

Menu of Adaptation Strategies & Approaches for Grasslands

Grasslands Climate Workshop
January 24, 2023

Courtney Peterson

Climate Adaptation Specialist

Adaptive Silviculture for Climate Change Network Coordinator

Northern Institute of Applied Climate Science

USDA Northern Forests & Southwest Climate Hubs

Courtney.Peterson@colostate.edu

Stephen Handler

Climate Adaptation Specialist

Northwoods Climate Change Response Framework Coordinator

Northern Institute of Applied Climate Science

USDA Forest Service

Stephen.Handler@usda.gov



United States Department of Agriculture
Climate Hubs

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, research, conservation, higher education, and tribal organizations led and supported in part by the USDA Forest Service.



USDA Northern Forests Climate Hub



United States Department of Agriculture
Climate Hubs

Established in 2014 to:

- Develop and deliver science-based, region-specific information and technologies to agricultural and natural resource managers that enable climate-informed decision-making, and to
- Provide assistance to implement those decisions



Tour de Adaptation Menus



Origins of Menus

Why are they important?

What is a menu?

How are they built?

Show me some examples

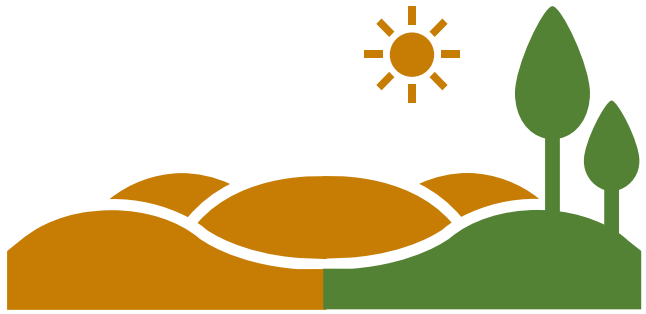
Adaptation - the adjustment of systems in response to climate change.



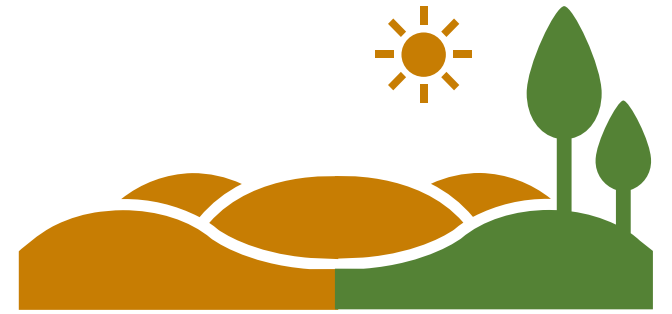
Ecosystem-based adaptation activities build on **sustainable management, conservation, and restoration.**

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

Climate-Driven Changes



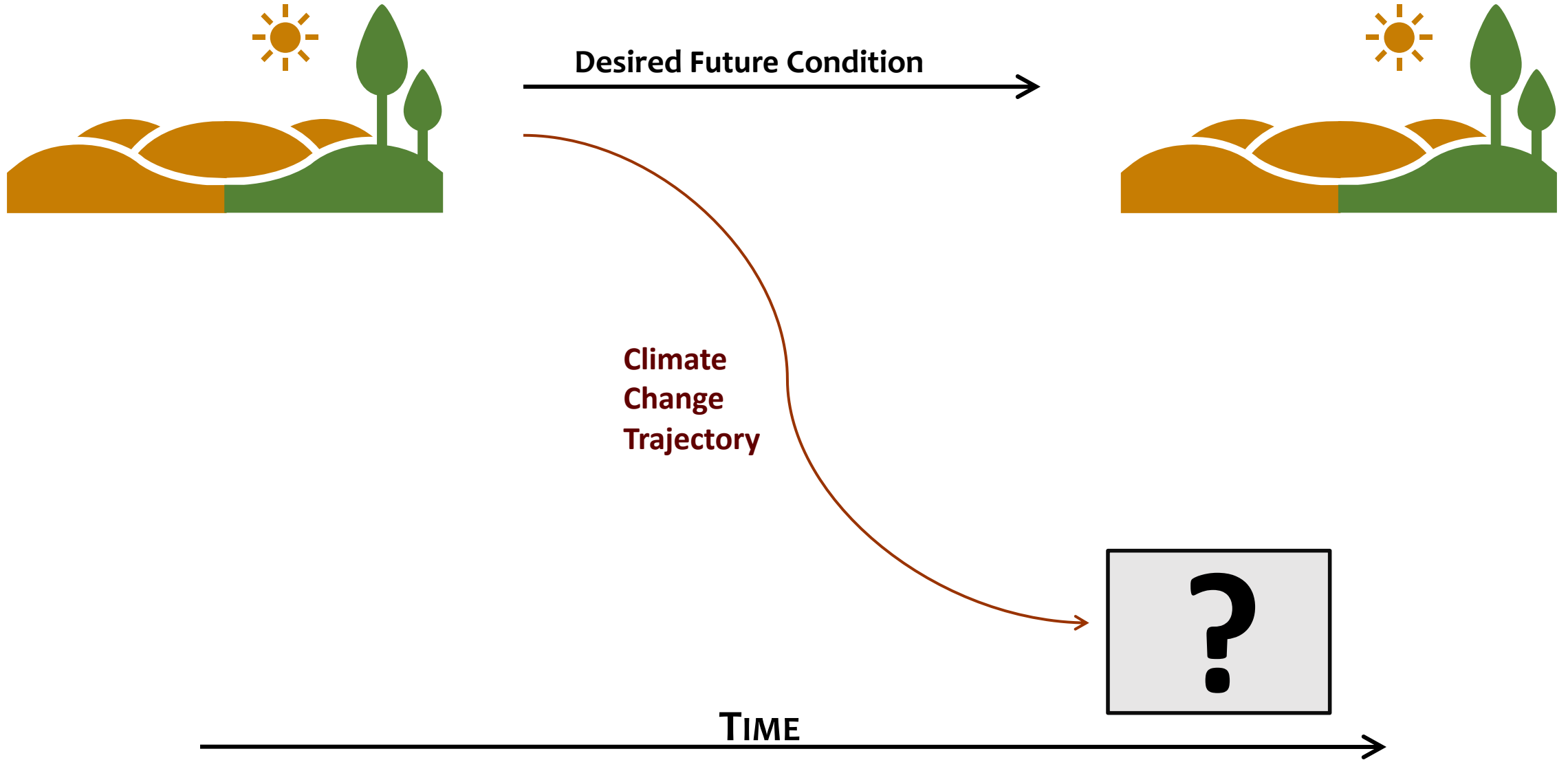
Desired Future Condition



TIME



Climate-Driven Changes



What actions can be taken to
enhance the ability of
a system to cope with
change
and
meet goals and
objectives?



Managing Risk

RESISTANCE



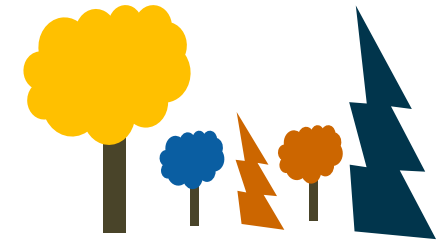
- Improve defenses of forest against change and disturbance
- Maintain relatively unchanged conditions

RESILIENCE



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

TRANSITION

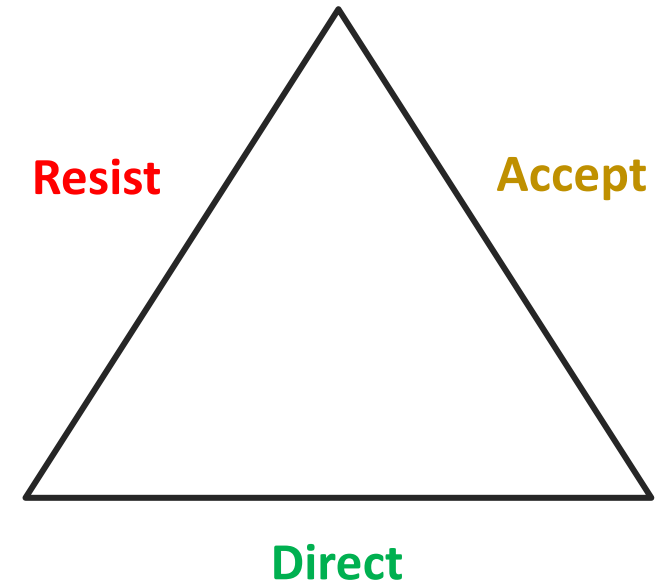
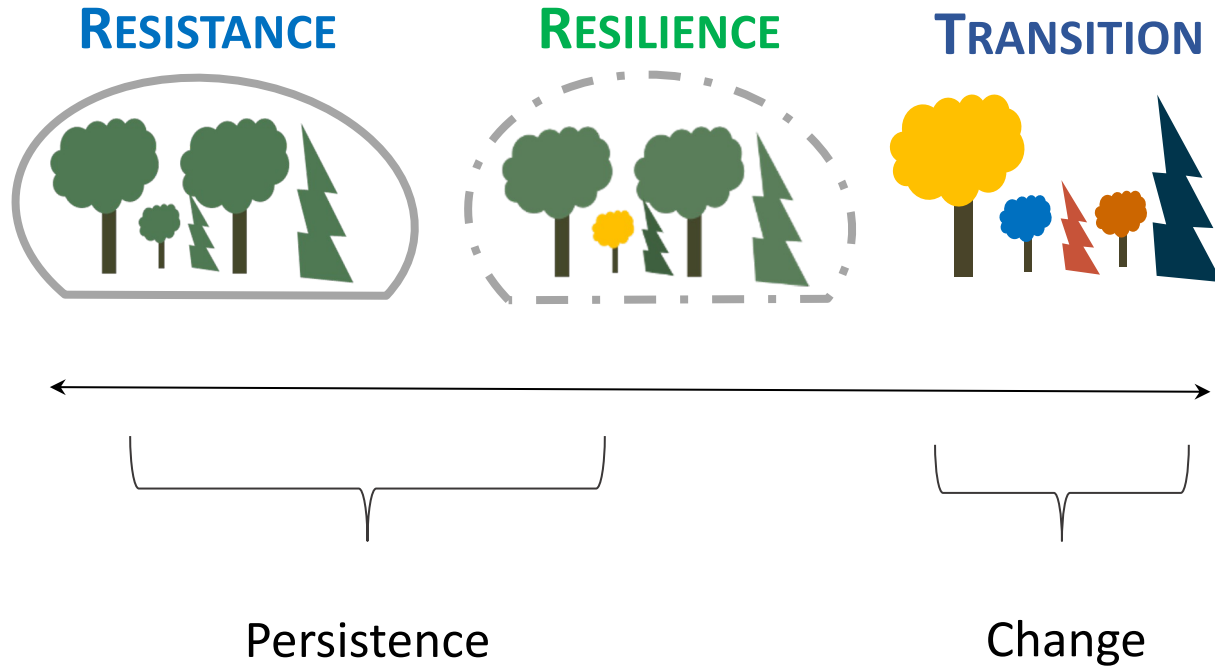


- Intentionally facilitate change
- Enable ecosystem to respond to changing and new conditions

← Reduce impacts/maintain current conditions

→ Forward-looking/promote change

Adaptation Concepts



All of these are meant to help you communicate what you're trying to do and be explicit about intent.

