

Lake Ice-Out and Ice-In in Vermont

by Mark Mitchell, Limnologist with UVM Lake Champlain Sea Grant and VT DEC

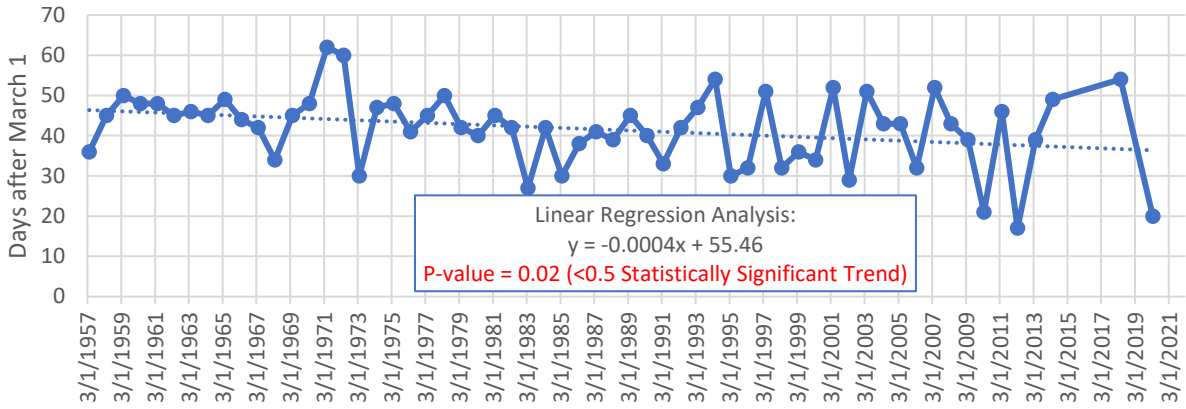
Spring is upon us in Vermont, and it is the time of year when ice on our lakes melts away to reveal open water once again. This annual happening is known as lake “ice-out” and is the reverse of “ice-in” when lakes freeze over in the fall/winter. Lake ice-out and ice-in dates can be recorded to track trends in Vermont’s changing climate. Earlier lake ice-out trends and later ice-in trends are an indicator of warming temperatures and can lead to a longer “growing season” for aquatic plants, algae and cyanobacteria to proliferate. The same is true for bacteria that decompose lake bottom sediments while depleting dissolved oxygen and releasing nutrients into the water column. Lake temperature also affects hibernating aquatic animals, like turtles and frogs, as well as fish spawning. These changes can all impact the balance of our lake food webs.

A recent [US EPA study](#) of ice-out data for selected lakes around the country from 1850 to 2019 shows earlier ice-out trends by about one day every decade on average. A [USGS study](#) of lake ice-out data in New England from 1850 to 2000 shows earlier ice-out trends by 9 days in northern and mountainous areas of New England (primarily northern and western Maine) and by 16 days in more southerly locations. The USGS study also estimates late winter/early spring air temperature warming in New England of about 2.6 F based on the relation between lake ice-out dates and air temperatures. According to the [Lake Champlain Basin Program State of the Lake Report](#), winter minimum and summer maximum air temperatures in Burlington show increasing trends since the early 1900s, especially in recent decades. Lake Champlain froze over nearly every year in the early 1900s but currently freezes over about once every 4 years.

