

Lake Ice & Loss of Winter as we knew it? What is Happening?

John J. Magnuson
Center for Limnology
University of Wisconsin - Madison



WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON



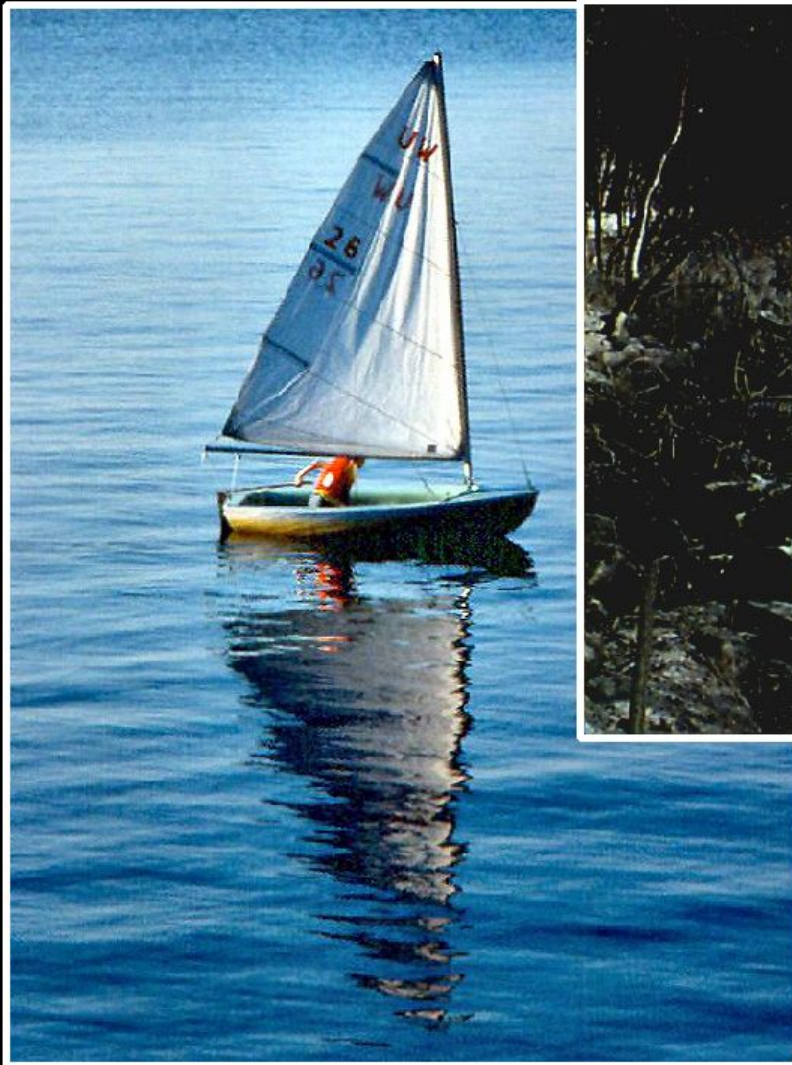
Center for Limnology
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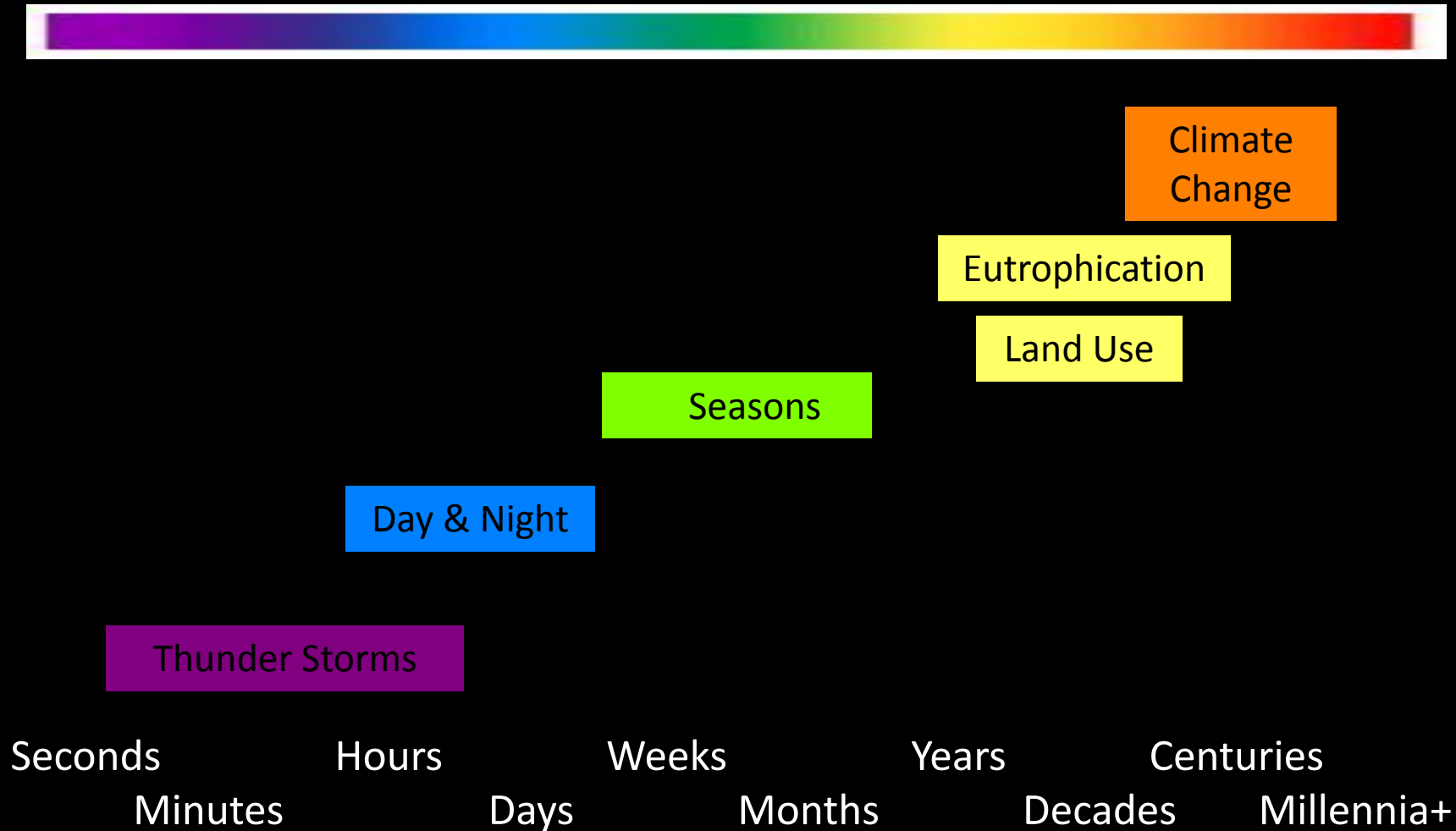
North Temperate Lakes
US Long-Term Ecological Research Network

Lake Mendota WI, March 25, 2010 (Magnuson)

First, How Do We Deal With Change?



Changes Occur Quickly and Slowly



Time Scales of Changes

An early quote about time

Marcus Aurelius Antonius,
Roman Emperor & Philosopher



Time is sort of a river of passing events, and
strong is its current;
no sooner is a thing brought to sight than it is
swept by
and another takes its place, and this too will be
swept away. (ca. 170)

