Wisconsin's Changing Climate and CNRED's Role Supporting Community Adaptation

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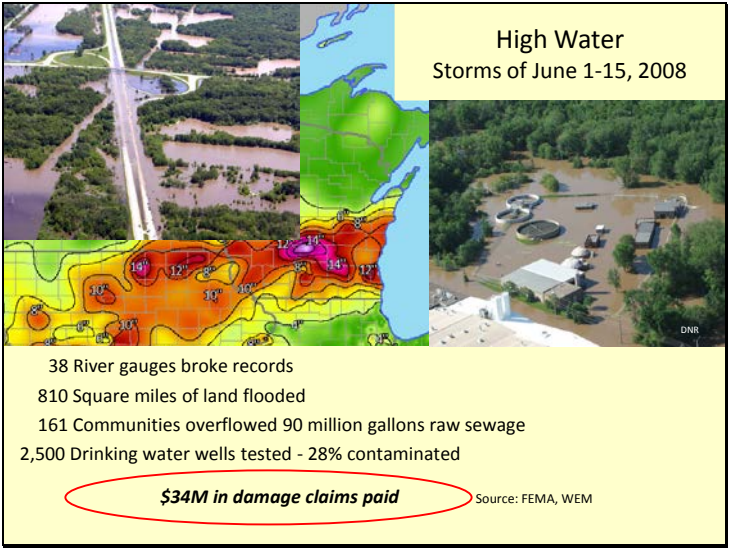
Why we need to think about climate change

- Climate and weather are fundamental influences on prosperity
- Climate-based impacts have and will continue to occur
- Community attitudes about climate change affect decision making
- Extension's evidence-based educational model and reputation are a source of information in the community

While it's unlikely that many communities will be concerned with long term climate change, all of them are concerned about the effects of extreme weather on public safety. Choices about investing in improved public safety need to include a discussion about forward trends in temperature and precipitation and how these influence risk from extreme weather.



An example of regional extreme weather impact that could have occurred anywhere in the state.

- 12” to 15” of rainfall over seven days .
- I39/I90-94 closed for three days due to flooding.
- Reedsburg wastewater plant 110 year flood dike submerged. $800k damage, SSO to Baraboo River (FEMA reimbursed).

Climate Change Communication Challenges

"Climate change? What climate change?"

The historical record can be convincing…
But climate projections may not persuade

"How hot? When?"

Long projected dates vs. Short planning horizons

"Between 4" and 9" of rainfall?"

Model uncertainty, Climate variability

"OK, so what do we do now?"

Climate adaptation strategies are needed

- Discussions of trends in temperature and precipitation raise, and will continue to raise, reasonable questions for which there is no certain answer.
- Many other local decisions are made using uncertain projections, so this should not be an insurmountable obstacle to considering climate.
- An effective approach is to acknowledge uncertainty, and focus on risk and vulnerability under a range of scenarios.

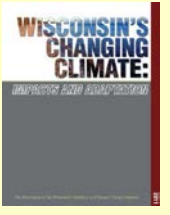
Scientific consensus on climate change

"There is a strong, credible body of evidence, based on multiple lines of research, documenting that climate is changing, and that these changes are in large part caused by human activities."

— US National Research Council, 2010

Wisconsin Initiative on Climate Change Impacts

- Understanding ways we can adapt to the consequences of climate change.

