

# Water Resources: Climate Change Challenges and Opportunities



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# General Water Resource Issues



Too Much



Water Quality?



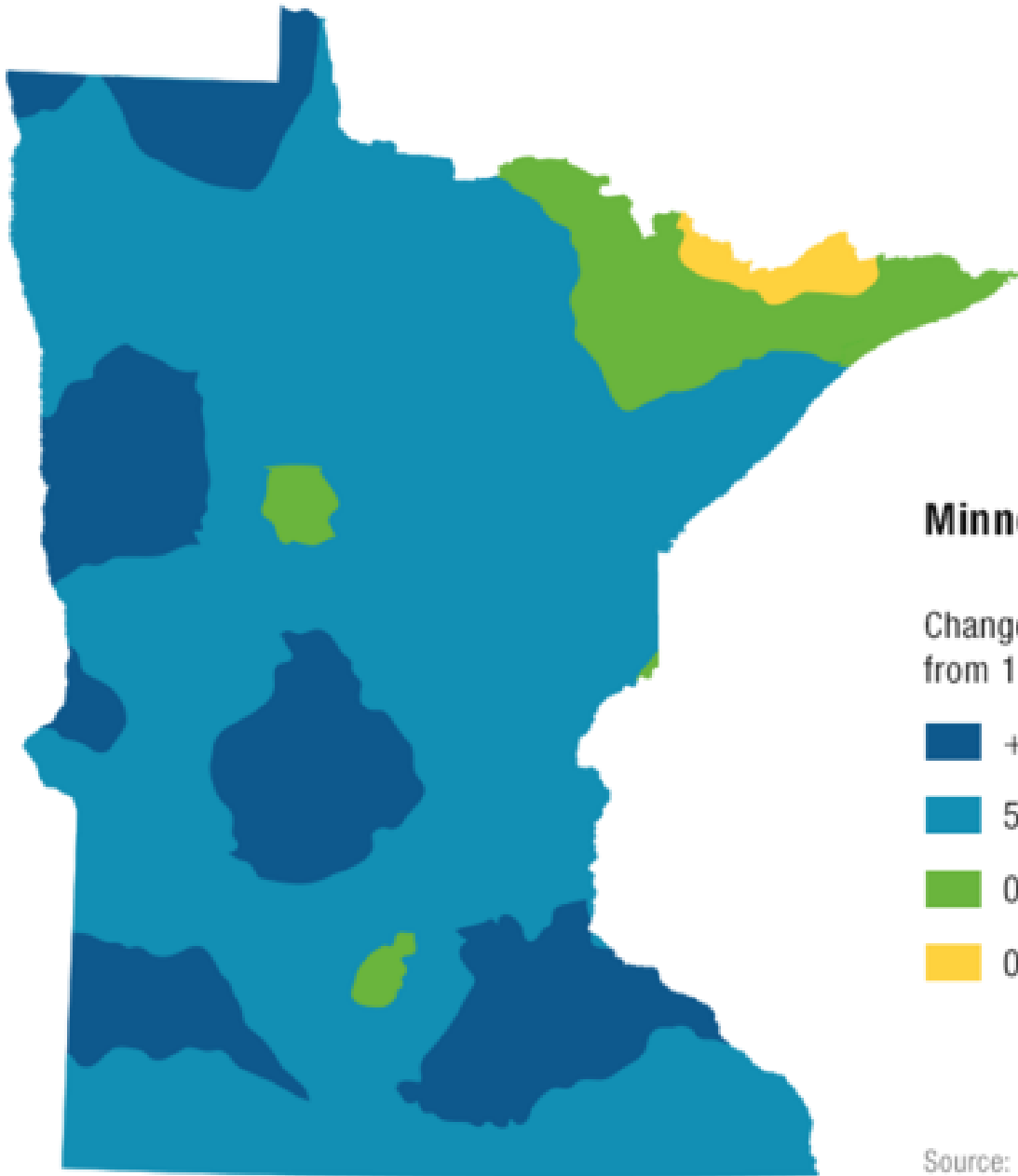
Too Little

*“Climate change has already altered, and will continue to alter, the water cycle, affecting where, when, and how much water is available for all uses.”*

**US Global Change Research Program 2009**

# Challenge #1: Flooding

- Across the Midwest annual precipitation has increased (up to 20% in some locations)
  - Much of the increase is due to more high intensity rain events
- More frequent and higher magnitude flooding