Intentionality

- Explicitly consider and address climate change
- Sure we might get lucky...
- Intentionally assessing risk and vulnerabilities **makes our plans more robust!**



Adaptation Planning



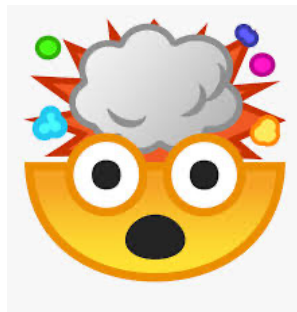
What should I
do here?

Adaptation Planning

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

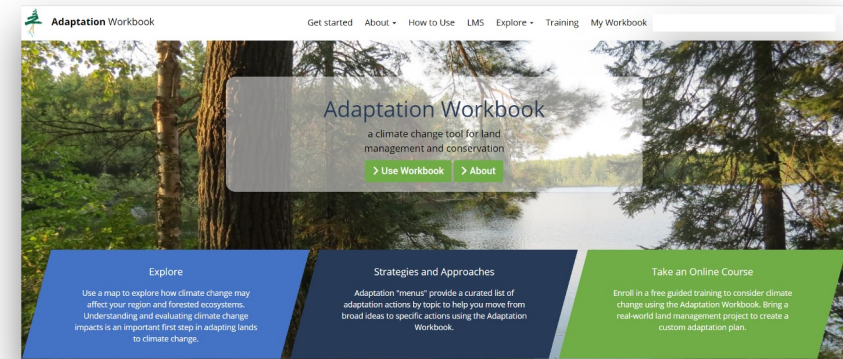
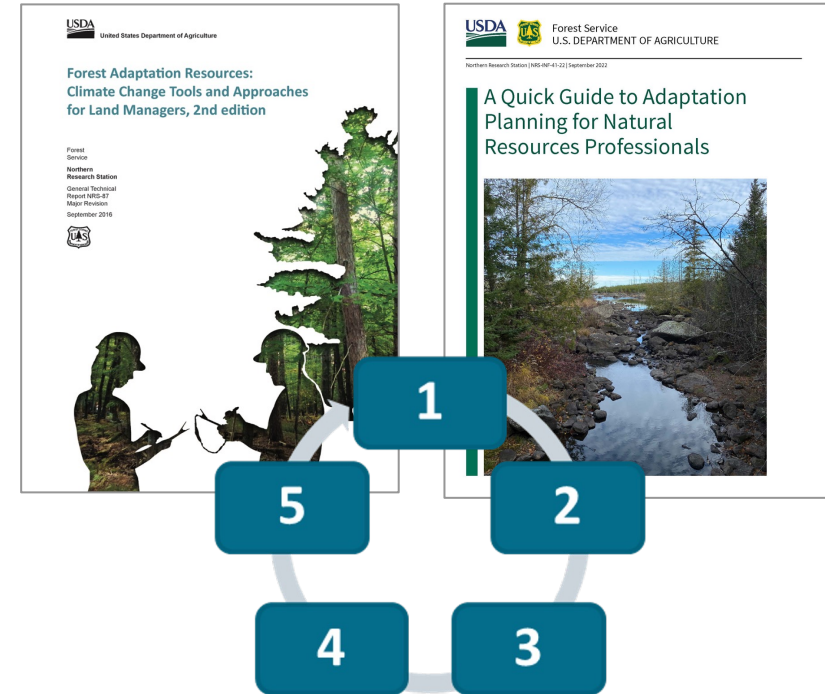
“It depends”

...ecosystem, objectives, climate pressure, risk tolerance, capacity...

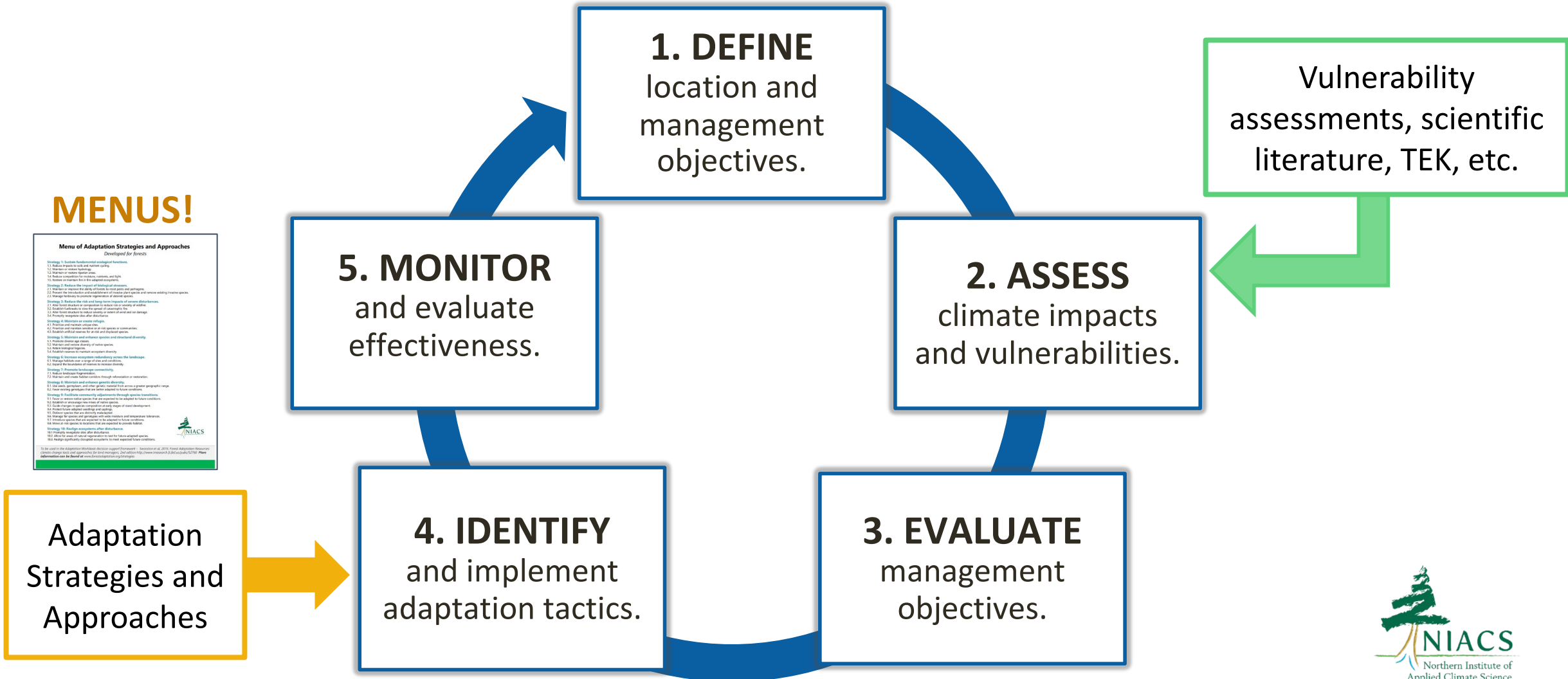


Adaptation Workbook & Adaptation Resources

- Flexible 5-step workbook designed for a variety of landowners with diverse goals
- Works at project level
- Centers around manager's expertise, and judgement
- Creates **clear rationale** for actions by connecting them to **broader adaptation ideas**
- **Does not make recommendations**
- **Includes:**
 - Adaptation workbook
 - Adaptation strategies for different resource areas (menus)



Adaptation Workbook



MENUS!

Menu of Adaptation Strategies and Approaches
Developed for forests

- Strategy 1: Restore fundamental ecological processes.
- 1.1 Reduce inputs to soils and nutrient cycling.
- 1.2 Increase soil organic matter.
- 1.3 Reduce or remove riparian shade.
- 1.4 Reduce or remove herbicide inputs.
- 1.5 Increase or restore fire to ecological processes.
- Strategy 2: Reduce the impact of biological invasions.
- 2.1 Reduce or remove the early colonizers to control plant and pathogen.
- 2.2 Increase or restore riparian shade.
- 2.3 Manage herbicide to promote regeneration of native grasses.
- Strategy 3: Reduce the impact of climate change on forest health.
- 3.1 Increase the diversity of tree and shrub species to reduce the impact of drought.
- 3.2 Increase the diversity of tree and shrub species to reduce the impact of wildfire.
- 3.3 Increase the diversity of tree and shrub species to reduce the impact of insect and disease.
- 3.4 Increase the diversity of tree and shrub species to reduce the impact of climate change.
- 3.5 Increase the diversity of tree and shrub species to reduce the impact of climate change.
- 3.6 Increase the diversity of tree and shrub species to reduce the impact of climate change.
- 3.7 Increase the diversity of tree and shrub species to reduce the impact of climate change.
- 3.8 Increase the diversity of tree and shrub species to reduce the impact of climate change.
- 3.9 Increase the diversity of tree and shrub species to reduce the impact of climate change.
- 3.10 Increase the diversity of tree and shrub species to reduce the impact of climate change.
- Strategy 4: Increase the diversity of tree and shrub species.
- 4.1 Increase the diversity of tree and shrub species.
- 4.2 Increase the diversity of tree and shrub species.
- 4.3 Increase the diversity of tree and shrub species.
- 4.4 Increase the diversity of tree and shrub species.
- 4.5 Increase the diversity of tree and shrub species.
- 4.6 Increase the diversity of tree and shrub species.
- 4.7 Increase the diversity of tree and shrub species.
- 4.8 Increase the diversity of tree and shrub species.
- 4.9 Increase the diversity of tree and shrub species.
- 4.10 Increase the diversity of tree and shrub species.
- Strategy 5: Increase the diversity of tree and shrub species.
- 5.1 Increase the diversity of tree and shrub species.
- 5.2 Increase the diversity of tree and shrub species.
- 5.3 Increase the diversity of tree and shrub species.
- 5.4 Increase the diversity of tree and shrub species.
- 5.5 Increase the diversity of tree and shrub species.
- 5.6 Increase the diversity of tree and shrub species.
- 5.7 Increase the diversity of tree and shrub species.
- 5.8 Increase the diversity of tree and shrub species.
- 5.9 Increase the diversity of tree and shrub species.
- 5.10 Increase the diversity of tree and shrub species.

© 2014 Northern Institute of Applied Climate Science (NIACS). All rights reserved. This document is for informational purposes only. It is not intended to be used as a legal document. For more information, please contact NIACS at 202-426-1000 or www.niacs.org.

Adaptation Strategies and Approaches

Vulnerability assessments, scientific literature, TEK, etc.

