

April Showers Make May ET?

Northern



Wisconsin Ecosystem Water Use Under Climatic Change

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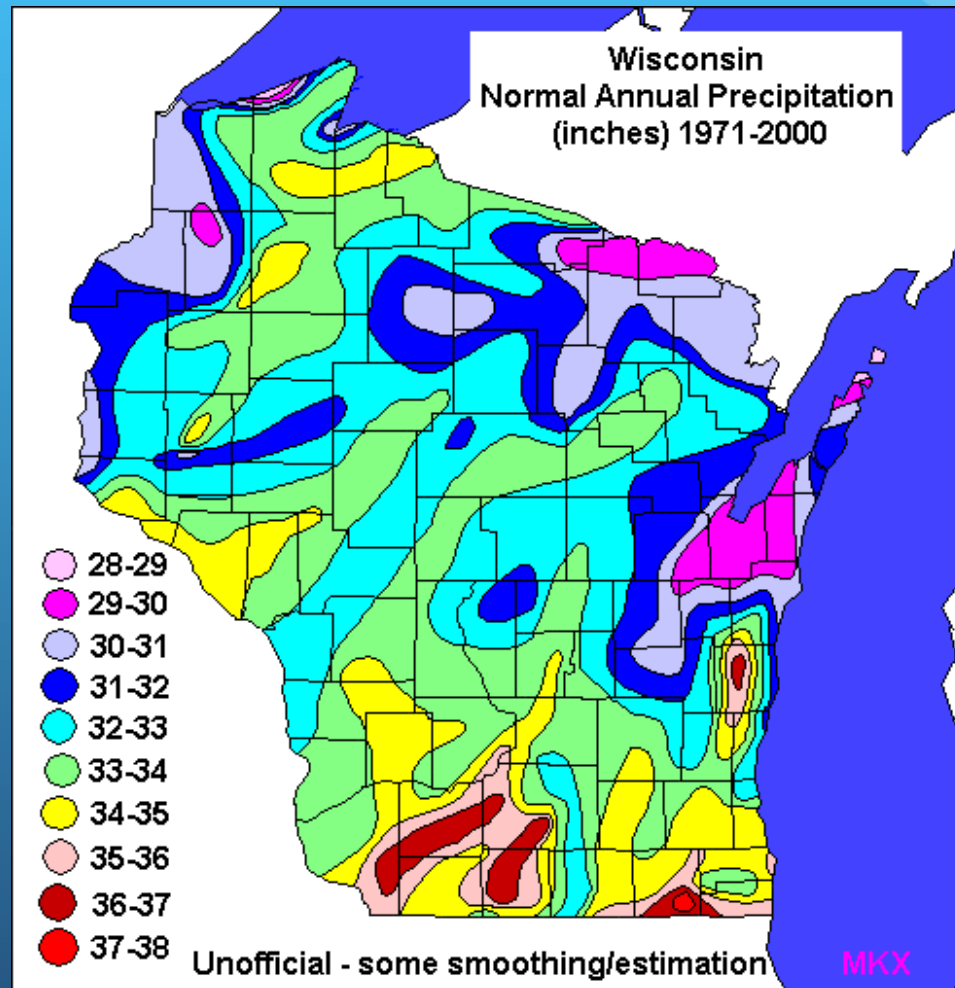
ET Mini-Conference

29 April 2011

Acknowledgments

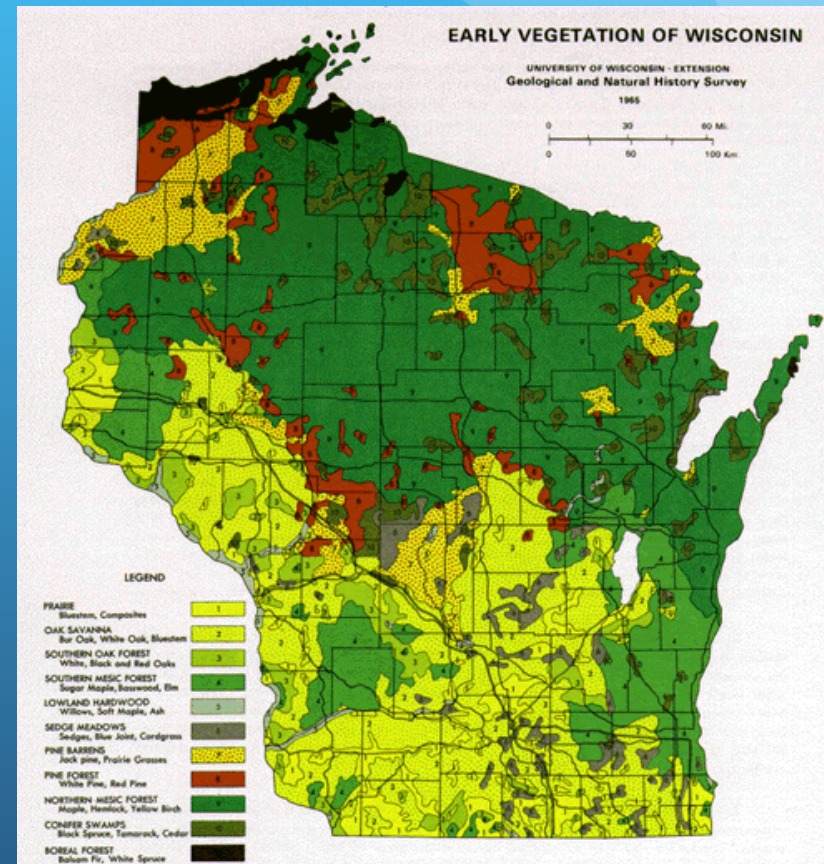
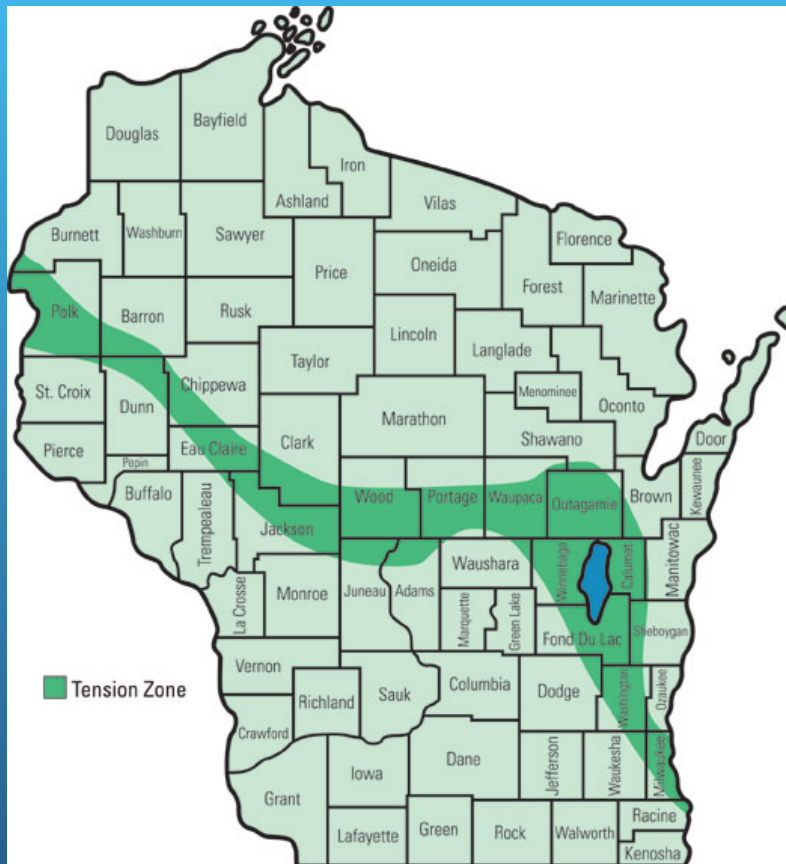
- Ben Sulman, UW AOS
- Justin Bagley, UW SAGE
- Paul Dirmeyer, IGES/COLA
- Steve Loheide and Doug Joachim, Civil Engineering
- ChEAS team
- NSF, DOE NICCR

Rainy?



