adaptations to Climate Change

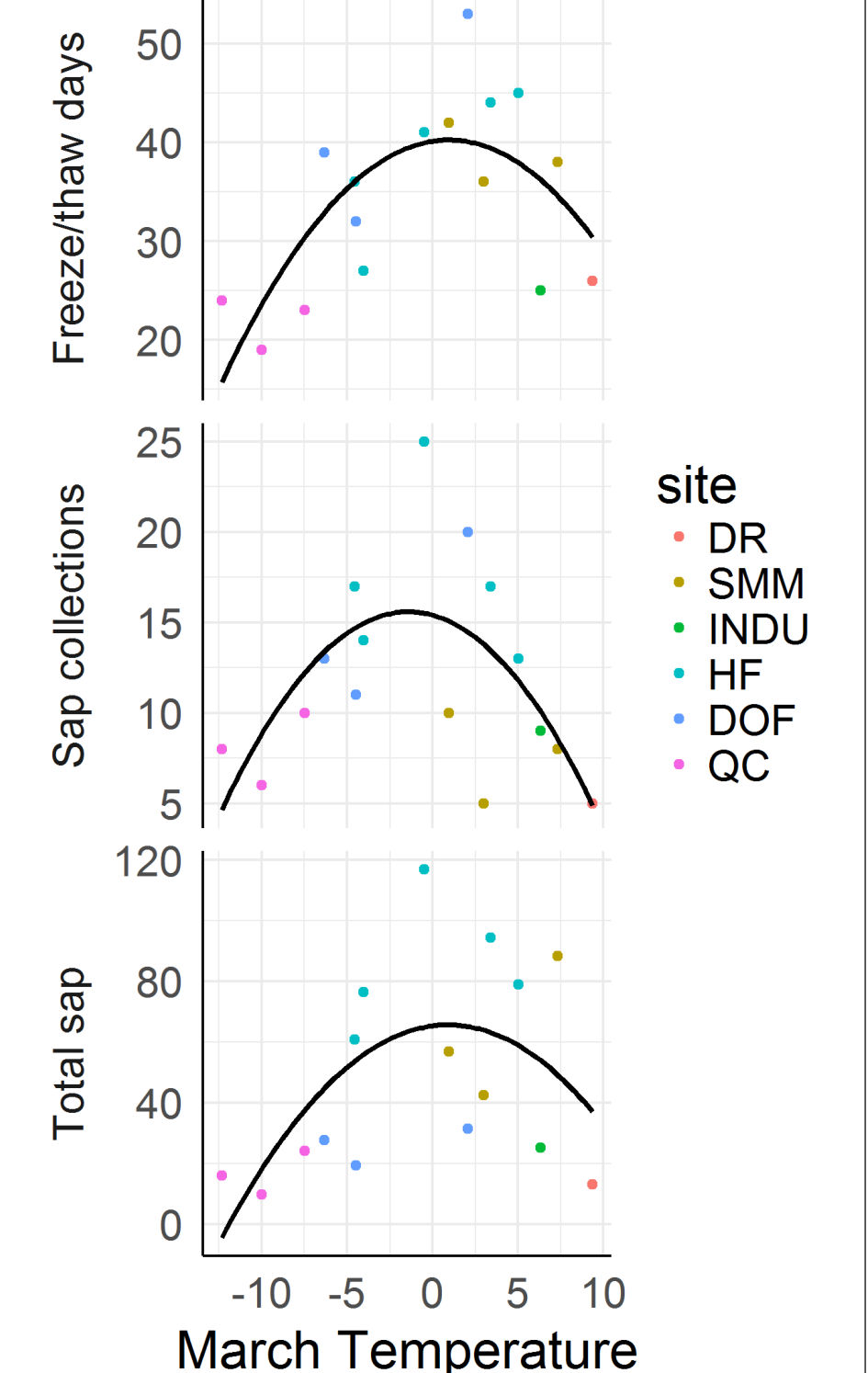
- Maple producers are adapting to climate change by:
 - Diversifying species tapped (e.g. red maple and birch);
 - Using technology - improved vacuum tubing, spouts, and processing technology;
 - Finding new markets;
 - Expanding maple production to untapped forest areas and cultivating plantations;
 - Reducing effects of acid rain, pests, and other stressors;
 - Managing and diversifying maple stands.