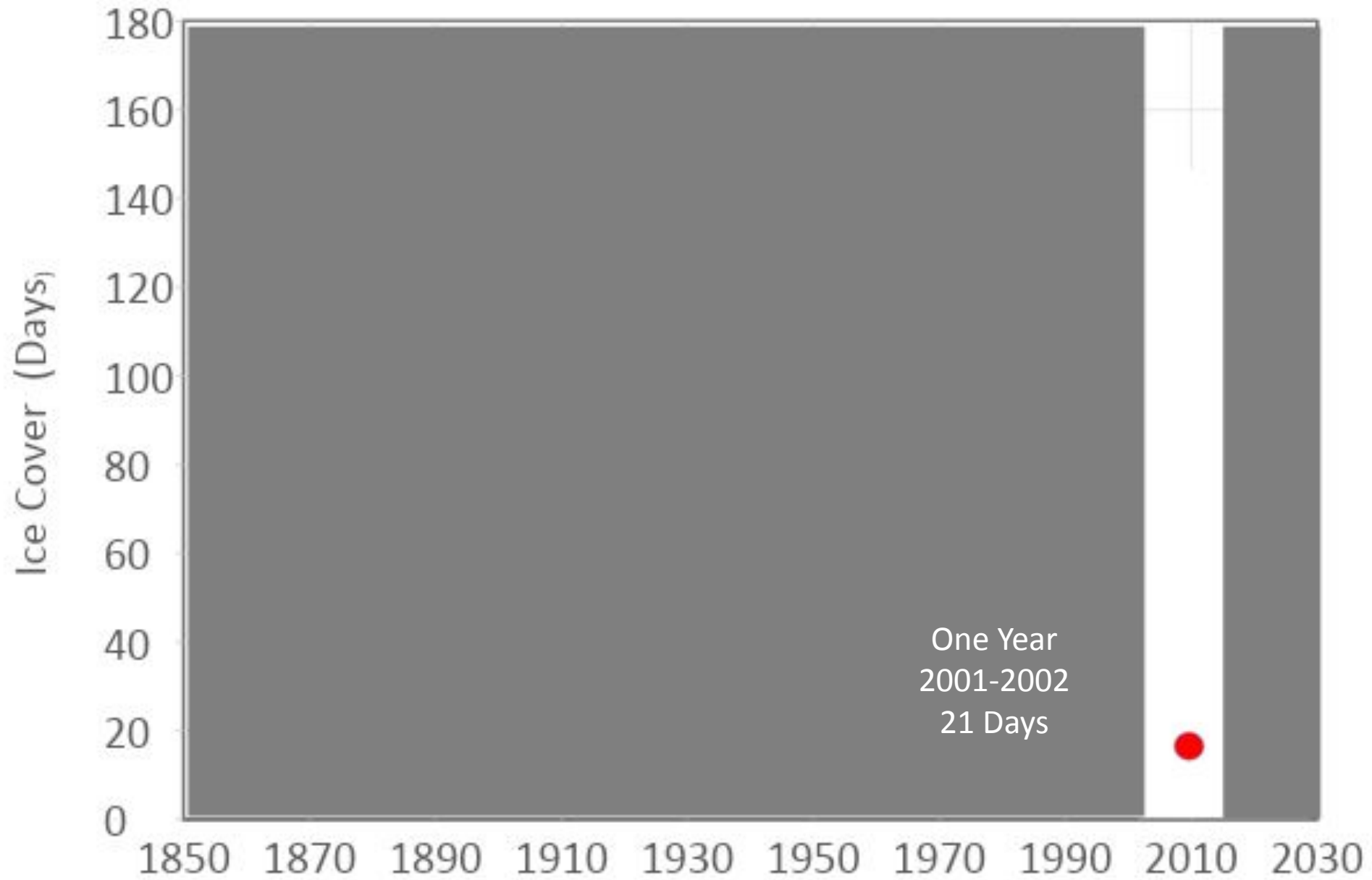


The Invisible Present

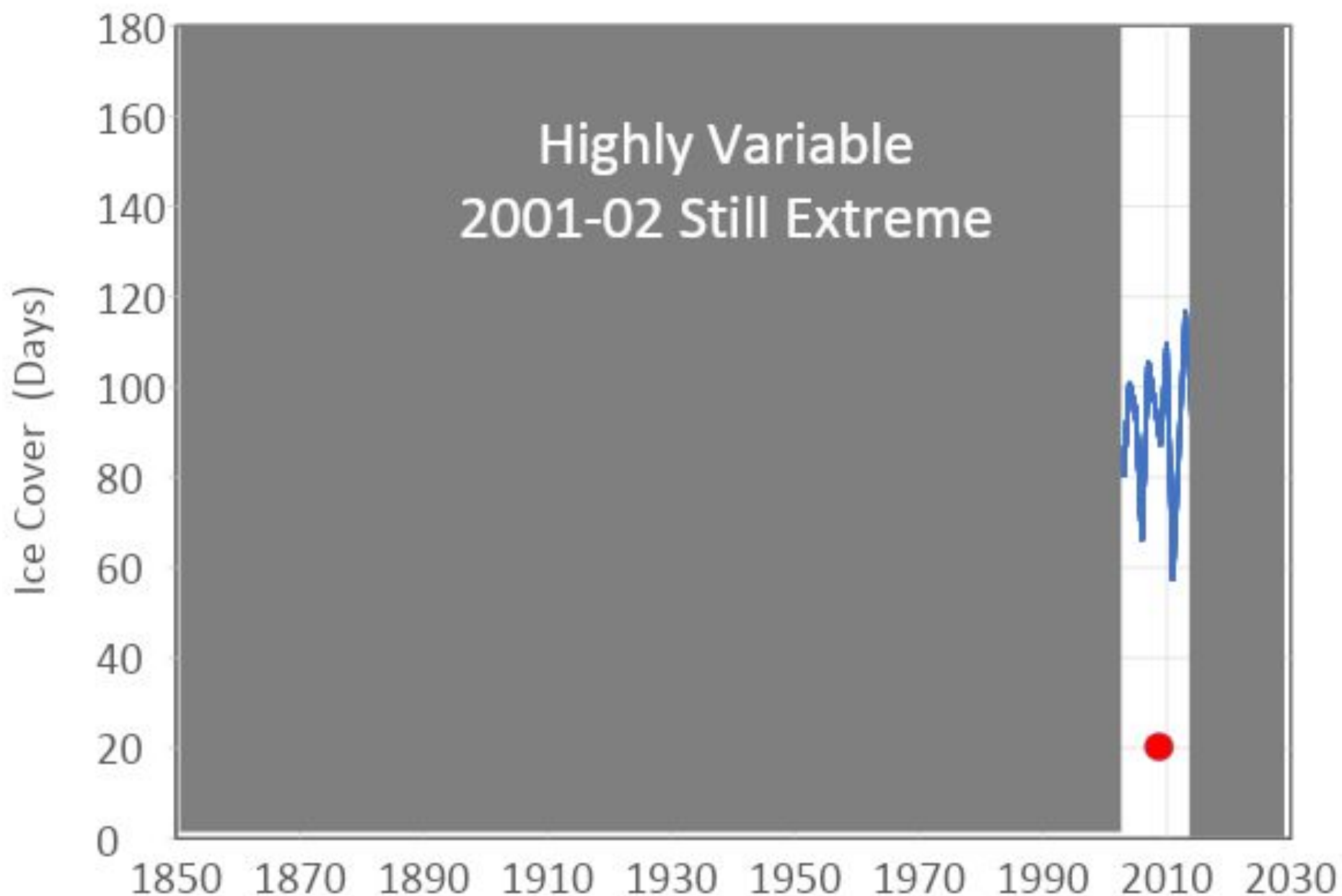
Lake Mendota Ice-on Day, January 20, 2007



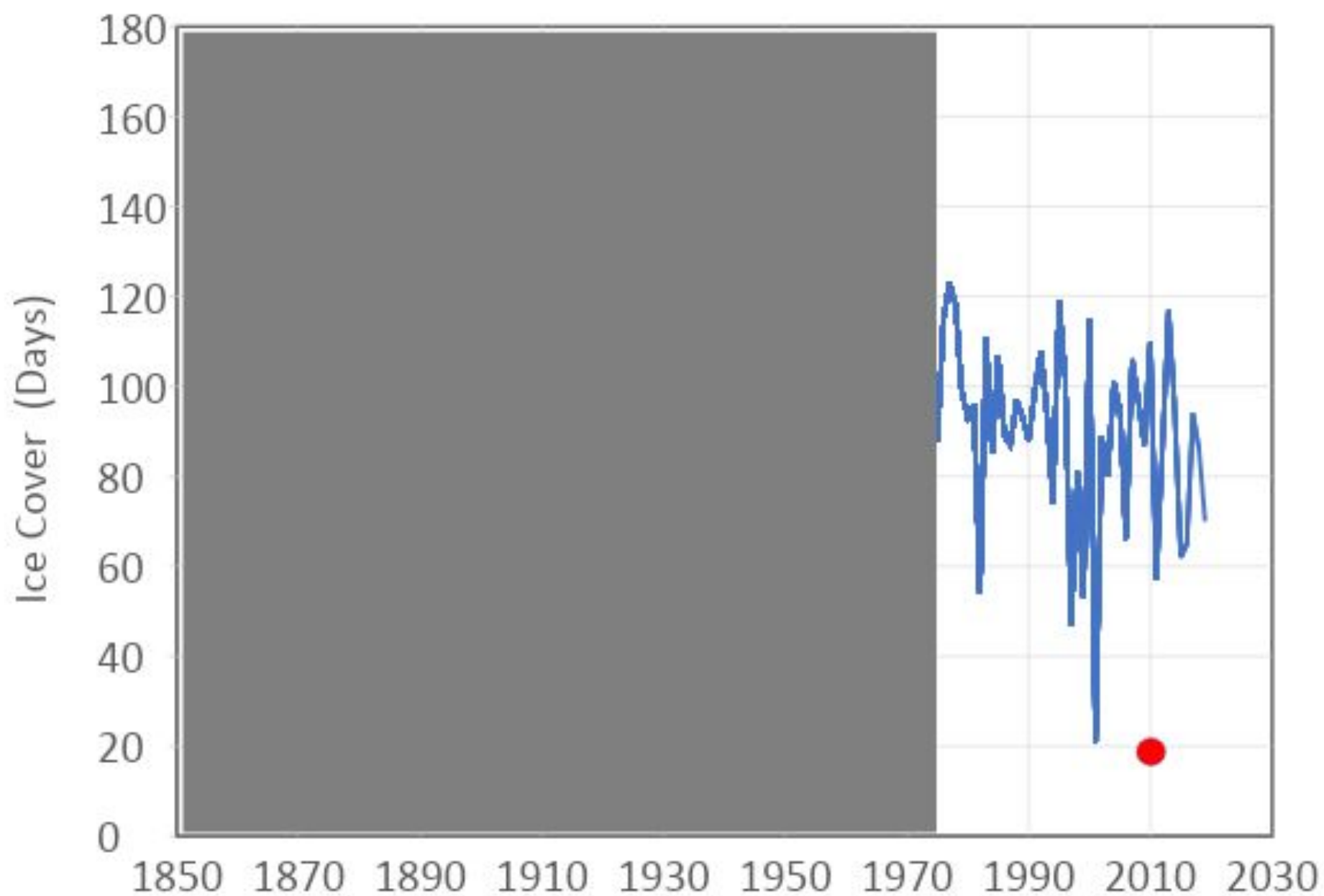
Lake Mendota Ice Duration Invisible Present



