

# Diminishing ice cover on Maine's lakes could impact fish populations

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By Vanessa Paoella

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This March 31, 2020, aerial photo of Lake Auburn from above Summer Street in Auburn illustrates how the south end is usually the last part of the lake to thaw. Ice-out was called the week after the photo was taken. People who are near the lake around the time of ice-out may hear a “tinkling” sound. As the ice melts, it forms pencil-like crystals arranged vertically through the ice mass. The ice becomes crystallized or “honey combed.” The pencil-like crystals fall against each other like dominoes when the waves of open water nibble at the ice edge, creating that special sound. *Russ Dillingham/Sun Journal file* [Buy this Photo](#)

AUBURN — In September 2012, local and state officials noticed something odd at Lake Auburn. Fish were dying for no discernible reason.

First, they saw just five. On the fifth day, a total of 50 dead fish, many of them lake trout, had been found.

Officials eventually recovered more than 200 dead or dying fish in all, making it the first fish kill ever recorded in Lake Auburn.

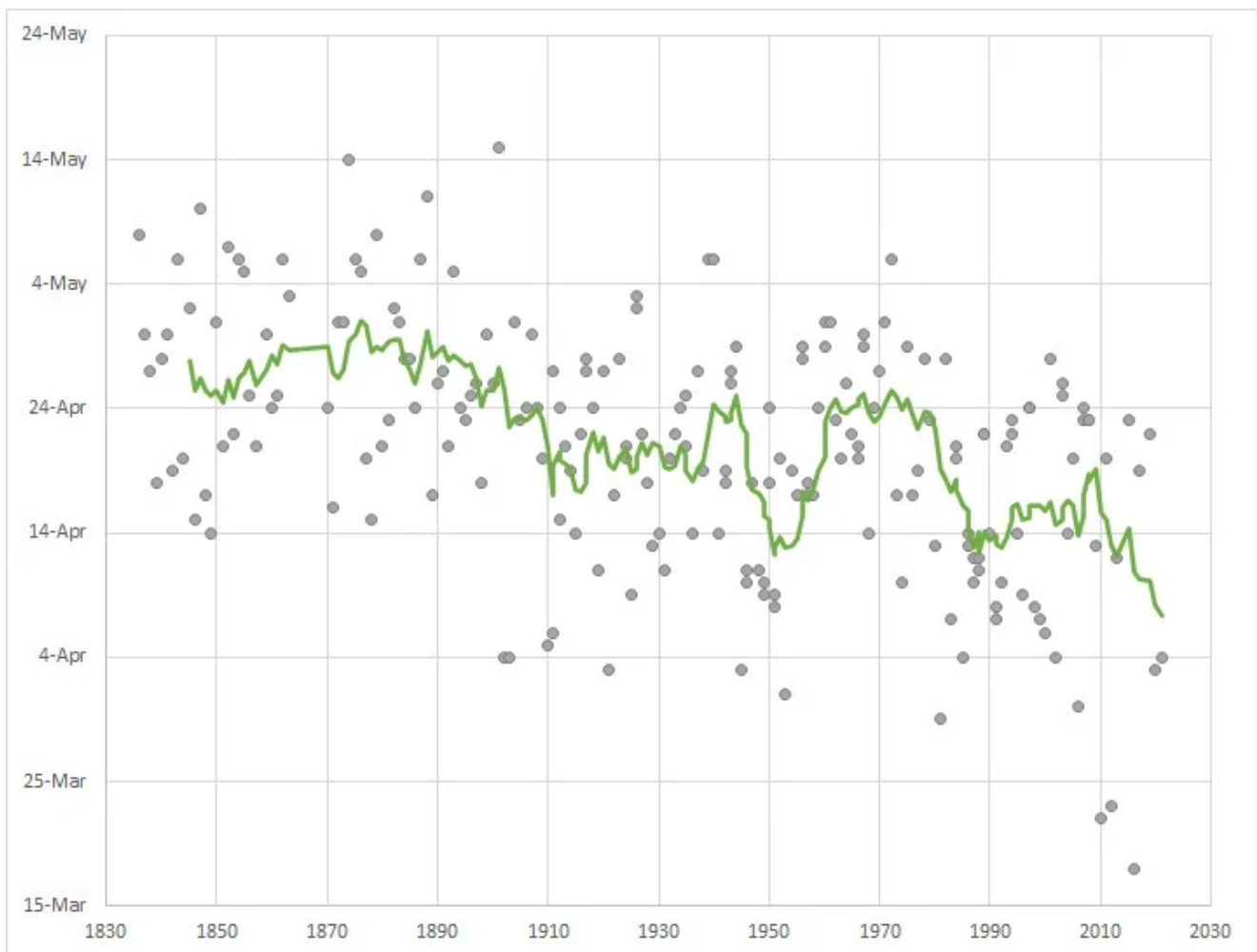
Scientists and officials said the event was related to an unseasonably warm year which resulted in an early ice-out on Lake Auburn and, later, the growth of a large, harmful algal bloom.

