



United States Department of Agriculture  
Northern Forests Climate Hub

# Responding to Climate Change Impacts in Forested Watershed Management



[www.ForestAdaptation.org/water](http://www.ForestAdaptation.org/water)

**Danielle Shannon**

Northern Institute of Applied Climate Science

A changing climate will affect the condition and quality of forested watersheds



Forests & wetlands



Water quality



Water quantity



Aquatic habitat

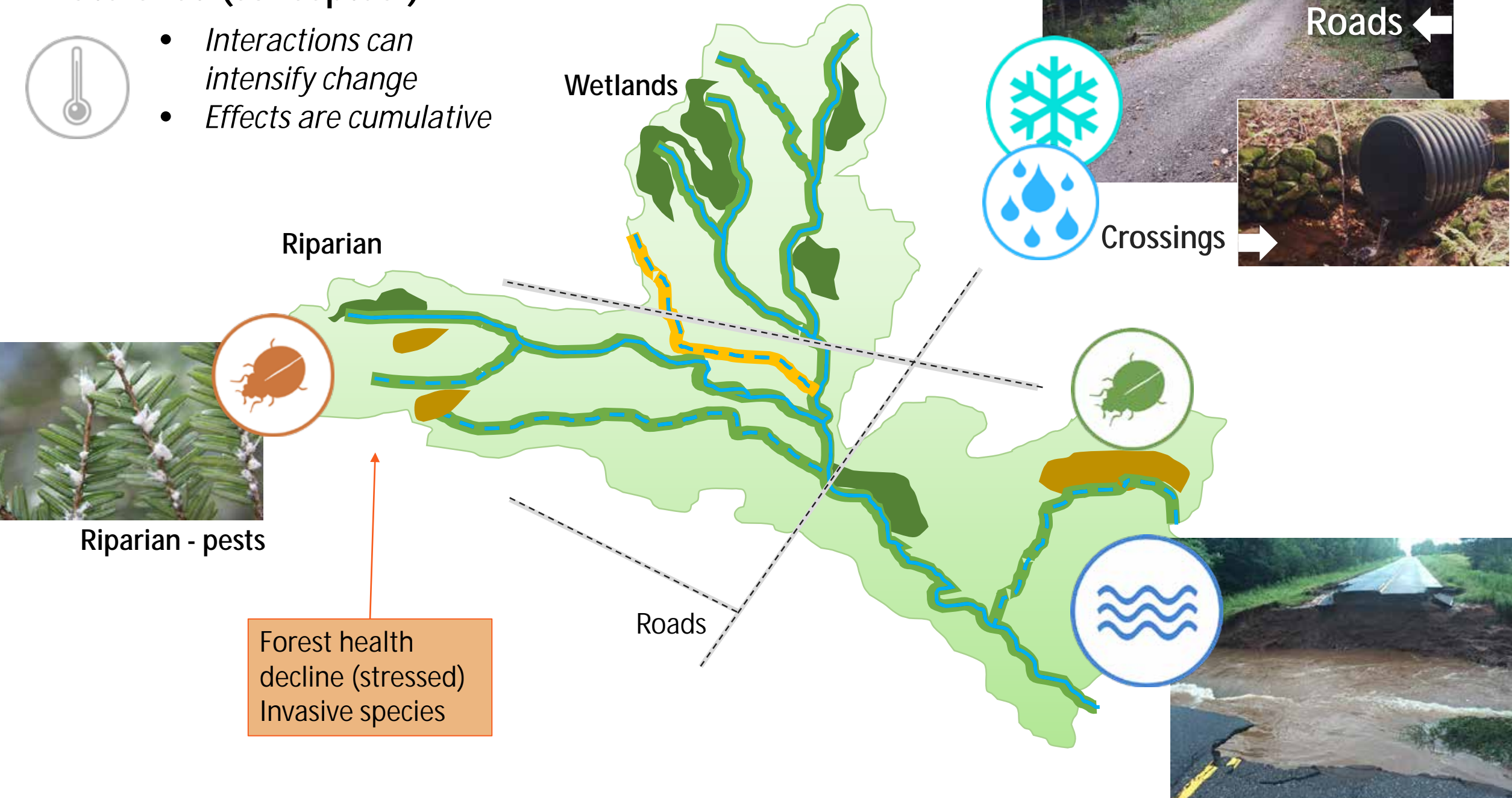


Infrastructure & facilities

# Watershed (conceptual)



- *Interactions can intensify change*
- *Effects are cumulative*



Forest health decline (stressed)  
Invasive species

Riparian - pests