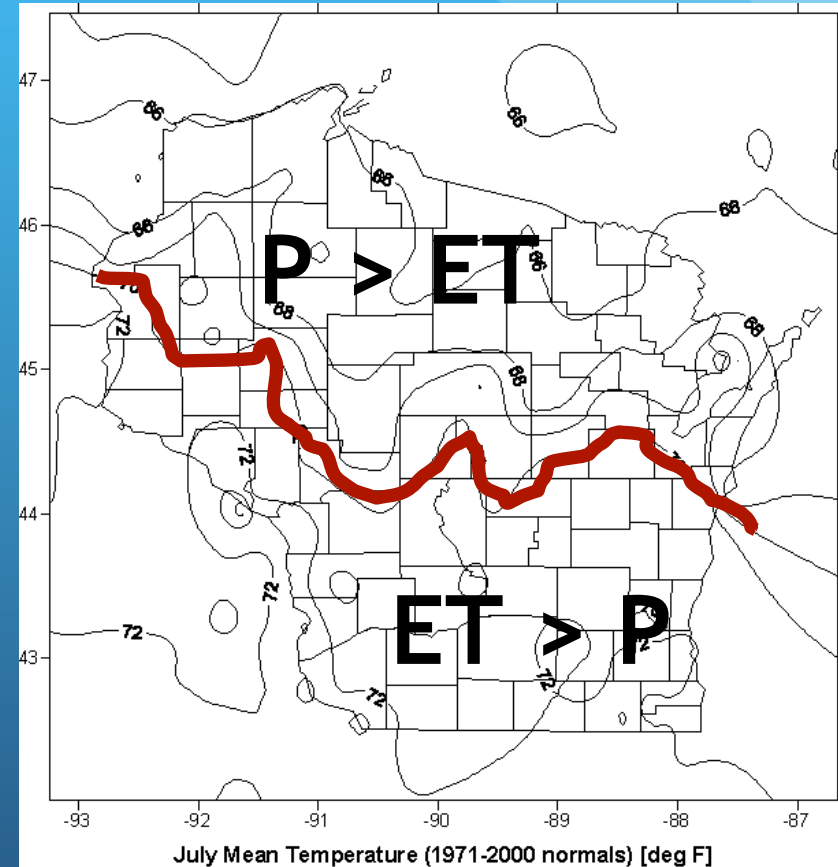
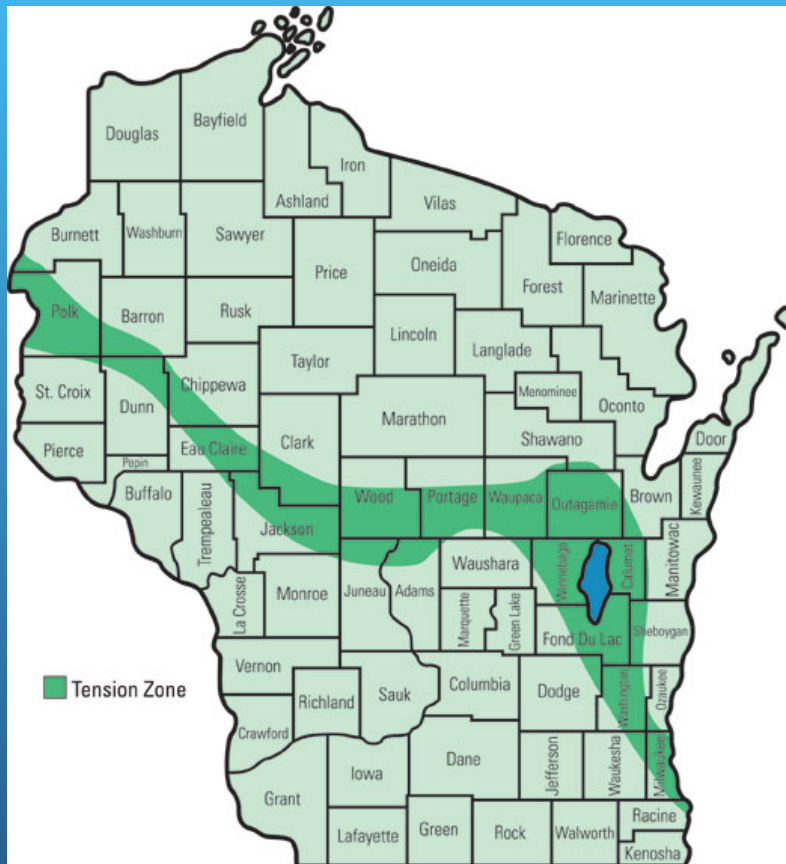
- Source : NOAA/NWS (MKX)

Tension Zone and Vegetation



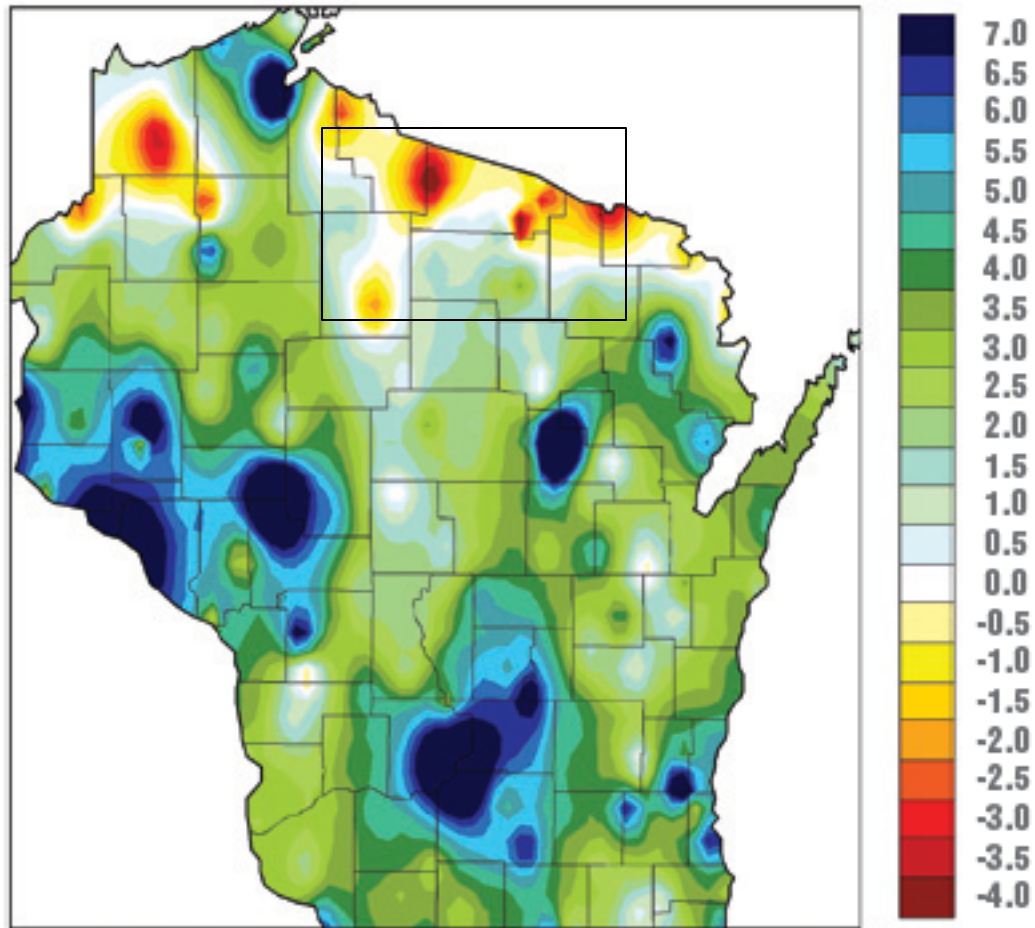
- Left: Curtis (1959) via WI DNR, right: From UWEX, WI Geological Survey

