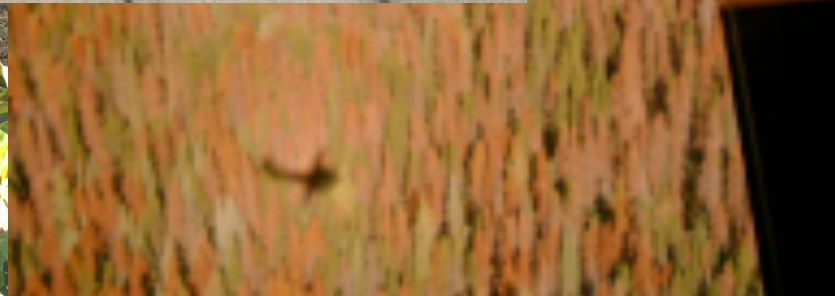
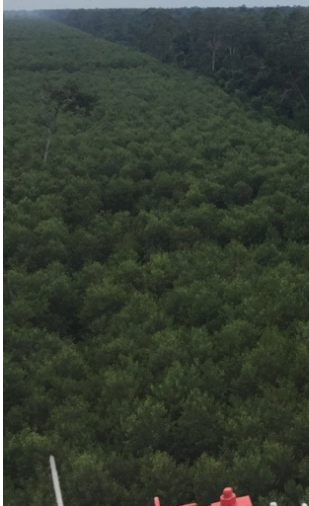
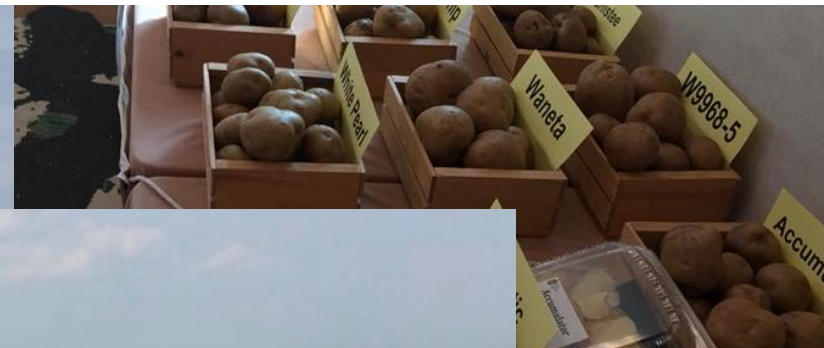
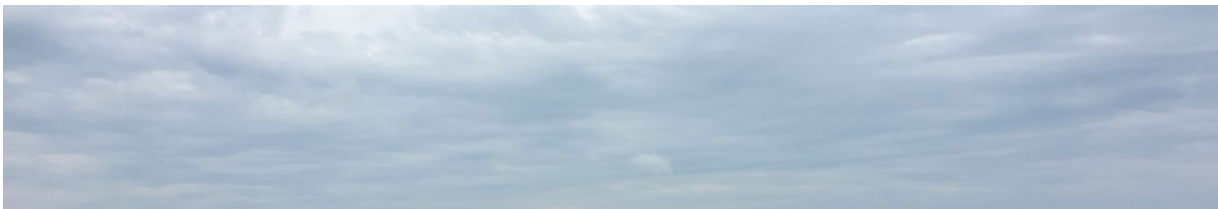


# Examining the Basis for Climate Action

Ankur Desai  
Dept of Atmospheric & Oceanic Sciences  
University of Wisconsin-Madison

Nature Conservancy WI  
Fri, April 20, 2018





The continued release of CO<sub>2</sub> to the atmosphere from burning fossil fuels would “almost certainly cause significant changes” and “could be deleterious from the point of view of human beings [...] and marked changes in climate, not controllable through local or even national efforts.



U.S. President's Science Advisory to President Lyndon B. Johnson 1966

# Bottom Line

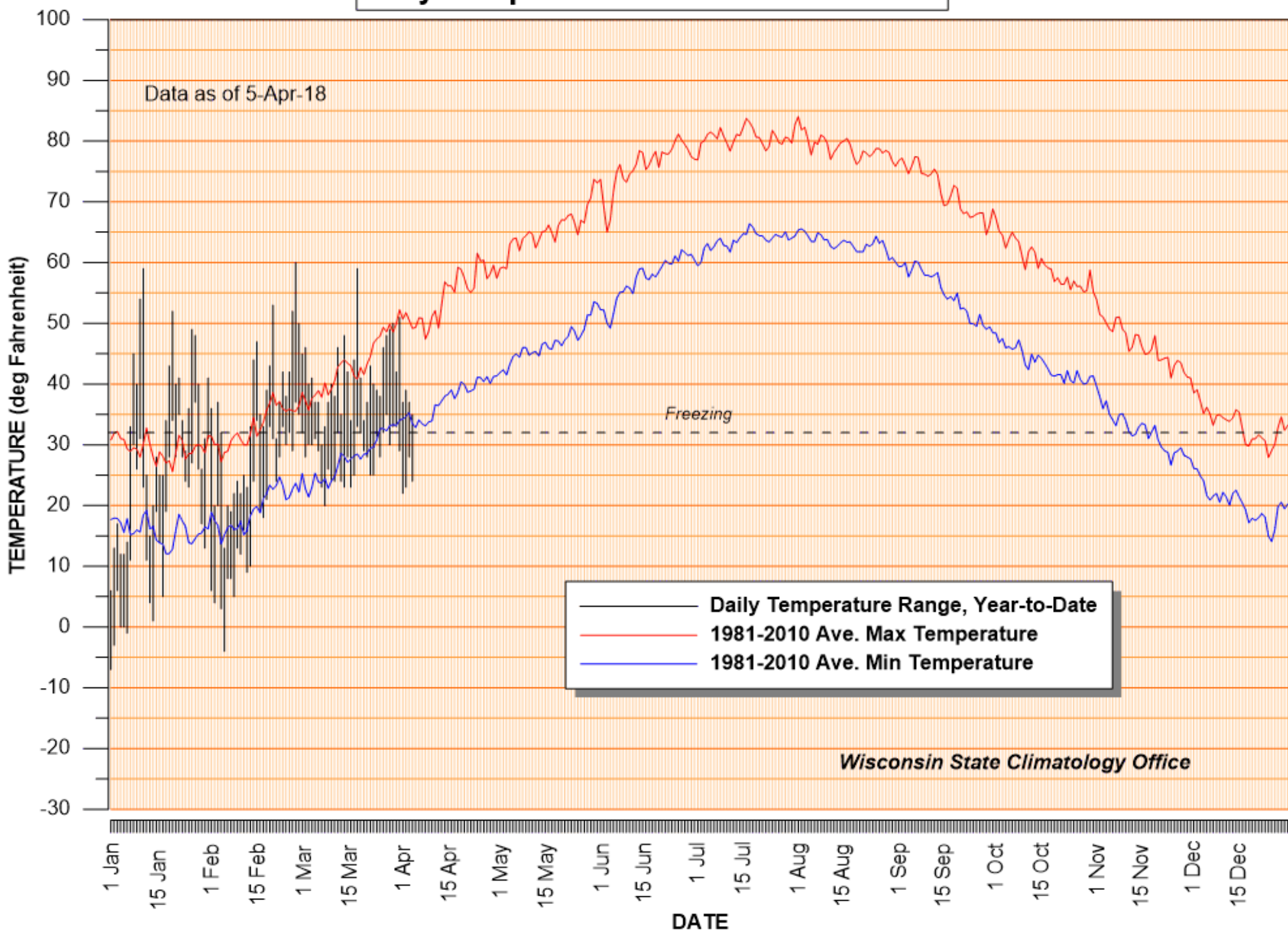
- Climate is warming and change is projected to accelerate in next century with continued increases in fossil fuel emissions
- Landscapes protected and supported by Nature Conservancy are at risk from these changes without appropriate adaptation measures
- The public increasingly supports action on climate change and is hungry for credible, legitimate, salient information on how to do so



