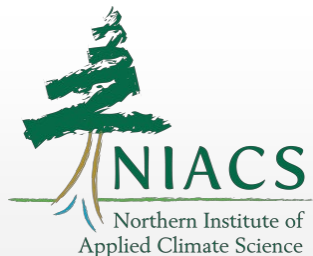




United States Department of Agriculture
Northern Forests Climate Hub

Responding to Climate Change Impacts in Forested Watershed Management



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



Roads



Crossings



Riparian

Wetlands

Roads

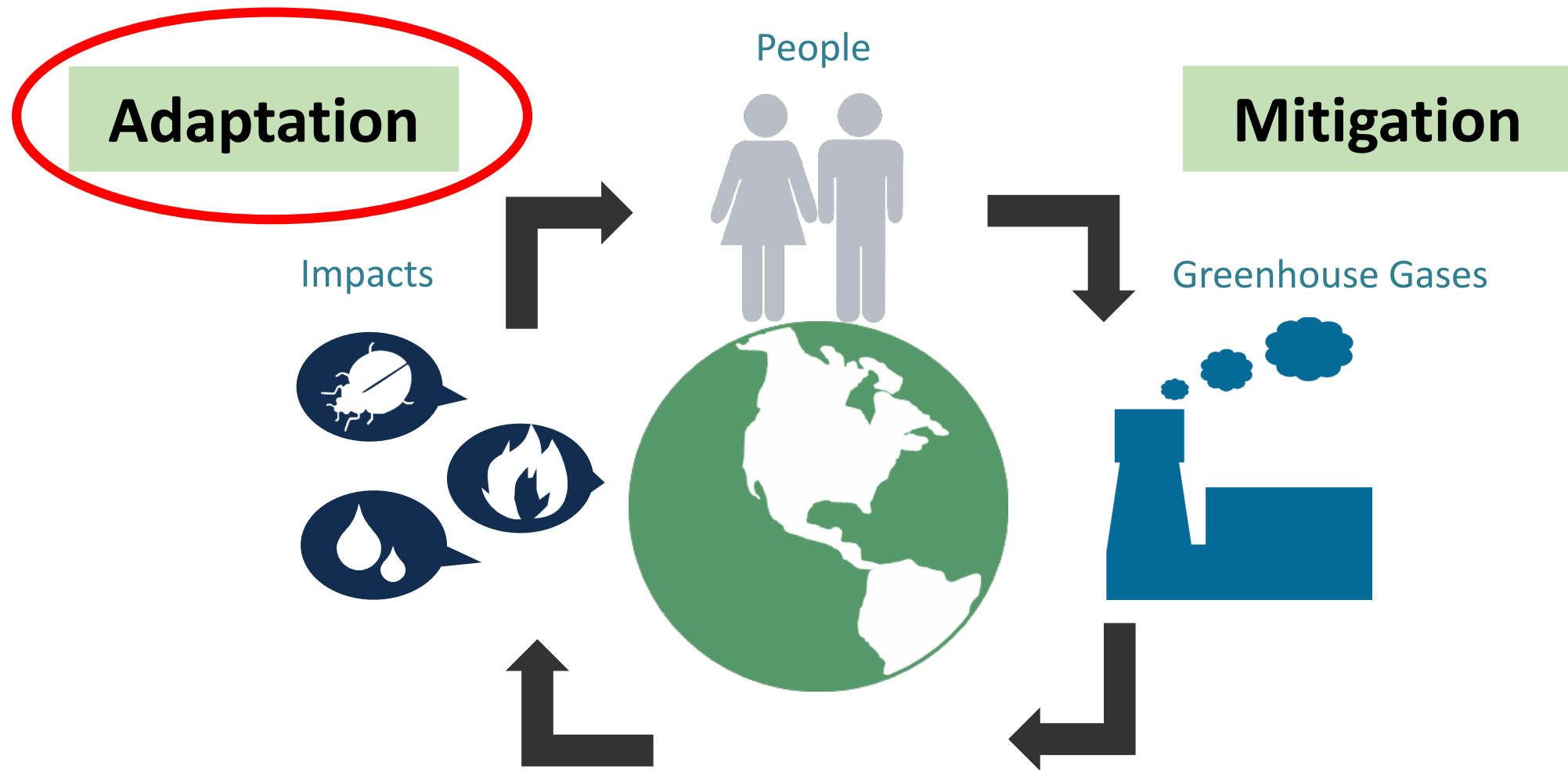


Riparian - pests

Forest health decline (stressed)
Invasive species



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

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



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)