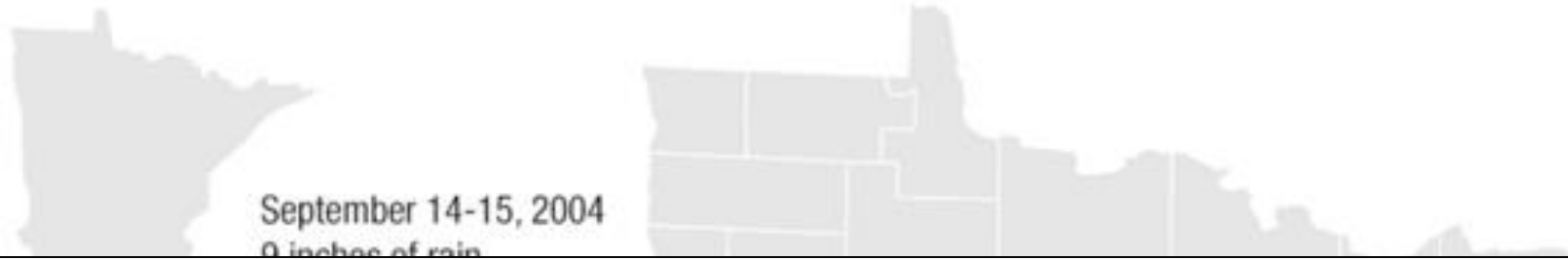
## Minnesota getting more rain

Change in average rainfall  
from 1901-1960 to 1991-2012

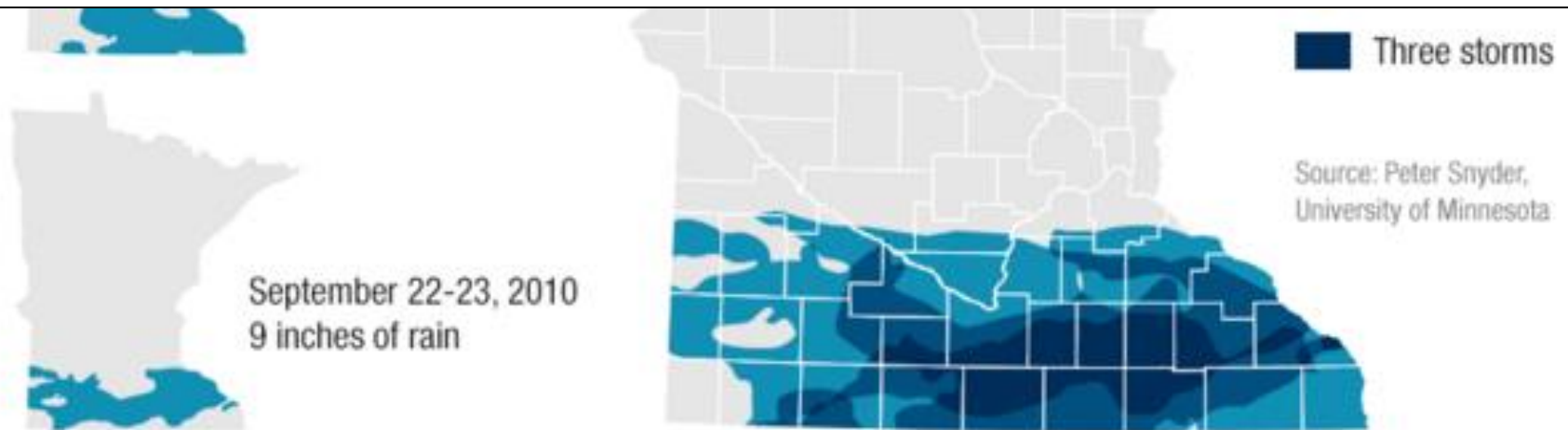
- +15% Increase
- 5-15% Increase
- 0-5% Increase
- 0-5% Decrease

