

A framework for assessing climate change vulnerability and identifying adaptation strategies in the Central Hardwoods region

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www.climateframework.org

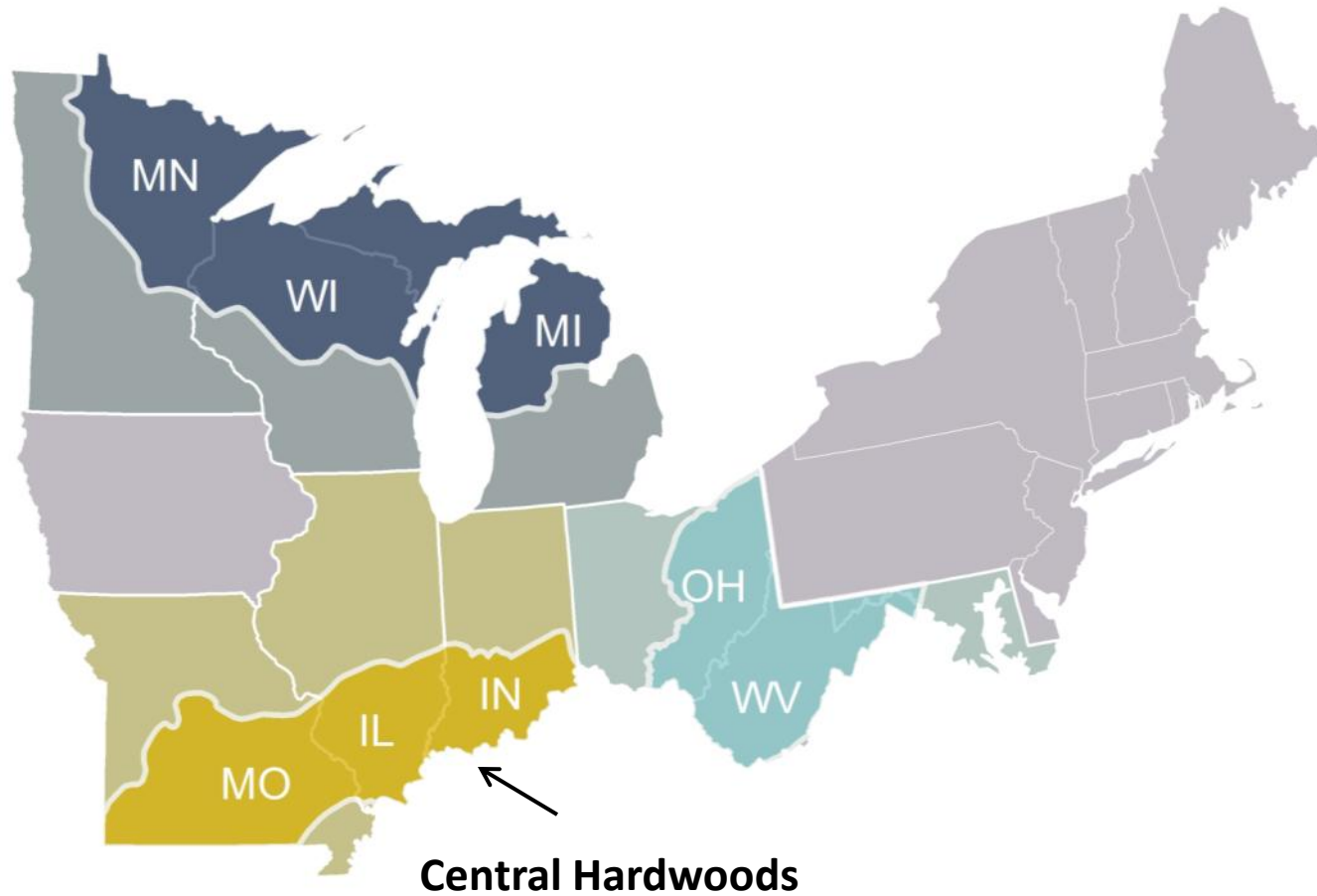


Where we have the greatest certainty about climate change



Where management decisions are made

Climate Change Response Framework



Where we have the greatest certainty about climate change



Where management decisions are made

Climate Change Response Framework

Partnerships

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graph TD; A[Partnerships] --> B[Vulnerability Assessment]; B --> C[Forest Adaptation Resources]; C --> D[Adaptation Projects];
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work with scientists, land managers
federal, state, NGO, university,
industry organizations