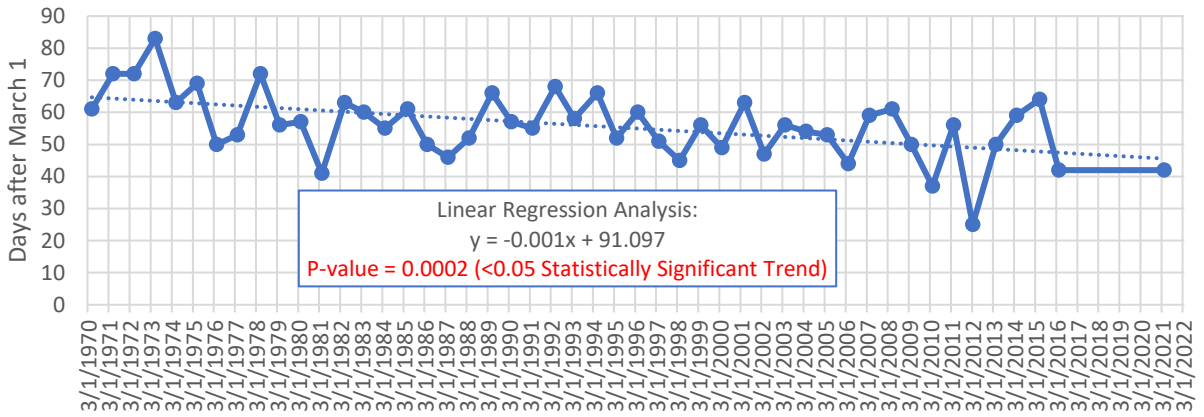
I conducted linear regression analysis for 15 lakes in Vermont with 20+ years of ice-out data from consistent reporting sources (see graphs below). Some lake ice-out dates are consistently reported by volunteers as mostly or completely ice-free, while others are from ice-out contests that use a clock mechanism connected to an object falling through the ice. All lakes except Lake Raponda show an earlier ice-out trend, and three of those lakes have a statistically significant trend (P-value < 0.05): Lake Bomoseen, Echo Lake (Charleston), and Joe’s Pond. On average, ice-out is occurring earlier by 1.5 days each decade for the 15 lakes in Vermont where we have at least 20 years of consistent data reporting. Four of the 15 lakes also have 15+ years of ice-in data that all show later ice-in trends: Echo Lake (Charleston), Halls Lake, Lake Memphremagog, and Seymour Lake (see graphs below).

The VT DEC [Lay Monitoring Program webpage](#) has an [online ice-out and ice-in reporting form](#) where the public can submit their observations with a description of what they see. There are also other volunteer opportunities, including cyanobacteria monitoring. So having volunteers who, anytime they're at a lake, they can report visually what they see. The more information we have, the better. We can track these changes and see what's going on from lake to lake, as well as in the region.

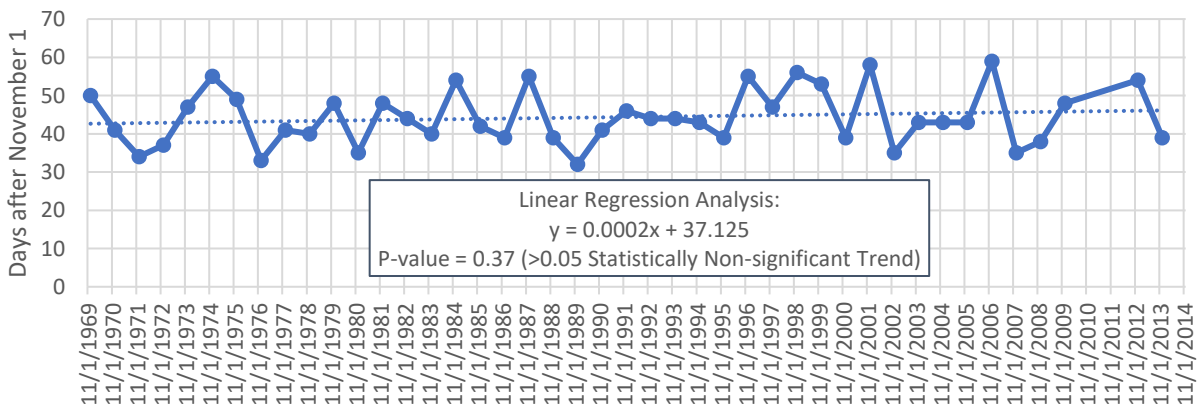
Lake Bomoseen Ice-Out: Days after March 1
 (multiple volunteers: "When one can travel by boat from the mouth of the channel to the float bridge in a relatively straight line")



