

# *Adaptation and Forest Conservation*



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[www.forestadaptation.org](http://www.forestadaptation.org)



# Northern Institute of Applied Climate Science



Climate

Carbon



ncasi



**Michigan  
Technological  
University**



College of Food, Agricultural  
and Natural Resource Sciences  
**UNIVERSITY OF MINNESOTA**



# Why should I care?



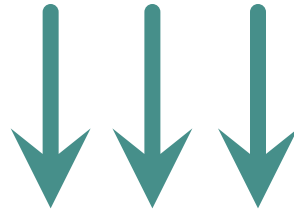
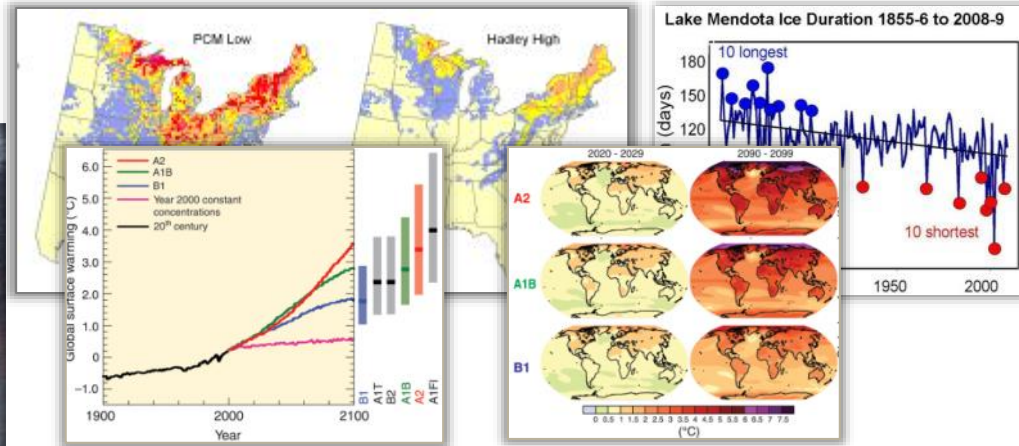
# Adaptation

Adaptation = taking action to prepare forests for climate change.

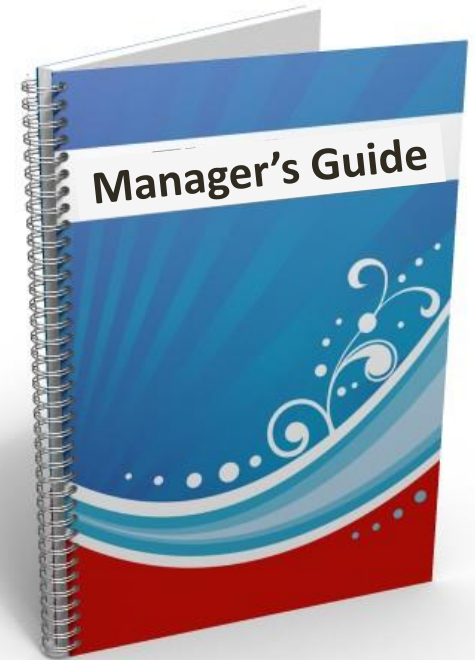
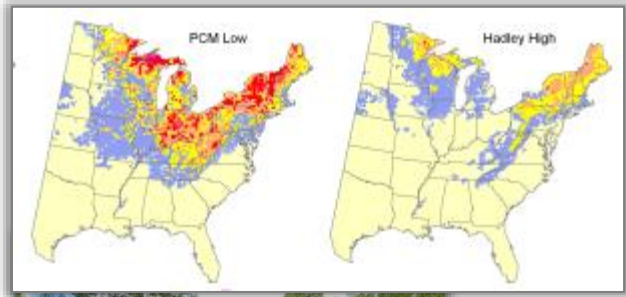


Adaptation activities can build on sustainable management, conservation, and restoration of forests

# When we started...



# ...so we thought we'd...



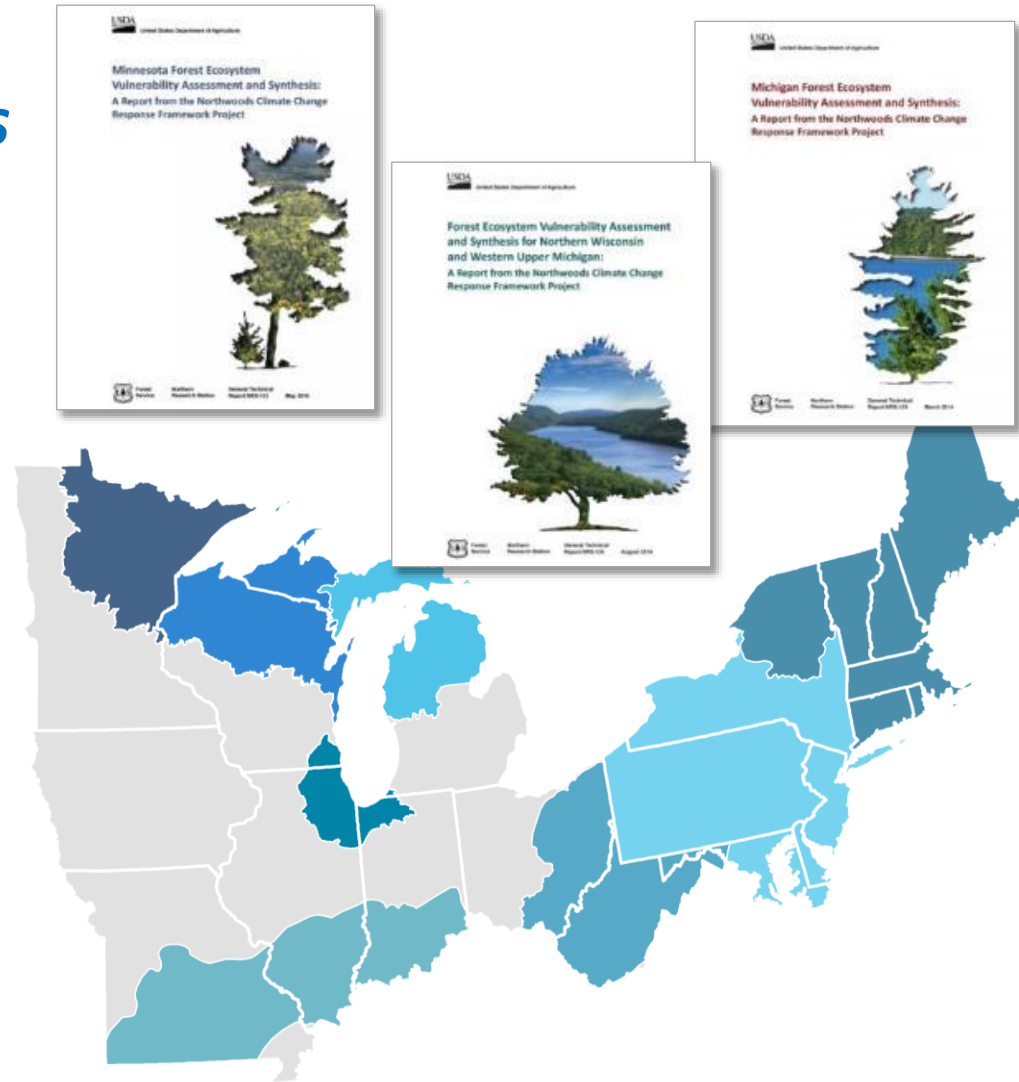
# Then we listened.



# We developed resources

## *Place-based, transparent Vulnerability Assessments*

- Examine a **range** of future climates
- **Do not make recommendations**
- Sources of information:
  - Models
  - Published research
  - Local managers and experts



# We developed resources

## *Web-based, national resource for land managers*

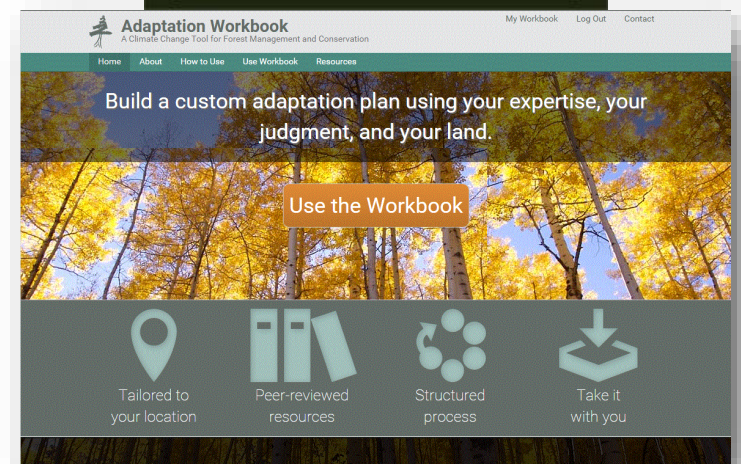
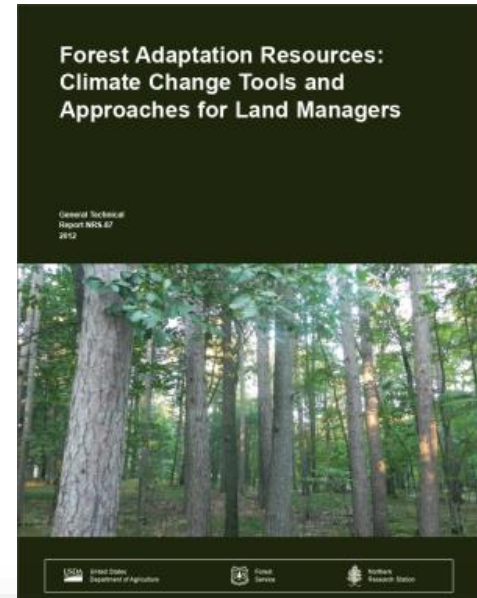
- Connects land managers with **useable science** to address climate change in **planning** and **application**
- Forest Service effort



# ...and a process to use them.

## *A flexible workbook and menu to address diverse needs*

- Designed for a variety of land owners with diverse goals
- Does not make recommendations
- Menu of adaptation strategies for forest management
- New online version!



...and a process to use them.



# Real-world examples

*Case studies to help the whole community learn*



## Climate Change Response Framework

Home Our Approach Projects Demos Products Partners Resources Contact

● Start-Up ● Planning ● Action ● Complete

Central Appalachians

Central Hardwoods

Mid-Atlantic

New England

Northwoods

Urban

**Demonstration Projects**

Demonstration projects are real-world examples of how managers have integrated climate considerations into forest management planning and activities. These projects use the partnerships and resources developed through the Framework to test new ideas and actions for responding to changing conditions. Demonstrations come in all shapes and sizes, showing a variety of adaptation actions that also achieve forest management goals.

Project:  State:  Landowner Type:  Status:

**Stockbridge-Munsee Band of Mohican Indians**

The Stockbridge-Munsee Band of Mohican Indians, located in east-central Wisconsin, manages over 20,000 acres of forestland. Tribal forestry staff members recently attended a Forest Adaptation...