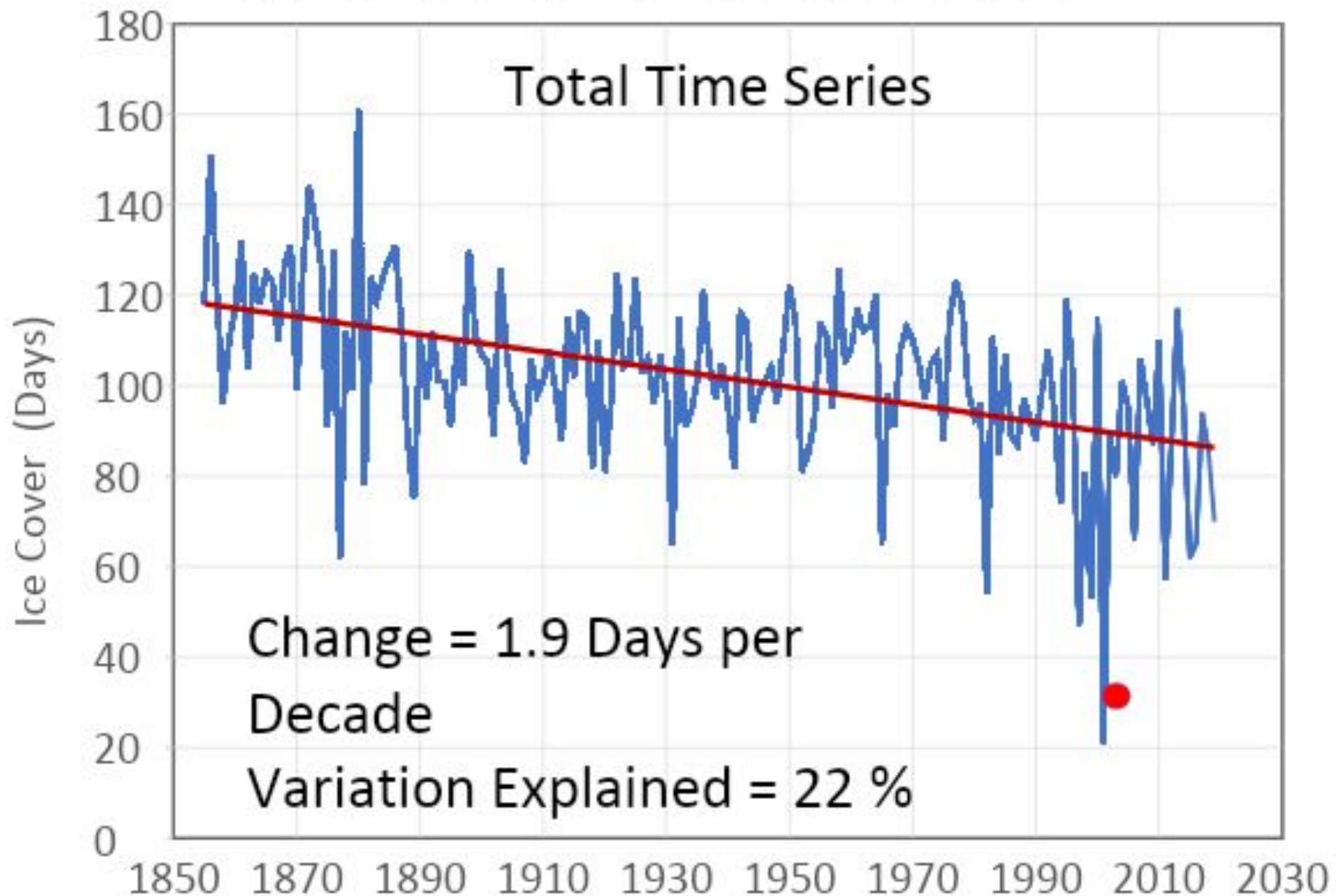
Lake Mendota Ice Duration 10 Years



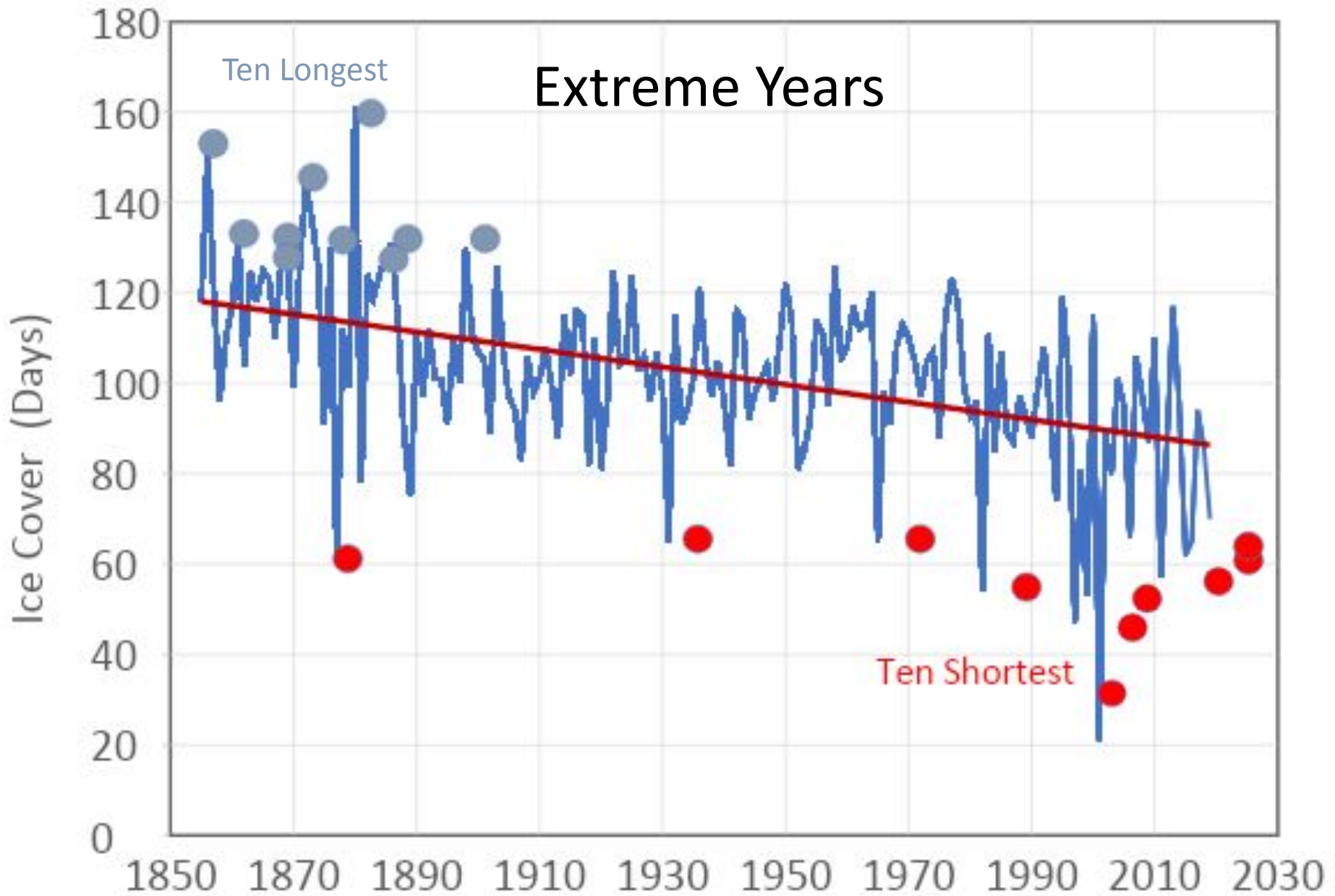
Lake Mendota Ice Duration 50 Years



Lake Mendota Ice Duration 1855-2020



Lake Mendota Ice Duration 1855-2020



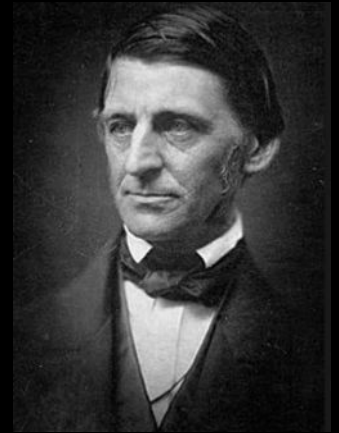


The Invisible Place

Quotes about Space

Ralph Waldo Emerson
Essays IX Circles (1841)

The field can not be well seen from within the field.



Albert Arnold (Al) Gore
The Earth in the Balance, Ecology and the Human Spirit
(1992)

It is helpful to stand at some distance
from any large pattern we are trying to comprehend.