# What is Climate?

- Climate is the average of weather
  - “Climate is what you expect, weather is what you get” –Andrew John Herbertson
  - “Climate is your personality, weather is your mood” –Marshall Shepherd
- Climate changes naturally (over eons) and by humans (over centuries)

## Daily Temperatures: MILWAUKEE 2018

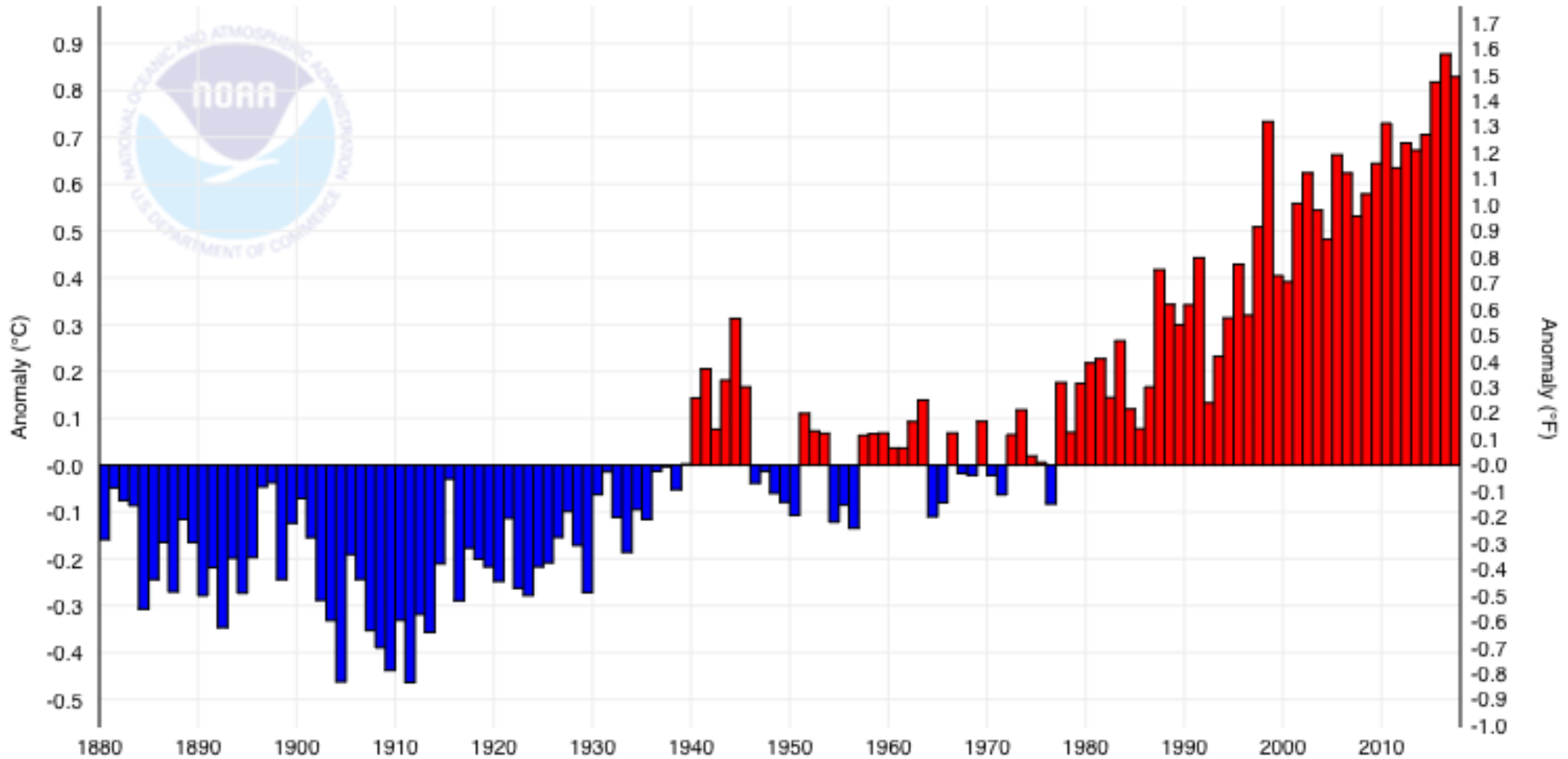


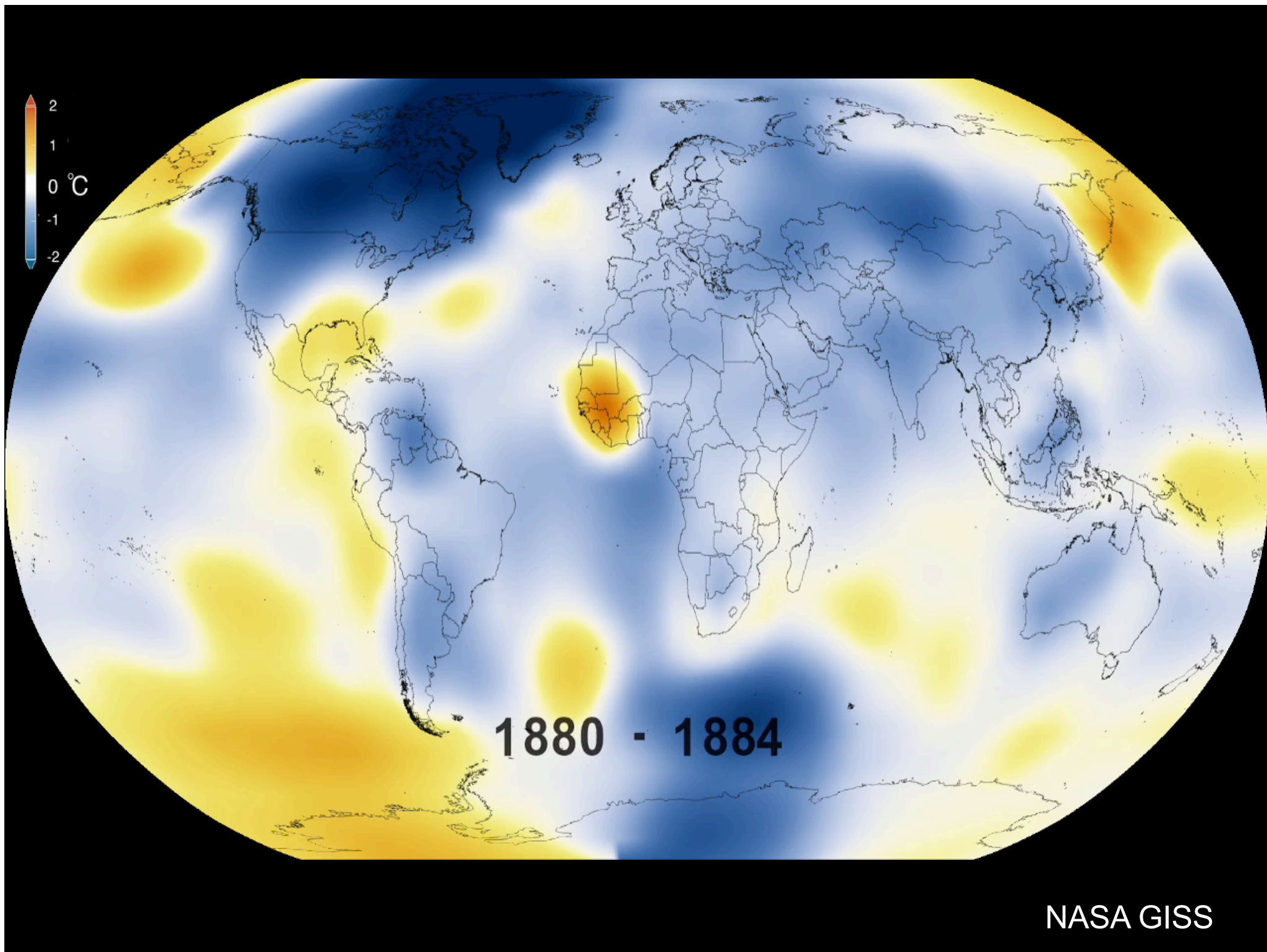


*“Like a dog walking up hill on a long leash”* – Jason Samenow

# MKE->WORLD

Global Land and Ocean Temperature Anomalies, July







*“CO<sub>2</sub> is to climate what steroids was to baseball...” –Jason Samenow*

Hotter

### What's Really Warming the World?

Skeptics of manmade climate change offer various natural causes to explain why the Earth has warmed 1.4 degrees Fahrenheit since 1880. But can these account for the planet's rising temperature? Watch to see how much different factors, both natural and industrial, contribute to global warming, based on findings from NASA's Goddard Institute for Space Studies.