Vulnerability Assessment

understand how climate change
may affect forests in an ecoregion

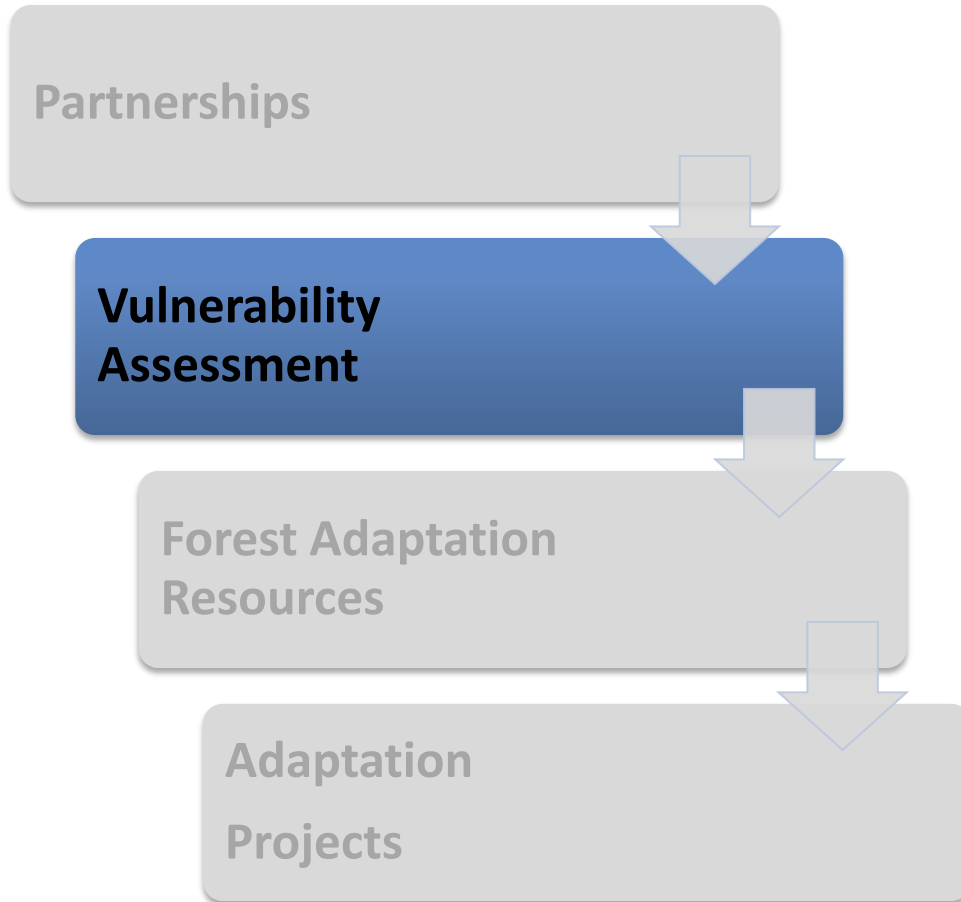
Forest Adaptation Resources

identify strategies, approaches, and
tactics to adapt to climate change

Adaptation Projects

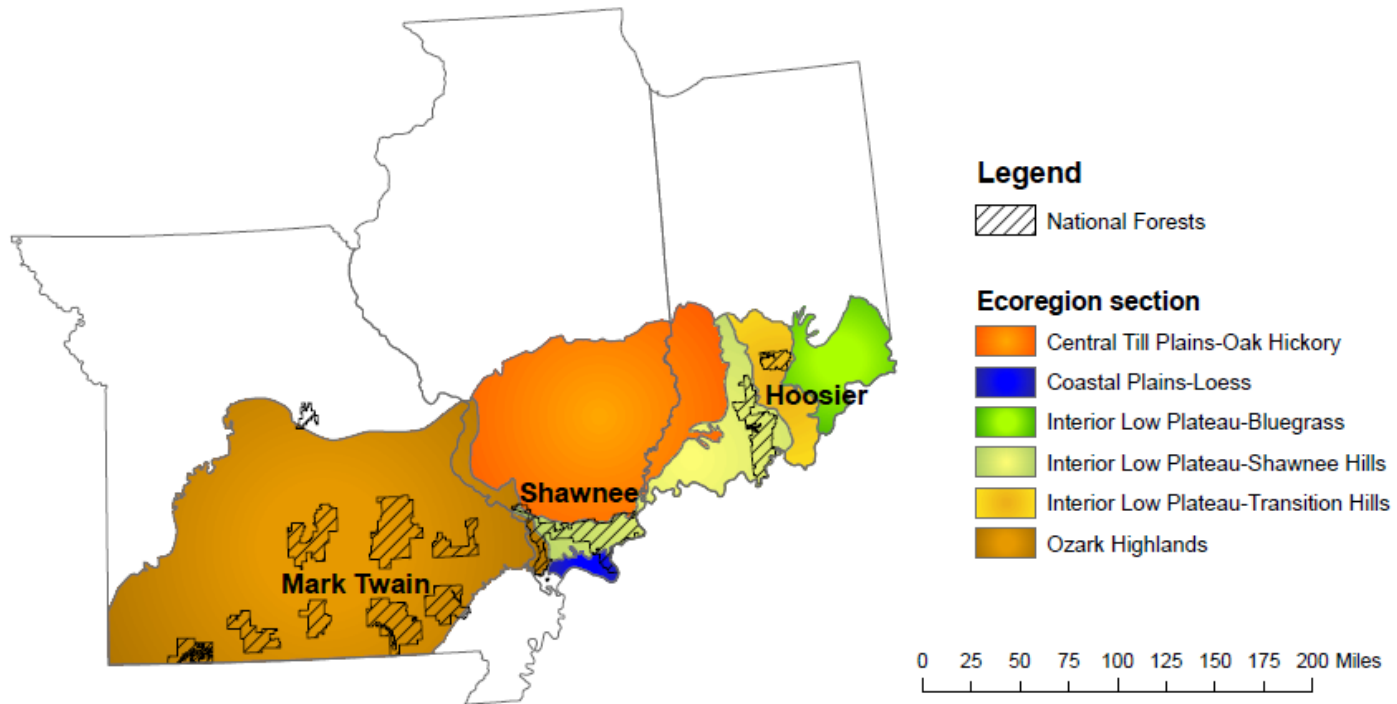
incorporate information
into decision-making and on-the
ground projects