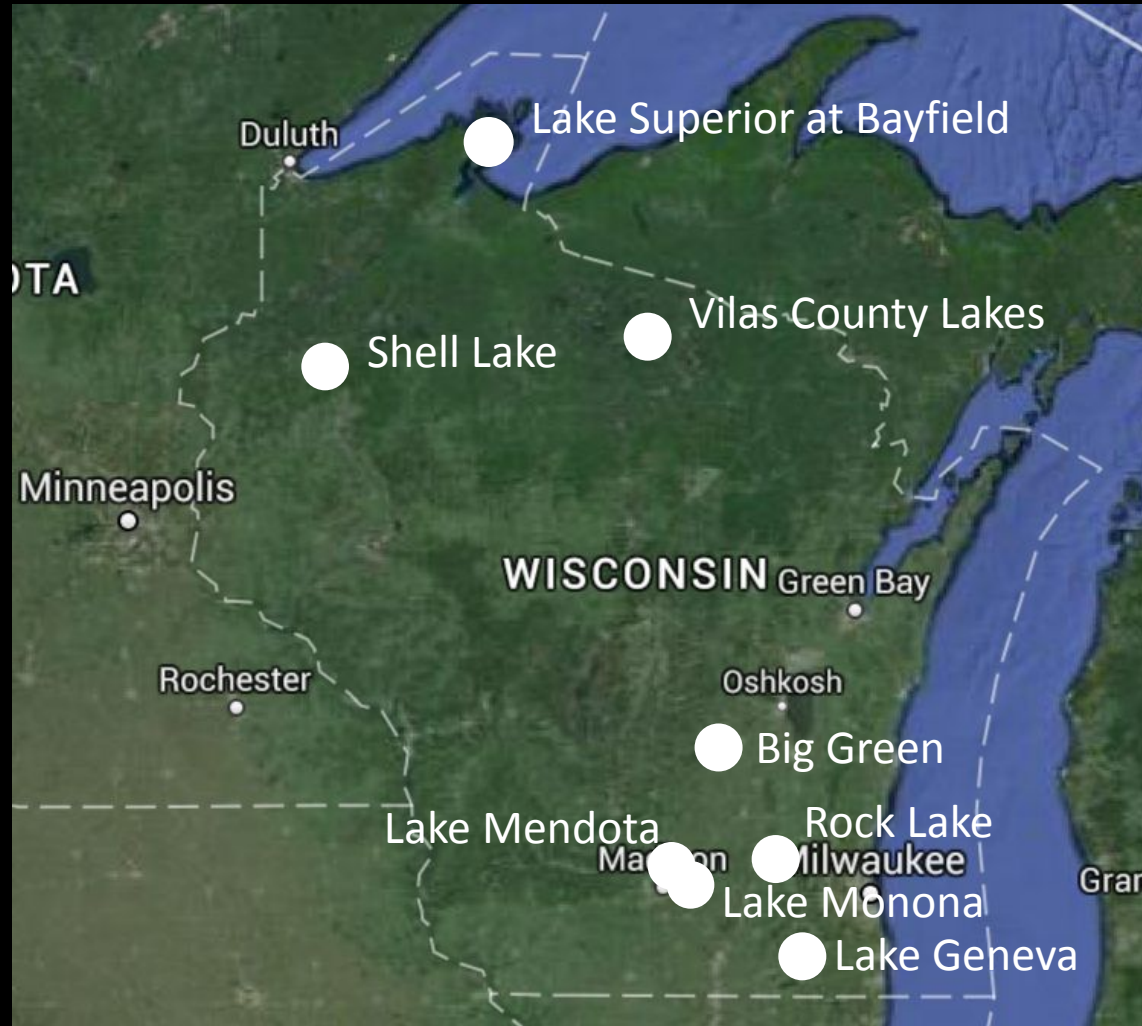


John Heywood (mid1500s)

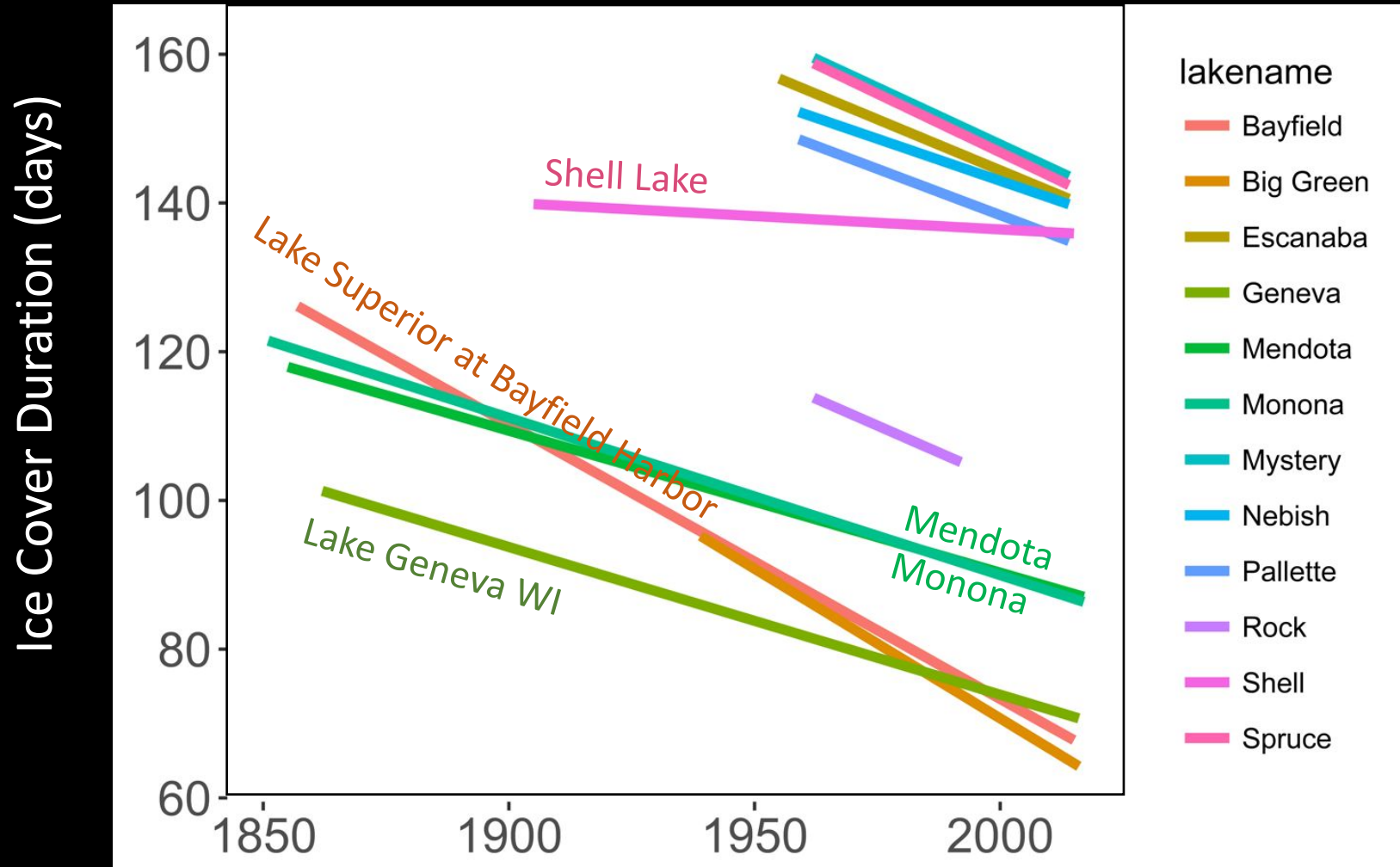
Not being able to see the forest for the trees.
You cannot see the wood for the trees.



