



United States Department of Agriculture  
Northern Forests Climate Hub

# Wisconsin's Forests and Climate Change: Updates from the WICCI Forestry Group



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USDA Forest Service and Northern Institute of Applied Climate Science

# WICCI Forestry Working Group Members

- Stephen Handler, U.S. Forest Service & NIACS
- Matt Dallman, The Nature Conservancy
- Lauren Dupey, UW-Madison Extension
- Jason Holmes, Bayfield County
- Brad Hutnik, Wisconsin DNR
- Linda Parker, U.S. Forest Service
- Alex Wrobel, GLIFWC



# Goals

1. **Communicate** climate information across the forestry community
2. Develop useful **outreach materials and tools**
3. Lead adaptation **training** and develop real-world adaptation examples
4. Integrate climate change adaptation and resilience into **decision-making**
5. Incorporate climate information into **forest inventory software**



Climate change is a game-changing issue for Wisconsin's forests, and we all have a stake in maintaining their health and sustainability.

The WICCI Forestry Working Group shares information about climate change impacts and adaptation across the forestry community. We help put information into action by helping foresters and land managers adapt and prepare for future change.

## Forestry Resources

- [Climate Wisconsin 2050: Forestry \(PDF\) | November 2016](#)
- [Climate change vulnerability assessment for northern WI forests](#)
- [Real-world examples of climate change adaptation and forest management](#)
- [Adaptation Workbook](#)
- [Recorded presentation on climate change impacts and Northwoods forests](#)
- [Climate Wisconsin video on Forestry](#)
- [WICCI climate maps](#)
- [Climate Change Resource Center](#)

[www.wicci.wisc.edu/forestry-working-group.php](http://www.wicci.wisc.edu/forestry-working-group.php)

# Examples of our work

- Forestry Roundtables
  - 3 sessions around the state
  - Diverse participation!



# Examples of our work

- Outreach materials!

**Climate Wisconsin 2050**

Wisconsin's climate is changing, and our forests will continue to experience direct and indirect impacts from these changes.

This publication provides guidance on how **forest managers and landowners are addressing these impacts, and how they are helping forests adapt and respond to change.**

## Scenarios of a State of Change: Forestry

Wisconsin has more than 17 million acres of forest land, covering nearly 50% of the state's total land area. Over 55% of Wisconsin's forests are owned by families, and 32% are owned by public agencies (federal, state, or county). These forests help sustain the state ecologically, economically, and culturally. For example, the combined forest products industries in Wisconsin account for 65,000 jobs and an economic output of nearly \$25 billion.

**Look inside for a snapshot of what we can expect from Wisconsin's climate and weather by the year 2050, and how forest managers can help adapt to these changing conditions.**



## Protect Your Woods for Tomorrow

A Tool to Assess Risk in a Changing Climate



Whether you spend time outside in your woods or just enjoy the beauty of your trees and wildlife from the window, you likely love your woods and want to keep it healthy.

Forests are always changing and adapting to new conditions. Some changes, like the progression of green summer leaves to bright red and gold fall foliage, or the annual return of migratory songbirds, are expected.

Other shifts, such as earlier spring leaf-out or an increase in nuisance plants such as buckthorn, are only visible when comparing differences in woodlands across many years or decades.

Our climate is changing, resulting in altered weather patterns, rising temperatures and shifts in seasonal precipitation patterns. Actions you take today can help your forest be resilient, healthy and productive in the face of future climate changes.

This publication can serve as a tool to help you assess the resilience of your woods in a quick and easy manner. It contains background information on the important characteristics of resilient and healthy forests and provides examples of potential adaptation strategies. The included scorecards can be used in the field to evaluate the resilience of your woods, which you can use on your own or to start a conversation with a forester.

**Forest Resilience:** The capacity of a forest to respond to a disturbance by resisting damage or stress and recovering quickly.

Photo: © iStockphoto.com

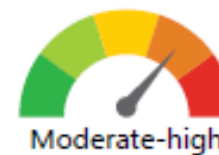
# Examples of our work

- Climate Change Field Guide
  - Designed for field foresters
  - Condensed and useful format
  - Site-level considerations
  - Northern WI complete, southern WI in prep

27

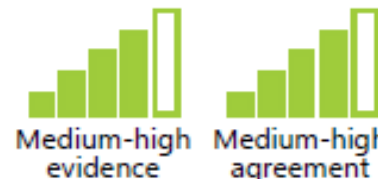
## Climate Change Vulnerability

Overall Vulnerability:



Moderate-high

Confidence:



Medium-high  
evidence

Medium-high  
agreement

## Climate Change Impacts: Negative



Drought stress during the growing season could cause stress and mortality on dry and poor-quality sites.



Projected temperatures may be beyond the physiological limits of aspen and birch by the end of the century. Quaking aspen and paper birch are near their southern range limits in Wisconsin.



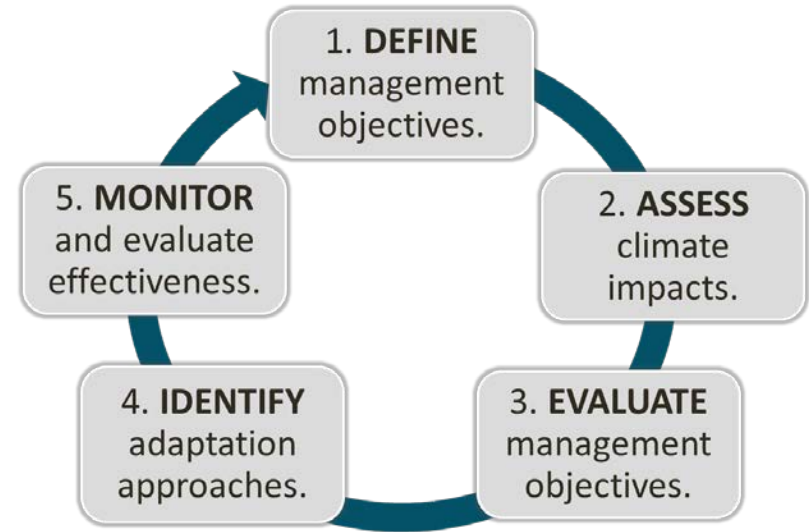
Insect pests such as forest tent caterpillar and gypsy moth, and diseases like hypoxylon canker, may become damaging under a warmer climate.



Deer populations are expected to increase with warmer winters and reduced snow cover, so herbivory may increase.

# Examples of our work

- Hands-on adaptation workshops
  - Real-world projects
  - Sharing with peers
  - Build your own custom adaptation plan!