Climate Change Response Framework



understand how climate change may affect forests in an ecoregion

Assessment Area



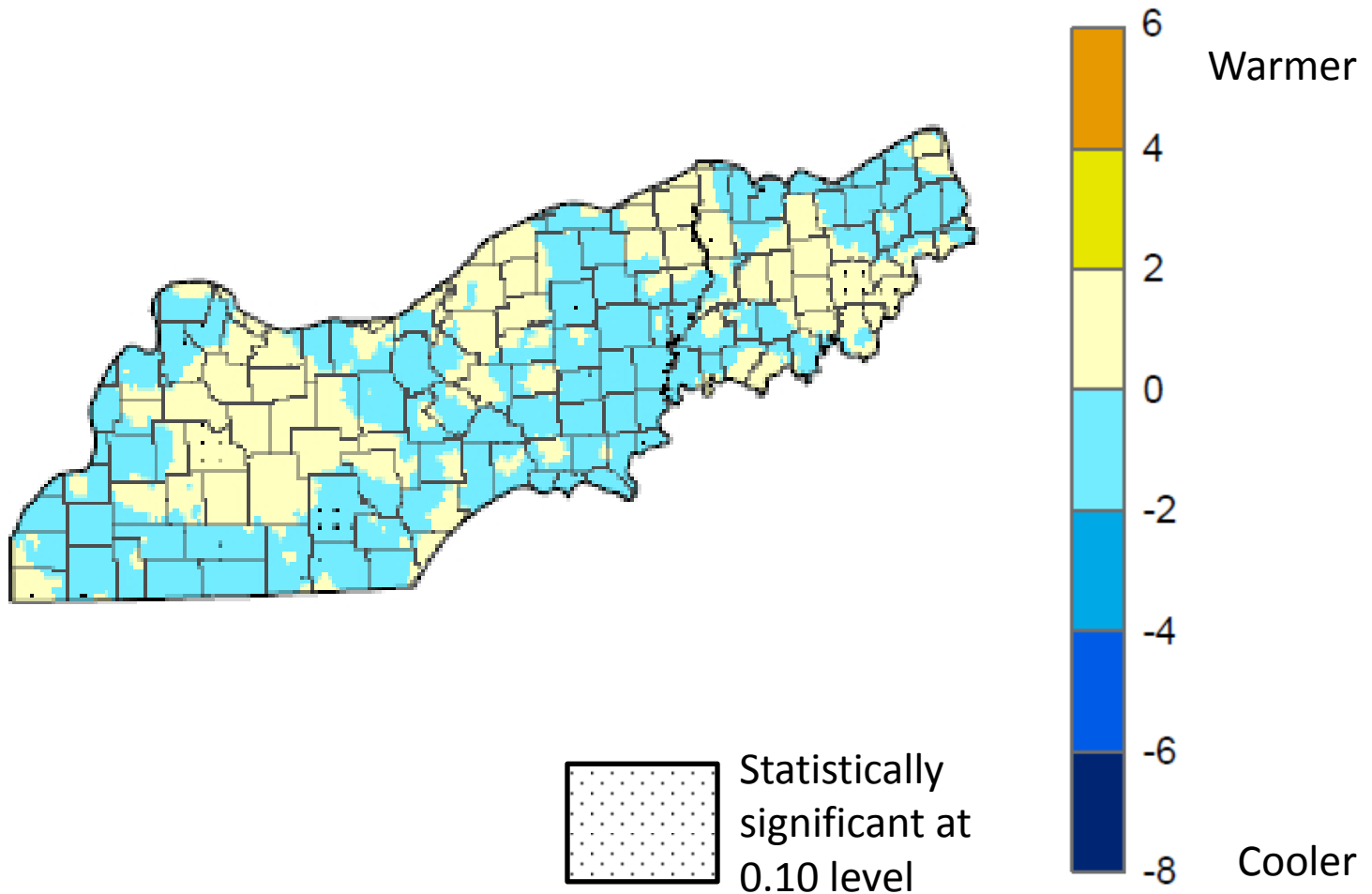
Ecological Subregions: Sections and Subsections of the Conterminous United States

Compiled at 1:500,000 to 1:1,000,000 scale in participation with Federal and State agencies and nongovernmental partners by David T. Cleland, Jerry A. Freeouf, James E. Keys, Jr.; Gregory J. Nowacki, Constance A. Carpenter, and W. Henry McNab.

U.S. Department of Agricultural, Forest Service

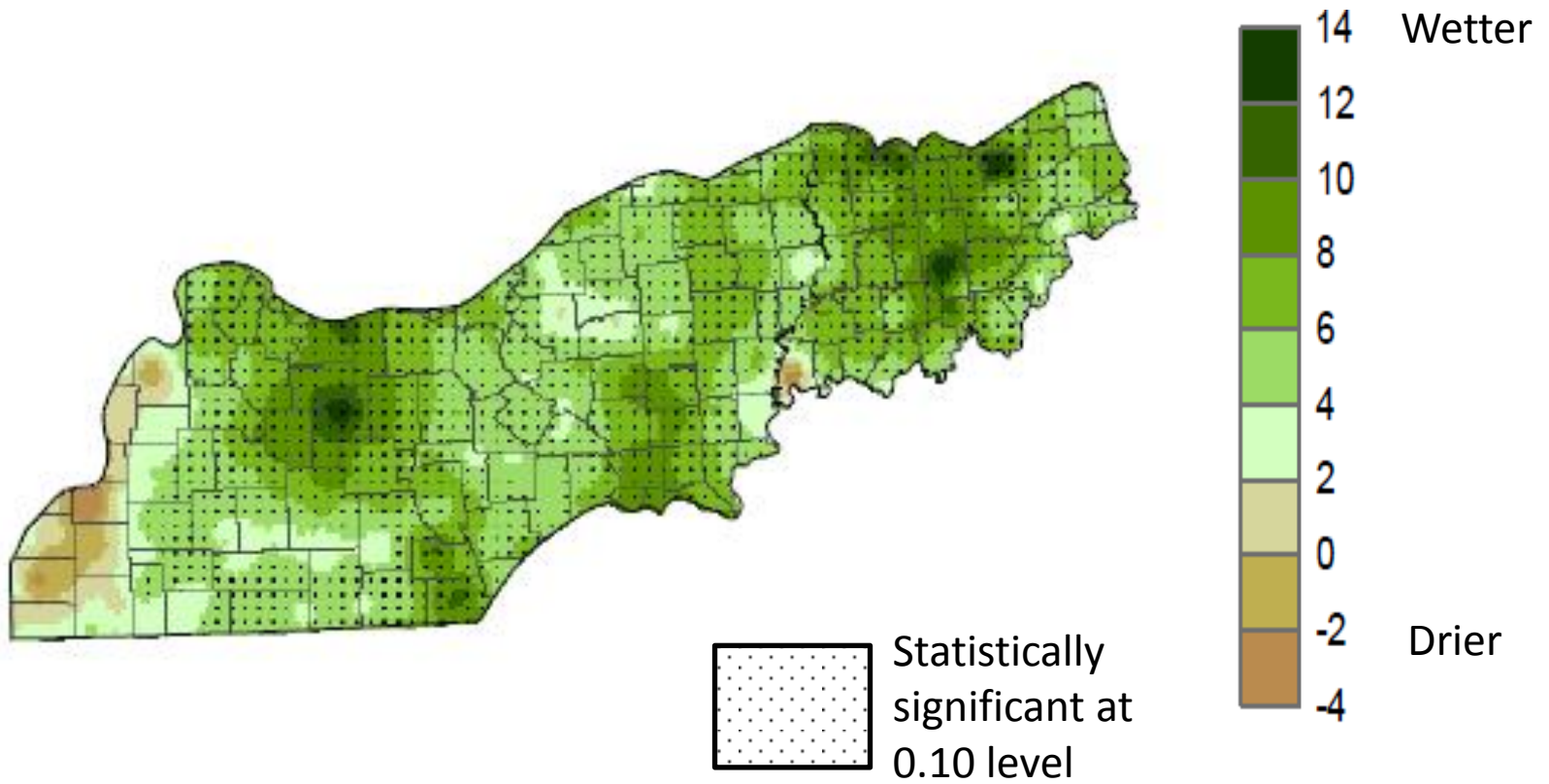
Not a lot of Temperature Change in Historic Record