Tension Zone and Climate



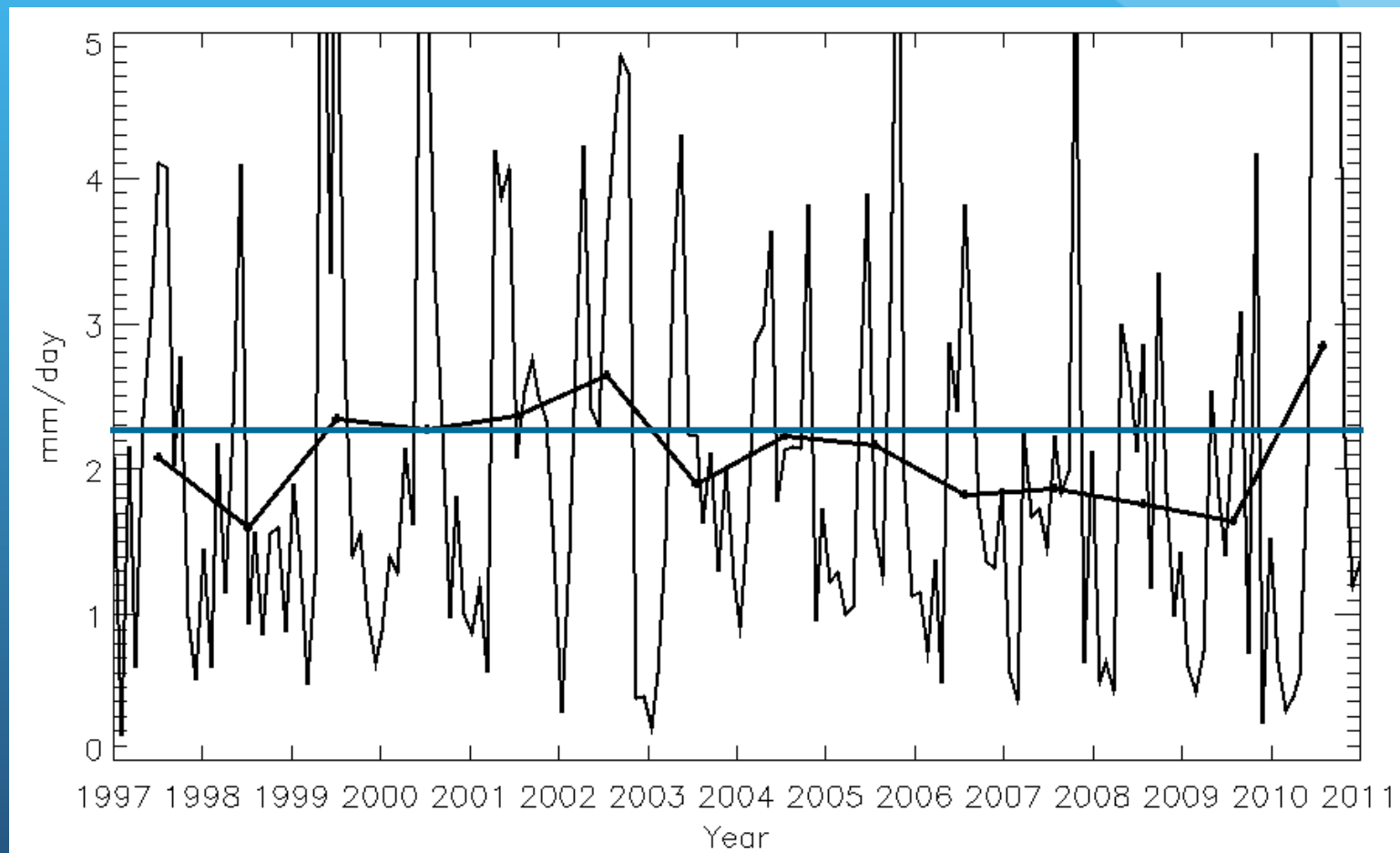
- Left: Curtis (1959) via WI DNR, right: From UW, State Climatology Office

CHANGE IN ANNUAL AVERAGE PRECIPITATION (INCHES) FROM 1950 TO 2006



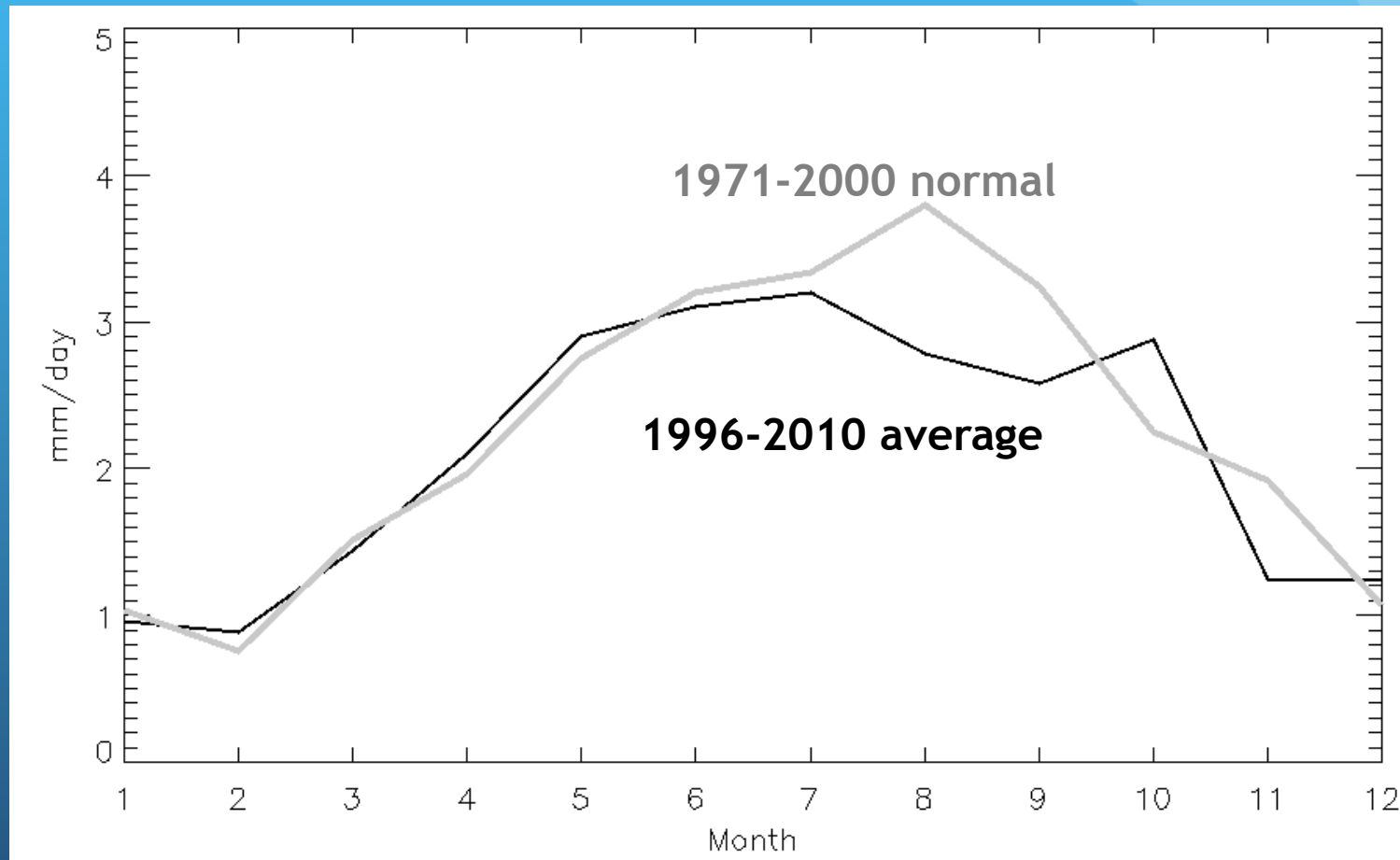
- <http://www.wicci.wisc.edu>

Precipitation Trends

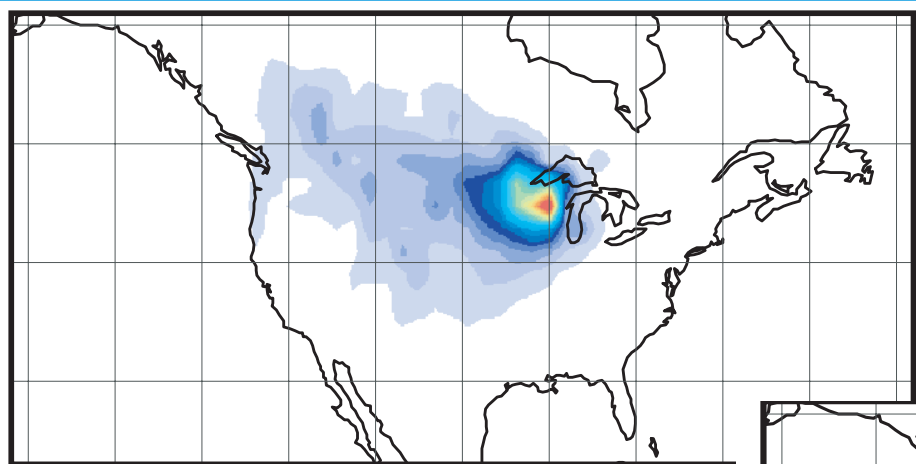


Source: Minocqua Airport - NOAA/NCDC

Dry Summers Apparent



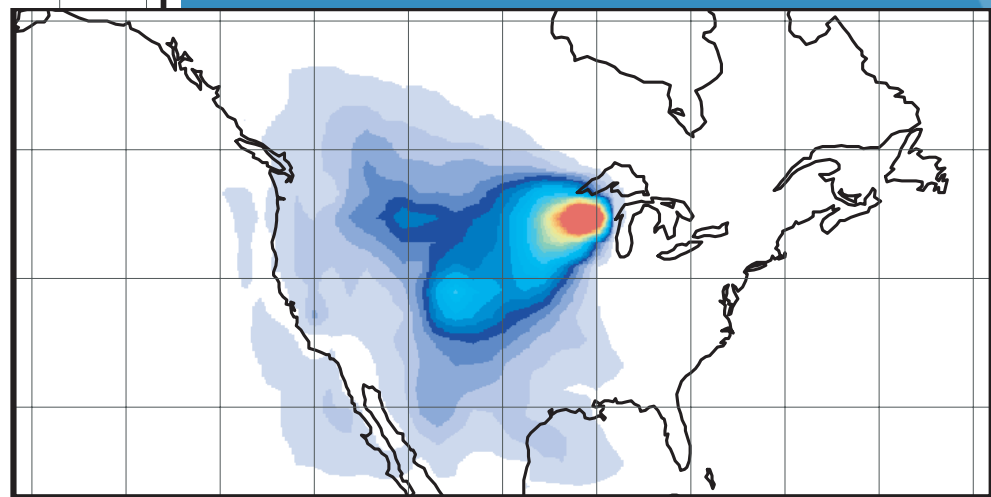
Evaporative Source Region for Precipitation Varies by Season