[Read more](#)

News & Events

[Training Opportunities](#)

[Forest Adaptation Planning & Practices](#)

# Adaptation Rules of Thumb

- Accept uncertainty and manage it
- Focus on your top priorities
- Take “win-win” opportunities
- Adaptation will be custom-built every time

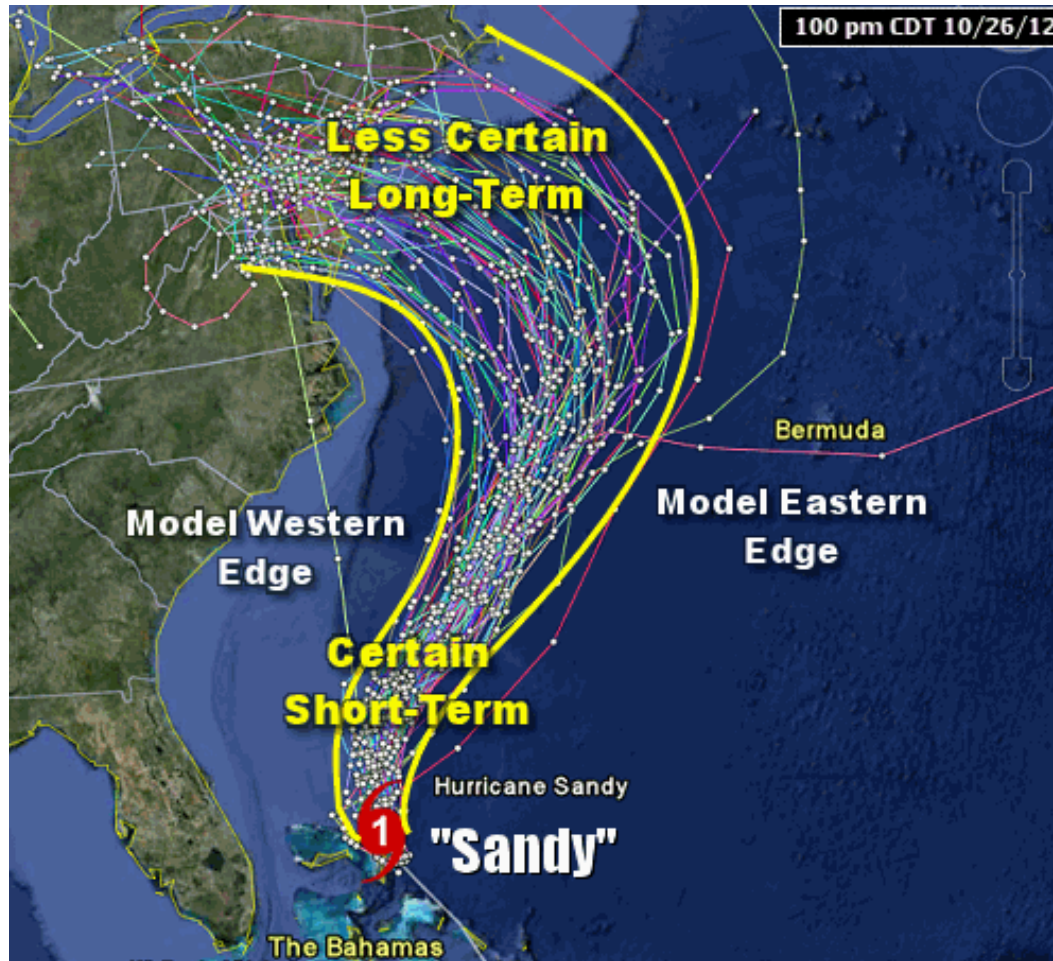
# An Uncertain Future

- Don't wait for a crystal ball



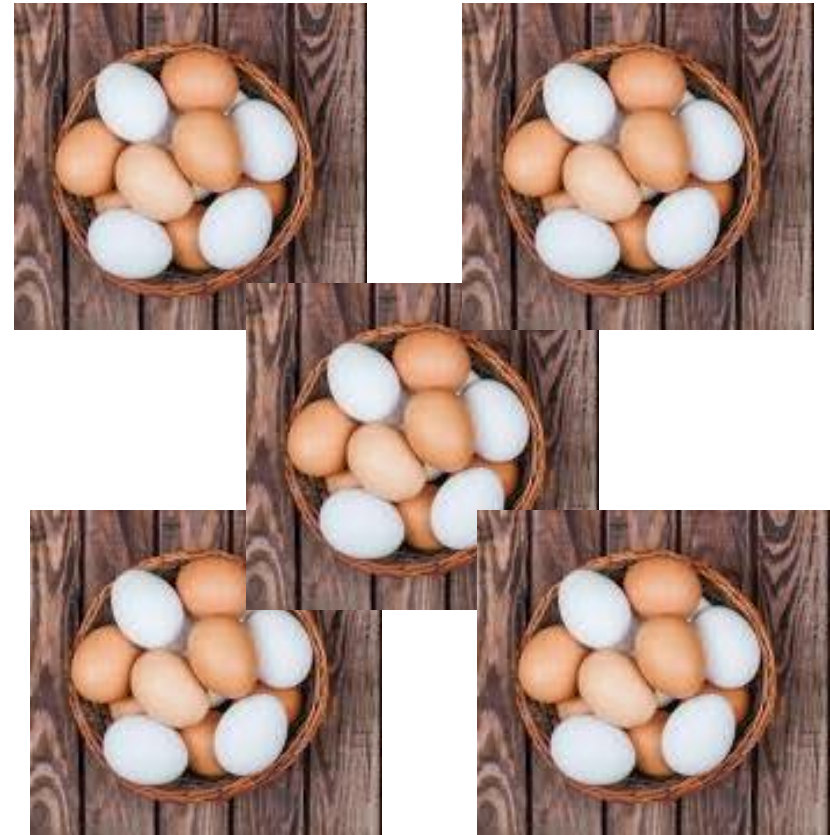
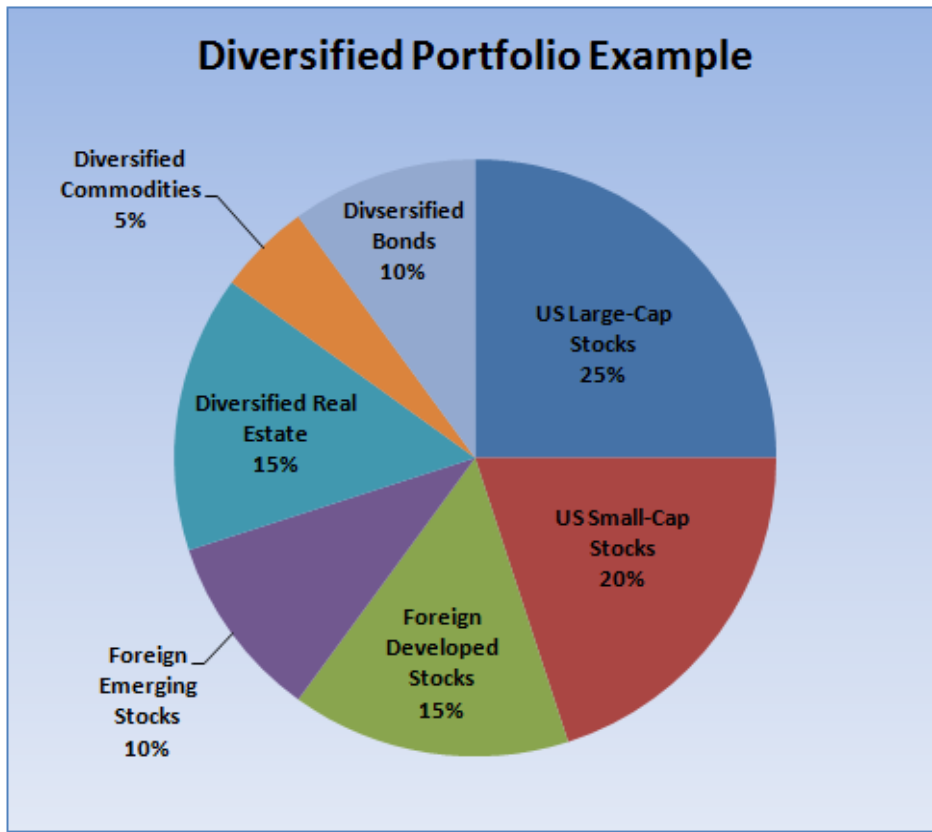
# We Don't Need Certainty

- Instead: think about risk management!

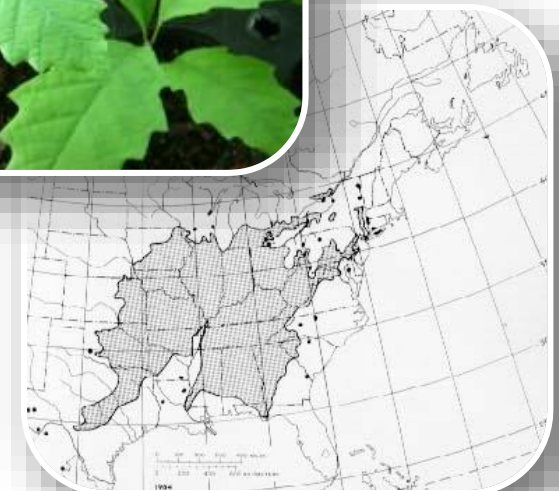


# Diversity as a Hedge

- You're already used to doing this



# Menominee Oak Wilt Restoration



# Adaptation Rules of Thumb

- Accept uncertainty and manage it
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- Take “win-win” opportunities
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# Focus on Your Top Priorities



# Focus on Your Top Priorities

- You can't always get what you want





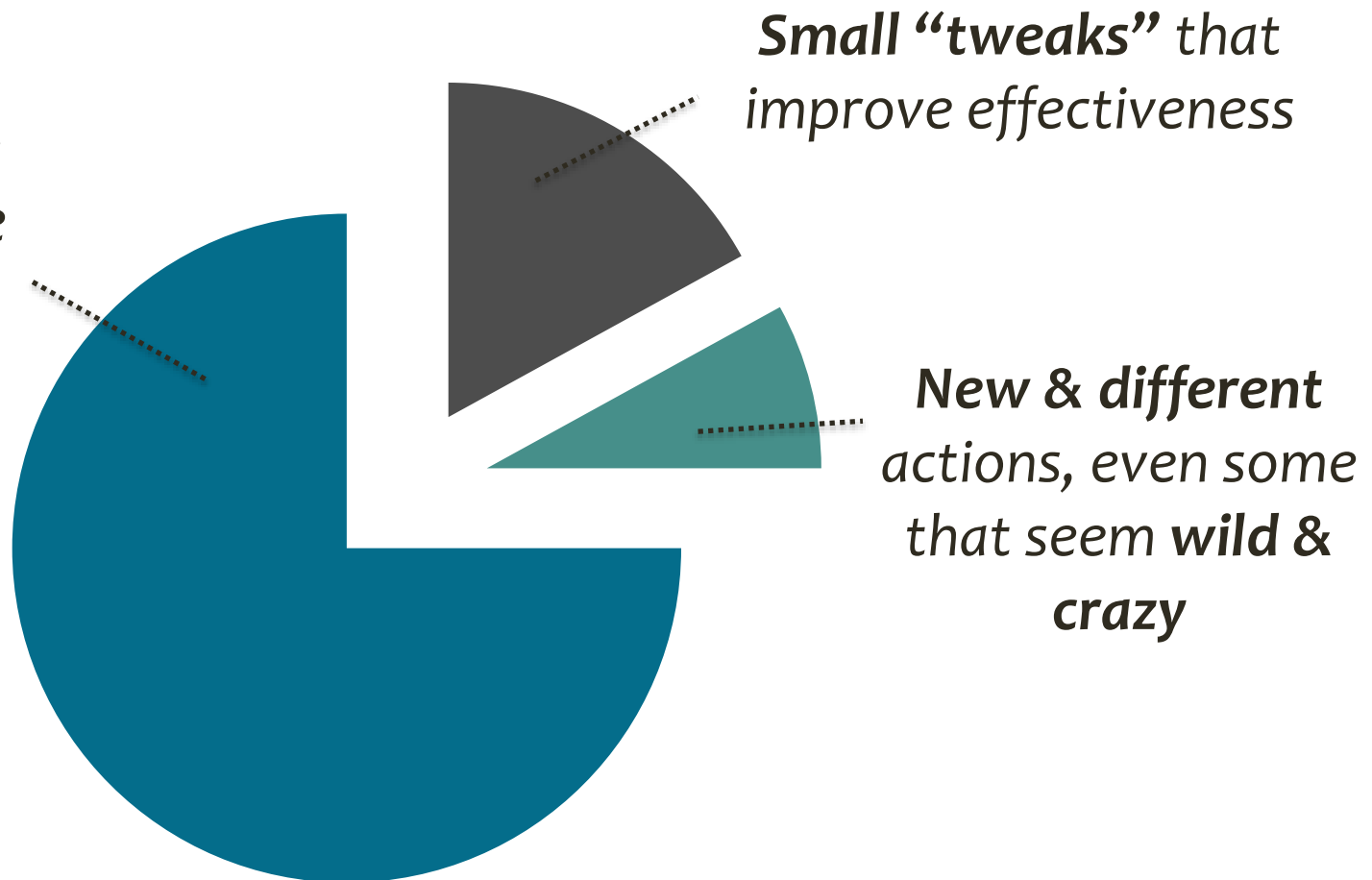
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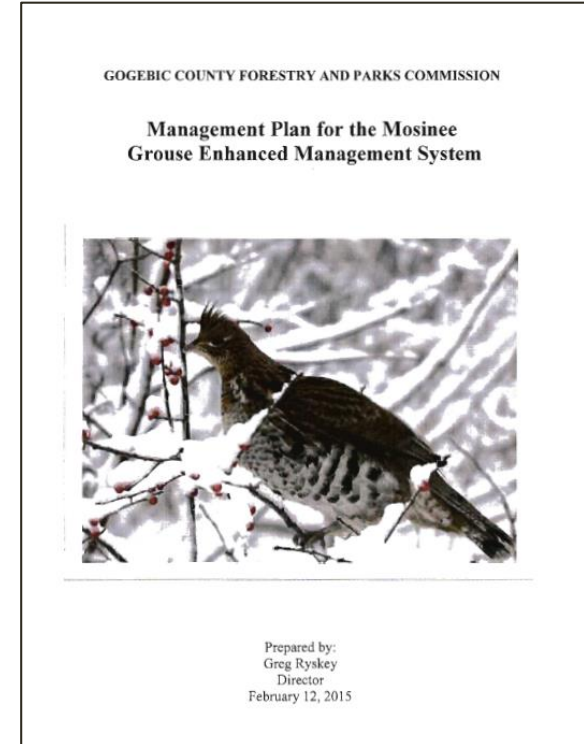
# Adaptation