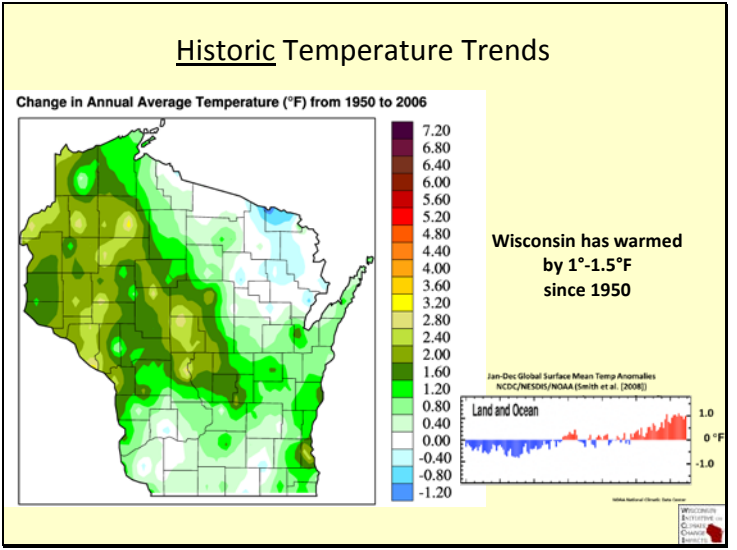


www.wicci.wisc.edu

- The reality of climate change need not be debated. Scientific consensus on the main trends (hotter and wetter) provides adequate credibility.
- Wisconsin's approach to evaluating risk from future climate engaged over 200 academic, government and private scientists and engineers to collaborate on the 1st WICCI Assessment report. (available on the WICCI website)

Sources:

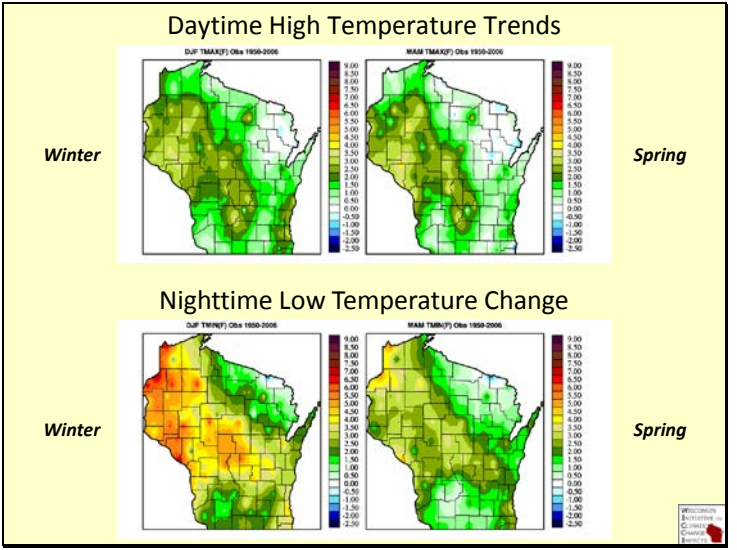
National Research Council. *Advancing the Science of Climate Change* . Washington, DC: The National Academies Press, 2010; http://www.nap.edu/catalog.php?record_id=12782
http://www.wicci.wisc.edu
http://www.wicci.wisc.edu/publications.php



- Kucharik analysis of 176 NWS Co-Op weather station data shows trends in Wisconsin's climate.
- This figure averages diurnal and seasonal temperature.
- Note the spatial variability.
- Compare magnitude to global temperature anomaly.

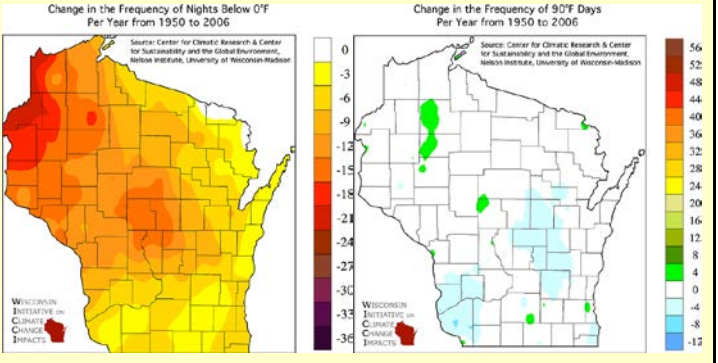
Source:

Kucharik, C.J., et al, *Patterns Of Climate Change Across Wisconsin From 1950 To 2006,* Physical Geography, 31 (1) pg. 1–28, 2010, DOI: 10.2747/0272-3646.31.1.1



- Temperature increases are seasonal.
- Warmer winter nights are responsible for overall average increase.
- Summer and autumn show little change and are not depicted.