Based on an interactive by Bloomberg

<https://www.bloomberg.com/graphics/2015-whats-warming-the-world/>

# Wisconsin Temperature Trends: 1950-2010

total change based on linear regression

Winter

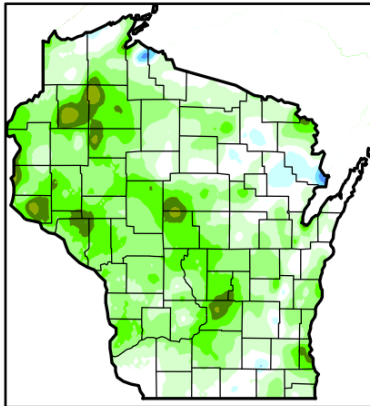
Spring

Summer

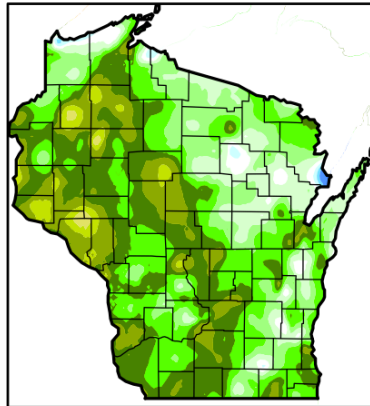
Fall

Daily highs

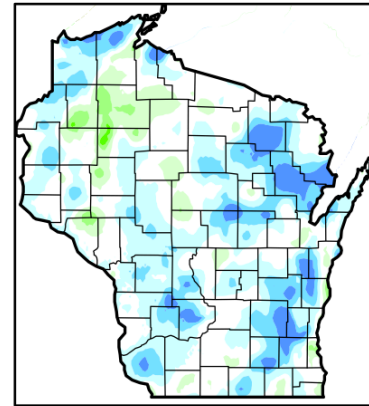
DJF TMAX(F) PRISM 1950-2010



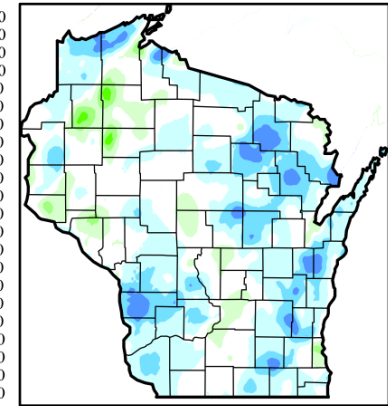
MAM TMAX(F) PRISM 1950-2010



JJA TMAX(F) PRISM 1950-2010

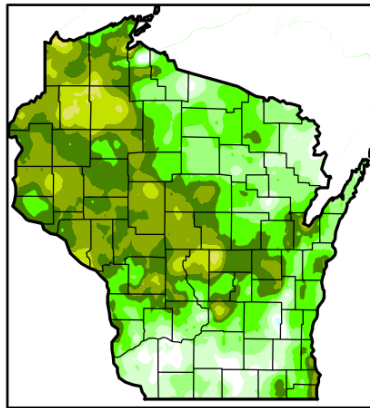


SON TMAX(F) PRISM 1950-2010

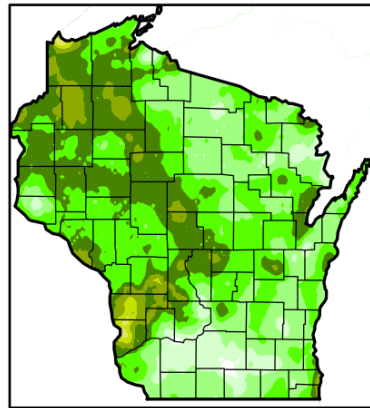


Daily lows

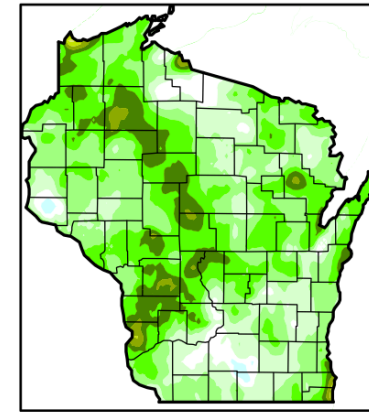
DJF TMIN(F) PRISM 1950-2010



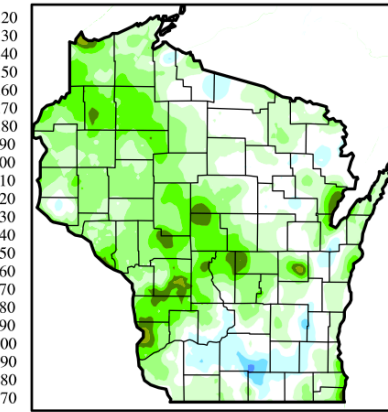
MAM TMIN(F) PRISM 1950-2010



JJA TMIN(F) PRISM 1950-2010



SON TMIN(F) PRISM 1950-2010



Kucharik et al., 2010; WICCI, 2011

The Greatest Amount of Warming (1-4°C or 1.8-7.2°F)  
has Occurred in Winter and Spring and nighttime



So what's the big deal?