Adaptation actions may not look that different from current management actions, especially in the near term.

**Same actions—**  
climate change  
just makes  
them that  
much more  
important



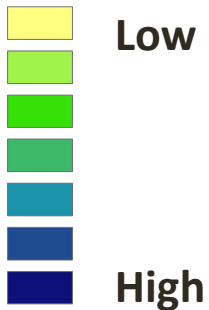
# Gogebic County: Mosinee GEMS



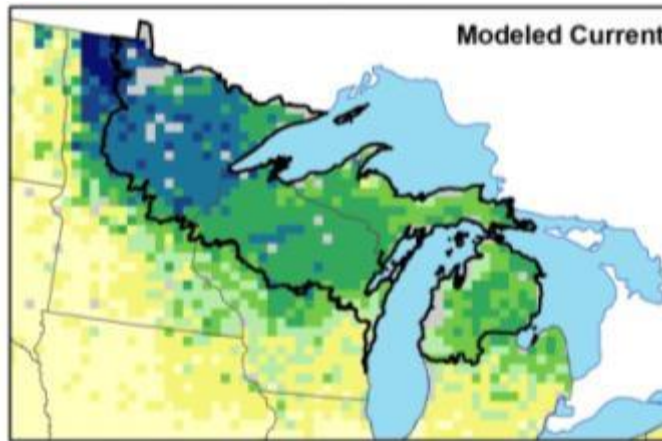
# Species Habitat Shifts

## Quaking Aspen

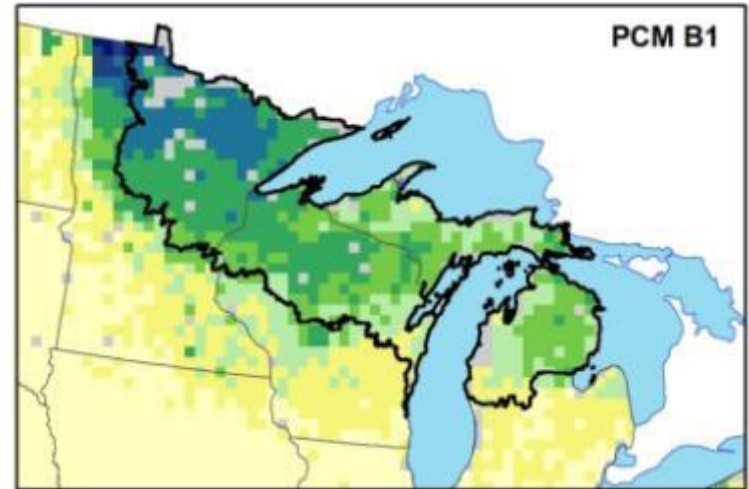
Importance  
Value



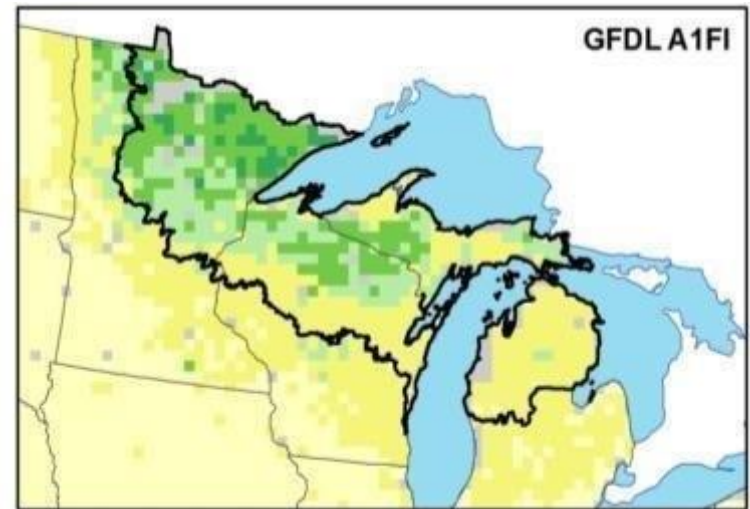
Current



2070-2100 Low



2070-2100 High



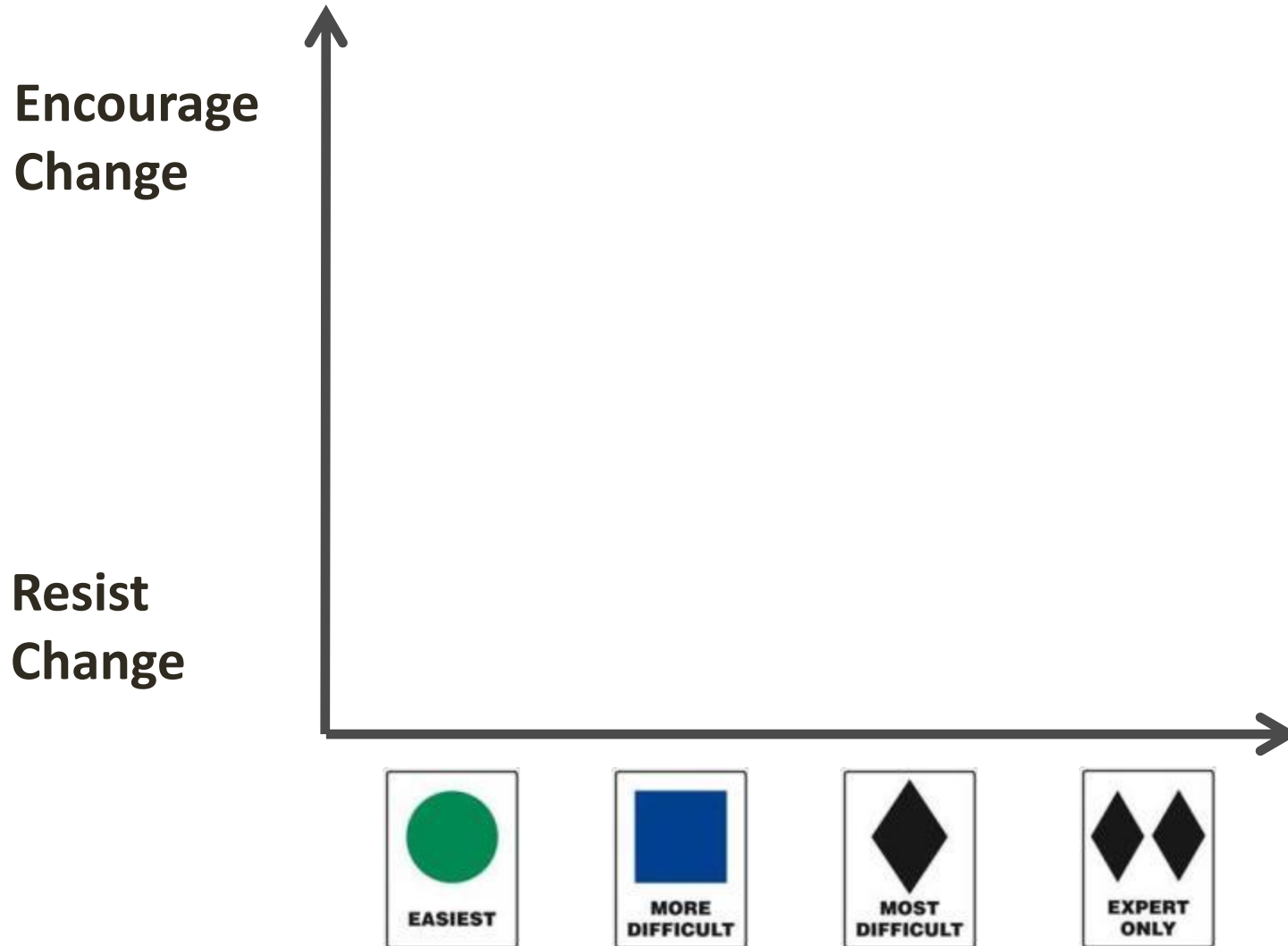
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# Adaptation Rules of Thumb

- Accept uncertainty and manage it
- Focus on your top priorities
- Take “win-win” opportunities
- **Adaptation will be custom-built every time**

# A Customized Approach





# How can NIACS help?

# Hands-on workshops!

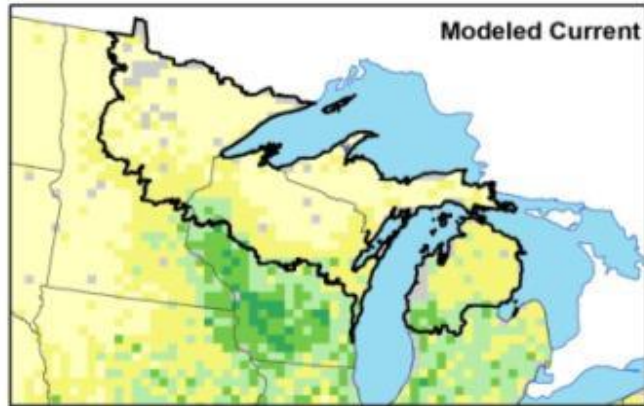
## *Forest Adaptation Planning and Practices*

- Bring your own project
- Use the Adaptation Workbook
- Leave with a custom-built adaptation plan

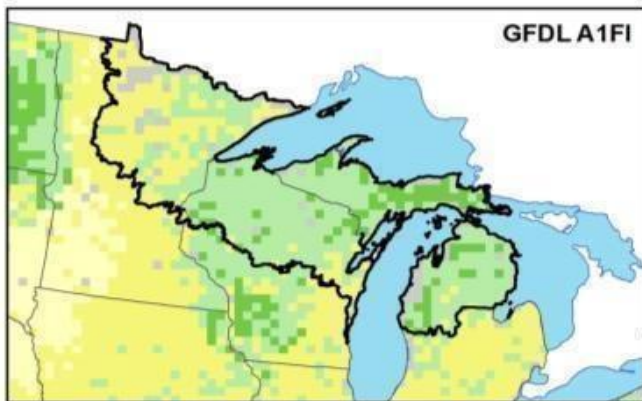


# Education and training!

Current

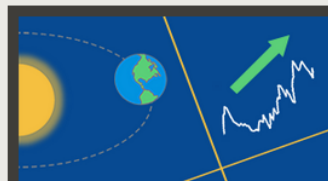


2070-2100 High



## Climate Change Education

### Education Modules



#### Climate Change Science and Modeling

An overview of the climate system, greenhouse gases, climate models, current climate impacts, and future projections.