# Climate Change Effects on Forests

SHIFTING SEASONS



SHIFTING SPECIES



SHIFTING STRESSORS





# Shorter, Warmer Winters

## Decreases in snow fall, cover, and depth

- 30-70% decreases in snowfall
- Greatest loss in shoulder seasons

## Decreased snowpack

- Increased soil freeze-thaw cycles can damage roots and alter soil processes

## Decreases in duration and extent of frozen ground

- Less reliable window of opportunity for management and transportation



# Shorter, Warmer Winters

## Less snow, but more rain

- Warmer temperatures
- Increased precipitation
- Extreme rain events

## Earlier peak stream flows

- Flashiness and episodic high flows may increase



# Longer Growing Season

Warmer temps result in longer growing seasons

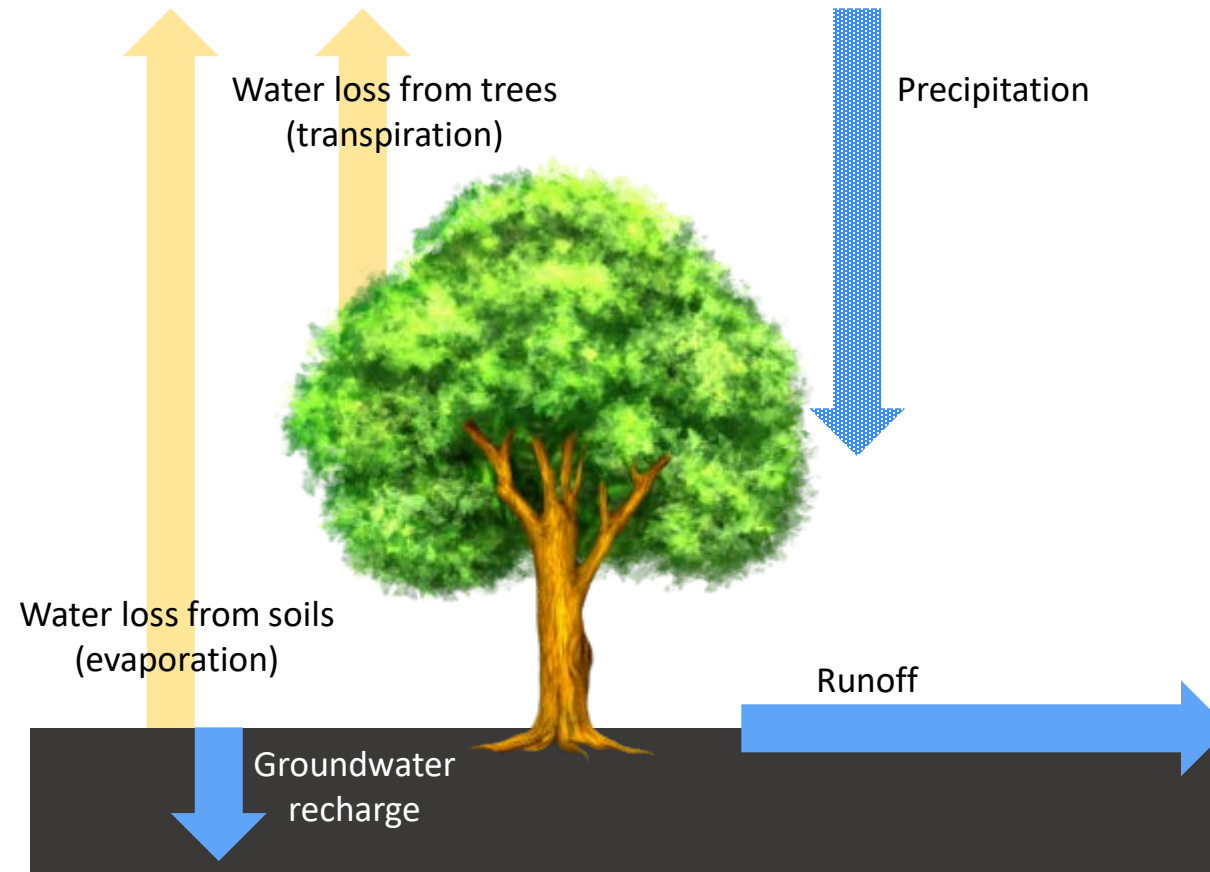
- Evidence of seasonal shifts
- Projected to increase 3-7+ more weeks

Longer period for plant growth



# Increased Risk of Drought Stress

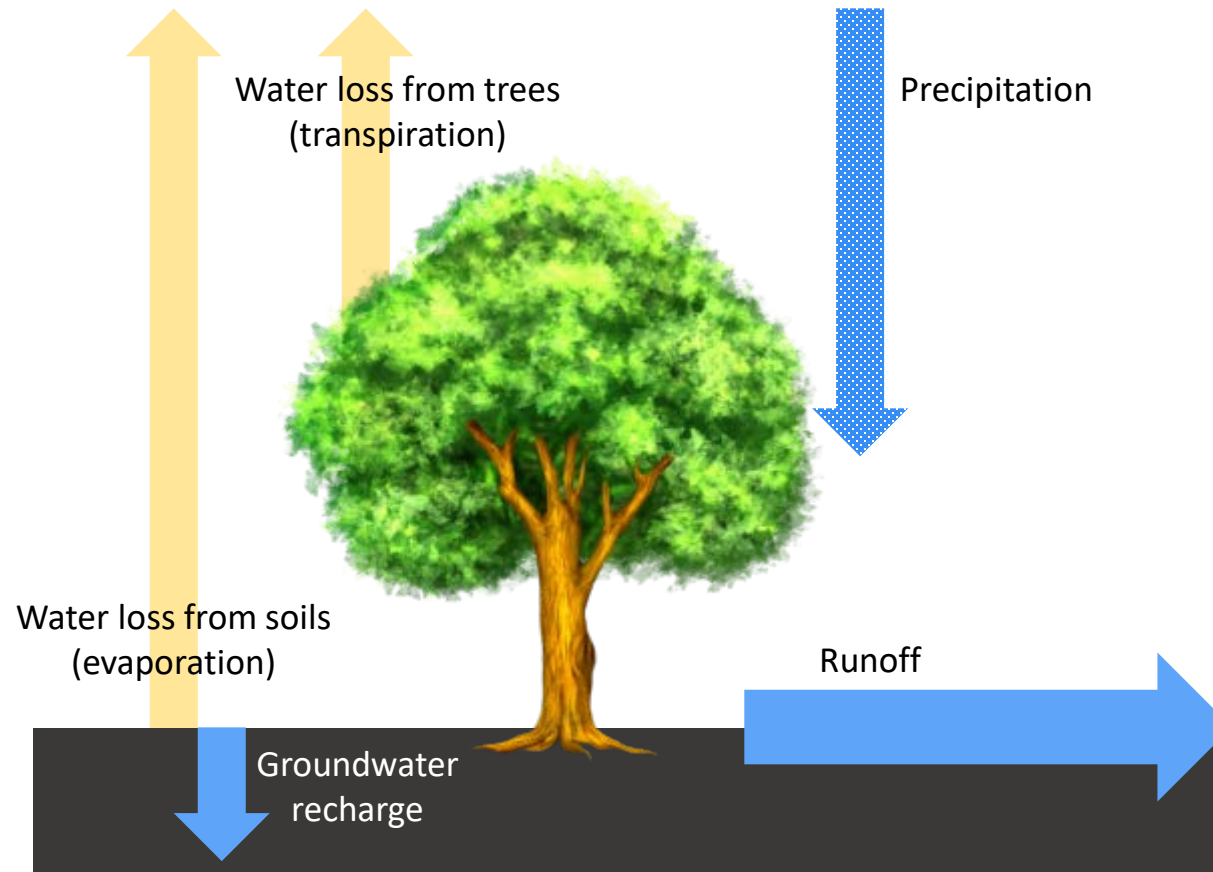
Longer and warmer growing seasons may lead to drier conditions during the growing season.



