

What Does Lake Ice Seasonality Tell Us about Climate Change in Fontana, Wisconsin, & Globally?

Fontana Public Library
Fontana, WI

A Badger Talk

July 11, 2023

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University of Wisconsin - Madison



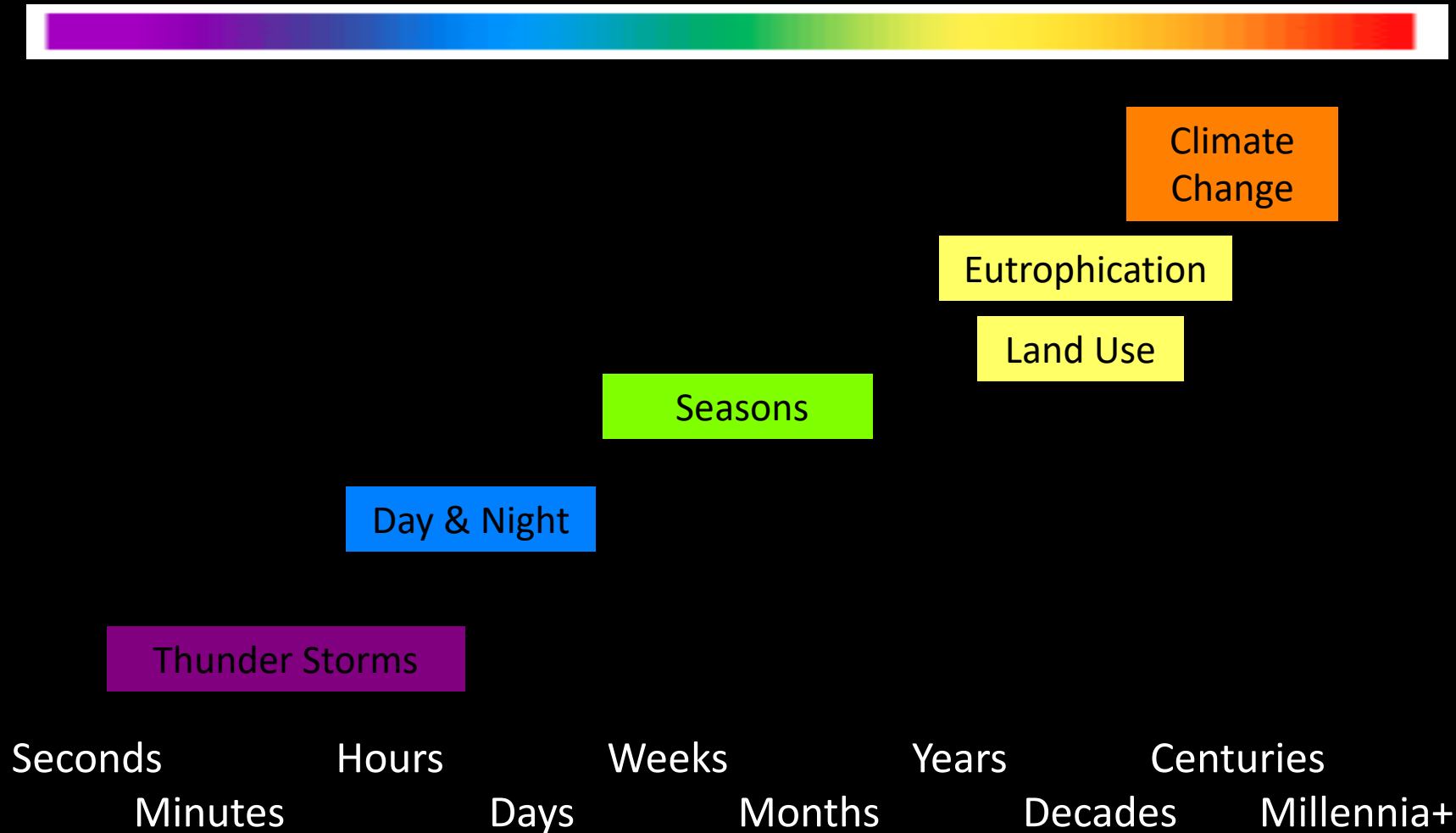
WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON

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)