Resistance

Resilience

Transition
(Response)



Reduce impacts/
Maintain current
conditions

Forward-looking/
Promote change

Adaptation Concepts

RESISTANCE



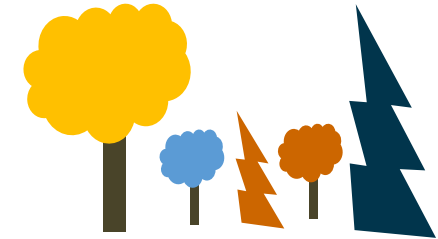
- Improve defenses of forest against change and disturbance
- Maintain relatively unchanged conditions

RESILIENCE



- Accommodate some degree of change
- Return to prior reference condition following disturbance

TRANSITION



- Intentionally facilitate change
- Enable ecosystem to respond to changing and new conditions



Watersheds + forests + climate change

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

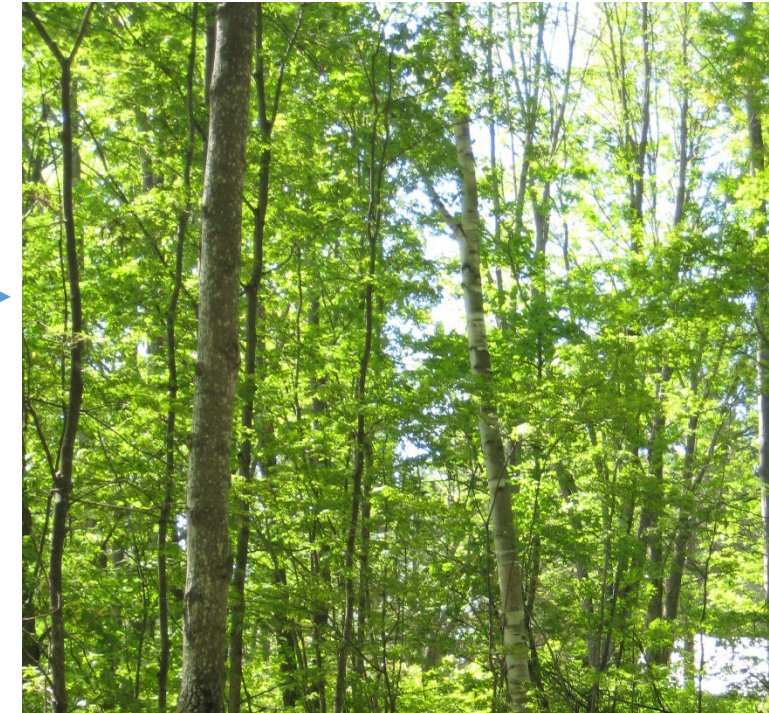
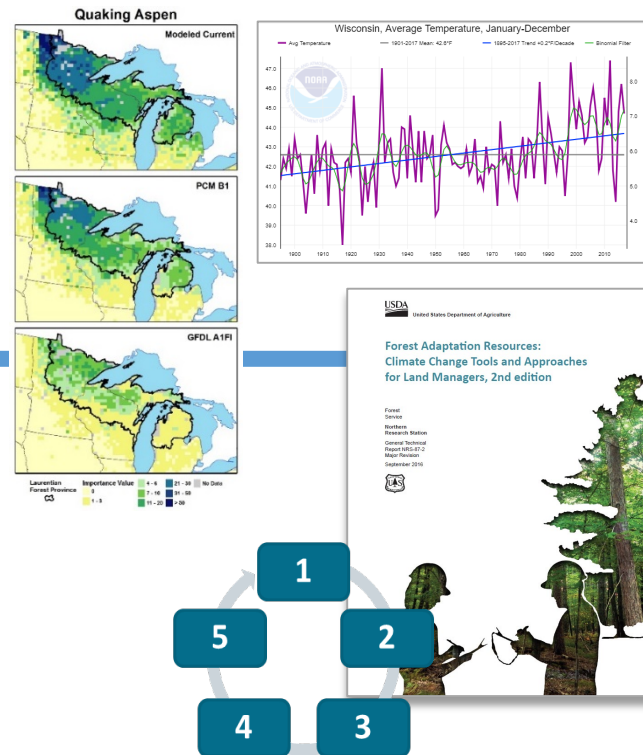