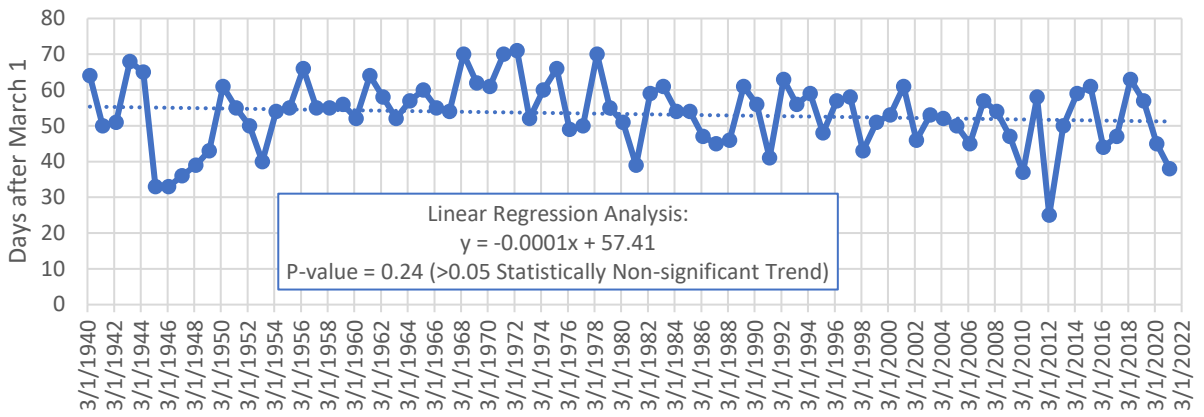
Echo Lake (Charleston) Ice-Out: Days after March 1
 (Diane & Arvin Anderson 1970-2010, Peter Engels & Tom Wagner since)



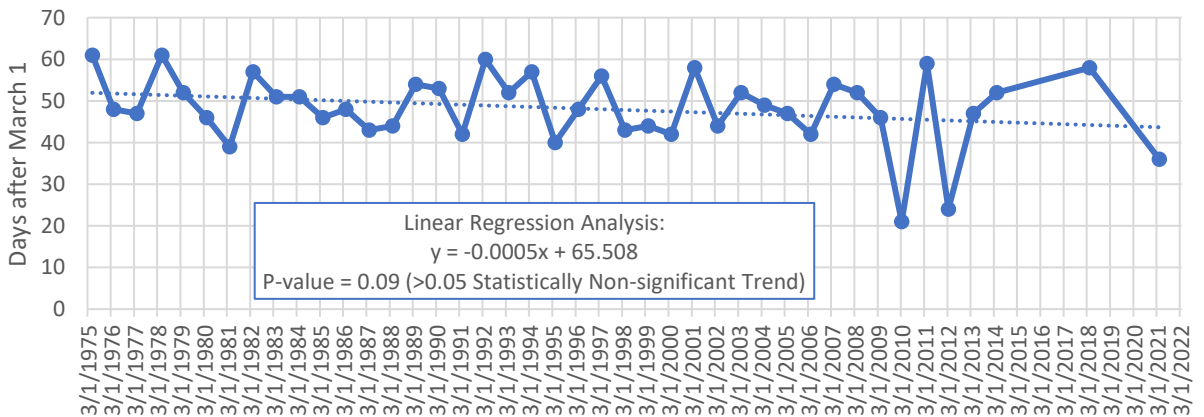
Echo Lake (Charleston) Ice-In: Days after November 1
 (Diane and Arvin Anderson 1969-2009, Peter Engels 2012-2013)



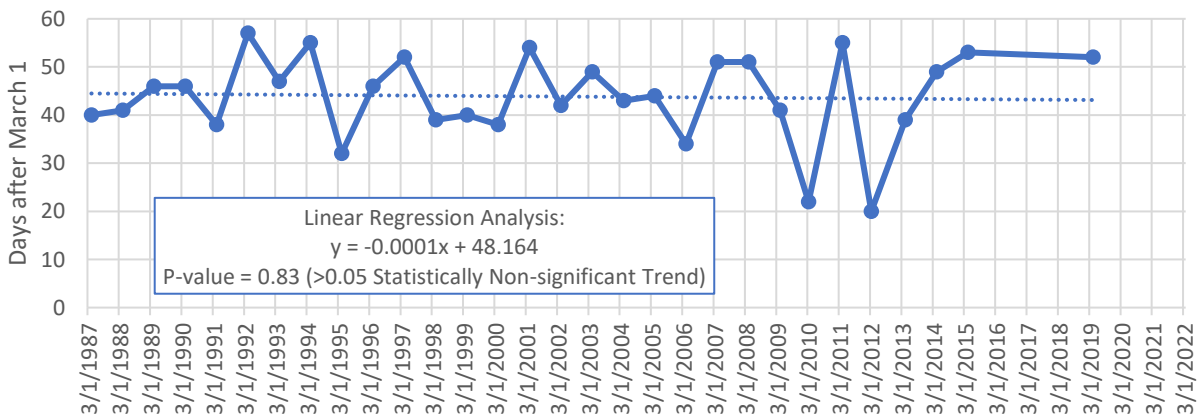
Lake Elmore Ice-Out: Days after March 1 (<http://www.elmorevt.org/community/iceout>)



