

ADAPTATION PLANNING FOR FOREST CONSERVATION AND STEWARDSHIP



Welcome and Introductions

Wednesday September 28, 2016



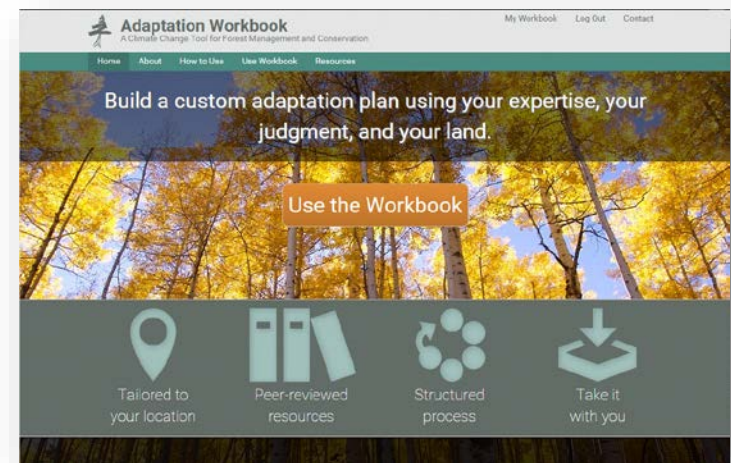
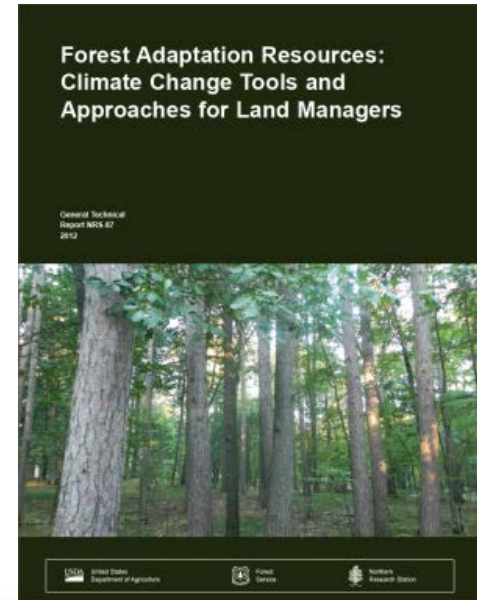
Two Questions

1. How might climate change affect the resources that I manage?
2. What management actions could help prepare for those effects?

Forest Adaptation Resources

A flexible workbook and menu to address diverse needs

- Designed for a variety of land owners with diverse goals
- Does not make recommendations
- Menu of adaptation strategies and approaches for forest management
- New online version!