# Increased Risk of Drought Stress

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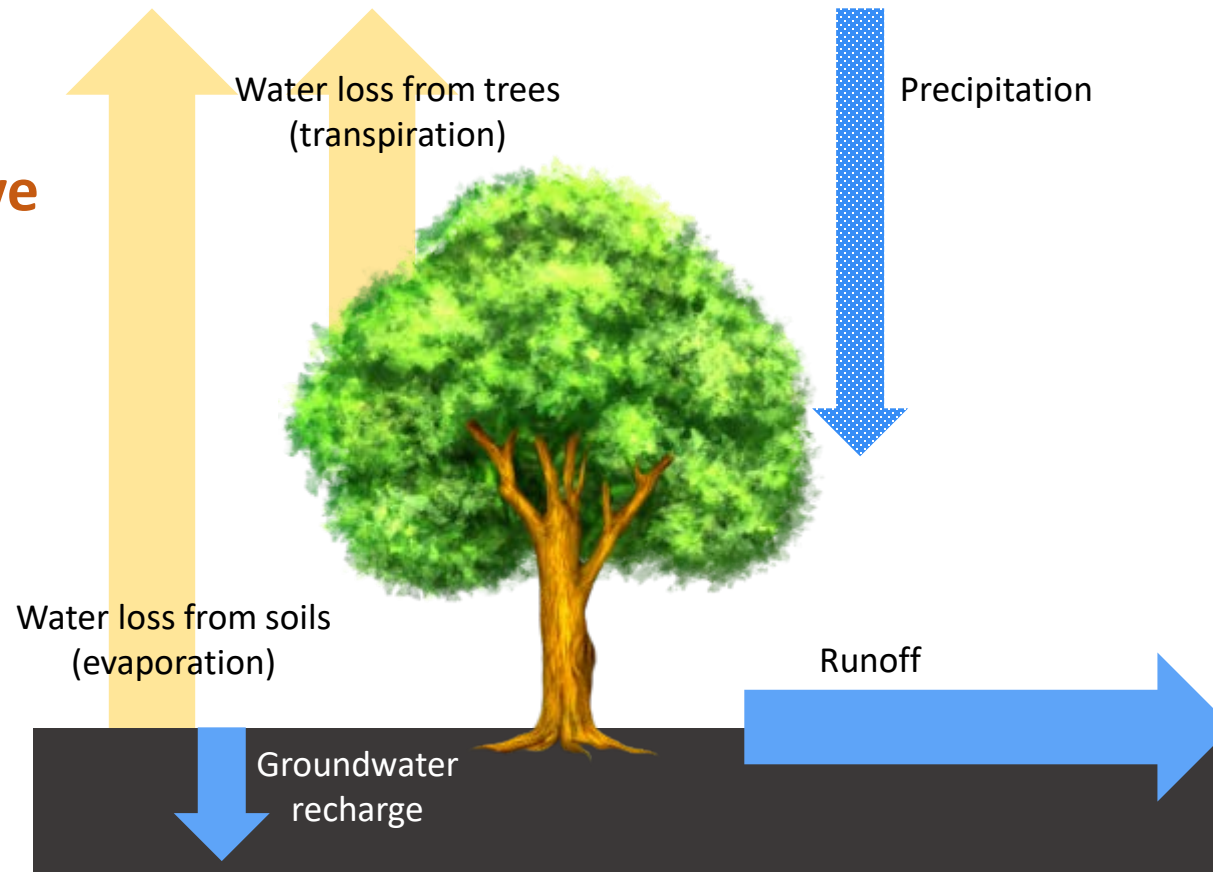
**Earlier spring runoff and increased runoff during extreme rain events**



# Increased Risk of Drought Stress

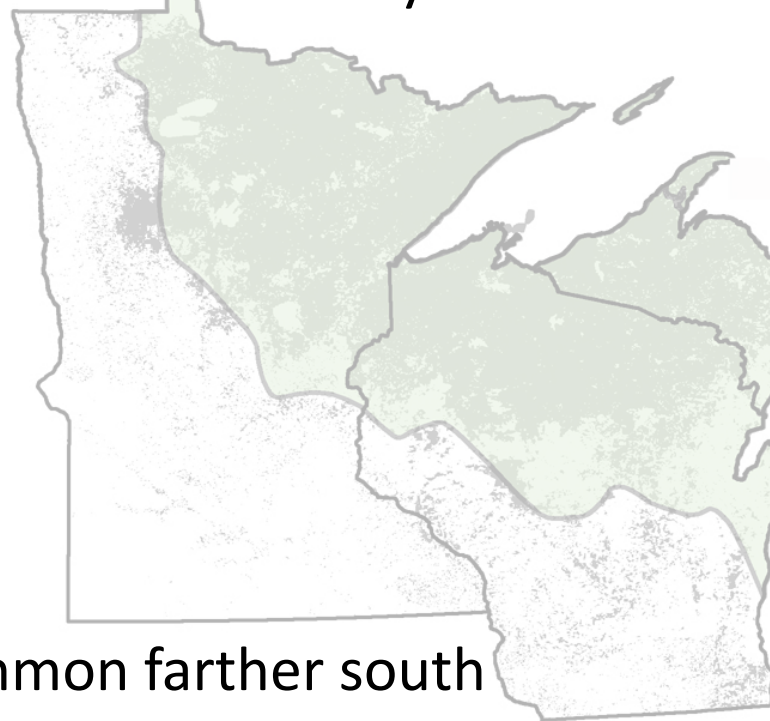
Longer and warmer growing seasons may lead to drier conditions during the growing season.

**Warmer temperatures drive water loss from soils and plants**



# Tree Species Range Shifts

Many northern/boreal species are projected to decline in the region— contract to more northern and consistently cold locations



Many species common farther south are expected to see increased and new habitat within the region.