“What we have seen is that phosphorus has remained steady but that ice-in, during the late fall and early winter, is coming later and later and the ice is gone much sooner than we have seen. That’s giving us a longer period for the algae to grow,” John Storer, superintendent of the Auburn Water District, said following the incident.

“Ice-out” is the first day of the year when the ice cover of a lake has thawed. The exact definition varies and each lake has its own standards: Some call for 80% of the ice to have melted, while others define ice-out by when a boat is able to traverse the lake.

In 2012, Lake Auburn monitors recorded the lake’s second earliest ice-out date since 1836. It was bumped to third-earliest when 2016 recorded the earliest-ever ice-out date of March 18.

In the mid-1800s, the average ice-out date for Lake Auburn was April 28. Now, almost two centuries later, ice-out usually arrives three weeks earlier.



Ice-out dates for Lake Auburn dating back to 1836. Ice-out occurs on average three weeks earlier at Lake Auburn now than it did in the 1800s. The green line represents the rolling 10-year average, which smooths out yearly swings in ice-out dates and provides a clearer picture of long-term trends. *Vanessa Paoletta*

Lloyd Irland, a professional forester, became interested in changing ice duration after studying the impacts of extreme weather events on forestry. He has analyzed ice-out trends for more than 20 years.

Irland said changes in ice cover duration are often relatively symmetrical at both the start and end of the season. That means that Lake Auburn may be ice-covered for as many as six weeks less on average today than it was in the mid-1800s.