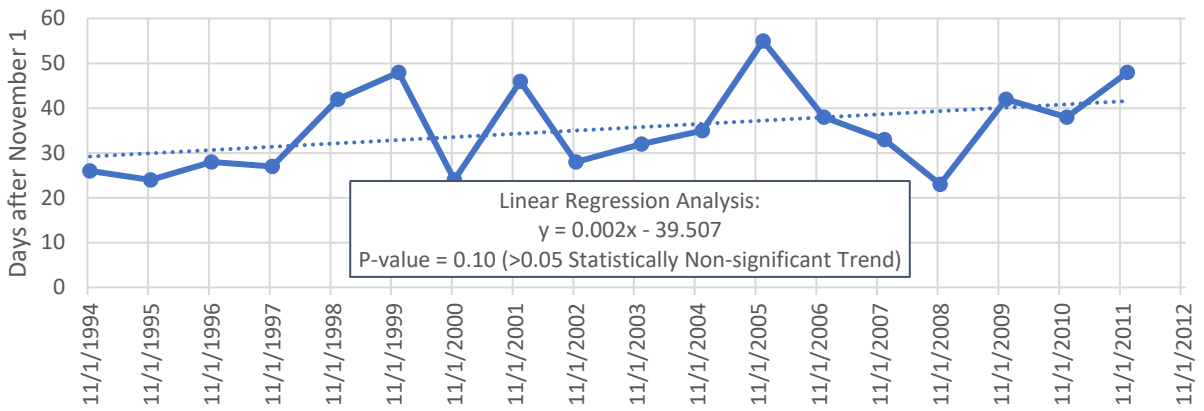
Lake Fairlee Ice-Out: Days after March 1 (Barbara Slack 1975-2010, multiple volunteers since)



Halls Lake Ice-Out: Days after March 1 (Mitzi MacQueen)

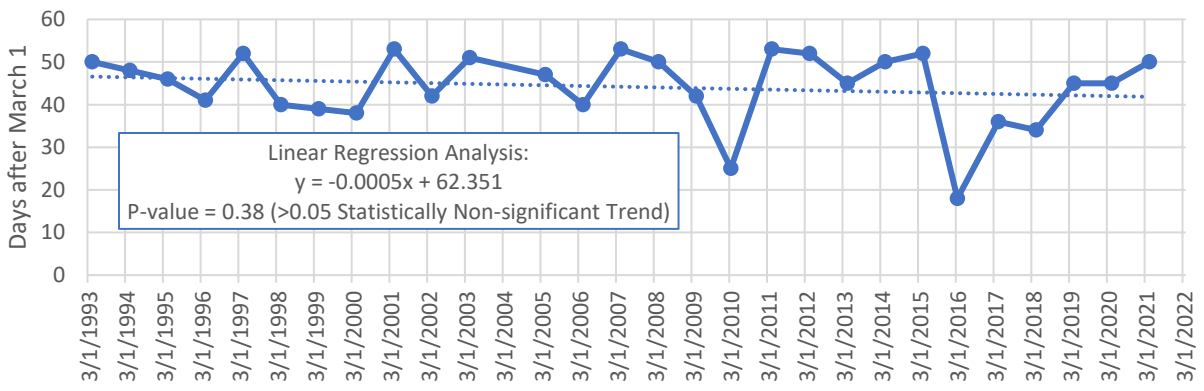


Halls Lake Ice-In: Days after November 1 (Mitzy MacQueen)