[Read More >](#)




#### Climate Change Effects on Forests and Grasslands

An overview of current and projected climate effects on water resources, vegetation, wildlife, and disturbances, specifically geared towards forest and grassland ecosystems.

[Read More >](#)

# And more...



**Mitigwaki idash Nibi:**  
(Our Forests and Water)  
*A Climate Adaptation Plan for the Red Lake Band of Chippewa Indians*

*Jerilyn Jourdain*  
Environmental Specialist/  
Climate Change Coordinator

Red Lake Department of  
Natural Resources



**SNOWSHOE HARE VULNERABILITY ASSESSMENT**  
**EASTERN UPPER PENINSULA, MICHIGAN**

Inland Fish and Wildlife Department – Sault Ste. Marie Tribe of Chippewa Indians  
Applied Forest and Wildlife Ecology Lab – Michigan State University  
Funded by the United States Bureau of Indian Affairs – Tribal Climate Change Program



# Thank You!

Get in touch with questions:

[sdhandler@fs.fed.us](mailto:sdhandler@fs.fed.us), (906) 482-6303

Learn more: [www.forestadaptation.org](http://www.forestadaptation.org)

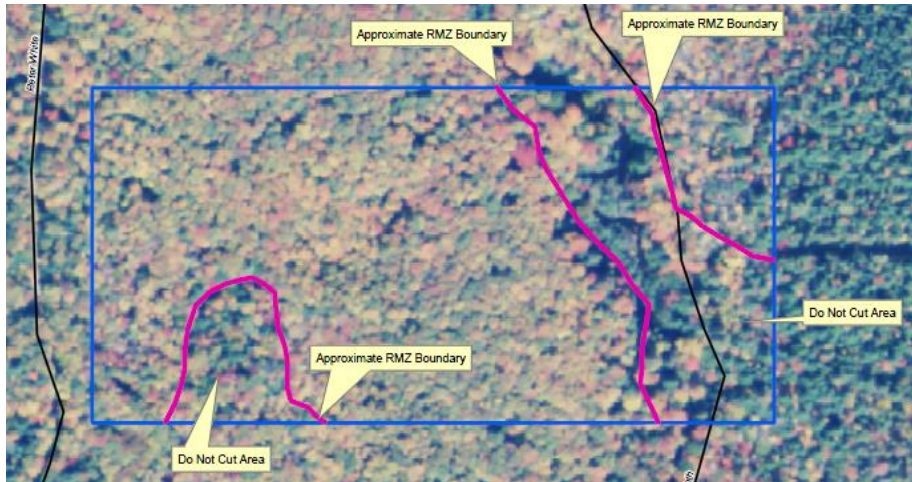


# Private landowner: Matt Watkeys



Step 1. DEFINE area of interest, management goals and objectives, and time frames.

Area of Interest: Watkeys Parcel, 20 Acres, Deer Trail, MI, owned privately, Bought 2015			
Location: N1/2 S21/4 E1/4 Sec 22 + 47 + 2720			
Forest Type(s)	Management Goals	Management Objectives	Time Frames
Northern Hardwoods - Maple, Beech	• Promote high-quality softwood • Increase diversity • Implement GAP subunitives for more soft-wood species	• Remove substandard + declining • Promote diverse age classes • Remove pest + disease products + diseased trees	• 1-5 years
Lowland Conifer - Hemlock, Cedar, B.P.F.	• Maintain timberland stock • Increase regeneration • Removal of snags + stumps for wildlife + to reduce bank stream	• Remove snags/stumps for decay	• 1-20 years
Upland Conifer - Spruce, B.P.F., Sitka, Hemlock	• Maintain old-growth species • Increase regeneration • Retention + increase snags + stumps		• 1-20 years
Lowland Hard - Bur Oak, White	• Retention Bur oak snags + stumps • Increase regeneration		• 1-10 years




# Private landowner: Warren Suchovsky



**NRCS FOREST MANAGEMENT PLAN**

**Landowner:** Warren Suchovsky  
N 9677 County Road 577  
Stephenson, Michigan 49887  
(906) 753-6666

**Legal Description:** T. 35 N. - R. 27 W. - Portions of Section 6  
T. 35 N. - R. 28 W. - Portions of Sections 1 & 11  
T. 36 N. - R. 27 W. - Portions of Section 31  
T. 36 N. - R. 28 W. - Portions of Section 26  
Menominee County, Michigan  
848 Acres



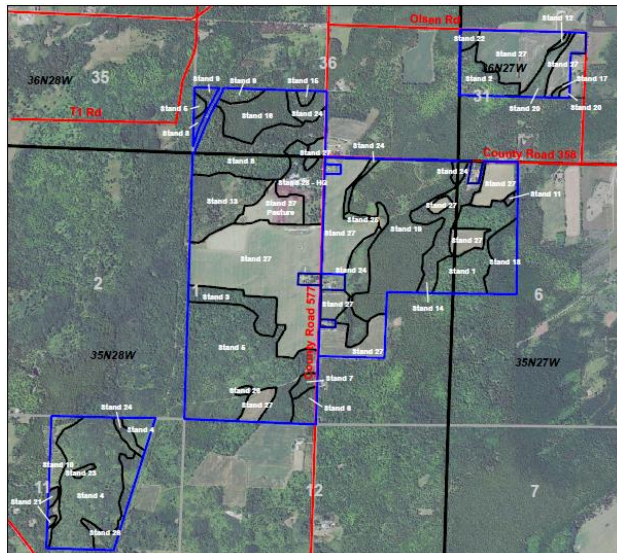
**Prepared By:** Rexx A. Janowiak, ACF

**Signature of Plan Writer:** Green Timber Consulting Foresters, Inc.  
11521 DesRochers Road  
Pelkie, Michigan 49958  
(906) 353-8584 or (906) 281-6458  
[rex@greentimberforesters.com](mailto:rex@greentimberforesters.com)  
[www.greentimberforestry.com](http://www.greentimberforestry.com)  
September 30<sup>th</sup>, 2014

**Landowner Approval Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**NRCS Approval Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

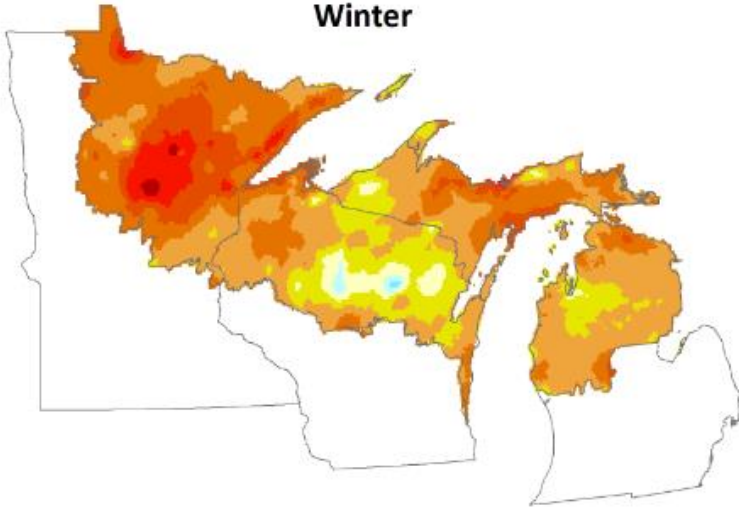
**NRCS Approval (Print):** \_\_\_\_\_ **Date:** \_\_\_\_\_