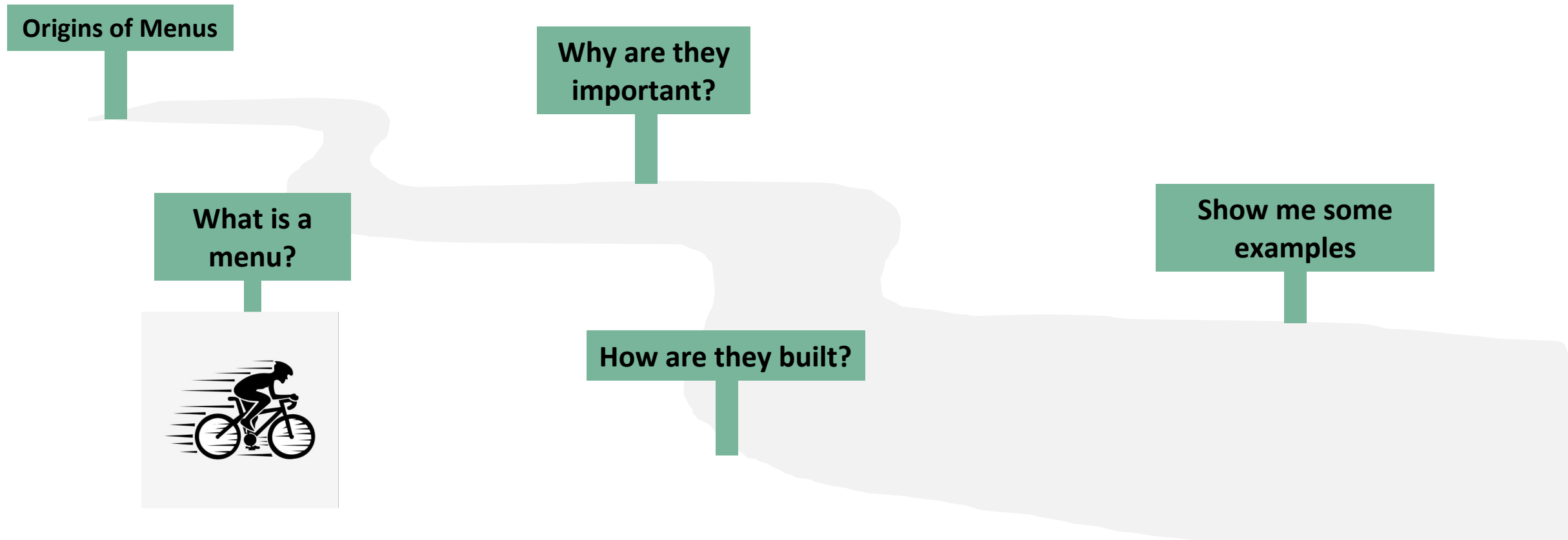


Adaptation Workbook = Climate Change Filter



Use the Adaptation Workbook to ensure ALL of your goals and objectives are robust to climate change impacts.

Tour de Adaptation Menus



Adaptation Menus of Strategies and Approaches



A “menu” of possible actions that allows you to decide what is *most relevant for a particular location and set of conditions.*

Brunch Classics			
Lemon Ricotta Pancakes Whipped Mascarpone Maple, Berries	15	AJ's Omelet Fontal Cheese, Spinach, Mushrooms	14
Cornflake Crusted French Toast Berries, Maple Syrup	15	Eggs Florentine Spicy Capicola, House-Made Cheddar Biscuit, Spinach	15
Bacon, Egg & Cheese Bacon, Two Eggs, Taleggio Cheese, Ciabatta	14	Porchetta Hash Poached Egg, Calabrian Chili Hollandaise	16
Avocado Toast Poached Eggs, Tomatoes, Chili Flakes, Sea Salt	15	Chia Pudding Chia Seeds, Toasted Coconut, Banana, Strawberry	14
Chicken Parmigliana Spicy Marinara, Fresh Mozzarella	22	Farmhouse Breakfast Two Eggs, House-Made Cheddar Biscuit, Chicken Sausage	14
Squid Ink fettuccine Vongole Little Neck Clams, Garlic, White Wine, Butter, Chili	22	Chicken Kale Caesar Chicken, Kale, Croutons	16

Create Your Own Pasta			
Shapes		Sauces	
Rigatoni Semolina, All-Purpose Flour, Olive Oil	14	Marinara San Marzano tomatoes, Garlic, White Wine, Basil, Chili	
Cavatelli All-Purpose Flour, Durum Flour, Eggs, Ricotta	15	Arrabiata All-Purpose Flour, Durum Flour, Eggs, Ricotta	+1
Tagliatelle All-Purpose Flour, Durum Flour, Eggs	15	Broken Meatball House Tomato Sauce with the Addition of Broken Meatballs	+4
Gluten-Free Rigatoni Gluten-Free All-Purpose Flour, Olive Oil, Eggs	16	Sunday Sauce House Tomato Sauce with Short Rib, Sausage, Veal	+4
Spaghetti Semolina, Durum Flour, Olive Oil	15	Roasted Garlic Pecorino Semolina, Durum Flour, Olive Oil	+2
			+3

Cocktails	
o Juice, Horseradish	10/45
ie Peche, Sparkling Wine	12/55
	12/55
ot Juice	12/55
ne de Peche	10/45
	12/55
o Lime, Grenadine	12/55
imosia Juice, Sparkling Wine	12/55



Adaptation Menus of Strategies and Approaches

Published:

2012: Forestry
2016: Urban Forestry
2016: Agriculture
2019: Forested Watersheds
2019: Recreation
2019: Non-Forested Wetlands
2019: Inland Glacial Lake Fisheries
2019: Tribal Perspectives
2020: Forest Carbon Management
2022: Fire-Adapted Ecosystems
2022: Wildlife Management
2022: Great Lakes Coastal Ecosystems

In Preparation:

- Grasslands
- Ocean Coastal Ecosystems
- Arid Grassland Ecosystems

Menu of Adaptation Strategies and Approaches

Developed for forests

Strategy 1: Sustain fundamental ecological functions.

- 1.1. Reduce impacts to soils and nutrient cycling.
- 1.2. Maintain or restore hydrology.
- 1.3. Maintain or restore riparian areas.
- 1.4. Reduce competition for moisture, nutrients, and light.
- 1.5. Restore or maintain fire in fire-adapted ecosystems.

Strategy 2: Reduce the impact of biological stressors.

- 2.1. Maintain or improve the ability of forests to resist pests and pathogens.
- 2.2. Prevent the introduction and establishment of invasive plant species and remove existing invasive species.
- 2.3. Manage herbivory to promote regeneration of desired species.

Strategy 3: Reduce the risk and long-term impacts of severe disturbances.

- 3.1. Alter forest structure or composition to reduce risk or severity of wildfire.
- 3.2. Establish fuelbreaks to slow the spread of catastrophic fire.
- 3.3. Alter forest structure to reduce severity or extent of wind and ice damage.
- 3.4. Promptly revegetate sites after disturbance.

Strategy 4: Maintain or create refugia.

- 4.1. Prioritize and maintain unique sites.
- 4.2. Prioritize and maintain sensitive or at-risk species or communities.
- 4.3. Establish artificial reserves for at-risk and displaced species.

Strategy 5: Maintain and enhance species and structural diversity.

- 5.1. Promote diverse age classes.
- 5.2. Maintain and restore diversity of native species.
- 5.3. Retain biological legacies.
- 5.4. Establish reserves to maintain ecosystem diversity.

Strategy 6: Increase ecosystem redundancy across the landscape.

- 6.1. Manage habitats over a range of sites and conditions.
- 6.2. Expand the boundaries of reserves to increase diversity.

Strategy 7: Promote landscape connectivity.

- 7.1. Reduce landscape fragmentation.
- 7.2. Maintain and create habitat corridors through reforestation or restoration.

Strategy 8: Maintain and enhance genetic diversity.

- 8.1. Use seeds, germplasm, and other genetic material from across a greater geographic range.
- 8.2. Favor existing genotypes that are better adapted to future conditions.

Strategy 9: Facilitate community adjustments through species transitions.

- 9.1. Favor or restore native species that are expected to be adapted to future conditions.
- 9.2. Establish or encourage new mixes of native species.
- 9.3. Guide changes in species composition at early stages of stand development.
- 9.4. Protect future-adapted seedlings and saplings.
- 9.5. Disfavor species that are distinctly maladapted.
- 9.6. Manage for species and genotypes with wide moisture and temperature tolerances.
- 9.7. Introduce species that are expected to be adapted to future conditions.
- 9.8. Move at-risk species to locations that are expected to provide habitat.

Strategy 10: Realign ecosystems after disturbance.

- 10.1. Promptly revegetate sites after disturbance.
- 10.2. Allow for areas of natural regeneration to test for future-adapted species.
- 10.3. Realign significantly disrupted ecosystems to meet expected future conditions.



To be used in the Adaptation Workbook decision-support framework – Swanston et al, 2016. Forest Adaptation Resources: climate change tools and approaches for land managers, 2nd edition <http://www.treesearch.fs.fed.us/pubs/52760> **More information can be found at** www.forestadaptation.org/strategies

Adaptation menus available at: www.forestadaptation.org/strategies

Adaptation Menus of Strategies and Approaches

Adaptation Workbook Get started About ▾ How to Use Explore ▾ Training Log in


Strategies and Approaches

The Northern Institute of Applied Science has led the development of adaptation strategies and approaches for a variety of natural resource topics, which can be used with the **Adaptation Workbook**. These "menus" provide a curated list of adaptation actions to help you move from broad ideas to specific actions. Although menu items can be applied in various combinations to achieve desired outcomes, not all items on the menu will work together. Furthermore, actions that work well in one ecosystem type may not work in another; it is up to the land manager to select appropriate actions according to project location and goals. Learn more about the workbook. All menus are peer-reviewed, interact with menus in the links below, and find supporting publications at the Climate Change Response Framework (forestadaptation.org).

These resources were designed for the **Midwest and Northeast U.S.**, and are a product of a synthesis of academic literature and widespread input from the management community. However, these tools may be useful in other regions as well. Adaptation actions for **other regions** are also available through the USDA Forest Service Climate Change Resource Center.

Browse Menu of Adaptation Strategies and Approaches, by topic:

- Forest Strategies and Approaches**
Developed for forested ecosystems, with focus on forest management and planning.
- Urban Forest Health Strategies and Approaches**
Developed for communities working in urban ecosystems. This version is supplemental to the 2016 version of the Urban Forest Strategies and Approaches menu, found [here](#).
- Forested Watershed Strategies and Approaches**
Developed for water resources management; with focus on hydrology, vegetation management, landscape planning, and infrastructure.



The diagram shows a vertical flow: MENU STRUCTURE (top) -> CONCEPT -> STRATEGIES -> APPROACHES -> TACTIC -> ACTION (bottom, with a tree icon). A large blue arrow points downwards through the center of these boxes.

The **Adaptation Workbook** contains browseable lists of NIACS adaptation menus, as well as a tool for adaptation planning.

www.adaptationworkbook.org/strategies

The **National Compendium for Climate Change Adaptation Actions** provides a searchable database of adaptation strategies for different geographic regions and resource areas.

www.fs.usda.gov/ccrc

USDA U.S. FOREST SERVICE Caring for the land and serving people
United States Department of Agriculture CLIMATE CHANGE RESOURCE CENTER

CLIMATE CHANGE RESOURCE CENTER

EDUCATION TOPICS TOOLS ADAPTATION LIBRARY

Compendium of Adaptation Approaches

Search CCRC

- Adaptation Approaches
- Adaptation Examples
- Featured Stories

The Adaptation Approaches help natural resource managers and landowners identify actions for responding to climate change. It provides a curated list of adaptation actions that helps you move from broad ideas to specific actions. Many illustrative examples of adaptation actions are included in this tool, but it is not a comprehensive list of all available options. **Learn more about adaptation actions.**

The collection is organized by adaptation approach – click on each approach for more information on how the idea links to broader adaptation strategies and more specific management tactics. You can browse by resource area, region, or climate change impact.