Making a plan!



“Adaptation Planning”

When land managers explicitly identify an climate adaptation pathway to meet their landscape goals and objectives. *(our philosophy)*

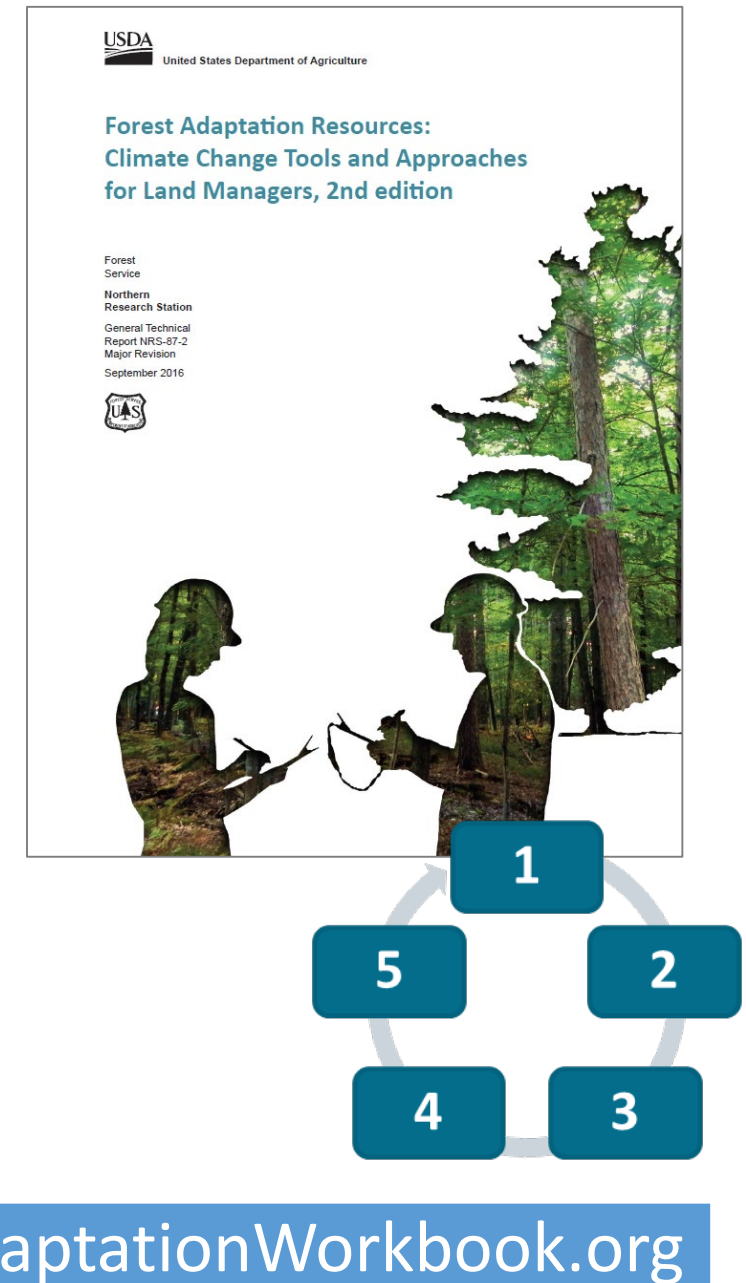