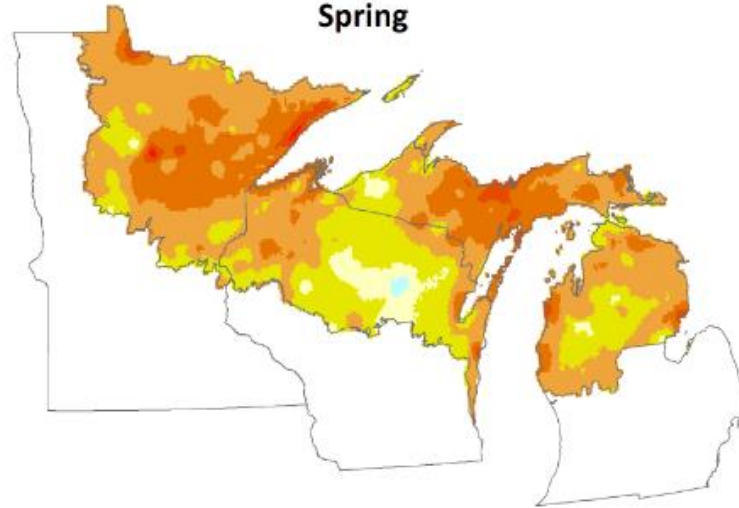
# Observed Temperature Changes

Change in Seasonal Mean Temperature, 1901-2011

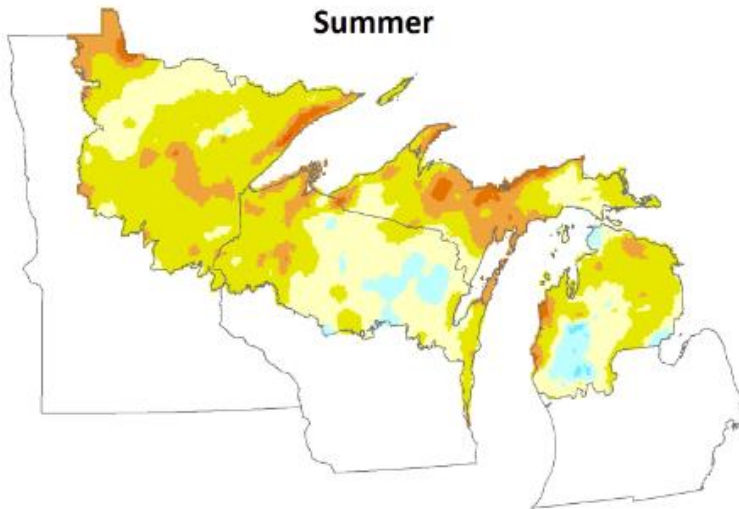
Winter



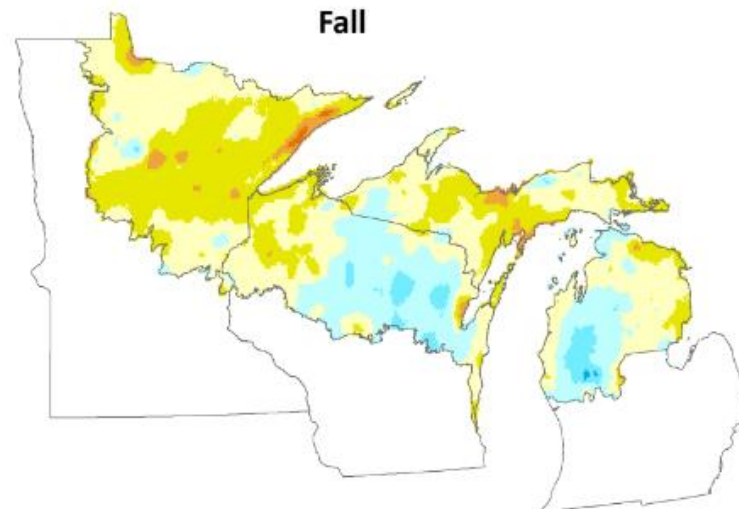
Spring



Summer



Fall

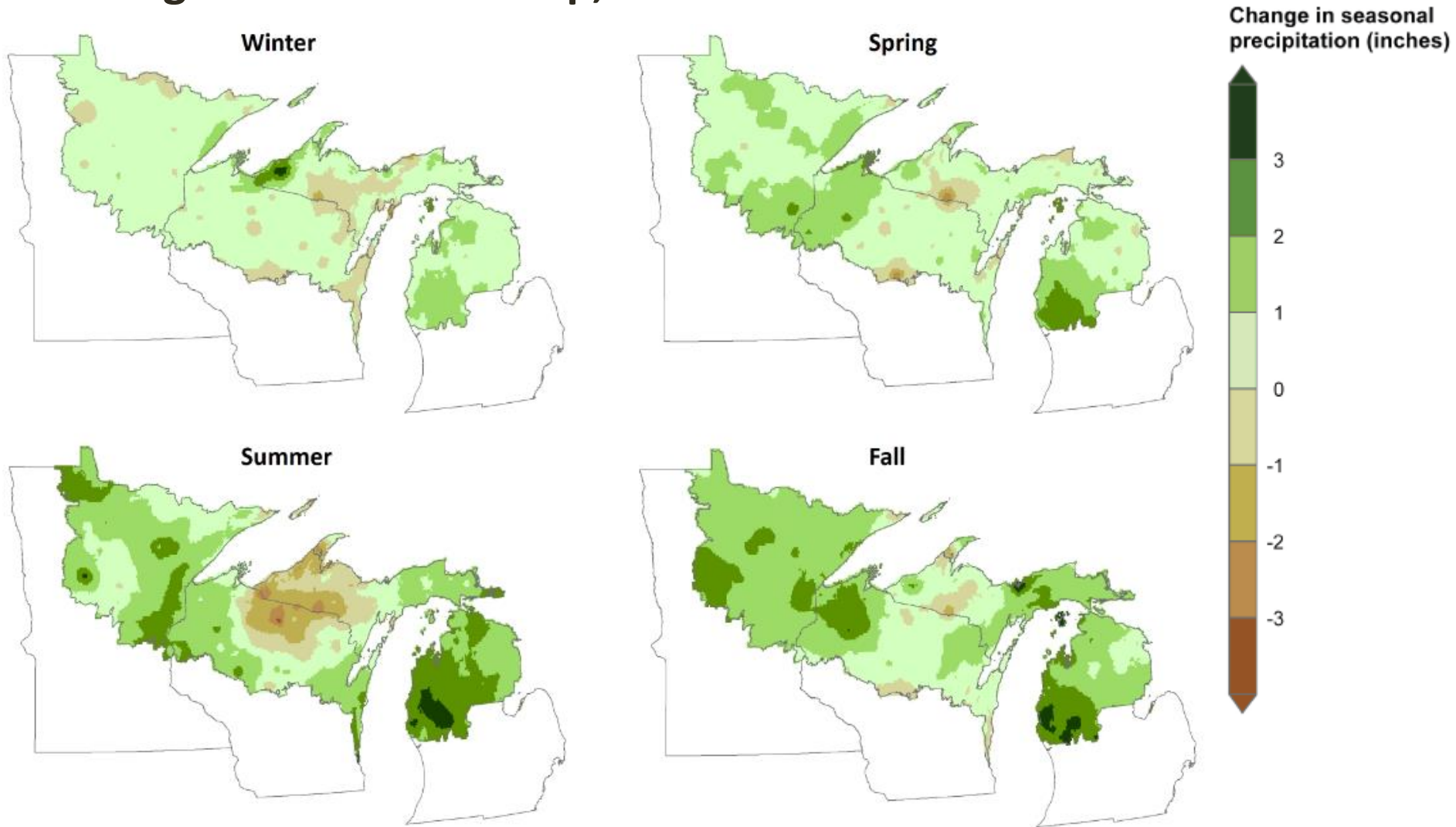


Temperature change (°F)



# Observed Precipitation Changes

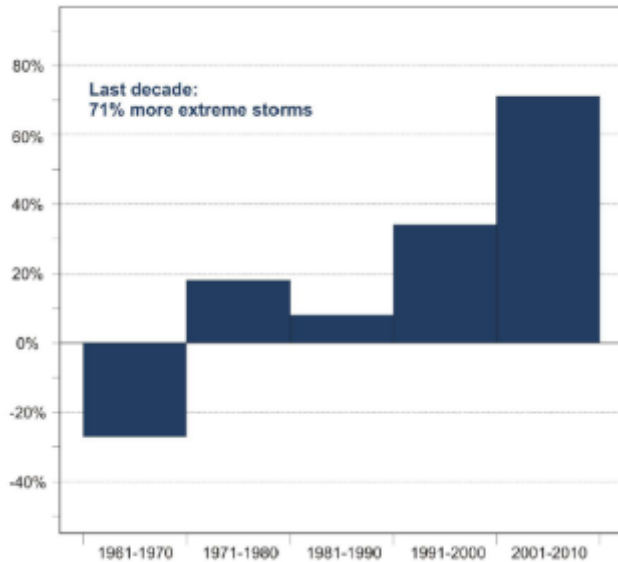
## Change in Seasonal Precip, 1901-2011



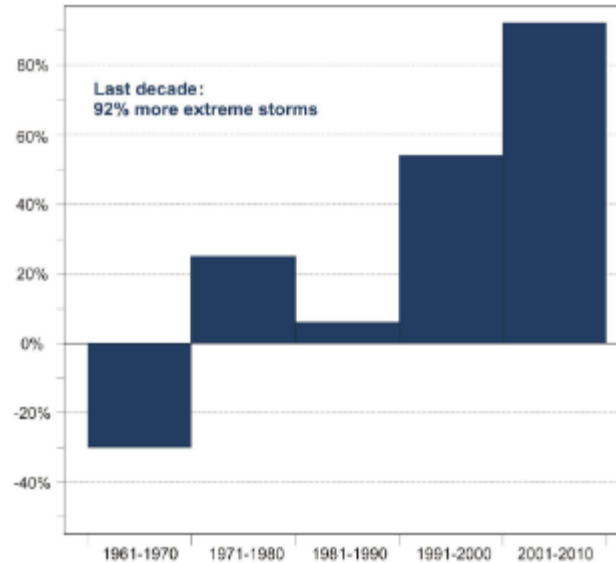
# Observed Trends in Extreme Weather

## Frequency of 3"+ rainstorms

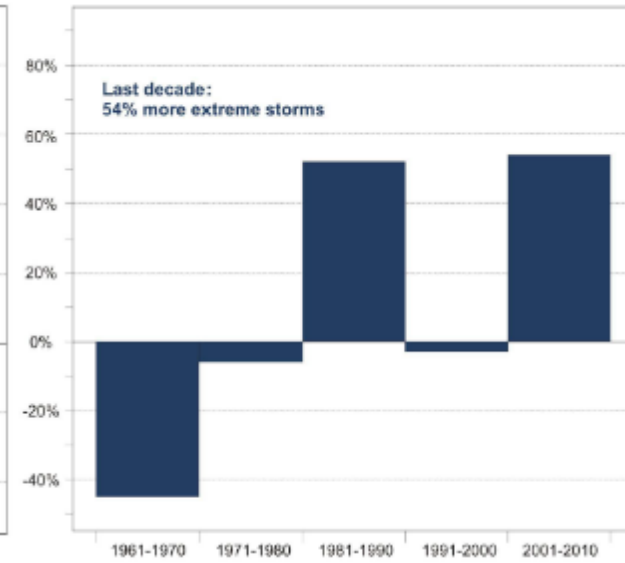
### Minnesota



### Wisconsin

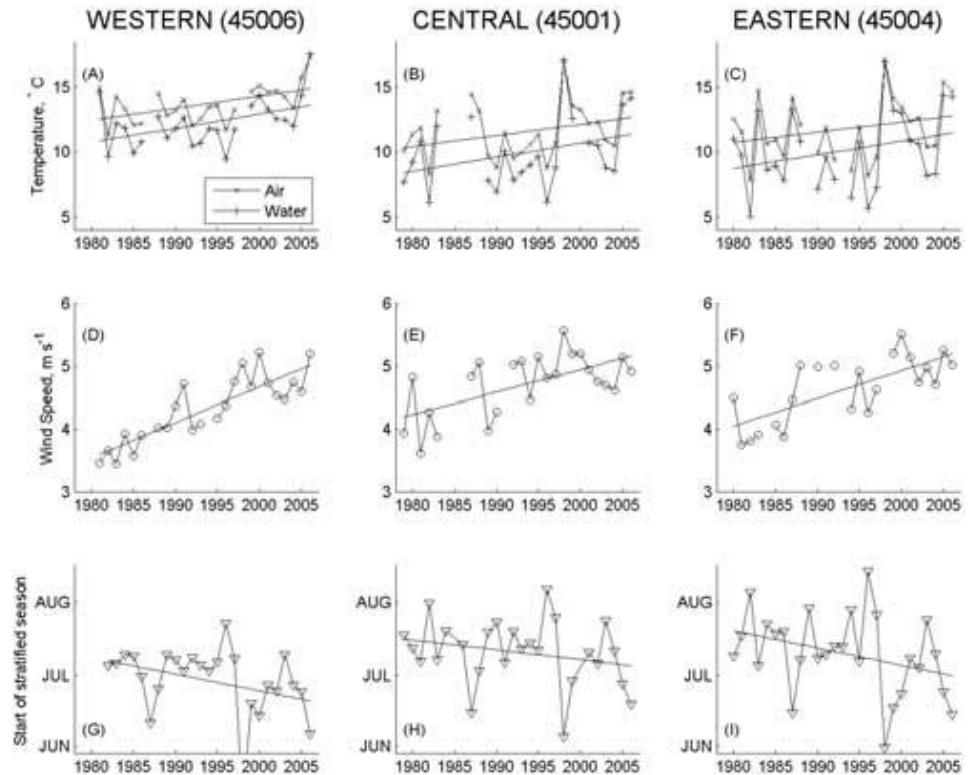
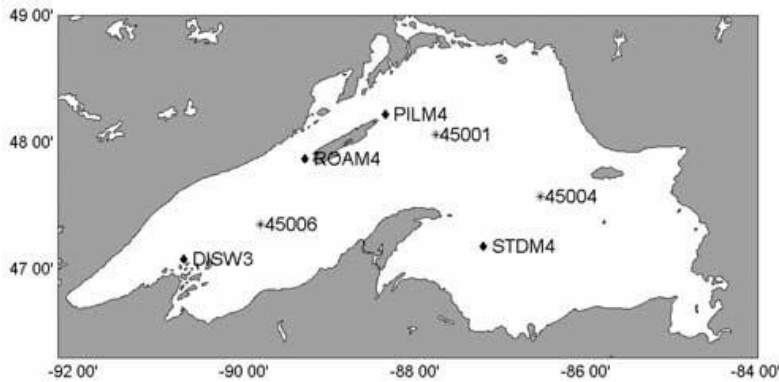


### Michigan



# Lake Temperature

Lake Superior near-surface temp increased 4.5°F from 1979-2006



# Observed Trends in Phenology

- 12-24 fewer soil frost days per yr since 1900
- 1-2 more freeze-thaw cycles per yr since 1900
- 6-8 day advance in growing season since 1950
- 2 days/decade earlier ice out since 1950



# Other On-going Stories

Climate is not the complete story, but the story's not complete without it.