We created this tool to inspire thinking and spur brainstorming for adaptation planning. It can also be used to link a specific management action to a broader adaptation approach in order to show how management is intentionally addressing climate change concerns. As you do this, it is important to consider your own management goals and local climate change impacts before selecting actions for implementation. We strongly encourage you to use a structured process to intentionally consider climate change in your planning and project development.

Find Approaches For Your Project

Resource Area: Climate Change Effect:

Region:

Tour de Adaptation Menus



Origins of Menus

Why are they important?

What is a menu?

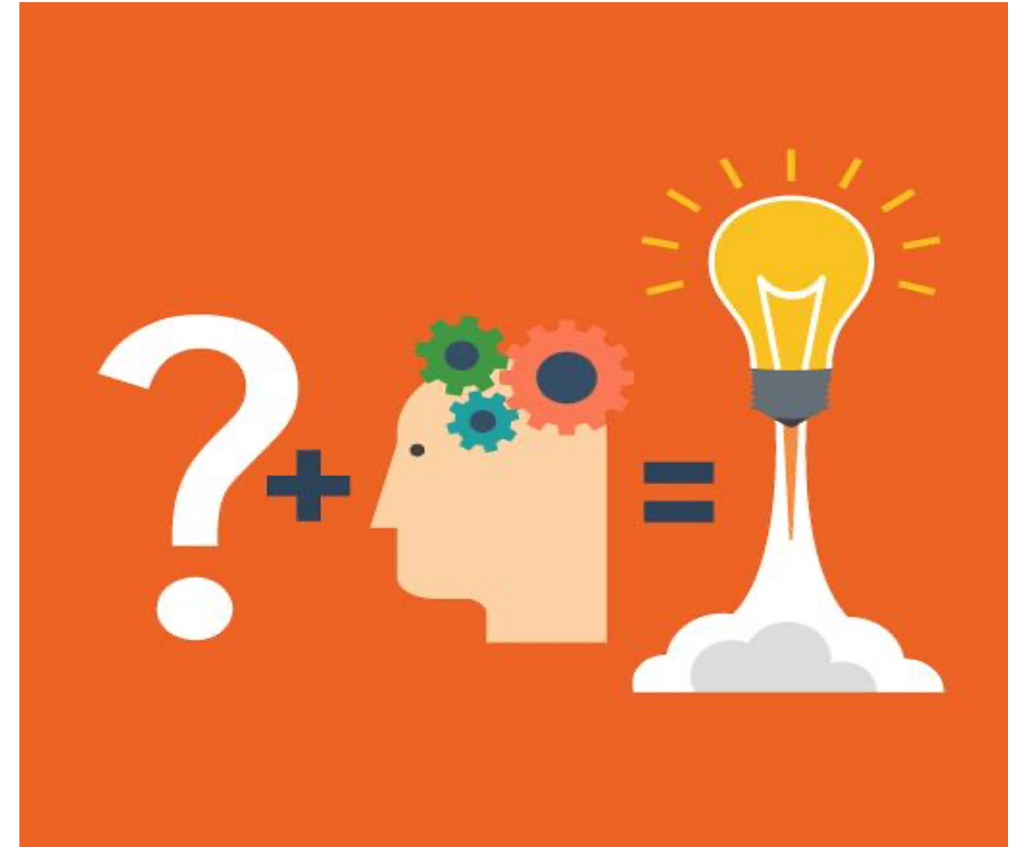
How are they built?

Show me some examples

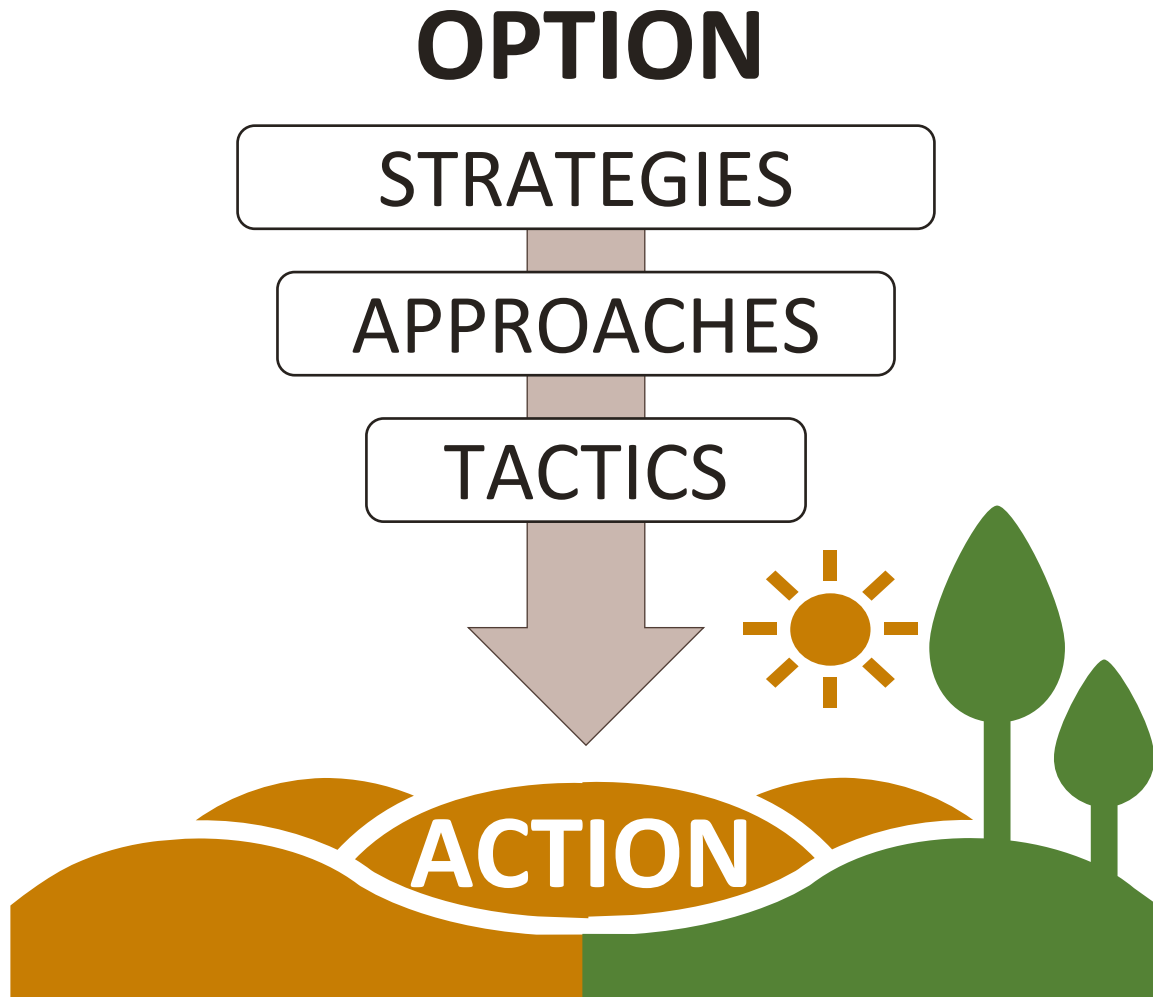
Adaptation Menu: Benefits

Address challenges in implementing adaptation:

1. Connecting broad ideas to specific actions
2. Making actions intentional
3. Communicating your ideas
4. Boosting creativity



1. Translating broad concepts to specific actions



Options:

- **Foundational adaptation concepts:**
- **Resistance, Resilience, Transition**

Strategies:

- Broad adaptation responses that consider:
 - Regional ecological conditions
 - Overarching management goals

Approaches:

- More detailed responses that consider:
 - Site-level conditions
 - Site-level management objectives

Tactics:

- Prescriptive actions designed for:
 - Specific site conditions
 - Specific management objectives

1. Translating broad concepts to specific actions

OPTION



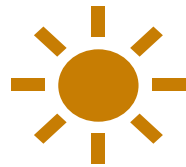
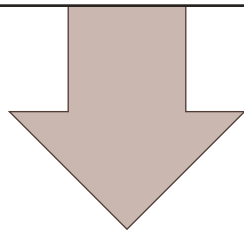
Example:

Resistance (persistence)

STRATEGIES

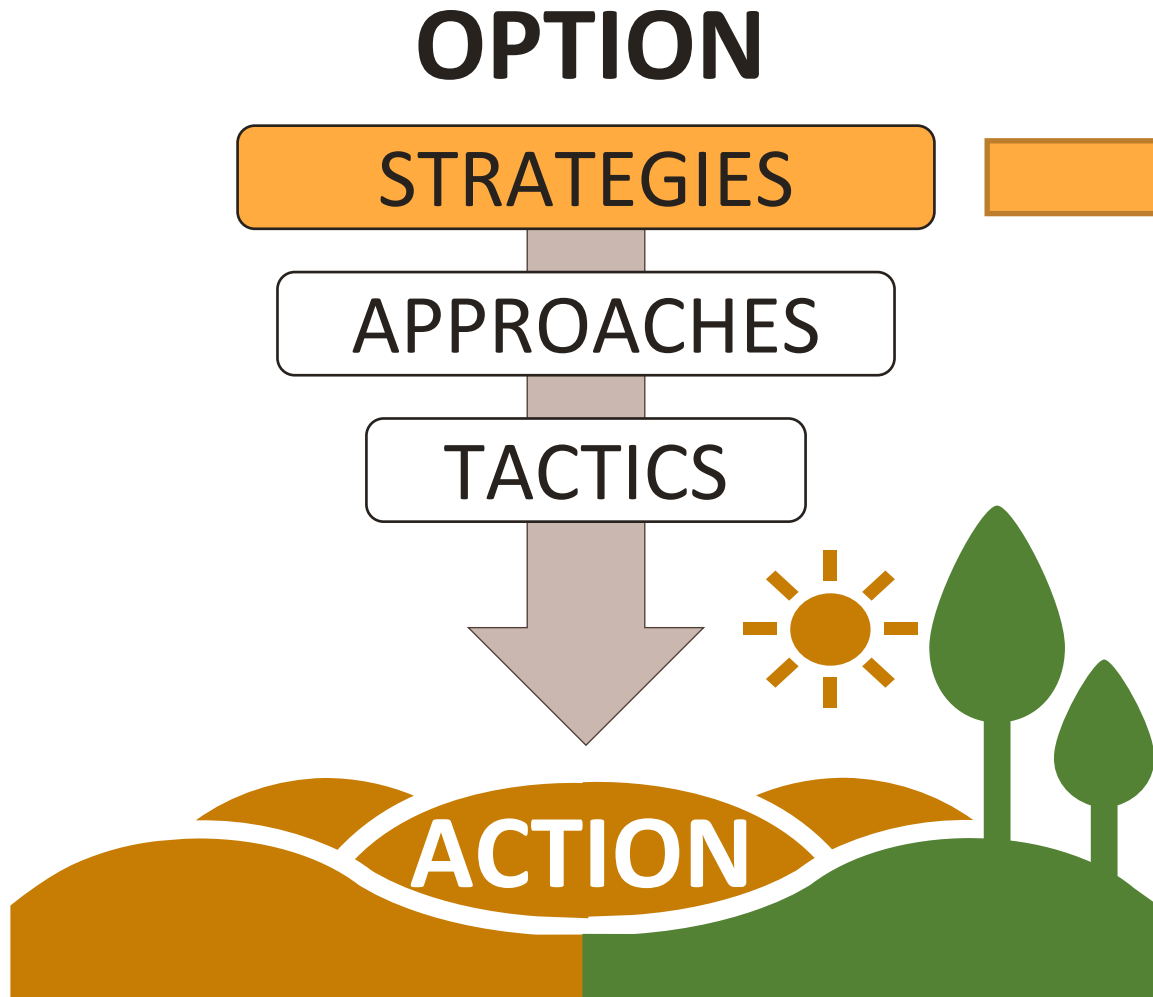
APPROACHES

TACTICS



ACTION

1. Translating broad concepts to specific actions



Example:

Strategy 1: Sustain fundamental functions in grasslands

1. Translating broad concepts to specific actions

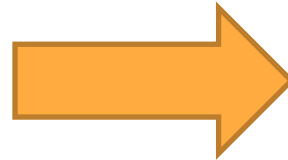
OPTION

STRATEGIES

APPROACHES

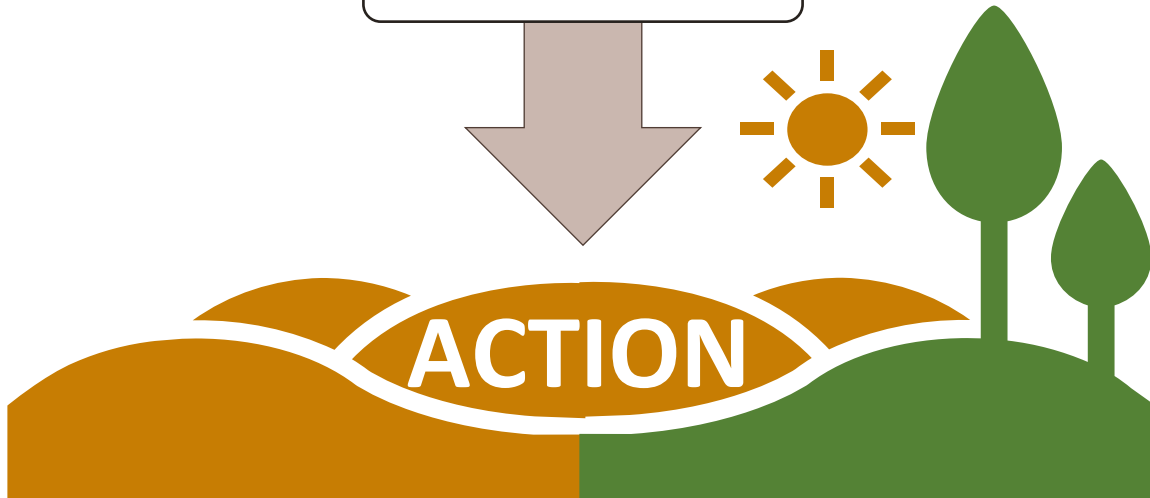
TACTICS

ACTION



Example:

Approach 1.4: Maintain or restore hydrology



1. Translating broad concepts to specific actions

OPTION

STRATEGIES

APPROACHES

TACTICS

ACTION



Example:

Maintain suitable litter cover to sustain soil moisture in drier grasslands.

1. Translating broad concepts to specific actions

OPTION

STRATEGIES

APPROACHES

TACTICS

ACTION



Example:

Convert agricultural land that is declining in productivity or frequently flooded to natural grassland cover.

1. Translating broad concepts to specific actions

OPTION

STRATEGIES

APPROACHES

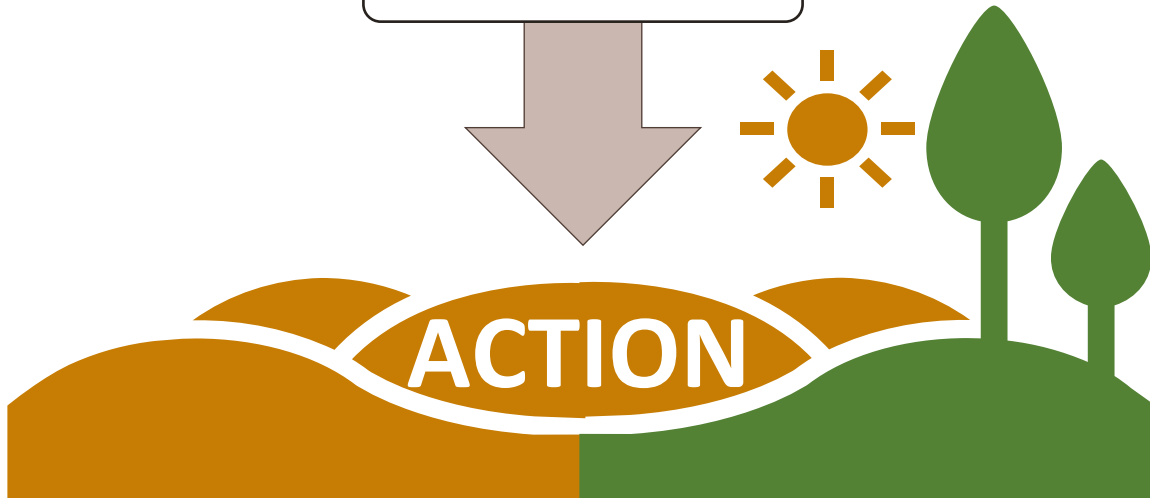
TACTICS

ACTION



Example:

Approach 7.4: Convert non-grassland systems to grasslands if the climate can no longer support the current land cover (forest, savanna, marginal ag)



1. Translating broad concepts to specific actions

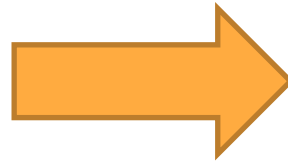
OPTION

STRATEGIES

APPROACHES

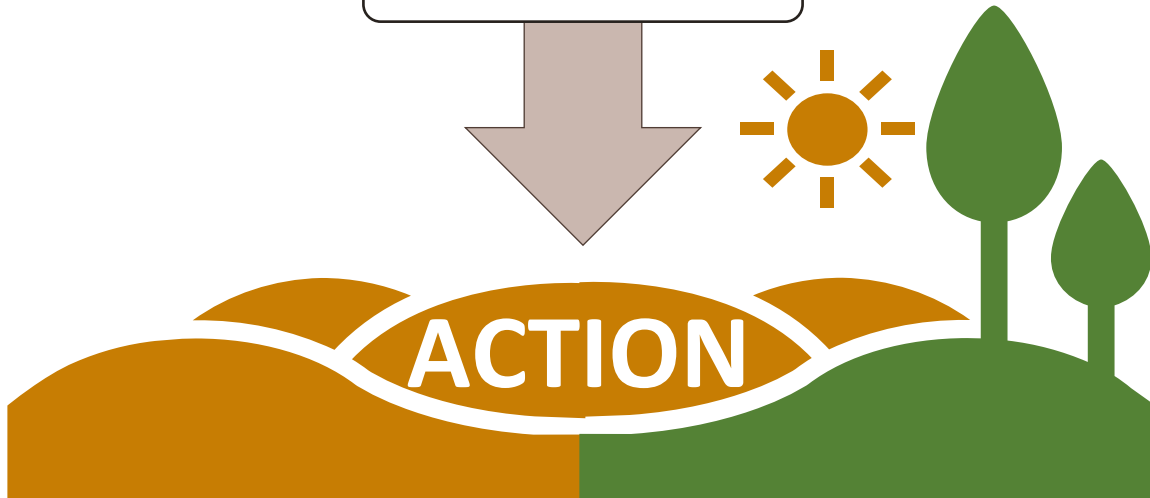
TACTICS

ACTION



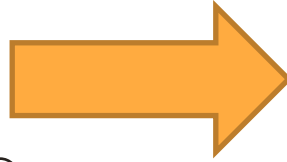
Example:

Strategy 7: Facilitate species or community transitions to align with expected climate conditions



1. Translating broad concepts to specific actions

OPTION



Example:

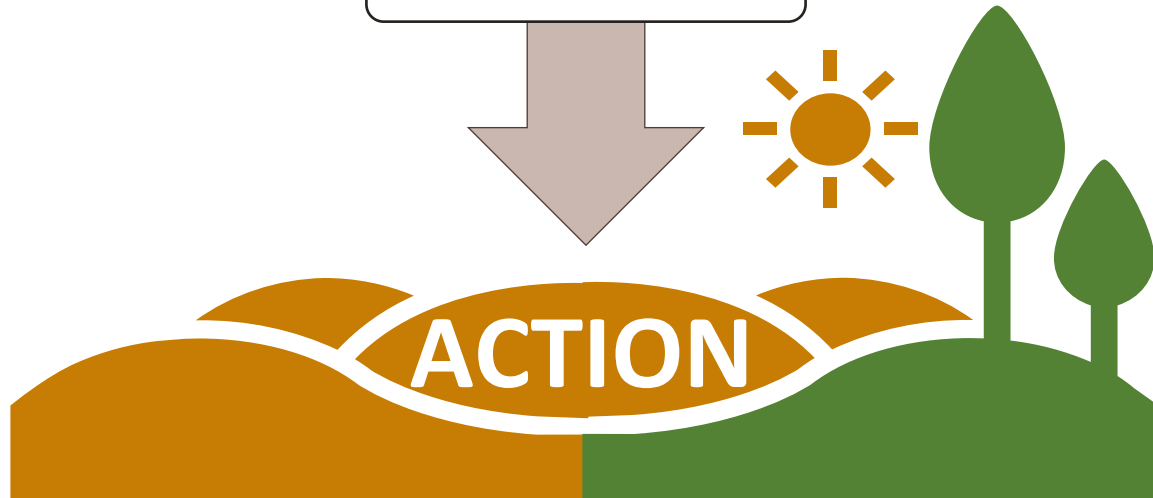
Direct/Transition (change)