Location of a few of the 46 Wisconsin lakes with ice cover observations

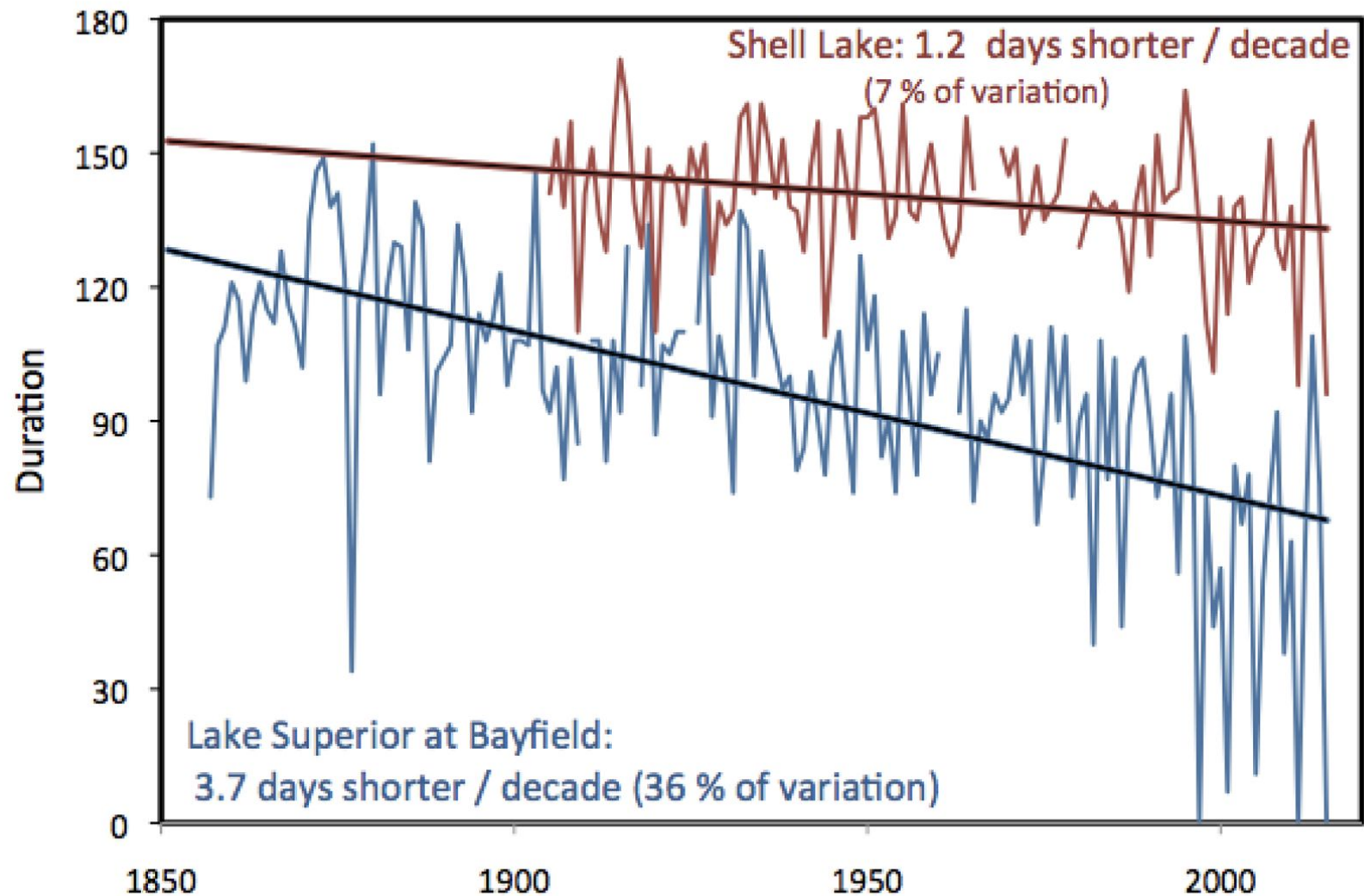


Ice cover duration on a few of the 46 Wisconsin lakes with ice observations

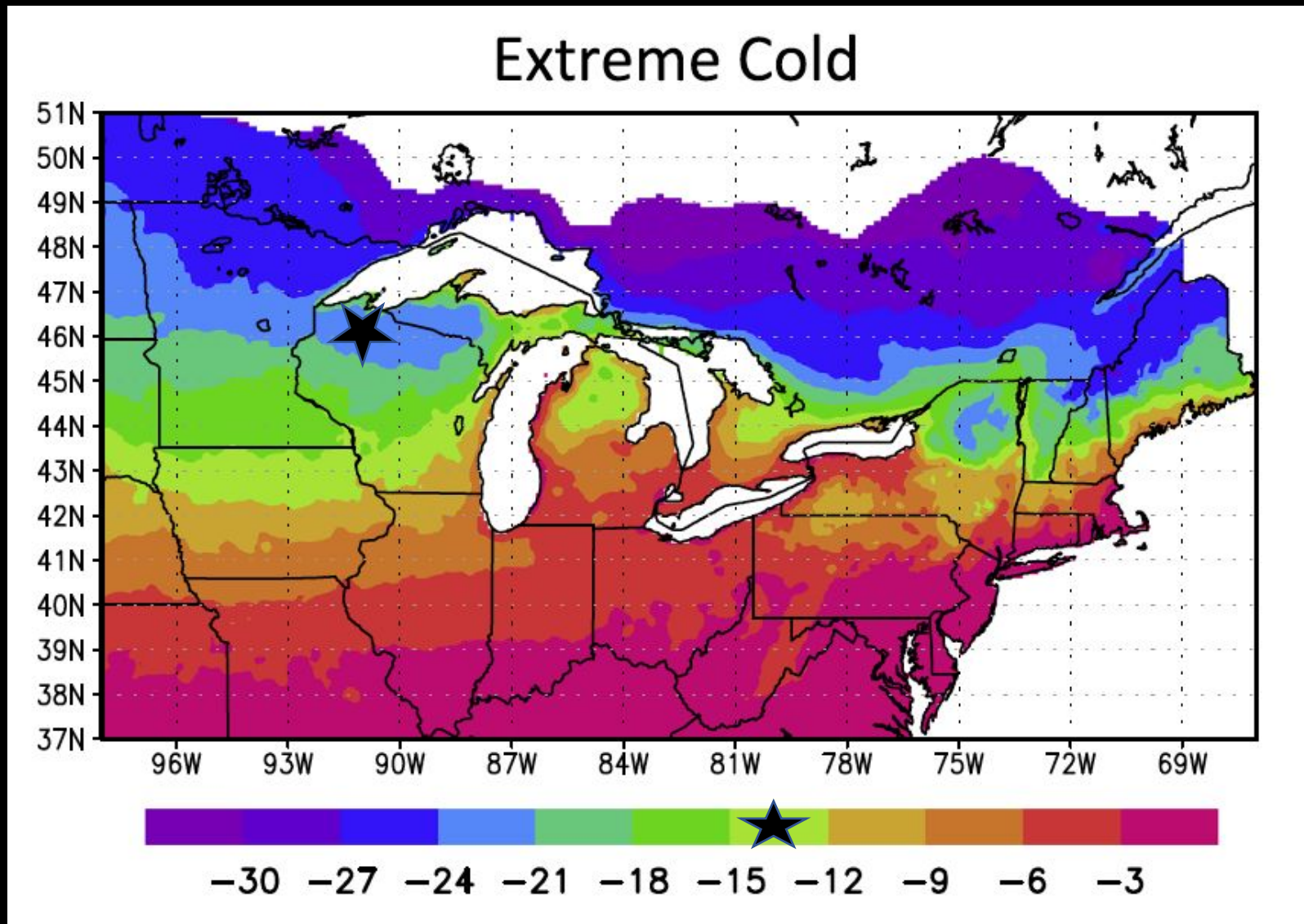


Longest Ice Records from Northern Wisconsin (Shell L. & L. Superior at Bayfield)

Ice Cover Duration on Northern Wisconsin Lakes (1855-2015)



Projected Decrease in Extreme Cold Days (<0°F) from 1961-2000 to 2046-2065



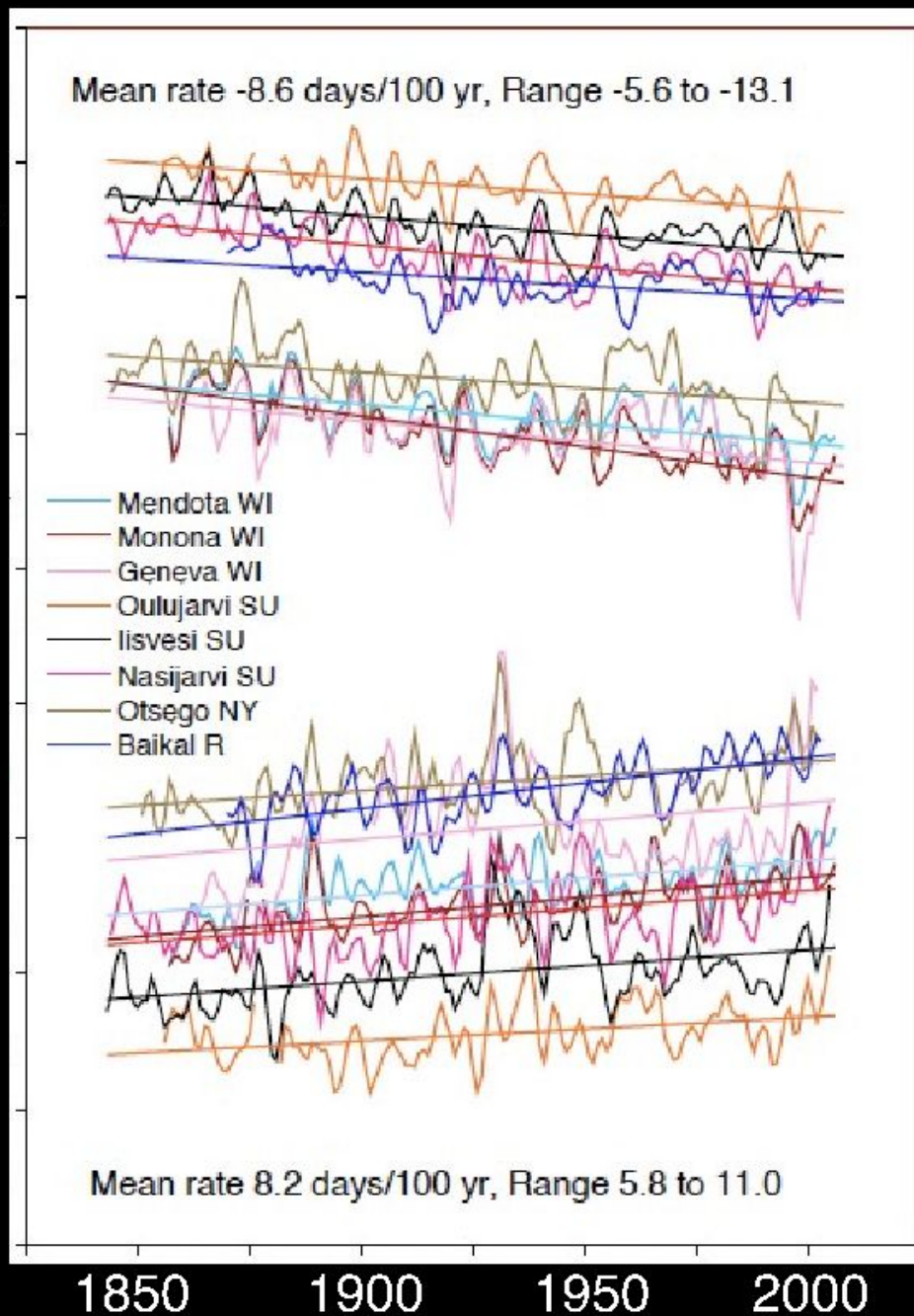
Changes in Freeze and Breakup Dates

winters
1843-4 to 2008-9
(8 lakes)

Breakup

Freeze

Jun
May
Apr
Mar
Feb
Jan
Dec
Nov
Oct



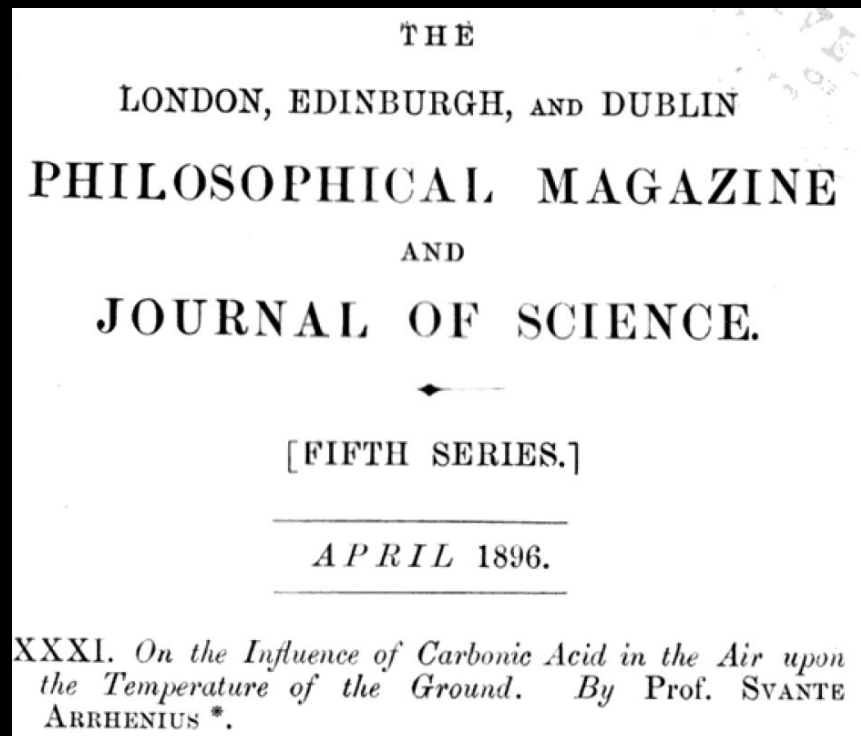
How Long Has Science Recognized the Importance of CO₂ in Warming the Atmosphere?