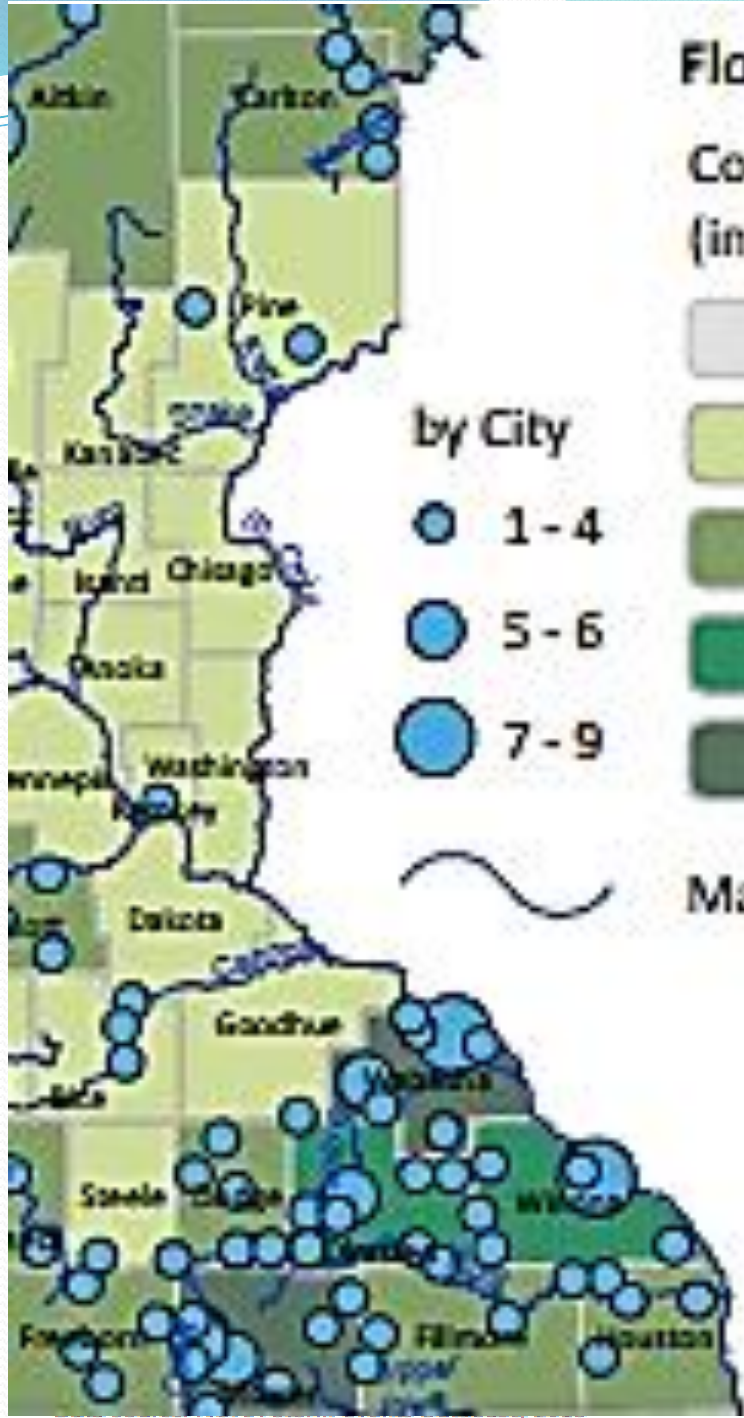
Source: National Climate Assessment

## Areas of heaviest rain during three 1,000-year storms this century



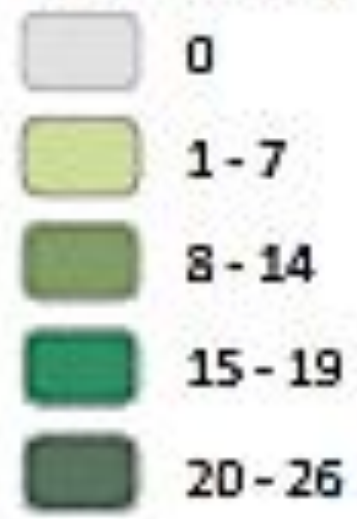
**More rain over shorter periods = more large floods**





## Flood Events

County Total  
(including City)



by City

1 - 4
5 - 6
7 - 9

Major Rivers

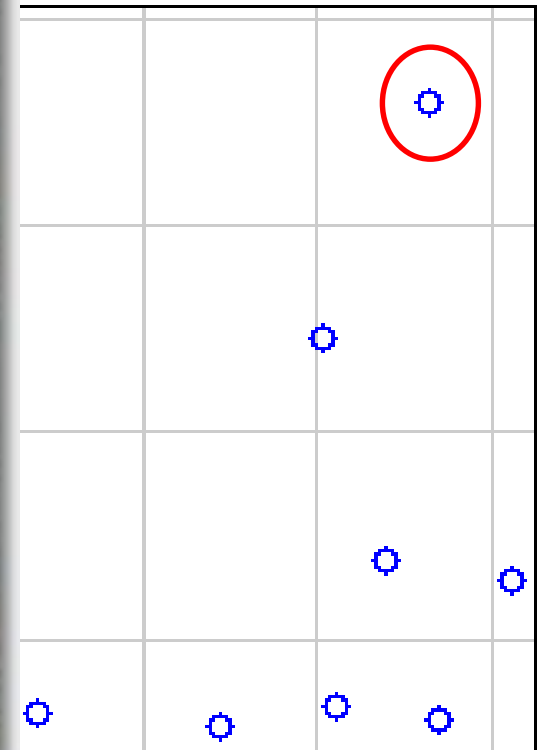


# Challenge #1: Flooding

- Floods are the #1 natural disaster in the United States.
- From 2005 to 2014, the U.S. averaged 71 flood deaths per year.
- From 2005 to 2014, total flood insurance claims averaged more than \$3.5 billion per year.
- Flooding threatens infrastructure (cities and roads), agriculture, ecosystems and wildlife.