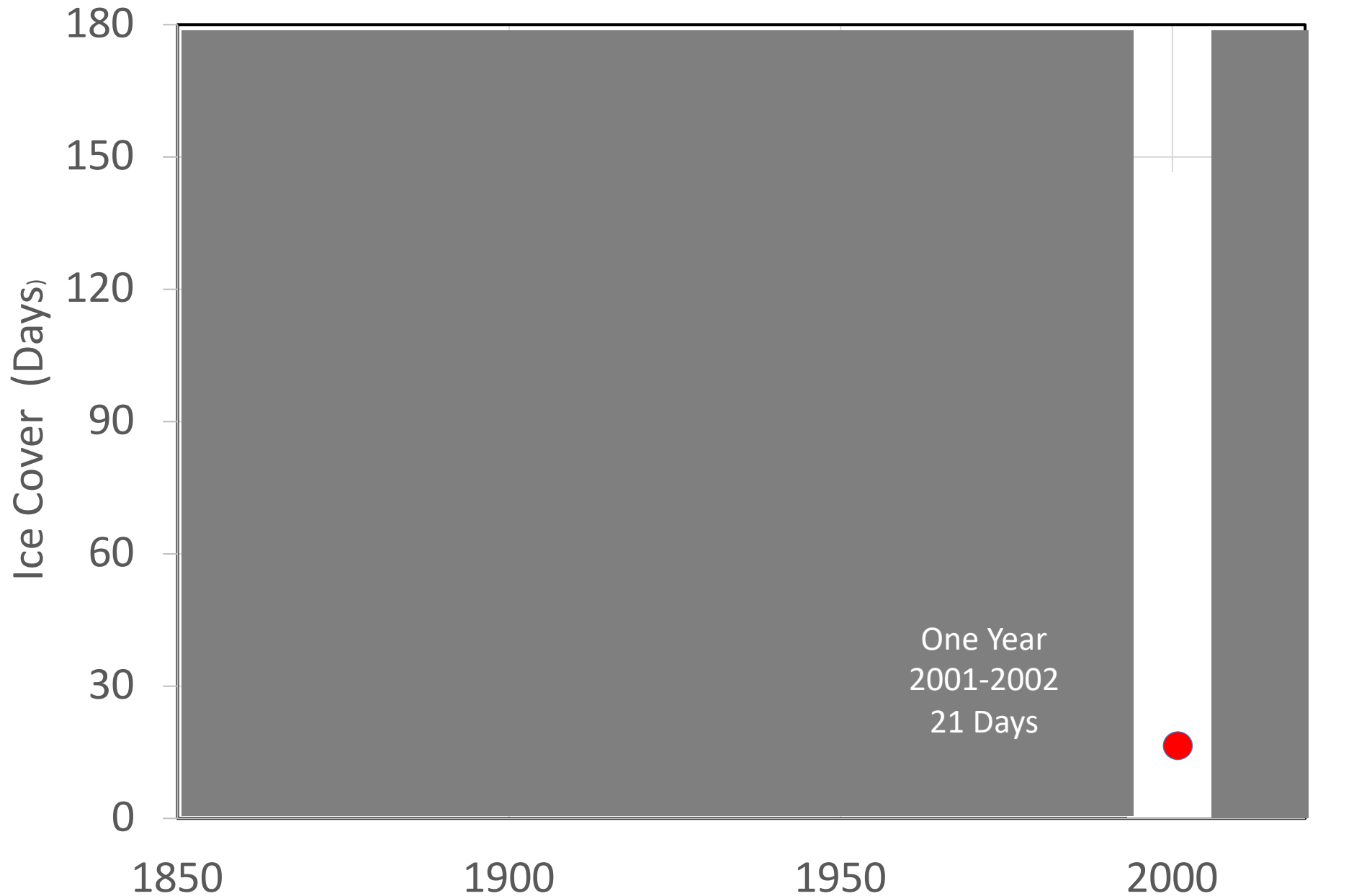


The Invisible Present

Lake Mendota Ice-on Day, January 20, 2007

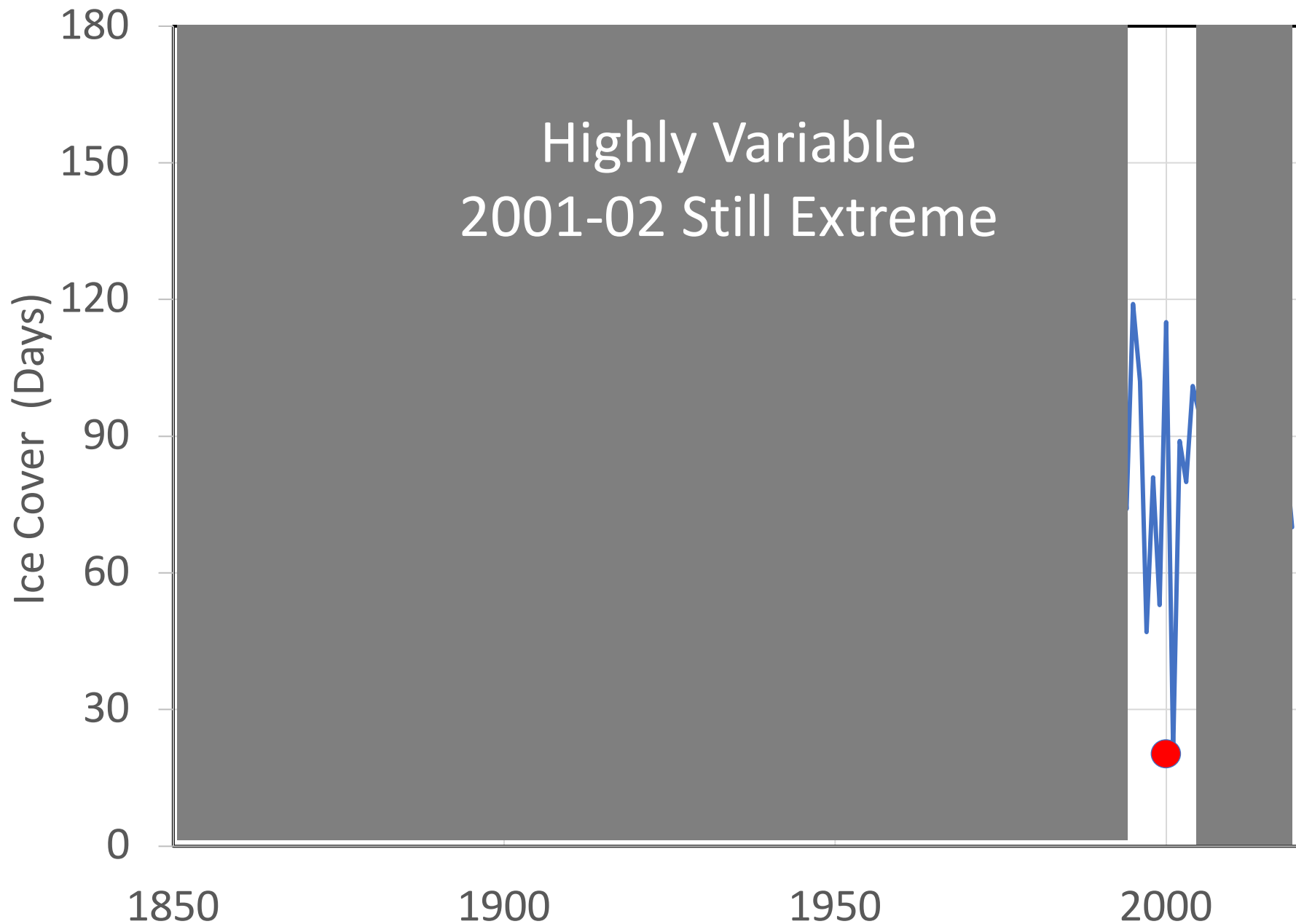


Lake Mendota Ice Duration Invisible Present

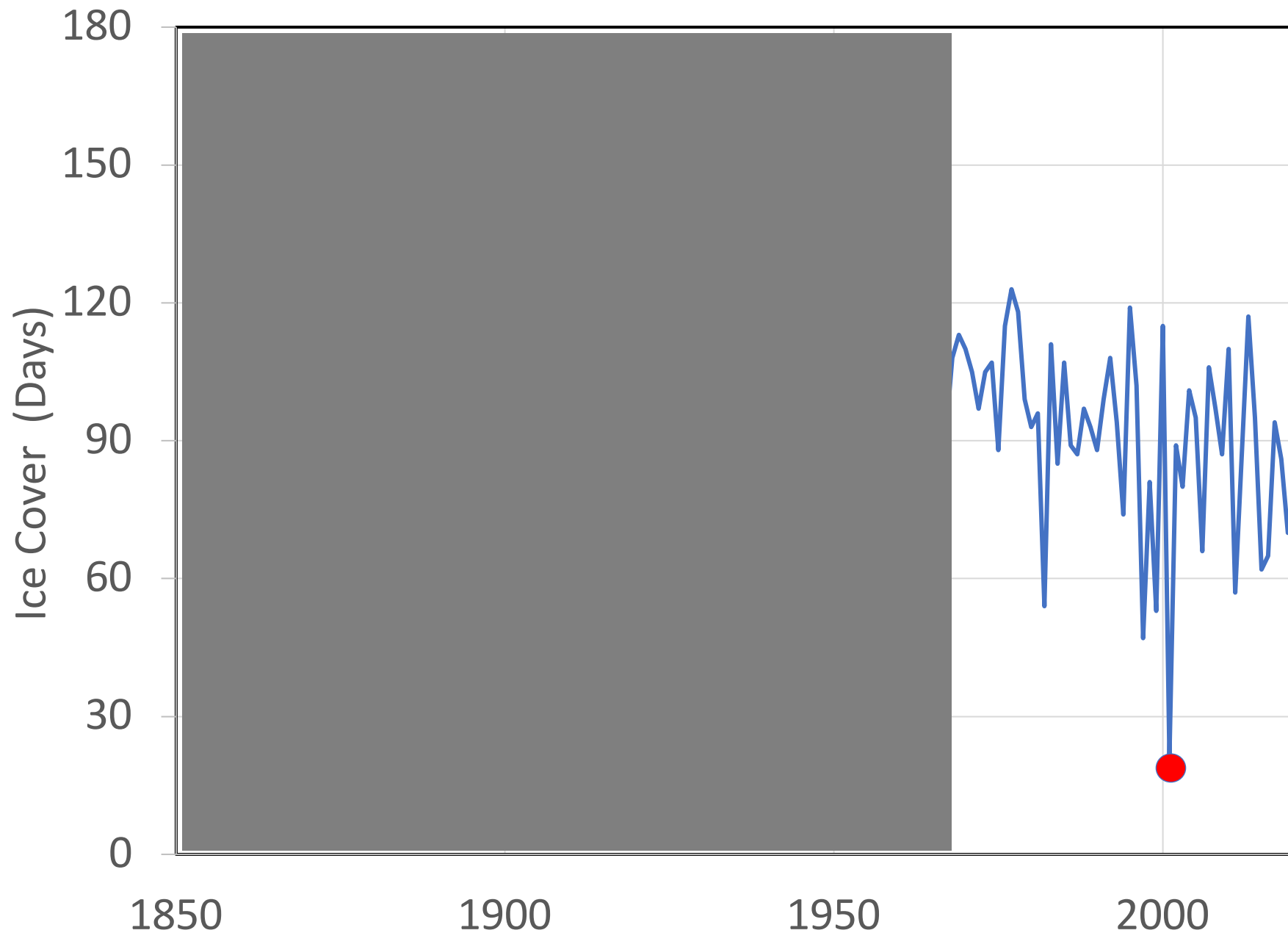


One Year
2001-2002
21 Days

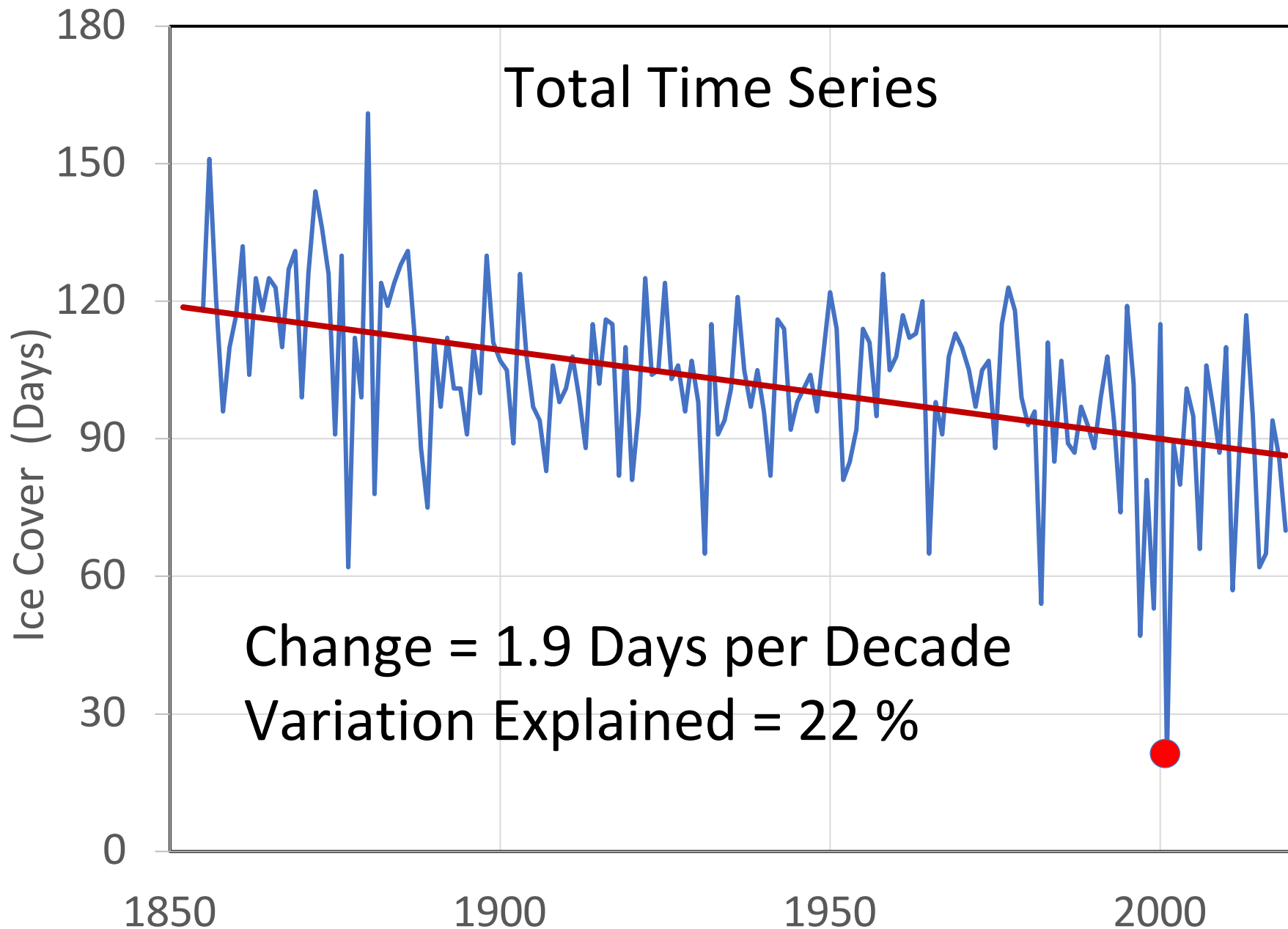
Lake Mendota Ice Duration **10 Years**



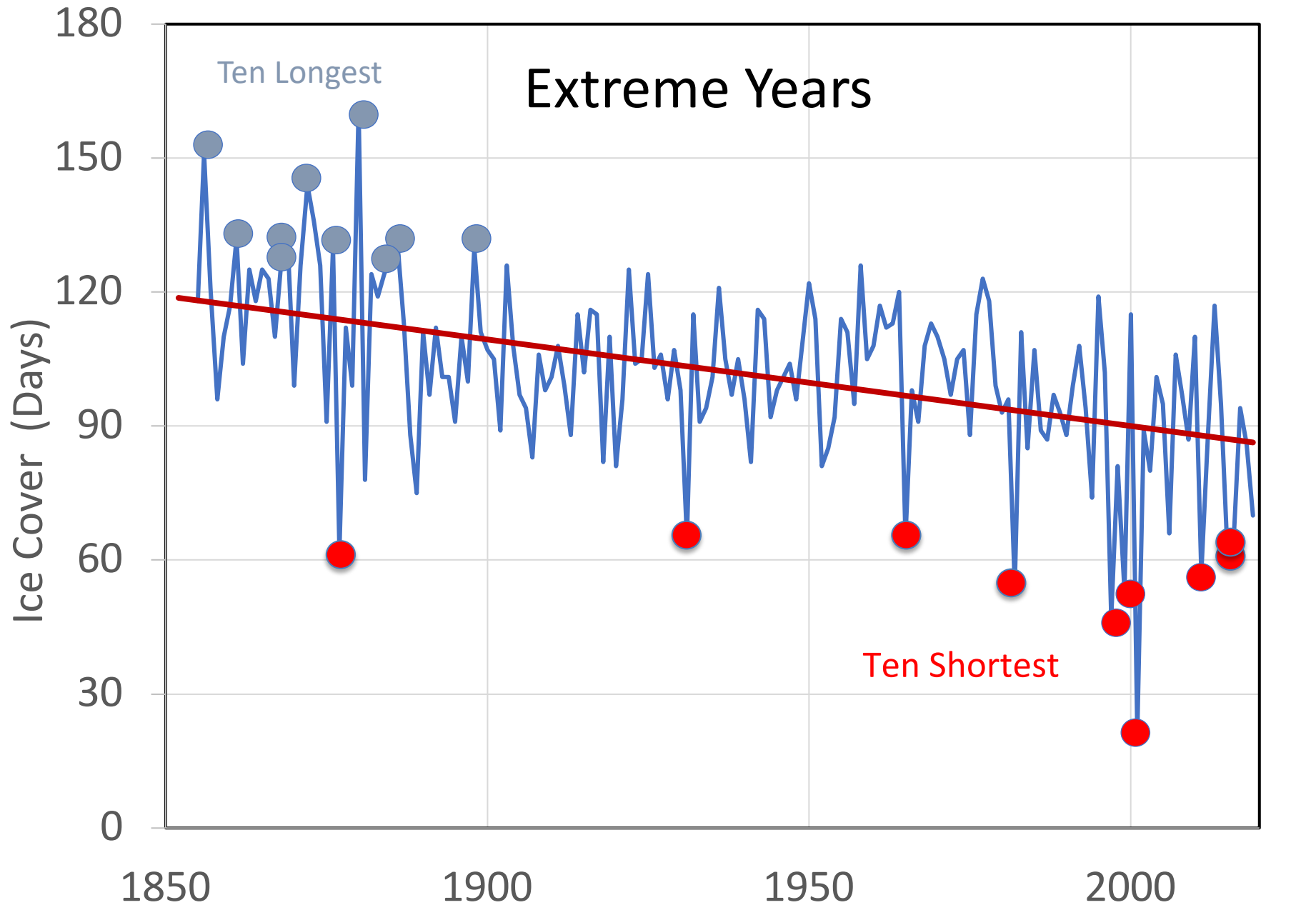
Lake Mendota Ice Duration 50 Years



