Climate Adaptation Tools for Forest and Watershed Management

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December 12, 2023

Northern Institute of Applied Climate Science

Climate

Carbon

The Northern Institute of Applied Climate Science (NIACS) develops synthesis products, fosters communication, pursues science, and provides technical assistance in climate change adaptation and carbon management.

NIACS is a collaborative partnership
of Federal, forest sector, conservation, higher education, and tribal organizations
led and supported in part by the USDA Forest Service.

NIACS
Northern Institute of Applied Climate Science

FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE

American Forests™

Great Lakes Indian Fish & Wildlife Commission

NCASI

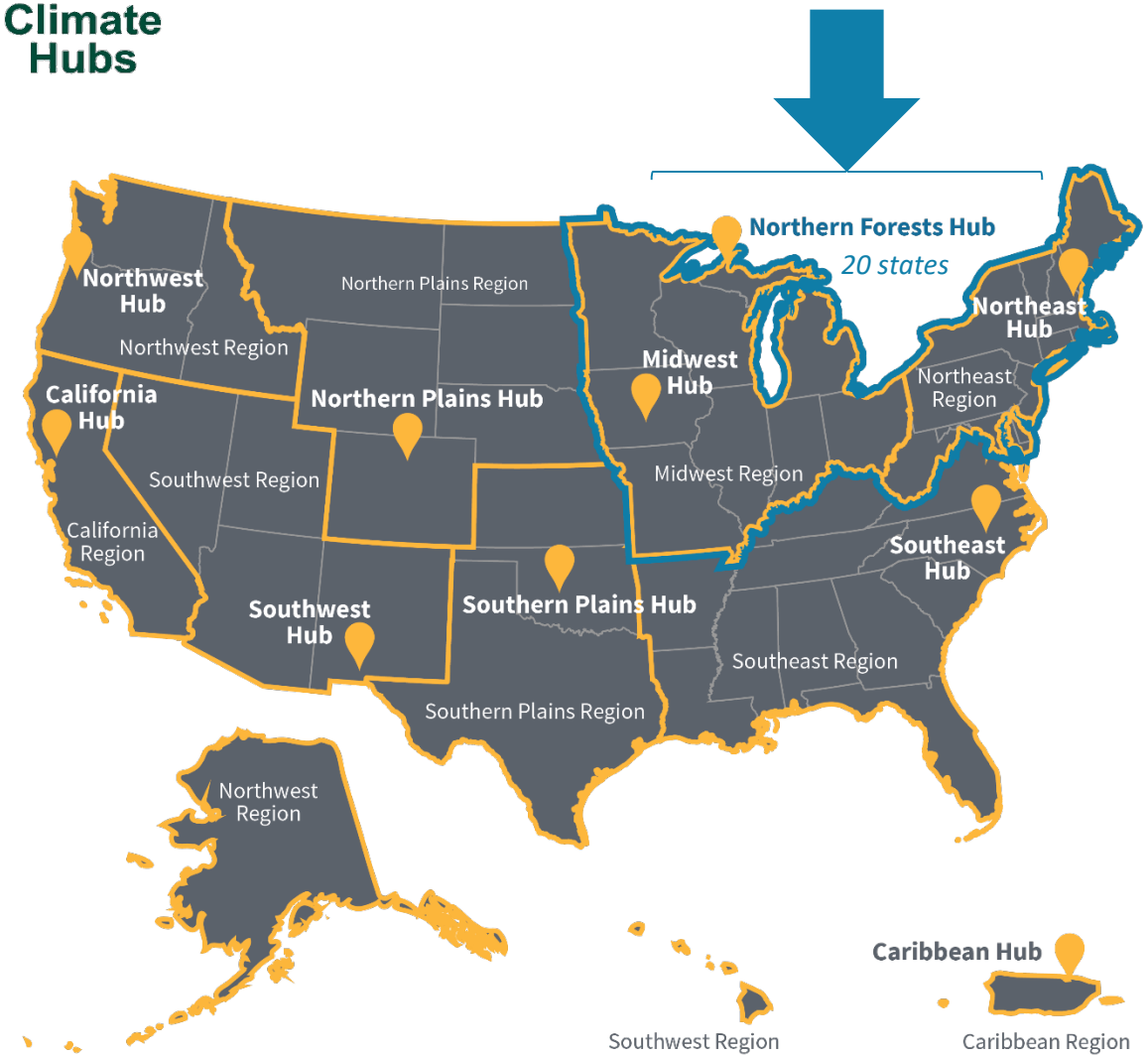
Michigan Technological University
1885

The UNIVERSITY of VERMONT

UNIVERSITY OF MINNESOTA

MICHIGAN STATE UNIVERSITY

USDA Northern Forests Climate Hub



Mission:

To develop and deliver science-based, region-specific information and technologies, to help **natural resource managers** and **woodland owners** integrate climate change information into **planning, decision-making,** and **management activities** in order to sustain the diverse benefits from forests in a changing climate.

The Northern Forests Climate Hub provides additional capacity to two USDA Regional Climate Hubs the **Northeast and Midwest Hubs**— and works within their broader scope and organization.