1901-2011
Temperature
Change (F)



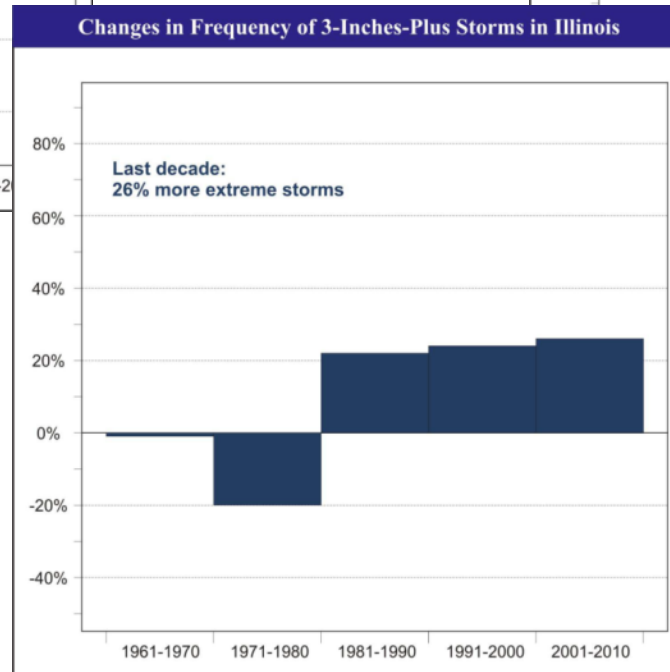
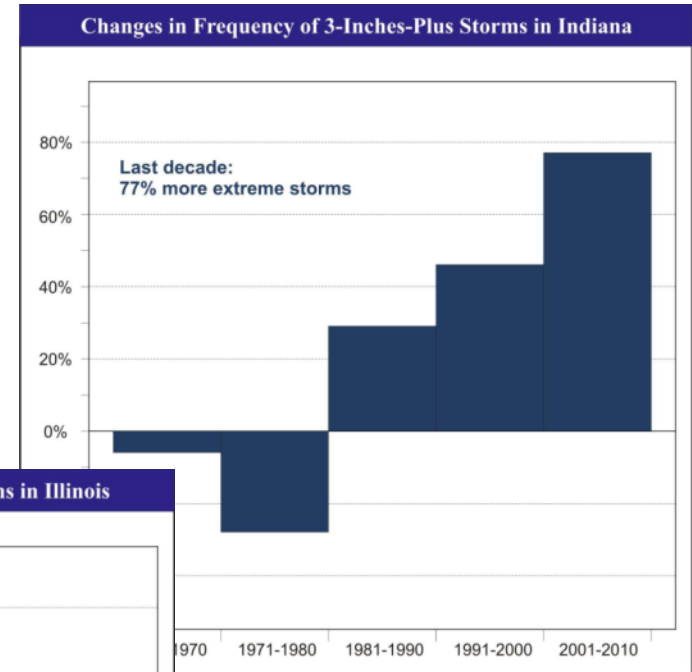
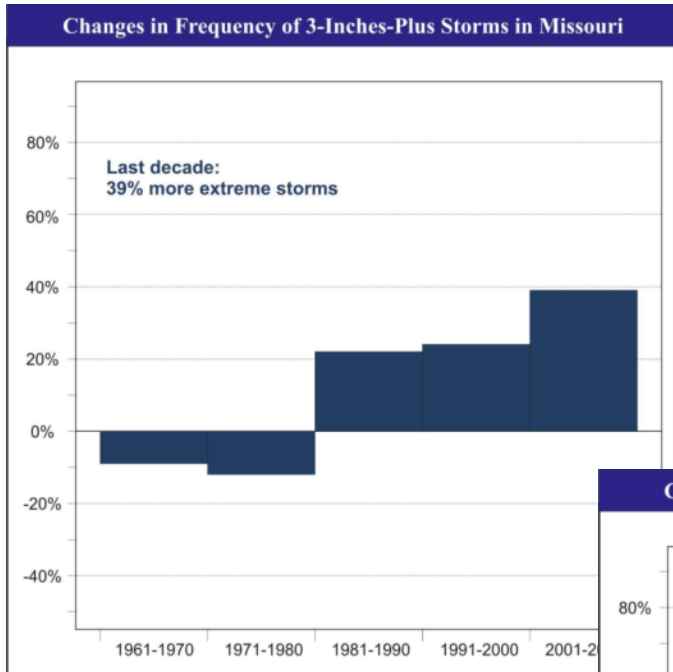
Precipitation Has Increased

1901 - 2011
Change in annual
Precipitation (in)