At least from 1896 through the works of Svante Arrhenius, a Swedish Chemist



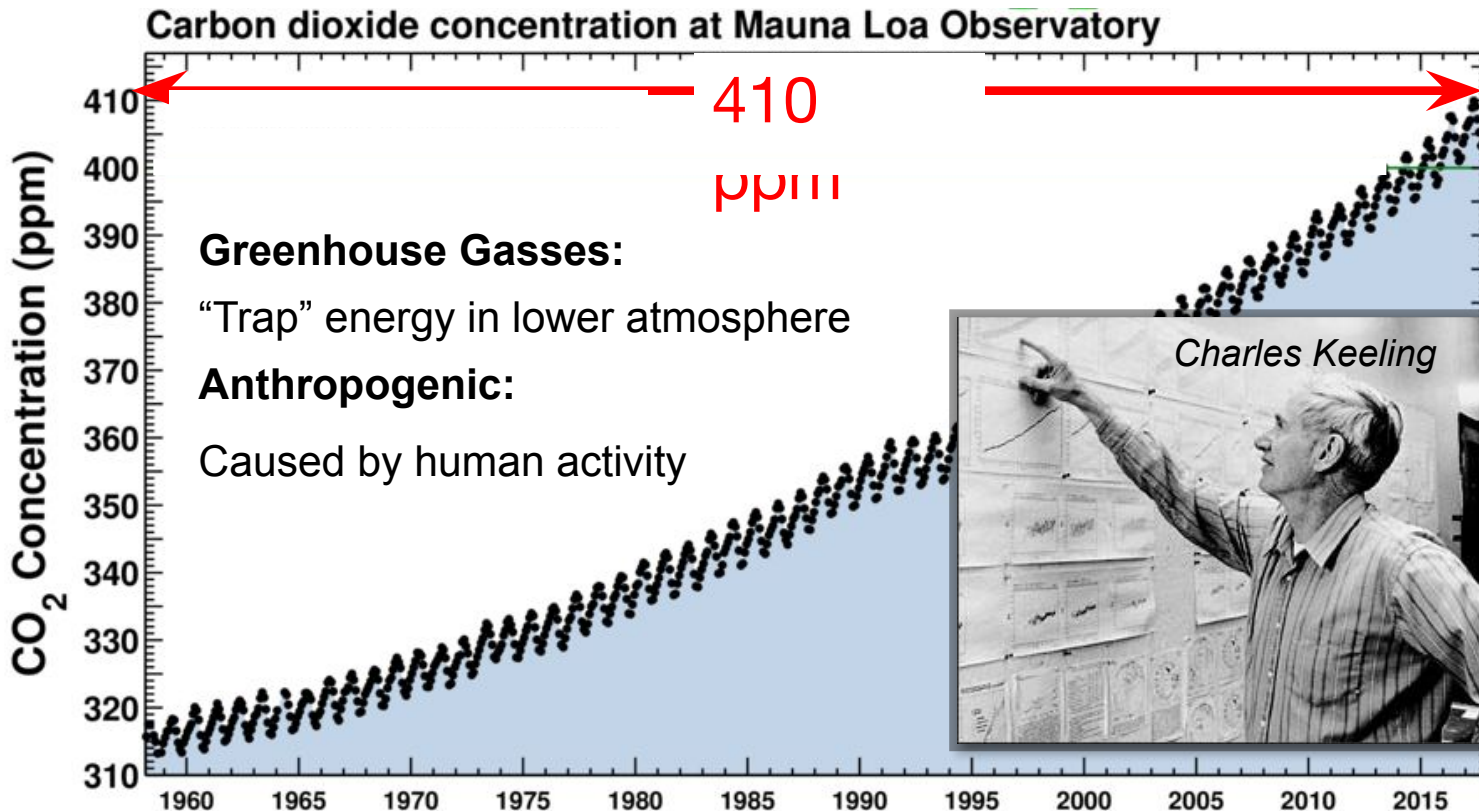
Quote:

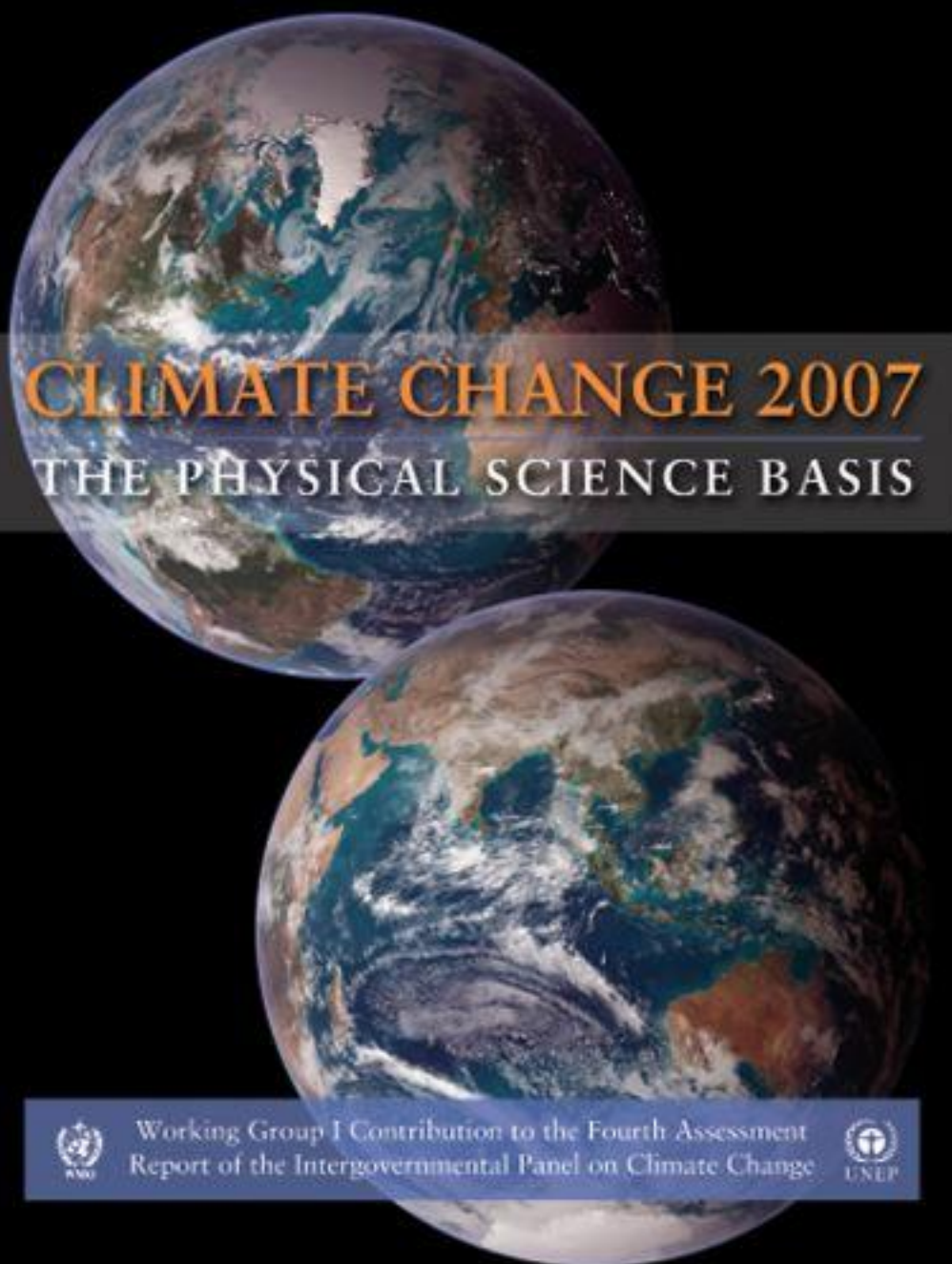
“if the carbon dioxide is increased by 2.5 to 3 times its present value, the temperature in the arctic regions must rise 8 to 9°C. and produce a climate as mild as that of the Eocene period.”