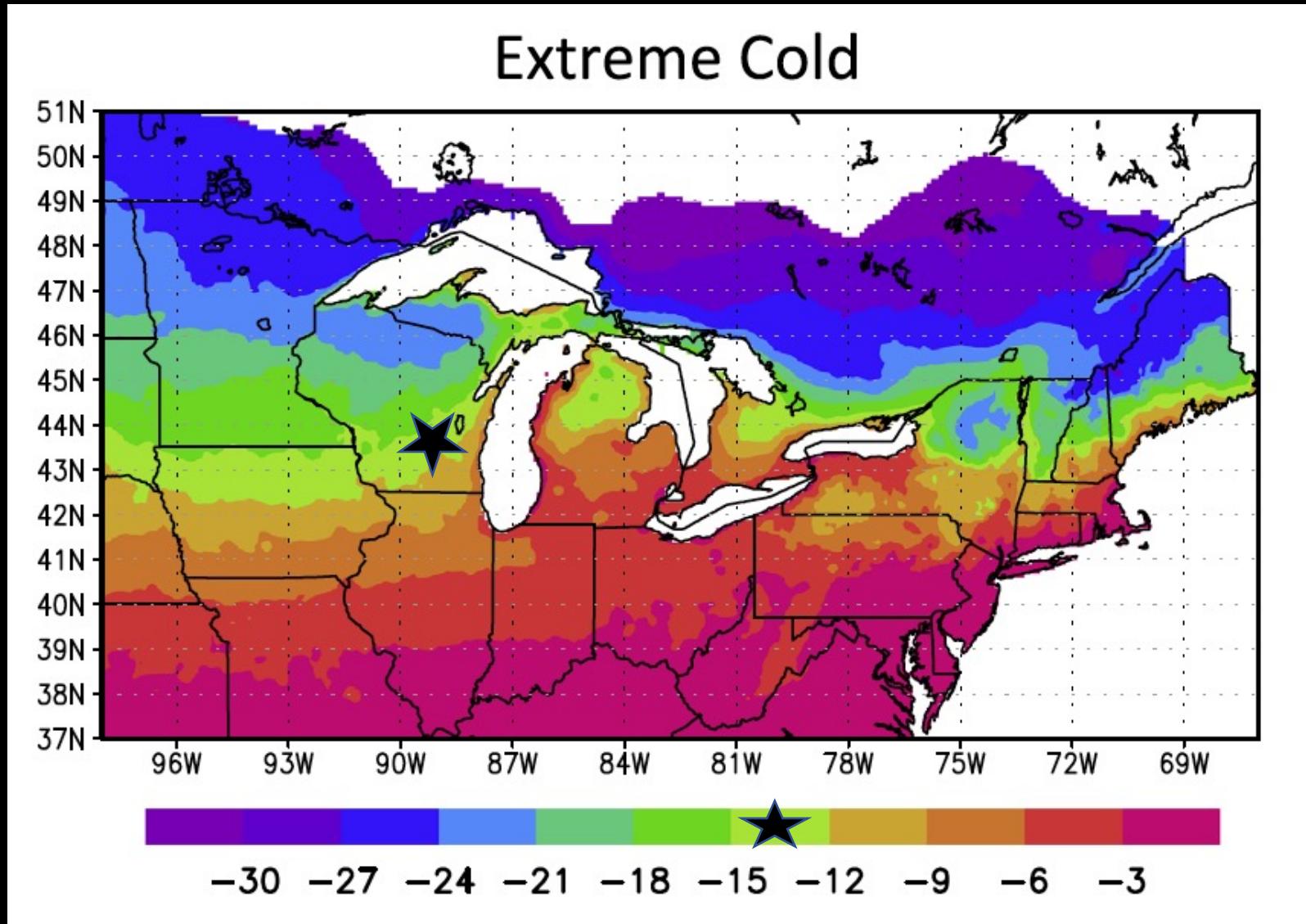
Lake Mendota Ice Duration 1855-2020



Lake Mendota Ice Duration 1855-2020



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

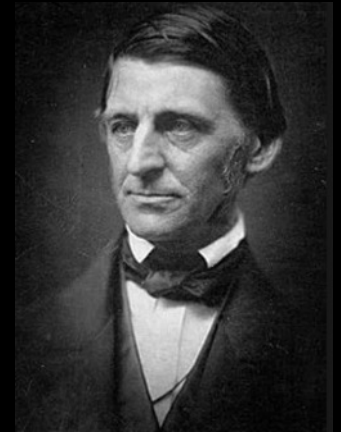




The Invisible Place

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)

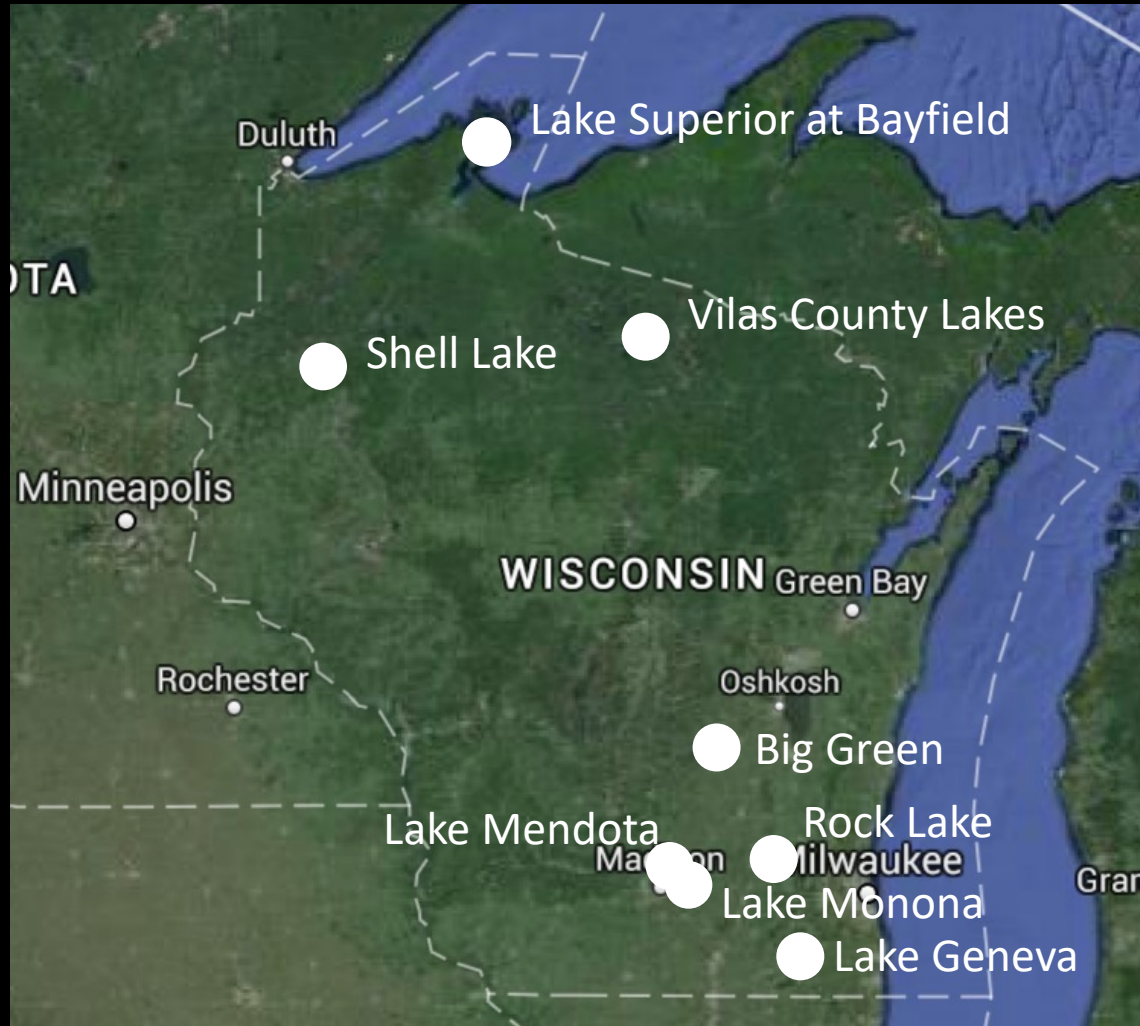
It is helpful to stand at some distance
from any large pattern we are trying to comprehend.