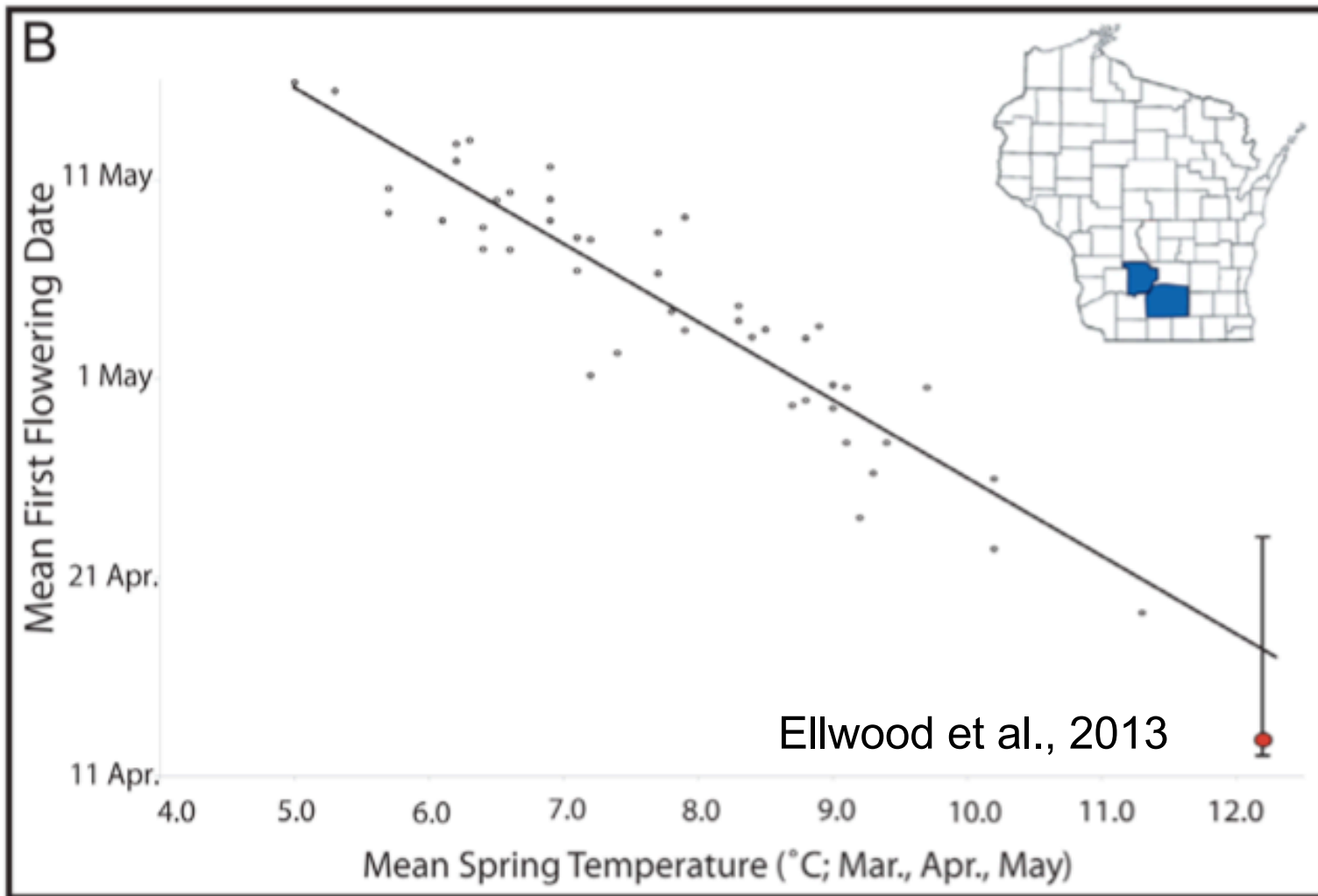
# Earlier arrival of spring in Wisconsin