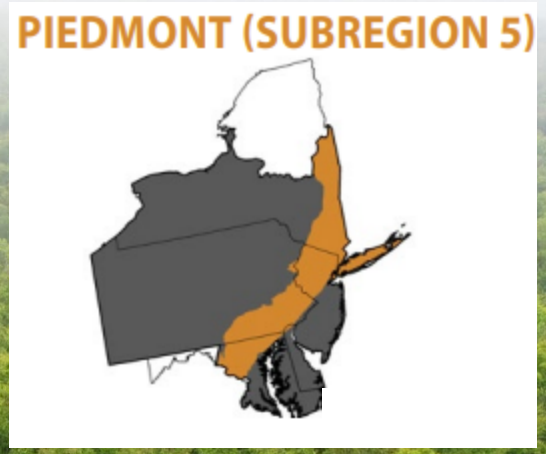
Website: **www.climatehubs.usda.gov/hubs/northern-forests**

Forest Ecosystem Vulnerability Assessments

Climate Change Response Framework

For land managers, created by land managers & scientists

- Focus on **forest** ecosystems
- Observed climate
- Future projected climate
- Impacts on forests & vulnerability
- Implications for management



Does not make recommendations

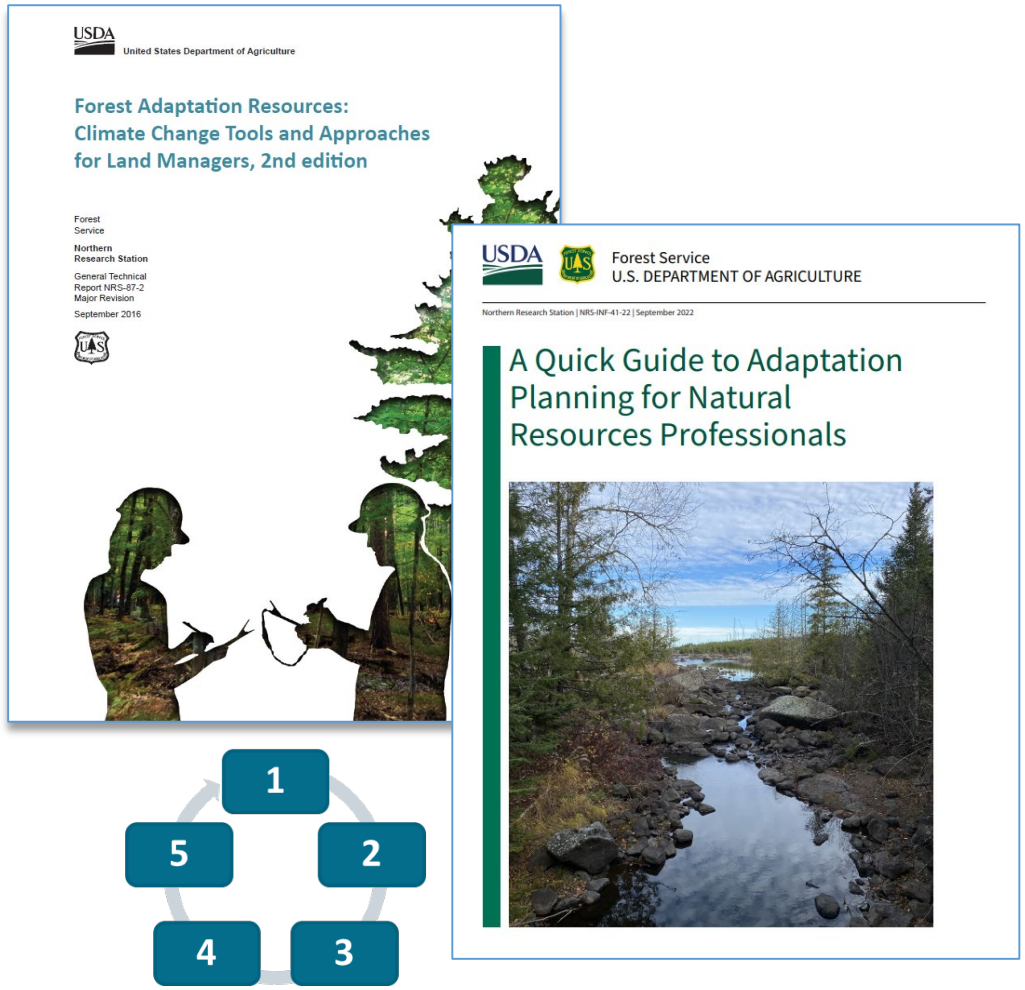
Place based, model-informed, expert-driven, transparent

Forestadaptation.org/Mid-Atlantic

Adaptation Resources: Flexible, not prescriptive

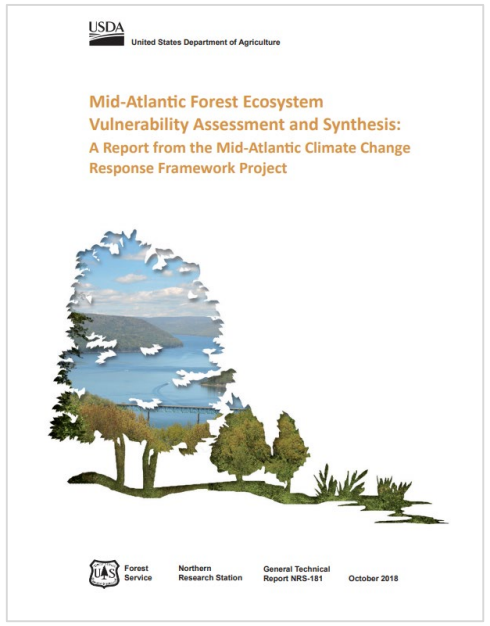
Process to <u>intentionally</u> consider climate in planning, and to customize adaptation actions