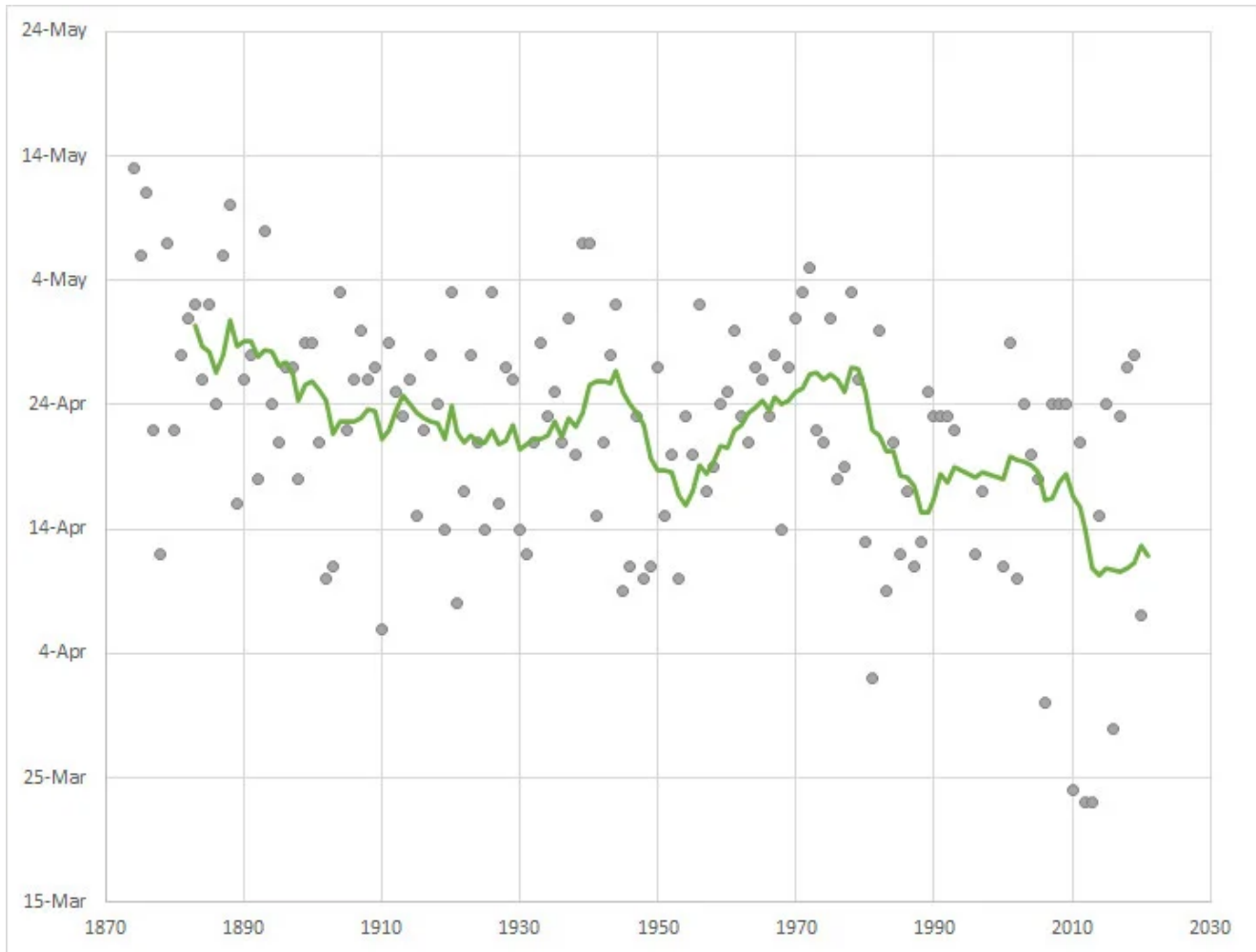
And, Lake Auburn isn't the only lake with waning ice. Lakes throughout Maine and New England are showing similar trends.

In Norway, Pennesseewassee Lake's average ice-out date has shifted from May 1 in the late 1800s to April 12 today, a 19-day difference. Rangeley Lake's ice-out is 11 days earlier on average now than it was in the late 1800s. Wilson Lake in Wilton has the smallest change of the four lakes; the average ice-out date is just a week earlier.

Scientists say this long-term trend is an indicator of climate change. Warming temperatures are leading to milder winters with less snow, resulting in shorter periods of ice cover for Maine's lakes.

In the short-term, ice cover is highly variable year-to-year. At times, there may be a series of years where ice cover actually increases.

However, the long-term trends are clear: Maine's lakes spend less time covered in ice now than they did decades earlier.



Ice-out dates for Pennesseewassee Lake in Norway dating back to 1874. Ice-out occurs on average 19 days earlier at Pennesseewassee Lake now than it did in the late 1800s. The green line represents the rolling 10-year average, which smooths out yearly swings in ice-out dates and provides a clearer picture of long-term trends. *Vanessa Paoletta*

## IMPACTS ON WATER QUALITY

Scientists say diminishing ice cover and warmer water may lead to a decline in water quality and hurt some species of fish. As the climate continues to grow warmer and more variable, the duration of ice cover on Maine's lakes will continue to decrease.

Scott Williams, the executive director of Lake Stewards of Maine, explained that Maine's lakes have especially good water quality in part due to the state's cold climate. Cold water discourages the growth of microorganisms like algae and plankton, keeping lake water clear for much of the year.