STRATEGIES

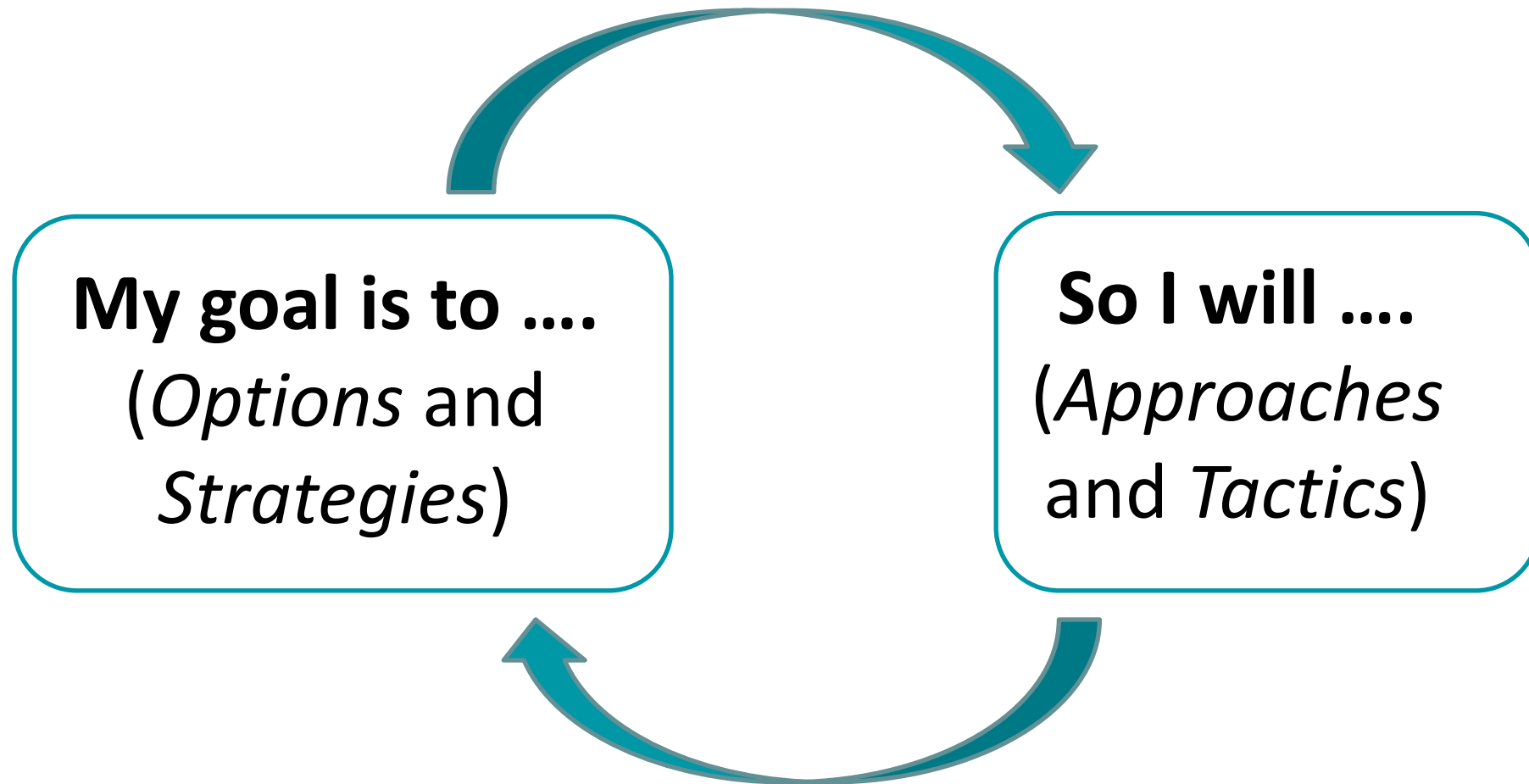
APPROACHES

TACTICS

ACTION



2. Making Actions Intentional



Workbook + Menu

Management Goals & Objectives

Climate Change Impacts

Challenges & Opportunities

Intent of Adaptation (Option)

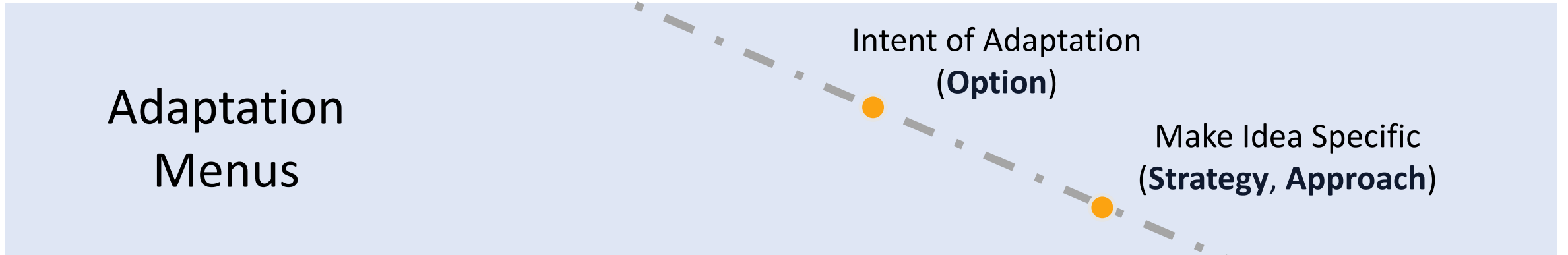
Make Idea Specific (Strategy, Approach)

Action to Implement (Tactic)

Why it's important:

Helps connect the dots from broad concepts to specific actions for implementation.

Adaptation
Menus



Workbook + Menu

Management Goals & Objectives

Climate Change Impacts

Challenges & Opportunities

Monitoring

Intent of Adaptation
(Option)

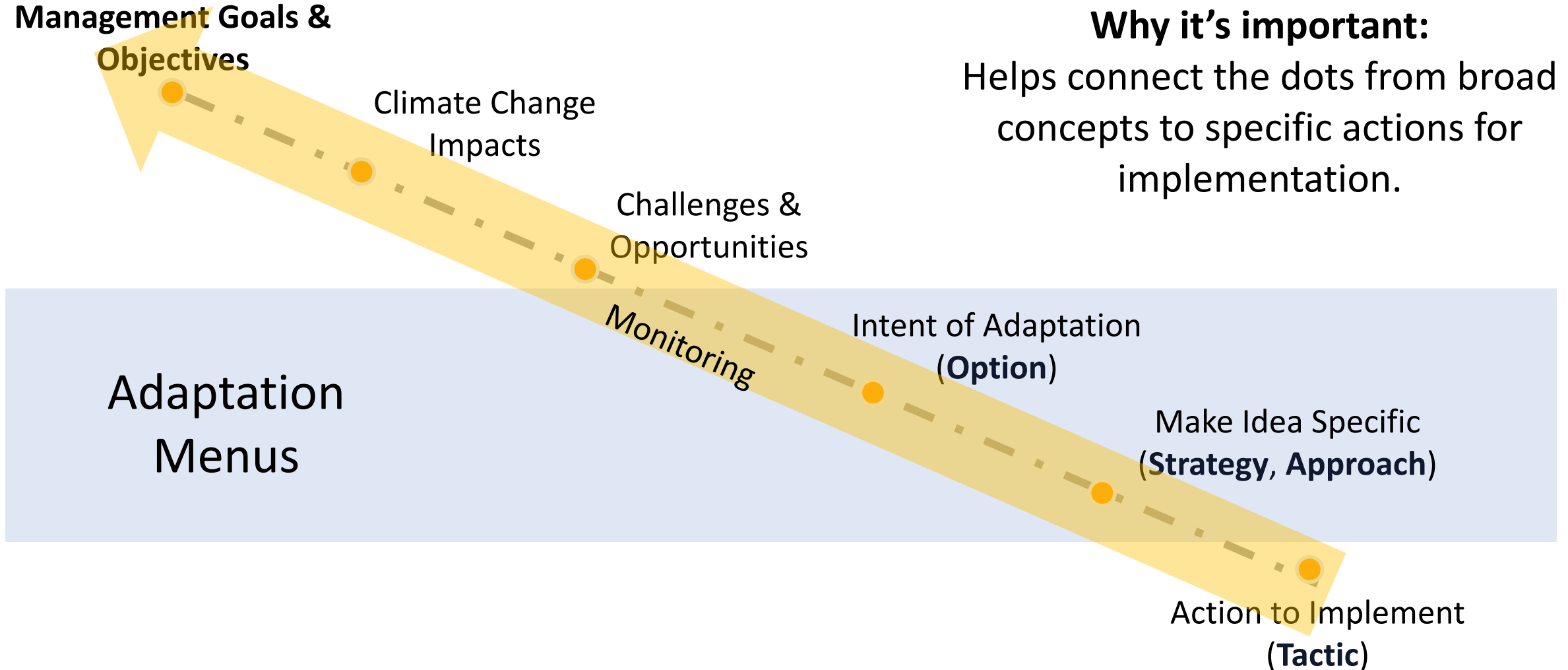
Make Idea Specific
(Strategy, Approach)

Action to Implement
(Tactic)

Why it's important:

Helps connect the dots from broad concepts to specific actions for implementation.

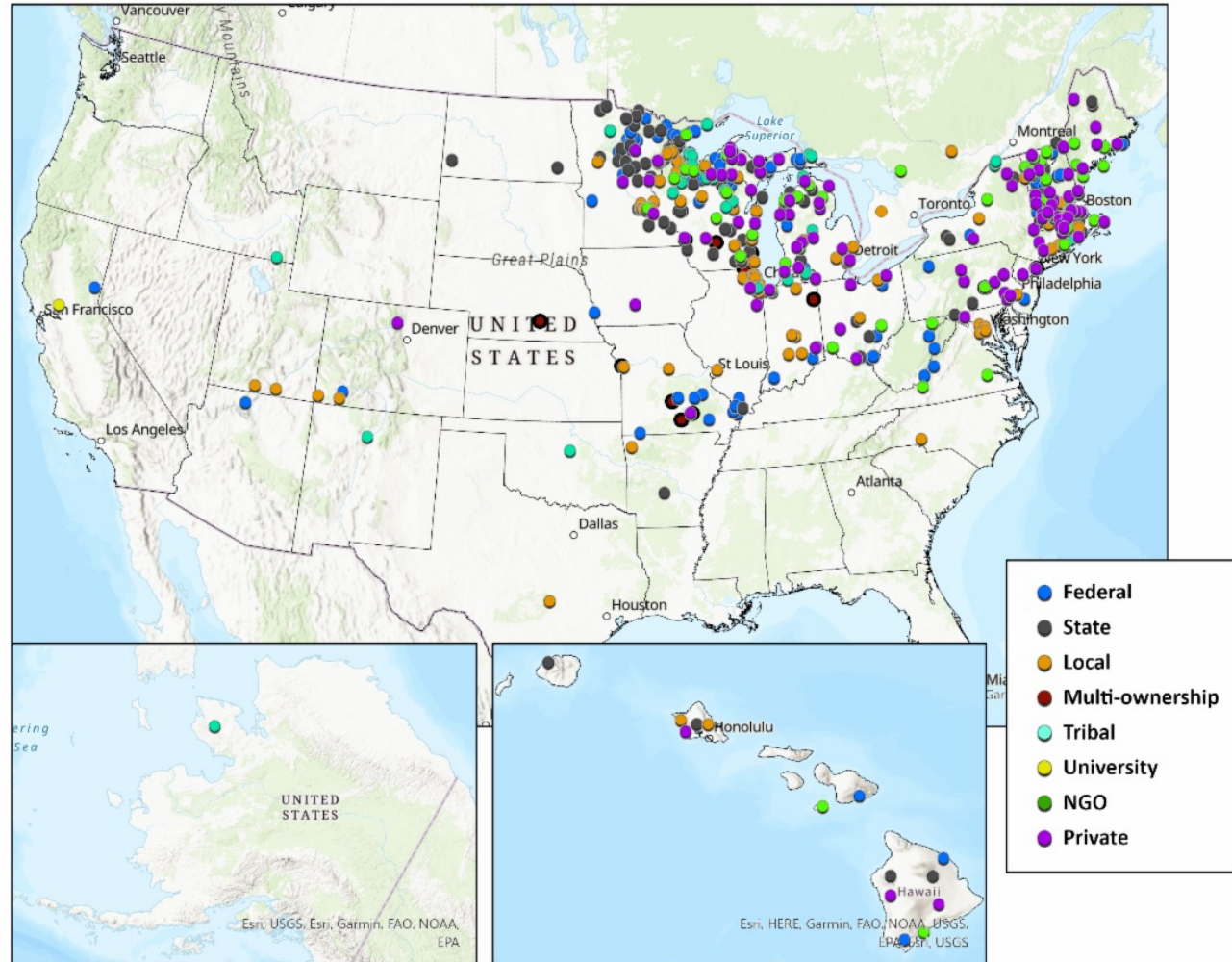
Adaptation
Menus



3. Communicating Your Ideas

Real-world examples of climate-informed forest management.