Adaptation and Forest Management

in·ten·tion·al

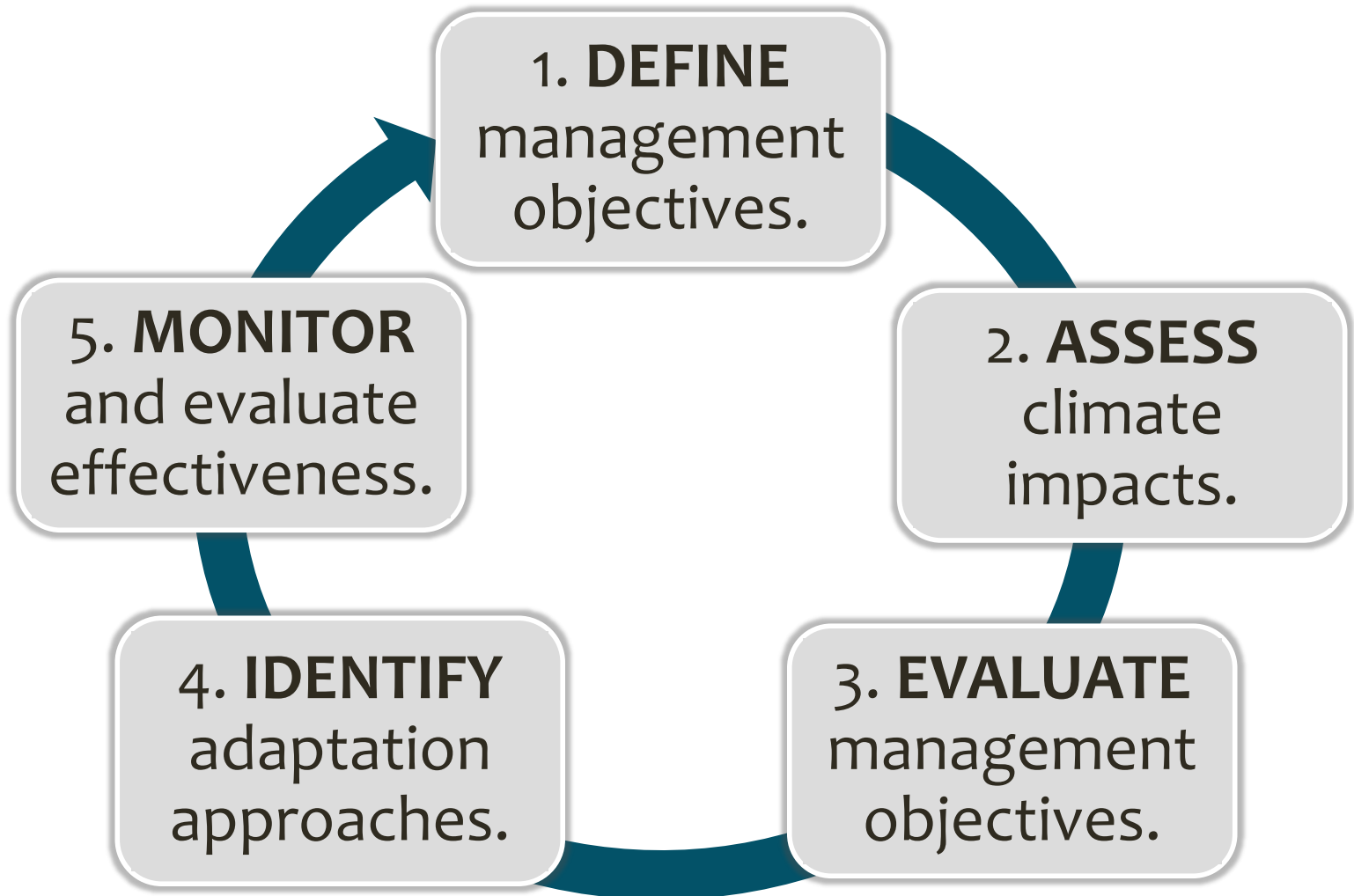
/in'tenʃənəl/

adjective

1. done on purpose; deliberate.

synonyms: deliberate, calculated, conscious, intended, planned, meant, studied, knowing, willful, purposeful, purposive, done on purpose