Roads ←

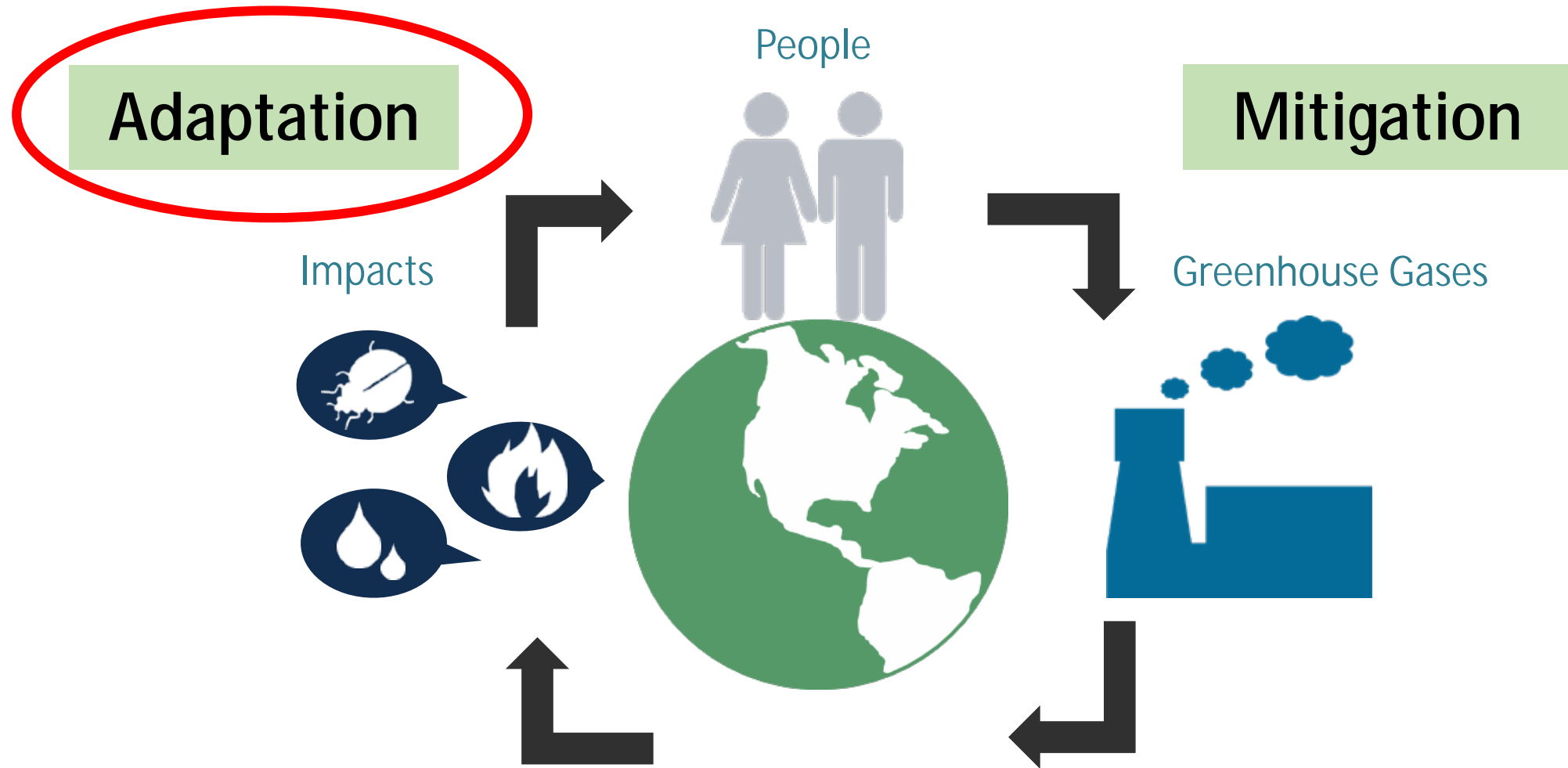
→ Crossings

Roads

Riparian

Wetlands

# How do we respond to climate change?



**Adaptation** is the adjustment of systems in preparation or in response to climate change.



Adaptation actions are designed to specifically address climate change impacts and vulnerabilities in order to meet goals and objectives

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Ecosystem-based adaptation activities that build on sustainable management, conservation, and restoration.

**Adaptation** is the adjustment of systems in preparation or in response to climate change.



- What do you **value**?
- How much **risk** are you willing to tolerate?