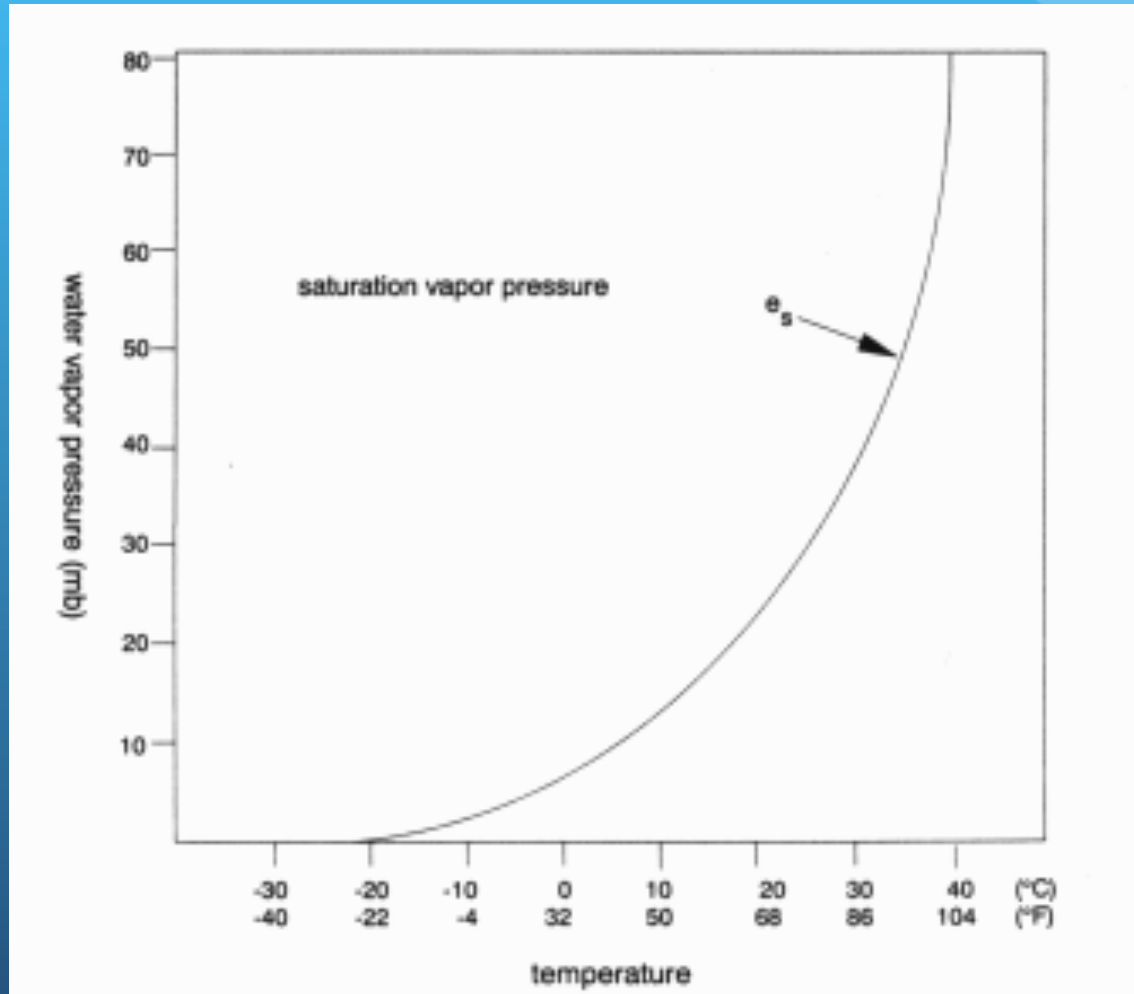
March: Local recycling



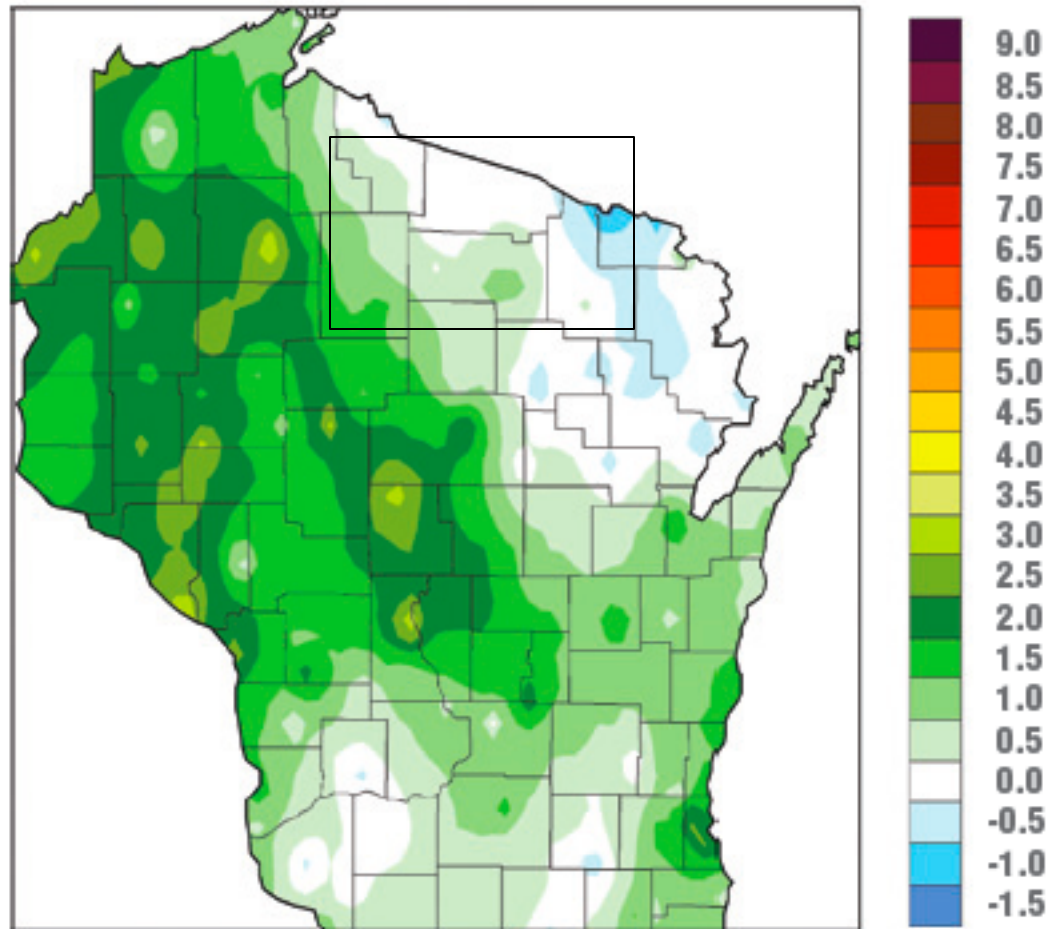
September: Synoptic sources from SW US



Thermodynamics of ET