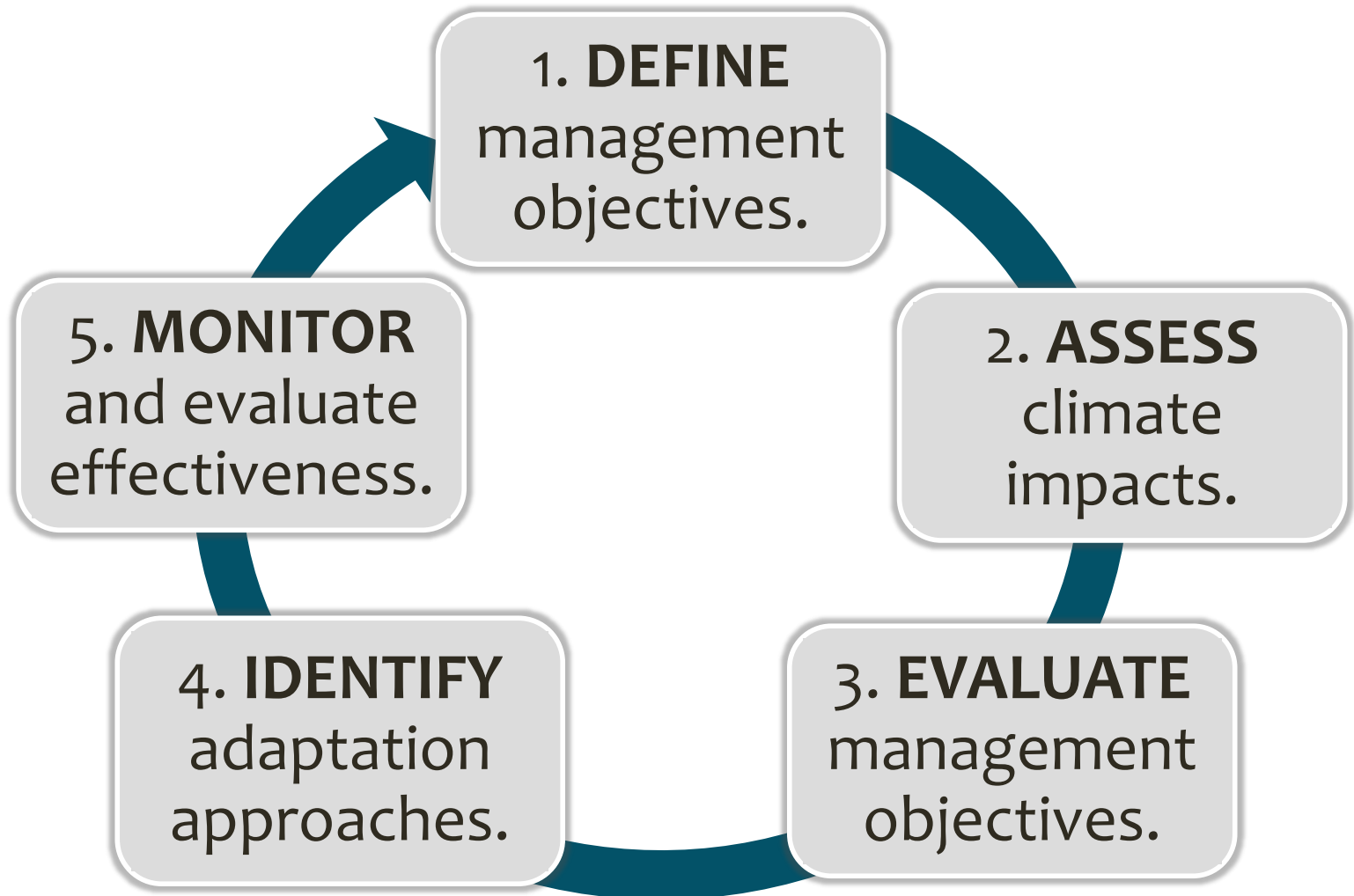
Adaptation Workbook



Organization and Documentation

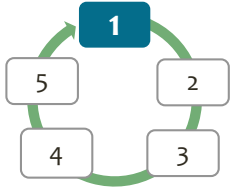
| Management Objectives | Challenges | Opportunities | Feasibility | Other Considerations | |
|-----------------------|------------|---------------|-------------|------------------------|----------------------|
| | | | | | |
| Adaptation Actions | | | Benefits | Drawbacks/ Barriers | Recommend Tactic? |
| Approach | Tactics | Time Frame | | | |
| | | | | | |

Agenda





Step 1: DEFINE area of interest, management goals and objectives, and time frames.



Step 1: DEFINE area of interest, management goals and objectives, and time frames.

Purpose:

- Define the scope of the project

Where are you working?

What are your current management goals and plans for this area?

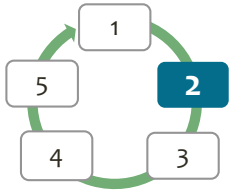
Introductions

- Walk the rest of us through what your project is about (location, ecosystem types, key goals/objectives)
 - A few *brief* comments, please!