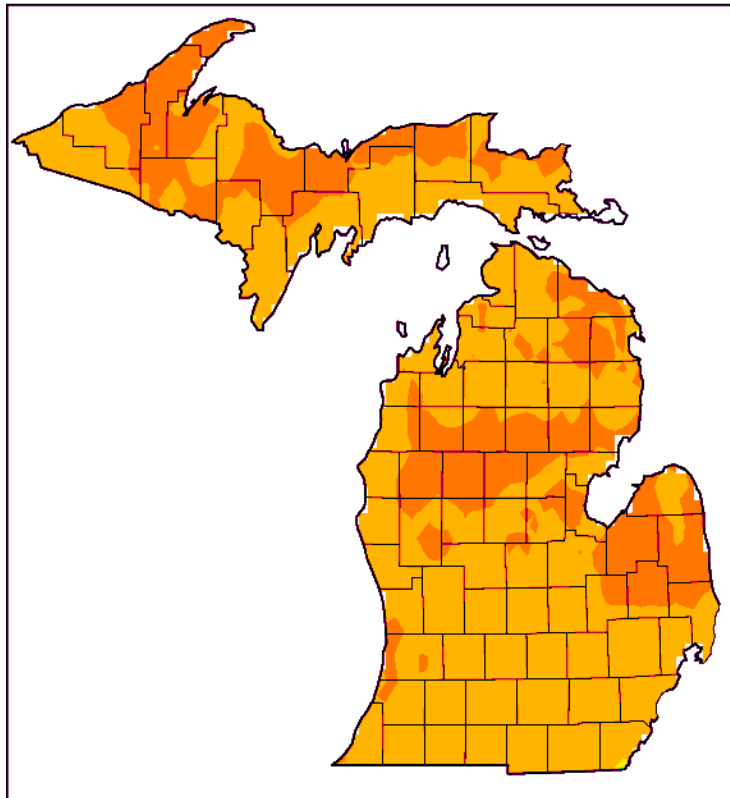
*OK, so what do we expect  
in the future?*

*(You folks chime in here...)*

# Last Spring Frost

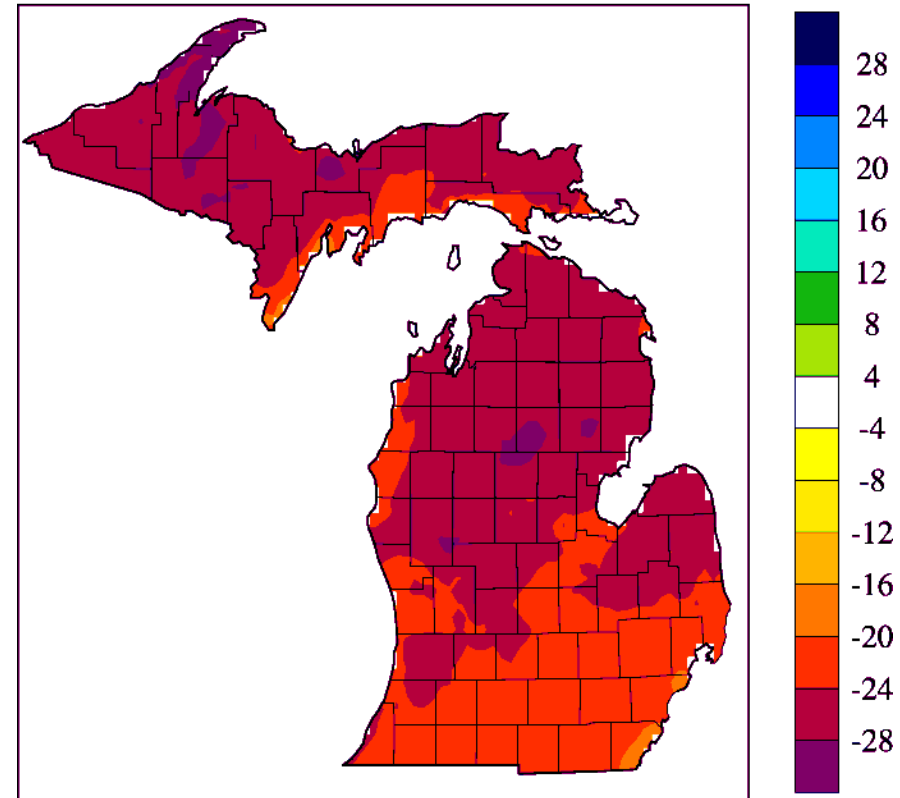
Low

LastSpringFreeze B1Late21-20C3M



High

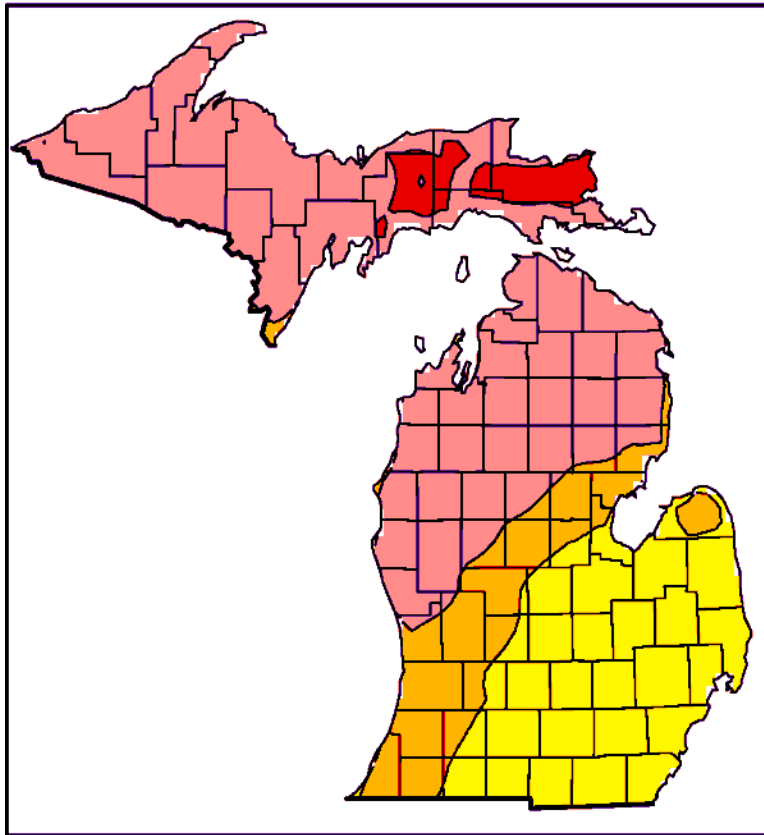
LastSpringFreeze A2Late21-20C3M



# Snowpack $\geq 10$ in.

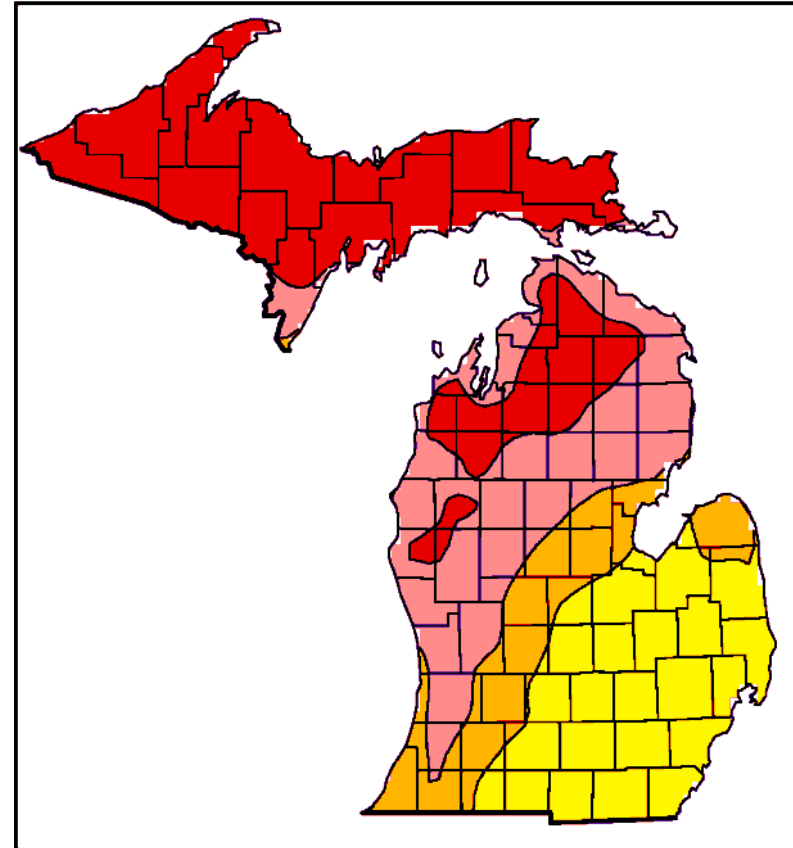
**Low**

**Change Numb Dys Depth 10in+ B1Late21-20C3M**



**High**

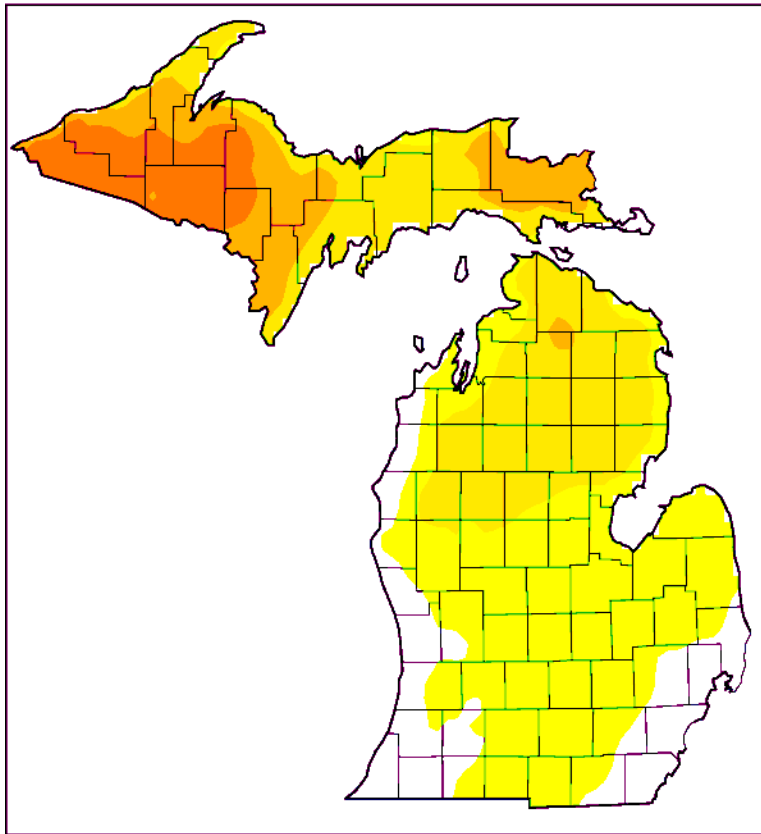
**Change Numb Dys Depth 10in+ A2Late21-20C3M**