If you want a single “answer” for how to respond to climate change, it’s

“It depends”

It depends on **where** you are working and **what** you’re trying to achieve.

# Adaptation Concepts

**Manage for Persistence:**  
Ecosystems are still recognizable as being the same system (character)

**Manage for Change:**  
Ecosystems have fundamentally changed to something different



Reduce impacts/  
Maintain current  
conditions

Forward-looking/  
Promote change

**TRANSITION**

# Watersheds + forests + climate change

Can land management enhance the ability of a system to  
**cope** with climate change  
and **meet your goals and objectives?**

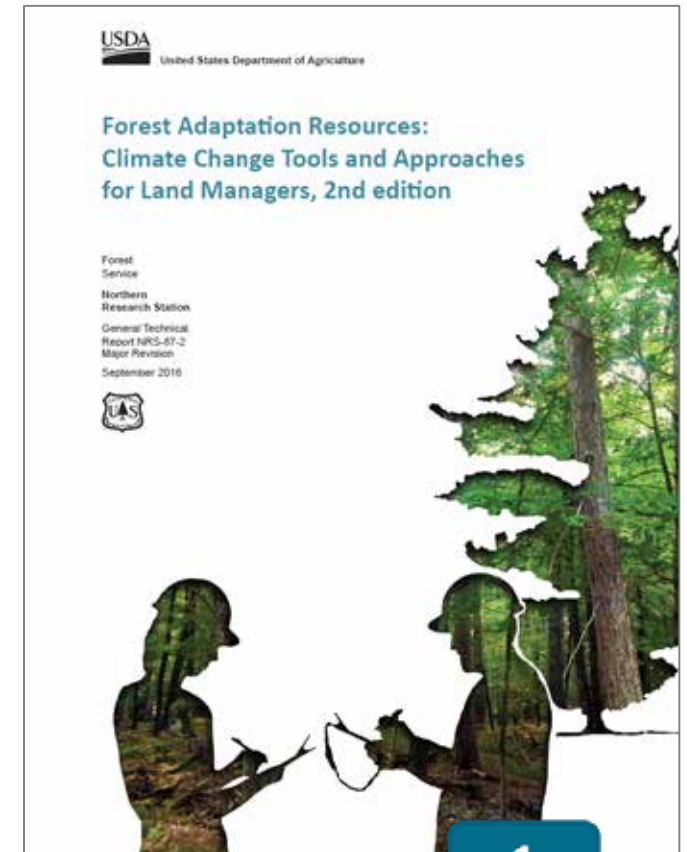


Making a plan!



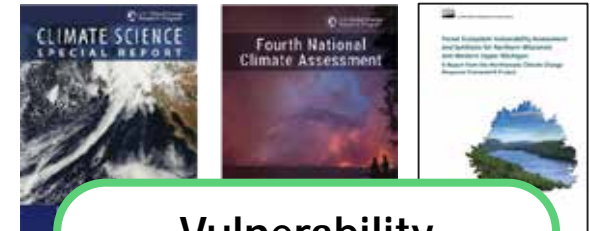
# Forest Adaptation Resources

- Designed for a variety of land owners with diverse goals
- Works at project-level
- Centers around manager's expertise, and judgement
- Does not make recommendations