Greenhouse gasses are increasing owing to burning fossil fuels

CO₂ reading on Jan 15, 2018: 407.8 ppm





CLIMATE CHANGE 2007

THE PHYSICAL SCIENCE BASIS



Working Group I Contribution to the Fourth Assessment
Report of the Intergovernmental Panel on Climate Change





INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE



Baiendra Kumar Pachauri

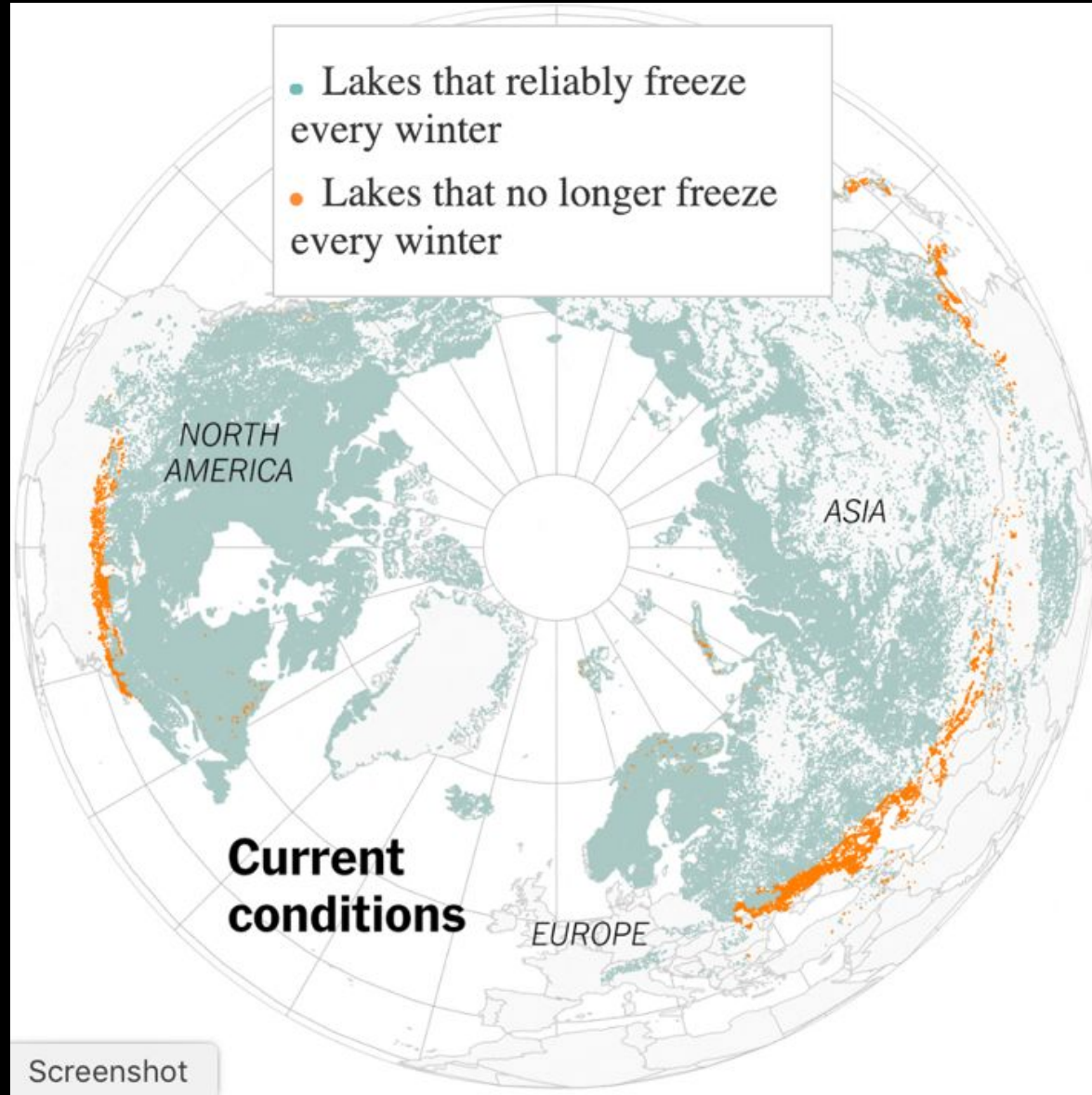
IPCC delegation
with Nobel Peace Prize Diploma
and Gold Medal
at the Oslo Town Hall

2007



Robert Watson

Lakes that do not freeze every winter (Projection)



Lakes that do not freeze every winter (Projection)



Current
Condition



Warming
2 Degrees C



Warming
4.5 Degrees C



Warming
8 Degrees C



Lake Ice: a Miner's Canary for Climate Change

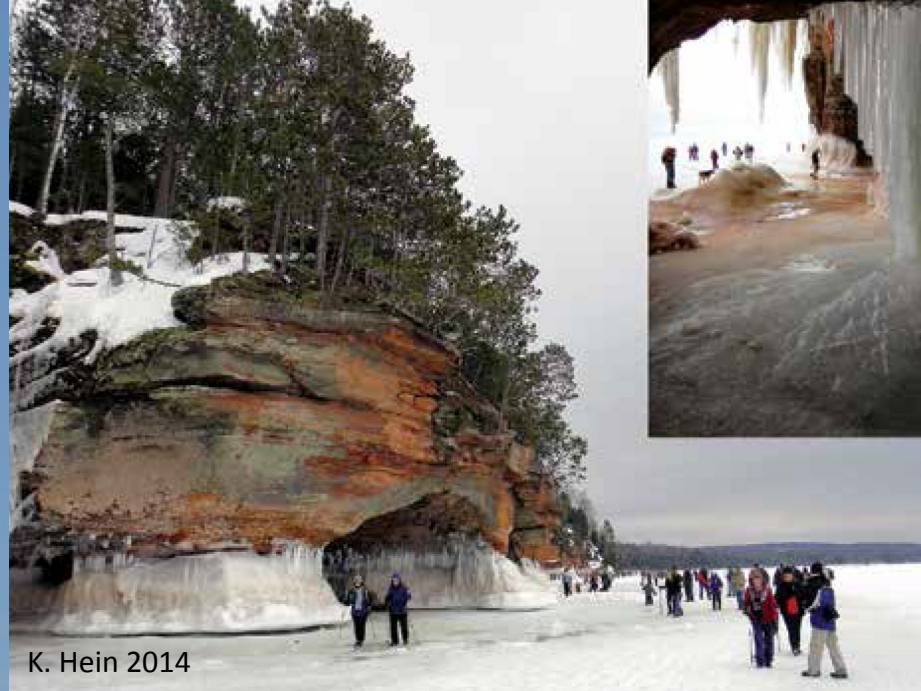
Magnuson photo
Mystery Lake , mid 1970s

Winter is a part of our “Sense of Place.”



Ice Services to us Declining with Warming





K. Hein 2014

Apostle Island National Lakeshore





Ice Road from Madeline Island to Bayfield, Wisconsin

Sources: Bob Hanson

https://www.youtube.com/watch?v=d_tDfye6Ffc



How much longer
can a good thing last?

Taken from an Article in Diane Daulton's Water Column (ddaulton@centurytel.net)

The Madeline Island Ferry was still running in February 2016.

Ice Cover = 0 days

The ferry can break through about 6 inches of ice.

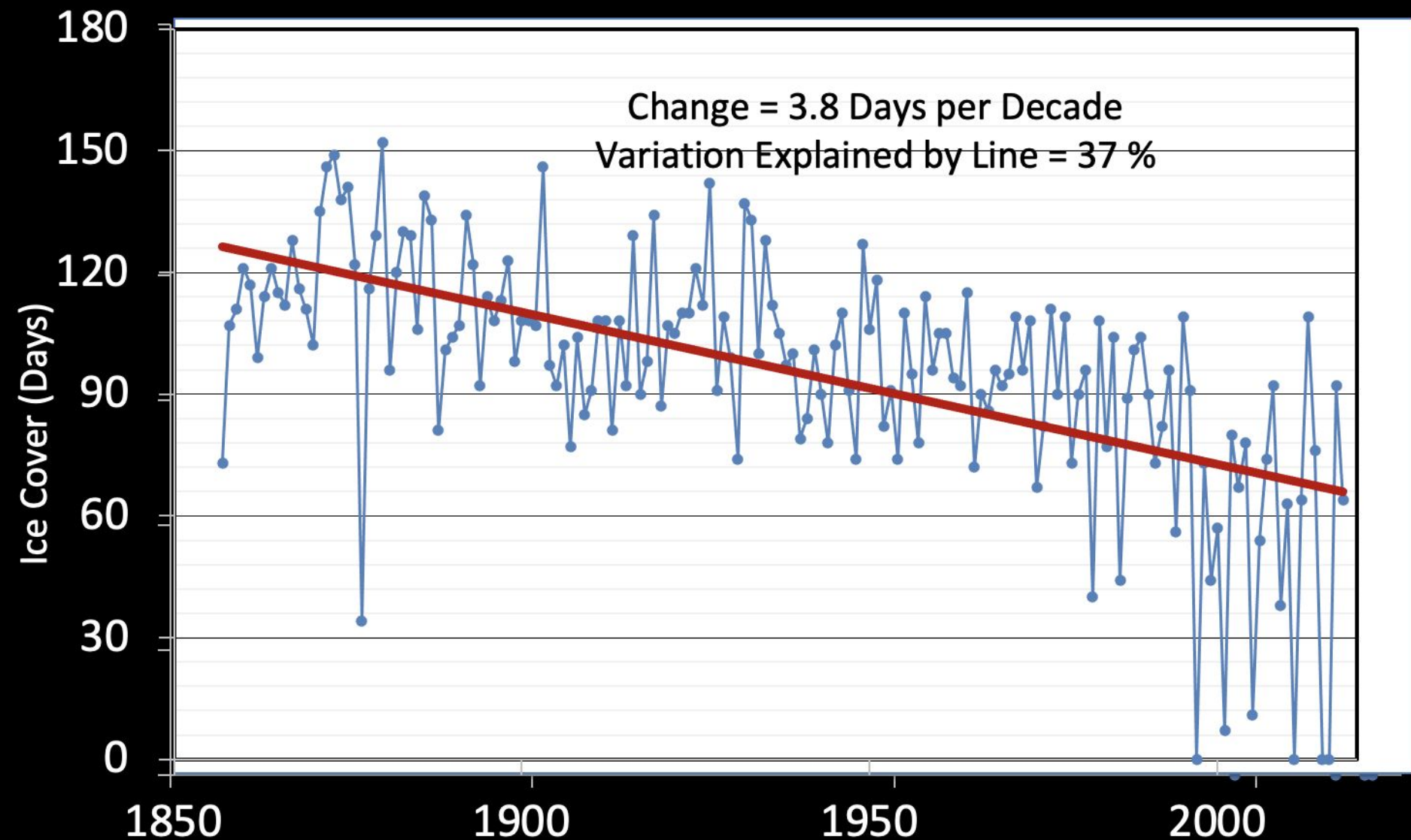
Boats may not have been as able to break ice as well in the early years.