# Nights Below 0 °F

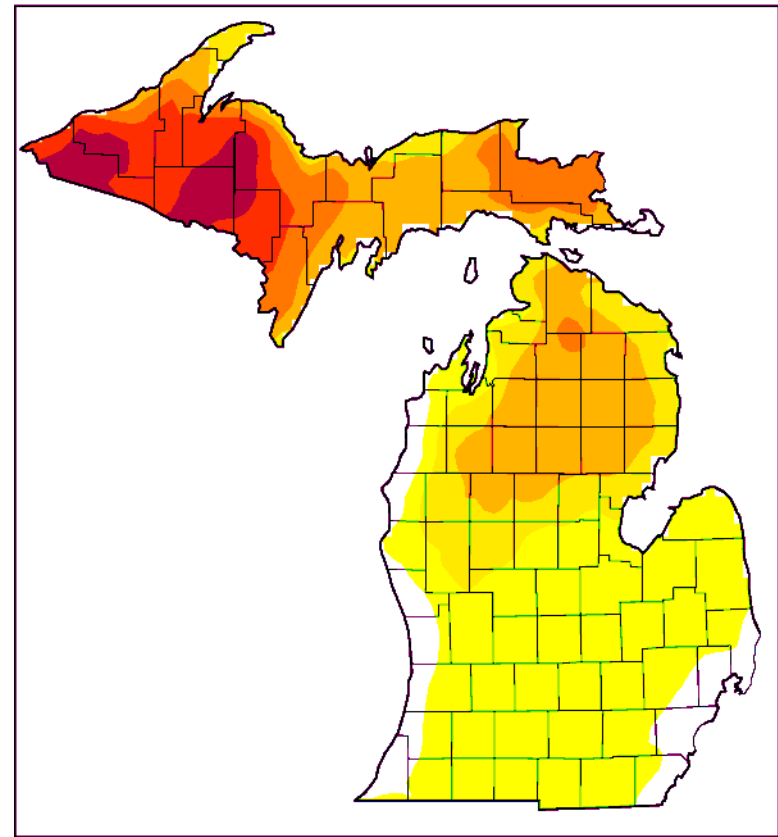
Low

0F- Days B1Late21-20C3M



High

0F- Days A2Late21-20C3M



# Winter Severity Index

Current

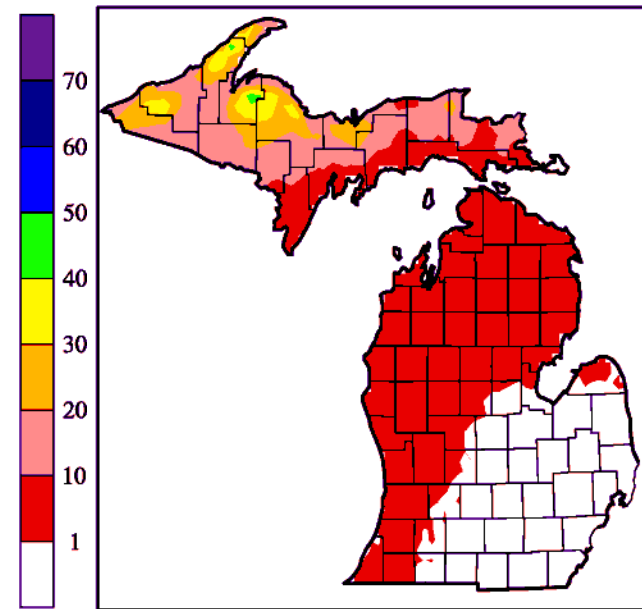
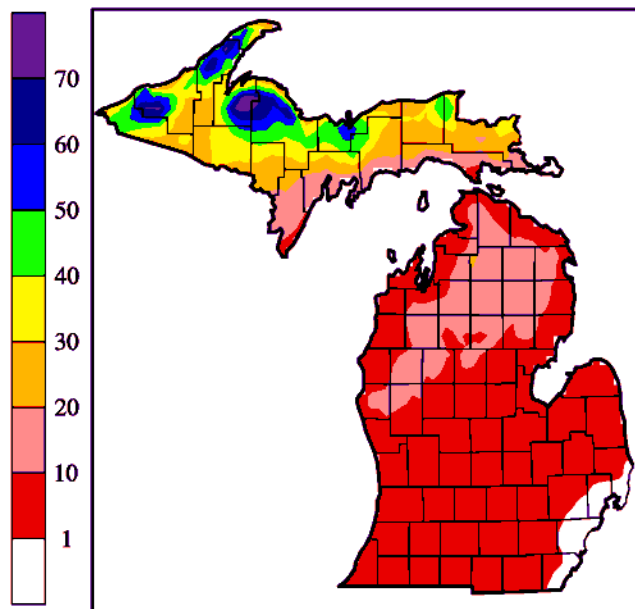
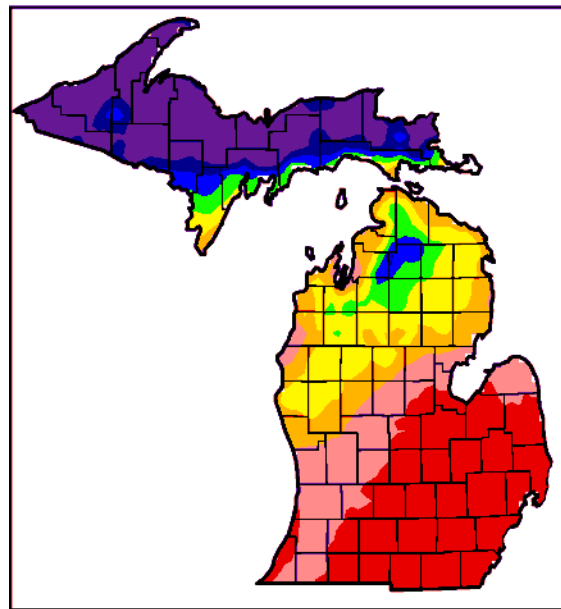
Low

High

WSI Late20th

WSI Late21st B1

WSI Late21st A2



# Impacts on Forests

- Longer growing season
- CO<sub>2</sub> fertilization
- Altered soil moisture
- Extreme weather events
- Less frozen ground
- Increased fire risk
- Species range shifts
- Increased stressors



# Longer Growing Season

## Benefits:

- More time for growth!

## Limits:

- Early bud break/loss of cold hardening
- Frost damage with spring frosts



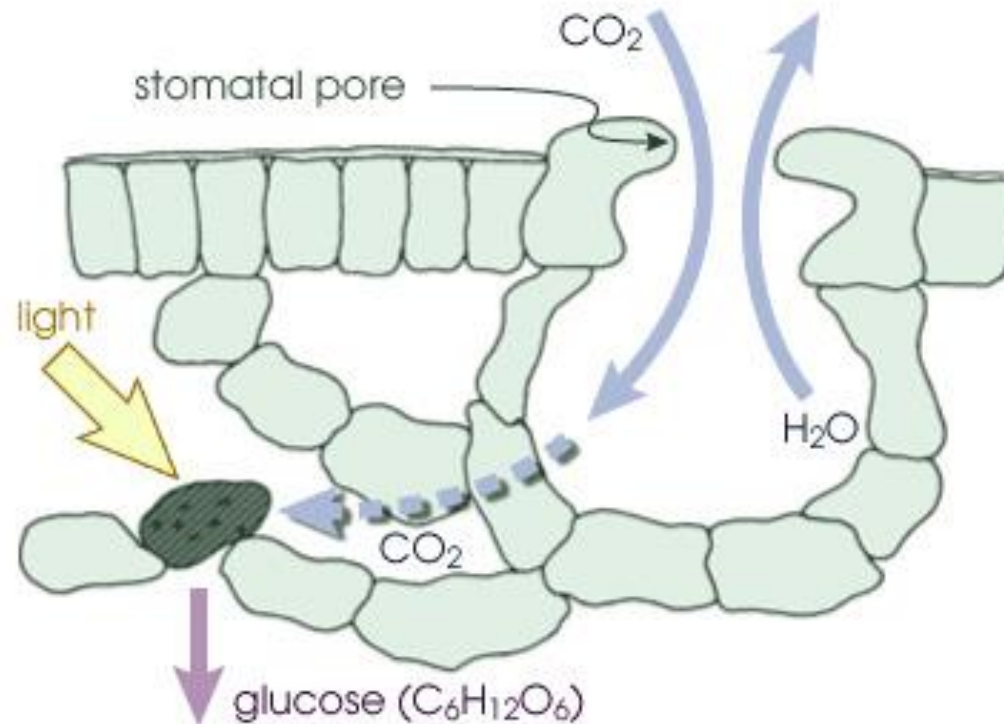
# CO<sub>2</sub> Fertilization

## Benefits:

- Increased growth
- Water-use efficiency

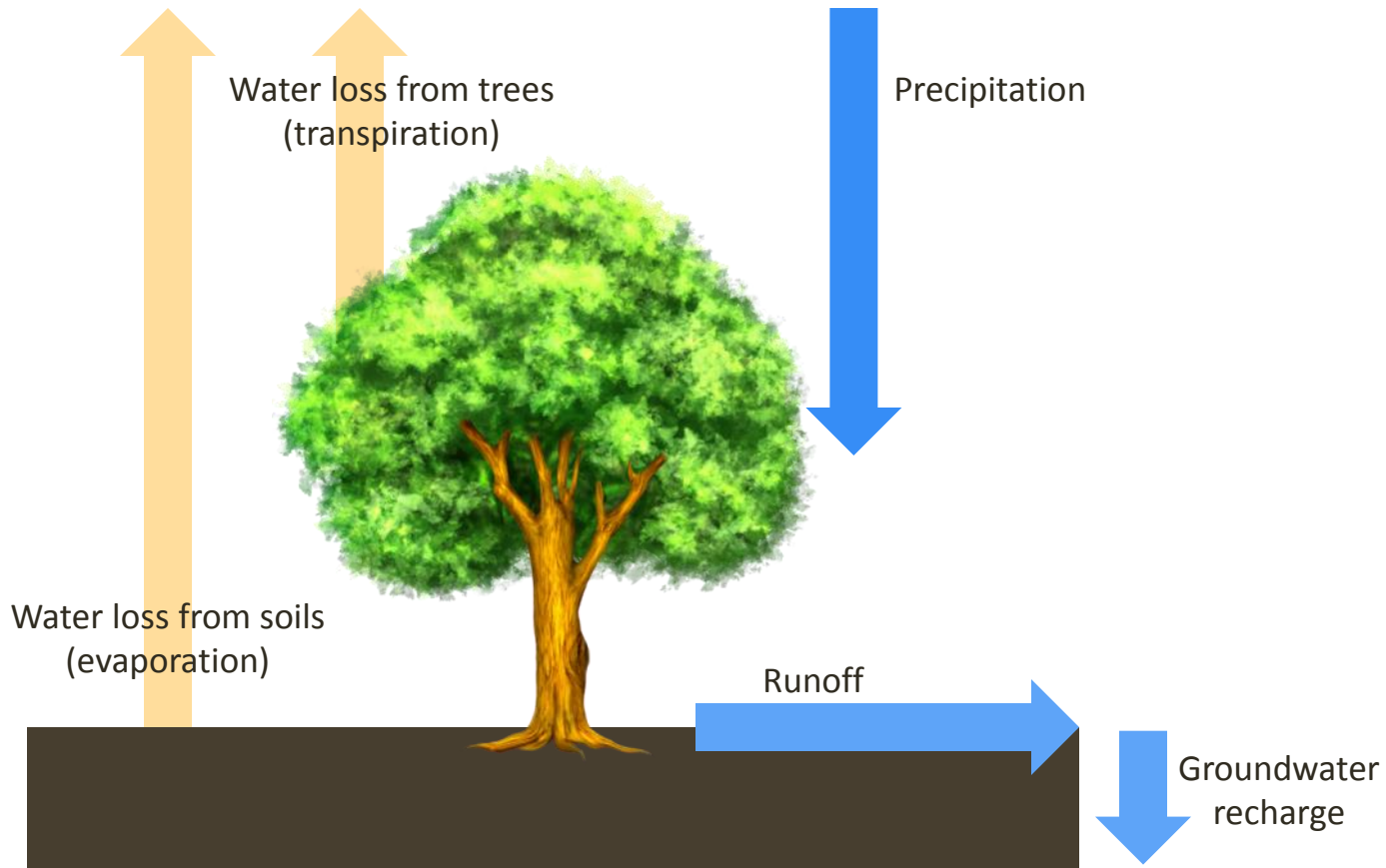
## Limits:

- Other nutrients or water
- Stressors or disturbance



# Altered Soil Moisture

Greater uncertainty about future precipitation,  
but great risk of summer moisture stress

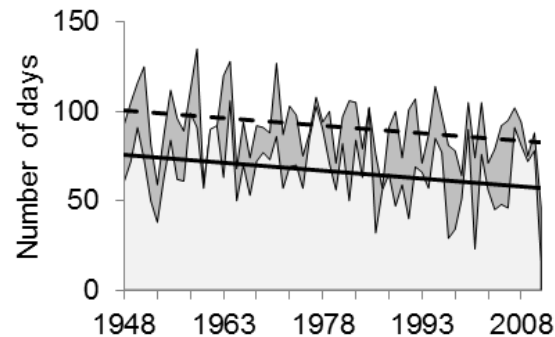


# Less Frozen Ground

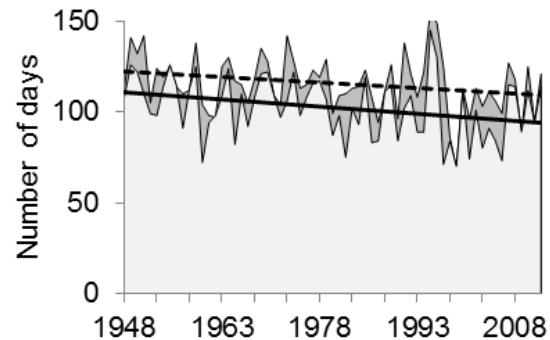
Frozen ground conditions have decreased across over the last 60+ years – WI example



**Dane County**



**Onieda County**



# Wildfire Risk

## Fire may increase, because:

- Warmer/drier summers
- Increased mortality from stress, pests, events
- More frequent weather conditions that promote large fires

## ...or maybe not, because:

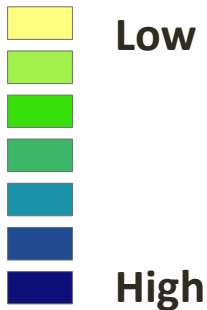
- Fire suppression will continue
- Spring/early summer moisture
- Current regeneration of more mesic species
- Spatial patterns of land use and fragmentation



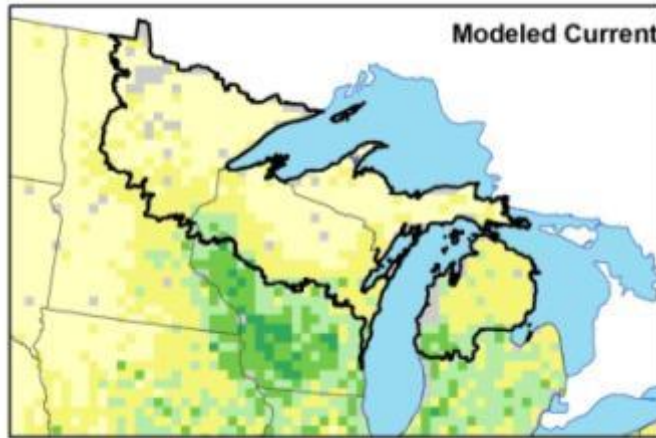
# Species Range Shifts

## White Oak

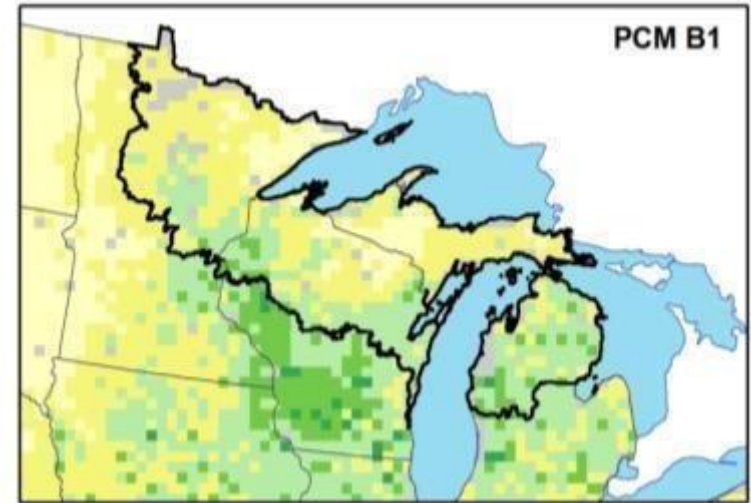
Importance  
Value



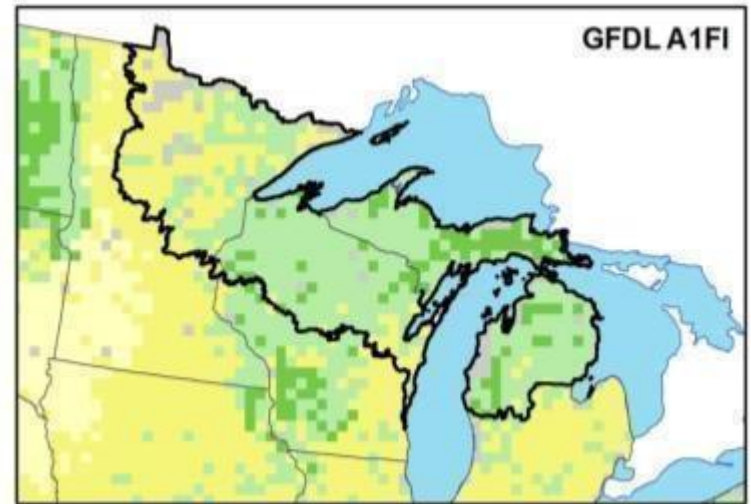
Current



2070-2100 Low



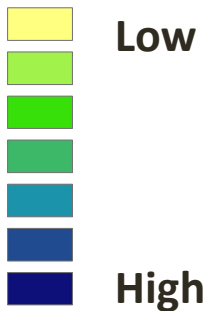
2070-2100 High



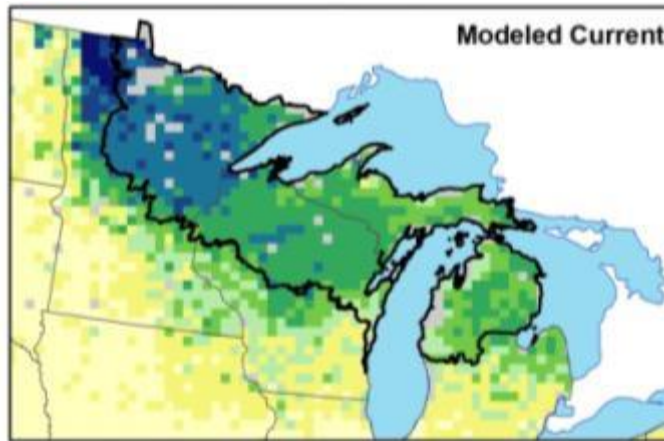
# Species Range Shifts

## Quaking Aspen

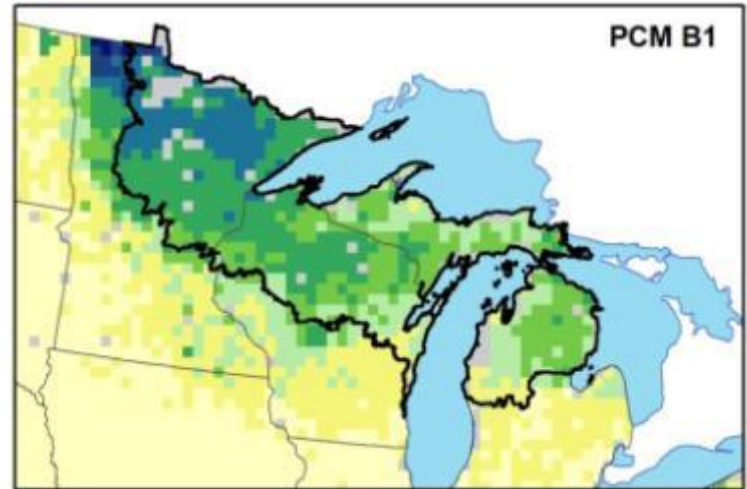
Importance  
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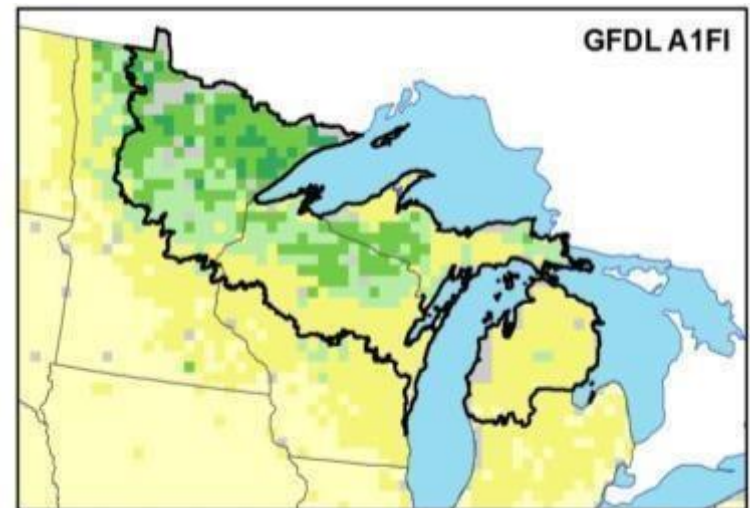
Current



2070-2100 Low



2070-2100 High



# Increased Stressors

Many forests are already under stress from other causes.

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



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

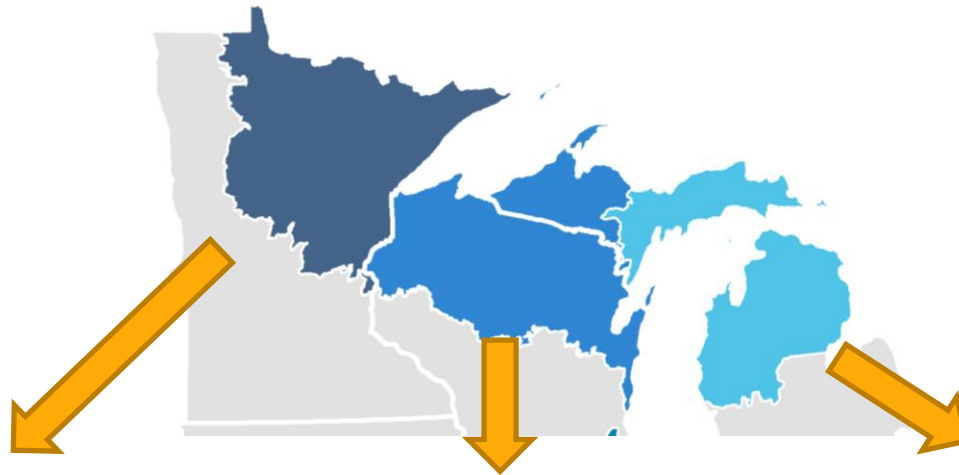


**Exotic Earthworms:**  
Increase drought susceptibility



**Invasive Plants:**  
Outcompete stressed trees

# Forest Type Vulnerability



Acid peatland  
Forested rich peatland  
Wet forest  
Managed aspen  
Managed red pine  
Fire-dependent forest  
Mesic hardwood forest  
Floodplain forest

Lowland conifer  
Upland spruce-fir  
Aspen-birch  
Lowland/riparian  
hardwoods  
Red pine  
Northern hardwoods  
Jack pine  
Oak  
White pine

Upland spruce-fir  
Lowland conifer  
Red pine/ white pine  
Jack pine  
Aspen-birch  
Northern hardwoods  
Lowland/riparian  
hardwoods  
Oak associations  
Barrens