Shorter periods of ice cover and rising air temperatures work in tandem, increasing water temperature and improving the growing conditions for microorganisms. This, in conjunction with other environmental factors such as excess nutrients, increases the prevalence and severity of harmful algal blooms.

As algal blooms die and decay, they consume precious oxygen from the water. In some cases, like at Lake Auburn in 2012, oxygen levels dropped so low following the algal bloom that fish were unable to breathe and many died.

Most algae and phytoplankton are not harmful to human health, however large growths of these microorganisms can impact the clarity and taste of drinking water sources.

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Ice and snow act as insulators, keeping lake water cool. Snow in particular helps reflect heat from the sun and prolong the time lakes spend covered in ice.

Yet, rain is becoming more common during the winter, and snow less so, leading to thinner, less developed ice cover. This is mainly due to changing climate patterns and rising temperatures during the winter months.

“The averages of annual temperatures are rising primarily in the winter,” Irland said. “The summer averages are not increasing that much, but the winter averages are rising.”

Irland stressed that while ice-out dates are useful, the problem is more complex than monitoring when lakes thaw. Ice cover is just one part of a complex series of ecological processes.

“Just looking at the ice-out phase on the lake understates the significance of the trickle effect of the ice regime on the availability of the oxygenation, how early the spring turnover is, (and) how late the fall turnover is now,” he said.



This photo taken in 2019 shows one of two large sections of open water on Lake Auburn near Tabers Restaurant and Mini Golf on Lake Shore Drive in Auburn. *Russ Dillingham/Sun Journal file*

## **ENVIRONMENTAL MISMATCH**

Research shows that ice cover isn't just getting shorter, it is also becoming more variable.

Irland said that extreme weather events are becoming more common; this directly impacts ice cover and ice-out dates.

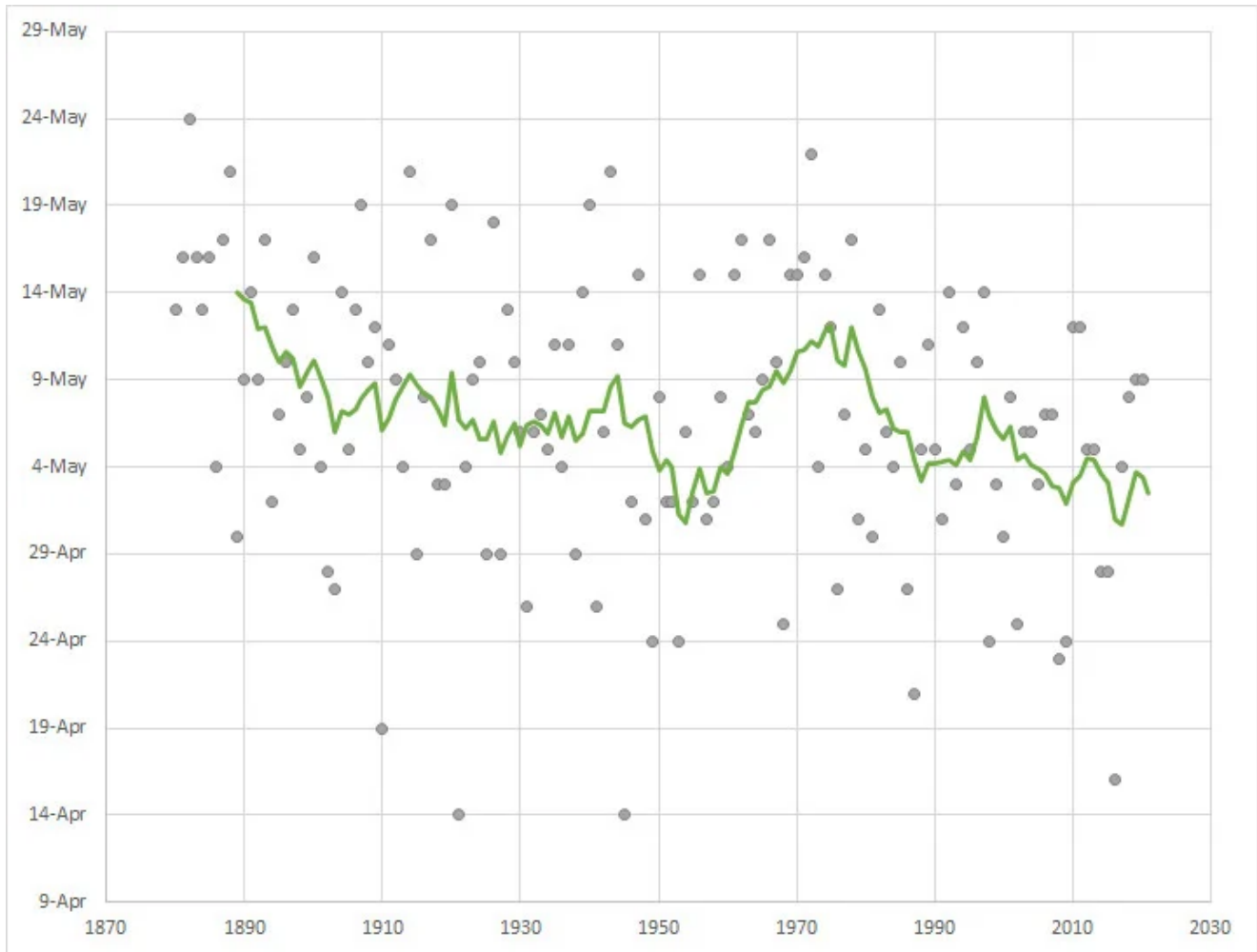
"The difference between the highs and lows (in ice cover duration) 50 years ago was smaller than it is now," Irland said.