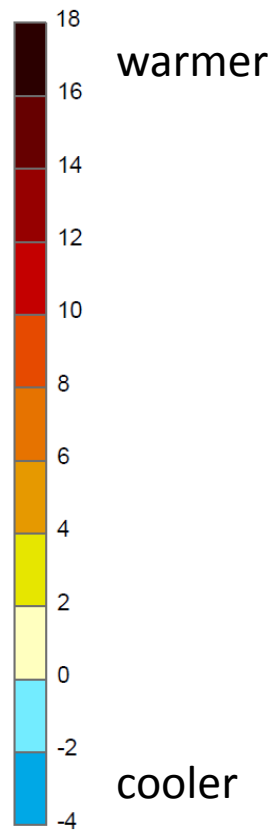
Average annual : 42.3 inches

Heavy Precipitation Events Have Increased

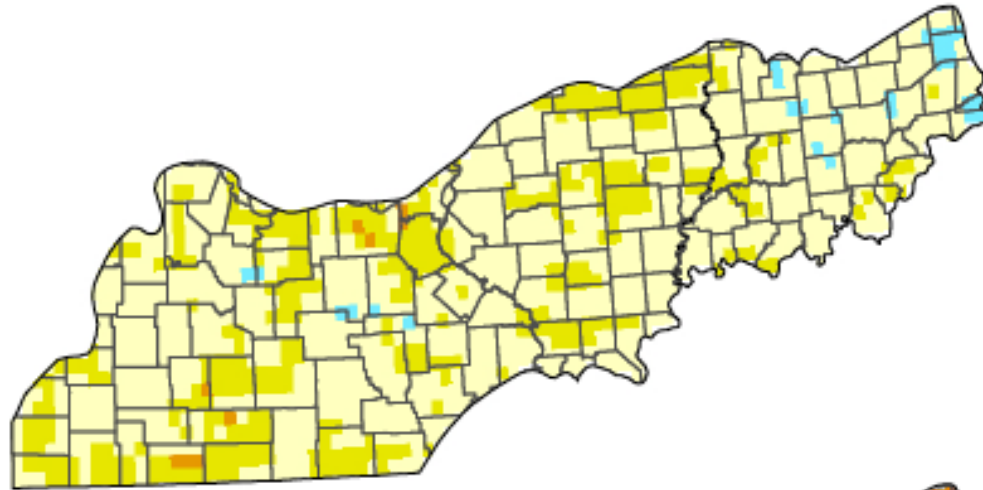


Mean Annual Temperatures Will Almost Certainly Get Warmer

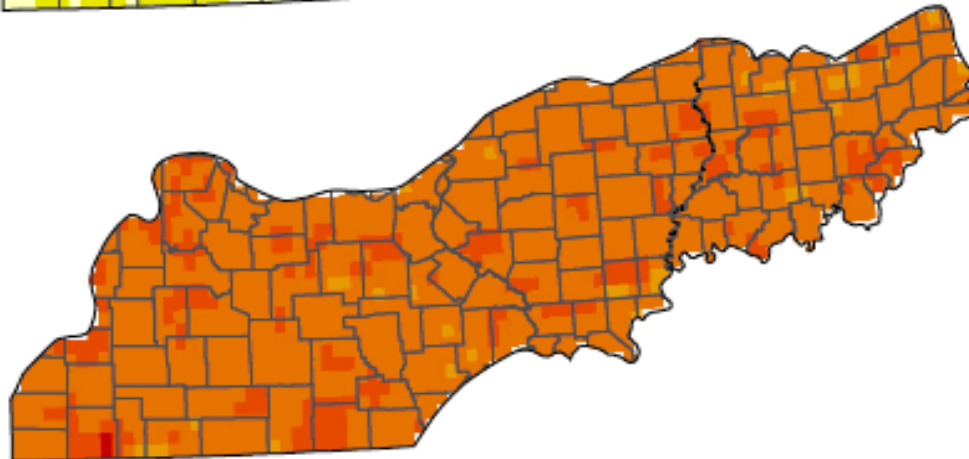
2070 - 2099
departure
from baseline
(°F)



Low
Emissions



High
Emissions



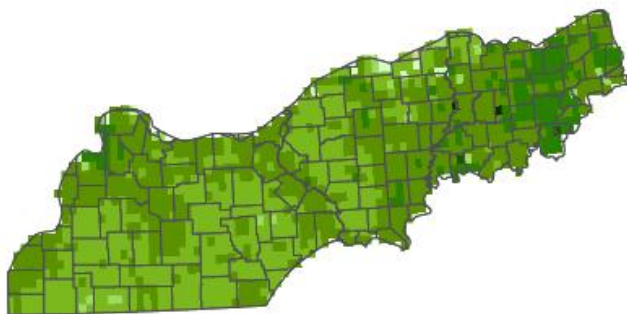
Summers or Falls May Be Drier

Low Emissions

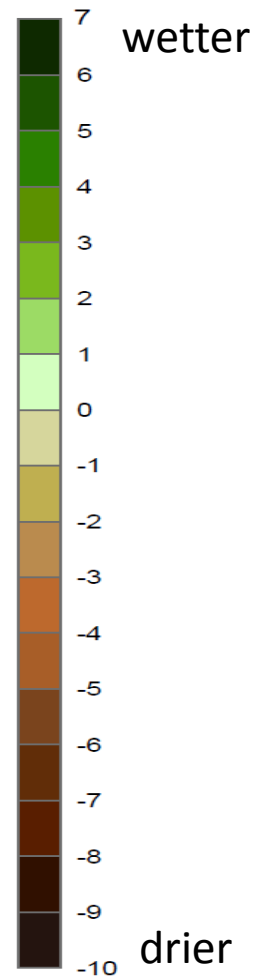
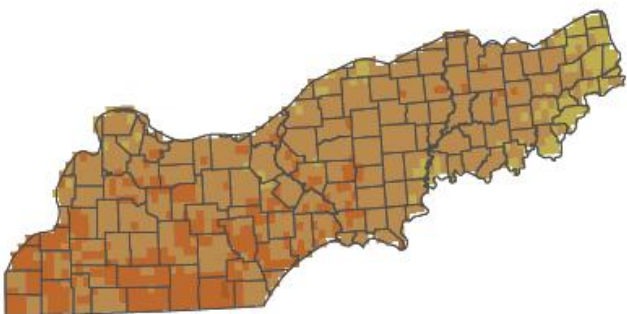
High Emissions

2070 - 2099
departure
from baseline
(inches)

Summer



Fall



Tree Species Will be Affected Differently

Winners



Shortleaf Pine,
“southern” species

Losers



Sugar Maple,
“northern” species

Still in the Game



Eastern Redcedar,
species
with wide distributions

Based on three separate models (Tree Atlas, LINKAGES, LANDIS PRO)