Bird

Ge

Cardi

Ro



Leopold S  
Photo: Aldo

Journal Sentinel

e  
e from

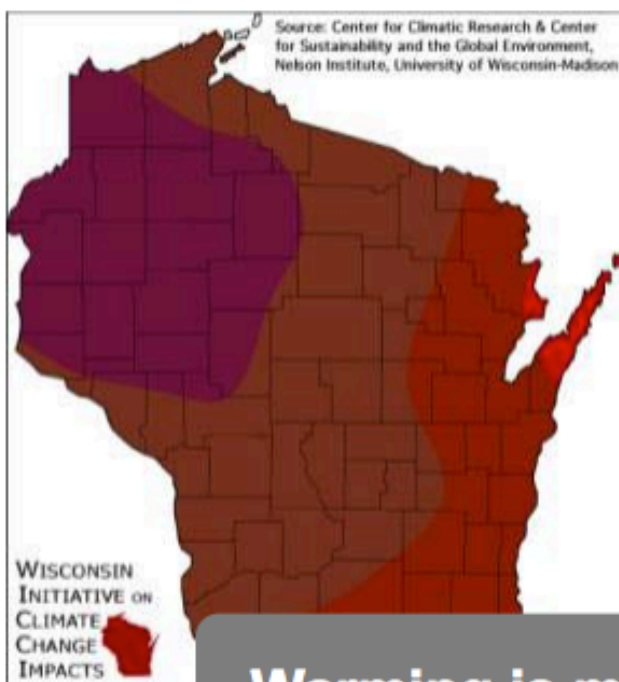
climate change

arik, UW-Madison



# Projected Change in Seasonal Temperatures 1980 to 2055 (° F)

Winter



Spring

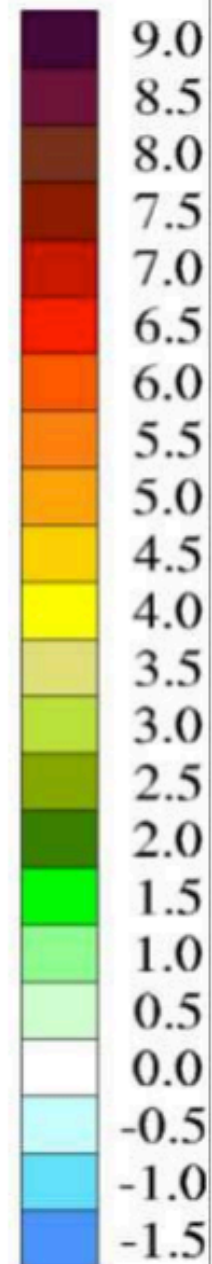


Warming is most pronounced in winter

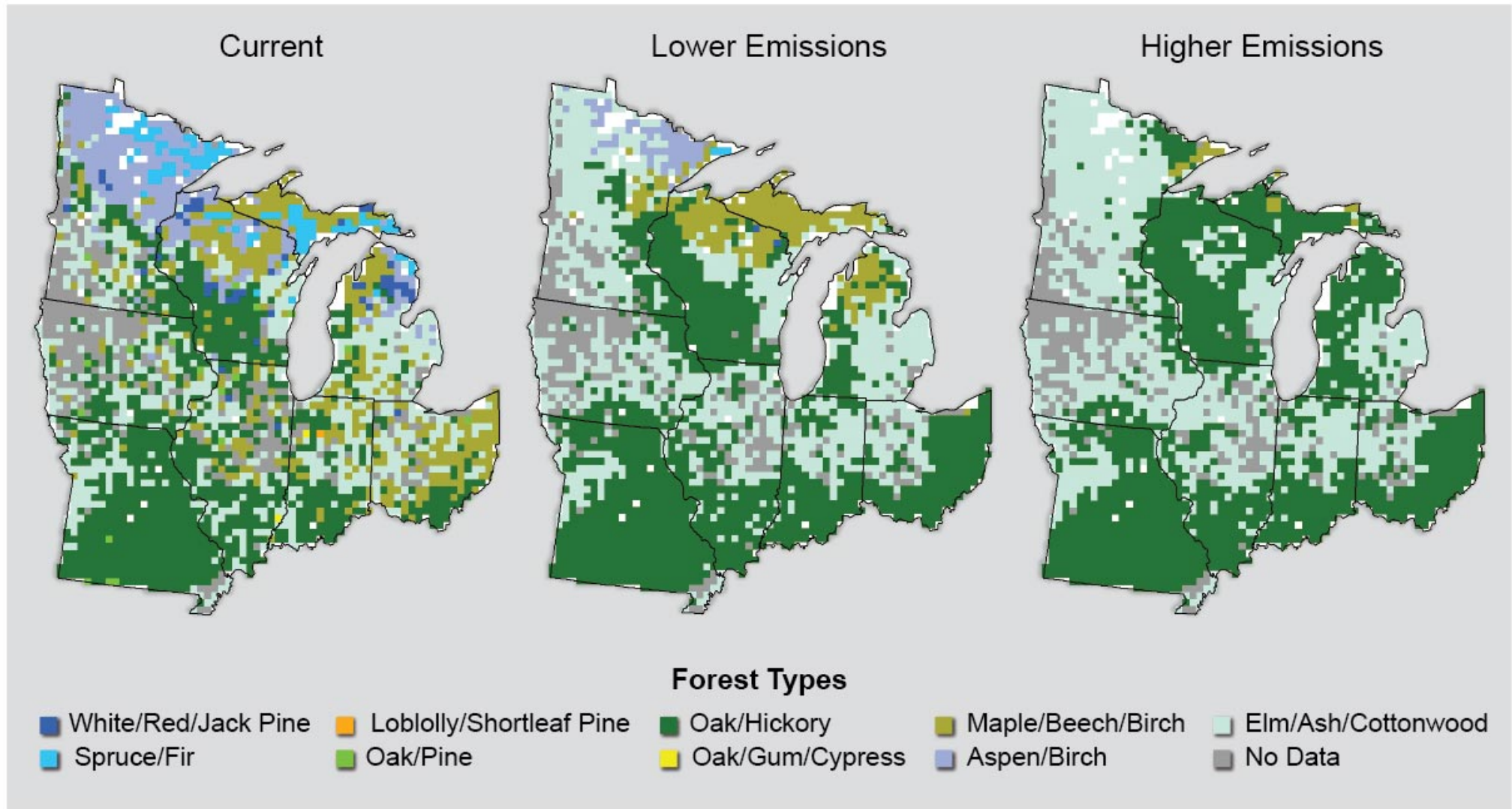
Summer



Fall



## Forest Composition Shifts





# Increased Stressors

Many forests are already under stress from other causes.

Climate change could make forests more susceptible to existing or new stressors.



**Hemlock wooly adelgid:**  
Pest limited by cold temps



**Exotic Earthworms:**  
Increase drought  
susceptibility

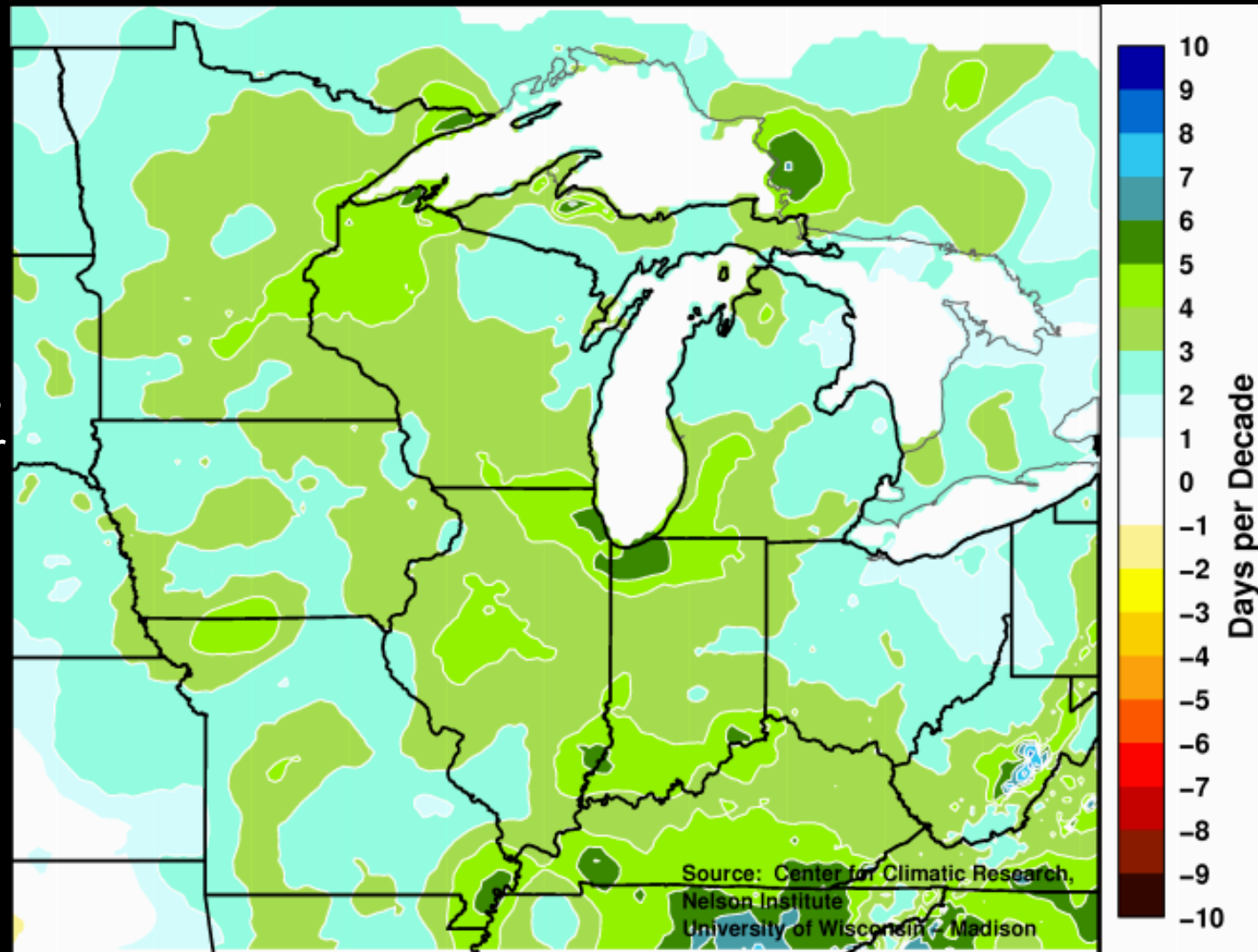


**Invasive Plants:**  
Outcompete stressed trees

# Projected Heavy Rainfall

Change in 2"+ inches per 24 hr rain events:  
Statistically downscaled GCM, 1980-2055 (SRES A1B)