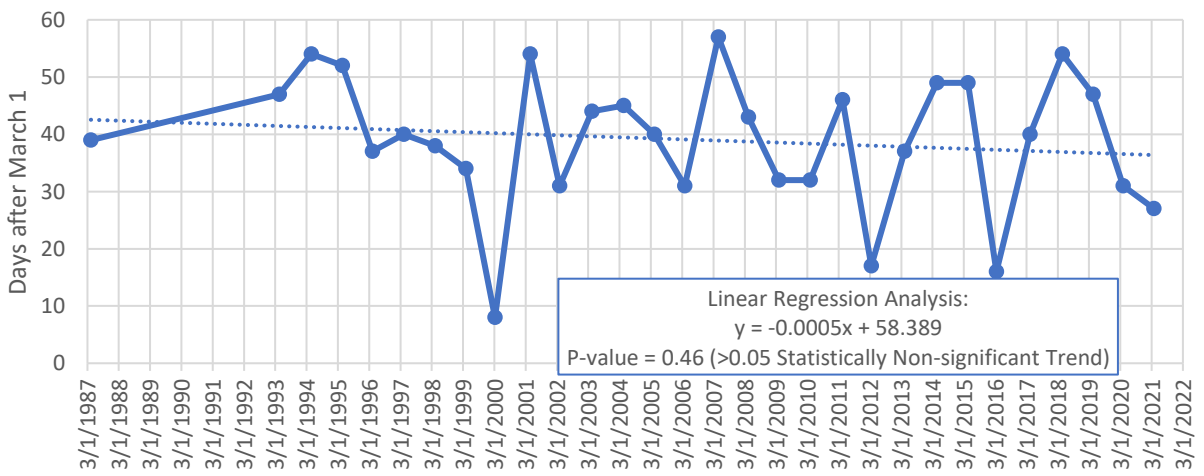
Harvey's Lake Ice-Out Clock Contest: Days after March 1

(http://lakeharvey.net/sites/lakeharvey.net/files/site_theme/ice_out_tickets_2021-2side.pdf)



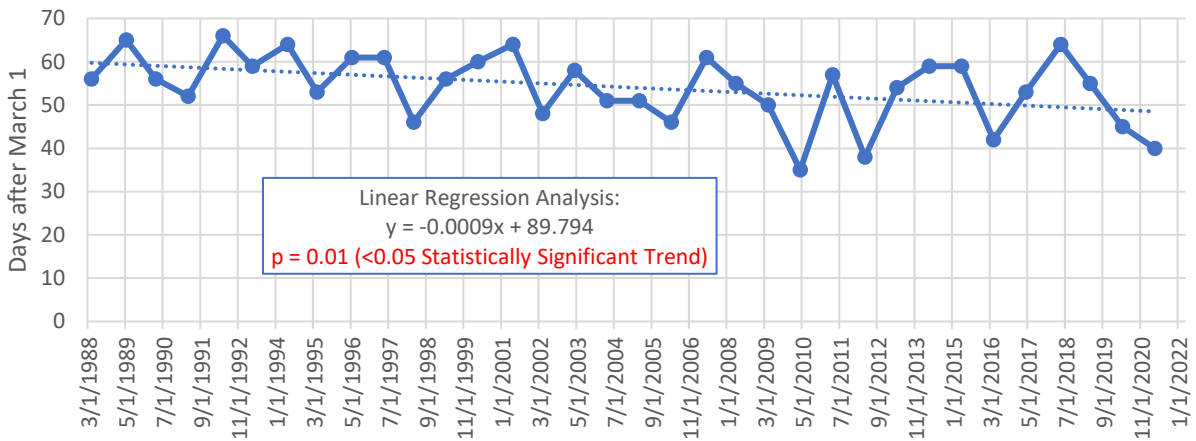
Lake Iroquois Ice-Out (Ice-Free): Days after March 1

(<https://www.lakeiroquois.org/enjoying/ice-out-dates>)



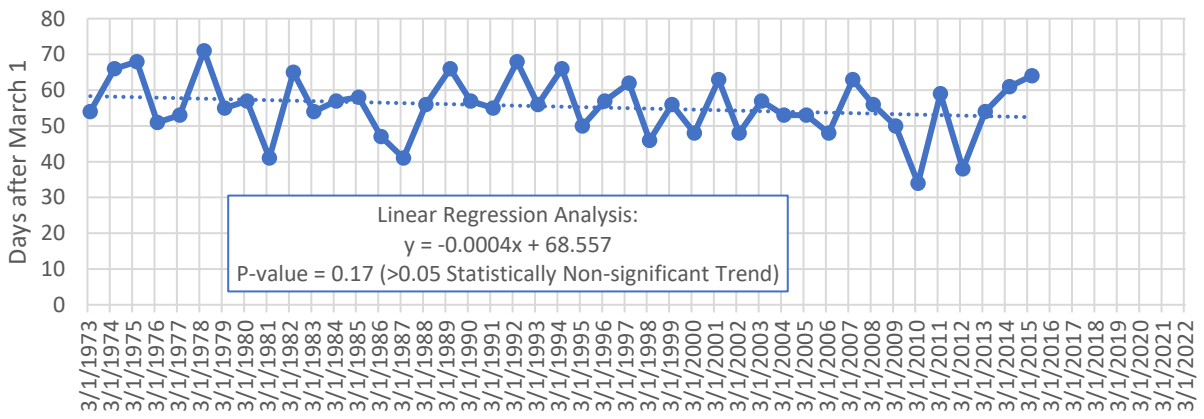
Joe's Pond Ice-Out Clock Contest: Days after March 1