CHANGE IN ANNUAL AVERAGE TEMPERATURE (°F) FROM 1950 TO 2006

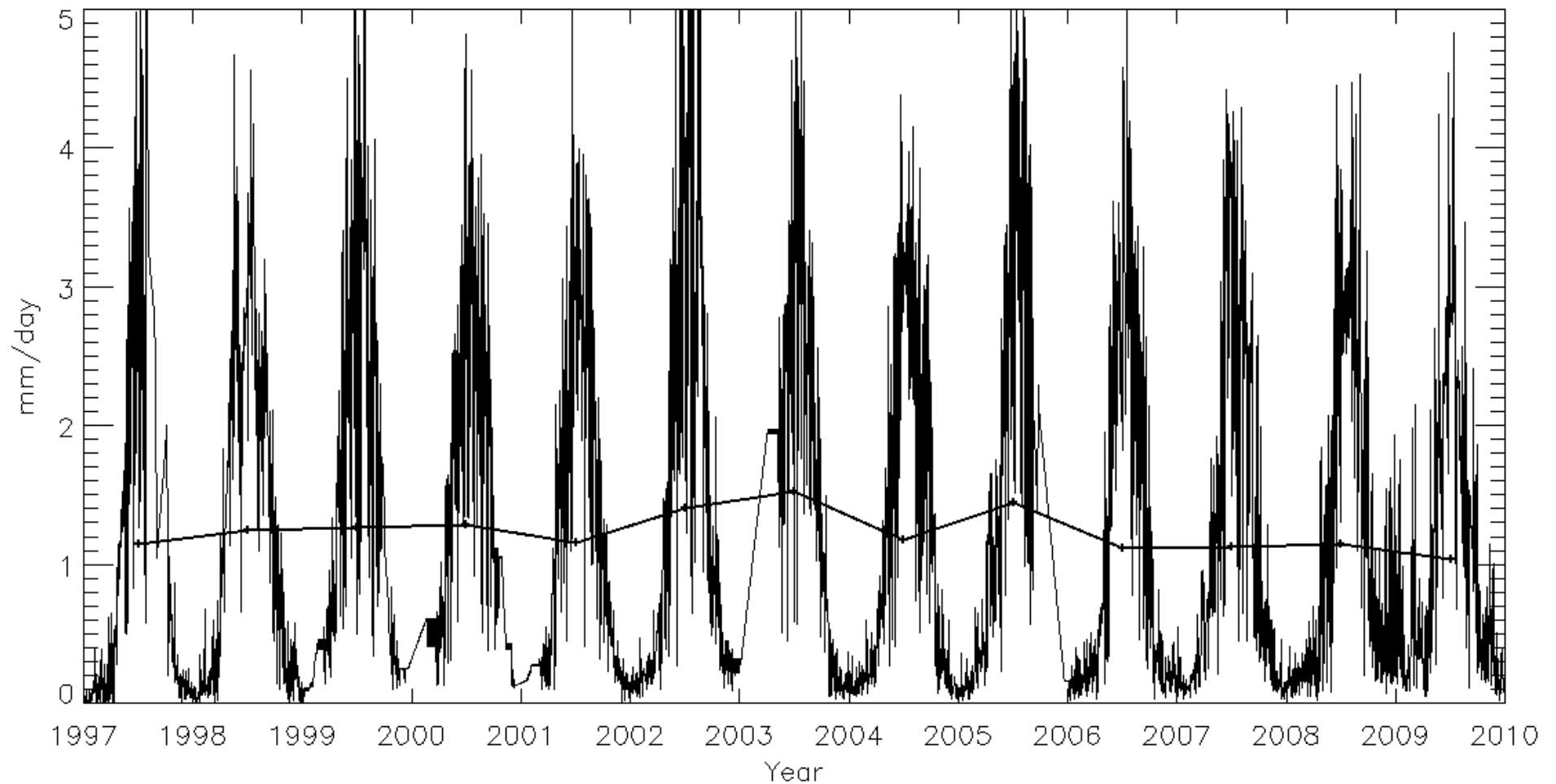


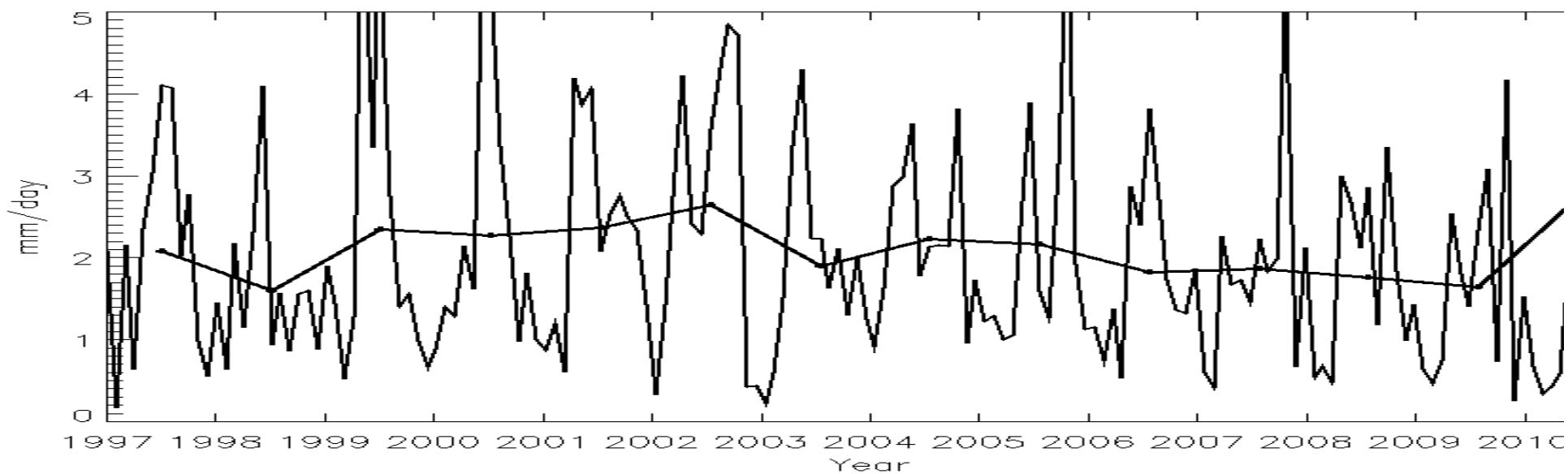
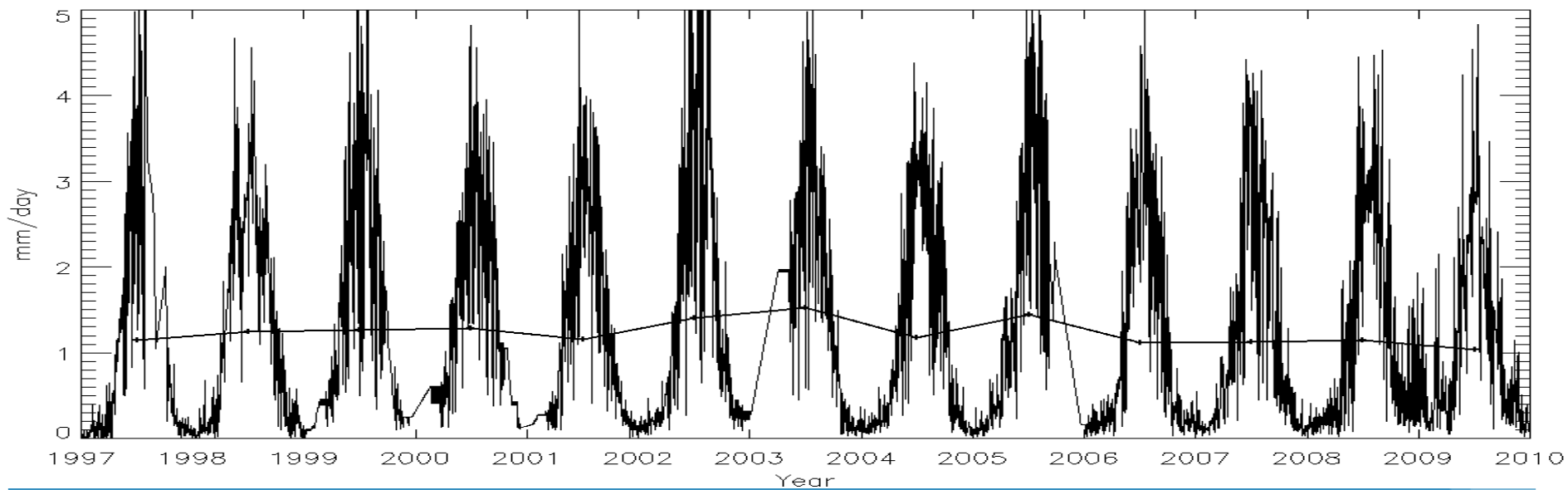
- <http://www.wicci.wisc.edu>