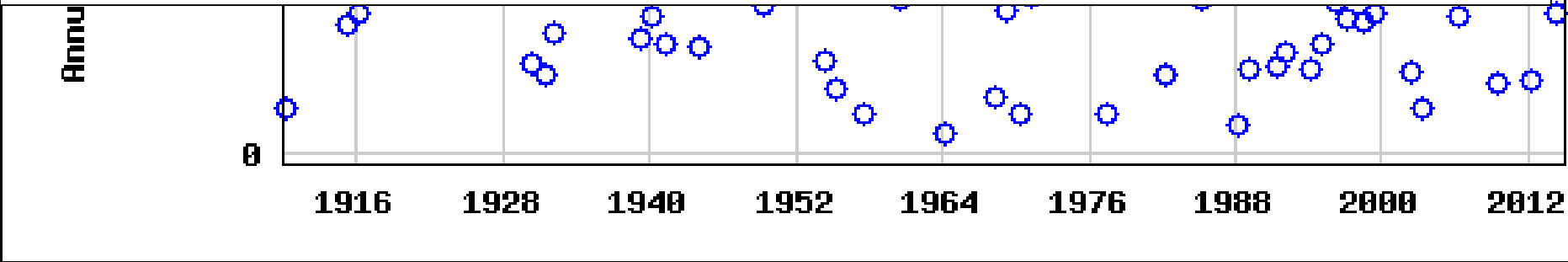


STON, MN



**Rushford, MN: Repairs to city cost \$40M**

**Winona County flood damage estimated at \$19M**





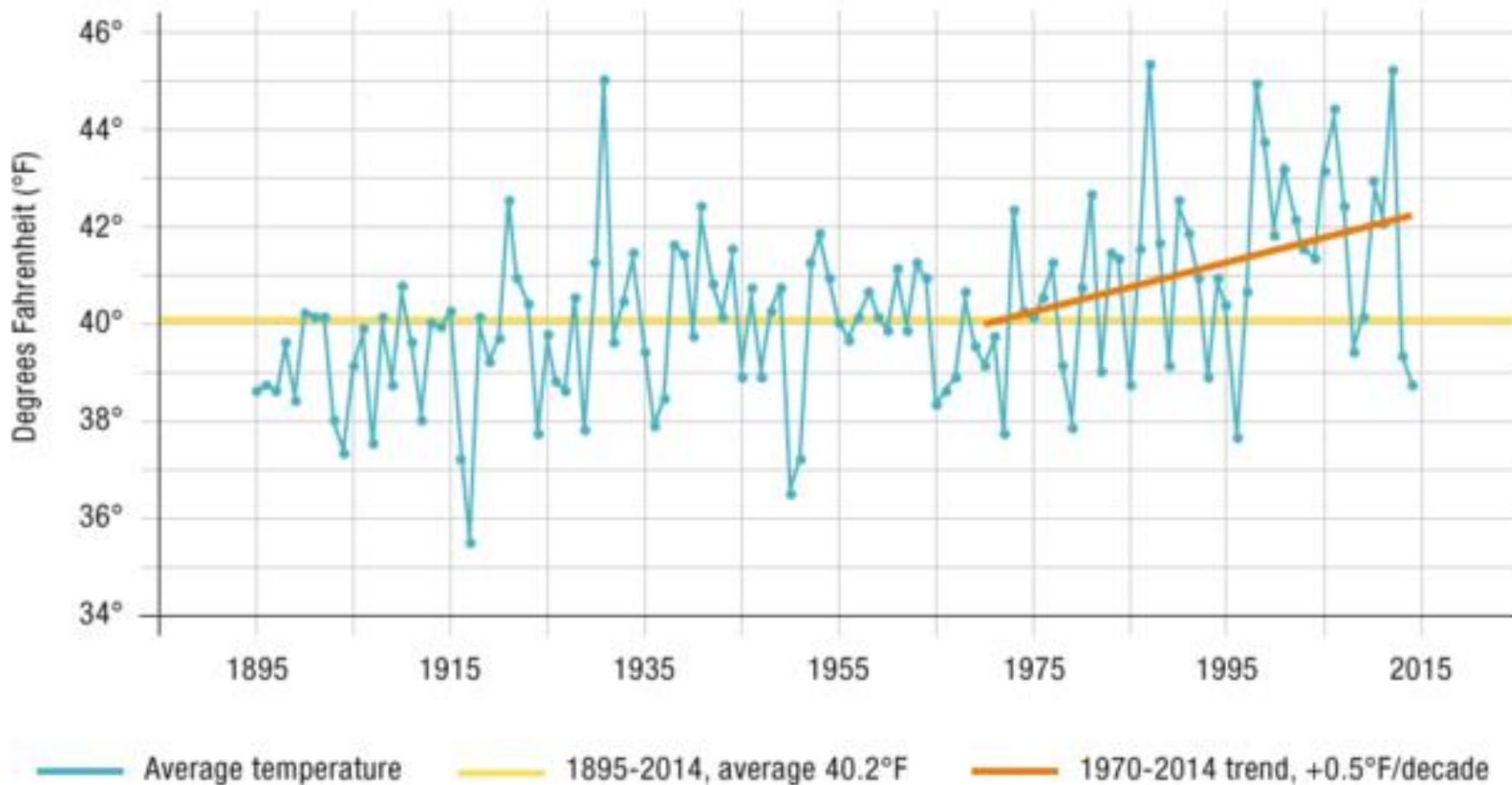
# Opportunities to Address Flooding

- ‘Balance Watersheds’
  - Drained lands and impervious urban areas must be offset by BMPs and ecosystem restorations aimed at slowing runoff and storing water (infiltration, wetlands, floodplain connectivity, etc.)
- Flood protection infrastructure must be designed for extremes