# Tree Species Range Shifts

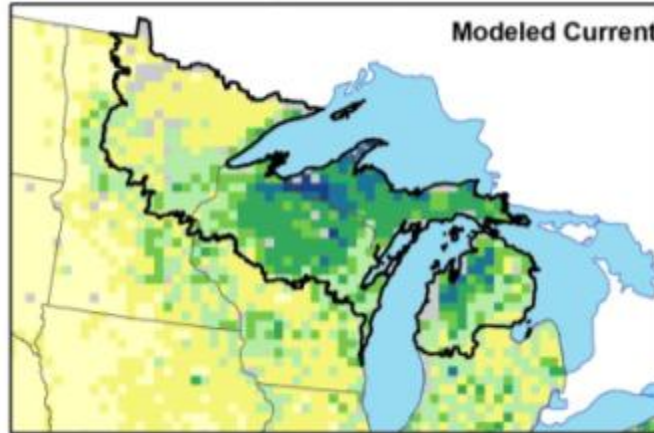
## Sugar Maple

Importance  
Value

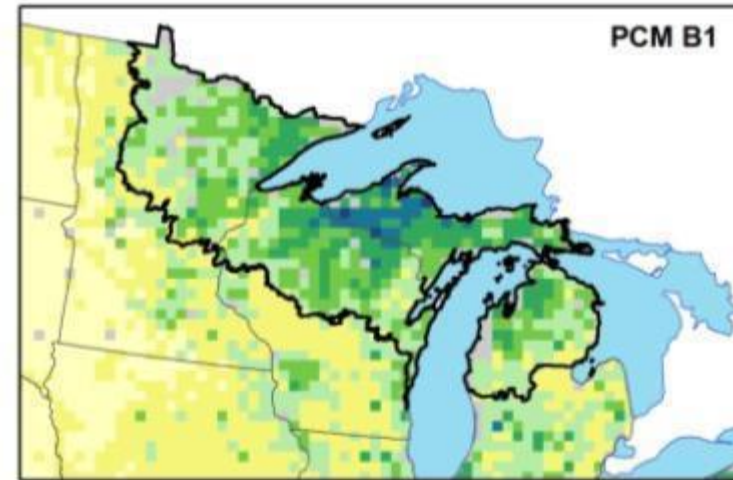
Low

High

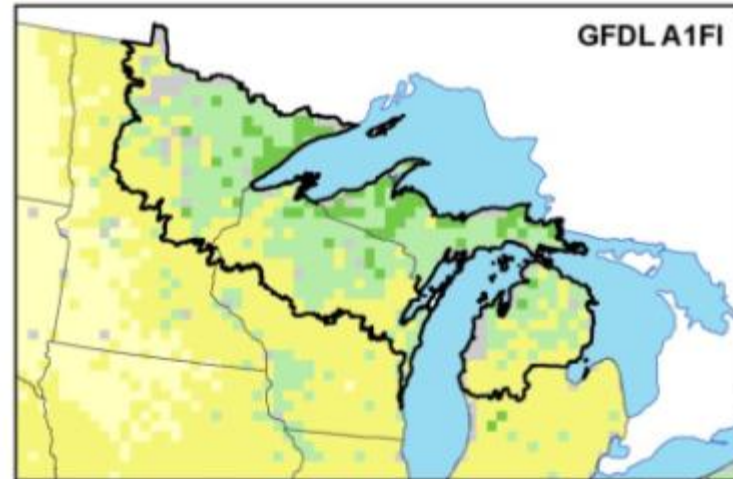
Current



2070-2100 Low



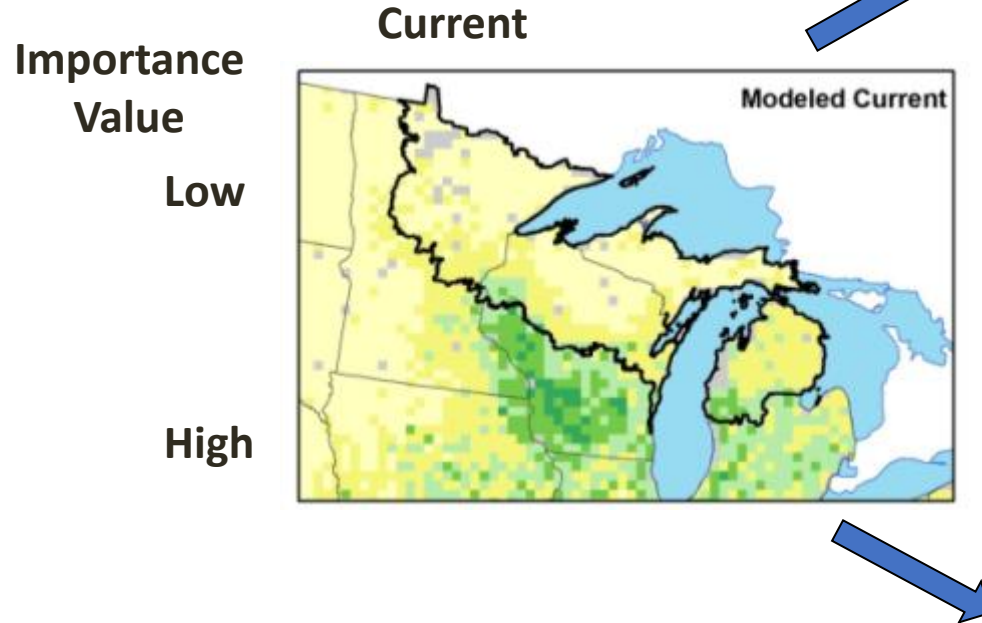
2070-2100 High



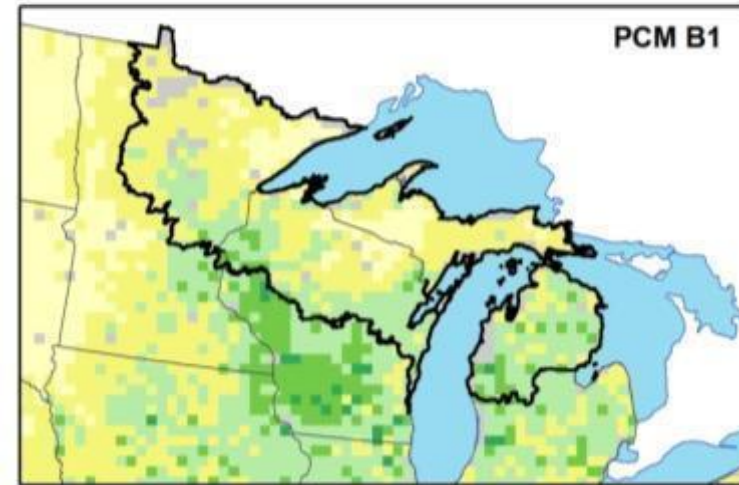


# Tree Species Range Shifts

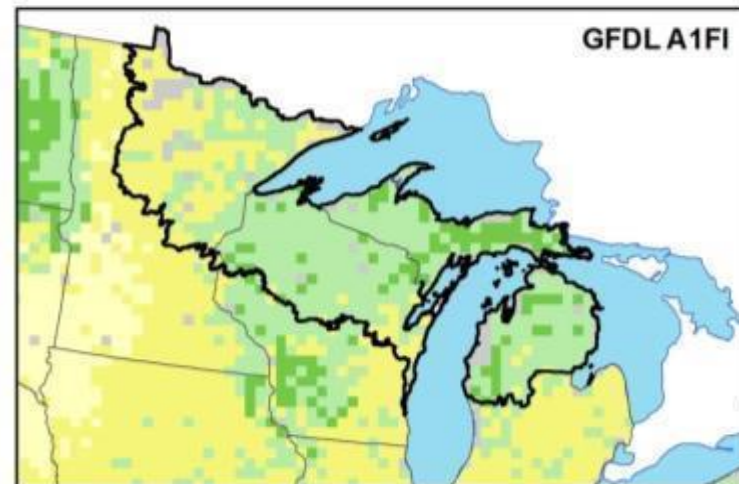
## White Oak



2070-2100 Low



2070-2100 High



# Tree Species Range Shifts

- Range shifts  $\neq$  instant catastrophic dieback
- Mature trees should fare better
  - Developed root system
  - Greater carbohydrate reserves
- Exposed to greater stress
  - Temperature
  - Moisture
  - Competition
