

## In Our Back Yard...

While putting together this newsletter two articles on ice out indicating climate changes, were found that peaked our interest. Since our ice out this year occurred on April 2<sup>nd</sup>, significantly earlier than prior years, we believed it would be of significant interest to our members. One was published in the Winter 2006 VLMP newsletter 'The Water Column' and the other was published in the UMaine Cooperative Extension newsletter. Additionally, we've included a trend analysis of Cold Stream Pond from 1952 to present and the approximate ice out dates on Cold Stream Pond from 1952 to present for your review.

### Historical Changes in Lake Ice-Out Dates as Indicators of Climate Change in New England, 1850-2000

Fact Sheet FS 2005-3002 January 2005. By the U.S. Department of the Interior & U.S. Geological Survey

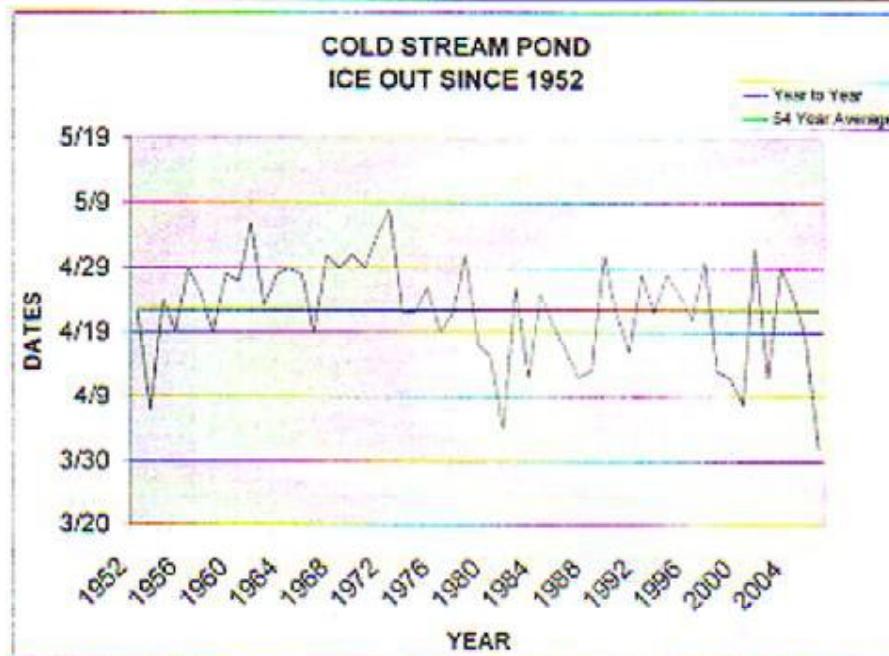
#### Introduction

Lake ice-out dates, or the dates of ice break-up, are the annual dates in spring when winter ice cover leaves a lake. Several studies in the last 15 years have used Lake ice-out dates in the Northern Hemisphere as measures of climatic variability and change. Very few lakes in New England have been analyzed, even though a remarkable amount of Lake ice-out data have been recorded and saved in New England during the past two centuries. For some lakes in New England, such as Moosehead Lake in Maine, ice-out dates were important for local steamship transportation. Data from other lakes, such as Richardson Lake, Maine, were important for annual log drives. Individuals have collected and saved extensive data because of general curiosity and community interest. For Damariscotta and West Grand Lakes in Maine the same family has been collecting ice-out data for three generations. The purpose of this study was to document and analyze the historical lake ice-out dates in New England.

#### Key Findings

Ice-out dates from 29 lakes in New England with 64 to 163 years of record were assembled and analyzed for this study. Twenty-two of these lakes are in Maine, four are in New Hampshire, and three are in Massachusetts. Ice-out dates have become significantly earlier in New England since the 1800's, ice-out dates changed between 1850 and 2000 by 9 days in northern and mountainous areas of New England (primarily northern and western Maine) and by 16 days in more southerly locations. Changes in the ice-out dates over time were very consistent between lakes with each of these two areas of New England.