- Designed to be flexible to accommodate: *diverse goals, values, landscapes, ownership*
- Works intuitively at the project level
- Centers on manager expertise and judgement
- Does not make recommendations



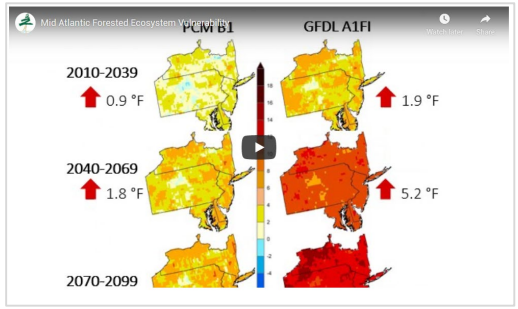
Download at: <u>forestadaptation.org/adaptation-workbook</u>

Practical tools you can use!

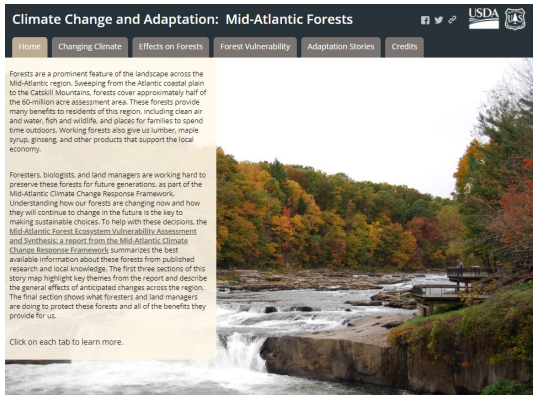


Assessments

Video presentations

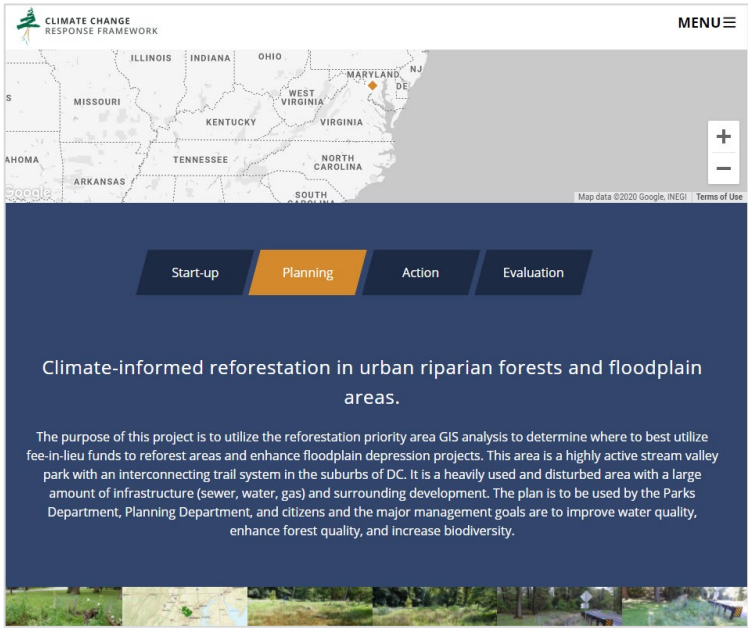


Story Map



Tree projections & Adaptation tools

Real stories of people making climate-informed decisions



ForestAdaptation.org/Mid-Atlantic