- Increased susceptibility to disturbance

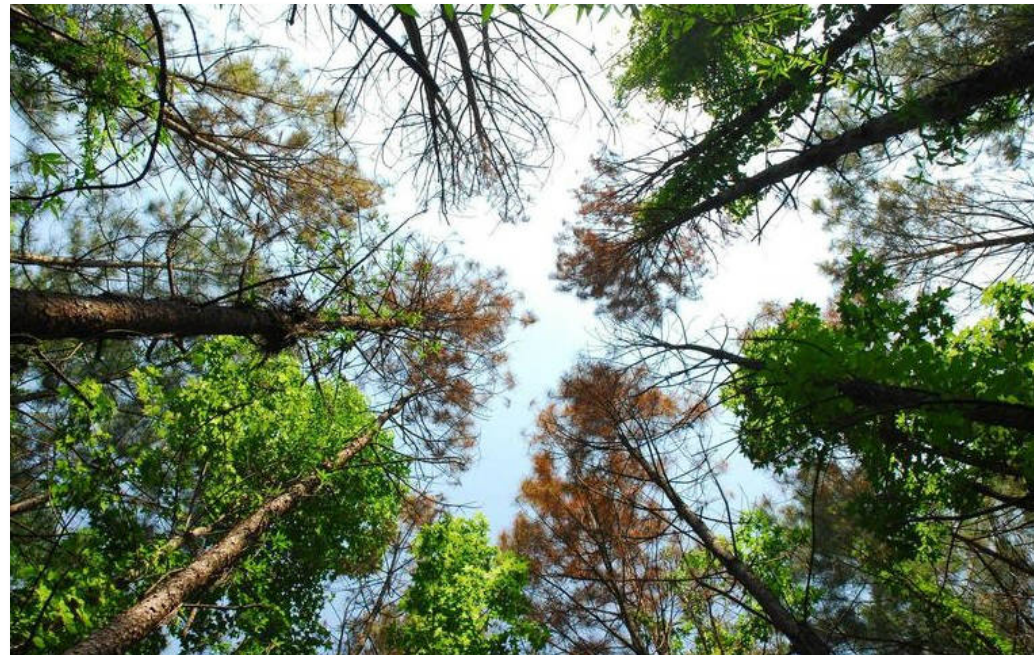
# Expanded Pest and Disease Ranges

Increased damage from forest insects & diseases

**Indirect:** Stress from other impacts increases susceptibility

**Direct:**

- Pests migrating northward
- Decreased probability of cold lethal temperatures
- Accelerated lifecycles



# Invasive Plants

Undesirable species moving northward (invasives)

## Indirect:

- Stress or disturbance from other impacts can affect the potential for invasion or success



## Direct:

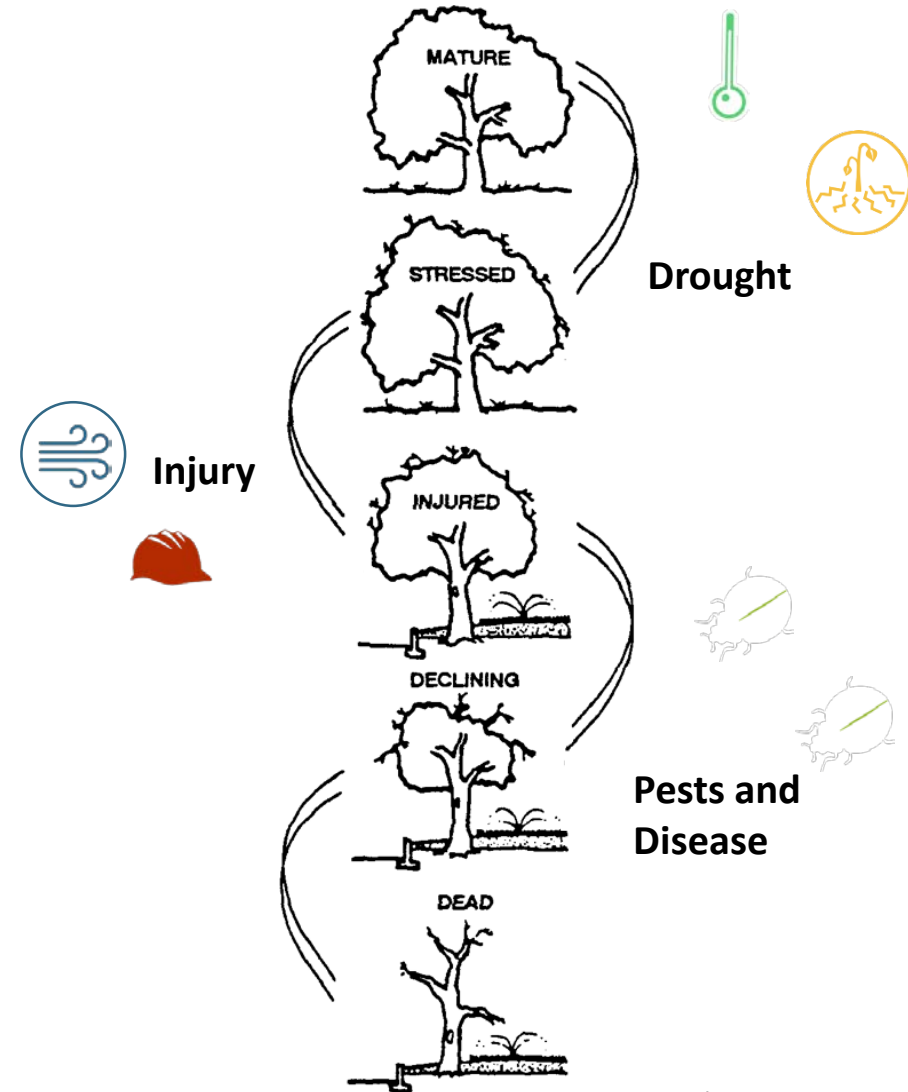
- Expanded ranges under warmer conditions
- Increased competitiveness from ability of some plants to take advantage of elevated CO<sub>2</sub>