John Heywood (mid1500s)

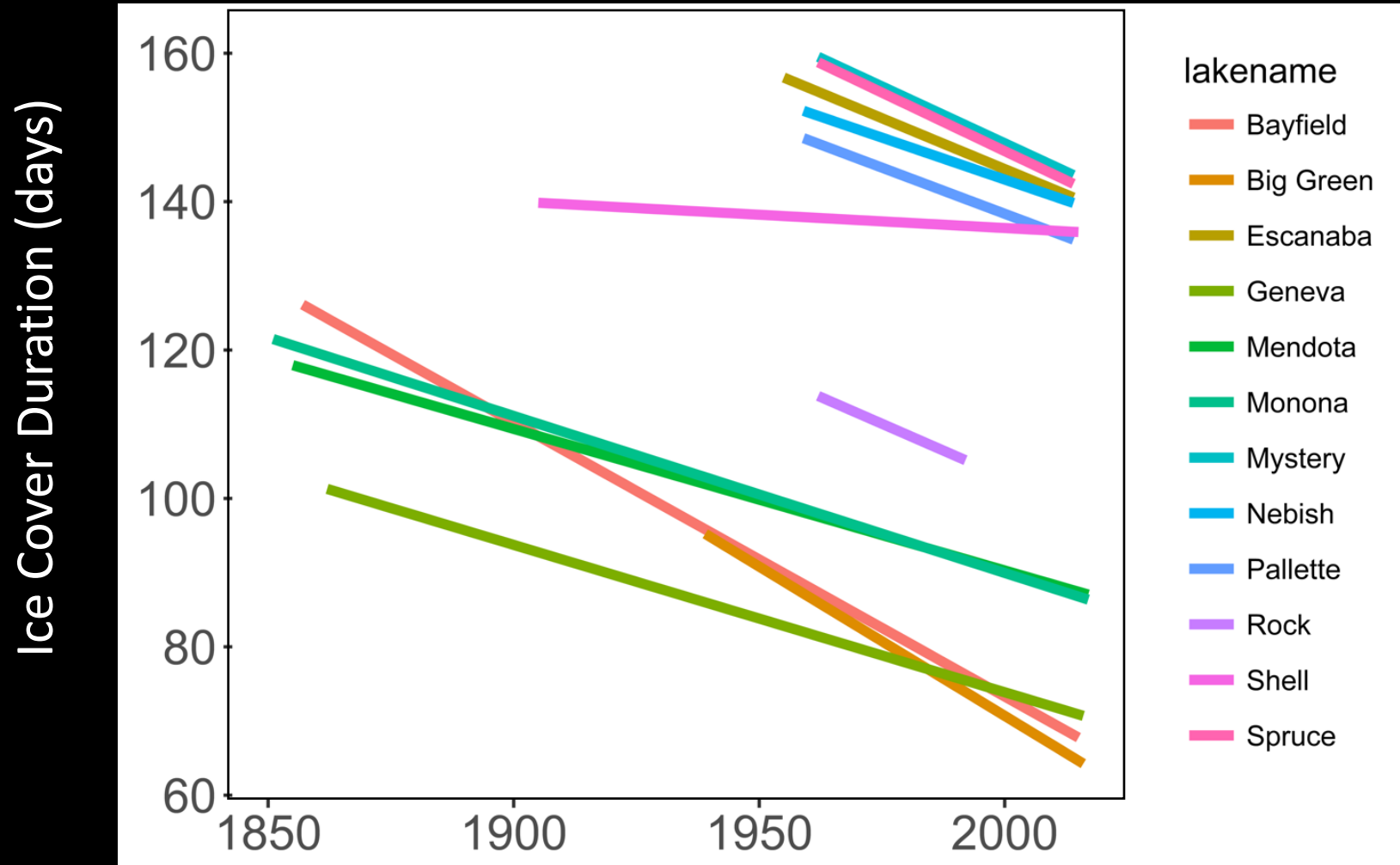
Not being able to see the forest for the trees.
You cannot see the wood for the trees.



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



Lake Geneva WI



Donna Frumento webpage photo

A few detailed notes

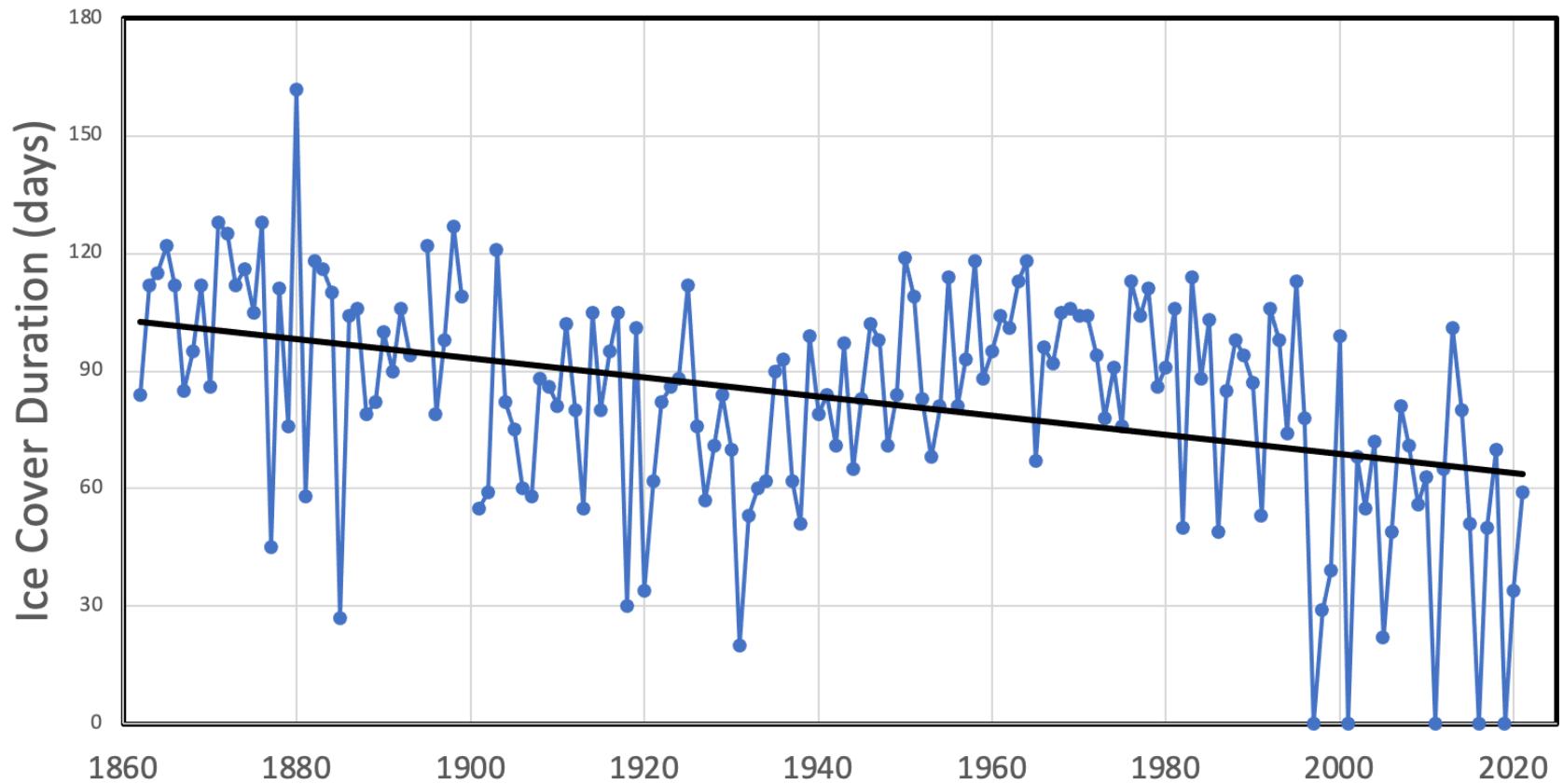
Geneva Lake's ice record began in 1862. Theodore W. Peters has been recording the data recently. The Lake typically freezes from the east end to the west end. The deepest area of the lake is the last area to freeze.

Peters observes the ice from the west end of the lake at seven points including Fontana. He looks towards the lake and scans for presence of ice with binoculars. Ice-on date is recorded as the date the lake has been frozen for two days. However, waterfowl will often keep water open, so up to about five acres of open water full of waterfowl is acceptable for the lake to be categorized as frozen.

The ice-off date is defined as when the lake is free of ice other than small ice plates that float around or are washed up on the leeward shore of the lake.

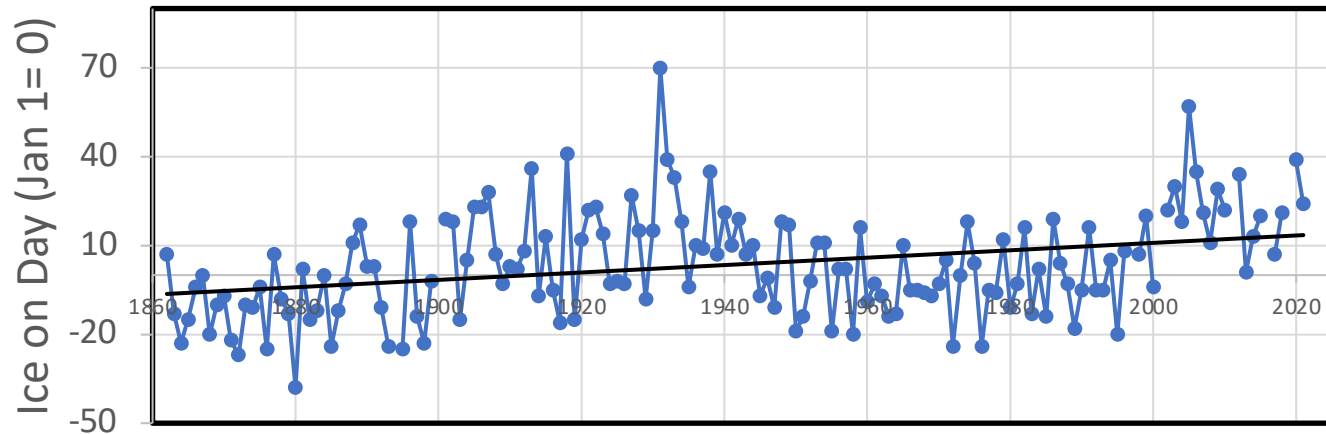
Geneva Lake did not record an "ice on", or fully frozen lake, for the first time in 1997. On January 24, 2022, Geneva Lake completely froze over and stayed frozen. Geneva Lake did not fully freeze in 2001, 2012, or 2017, and 2020 was the fourth year in 20 years that Geneva Lake did not fully freeze over.