  - Areas that are unprotected need infrastructure designs capable of withstanding flooding

# Challenge #2: Water Scarcity

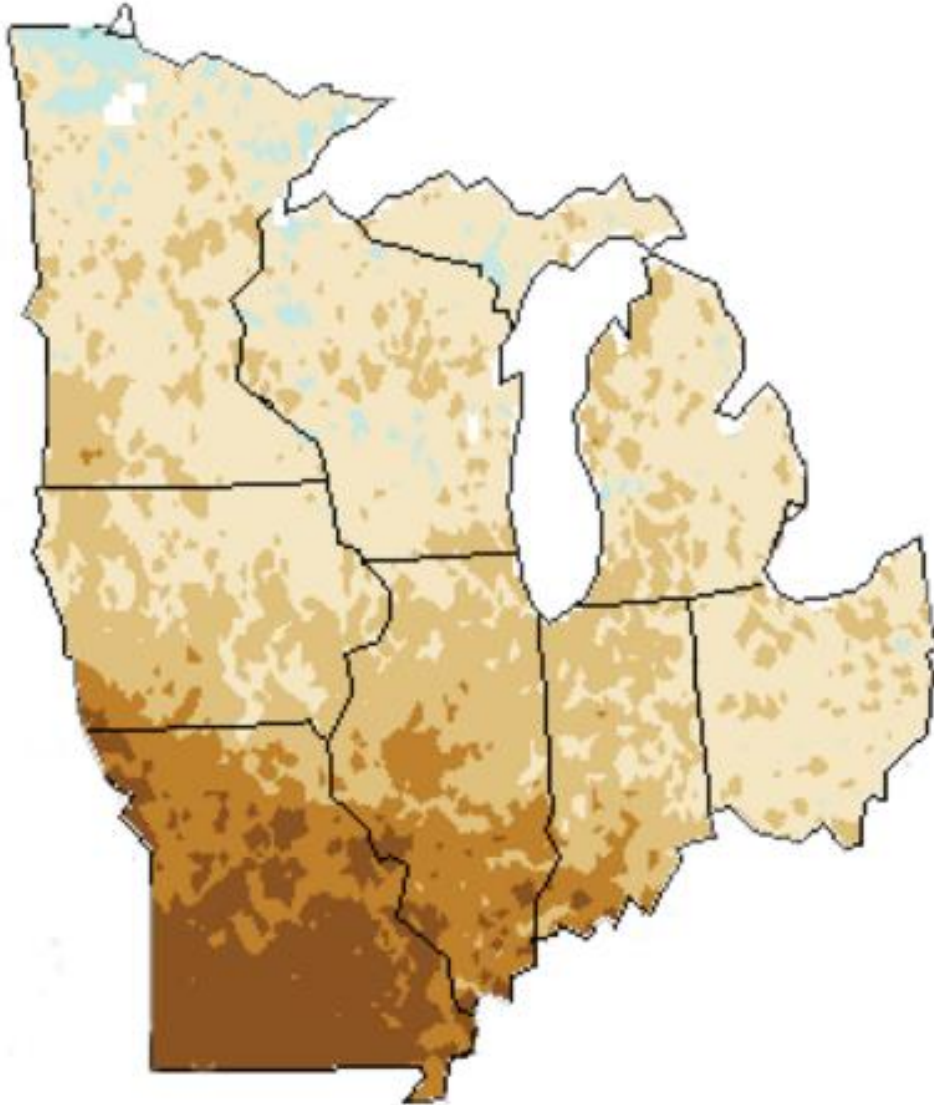
- Models indicate decreased summer precipitation (average of 8% by mid-Century)
- Coupled with warmer temperatures and higher evapotranspiration rates, water scarcity issues are already beginning to occur in MN
- Increased demand on water supply will magnify dry periods – driving water demand that much higher