Photo courtesy of Jon Armstrong www.apostlerentals.com

Bayfield Harbor, Lake Superior

Days between Last Boat in Fall and First Boat in Spring



Winter is a part of our “Sense of Place.”



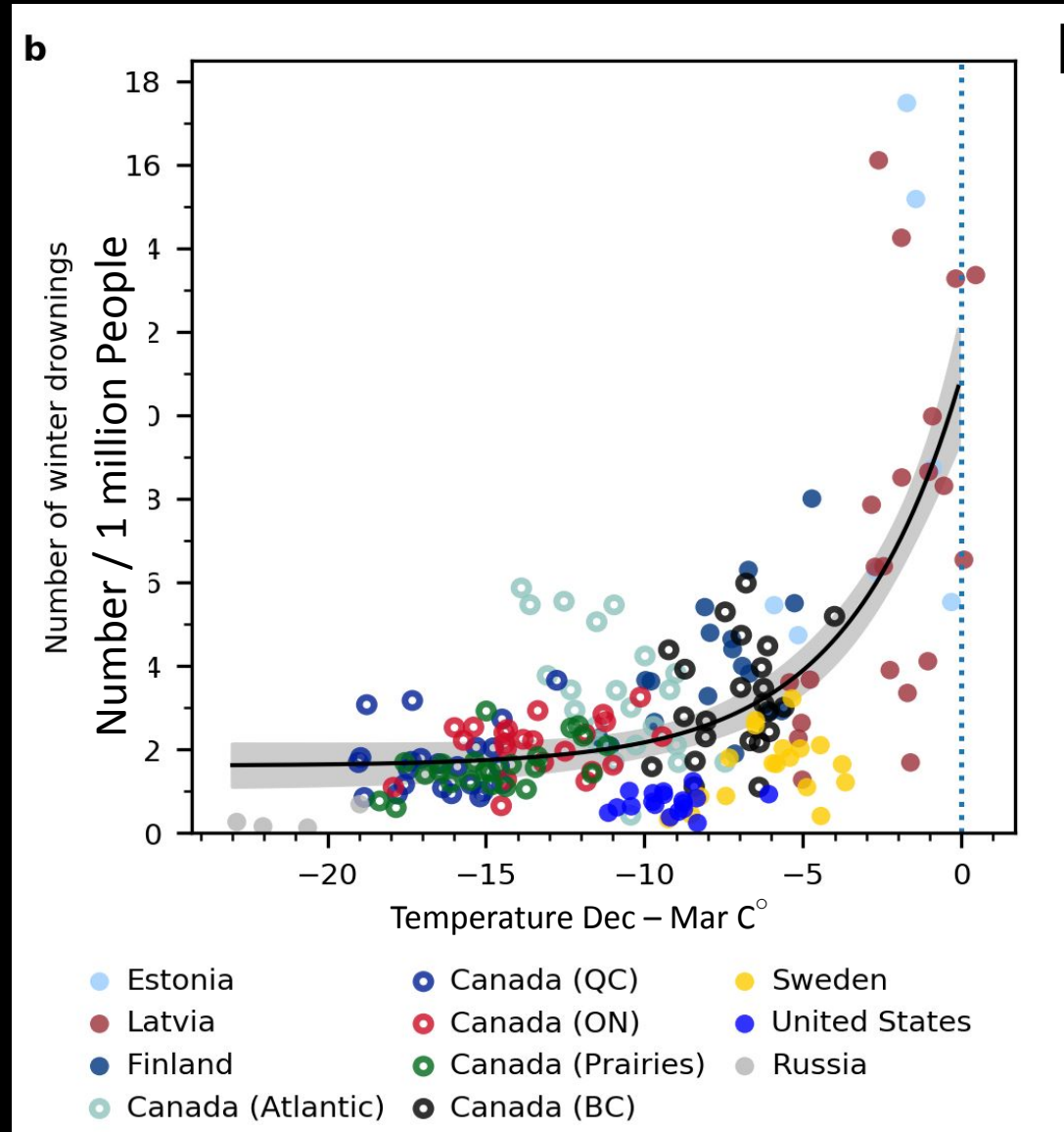
Increased Winter Drownings in Warmer Winters.

Increased winter drownings on ice-covered lakes regions with warmer winters

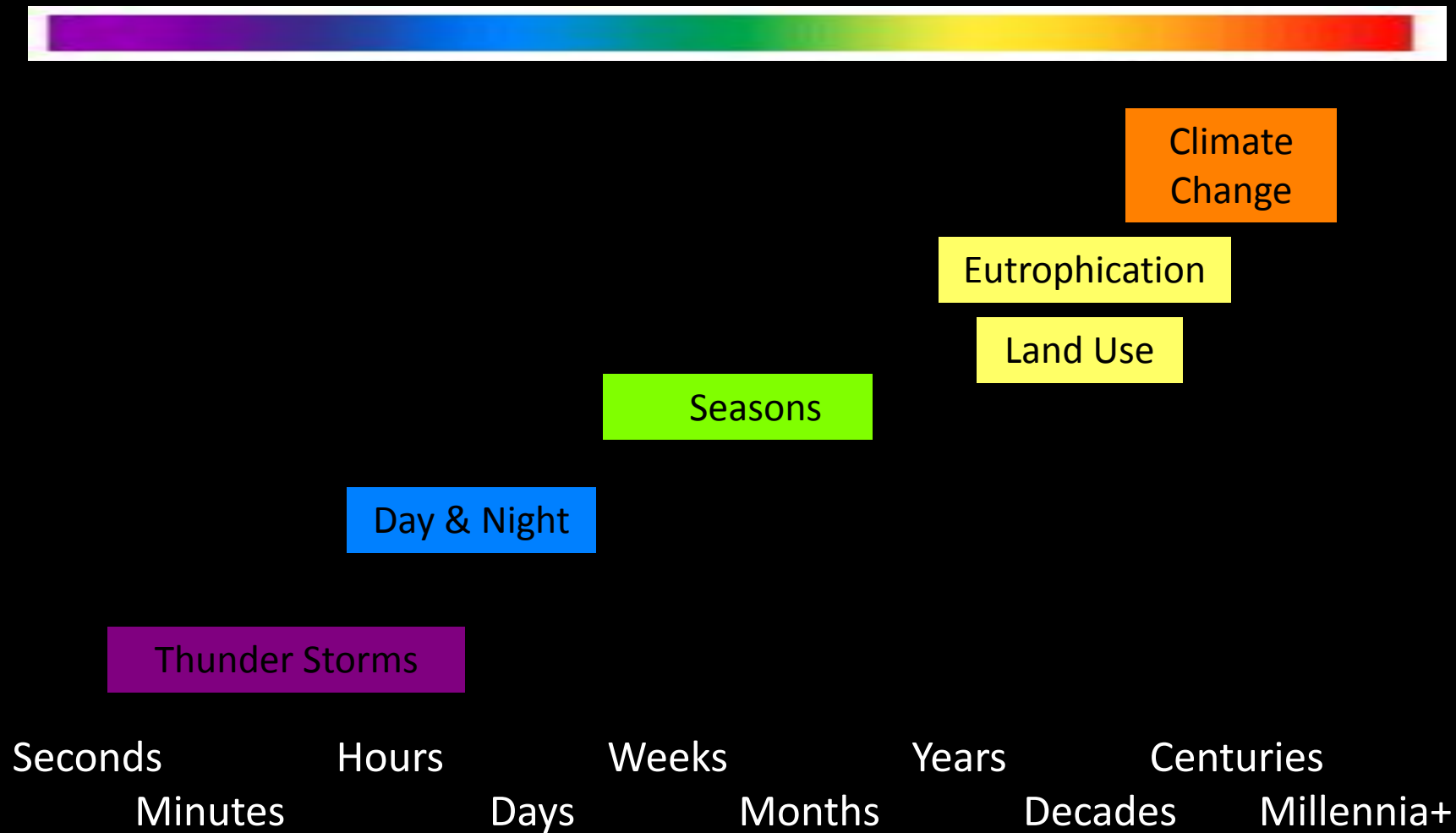
We analyzed 4,000 winter drownings in 10 countries

About 20 % of total drownings

48 % of drownings are explained by winter temperatures



Changes Occur Quickly and Slowly



Time Scales of Changes

Lake Mendota's ice ridges mirror the complex interannual variability



So be aware & use what we learned today
to help understand long-term change



Do not fall victims to living in:

The Invisible Present

The Invisible Place



Think Ahead! Climate Change Adaptation & Mitigation