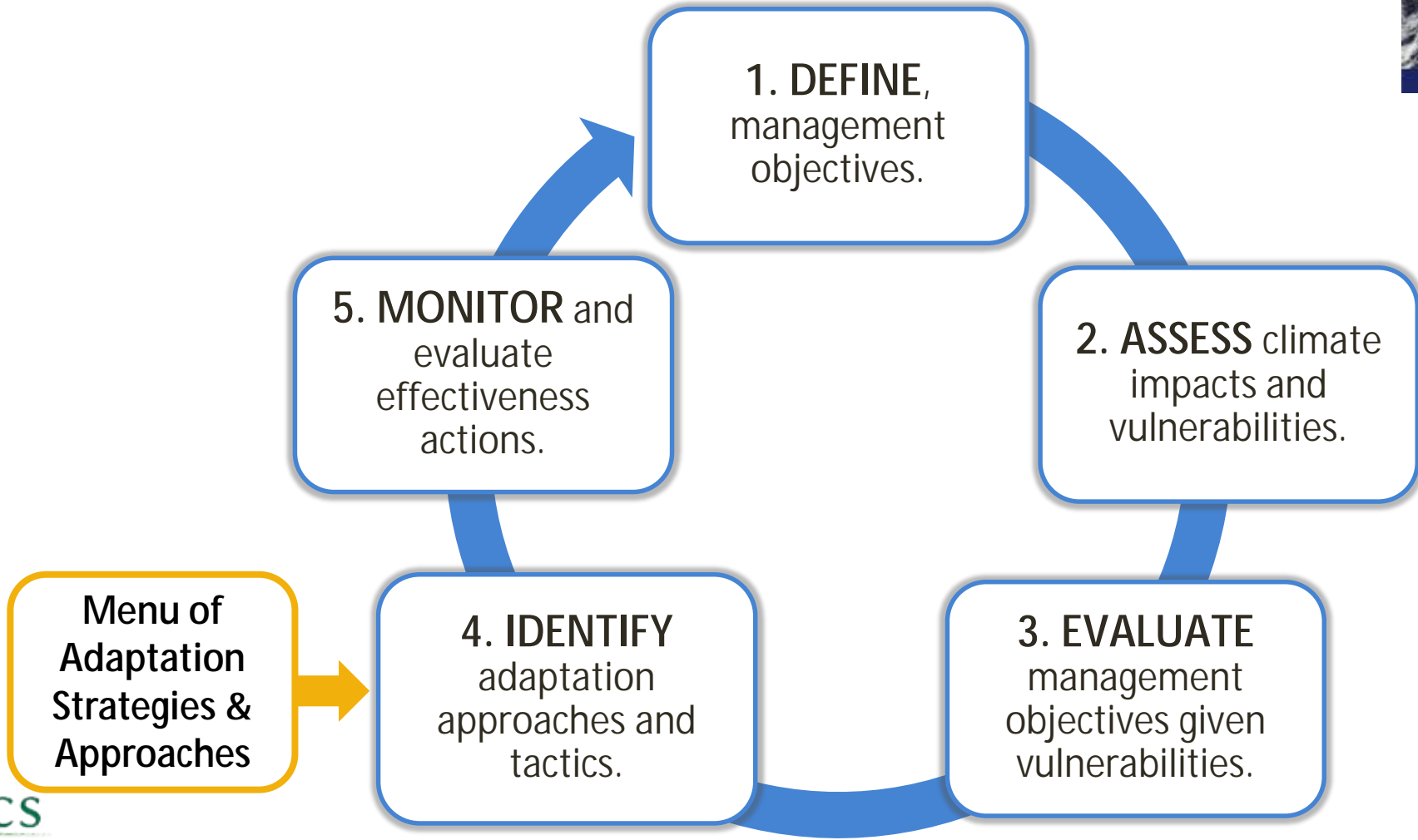


# Adaptation Workbook: Decision-support tool

Provides “structured flexibility”



Vulnerability assessments, scientific literature, and other resources



# Adaptation Menus of Strategies and Approaches

A “menu” of possible actions that allows you to decide what is



# Adaptation Menus of Strategies and Approaches

A collection of plausible adaptation actions that is:

- Specific to a discipline
- Organized into a tiered hierarchy
- Thorough and comprehensive (including opposing ideas!)



# Adaptation Strategies for Natural Resource Management

Adaptation topics = a variety of perspectives



• Forests

• Urban forests

• Agriculture

• Forested watersheds

• Tribes & cultural resources

• Carbon management

• Non-forested Wetlands\*

• Wildlife\*

• Coastal habitats\*, Grasslands\*,  
Glacial Lakes,

*\*Resources in development*

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

# Adaptation Resources: Forests

- Forest management focused on habitat quality, tree species, landscape connectivity and more.
- Vegetation focus



Forest & Ecosystem  
Management

*Adaptation  
Strategies and  
Approaches*



## FOREST Adaptation Strategies

- Sustain **ecological functions**
- Reduce biological stressors
- Reduce risks related to disturbance
- Maintain/create **refugia**
- Enhance structural **diversity**
- Increase **redundancy**
- Promote **landscape connectivity**
- Enhance **genetic diversity**
- Facilitating **change, and community transitions**

# Adaptation Resources: Forests + Water

- Forest management for the maintenance/enhancement of water resources in a watershed
- Resources now reflect a hydrologic & watershed perspective