ACERnet spoke with Tribal maple producers at the Great Lakes Intertribal Food Summit in Red Lake, MN: "Sap is culturally significant. The first flow of spring is a symbol of life and being reborn. [Sap is like] the water breaking before birth. Sap is a gift." – MI
 "This past syrup season was less than 2 weeks. It was the worst season in [our] history. The summer broke record temperatures with a high of 80s and 90s. There was extreme heat and few rains." - NY
 "Every year is different for syrup. This year was longer than usual." - MN



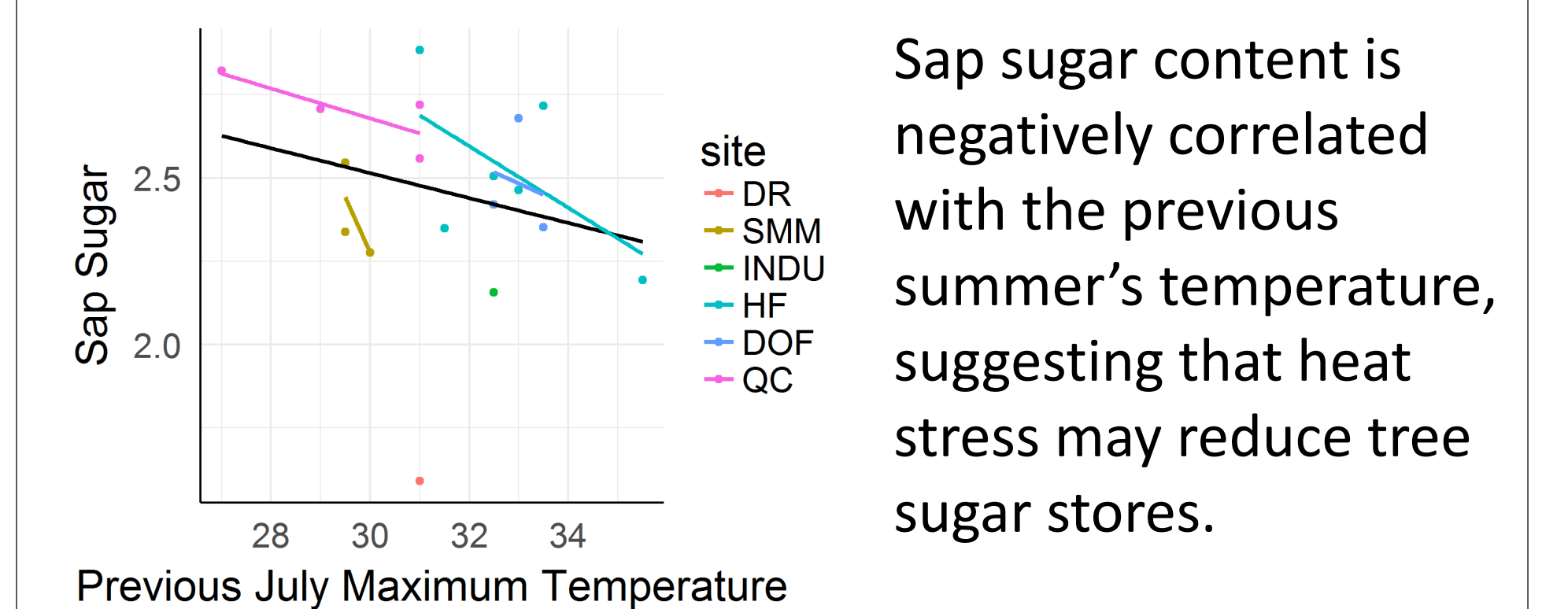
Sap Flow.

While the physiological mechanism of sugar maple sap flow and its dependence on the freeze thaw cycle is well understood^{4,5}, the effect of regional climate on commercial sap flow is less explored. Our sampling shows that there is a climate sweet spot for sap flow with the number of freeze-thaw cycles, sap flow days and total sap flow lower at both the cold and warm extremes of the climate gradient.



Sap Quality.