Temperature Extremes

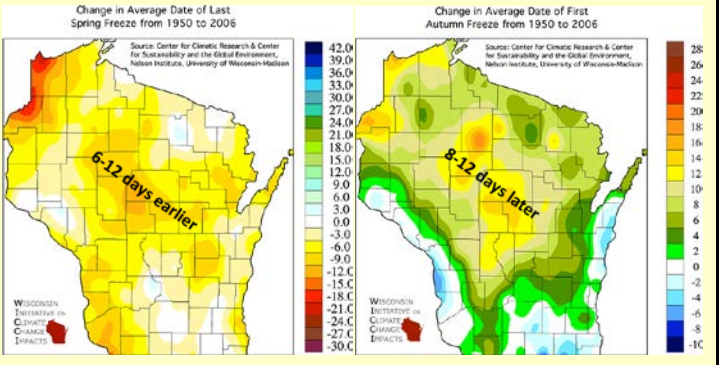


Sub-zero nights: much less frequent

Very hot days: little change

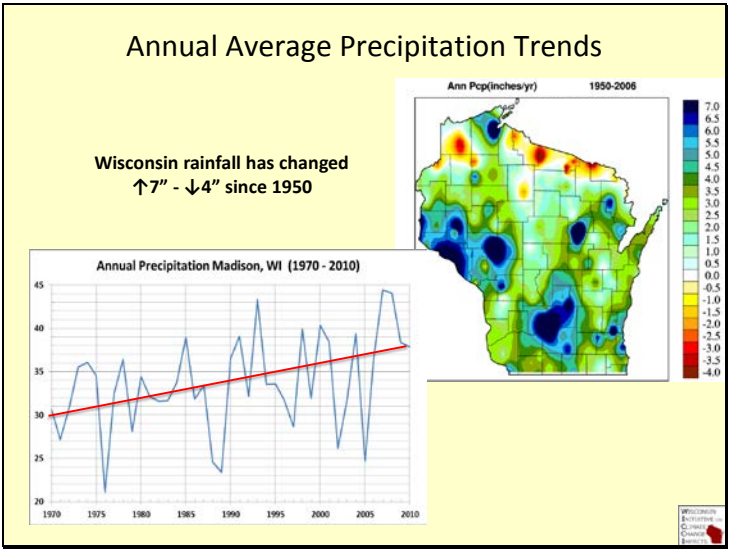
- Trends for extreme temperatures are consistent with the previous slides.
- “Wisconsin isn’t getting warmer, it’s getting less cold” – CK.

Dates of Spring and Fall Freeze



Wisconsin growing season lengthened by 1-4 weeks since 1950

- Warmer winter means a longer growing season for most of state.



- Precipitation trends have been more spatially variable (note drying areas).
- Madison data indicates a wet trend.

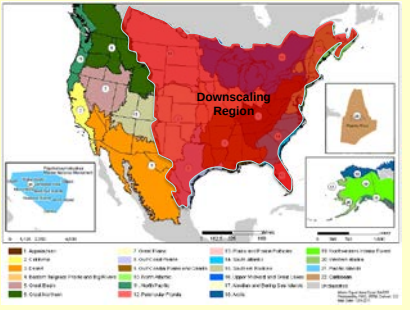
Source:
http://www.aos.wisc.edu/~sco/clim-history/stations/msn/msn-pcpn.html

WICCI Climate Assessments and Projections

UW-Center for Climatic Research (CCR)

Objective:

Statistically downscale global climate model simulations across the east and central Landscape Conservation Cooperatives (LCCs), to scales that are relevant for decision makers (~10 km).



- A statistical method was used to reduce thirteen global models to a useful (regional) scale.
- This is the best science available.
- CCR/WICCI research funded by Land Conservation Cooperatives (US Dept. of the Interior). (Western US not modeled due to complicating effect of Rocky Mountains.)

Summary of Wisconsin's likely future climate

- Warmer winter and nighttime temperatures
- Frequent hot summer days, heat waves and dry periods
- Increased frequency and intensity of precipitation
- More rainfall during winter and spring

Short term variability (weather) and extreme events cannot be projected

- The results of the WICCI modelling show the probability of future climate (they do not predict future conditions).
- This means the data are suitable for scenarios used to identify risk and vulnerability.