Lake Geneva Ice cover duration (1863 -2021)

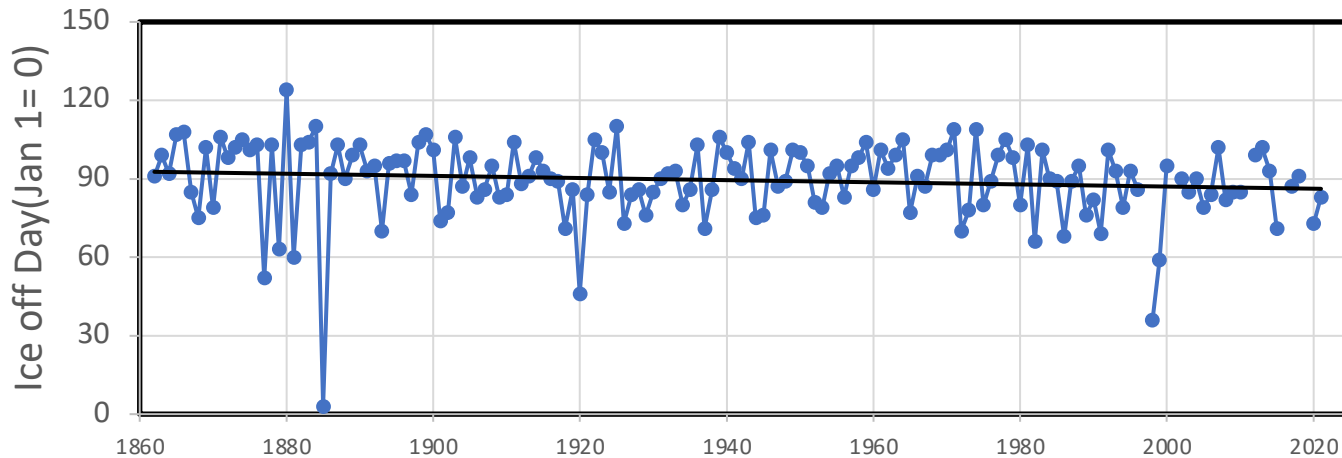


Ice on Versus Ice off (1863-2021)

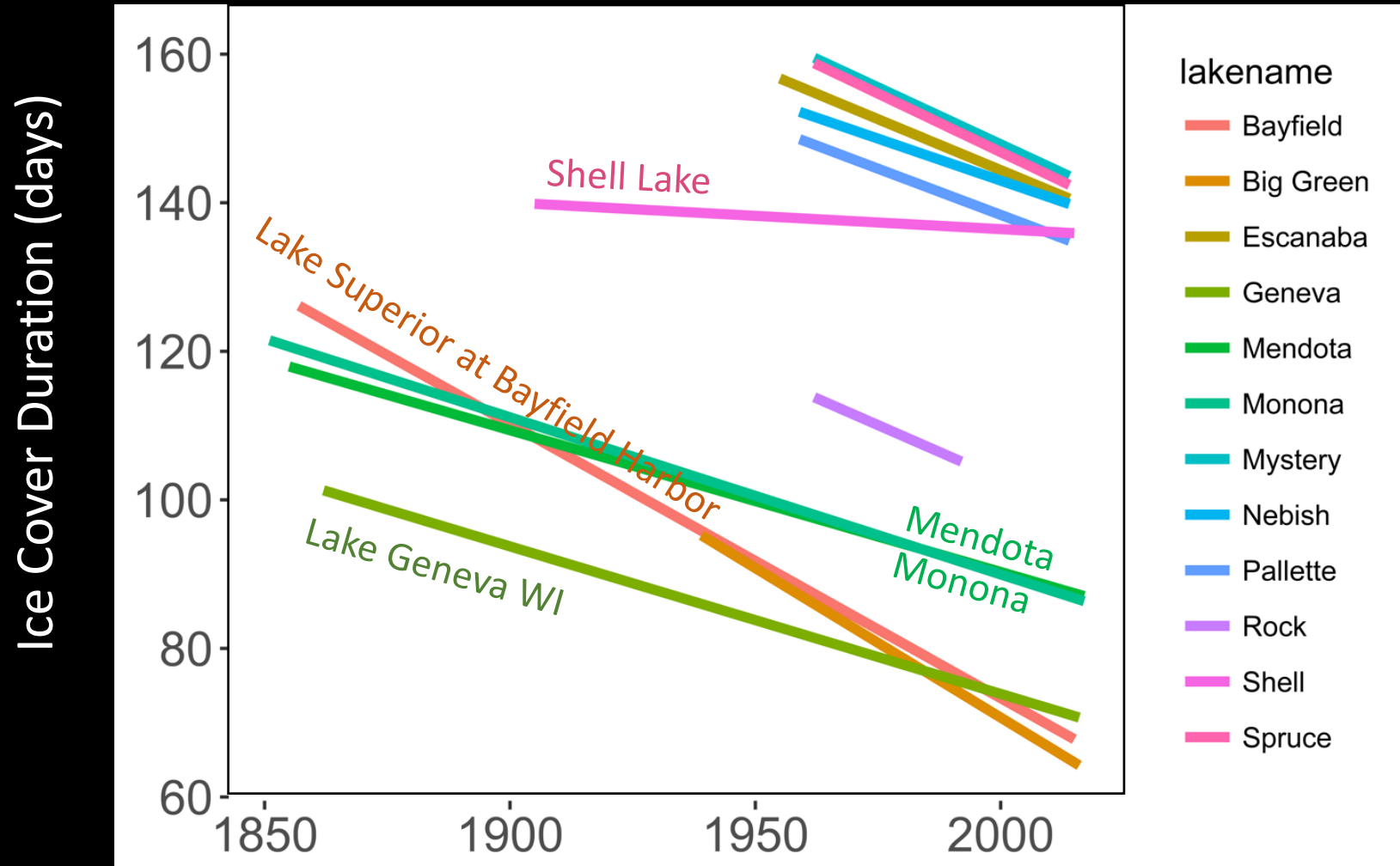
Lake Geneva Ice on Day (1863-2021)



Lake Geneva Ice off Day (1863-2021)