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




Adaptation actions are designed intentionally to meet goals and objectives

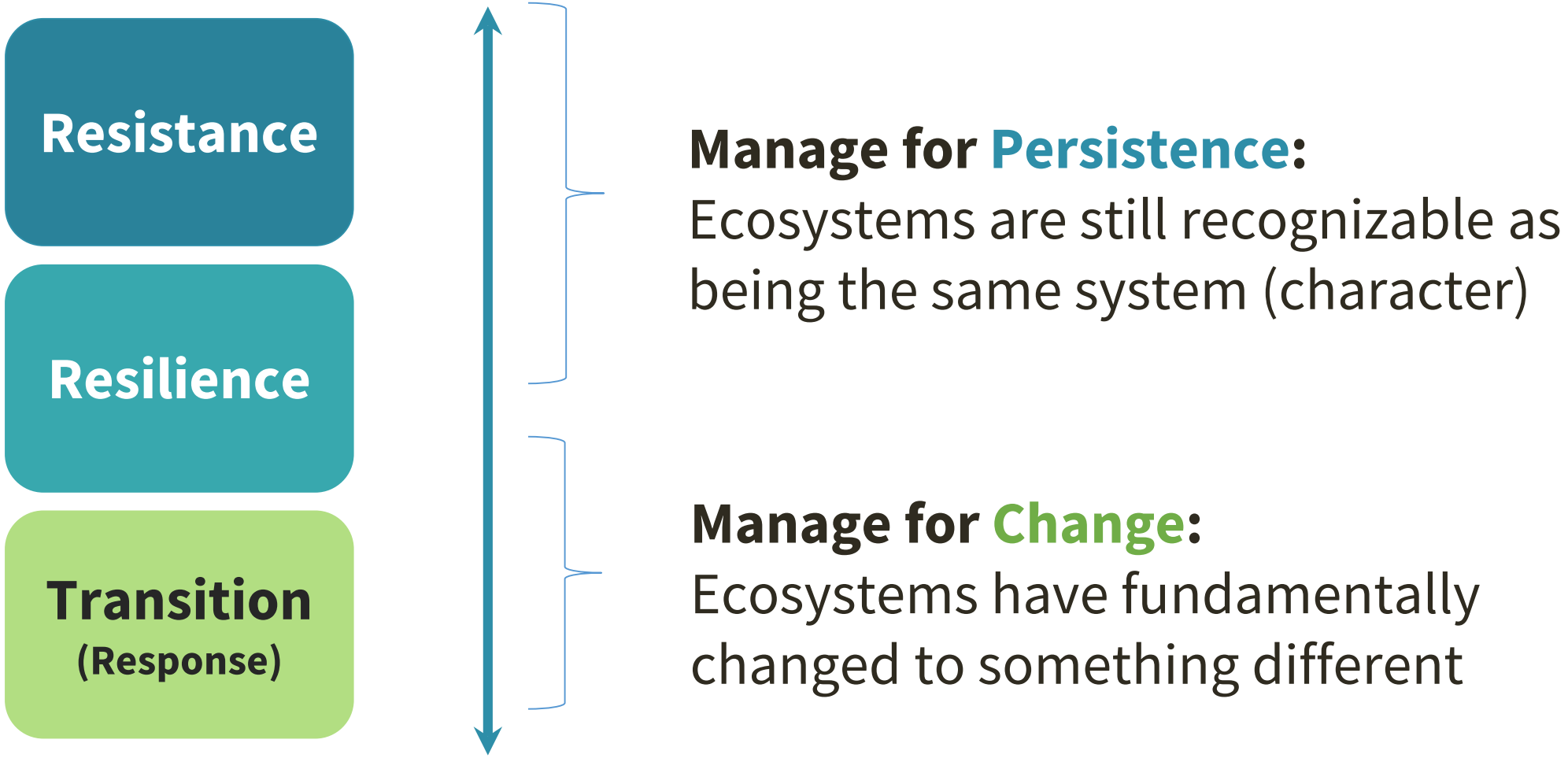
Adaptation is the adjustment of systems in response to climate change.




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

However, there are things that may need re-examination due to climate change.

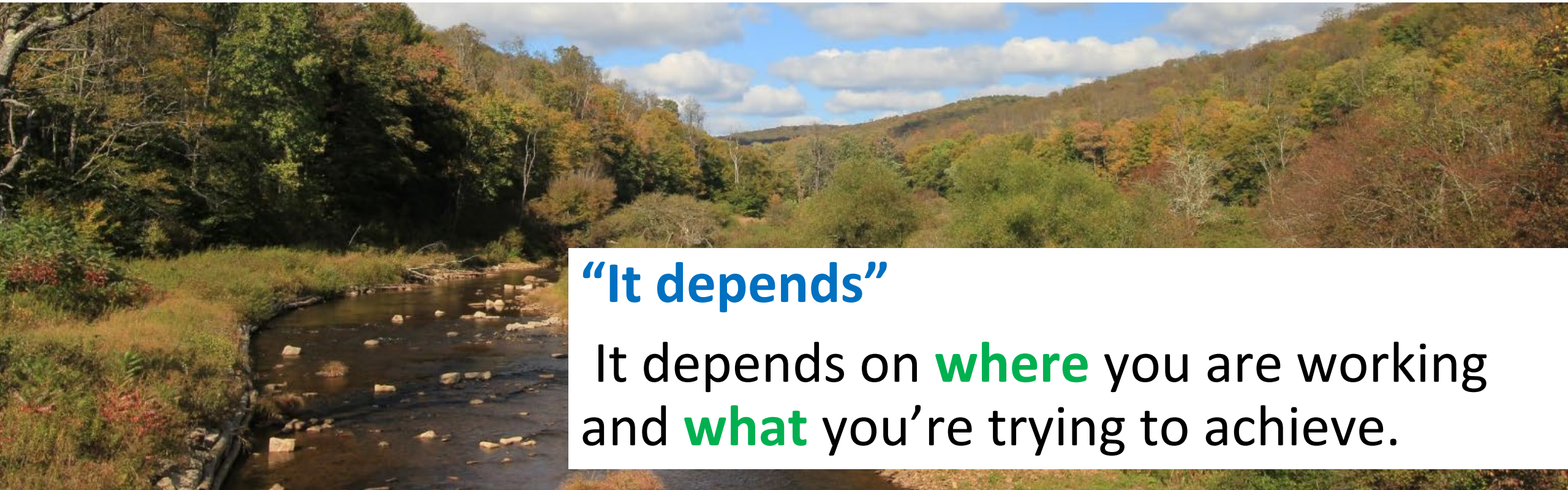
Identifying Adaptation options



Millar et al. 2007, Swanston et al. 2016

Watersheds + forests + climate change

Can we enhance the ability of a natural ecosystem to **cope** with climate change and **meet our goals and objectives**?