Other Forest Impacts

Increased probability of wildfire by end of century



Greater susceptibility to non-native species invasions



Carbon dioxide fertilization



More pest and disease outbreaks

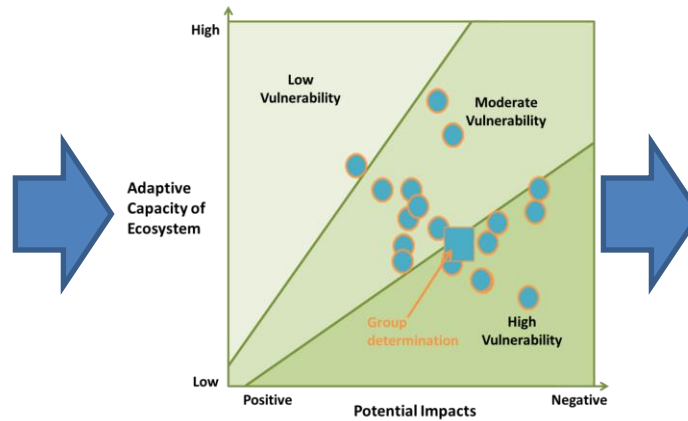


Sources: Moritz et al. 2012, Dukes et al. 2009, Lenihan et al. 2008

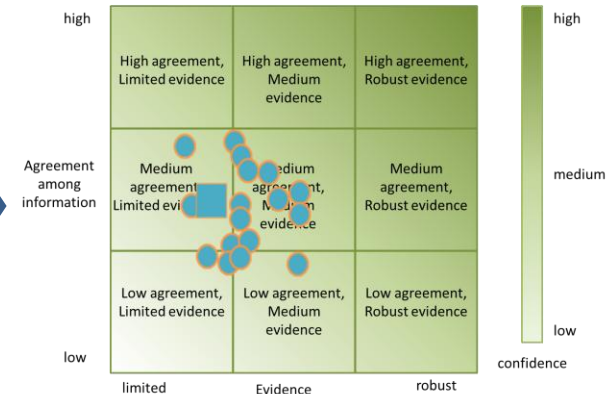
Assessing Vulnerability



Panel of experts evaluate information



Vulnerability determined based on impacts and adaptive capacity

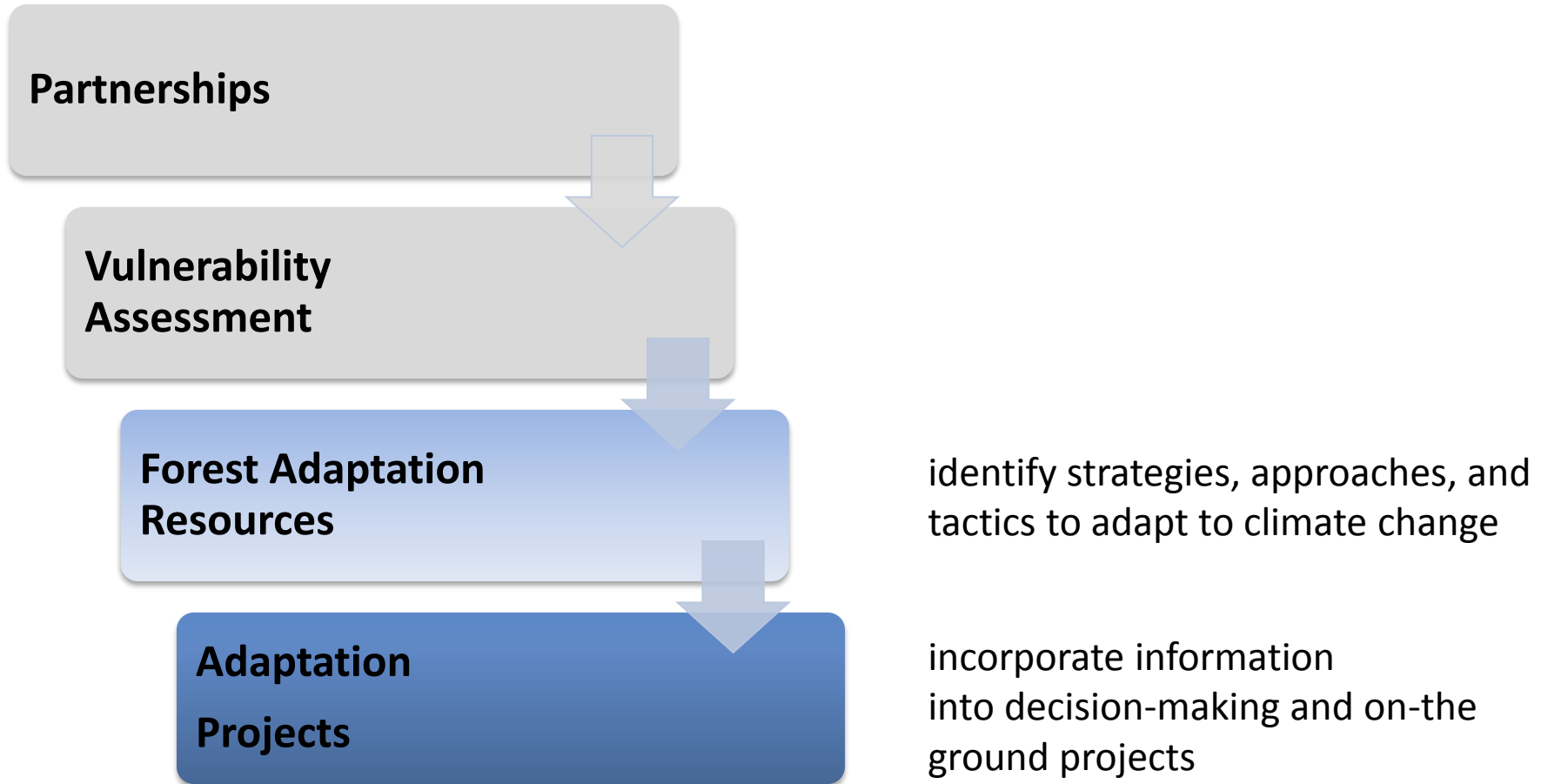


Level of Confidence Determined

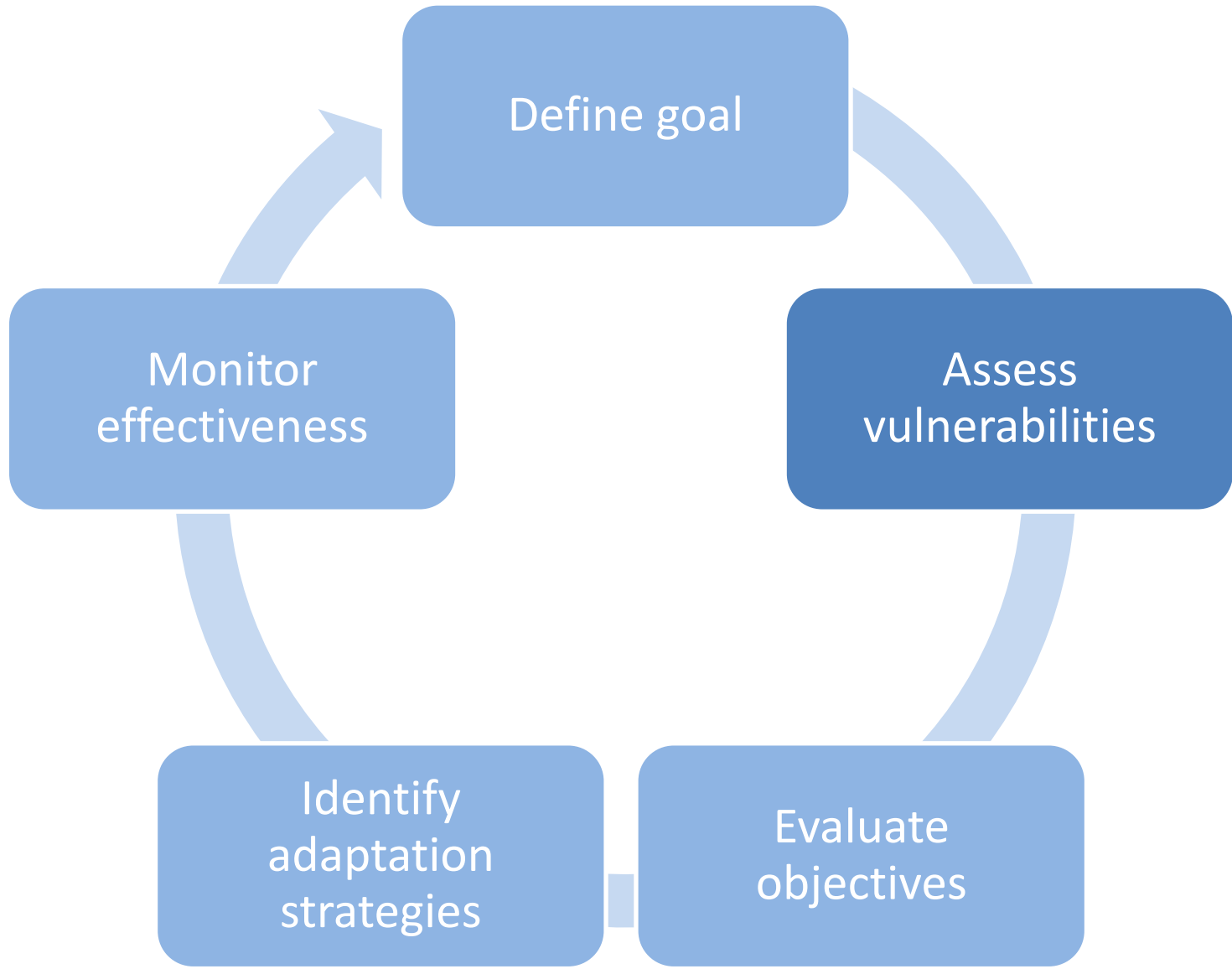
Communities Assessed

Community Type	Potential Impacts	Adaptive Capacity	Vulnerability	Confidence
Barrens	Moderate	High	Low	Medium-high agreement; Medium evidence
Closed Woodland	Positive	High	Low	Medium agreement; Limited evidence
Open Woodland	Positive	High	Low	Medium agreement: Medium to Limited evidence
Dry-Mesic Upland Forest	Moderate	High	Low-Moderate	Medium to high agreement; Medium evidence
Flatwoods	Slightly Positive	Moderate	Low-Moderate	Medium agreement.; Limited to medium evidence
Glade	Slightly Positive	Moderate	Low-Moderate	Medium to high agreement; Medium evidence
Mesic Bottomland Forest	Moderate	Moderate	Moderate	Medium agreement; Medium to limited evidence
Wet Bottomland Forest	Slightly Negative	Moderate	Moderate- High	Medium agreement; Medium to limited evidence
Mesic Upland Forest	Negative	Low	High	Medium-high agreement; medium evidence

