Holding on to the Cold

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As the weather cools down and we get ready for the winter season, some of us may be thinking about last winter when warm temperatures limited snow and ice cover. Ice-in for Newfound Lake didn't occur until the second half of February and Winnipesaukee had just 37 days of complete ice cover. Was last winter's warmth an unusual event or is that the new normal for us in New Hampshire?

Since 1901 annual temperatures in New Hampshire have risen 3.5 ℉ according to the New Hampshire Climate Assessment 2021 (Lemcke-Stampone et al. 2022) with most of that change coming since 1971. While all seasons have warmed, the greatest change has been in winter minimum temperatures which have warmed 1.17 ℉ per decade since 1971. At the same time, although overall precipitation has increased, there have been more intense, but fewer precipitation events and decreasing snow cover in the winter. The results are winters with less snow and fewer ice-covered lake days. Models predict that these changes will continue through the 21st century with warmer day and night temperatures and a decrease of 20-50% in snowfall by 2099 (Lemcke-Stampone et al. 2022).

Milder winters will have big impacts on our lakes and land-based ecosystems. During the year, the water in lakes changes temperature, warming with the spring and summer and cooling with the fall and winter. During those times with lots of sunshine, the upper layer of water warms enough to separate from the cooler water below and mixing between the surface and bottom stops- this keeps cooler water at the bottom, which can be important habitat for some fish, but also keeps the oxygen-rich water at the top. During those times when the top and bottom layers of water are close in temperature (spring and fall), mixing and turnover occurs which helps distribute oxygen throughout the lake. Ice and snow are good at reflecting sunlight, so less ice cover means lakes warm up earlier and have a longer period of stratification. Earlier open water also means that more light gets through to phytoplankton and other aquatic plants, which can lead to blooms and more plant growth.

Changes to snow cover also present challenges to local plants and animals. Snow is insulating and, even though it's cold, provides protection from even colder temperatures. With a good cover of snow, the ground temperature stays near freezing, and plants are protected from some of the worst impacts of winter. The 2021 New Hampshire Climate Assessment predicts more than 20, and possibly above 50, additional bare ground days by the end of the 21st Century (Lemcke-Stampone et al. 2022) which could increase plant injury and mortality from cold. Many animals also depend on snow both for insulation and protection. Research in Scandinavia found that, while snow can provide insulation and space for tunnels, ice can be too hard to get through, limiting where those animals can go to find food (Korslund and Steen 2006). Predicted warmer winters in New Hampshire will decrease the chance of snow and increase the chance of rain, sleet, and freezing rain which could be a problem for the voles, mice, and shrews here.

There are things we can do to limit how much our climate warms and how that change impacts our watersheds. In addition to generally reducing greenhouse gas emissions, there are actions we can take to limit changes in winter ecosystems. Decreased ice cover doesn't have to

lead to algal blooms and limited oxygen for deep-water wildlife. Phytoplankton require sunlight and several nutrients, including nitrogen and phosphorus, for growth. By managing stormwater, even in the winter, you can keep those nutrients out of our lakes and prevent spring blooms. On land you can provide the conditions that plants and animals need with some late fall/early winter chores- dead leaves and other mulch insulate the ground from deep freezes, protecting plants, hibernating bumblebees, tunneling rodents, and other creatures. A few strategic leaf piles or letting them settle where they will can provide an extra buffer from the cold in the event of a low-snow year.