About half of the year-to-year variability in the lake ice-out dates is explained by historical March-April air temperatures. The ice-out dates of the two areas have a different response to changes in air temperature though. The ice-out dates in the northern/mountainous areas are less sensitive to changes in air temperatures than the ice-out dates in the more southerly areas. This may be due to the typically higher amounts of snow on the lake ice in the northern/mountainous areas in late winter/early spring. The estimated late winter/early spring air-temperature is warming in both areas of New England since 1850, based on the relation between Lake ice-out dates, and air temperatures, is about 2.6 degrees Fahrenheit. Changes in Lake ice-out dates over time can affect important characteristics of lakes, such as the rate of change of summer oxygen levels, and the health of important parts of the food chain.



\*Graph courtesy of Nels Kramer and Cold Stream Pond ice-out dates courtesy of Steve Greenleaf. Thanks

## Ice Is An Indicator

*By Tamara Whitmore, AmeriCorps Intern, with the Maine DEP's Bureau of Land and Water Quality*

The possible effects of Climate Change can be seen throughout the globe, from earlier spring weather to changes in planting zones, as well as changing rain and snow patterns. But did you know that there is evidence of changing climate right here in Maine? And for many of us, it is right in our backyards!

Late winter and early spring is the perfect time for Mainers to observe climate change and key pieces of evidence in our ice, water and air! Ice cover on rivers and lakes is a good climate change indicator to observe since there is a long history (150 years) on a number of Maine lakes and rivers. The date of ice-out has been important over the years for transportation, annual log drives, and the end of ice fishing season. This has led to records of ice-out dates for some Maine lakes since before the 1850's (Sebago Lake starts in 1807)!

Researchers at the United States Geological Survey (USGS) use this historical information, along with current research, to identify trends in climate change over the years. Changes in ice thickness, date of ice-out on rivers and lakes, timing of high seasonal flows (spring melt and run-off) and winter air temperatures are all indicators that the USGS measure and analyze in order to identify significant trends.

So what is our ice cover telling us? According to USGS researchers, although there is a great deal of year-to-year variability, there has been a significant change in the past 30 to 40 years. There have been other periods of change, but not as dramatic. This is evidenced by warmer average winter air temperatures and measurements of thinner ice. There is an overall trend in many river and lake ice-out dates, documenting spring run-off dates are occurring from one to two weeks earlier.

How does this change affect us? While some might be joyful at the possibility of milder and shorter winters and longer growing seasons in the years to come, others that enjoy winter may not be so happy. This warming trend could also harm cold water fish habitat, such as the atlantic salmon or trout that can be sensitive to changes in stream flow and water temperatures. And as this trend continues, there are additional consequences that can affect all of us – changes in precipitation patterns, rises in sea level, loss of coastline, changes in ocean currents and even possible changes in the availability and quality of our water resources right here in Maine!

So what can you and I do about these changes in our climate? We can keep our eyes on the ice and other indicators of climate change and alert others to what's going on in our environment. You can encourage your friends and neighbors to switch to renewable energy sources wherever possible and practice energy conservations (such as combining trips and car pooling, turning down the thermostat, and shorter showers). Together we can make a difference to clean up the air and put the freeze on our energy bills.

COLD STREAM POND ICE OUT DATES						
YEAR	1950'S	1960'S	1970'S	1980'S	1990'S	2000'S
0		28-Apr	30-Apr	16-Apr	23-Apr	09-Apr
1		07-May	05-May	06-Apr	21-Apr	02-May
2	23-Apr	24-Apr	09-May	27-Apr	29-Apr	13-Apr
3	08-Apr	29-Apr	23-Apr	12-Apr	24-Apr	30-Apr
4	25-Apr	30-Apr	23-Apr	25-Apr	28-Apr	17-Apr
5	20-Apr	29-Apr	27-Apr	21-Apr	26-Apr	19-Apr
6	30-Apr	20-Apr	20-Apr	17-Apr	21-Apr	02-Apr
7	26-Apr	02-May	23-Apr	15-Apr	01-May	
8	20-Apr	19-Apr	02-May	15-Apr	13-Apr	
9	29-Apr	02-May	18-Apr	03-May	13-Apr	

WORLD WATER BUDGET	
Earth's surface is 70% water.	
97.5% of that water is salt.	
2.5% is fresh water.	
DISTRIBUTION OF FRESH WATER	
Polar ice caps, glaciers	1.8%
Groundwater, aquifers	.635%
Atmosphere	.001%
Lakes	.01%
Reservoirs	.001%
Rivers	<.001%
MOST ACCESSIBLE FRESH WATER RESOURCES	
Lakes, Reservoirs and Rivers	
Percent of the Total Budget	.012%