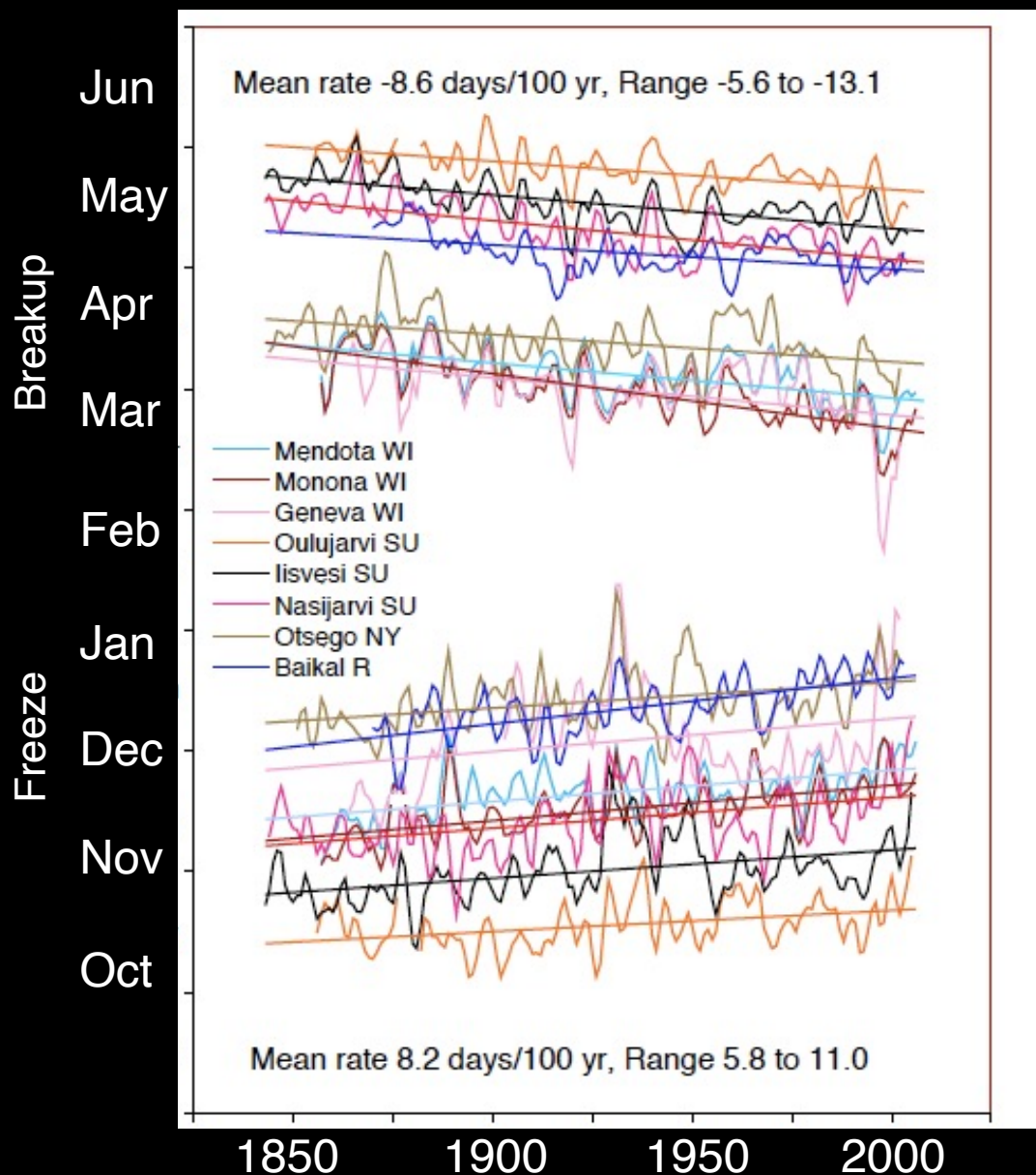


Ice cover duration on a few of the 46 Wisconsin lakes with ice observations



Changes in Freeze and Breakup Dates

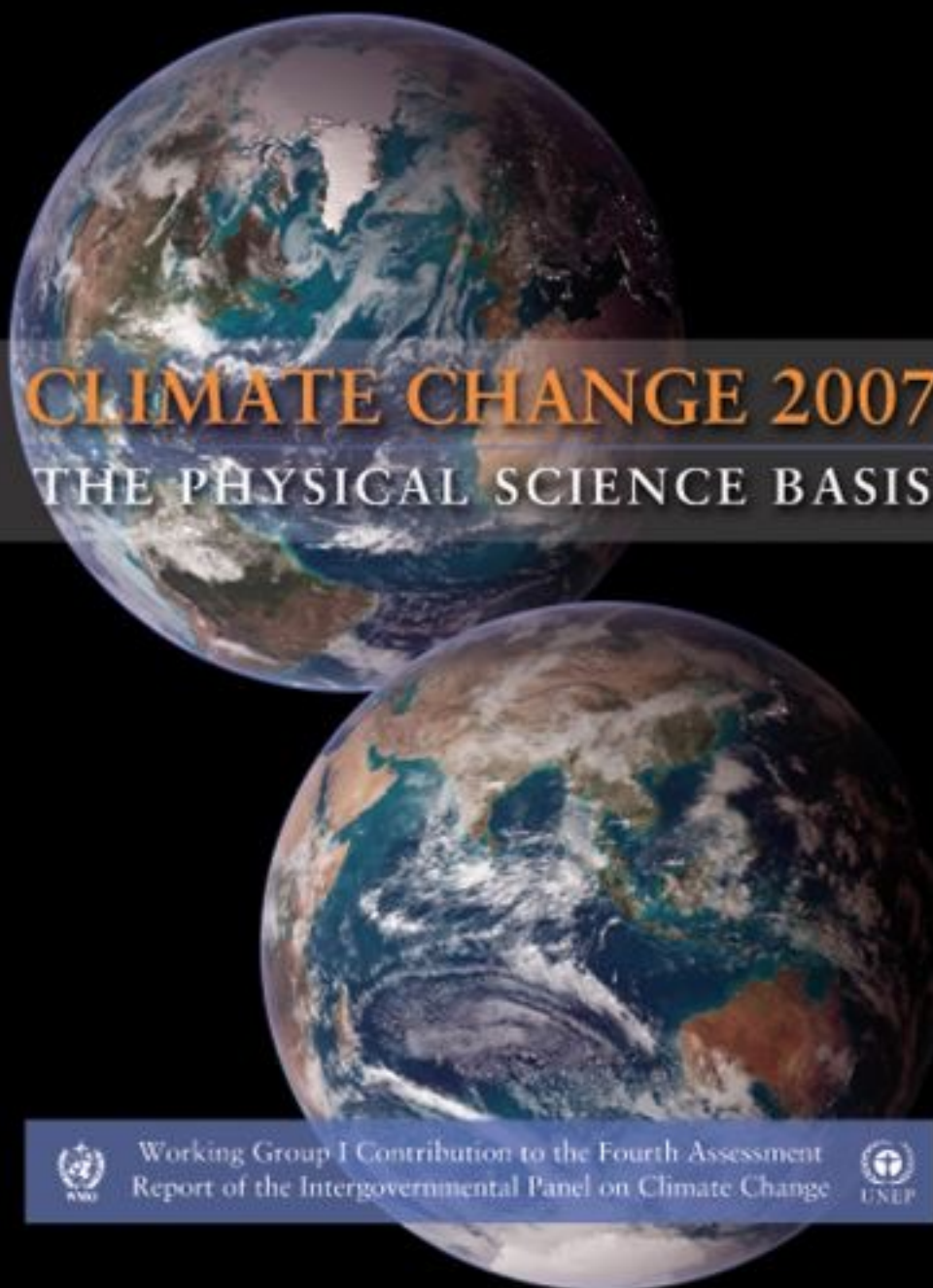
winters
1843-4 to 2008-9
(8 lakes)





Lake Ice: a Miner's Canary for Climate Change

Magnuson photo
Mystery Lake , mid 1970s



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



Rajendra Kumar Pachauri

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

2007



Robert Watson

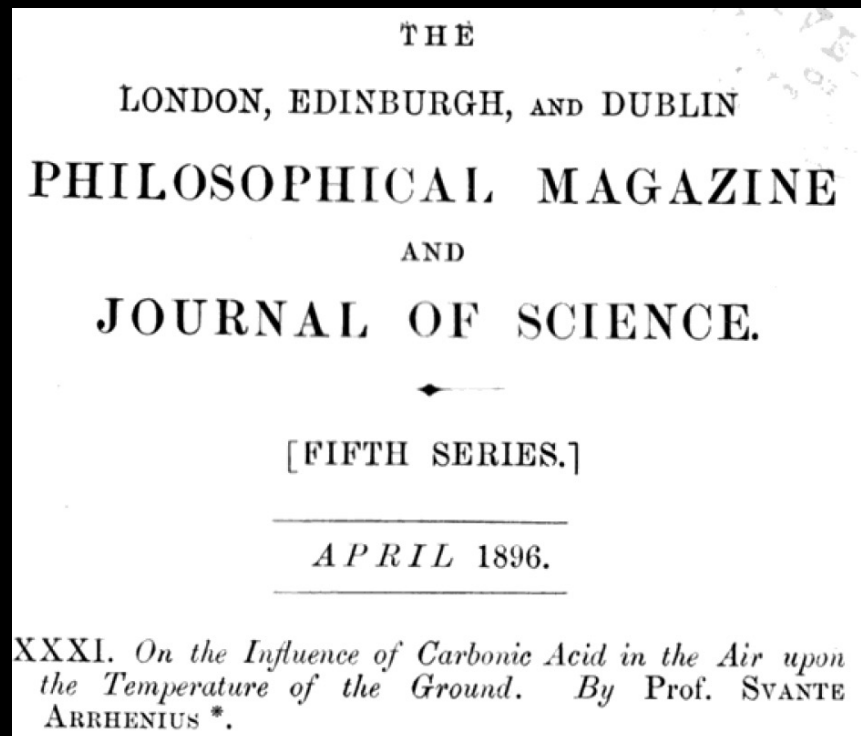
How Long Has Science Recognized the Importance of CO₂ in Warming the Atmosphere?

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



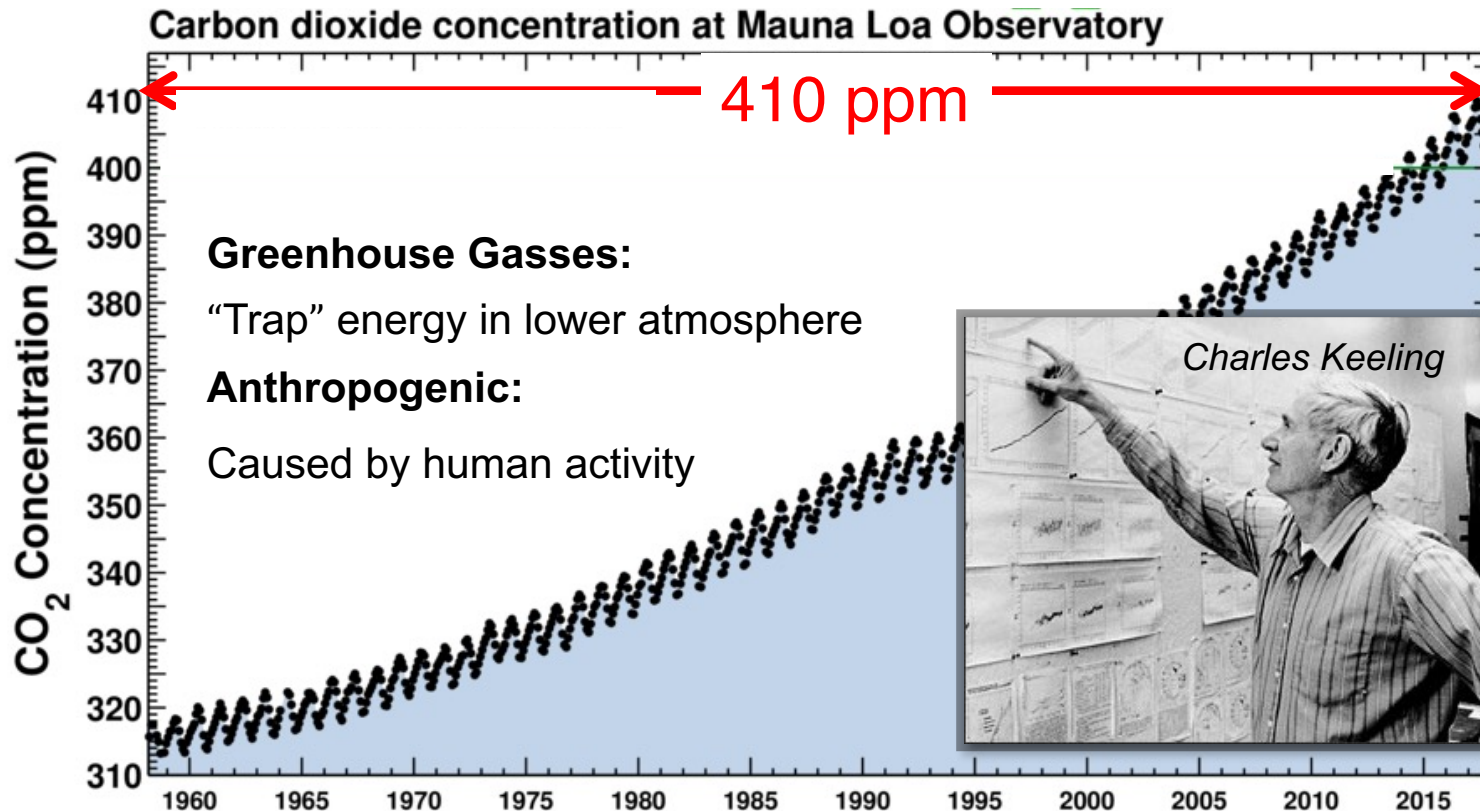
Quote:

“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.”