Forest Adaptation Resources and Adaptation Workbook
www.nrs.fs.fed.us/pubs/52760

Forest Adaptation Resources

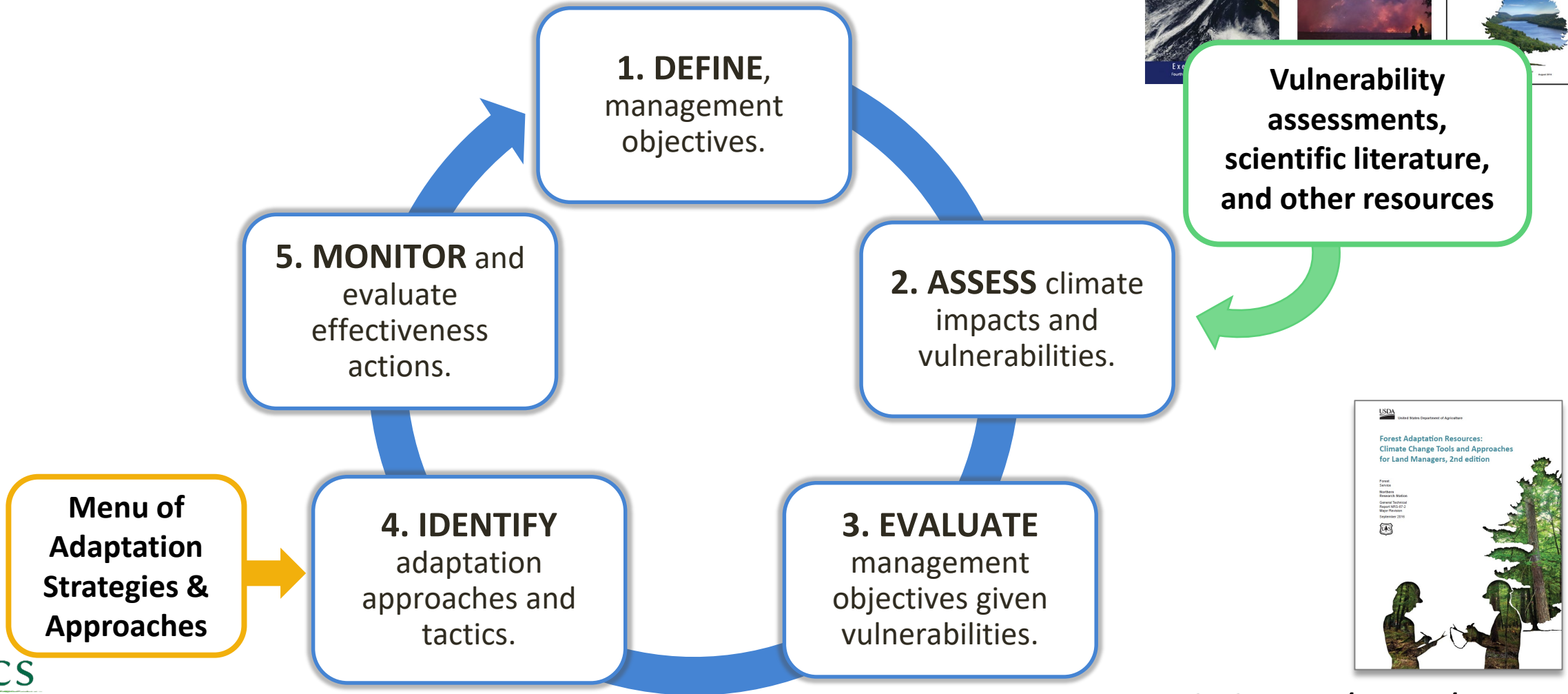
A flexible workbook and menu to address diverse needs