# Climate change is a “threat multiplier”

- Chronic stress
- Disturbances
- Insect pests
- Forest diseases
- Invasive species

**Interactions make all the difference.**



Drawing: Bartlett Tree Experts

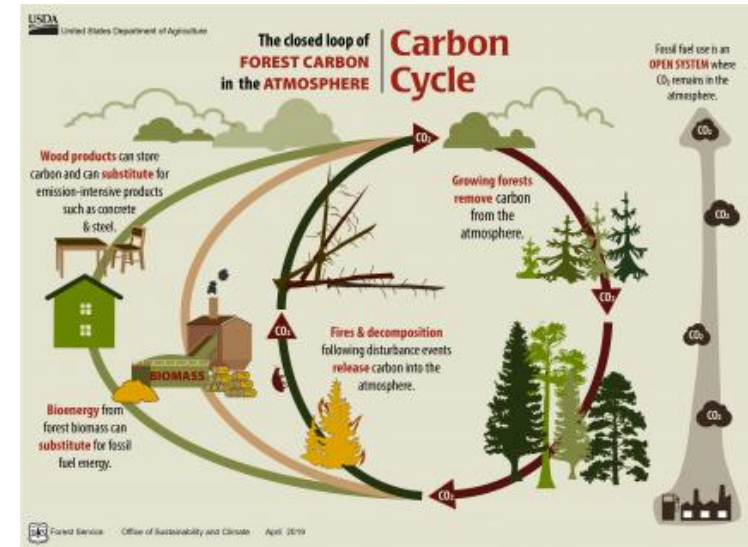
# Subcommittee questions!

# Mitigation and Adaptation

- What is your perspective on mitigation vs. adaptation as it relates to their work and our recommendations?

# Mitigation and Adaptation

- Mitigation = 1) carbon storage, 2) carbon sequestration, 3) fossil fuel displacement (product substitution)





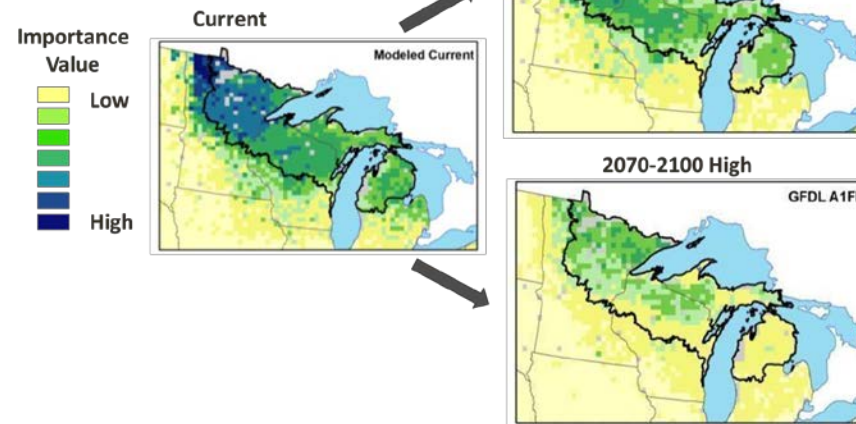
# Mitigation and Adaptation

- Adaptation = taking action to prepare for climate change impacts



## Regional Tree Species Information

### Quaking Aspen



[www.fs.fed.us/nrs/atlas/](http://www.fs.fed.us/nrs/atlas/)

Source: Louis Iverson et al. (US Forest Service)



# Mitigation and Adaptation

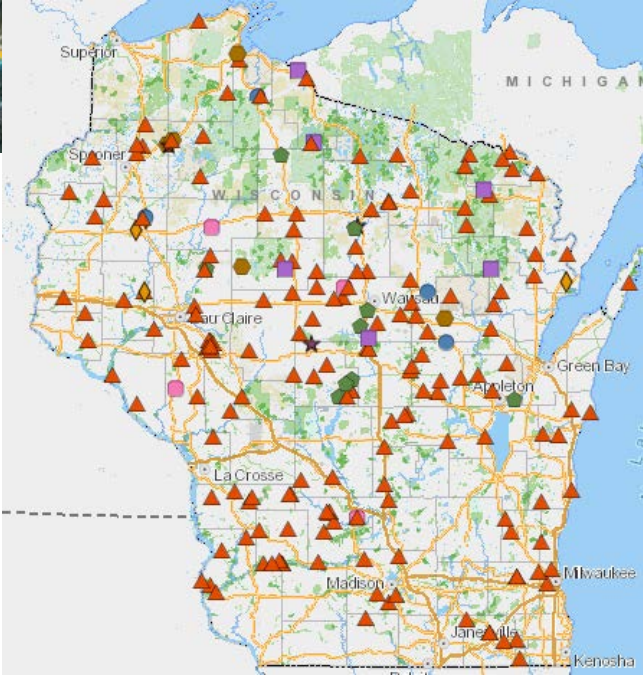
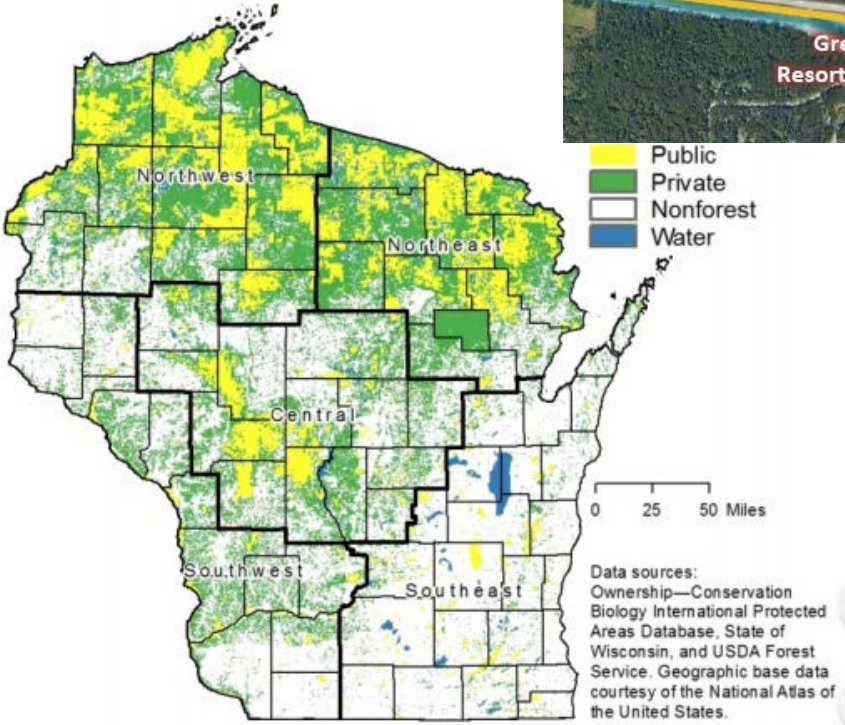
- You need both!