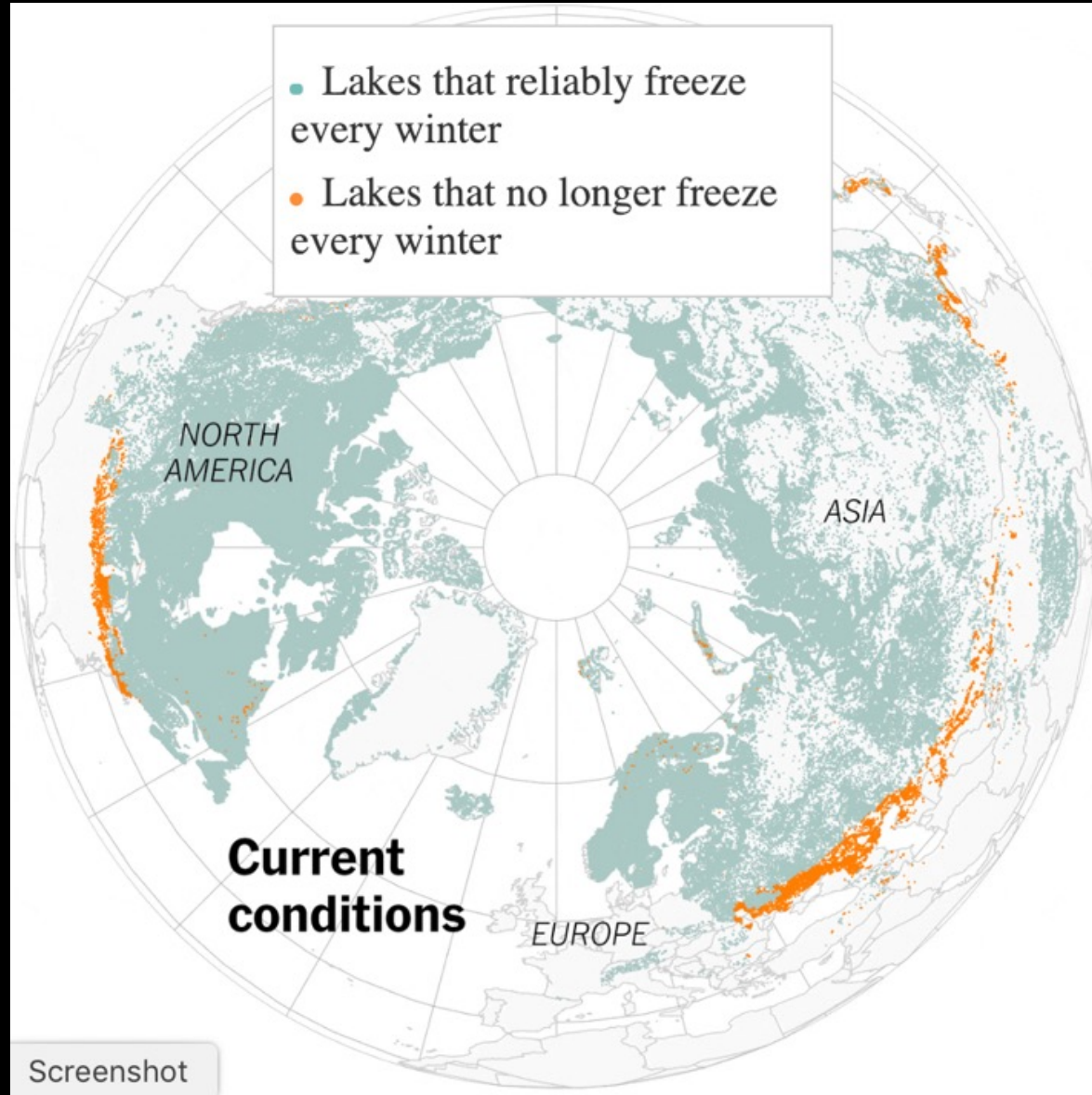


Greenhouse gasses are increasing owing to burning fossil fuels

CO₂ reading on Jan 15, 2018: 407.8 ppm



Lakes that do not freeze every winter (Projection)



Lakes that do not freeze every winter (Projection)