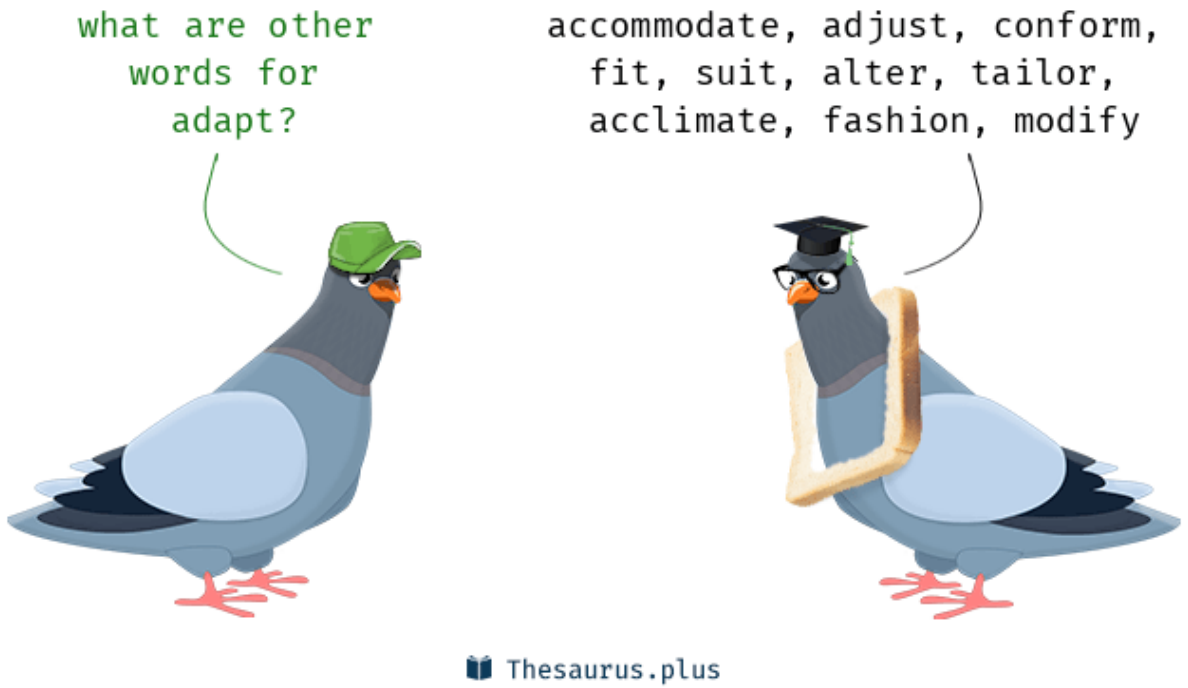


"It depends"

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

Adaptation Strategies

- How do we organize our ideas around Climate Adaptation?
- How do we communicate what we're trying to do?



Adaptation can help to retain ecosystem services

Challenge:

Existing climate adaptation literature and reports tend to:

- Only covers broad adaptation **concepts**
- Focus on hyper specific management practices relevant to a **system or location**

Solution

Develop a **list** of plausible strategies and approaches that can help natural resources practitioners move from **general concepts to tangible**, **targeted** adaptation tactics designed for their system.

Image source: US Fish and Wildlife Service

Menus of Adaptation Strategies and Approaches

- A diverse set of **options** for responding to climate change within forests and ecosystems.
- **Derived from** contemporary reports, expert input, and peer-reviewed publications
- **Flexible**, can be used in various ecosystems, land ownerships and locations throughout the Midwest and Northeast Regions.

Intended users: those planning and implementing on-the-ground conservation & management actions.

What is a menu of adaptation strategies?

A menu is NOT …

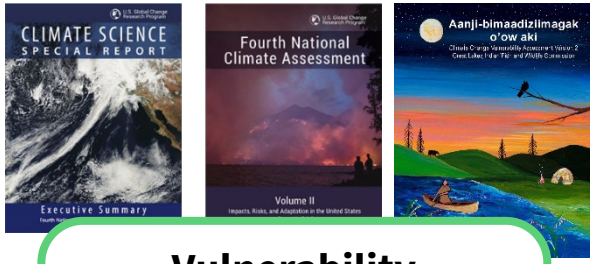
- **Not intended to replicate existing resources** nor to provide an overview of ecosystem dynamics or climate vulnerabilities, which are covered in other sources.
- **Not an assessment** of climate impacts and vulnerabilities.
- **Not a spatial tool** that will tell you WHERE to act. That's up to you!
- **Not setting guidelines,** or **recommendations**.