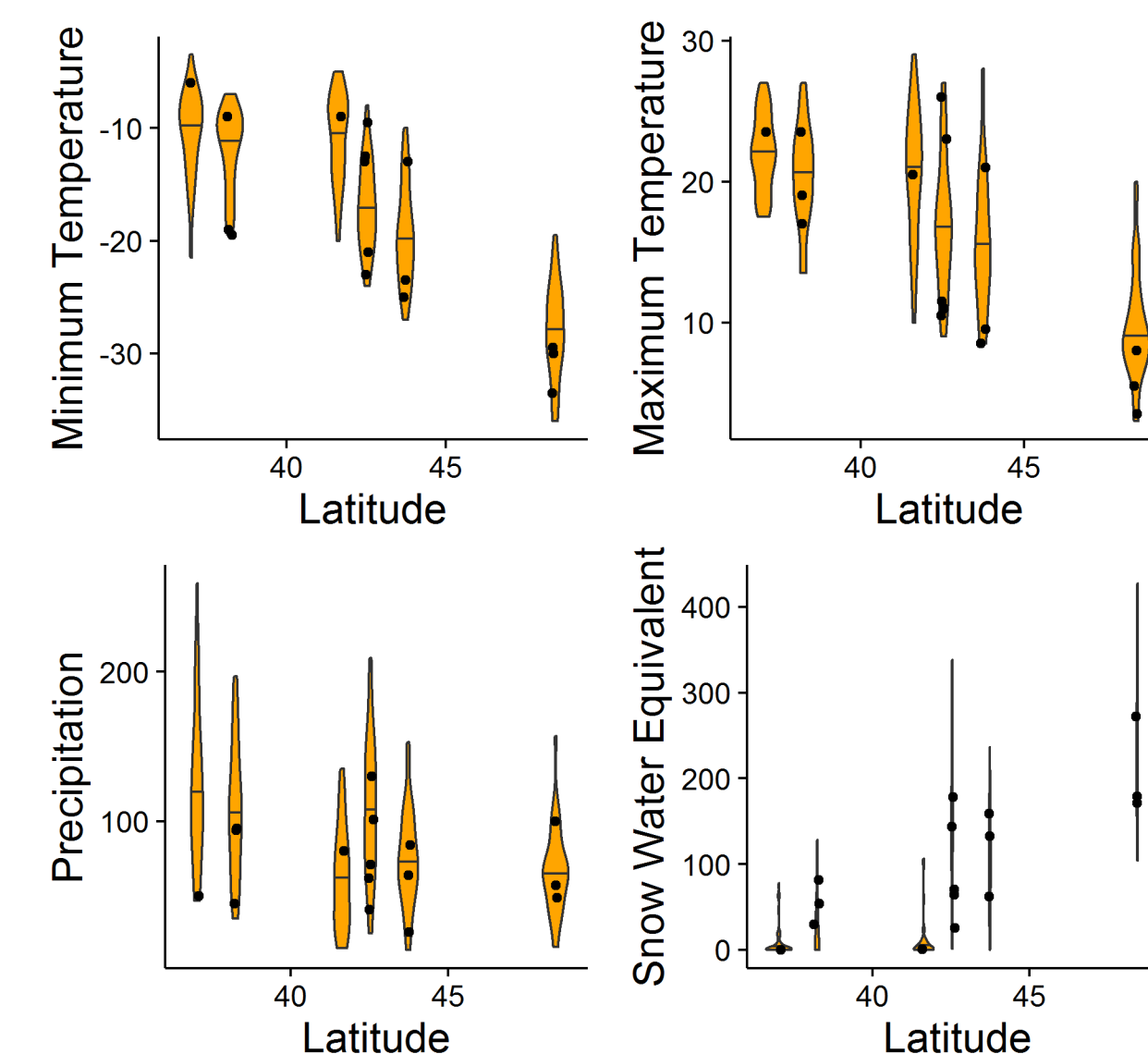
Sap quality is determined by its sugar content, mineral and nutrient profile, and the phytochemicals that create the distinct taste of maple syrup⁶ and impart its human health attributes⁷. Climate change is likely to influence sugar, mineral, nutrient, and phytochemical profiles of sugar maple, but these effects are not clearly understood.



ACERnet is also monitoring sap phytochemicals. Since many phytochemicals are produced in response to stress⁸, phytochemicals may increase if climate conditions become more stressful for maple trees.



March Climate



ACERnet sap sampling sites cover the range of climates where sugar maple grows. The sugaring season starts in January in southwestern Virginia and ends in May near the northern limit of sugar maple in Quebec. The length of the season is variable from year to year but tends to be longest near the center of sugar maples range.