# Minnesota's average annual temperature 1895-2014



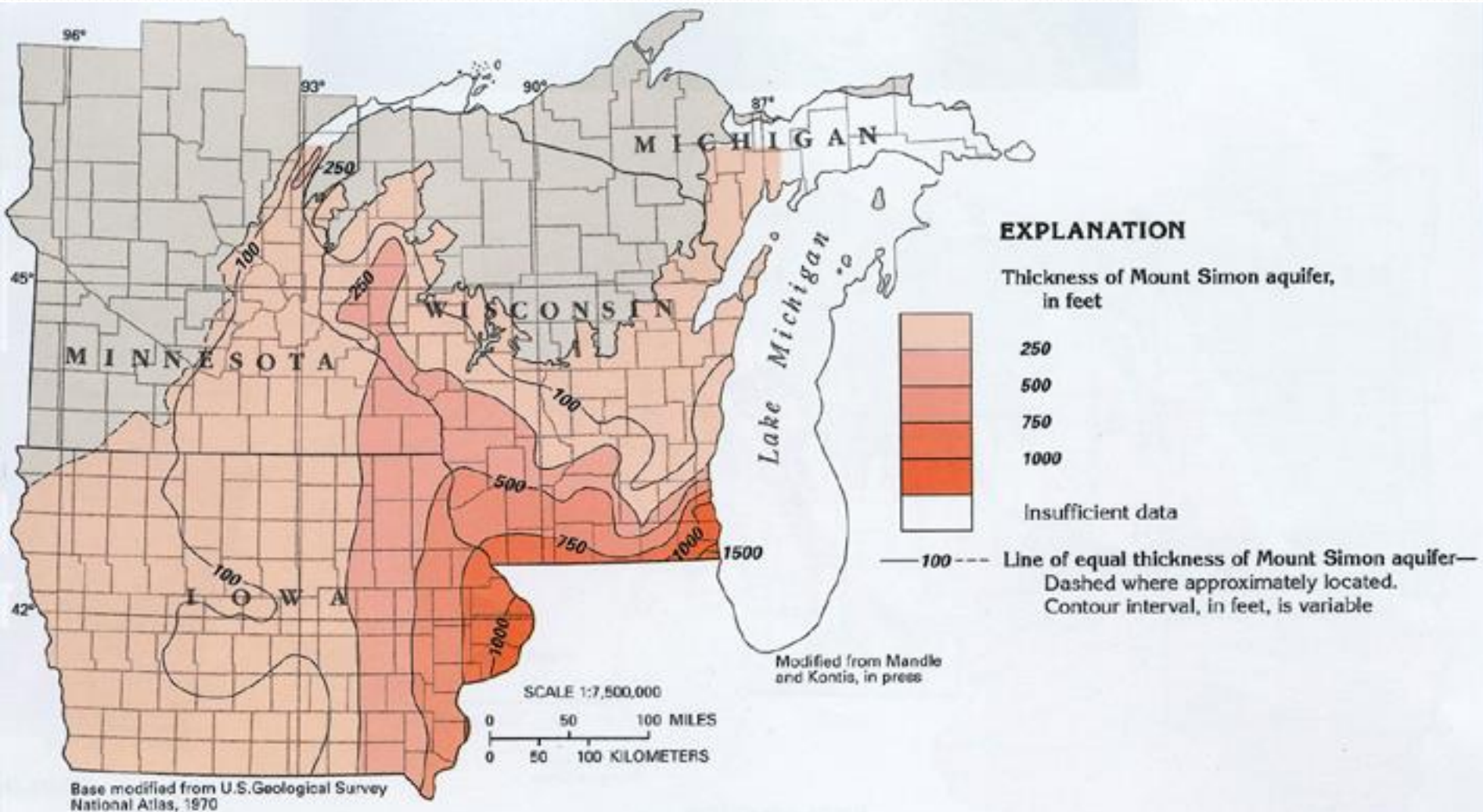
Source: National Climatic Data Center

# Increase in Consecutive Dry Days by Mid-Century

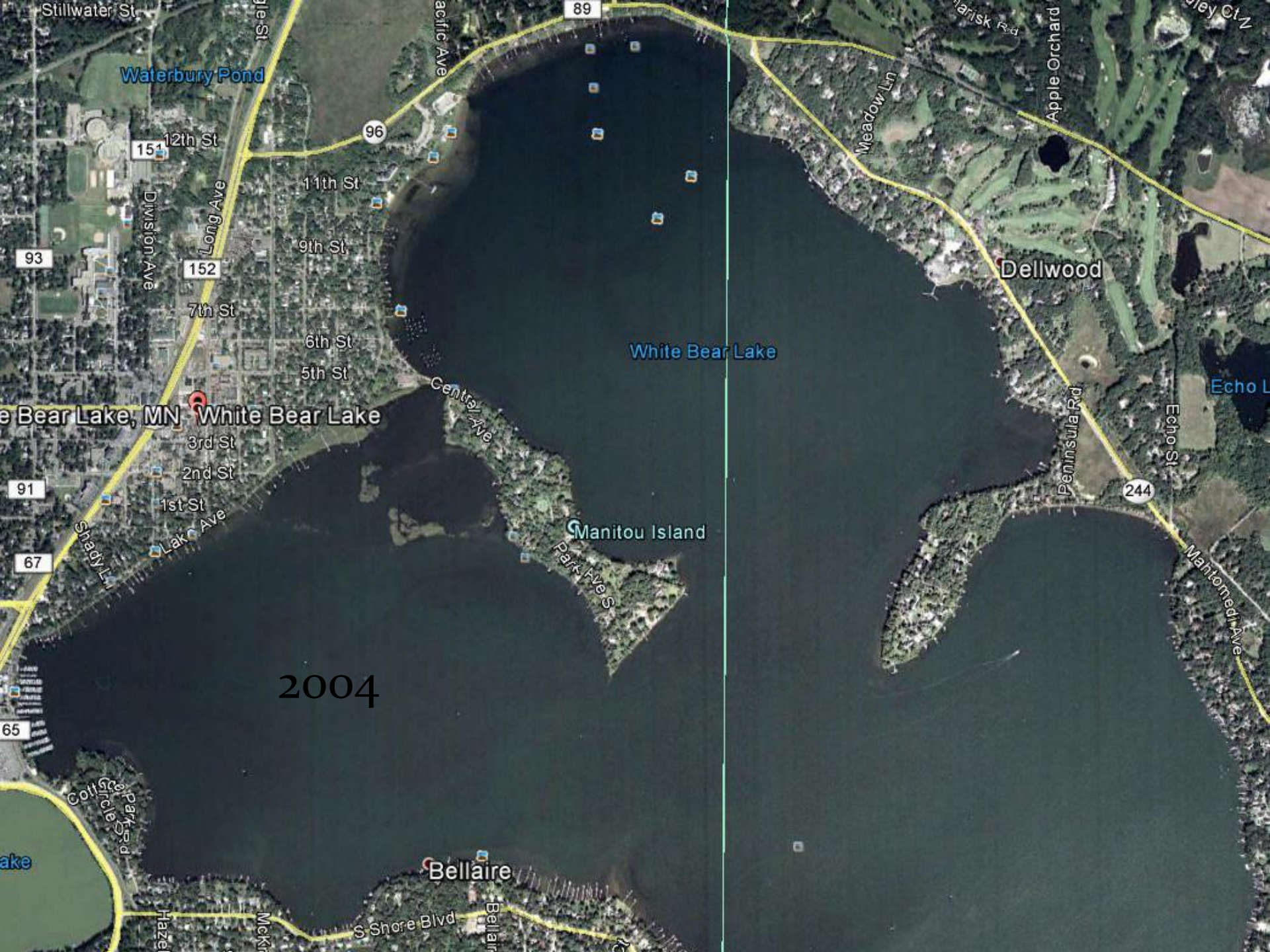


# Human Response





**Figure 115.** The Mount Simon aquifer ranges in thickness from a featheredge in northern Wisconsin to about 1,500 feet in the southeastern part of the State and generally is 100 to 500 feet thick in most places in Iowa and Minnesota.