Source: USGS

forestadaptation.org/strategies

Designed to be used with the Adaptation Workbook

Decision-support framework



Vulnerability assessments, scientific literature, indigenous knowledge

1. DEFINE management objectives

2. ASSESS climate impacts

3. EVALUATE management objectives.

4. IDENTIFY adaptation tactics.

5. MONITOR and evaluate effectiveness.

Menu of Adaptation Strategies & Approaches

Swanston et al. 2016

www.fs.usda.gov/research/treesearch/52760

Adaptation Strategies for Natural Resource Management

*Adaptation topics for a **variety** of perspectives*

Published Adaptation Strategies:

- Agriculture
- Fire-Adapted Ecosystems
- Forests
- Forest Carbon Management
- Forested Watersheds
- Great Lakes Coastal Ecosystems
- Inland Glacial Lake Fisheries
- Non-Forested Wetlands
- Recreation
- Tribal Perspectives
- Urban Forests
- Wildlife Management

Browse all menus at: ForestAdaptation.org/strategies

Adaptation Menus of Strategies and Approaches

Option: Foundational adaptation concepts: resistance, resilience, and transition

Strategy: A strategy is a broad adaptation response that is applicable across a variety of resources and sites

Approach: An approach is an adaptation response that is more specific to a resource issue or geography

Tactic: The most specific adaptation response, providing prescriptive direction about actions that can be applied on the ground

ForestAdaptation.org/strategies

Adaptation Strategies for Forested Watersheds

Strategy 1: Sustain fundamental hydrologic processes

Strategy 2: Maintain and enhance water quality.

Strategy 3: Maintain or restore forests and vegetative cover.

Strategy 4: Facilitate forest ecosystem adjustments through species transitions.

Strategy 5: Accommodate altered hydrologic processes.

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

Resistance

Resilience

Transition
(Response)

Shannon, P.D., et al 2019. https://doi.org/10.1016/j.cliser.2019.01.005

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Strategy 5: Accommodate altered hydrologic processes.

- **Approach 5.1: Manage systems to cope with decreased water levels and limited water availability.**
- Approach 5.2: Enhance the ability of systems to retain water.
- Approach 5.3: Adjust systems to cope with increased water abundance, and high water levels.
- Approach 5.4: Respond to or prepare for excessive overland flows (surface runoff).

Tactics (examples)

- Reduce leaf area, favor native species that consume less water (like xeric drought tolerant species)
- Control invasive species on newly exposed soils due to lower water levels
- Reduce aquatic habitat fragmentation during periods of low water levels by removing modifications may exacerbate low water levels (dams, drain tiles, undersized culverts).

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Tactics (examples)

- Protect, and expand setbacks in riparian areas to slow the flow
- Diversify and favor riparian species tolerant of wet/moist conditions
- Target invasive species management in new flood prone areas
- Protect soils from erosion

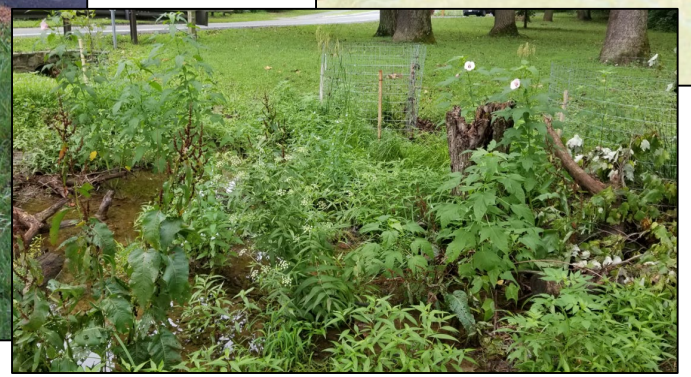
Volunteers planting trees at Crosby Farm Regional Park; Photo Credit: Mary Hammes, Mississippi Park Connection - www.adaptivesilviculture.org

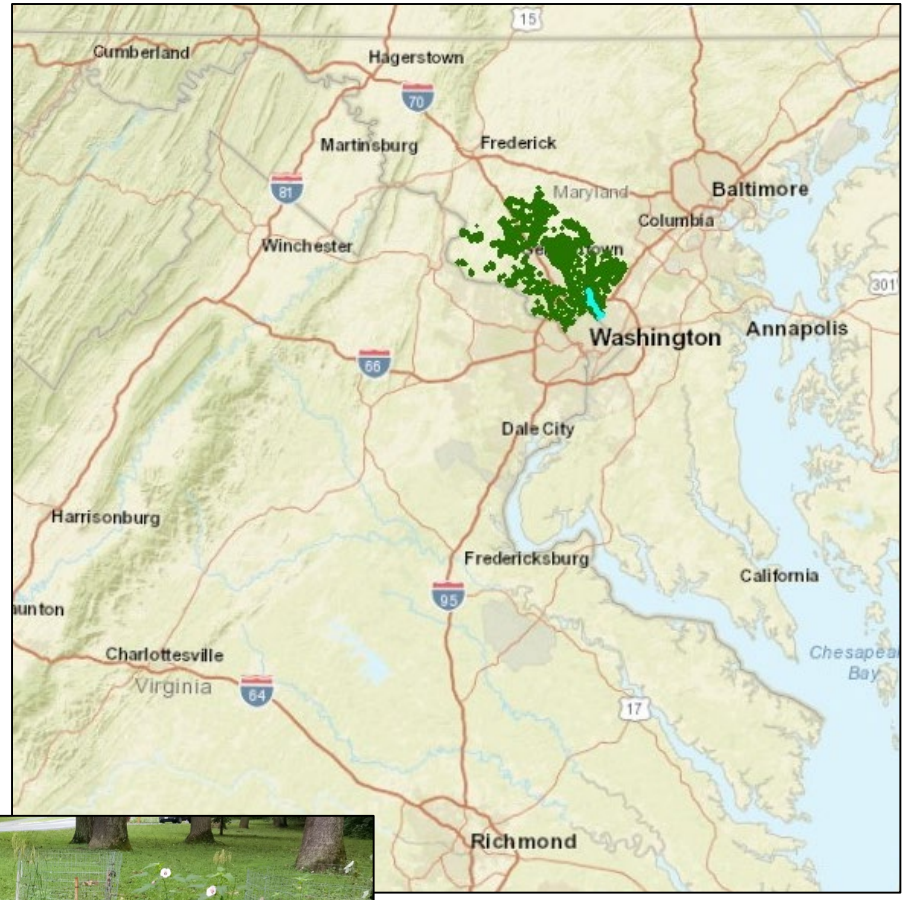
Shannon, P.D., et al 2019. https://doi.org/10.1016/j.cliser.2019.01.005