(<https://www.joespondvermont.com/historical-datestimes.html>)



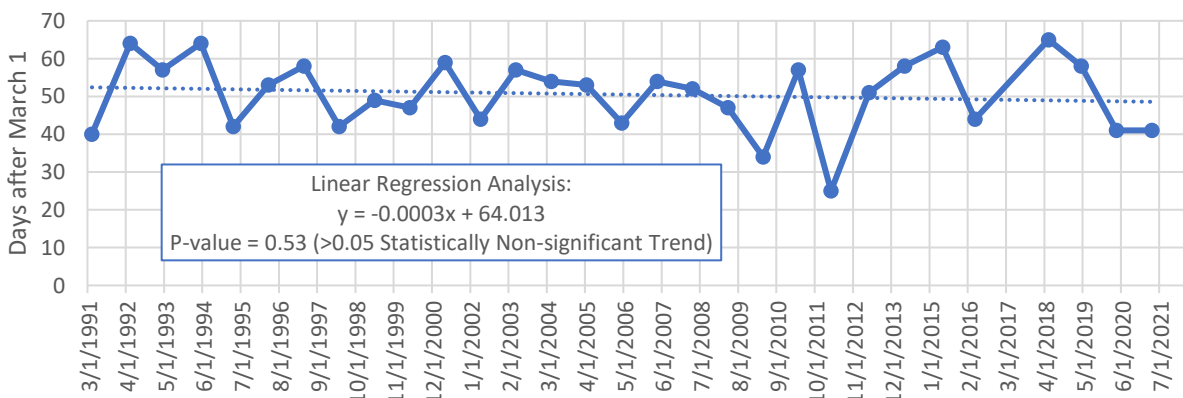
Maidstone Lake Ice-Out (Ice-Free): Days after March 1

(Charlie Fitch, <https://maidstonelake.net/town-info>)