The Landscape and a Tower

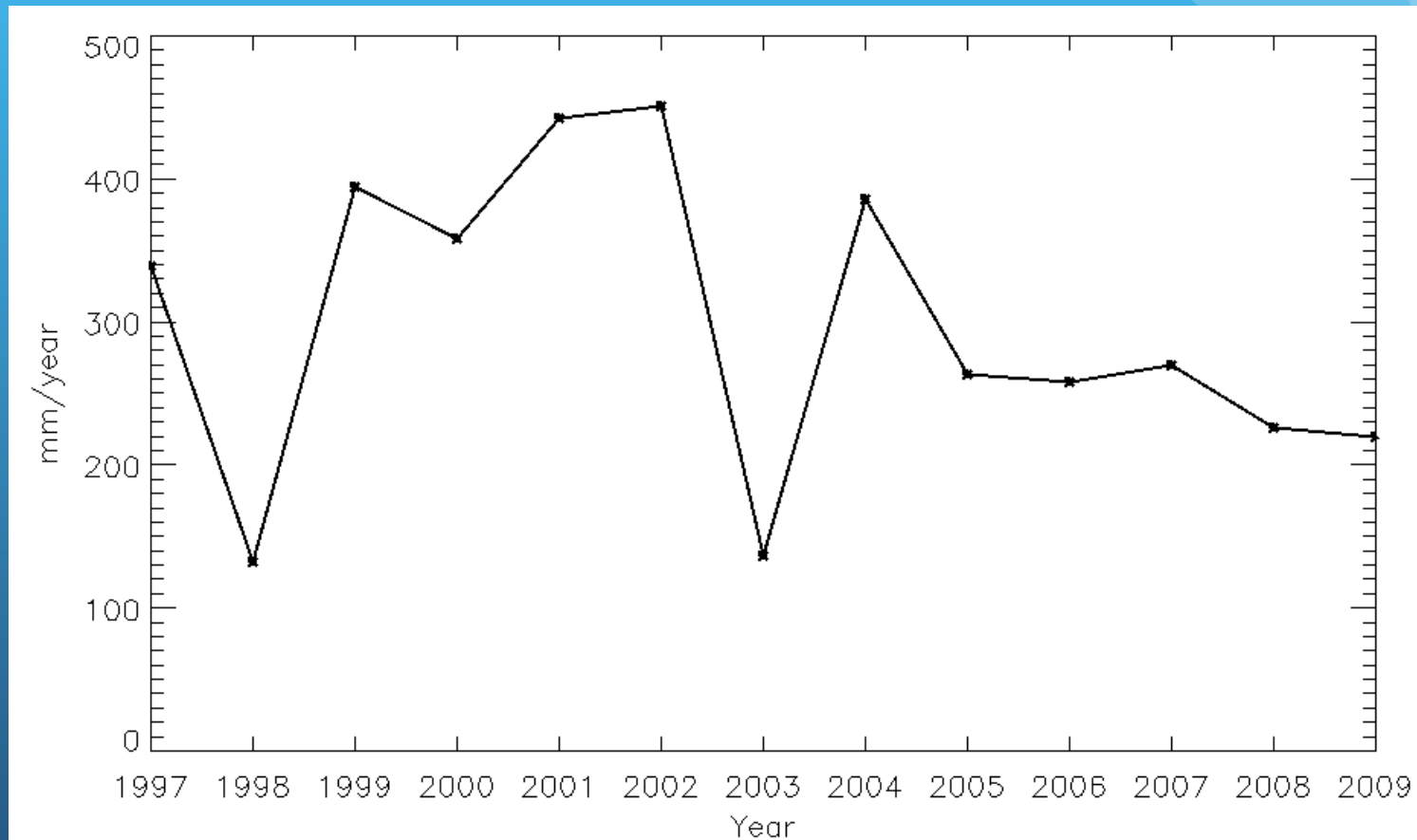


ET Trends Exist

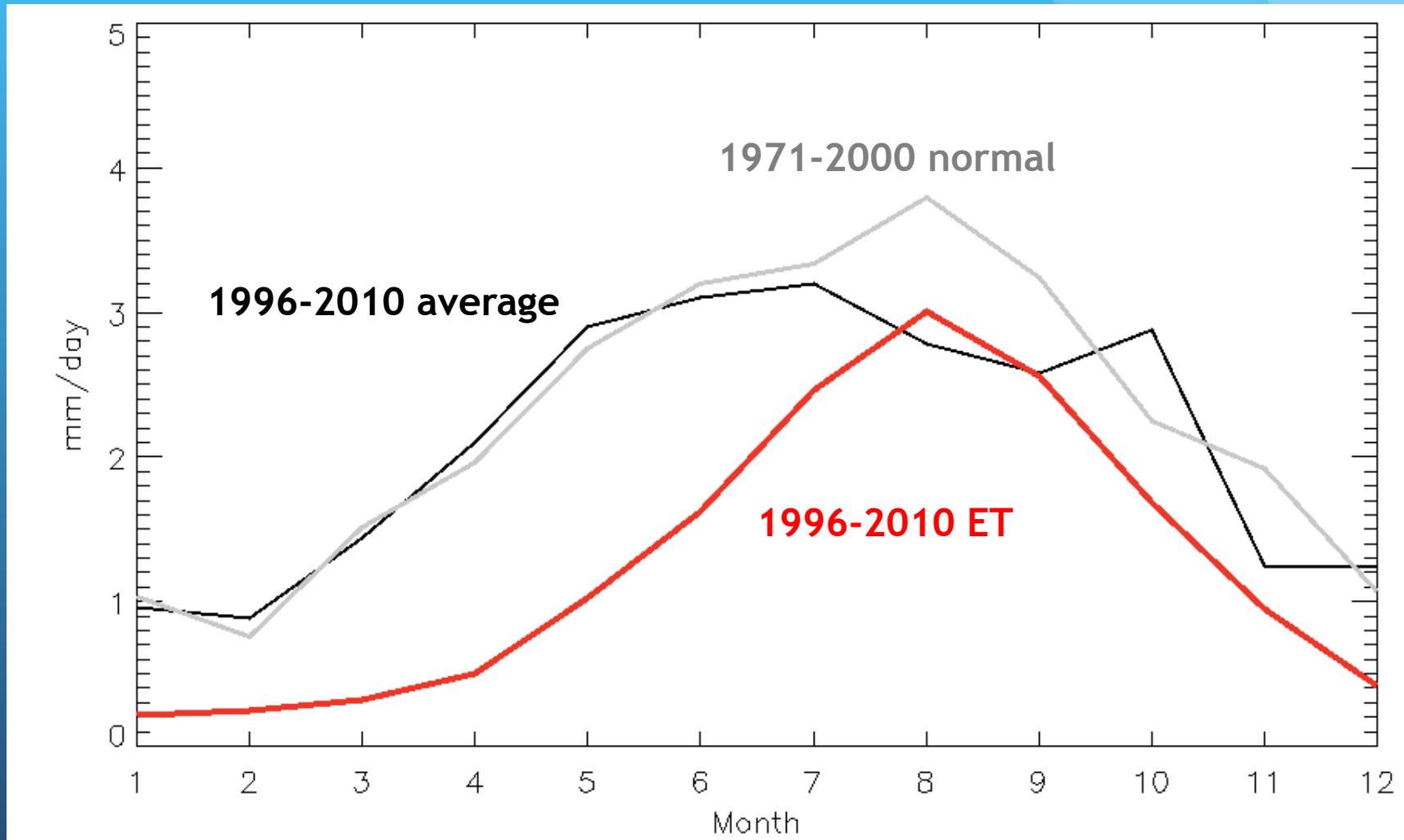




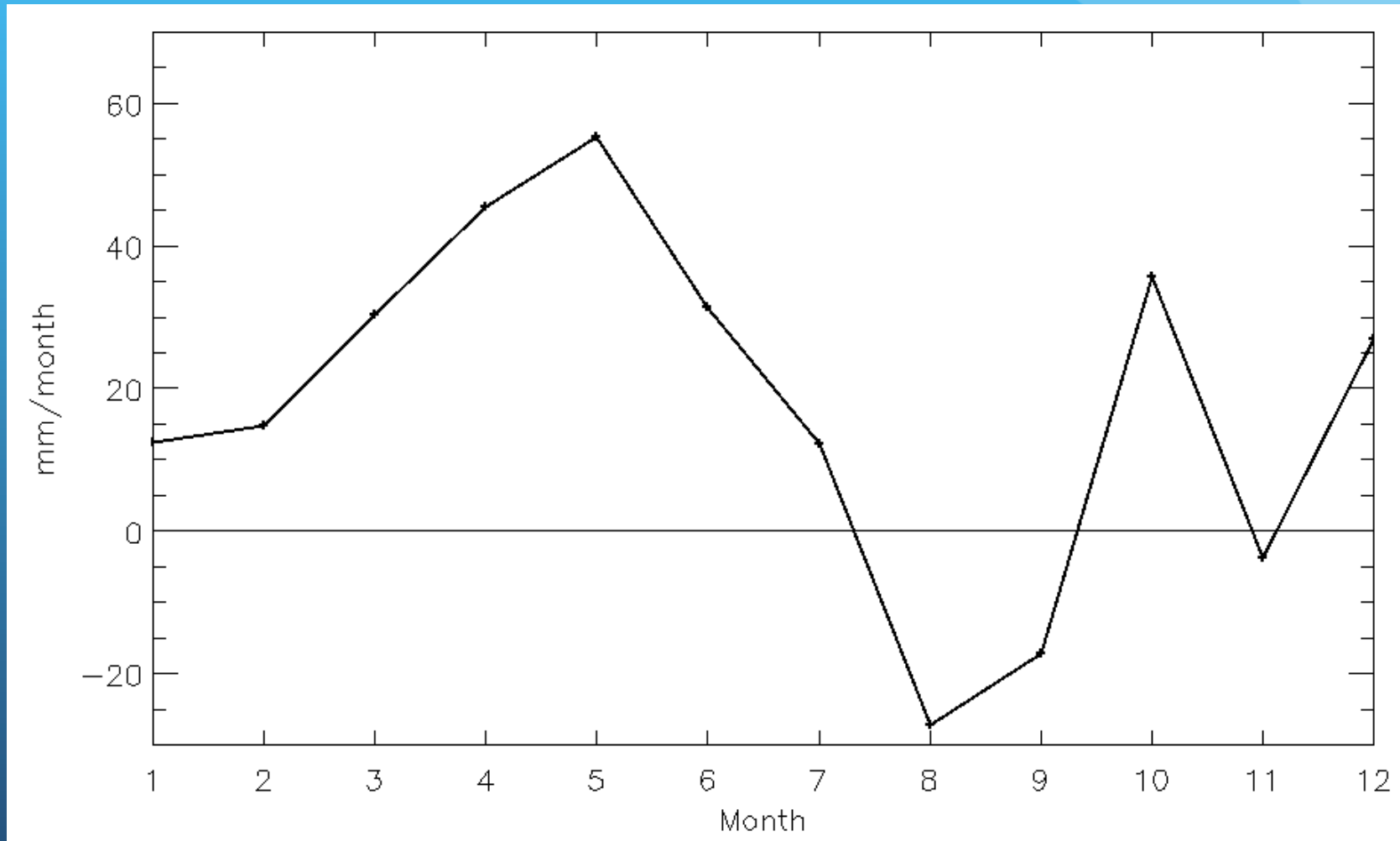
P-E variability is large!