Over 500 projects have used the **Adaptation Workbook** to consider climate change and identify adaptation actions.



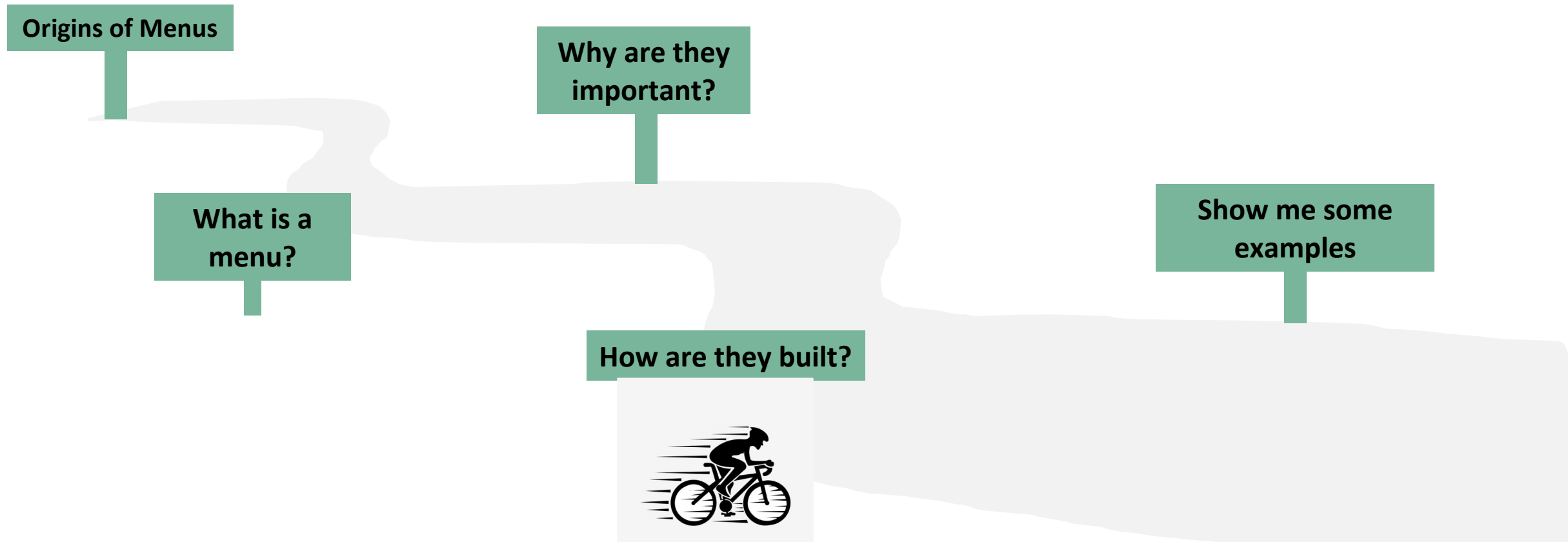
501 Climate change adaptation and mitigation demonstration projects, some featured on forestadaptation.org. Updated Sept. 27, 2021.

4. Boosting Creativity



forestadaptation.org/strategies

Tour de Adaptation Menus

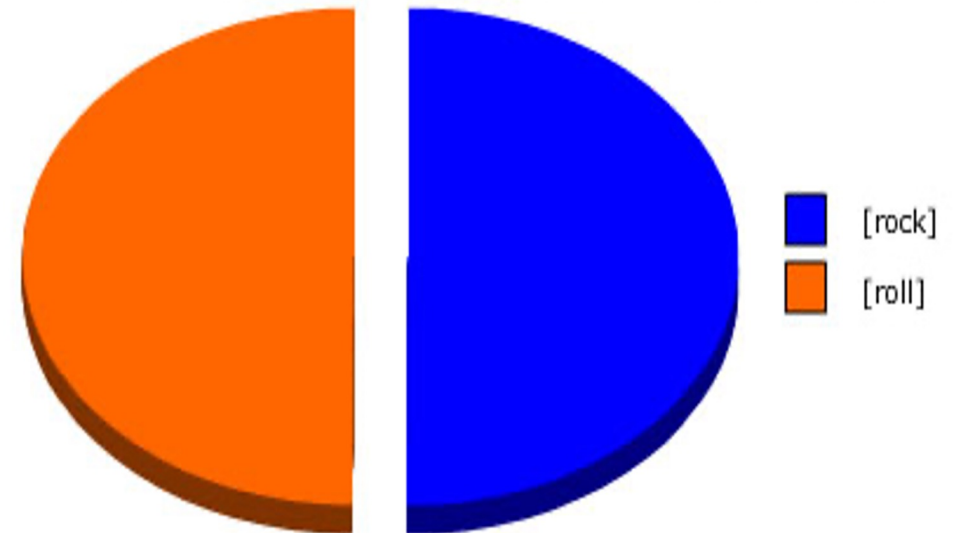


How are Menus Created?

Recipe:

- A need from the community
- Partners
- Literature review
- Vetting in real-world situations
- Peer-review
- Publication

MATERIAL USED TO BUILD THIS CITY



GraphJam.com

Grassland Adaptation Menu

Core team:

- NIACS (*Stephen Handler*)
- USFS (*Leslie Brandt*)
- USGS (*Christine Ribic*)
- University of Wisconsin-Madison (*Ben Zuckerberg, Scott Nelson*)

Audience includes conservation planners, specialists, and technical service providers.

Key Climate Impacts:

- Increasing seasonal, annual, min and max temperatures
- Changing precipitation patterns
- Increasing drought frequency
- Lengthening of frost-free season
- Encroachment of new species
- Increases in wildfire risk
- Loss of wetland habitats
- Species shifts from C3 to C4 grassland communities
- Phenological shifts



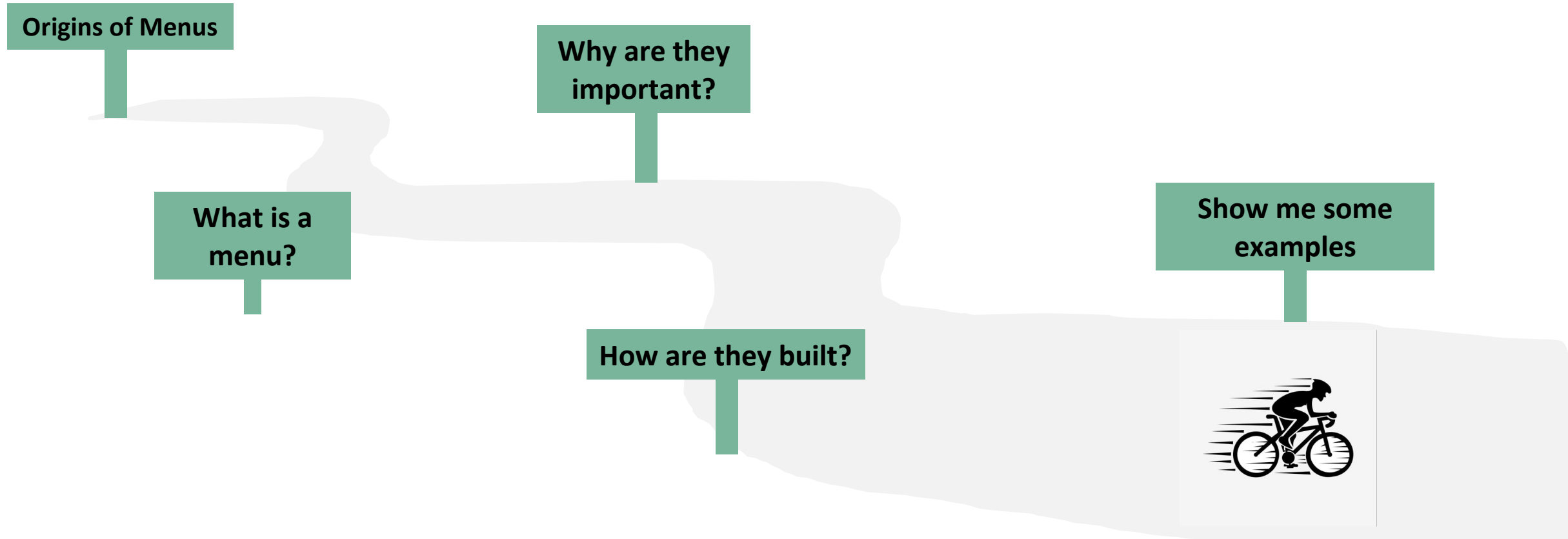
<https://climatechange.lta.org/impacts-to-grasslands/>

Grassland Adaptation Menu



- Strategy 1: Sustain fundamental functions in grasslands
- Strategy 2: Reduce the impact of physical and biological stressors on grassland communities
- Strategy 3: Enhance plant genetic, species, and functional diversity and structural heterogeneity
- Strategy 4: Restore or maintain the extent of grasslands across the landscape
- Strategy 5: Provide for landscape-scale grassland resilience under future climate scenarios
- Strategy 6: Adjust management actions to account for changing conditions
- Strategy 7: Facilitate species or community transitions to align with expected climate conditions
- Strategy 8: Engage human communities in grassland conservation and adaptation

Tour de Adaptation Menus



Grassland Menu Project Example: Nebraska Sandhills

Management Objectives:

- Ensure the continued diversity of ecological communities in the Sandhills by sustaining the range and distribution of habitats needed by all species
- Prevent the spread of invasive plants to uninvaded sites and reduce the dominance/impact of those species where they have become established
- Ensure that land management in the Nebraska Sandhills sustains the health and productivity of both human and ecological communities that rely on the landscape



Climate Challenges:

- Increased woody plant invasion
- Drier, hotter summers and wetter springs and falls may limit windows for prescribed fire
- High water in the early part of the growing season makes it difficult to access or manage wet areas for invasive species control
- Areas frequently covered in standing water provide no livestock production value to ranchers, making it less likely ranchers will actively focus on invasive species management there
- Warmer and wetter springs (and falls) will favor cool season species like reed canarygrass and creeping foxtail