Comparing: Late 20th to mid-21st

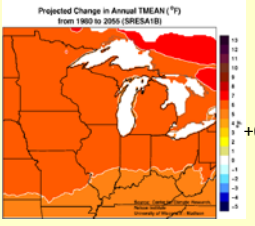
How far do we need to look ahead?

Planning Horizons

- Local budgets 1-2 years
- Staffing levels 3-5 years
- Buildings 25-50 years
- Water, Sewers, etc. >50 years

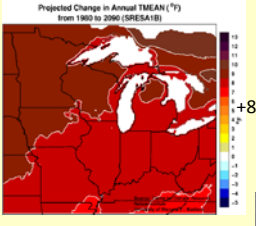
Today's climate is what drives most decisions

35 years



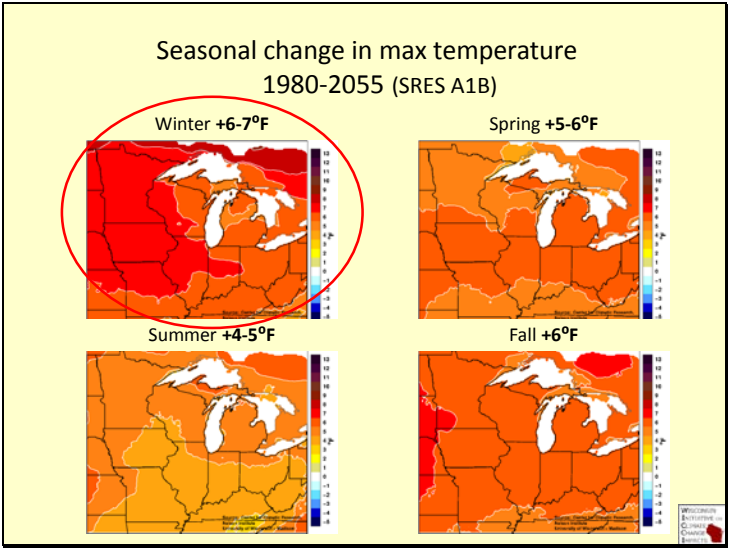
+6 °F

85 years



+8-9 °F

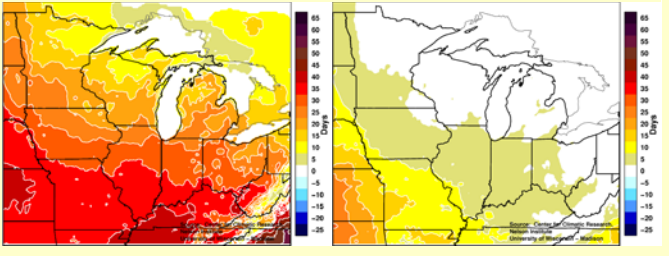
- Discussion of climate change must be relevant to the time scale of decision makers.
- Change in annual mean temperature for mid and late 21st century for A1B emission scenario.
- WICCI uses mid-21st century projections to inform long range planning.



- Variability in seasonal average maximum daily temperature indicates more warming during winter.
- Risks include: more frequent icing conditions, fewer days of winter recreation

Projected change in annual peak temperatures
1980-2055 (SRES A1B)