- 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**



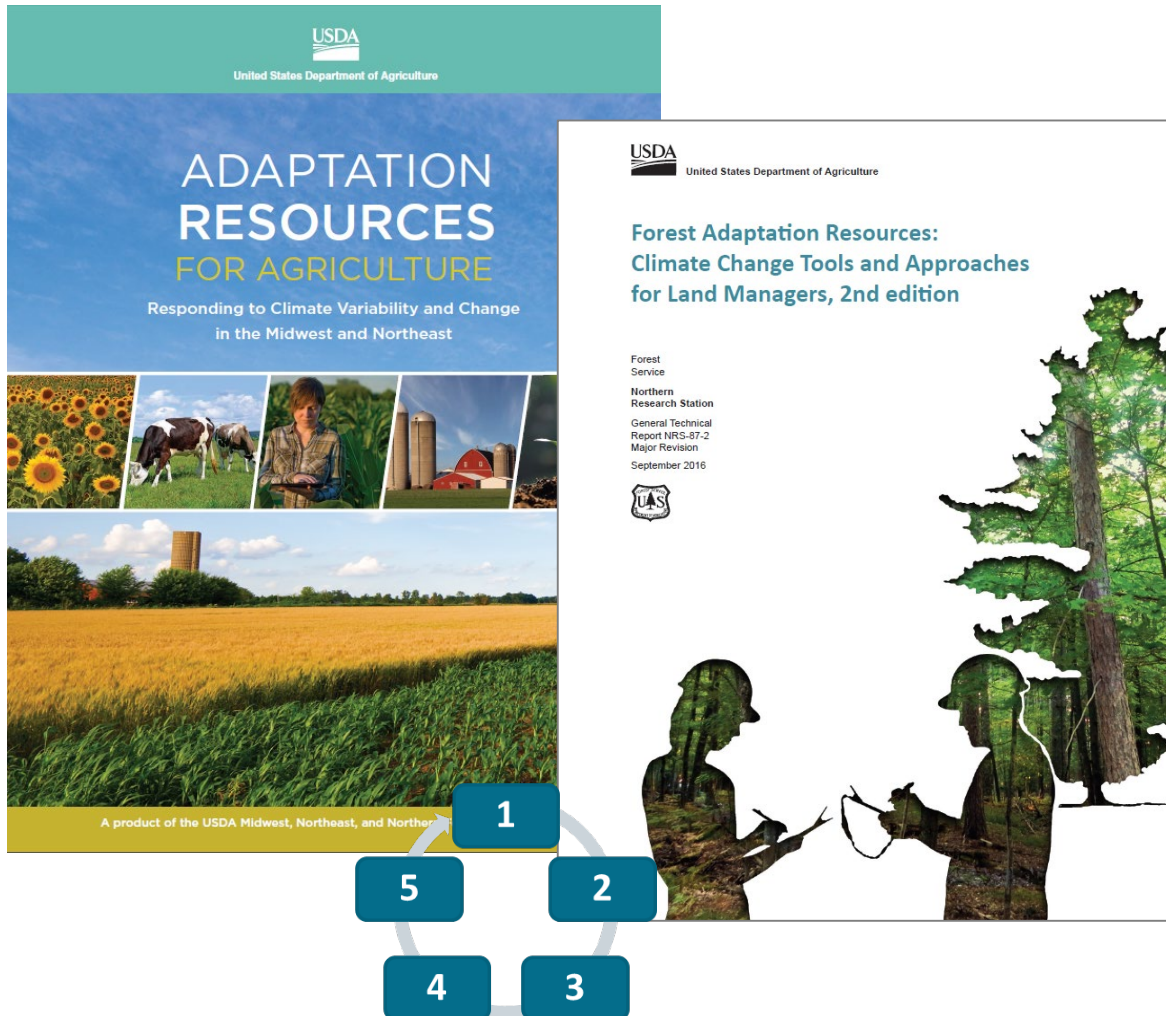
Adaptation Workbook: Decision-support tool

Provides “**structured flexibility**”



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

Adaptation Strategies and Approaches: *Making Actions Intentional*

My goal is to
(Adaptation Concept
and overall Strategy)



So I will
Take a specific Approach
and implement a
custom *Tactic*

Links the “why” to the “how” – sets context for responses to climate change

Adaptation Strategies for Natural Resource Management

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**Resources in development*

forestadaptation.org/strategies

Watershed Adaptation Strategies: Big ideas

Sustain fundamental hydrologic processes



Maintain and enhance water quality



Maintain or restore forests and vegetative cover



Facilitate forest ecosystem adjustments through species transitions



Accommodate altered hydrologic processes



Design and modify infrastructure to accommodate future conditions

A spectrum of options: Persistence, Change

Includes classic **persistence** approaches appropriate to managing ecosystems

... and choices grounded in **change**.