2-5 days  
more per  
decade



Source: UW-Madison  
Nelson Institute  
Center for Climatic Research

# Does anyone care?





# Estimated % of adults who think global warming is happening, 2016

Display model output: Global warming is happening

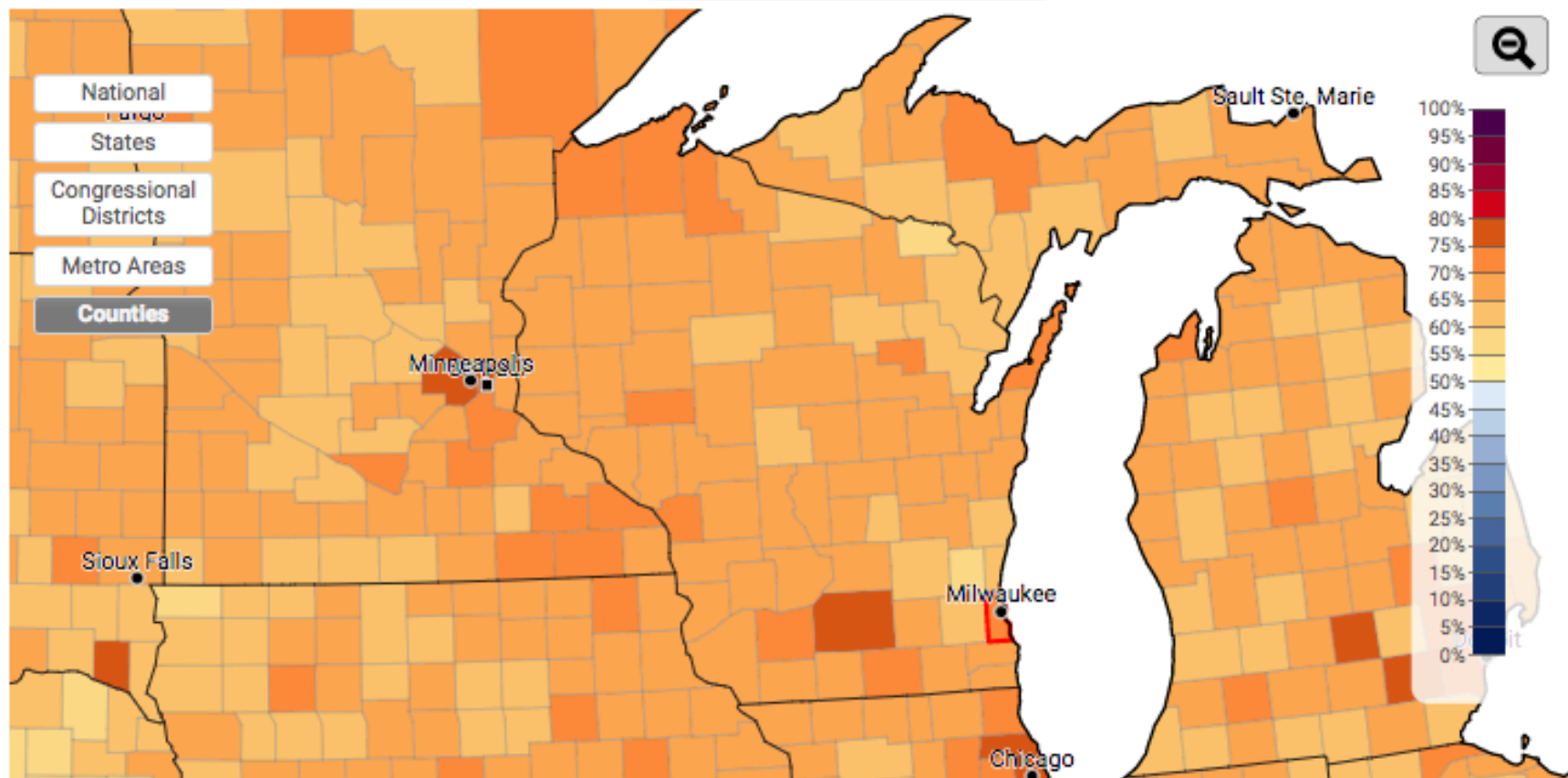
Absolute Value

Permalink

Click on map to select geography, or: Wisconsin

Milwaukee County, Wisconsin

Un-Select



<http://climatecommunication.yale.edu/visualizations-data/ycom-us-2016/>

Milwaukee County, Wisconsin

50%