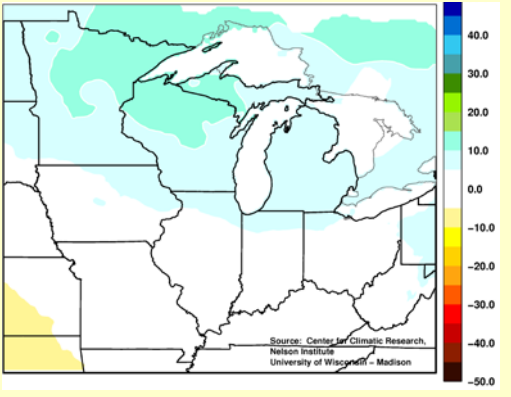
+10-25 days >90°F **+0-5 days >100°F**



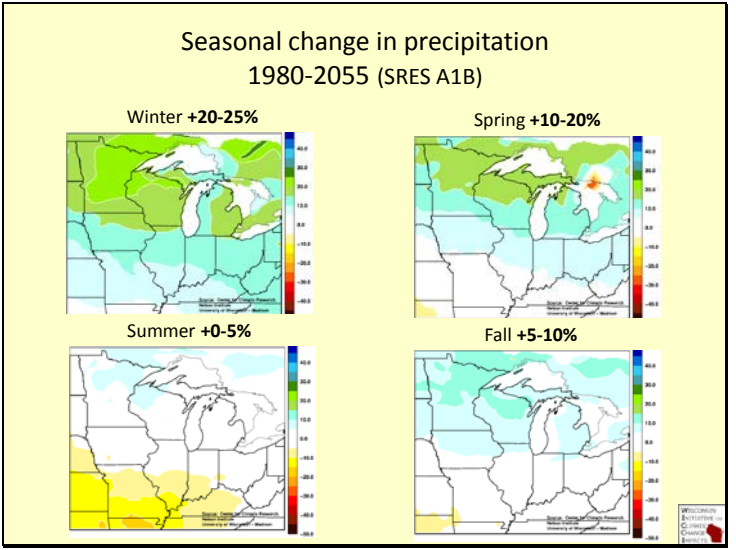
- Projected increase in number of hot days means greater risk of heat waves (number one cause of fatalities from natural disasters in WI) .

Projected change in annual precipitation

+5-15% 1980-2055 (SRES A1B)



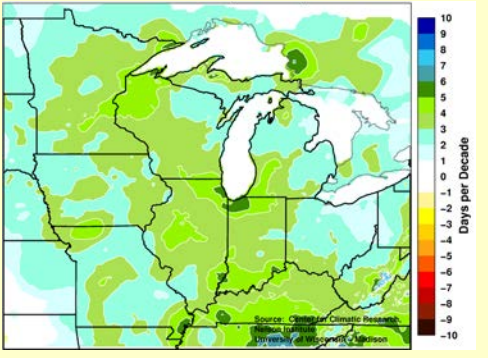
- Upper Midwest projected to become generally wetter



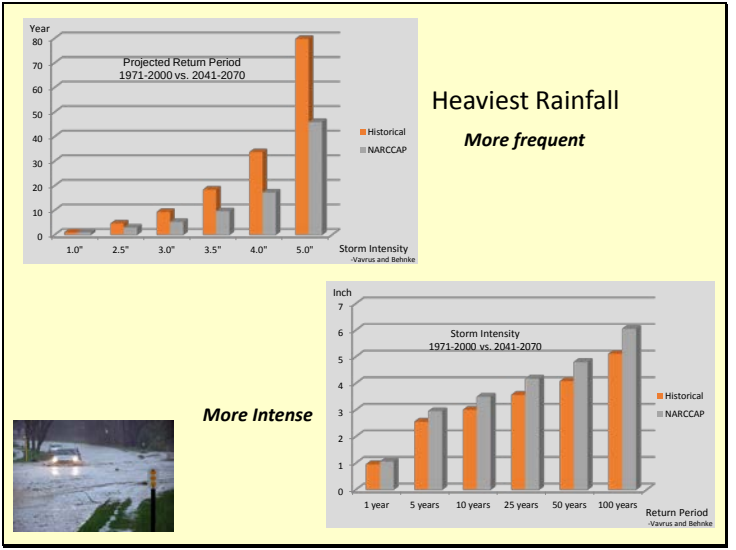
- Most of the increase projected for fall-winter-spring.
- This suggests: more winter precipitation, while summers will be drier (and hotter).

Projected change in > 2” rain

2-5/10yr 1980-2055 (SRES A1B)



- Heavier rainfall is projected to occur more frequently.