Current
Condition



Warming
2 Degrees C

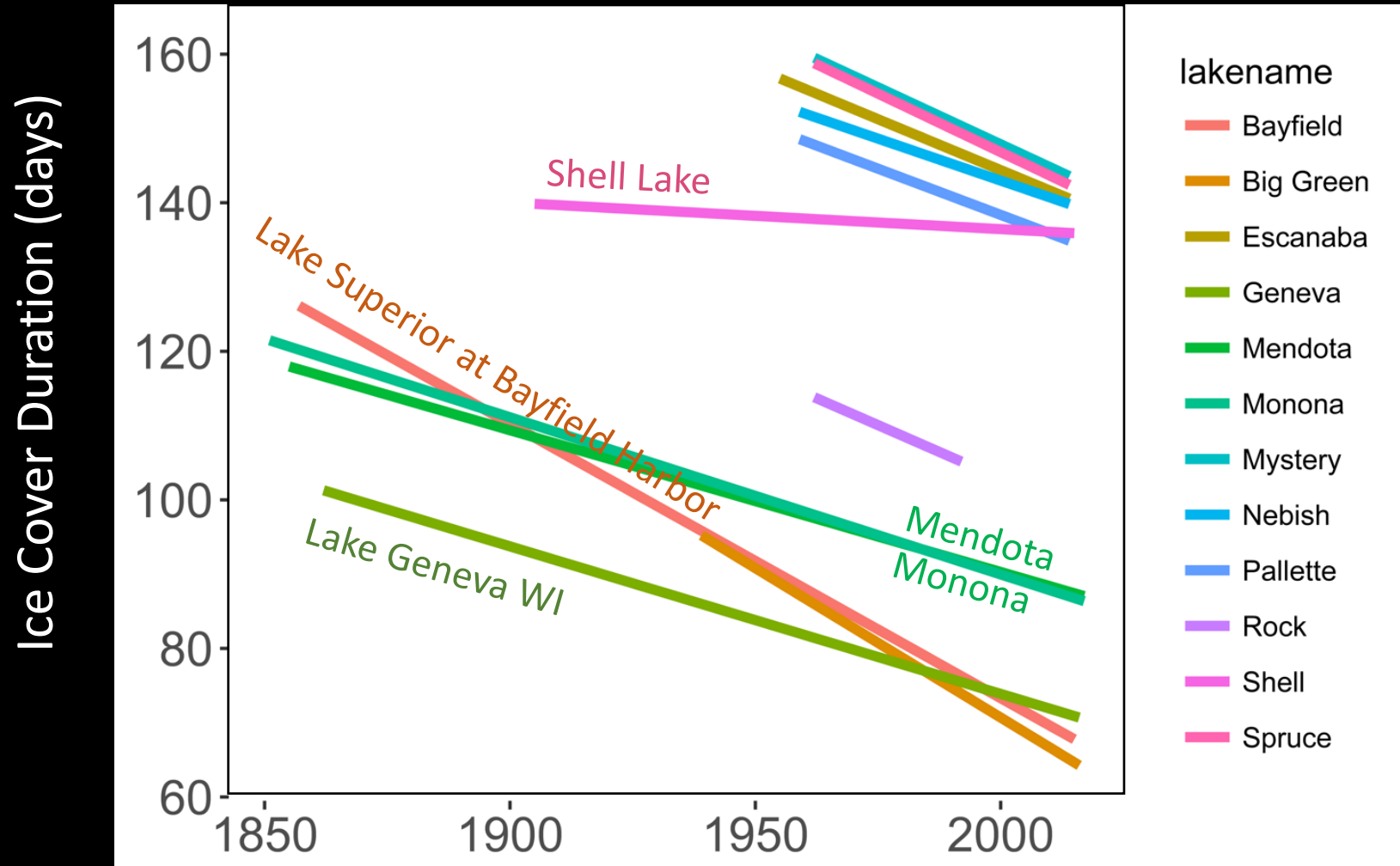


Warming
4.5 Degrees C

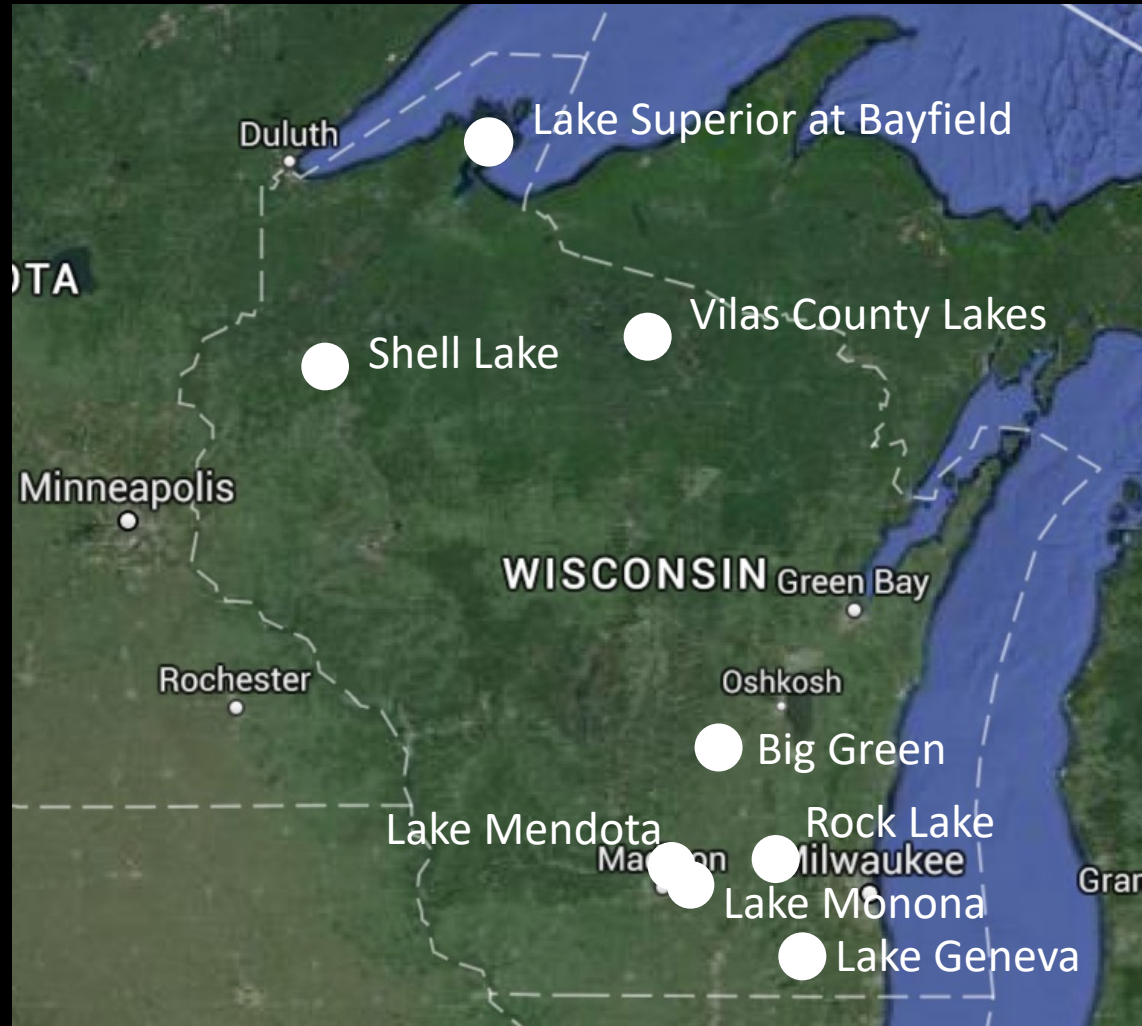


Warming
8 Degrees C

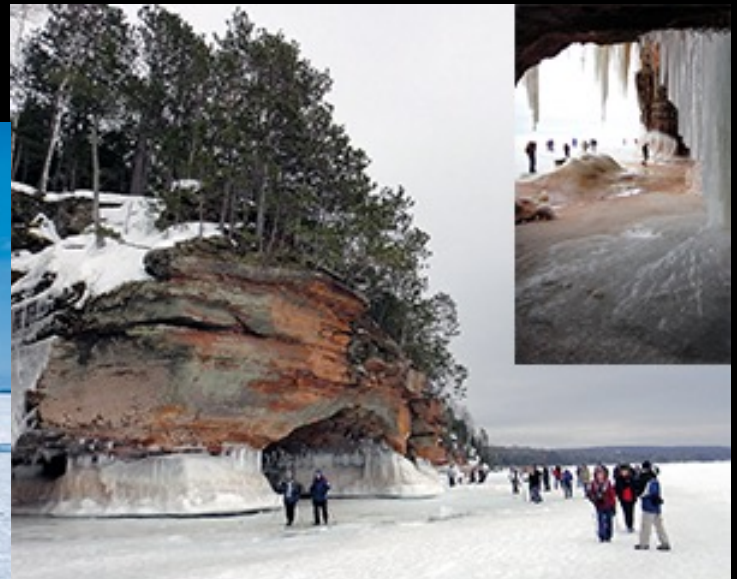
Ice cover duration on a few of the 46 Wisconsin lakes with ice observations



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



Recreational Values Are Being Lost



Magnuson and Lathrup 2014

Ice Services to us Declining with Warming



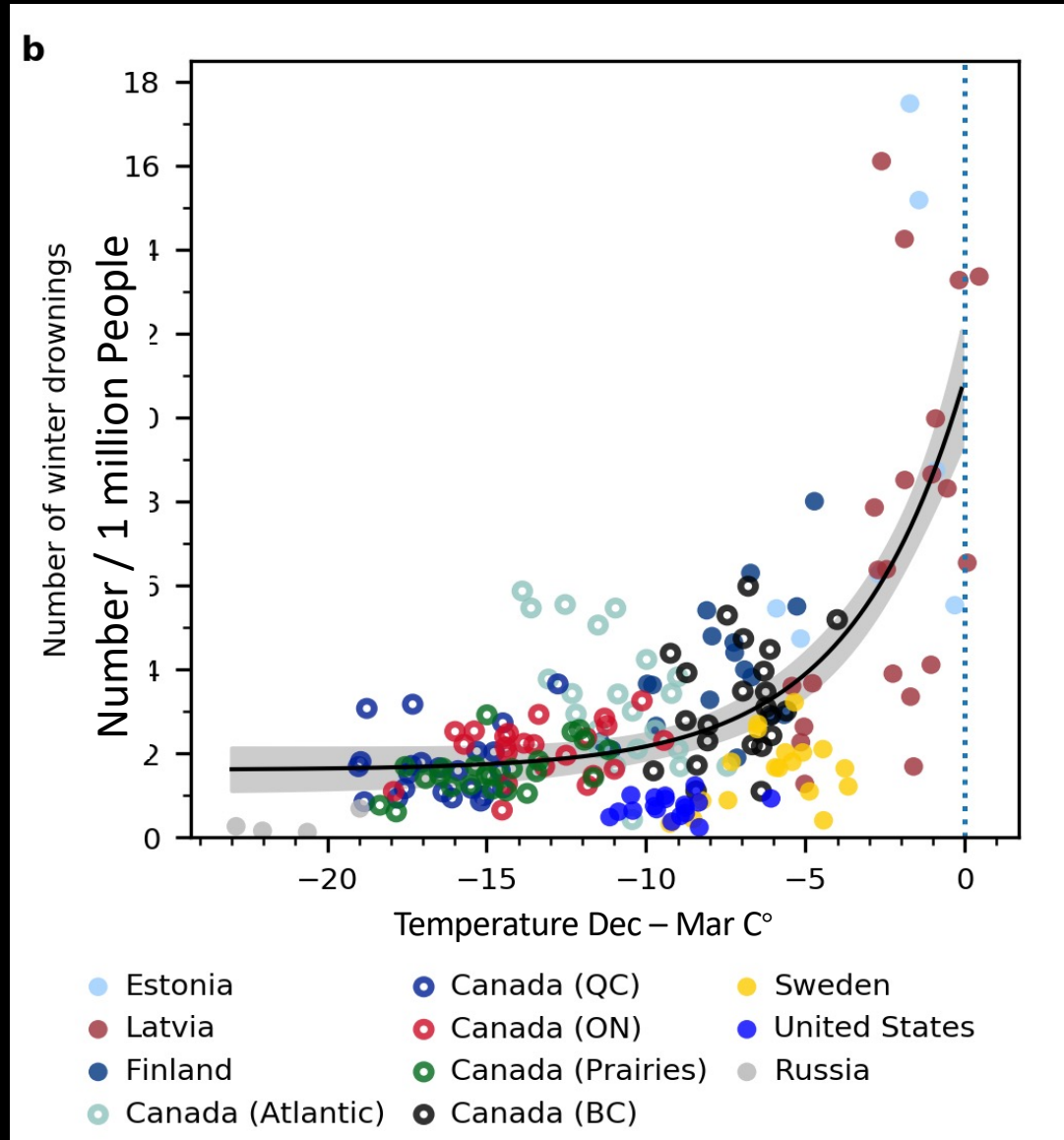
Increased Winter Drownings in Warmer Winters.

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

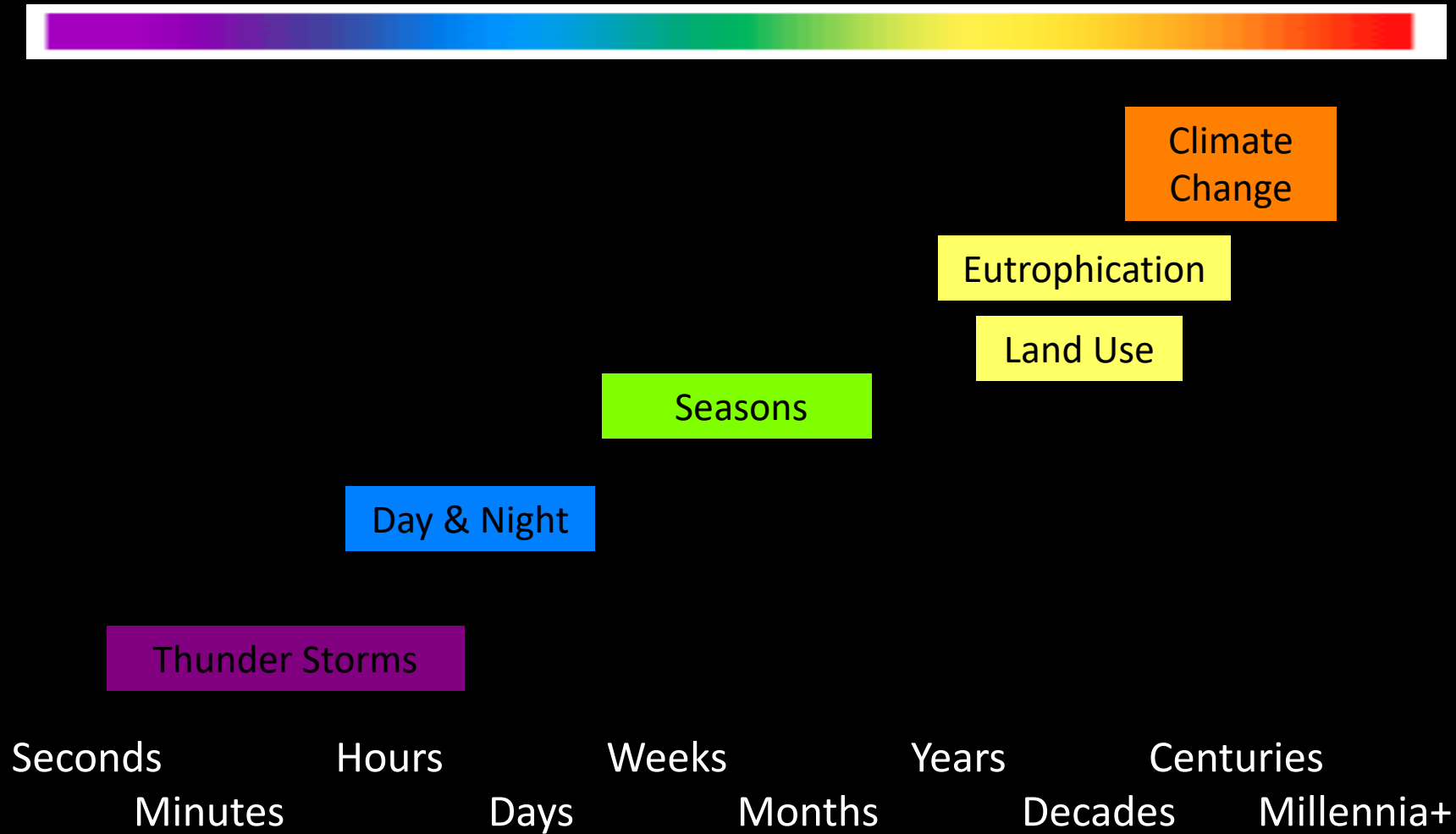
We analyzed 4,000 winter drownings in 10 countries

About 20 % of total drownings

48 % of drownings are explained by winter temperatures



Changes Occur Quickly and Slowly



Time Scales of Changes



Think Ahead! Climate Change Adaptation & Mitigation