Adaptation example

Adaptation in the wild

- Climate-informed reforestation in urban riparian forests and floodplain areas.
- Threats: Rising temperatures + urban-heat-island effect can lead to heat related stress on urban trees.





More info at: forestadaptation.org/sligo-creek-reforestation

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Adaptation <u>Approaches</u>:

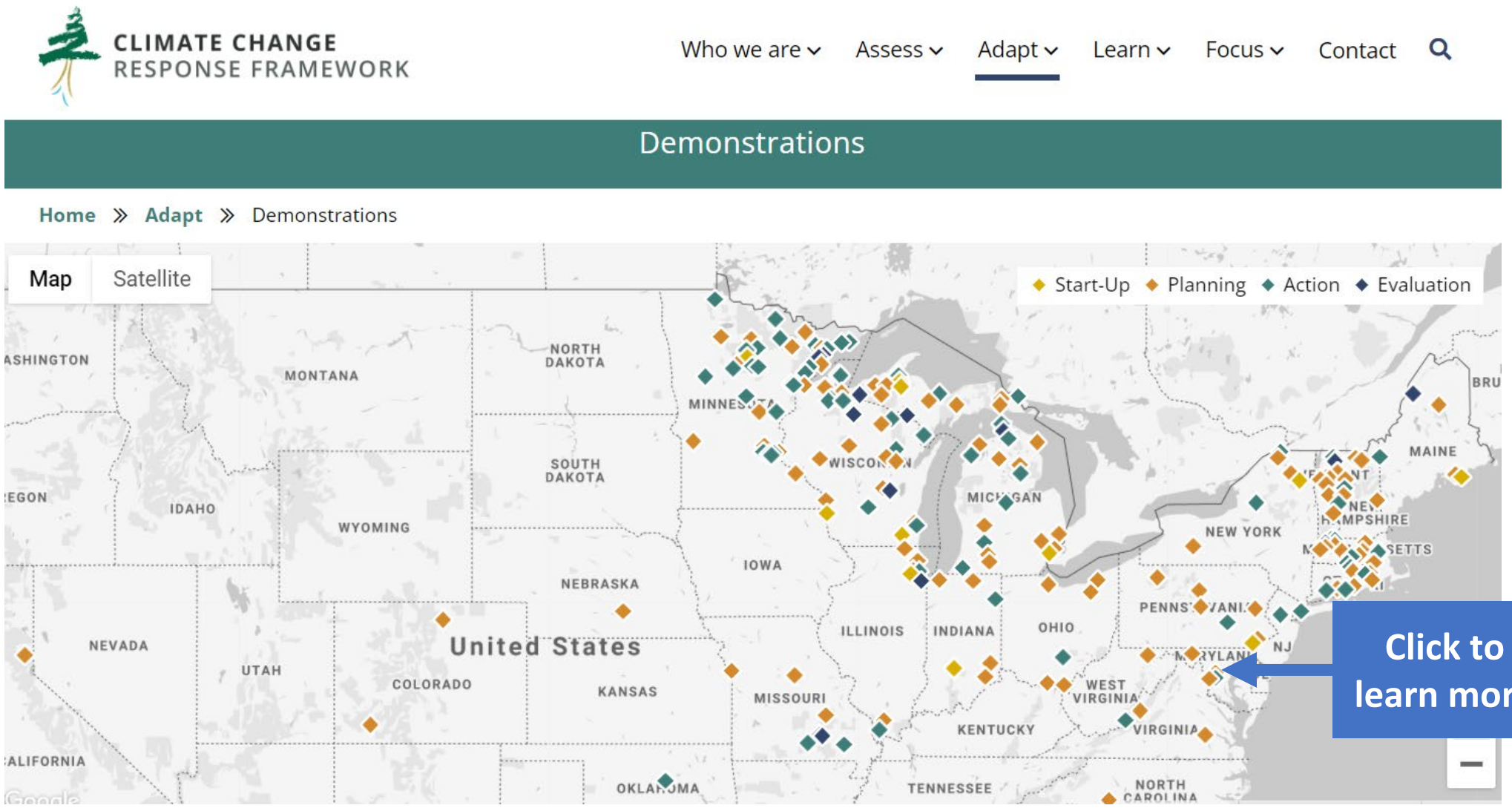
- Reduce soil erosion and sediment deposition.
- Promptly revegetate after disturbance
- Promote diverse age classes
- Maintain and restore diversity of native species

On-the-ground tactics:

- Replace failing stream structures
- Plant # trees per year with a diversity of tree species to enhance biodiversity
- Remove non-native invasive shrub layer and replace with native shrub layer, diverse age class of trees
- Maintain meadow/open space

More info at: forestadaptation.org/sligo-creek-reforestation

Learn from the community.