*Adaptation Strategies and Approaches focus on these topics*



# Watershed Adaptation Strategies: Big ideas

Sustain fundamental hydrologic processes



Accommodate altered hydrologic processes

Maintain and enhance water quality



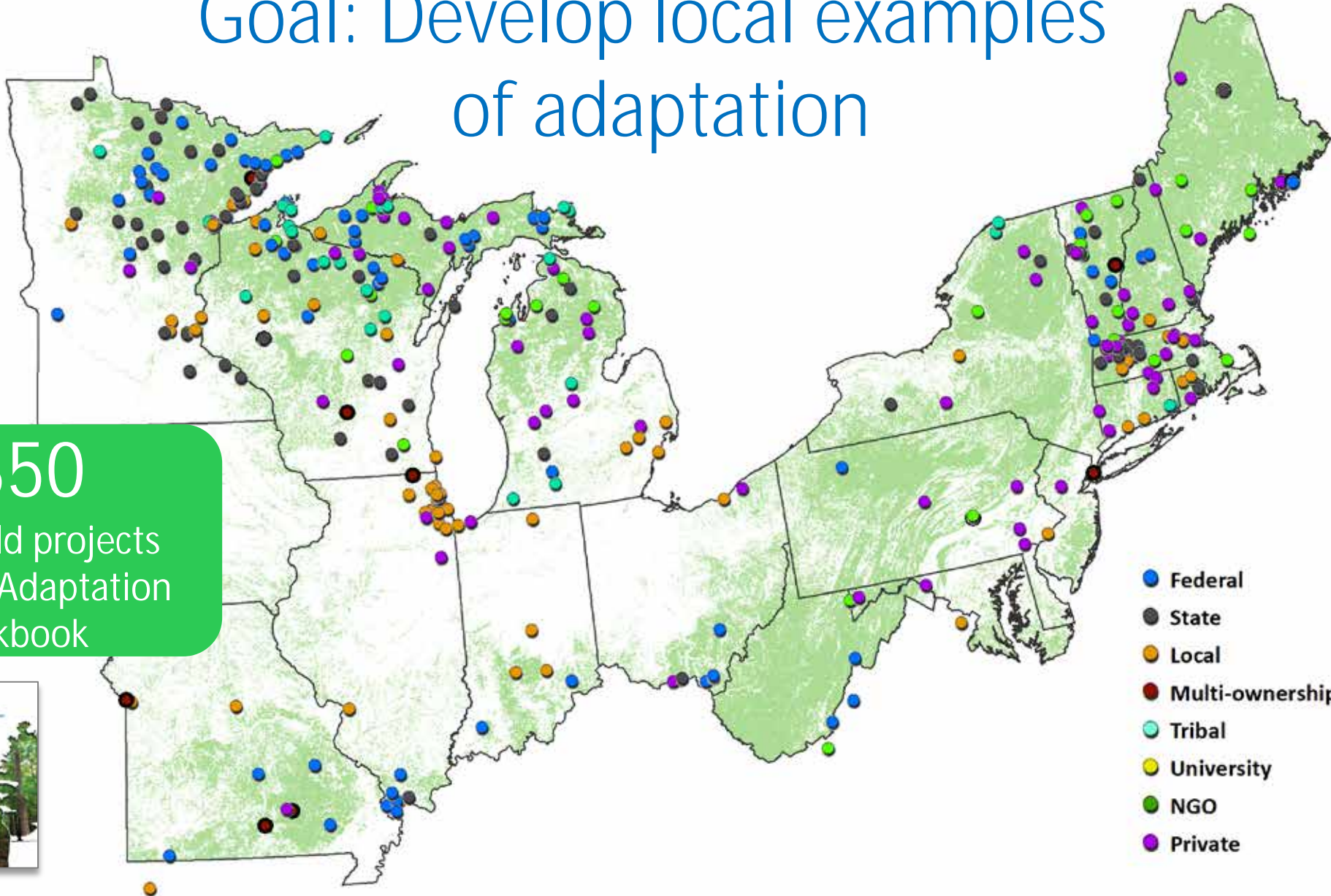
Maintain or restore forests and vegetative cover



Design and modify infrastructure to accommodate future conditions

Facilitate forest ecosystem adjustments through species transitions

# Goal: Develop local examples of adaptation



+350

Real-world projects  
using the Adaptation  
Workbook



[Forestadaptation.org/demos](http://Forestadaptation.org/demos)

# Adaptation Examples!



# Adaptation in the wild

Examples: Coping with too much water

- Shorter, warmer winters
- Increase frequency of rain-on-snow events
- Reduced seasonal snowpack depth and retention



## Transition/Resilience

Strategy 5. Accommodate altered hydrologic processes

Approach 5.4: Respond to or prepare for excessive overland flows (surface runoff)