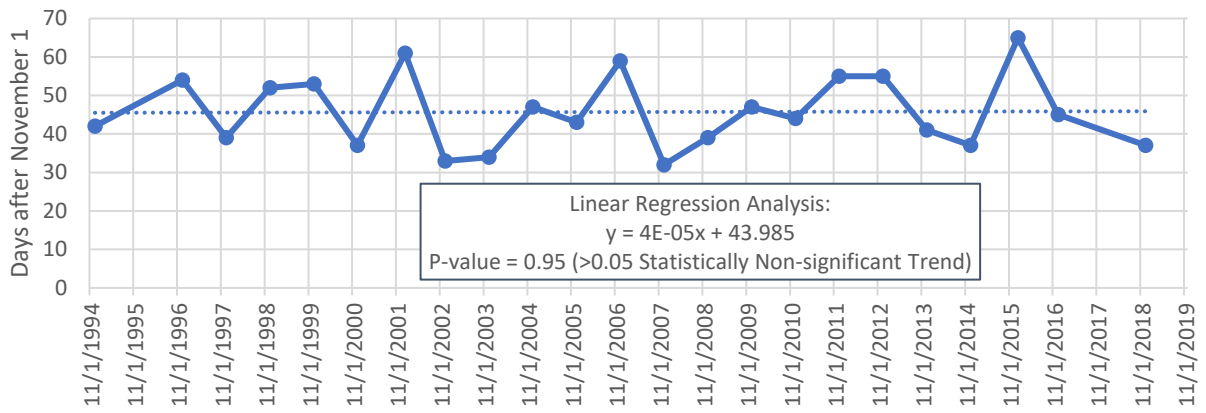


Lake Memphremagog Ice-Out: Days after March 1

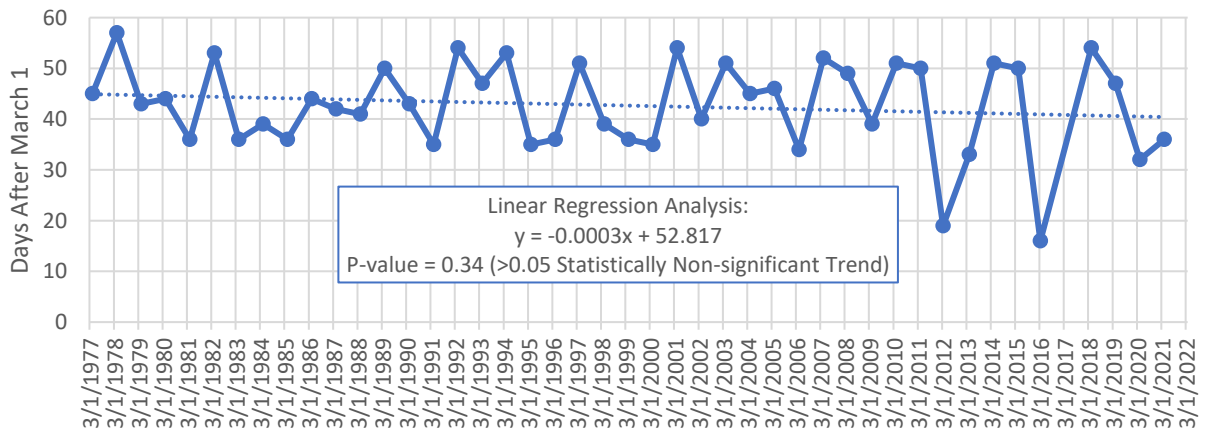
(Don Hendrich & Doug McKenney)



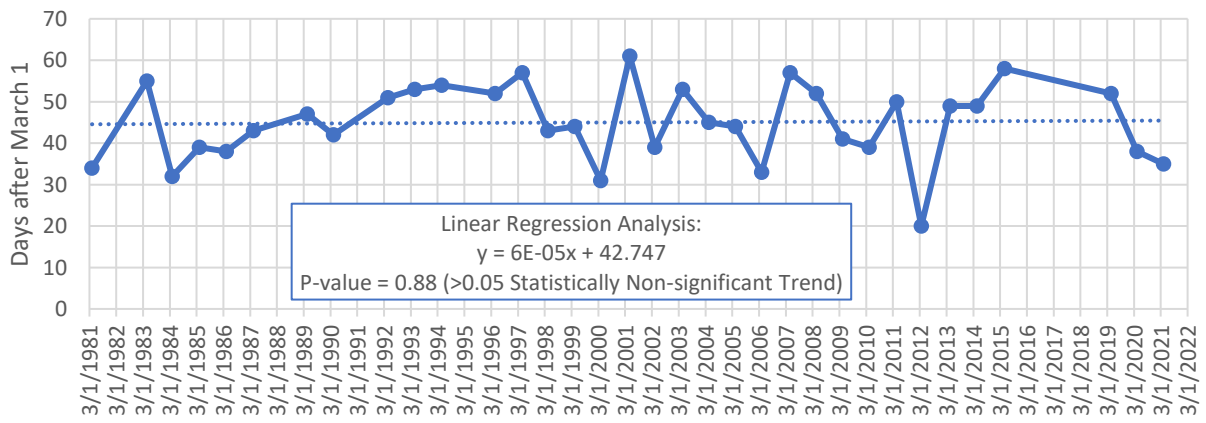
Lake Memphremagog Ice-In: Days after November 1 (Doug McKenny and Don Hendrich)



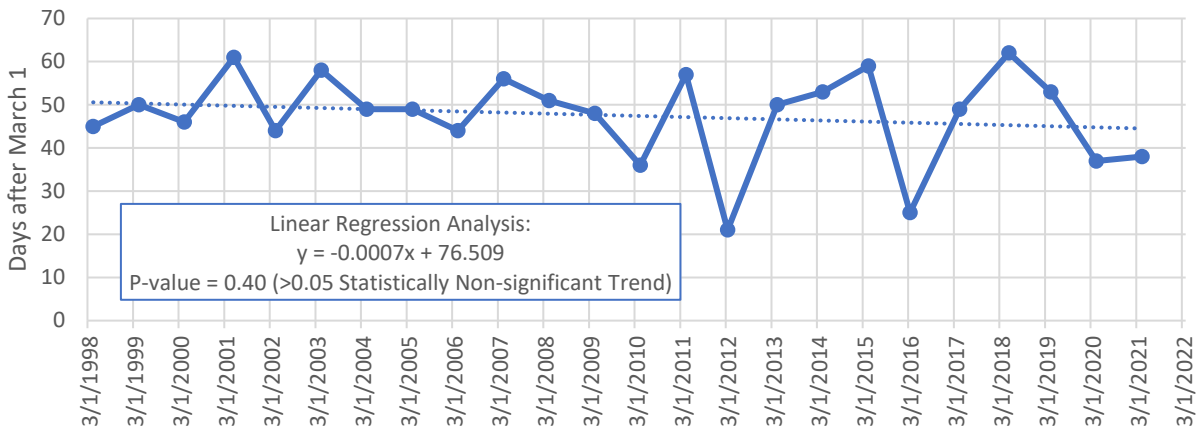
Lake Morey Ice-Out: Days After March 1 (<https://www.fairleevt.org/2016/03/ice-out-on-lake-morey-1977-2016/>)