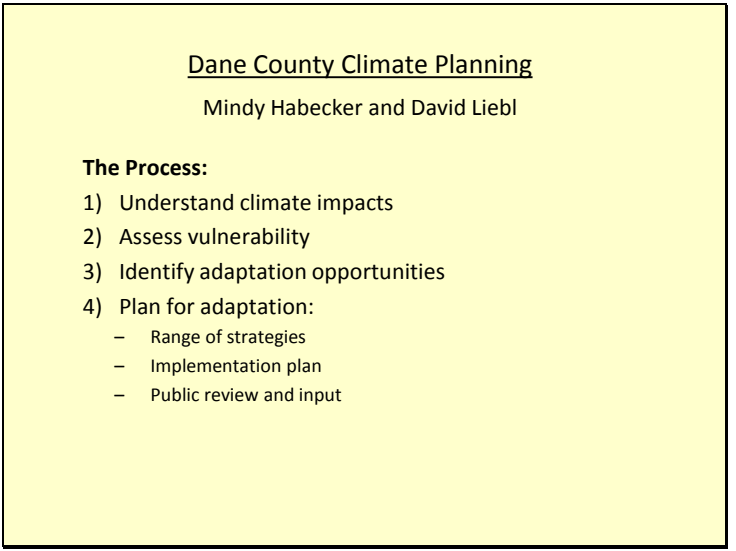


- Attempts to project extreme rainfall indicate that the same trend applies.

Source:

Vavrus, Steve; R. Behnke, *A Comparison of Projected Future Precipitation in Wisconsin using Global and Downscaled Climate Model Simulations: Implications for Public Health*, (in review)

Diffenbaugh, Noah S., et al, *Robust increase in severe thunderstorm environments in response to greenhouse forcing*, http://www.pnas.org/cgi/doi/10.1073/pnas.1307758110



- A pilot project in Dane County was used to develop the approach to including climate in local government planning.

1) Extension provided an orientation to the WICCI data, and scenarios of future climate conditions.

2) Extension facilitated the vulnerability assessment process.

3) County staff identified adaptation opportunities, and implementation strategies

4) Extension organized the results and teamed with the County Executive to engage local communities.

Dane County Climate Change Action Council

- Administration (Facilities Management and Risk Management)
- County Executive's Office
- Dane County Regional Airport
- Emergency Management
- Human Services
- Land and Water Resources
- Planning and Development
- Public Health Madison/Dane County
- Public Works
- Sheriff
- Zoo

- Effort was under the directive of the County Executive
- Council members were county department heads
- Note that Dane County UW-Extension was not included.

Dane County Vulnerability Assessment

Example results

Rainfall:

- Floodplain, surface and facility flooding
- Stormwater BMPs washed out or ineffective
- Hazardous materials in floodways
- Inadequate emergency response capacity
- Septic system overflows and well contamination

Temperature:

- Heat wave risk to vulnerable people
- Increasing facility air conditioning costs
- Longer warm weather recreational season
- Heat stress on employees working outdoors
- High temperature buckling of roadways

- County staff identified sixty four specific impacts from scenarios with increased temperature and precipitation

Dane County Vulnerability Assessment
Example adaptation strategies

Rainfall:

- Identify heat-vulnerable individuals and provide cooling shelters
- Improved mosquito control
- Identify wells susceptible to flooding and contamination
- Improved coordination among emergency response providers

Temperature:

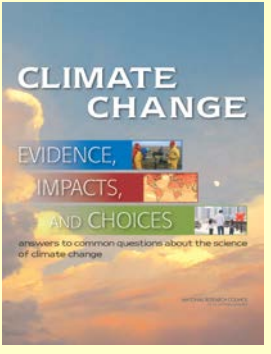
- More energy efficient building design and operation
- Staff training to prevent heat stress
- Flooding quick response capacity (e.g. sandbags)
- Extreme weather-ready emergency and police vehicles

What CNRED Can Do

- Understand the science of climate change
- Identify the relevant local decision makers
- Discuss issue of risk and vulnerability
- Include climate trend projections in planning
- Support local capacity building

- Every community will have different attitudes, needs and expectations
- Extension can improve the quality of local planning, without engaging in the climate change debate
- We have not mentioned carbon mitigation because the CNRED sustainability team has developed guidance on energy efficiency

Other resources:



https://fyi.uwex.edu/climate/

Sources:

- http://www.cpo.noaa.gov/education/pdfs/ClimateLiteracyPoster-8_5x11_Final4-11.pdf
- http://nas-sites.org/americasclimatechoices/files/2012/06/19014_cvtx_R1.pdf