Using downed wood to deflect & infiltrate snowmelt runoff to trout stream

- Retain trees better adapted to future conditions
- Plan for more freq. winter melting & runoff
- Enhanced infiltration, protect snowpack, increase retention of water on-site

More info at: [ForestAdaptation.org/MNdnrKnifeRiver](https://ForestAdaptation.org/MNdnrKnifeRiver)

# Adaptation in the wild

Examples: Coping with too much water

- High intensity rain events
- Flashy high velocity streamflow
- Warmer summers, reduced thermal refugia



Resilience

**Strategy 6: Design and modify infrastructure to accommodate future conditions**

**Approach 6.1: Reinforce infrastructure to meet expected conditions**

Improved structures:

- Increases hydrologic connectivity
- Provides Aquatic Organism passage
- Increases resilience to extreme storms & conveys lower low flows

More info at: [forestadaptation.org/TU-ne](https://forestadaptation.org/TU-ne)



# Join us for a training! In-person or online

- Create custom adaptation plans using Adaptation Workbook
- Regional or topical focus

**In-person** 1-2 day interactive workshop



## Online



- Distance learning course
- 8 weeks – 1 session/week
- Access to adaptation coaching

Upcoming  
Course:  
Winter 2020!

[forestadaptation.org/training](https://forestadaptation.org/training)



# Closing Thoughts...

## Uncertainty is the new certainty

*Incorporate it, don't succumb to decision paralysis*

## Same job, new challenges

*Similar stressors, but new patterns and agents*

## Adapt based on values and risk tolerance

*Think about place and objectives within the context of risk and values*

## Document rationale and intent

*...then share your plan!*



*Thank you!*

Danielle Shannon  
dshannon@mtu.edu



A photograph of a clear glass filled with water, which is splashing onto a dark, textured surface. The water is captured in mid-air, creating a dynamic and energetic scene. The background is blurred, focusing attention on the glass and the splash.

**It's not like water  
falls from the sky.**

**Oh wait, it does.  
Help it get back  
into the ground.**

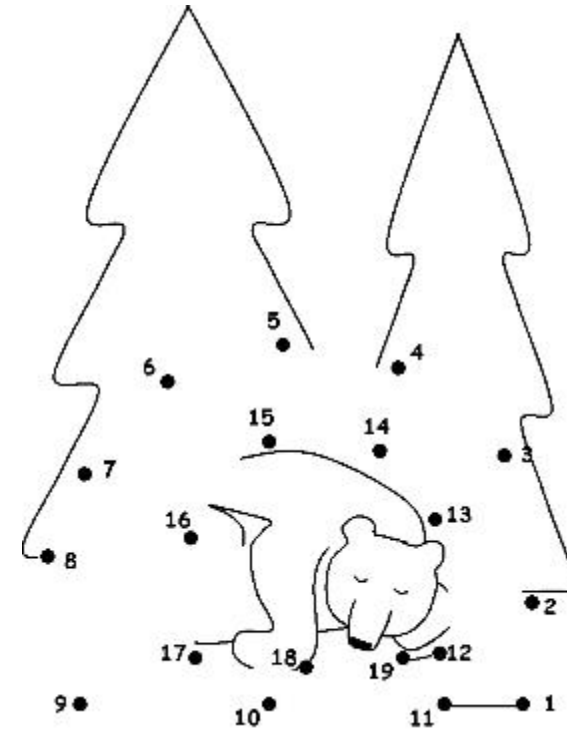


# Actions for Adaptation

*...are*

Connect the dots!

- What are your management goals and objectives?
- How might your ecosystem be uniquely affected by climate change?
- How are your goals challenged? Are they still feasible?
- What specific actions can you take to address specific impacts?



# Actions for Adaptation

*...are  
...but not always different*

“Climate-informed” decisions still reflect

- Restrictive mandates, plans, laws, etc.
- Public perception
- Costs
- Values
- Other barriers to change



# Taking action



**Prioritization:** based on the vulnerability of resources and on the likelihood that actions will be effective in reducing vulnerability.

**"No regrets" decisions:** Actions that result in a wide variety of benefits under multiple scenarios and have little or no risk.

**Precautionary actions:** Where vulnerability of an ecosystem is high, taking precautionary actions to reduce risk and protect in the near term.

**Managing for variability and uncertainty:** Increasing climate variability will lead to equal or greater impacts that will need to be addressed.

**Managing multiple stressors:** Where impacts from changing climate create ecological disturbances (wildlife, flood, insects and disease).

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

Same actions–