Change in summer P-E balance



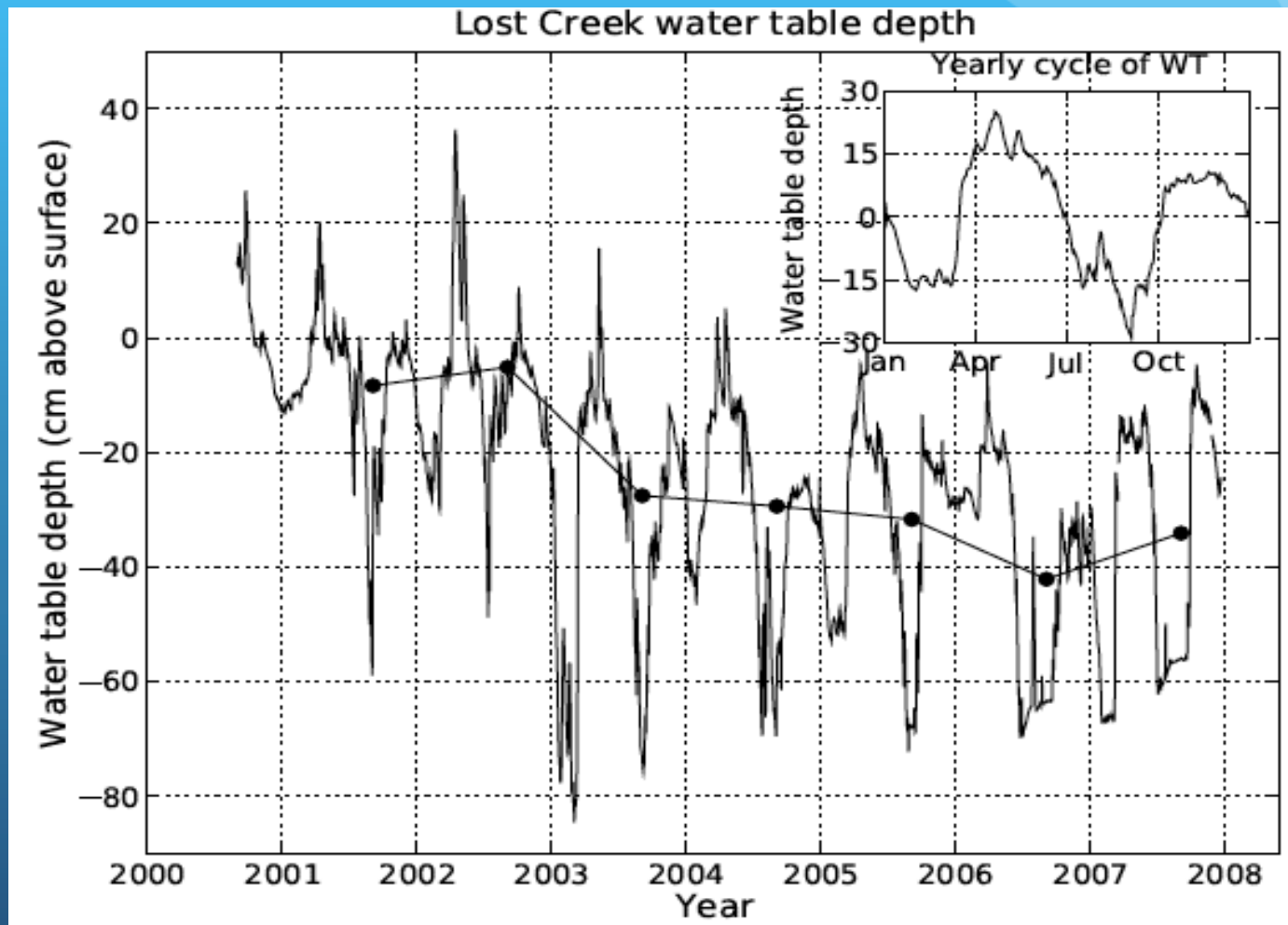
P-E 2003-2009



Coincident Trends 2000-2010

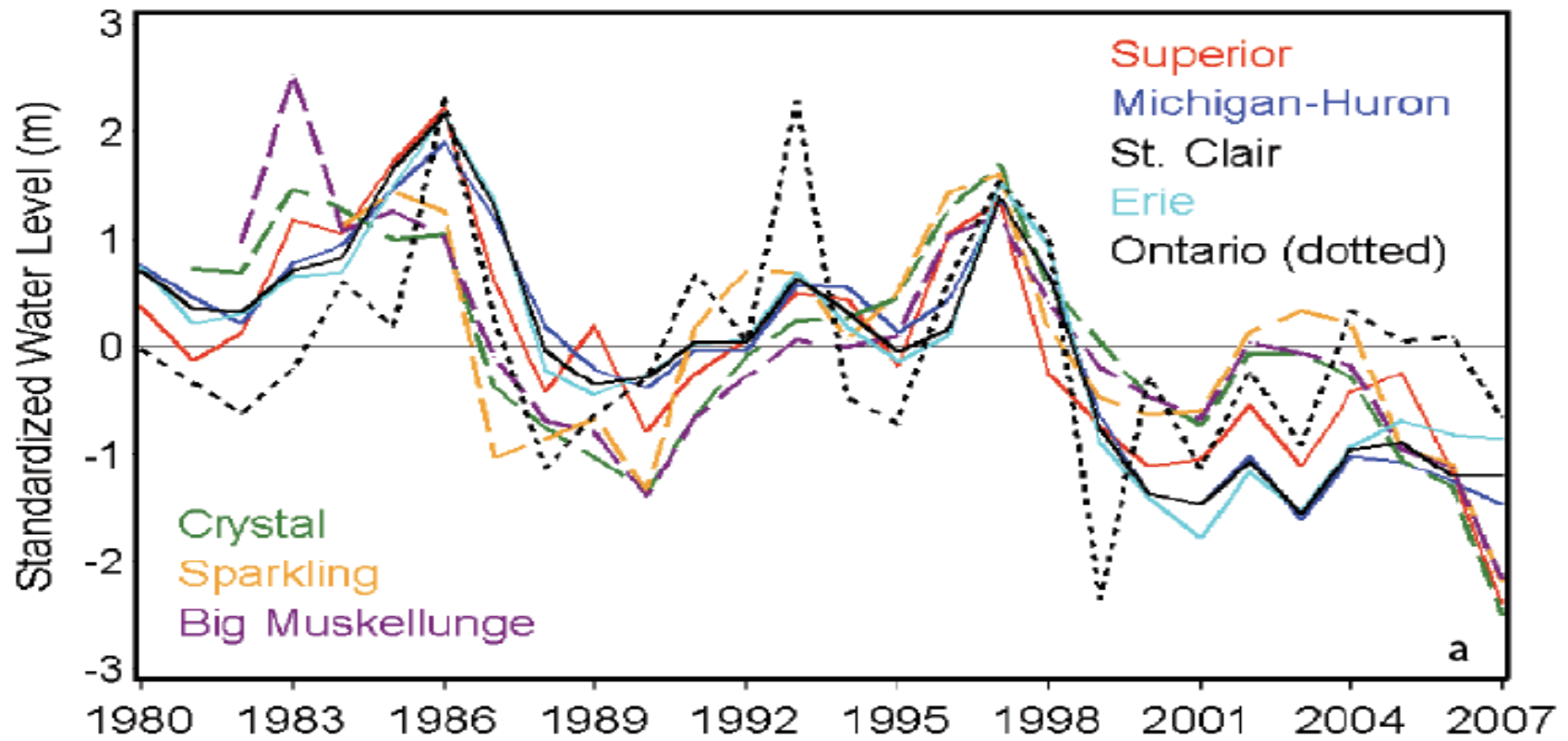
- Solar radiation increased over this period
- Growing season length extended
- Winter temperatures increased
- Summer drought continued (declining precipitation)
- ET in this region initially increased in response to transpiration stress, but appeared to decline in later years with continued drought
 - Transpiration is 80% of ET here