Merry Gallagher, a fisheries biologist for the Maine Department of Inland Fisheries & Wildlife, explained that ecosystems have evolved to deal with a limited amount of environmental variability.

"Environmental variability is normal, and fish species, like everything else, all other biota on the planet, have evolved under somewhat variable conditions anyway," she said.

When conditions change beyond those bounds, ecological timelines may no longer line up.





Ice-out dates for Rangeley Lake dating back to 1880. Ice-out occurs on average 11 days earlier now at Rangeley Lake than it did in the late 1800s. The green line represents the rolling 10-year average, which smooths out yearly swings in ice-out dates and provides a clearer picture of long-term trends.

Usually, fish eggs hatch at approximately the same time plankton populations are increasing. The hatchling fish rely on plankton as their first food source.

However, warming water temperatures may cause fish to hatch early. If the fish hatch before the plankton are able to grow, many will starve. This misalignment of events is called environmental mismatch.

“(Fish) may be hatching at a point in the lakes’ planktonic cycle that isn’t quite up to the level to provide adequate food resources for all those hatching fish eggs,” Gallagher said. “So that’s where we get into environmental mismatches.”

Lake whitefish is one type of fish which has been impacted by increasing variation. Biologists noticed that less larval lake whitefish were reaching maturity and found that in some years, the fish were hatching earlier than usual.