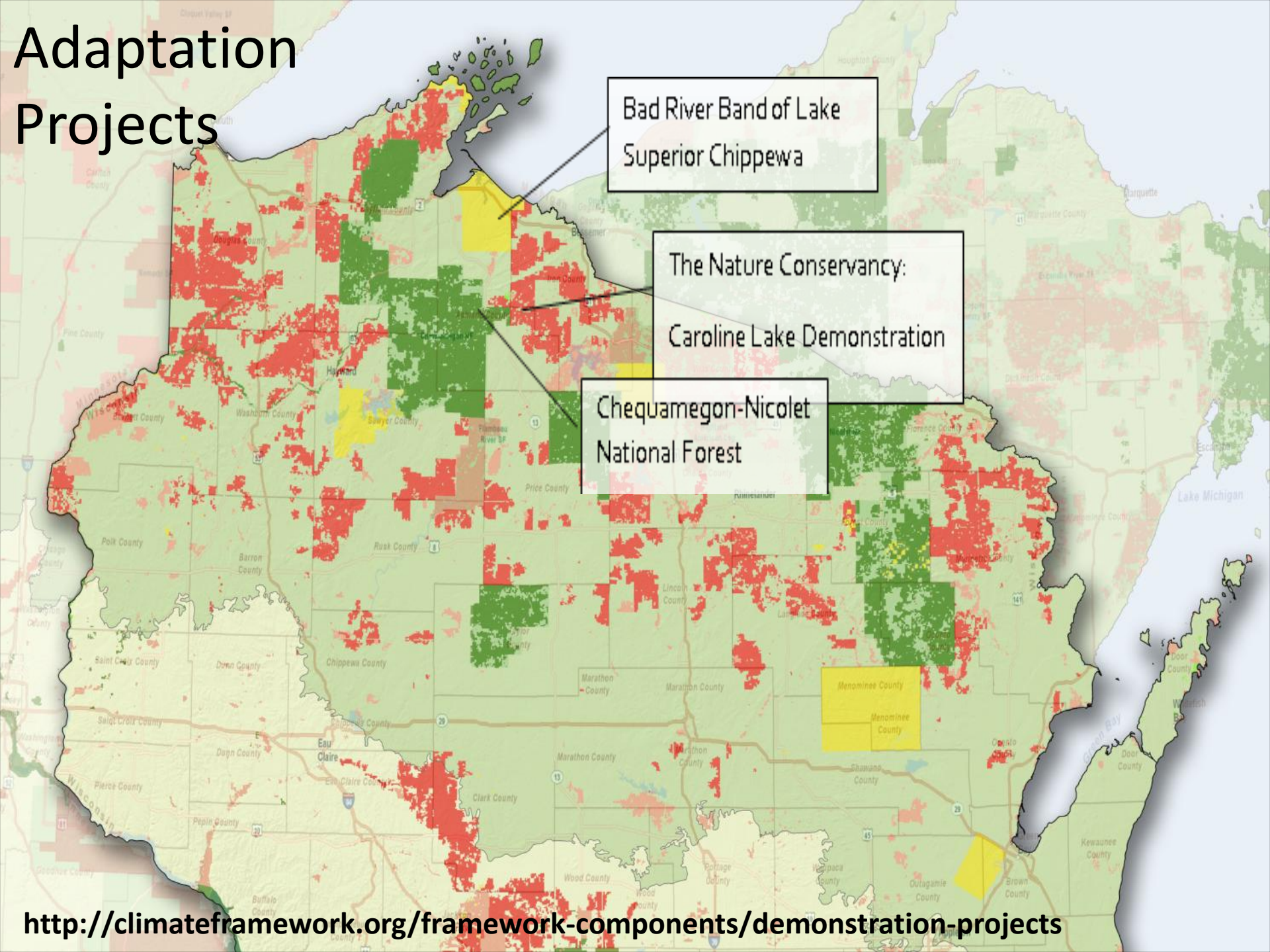
Climate Change Response Framework



Adaptation Workbook



Adaptation Projects



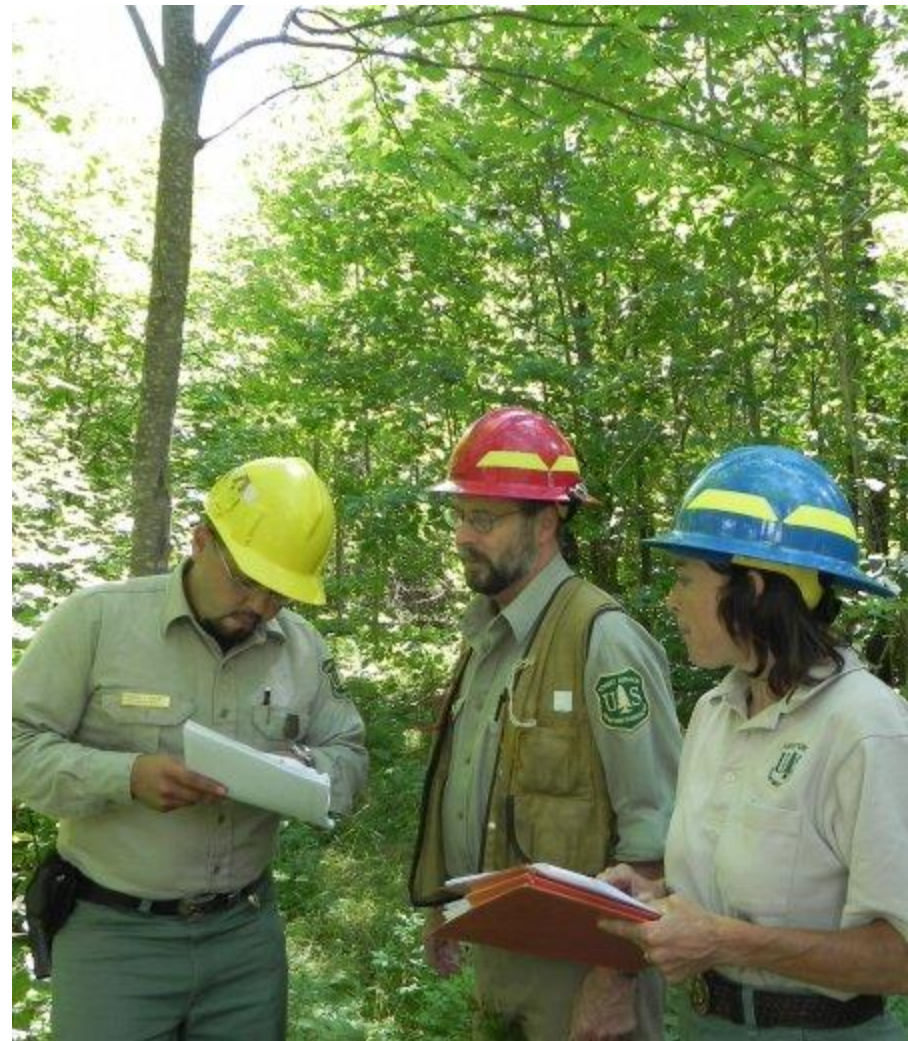
Bad River Band of Lake
Superior Chippewa

The Nature Conservancy:
Caroline Lake Demonstration

Chequamegon-Nicolet
National Forest

Example: Aspen Stands on the Park Falls District, Chequamegon-Nicolet NF

- Adjustments made to silvicultural prescriptions
- Favor species more likely to do well under altered climate
- Monitoring metrics identified





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