Declining Water Table



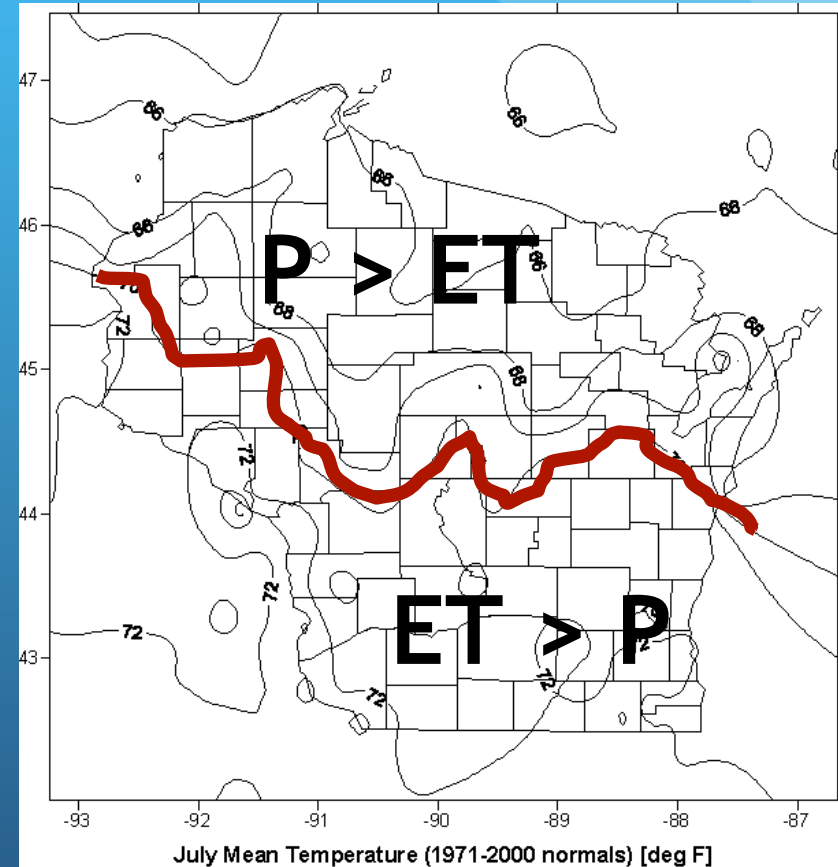
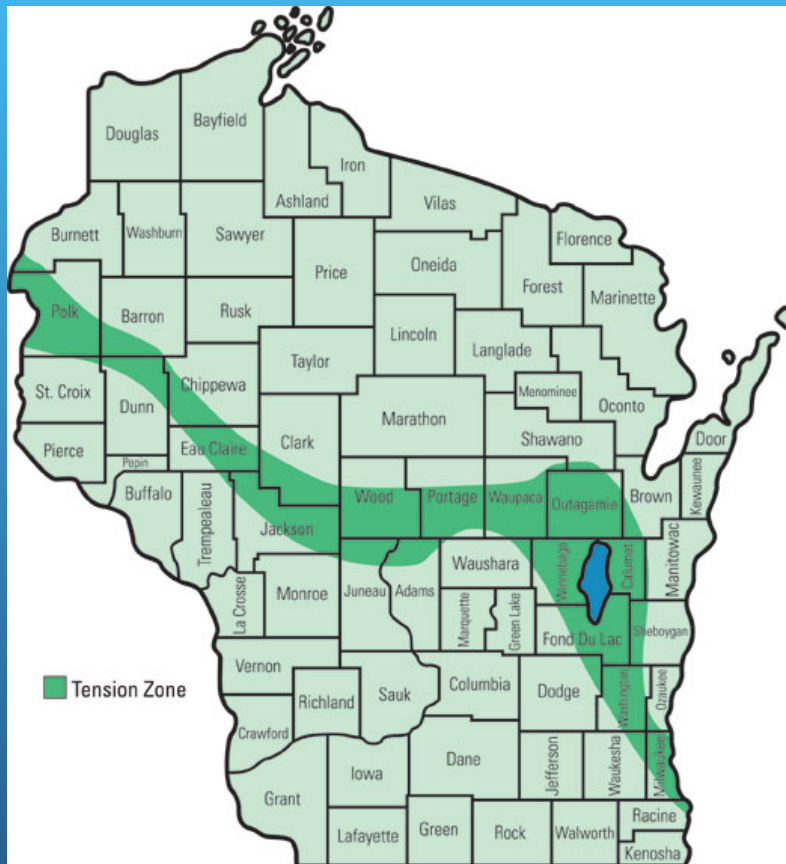
- Sulman et al (2009)

Declining Lake Levels



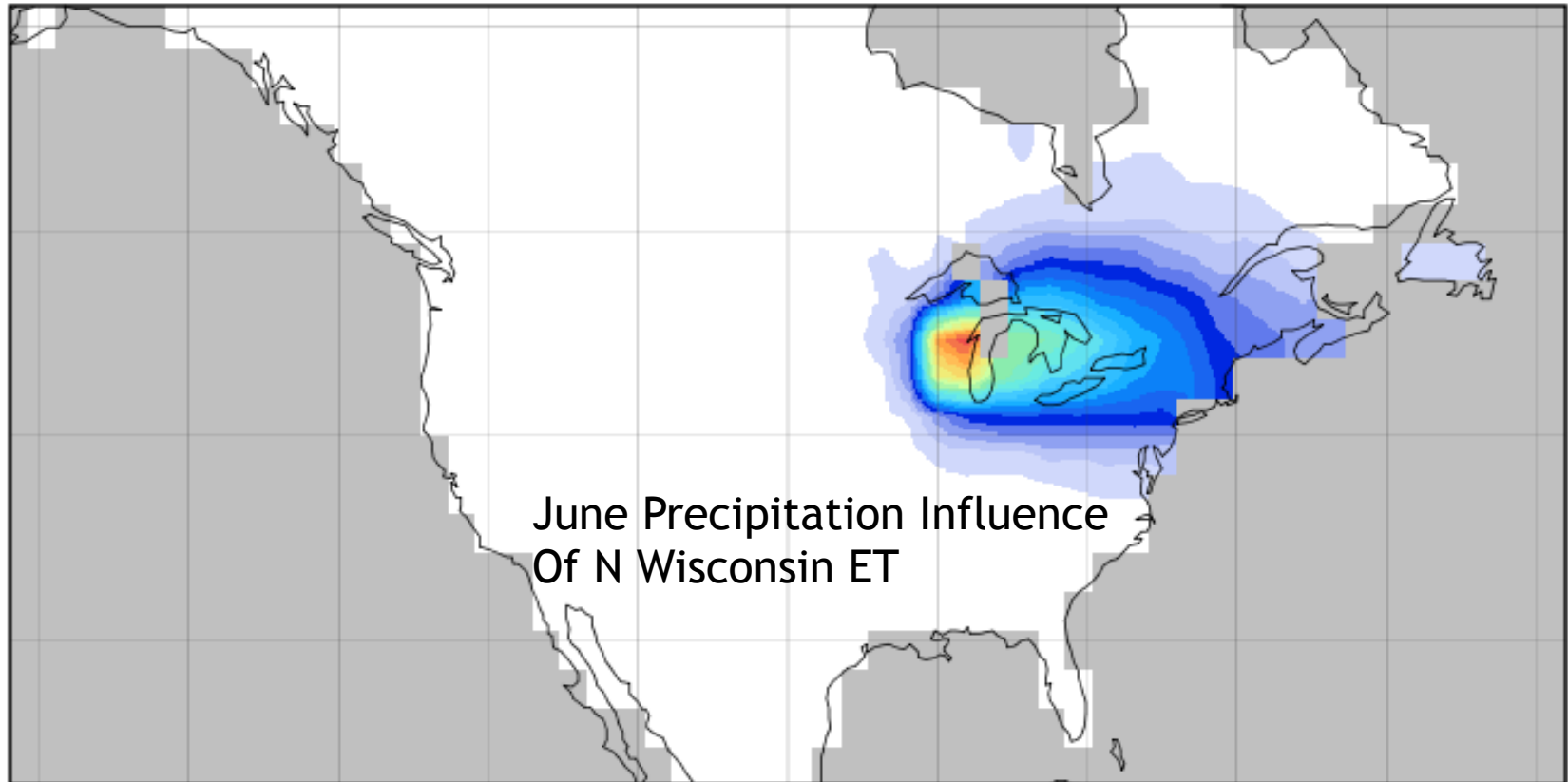
- Stow et al (2008)

A Shift in the Tension Zone?



Increases in ET and decreases in precipitation drove declines in lake levels and water table in Northern Wisconsin

A Regional Change!



Source: J. Bagley and P. Dirmeyer

Thanks!

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<http://flux.aos.wisc.edu>