# Region-specific needs

- How do you advise that we capture the region-specific needs in our broader recommendations?

# Region-specific needs



Forest Products Mills



# Carbon sequestration in existing woodlots

- What programs, in place now, could be modified or enhanced that would improve carbon sequestration in our existing woodlots, would more dollars and/or education help this process along?

# Carbon sequestration in existing woodlots

- Managed Forest Law (landowner incentive program)
- Environmental Quality Incentives Program
- Forest Stewardship Program
- Forest Legacy Program
- Others



# Infrastructure on forest land

- We have had to replace infrastructure in some areas multiple times. Doing the same thing over and over and expecting a different results is not wise. What can we do differently to stop this expensive cycle?

# Infrastructure on forest land

- Large rain events (2"+) have become more frequent





# Infrastructure on forest land

- Local experience on the Chequamegon-Nicolet NF

## Preemption Creek on Forest Road 377

Before Upgrade



After upgrade



The Test...



# Equity

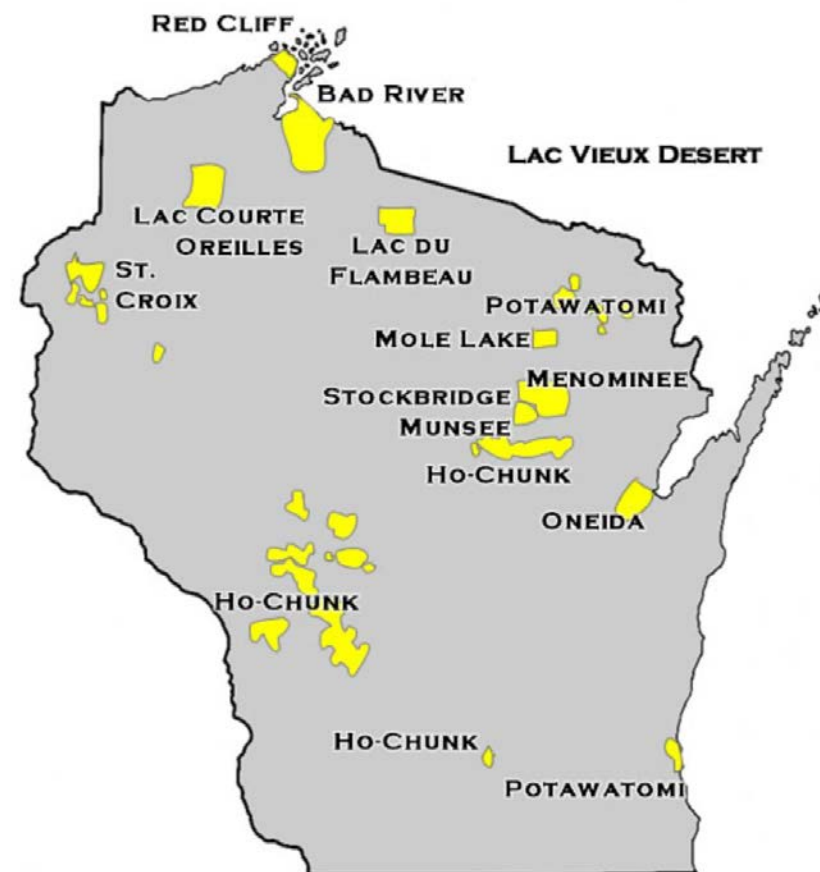
- Do you have any frameworks or considerations you can share that would help us center equity in our recommendations related to this sector?