Forestadaptation.org/demos

Closing Thoughts…

Forest and Watershed management: Same job, new challenges

- *Similar stressors, but new patterns and agents.*

Adaptation actions will reflect values and risk tolerance

- There is no one-sized fits all solution to climate change.
- Think about place and objectives within the context of risk and values.
- Document your rationale and intent.

Attend this free course:

Adaptation Planning Course

Online, 8 weeks – 1 session/week

ForestAdaptation.org/training

Thank you!

Danielle Shannon
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Thank you!

Contact me with any questions!

Danielle Shannon (dshannon@mtu.edu)

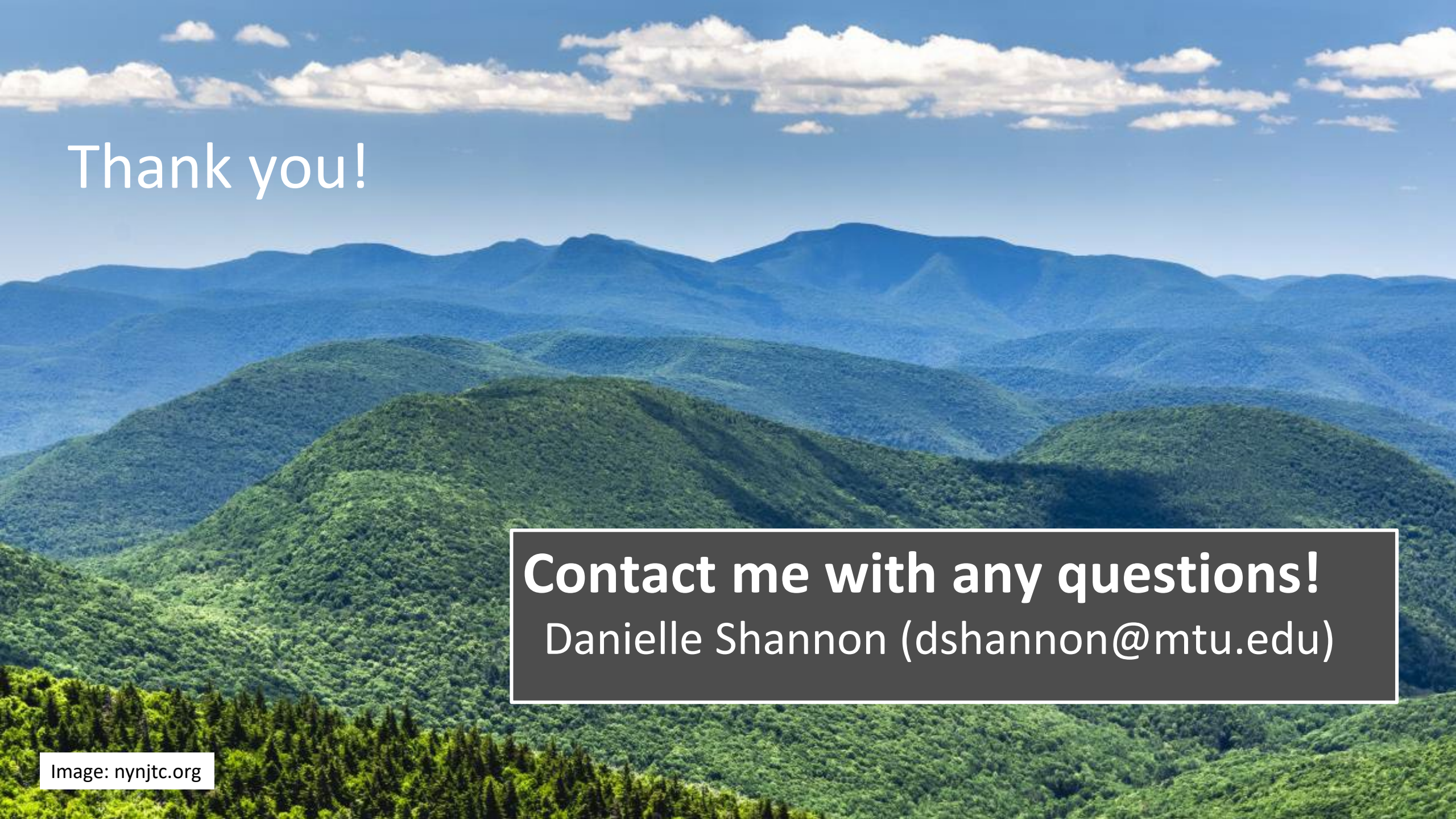

Image: nynjtc.org