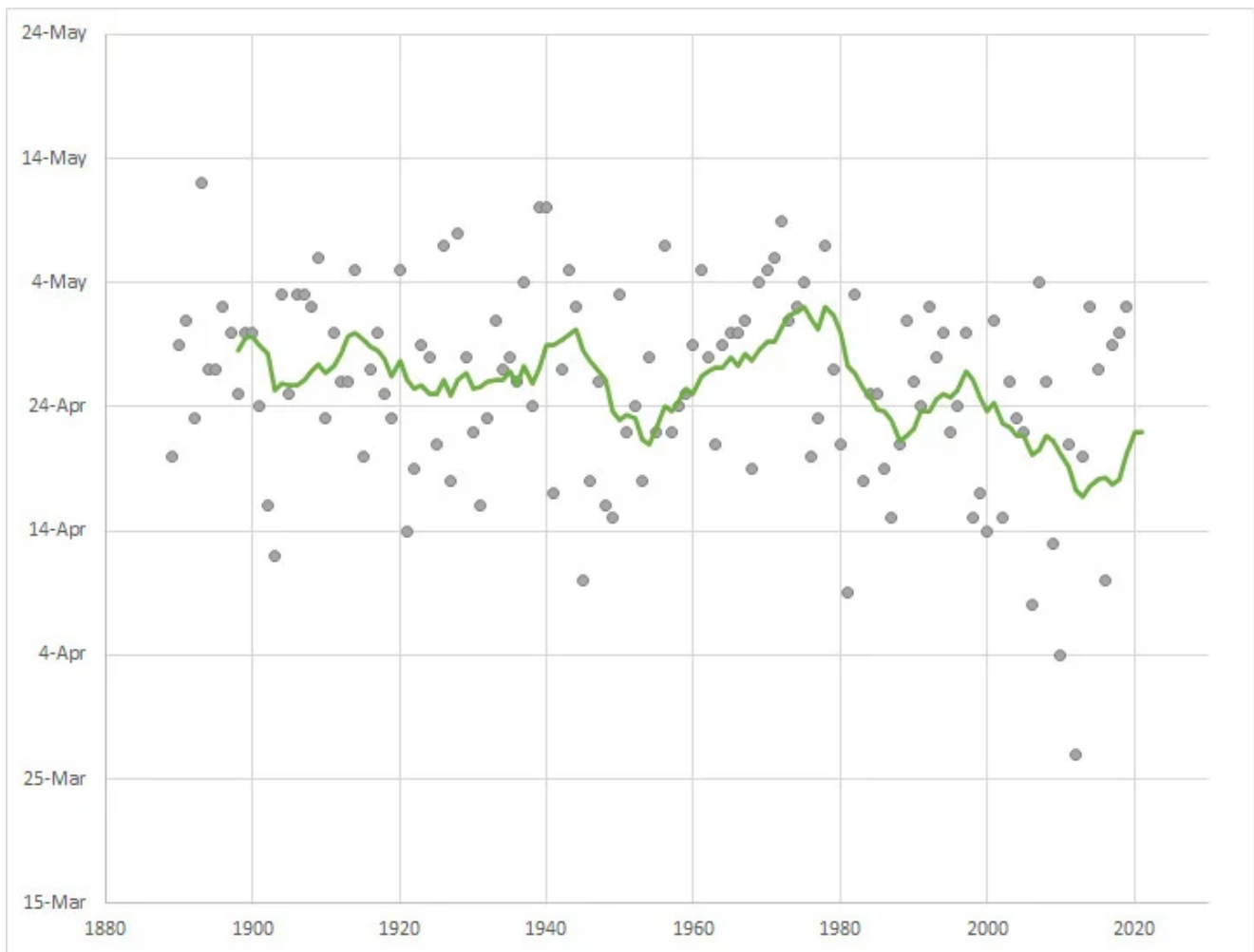
Because of this, populations of lake whitefish are experiencing decline in Maine.

Gallagher said biologists have similar concerns for other species of fish in the state. Environmental conditions are changing faster than many species of fish, particularly native species, can adapt to, and variations in ice cover are part of the problem.

There isn't much that scientists can do to change the weather or the temperature of the water. What they can do, Gallagher said, is improve in-flowing streams which often add cool, oxygen rich water to lakes.

"It's more about maintaining cool water influx from the tributaries into those lakes to make sure that those lakes stay cool enough over time to continue for those populations to thrive and persist," she said.

"There's big changes happening all around," Gallagher added. "And (the effects of climate change) is not something that we can continue to ignore. We just have to face it. We have to adjust some ways so that our fish and wildlife can continue to thrive."



Ice-out dates for Wilson Lake in Wilton dating back to 1889. Ice-out occurs on average one weeks earlier at Wilson Lake now than it did in the late 1800s. The green line represents the rolling 10-year average, which smooths out yearly swings in ice-out dates and provides a clearer picture of long-term trends. *Vanessa Paoletta*



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