Nebraska Sandhills – Adaptation Strategies

Strategy 6: Adjust management actions to account for changing conditions

- Approach 6.2: Adjust the timing, frequency, or intensity of grazing to align with current and projected climate conditions
- Tactic: Consider options for adapting grazing strategies to account for a changing plant community/forage base and to help suppress the dominance of invasive cool-season grasses in uplands. Graze cattails to decrease dominance while avoiding key areas for wildlife habitat (open water for waterfowl; shoreline shallow water for shorebirds, dabbling ducks)



<https://ianr.unl.edu/growing/majestic-resource-preserving-nebraska-sandhills>

Nebraska Sandhills – Adaptation Strategies

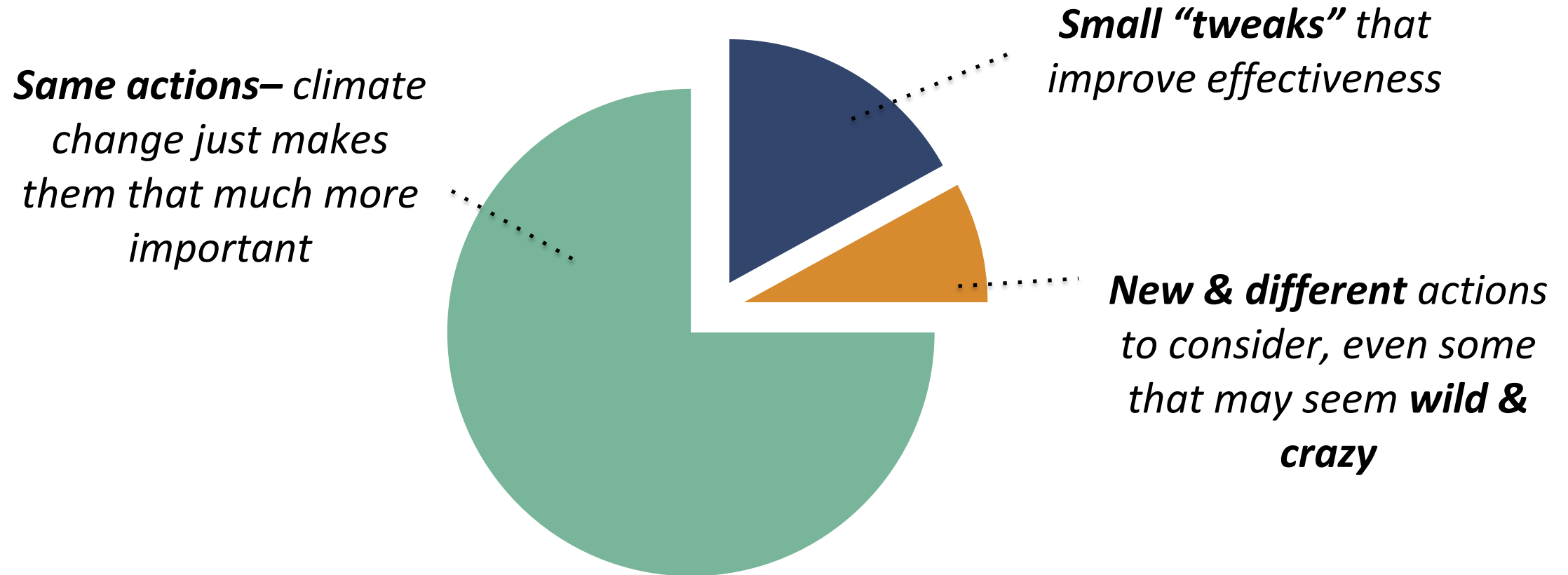
Strategy 8: Engage human communities in grassland conservation and adaptation

- Approach 8.4. Develop economic incentives for grassland adaptation and conservation on private lands
- Tactic: Look for other ways to generate income from lakes and wetlands that take advantage of the higher water levels (e.g., leases to water hunting outfitters?) and help incentivize/pay for invasive species management



<https://ncta.unl.edu/news-releases/sandhills-ranch-becomes-outdoor-classroom>

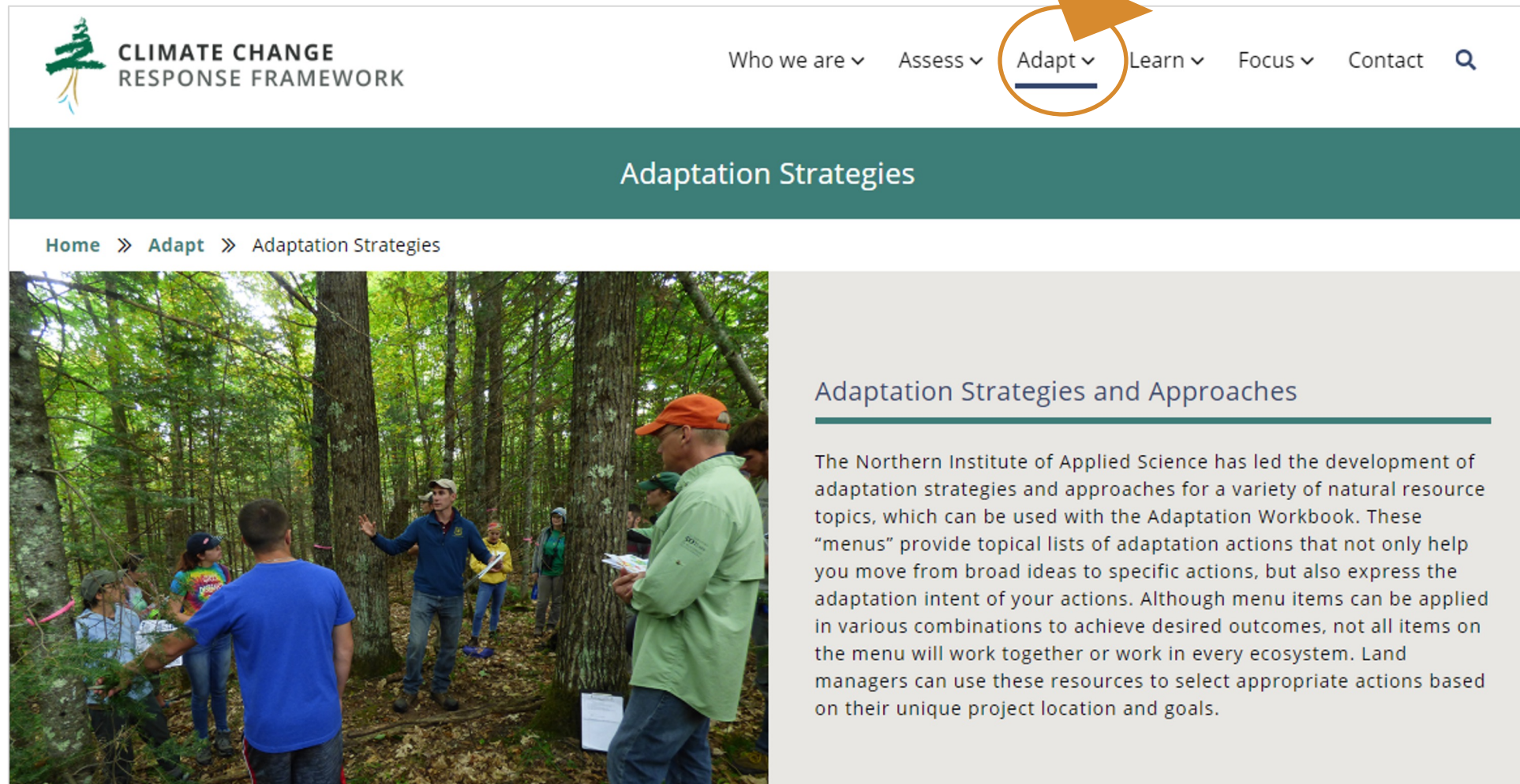
Adaptation Actions Can Be...



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

Climate Adaptation Strategies and Approaches

More Information




CLIMATE CHANGE RESPONSE FRAMEWORK

Who we are ▾ Assess ▾ Adapt ▾ Learn ▾ Focus ▾ Contact 🔍

Adaptation Strategies

Home » Adapt » Adaptation Strategies



Adaptation Strategies and Approaches

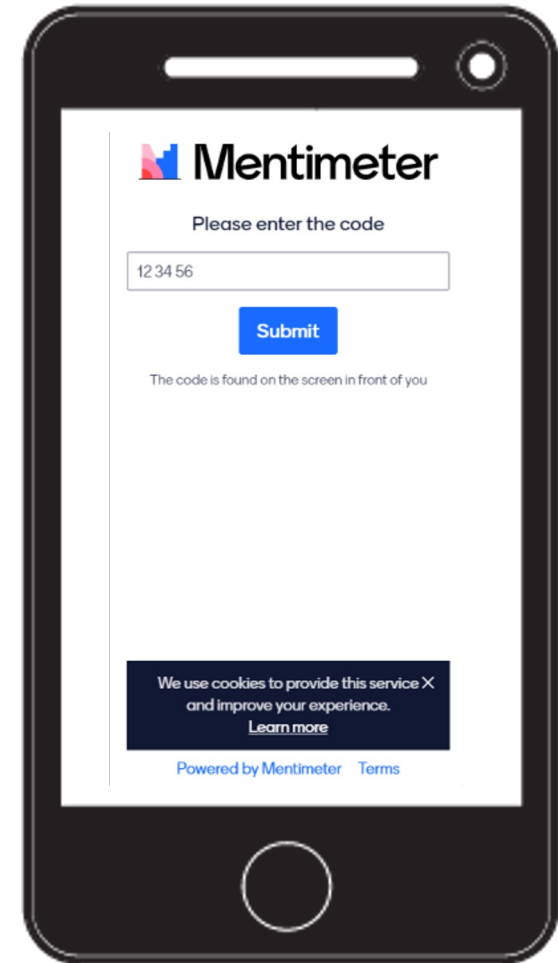
The Northern Institute of Applied Science has led the development of adaptation strategies and approaches for a variety of natural resource topics, which can be used with the Adaptation Workbook. These “menus” provide topical lists of adaptation actions that not only help you move from broad ideas to specific actions, but also express the adaptation intent of your actions. Although menu items can be applied in various combinations to achieve desired outcomes, not all items on the menu will work together or work in every ecosystem. Land managers can use these resources to select appropriate actions based on their unique project location and goals.

forestadaptation.org/strategies

ACTIVITY!

- Find your way to [menti.com](https://www.menti.com)
- Access on your computer or use your phone!

<https://www.menti.com/alqyfucuwamj>



Discussion - Which adaptation strategies from the menu do you already utilize in your management?





Discussion - Are there missing topics in the menu?

How can FWS
utilize the
grassland menu
in planning and
implementation?



Photo: Central Grasslands Roadmap

Questions? Thank you!

Courtney.Peterson@colostate.edu

Stephen.Handler@usda.gov

www.forestadaptation.org



**United States Department of Agriculture
Climate Hubs**