Waterbury Pond

White Bear Lake

Dellwood

White Bear Lake, MN - White Bear Lake

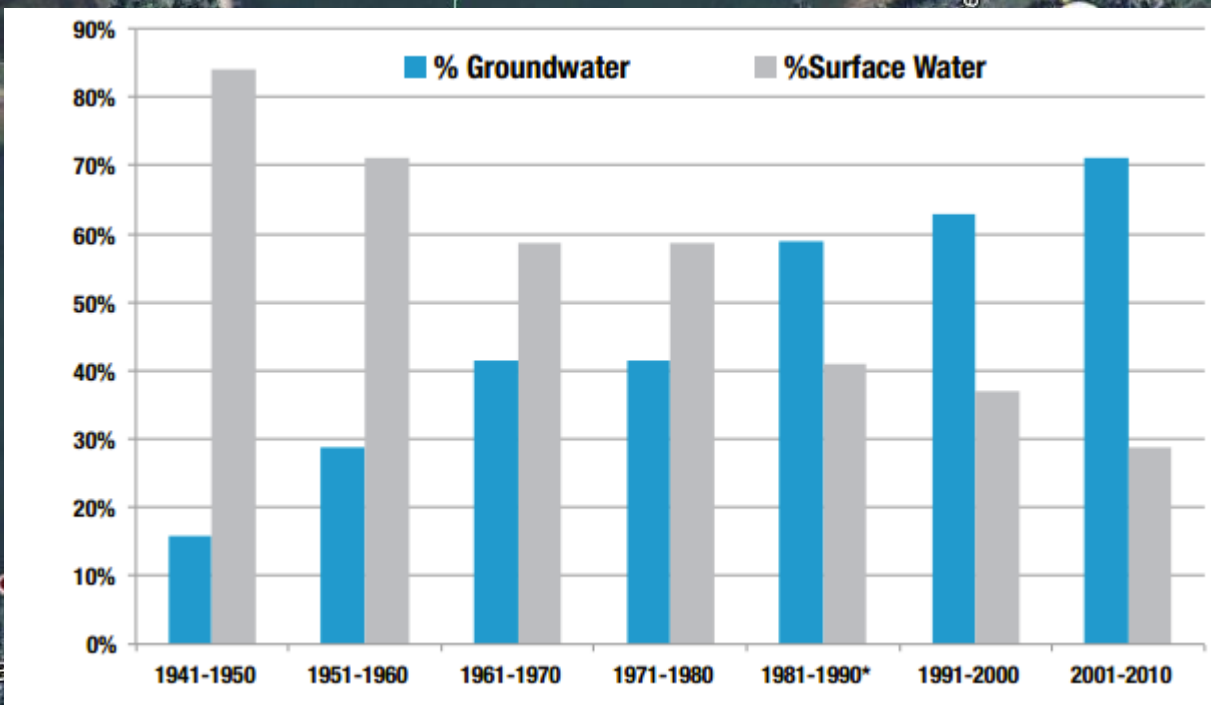
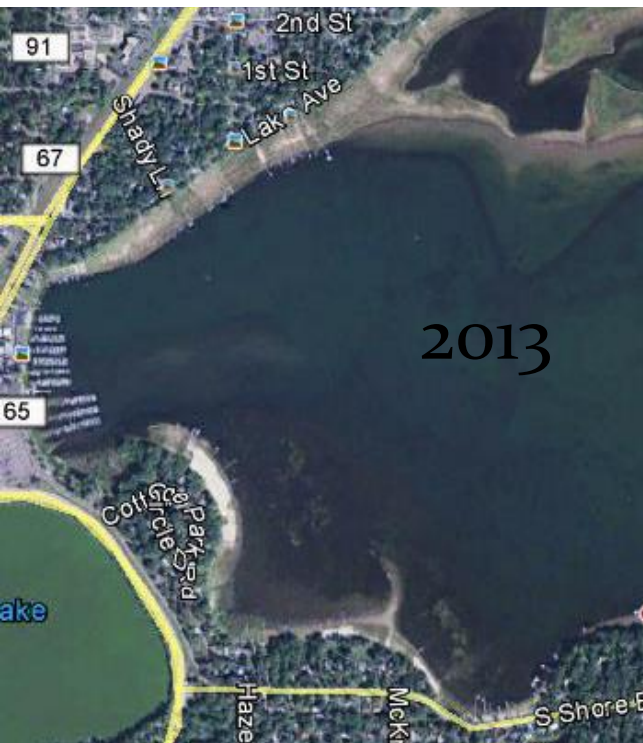
Manitou Island

2004

Bellaire

lake

Recorded Water Levels  
2003-7-15 to 2013-7-15





# Opportunities to Limit Water Scarcity

- Quantify our water supplies and their availability
- Track water use and develop a system for sharing water equally during shortages (before we need it!)
- Implement multi-party, watershed / aquifer approach to water issues
  - Water shortages: demand-side, not just supply-side solutions

# What actions can we take?

Personal responsibility: Ensure home and business use protects both the quantity and quality of our waters.

Prepare for extremes: Limit development in floodplains, the overuse of water supplies and other activities that will increase costs for everyone. Physically or financially we will all be affected by flooding and water scarcity.

Let your voice be heard: Advocate for a balanced approach to land and water management, one that ensures water equality. Slow runoff, increase infiltration and efficient water use.



# Thank You!

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