# Equity

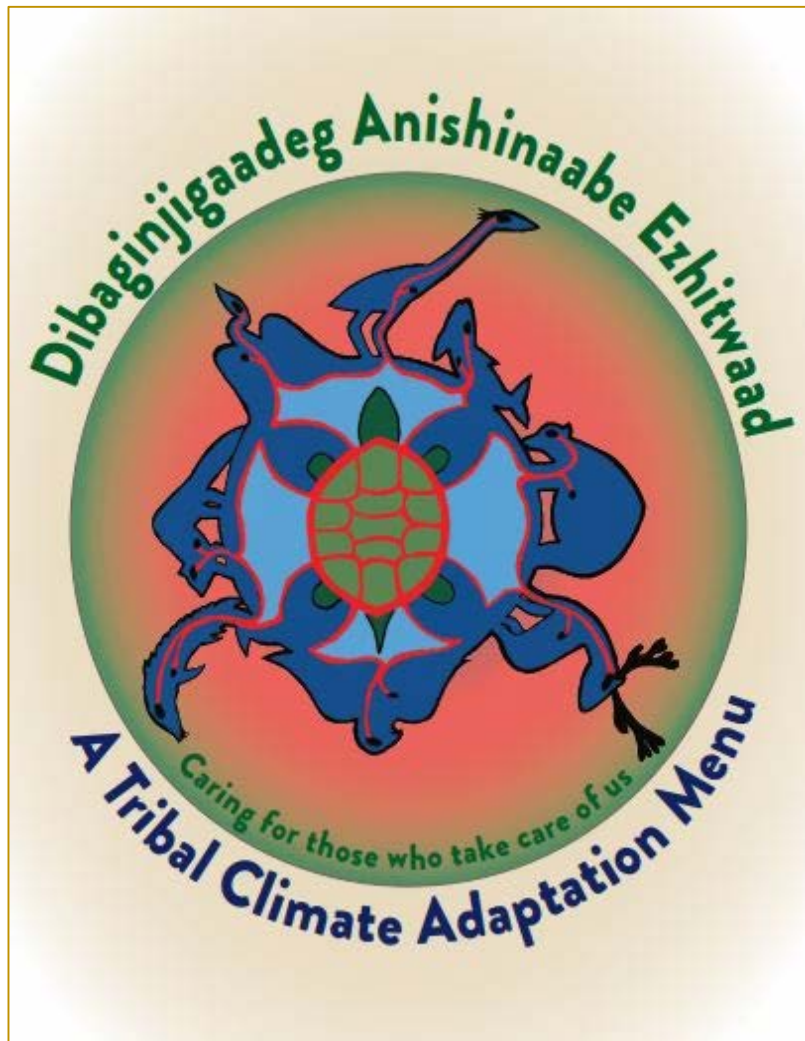
## Ceded Territories in Wisconsin



## Federally Recognized Tribes



# Equity



## Distinct Focus:

- Cultural practices
- Community engagement
- Reciprocity and respect



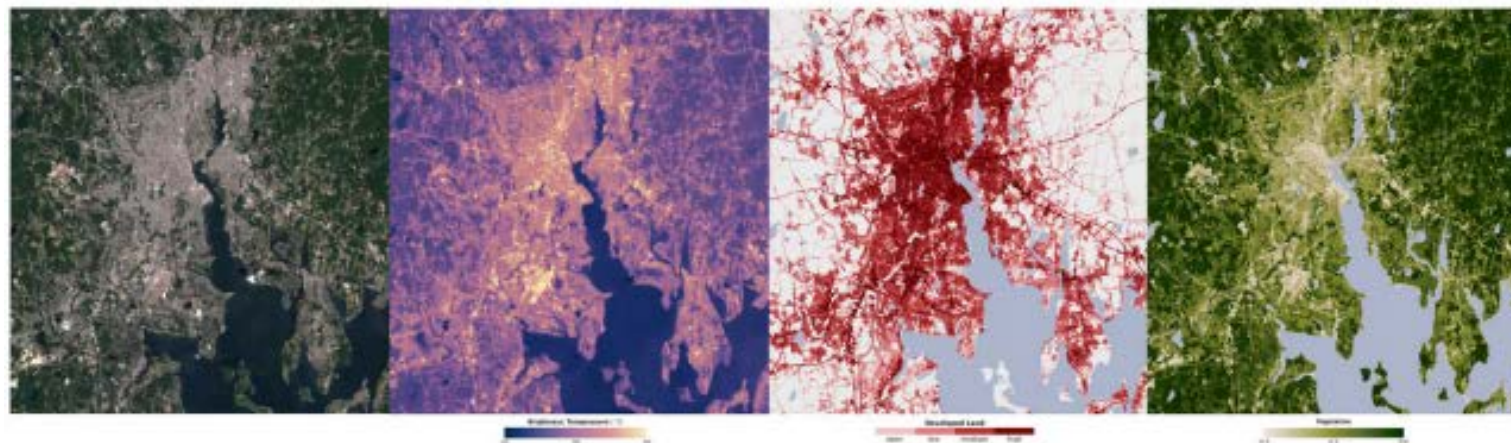
**Questions ?**



# Urban tree-planting

- How Wisconsin could help small, medium and large cities rapidly expand tree planting – both on private property and in the public rights of way? What states have the best urban tree planting programs? What are they doing that we can learn from?

# Urban tree-planting



**Rhode Island Urban Forests for Climate and Health Initiative**

# Prior Work Plan, 2015-2017

- Review of our progress to keep us accountable
- Opportunity to reflect on our purpose
- Useful to share with supervisors and partners

The graphic is a summary of the 2015-2017 work plan. It features a red header with the text 'WISCONSIN INITIATIVE ON CLIMATE CHANGE IMPACTS' and 'Forestry Working Group'. Below the header, it lists two main projects: (1) Forest ecosystem vulnerability assessment and synthesis for northern Wisconsin and western Upper Michigan, and (2) Adaptation and Forest Management in Wisconsin: a flexible workbook approach. Each project is accompanied by a brief description and a small image or diagram. A red box at the bottom states that two Wisconsin projects were recently recognized as Finalists for the 2017 American Society for Adaptation Professionals Prize for Progress.

**WISCONSIN INITIATIVE ON CLIMATE CHANGE IMPACTS** **Forestry Working Group**  
**2015-2017 Work Plan Summary**

**(1) Forest ecosystem vulnerability assessment and synthesis for northern Wisconsin and western Upper Michigan**

The Northern Institute of Applied Climate Science (NIACS) published a forest ecosystem vulnerability assessment, focusing on forests in northern Wisconsin and the western Upper Peninsula of Michigan. Over 40 managers and researchers contributed to the report, from a range of federal, state, tribal, non-profit, academic, and private organizations. In addition to the vulnerability assessment, several companion pieces were produced, including tree species specific handouts. These can be found at: [https://forestadaptation.org/Northwoods\\_treehandouts](https://forestadaptation.org/Northwoods_treehandouts)

In total, 1,300 copies of the assessment have been distributed, in addition to online views and downloads.

**(2) Adaptation and Forest Management in Wisconsin: a flexible workbook approach**

The Northern Institute of Applied Climate Science is providing resources and assistance to help forest managers and landowners develop custom, place-based adaptation plans. A second edition of Forest Adaptation Resources was released in 2016 with a revised Adaptation Workbook and new adaptation menu for Urban Forestry, and an online version was relaunched. The workbook contains a flexible process to guide users through a series of key considerations, as well as a "menu" of possible adaptation actions for forest management. The process is designed to help translate broad-scale information on climate vulnerabilities to project-specific concerns, and to help managers figure out how they can continue to meet their own unique management goals through adaptation. The online resource currently houses over 30 adaptation demonstrations projects in Wisconsin.

Two Wisconsin projects were recently recognized as Finalists for the 2017 American Society for Adaptation Professionals Prize for Progress.



# Current Work Plan, 2017-2019

- “Aspirational” plans to keep us motivated
- Project descriptions and desired outcomes
- Useful to share with supervisors and partners

## WICCI Forestry Working Group

### Work Plan, 2017-2019

Date: October 3, 2017

Completed by the WICCI Forestry Working Group Core Team:

Stephen Handler, NIACS and USFS Northern Research Station ([sdhandler@fs.fed.us](mailto:sdhandler@fs.fed.us))

Linda Parker, Chequamegon-Nicolet National Forest

Brad Hutnik, Wisconsin Dept. of Natural Resources

Kris Tiles, University of Wisconsin-Extension

Matt Dallman, The Nature Conservancy

Jason Holmes, Bayfield County

Alex Wrobel, Great Lakes Indian Fish and Wildlife Commission

#### Background

The WICCI Forestry Working Group (FWG, [www.wicci.wisc.edu/forestry-working-group.php](http://www.wicci.wisc.edu/forestry-working-group.php)) is designed to share information about climate change impacts and adaptation across the forestry community. We also help put information into action by helping foresters and land managers adapt and prepare for future change. Our primary target audience is forestry and natural resources professionals, but other audiences for our work include land managers and owners, forest industry professionals, the academic community, and the interested public.

#### Work Plan

This work plan is designed to outline the goals and projects of the FWG. It has been revised and expanded from an initial plan that guided the FWG from 2015-2017, and it is best described as an aspirational “wish list” to document our vision for what could optimistically be achieved by the FWG. The activities of the group will be determined by our Core Team and by input we receive from the forestry community. Core Team members will collaborate on particular projects and involve additional partners as necessary. The FWG will be flexible and opportunistic, and this Work Plan can be amended based on future needs or interest.

#### Projects

The following priority projects will be the focus of the FWG for the next years. New projects may be added to this list, and many of the projects listed below will continue beyond December 2019. These projects are discussed in more detail in the following pages:

1. Communicate relevant climate change information across the forestry community
2. Develop useful outreach materials and tools for foresters, land managers, and landowners
3. Lead adaptation training and develop real-world adaptation examples
4. Integrate climate change adaptation and resilience into decision-making processes of land management agencies
5. Incorporate climate change information into forest inventory software