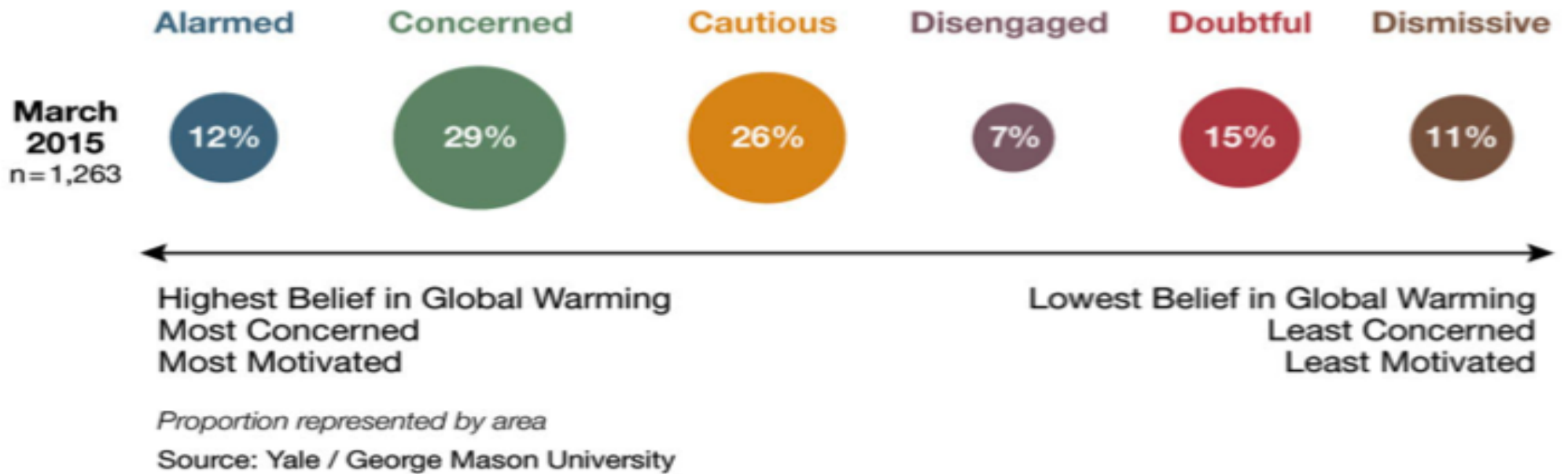


Wisconsin

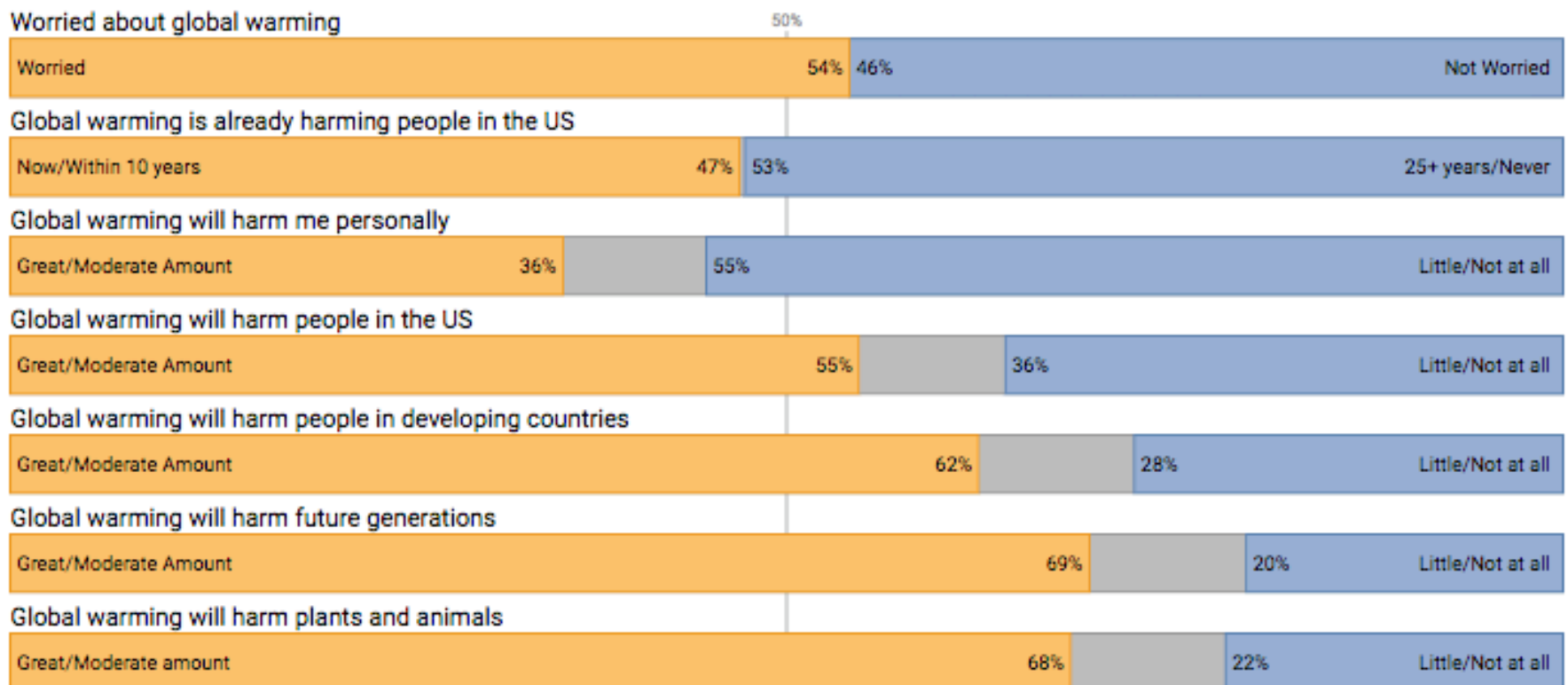


United States





## RISK PERCEPTIONS



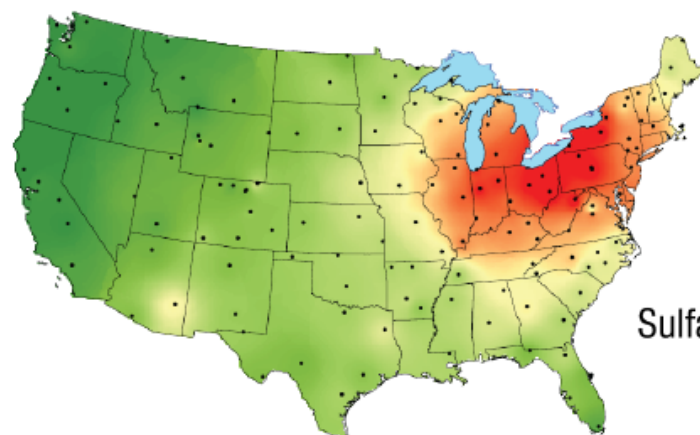
# Community standards do change

- Education and generational change
  - Recycling
- Innovation
  - The Ozone Hole
- Regulation
  - Acid rain

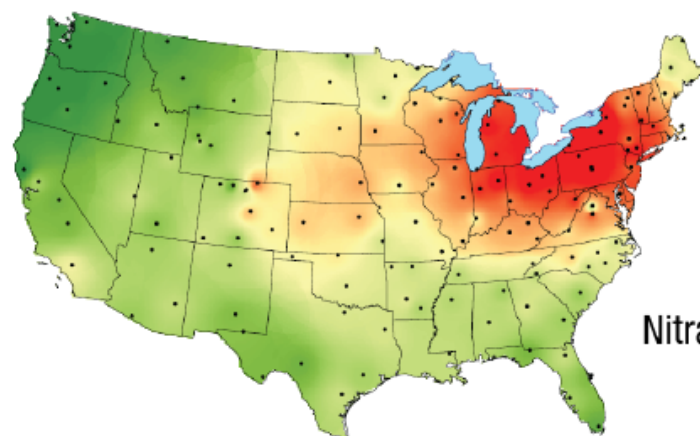
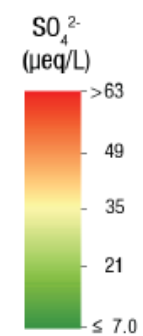


1984-1986

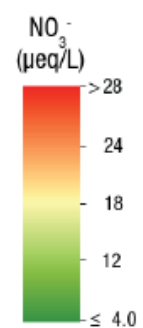
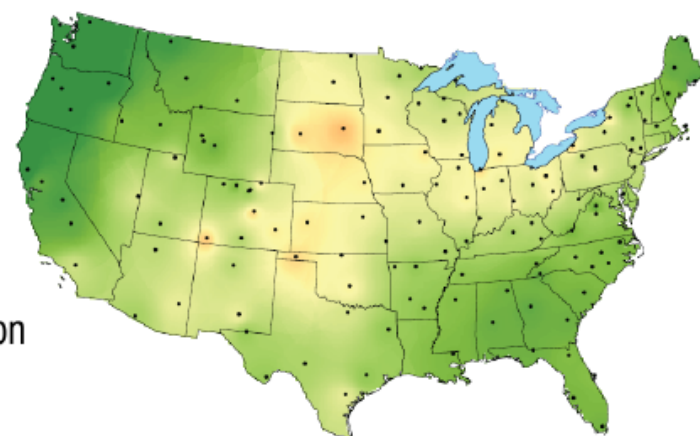
2012-2014