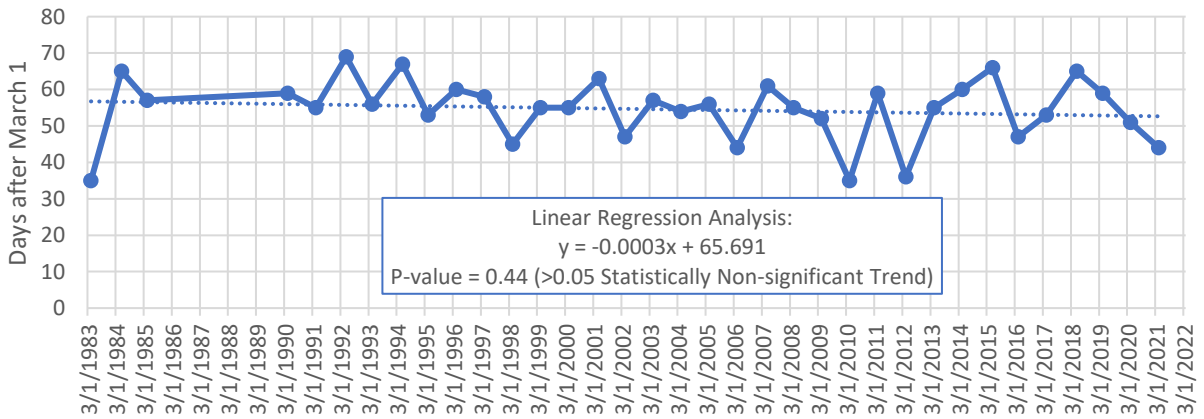
Lake Raponda Ice-Out: Days After March 1 (John and Cindy Meyer)



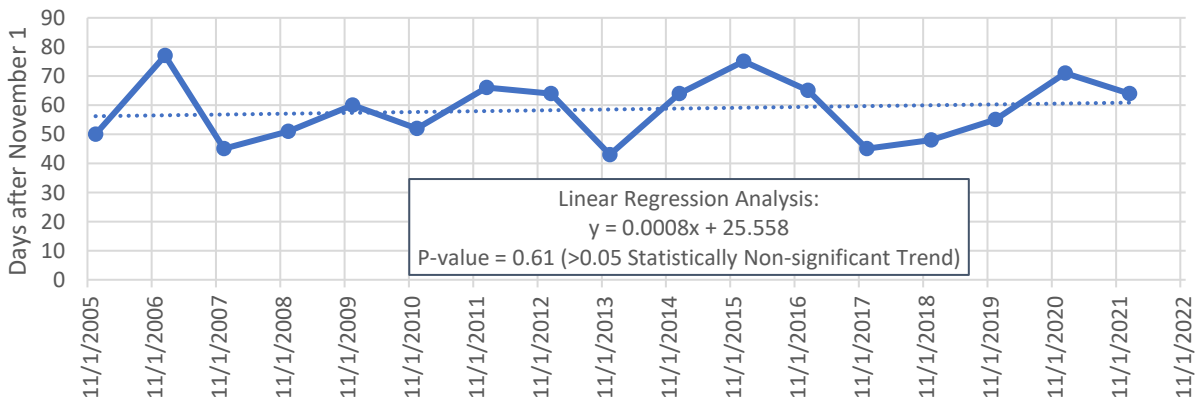
Lake Rescue Ice-Out: Days after March 1 (Frank Wingate, <https://lakerescue.org/ice-out/>)



Seymour Lake Ice-Out (Ice-Free): Days after March 1 (Janet Selby, Seymour Lake Association)



Seymour Lake Ice-In: Days after November 1 (Janet Selby, Seymour Lake Association)



Lake St. Catherine Ice-Out: Days after March 1 (Mary Jo Teetor and historical records)