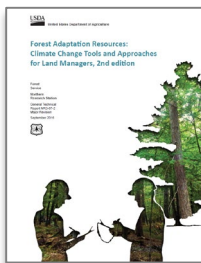
Many paths forward: Adaptation resources offer a suite of approaches to mix and match as appropriate to a planning effort



Goal: Develop local examples of adaptation

+350

Real-world projects
using the Adaptation
Workbook



Ownership

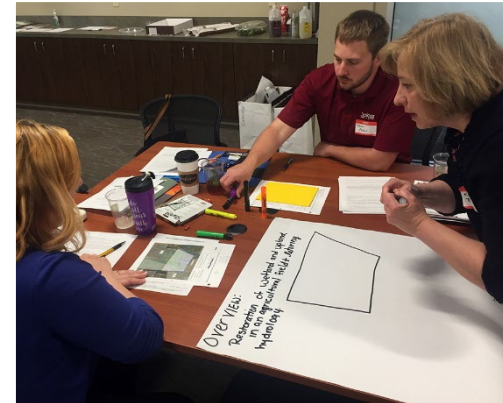
- Federal
- State
- Local
- Multi-ownership
- Tribal
- University
- NGO
- Private

[Forestadaptation.org/demos](https://forestadaptation.org/demos)

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 – Free



Upcoming
Course:
Winter 2020!

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

forestadaptation.org/training



Adaptation Examples!

An aerial photograph of a vast forest landscape. The forest is dense, with a mix of green and yellow foliage, suggesting an autumn scene. In the distance, a large body of water, likely a lake or a wide river, is visible, surrounded by more forest. The sky is overcast with soft, grey clouds. The overall scene conveys a sense of a large, natural environment.

Key Question:

What actions can help to adapt to anticipated changes *and* meet your goals?

Next presentations – forest adaptation stories!



Christopher Riely

forestadaptation.org/providence



Brian Keevan

forestadaptation.org/quabbin



Robert Turner

forestadaptation.org/atlas

Closing Thoughts...

Uncertainty is the new certainty

Incorporate it, don't succumb to decision paralysis

Same job, new challenges

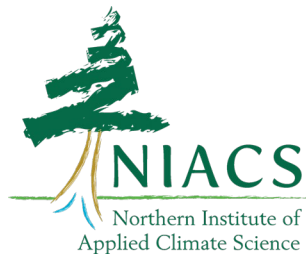
Similar stressors, but new patterns and agents

Adapt based on values and risk tolerance

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

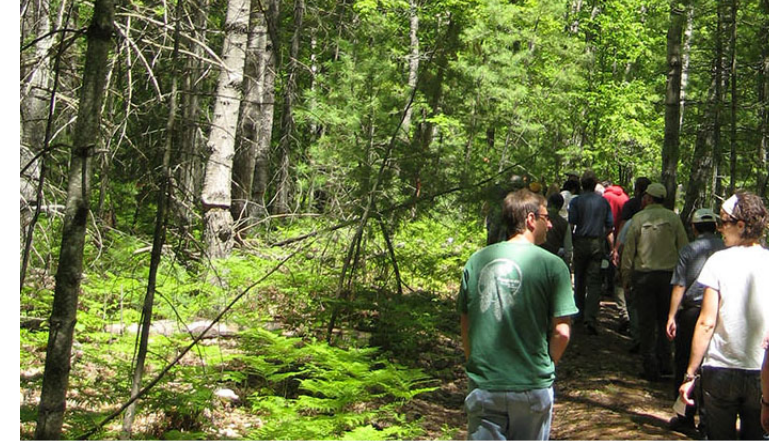
Document rationale and intent

...then share your plan!



Thank you!

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

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