Sulfate Ion



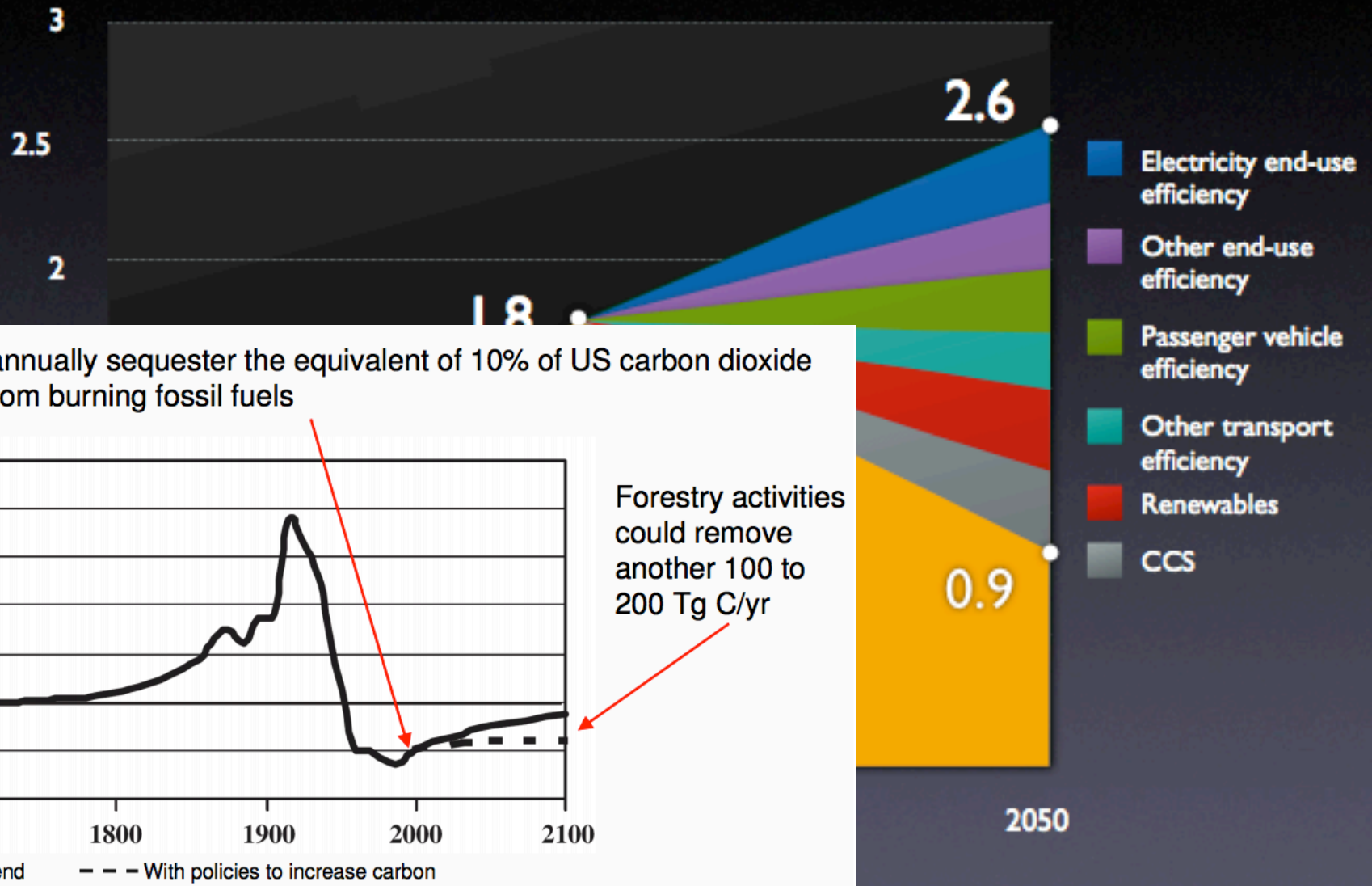
Nitrate Ion



# U.S. Emissions

After Pacala and Socolow, 2004;  
ARI CarBen3 Spreadsheet

## • Carbon Capture & Storage



***The mission of The Nature Conservancy is to conserve the lands and waters on which all life depends.***





# Implications for land management

- Discussions with land owners and managers on ongoing changes
- Increasing diversity of climate-adapted species
- Increased monitoring/removal of invasive species
- Adaptive/risk-based management

# Opportunities for membership engagement

- Nature Conservancy is highly respected across political spectrum, can act as an “honest broker”
- Active members need help and information to engage their community
- Demonstration projects that specifically target climate mitigation or adaptation

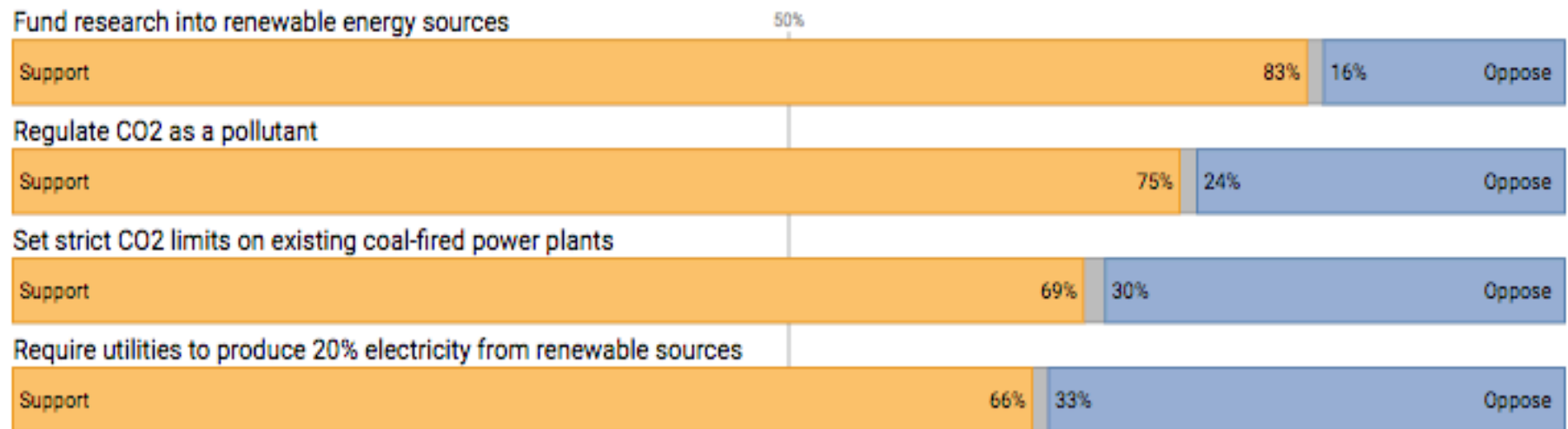
DNR Spring Hearings and  
Wisconsin Conservation Congress  
County Meetings  
Monday, April 9, 2018

- Ballot returned by 6,893 members
- 66% of voters (90% of counties) support WCC to encourage DNR to take a position on market based legislation to reduce risk of global warming and increase renewable energy

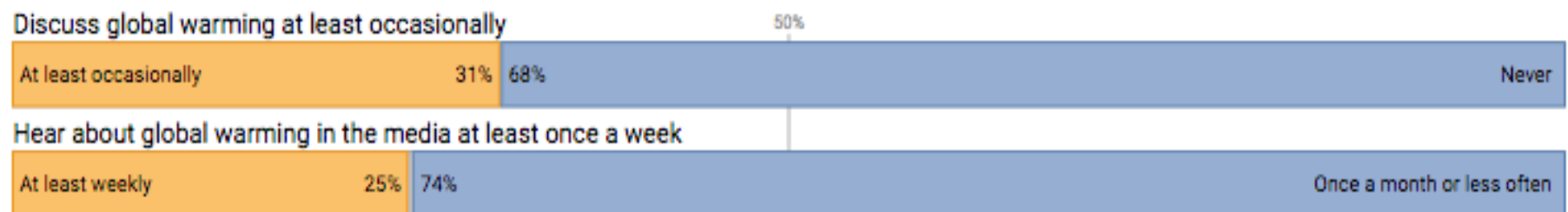


# There is support among Wisconsin residents

## POLICY SUPPORT



## BEHAVIORS



# THANKS!

- [desai@aos.wisc.edu](mailto:desai@aos.wisc.edu)
- @profdesai
- <http://flux.aos.wisc.edu>

