Understanding Climate Change in Wisconsin

Midwest Deer & Wild Turkey Study Group
Lake Delton  9/9/15

David S. Liebl
Wisconsin Initiative on Climate Change Impacts

_Understanding ways we can adapt to the consequences of climate change_

- Create regionally relevant climate history and climate projections;
- Assess climate change impacts on specific Wisconsin natural resources, ecosystems;
- Evaluate potential climate vulnerabilities of industry, agriculture, tourism, and other human activities;
- Identify climate adaptation strategies;
- Facilitate climate outreach and learning.

www.wicci.wisc.edu
Looking back to look forward
Understanding historic climate

We’ve been measuring temperature and rainfall since the 1800’s
Wisconsin has warmed by 1°-1.5°F since 1950.
Daytime High Temperature Change

Winter

Nighttime Low Temperature Change

Spring
Wisconsin growing season lengthened by 1-4 weeks since 1950.
# Earlier Arrival of Spring in Wisconsin

<table>
<thead>
<tr>
<th>Bird migration</th>
<th>Vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geese Arrival:</td>
<td><em>Baptista</em> bloom:</td>
</tr>
<tr>
<td>29 days earlier</td>
<td>18 days earlier</td>
</tr>
<tr>
<td>Cardinal first song:</td>
<td>Butterfly weed bloom:</td>
</tr>
<tr>
<td>22 days earlier</td>
<td>18 days earlier</td>
</tr>
<tr>
<td>Robin arrival:</td>
<td>Marsh milkweed bloom:</td>
</tr>
<tr>
<td>9 days earlier</td>
<td>13 days earlier</td>
</tr>
</tbody>
</table>

55 ecological indicators of spring occurred on average 1.2 days earlier per decade from 1936 to 1998.
Objective: To statistically downscale global climate model simulations to scales relevant for decision makers (around 10 km resolution)
Projected Change in Mean Annual Temperature

$+6^\circ F$ 1980-2055 (SRES A1B)

Source: Center for Climatic Research, Nelson Institute, University of Wisconsin – Madison
Seasonal Change in Max Temperature
1980-2055 (SRES A1B)

Winter +6-7°F

Spring +5-6°F

Summer +4-5°F

Fall +6°F
Seasonal Change in Precipitation
1980-2055 (SRES A1B)

Winter +20-25%

Summer +0-5%

Spring +10-20%

Fall +5-10%
Projected Winter Precipitation
1980 to 2055

Precipitation as snow reduced by 20% by mid-century
= 30% decrease in midwinter snow depth
= increased winter rainfall

Notaro et al. 2010
Summary of Wisconsin’s Projected Climate

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

*Short term variability (weather) and extreme events cannot be projected*
Wisconsin’s Tension Zone is projected to move north due to a warming climate. As a result, many northern plant and animal species could be severely impacted while more southern species could benefit.
Ecological Landscape Impacts

• Oak savannas may persist
  – Already intensively managed
  – Climate changes that favor prairie conditions may help maintain or increase these habitats

• Red pine vulnerability
  – Extended summer droughts in central sands could exacerbate pocket decline & other pathogens

• Red maple invasion
  – Lowlands in the central sand hills may be invaded by red maple which is well adapted to warmer conditions
Changing Character of Forests

White Birch

Southern range limits
- Current (FIA data)
- 2100 Predicted (based on avg of 5 GCMs)

Adapted from Prasad, A. M. and L. R. Iverson. 1999-ongoing.
http://www.fs.fed.us/ne/delaware/atlas/index.html
Loss of Sugar Maple Industry

Current

Low Emissions (2100)

High Emissions (2100)

Figures courtesy of Climate Change Atlas Lab

Maria Janowiak - NIACS
A disconnect for photoperiod and temperature dependent interactions
Brook Trout Fishery at Risk

John Lyons, Matt Mitro, Wisconsin DNR
Brook Trout Adaptation Strategies

- Use predictive models to better allocate resources
- Monitor temperature and fish
- Stream Bank Restoration
Changing Character of Winter and Wildlife


Year

Winter Severity Index

Very Severe
Severe
Moderate
Mild


Fawns Per Doe

r = -0.57

y = -0.0015x + 0.907

R² = 0.3297

y = -0.0015x + 0.907
Decline in Snow Cover Extent

Month of max snow cover has shifted from Feb. to Jan.
Accelerating spring melt by almost two weeks
1970 to 2010, rate of decrease in snow cover was 7 - 11%
In northern WI, snow depth is projected to decrease 50% by mid-21st century.

Modification of existing management and conservation programs
Can Camouflage Keep Up with Climate Change?

Nowhere to run
Nowhere to hide
Adaptation Strategies
Conserve & Connect Habitat

Land Acquisition Strategy

Principle:
Adapt to changing circumstances.

Objective:
Protect & restore lands to facilitate species’ adaptation to shifting land use & climate impacts.
Adaptation Strategies
Manage Species and Habitats

Property
Master Planning

Cast your ideas into...
Planning the use and management of Department of Natural Resources' properties along Driftless Area Streams

- Enjoy fishing for trout or smallmouth bass?
- Live in, or like to visit, the Driftless Area?
- Interested in the future of DNR fishery lands?

If so, then the DNR wants your input and ideas!
**Adaptation Strategies**
Increase Knowledge and Information

- **Business Adaptation:**
  - Production, harvest, transport practices
  - Technological developments
  - Financial management
  - Government programs & insurance

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**Impacts of Changing Winter Weather on Wisconsin Forestry**

![Image of a tractor loading logs in winter weather]
Wildlife: Winners and Losers

**Winners**

- Short generation times
- Wide distributions
- Move easily across landscape
- General habitat requirements
- Not sensitive to human activity

**Losers**

- Long generation times
- Narrow distributions
- Poor dispersal ability
- Special habitat requirements
- Sensitive to human activity
WICCI 1st Adaptive Assessment Report

**Changes:**
- Climate Trends in Wisconsin
- Understanding Adaptation

**Impacts:**
- Water Resources
- Natural Habitat and Biodiversity
- Agriculture and the Soil Resource
- Coastal Resources
- People and their Environment

**Actions:**
- Implementing Adaptation
- Moving Forward

**WICCI Wildlife Working Group Report**