Step 2: Assess site-specific climate change impacts & vulnerabilities

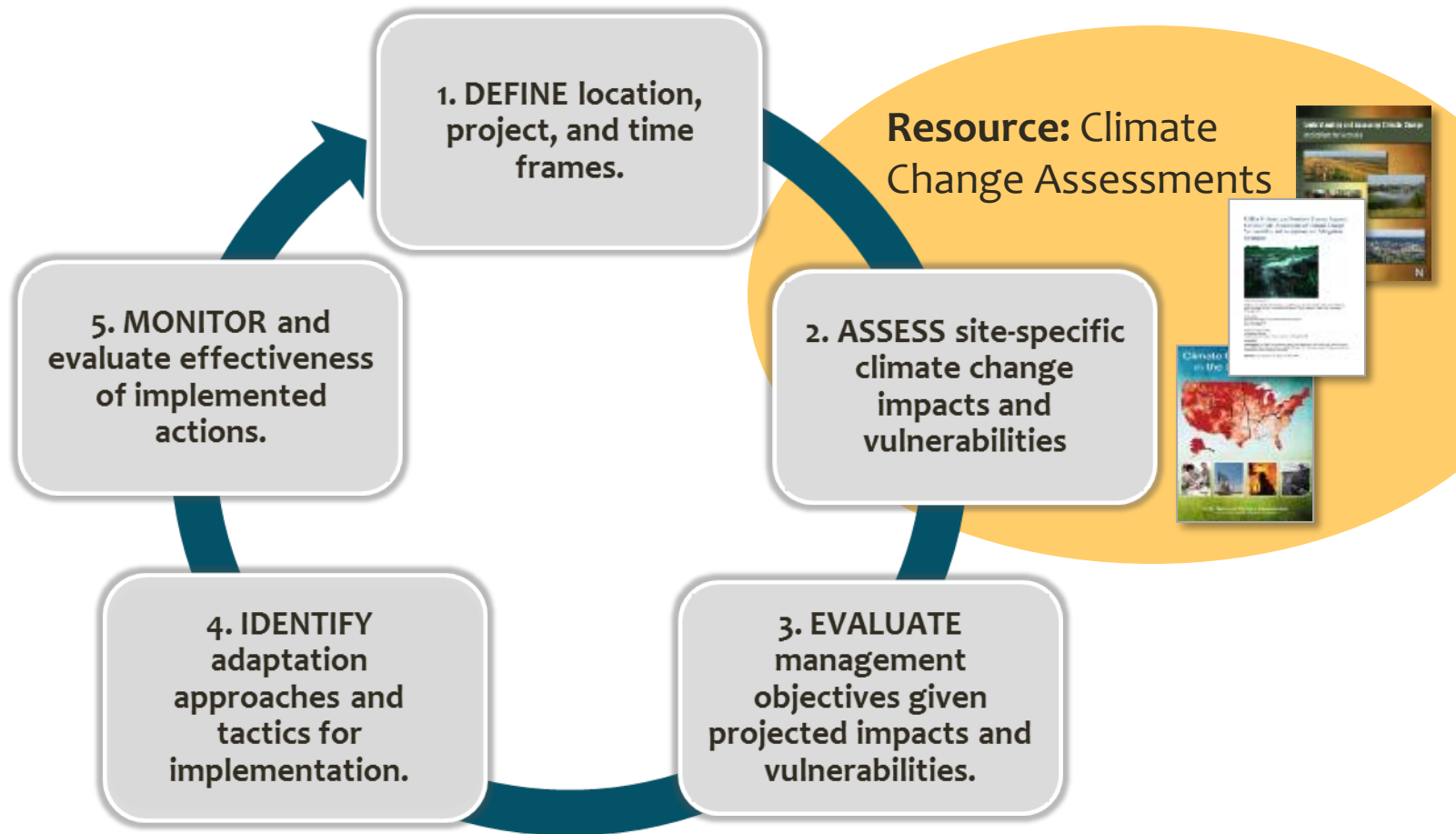


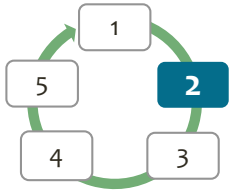
Step 2: ASSESS site-specific climate change impacts and vulnerabilities.

Purpose:

- Consider how climate change may specifically affect the project area
-
- Climate Impacts and Vulnerability
 - Vulnerability Determination

Adaptation Workbook Process



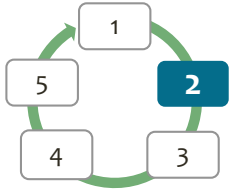


Step 2: ASSESS site-specific climate change impacts and vulnerabilities.

Climate Change Impacts – Notes and Prioritization

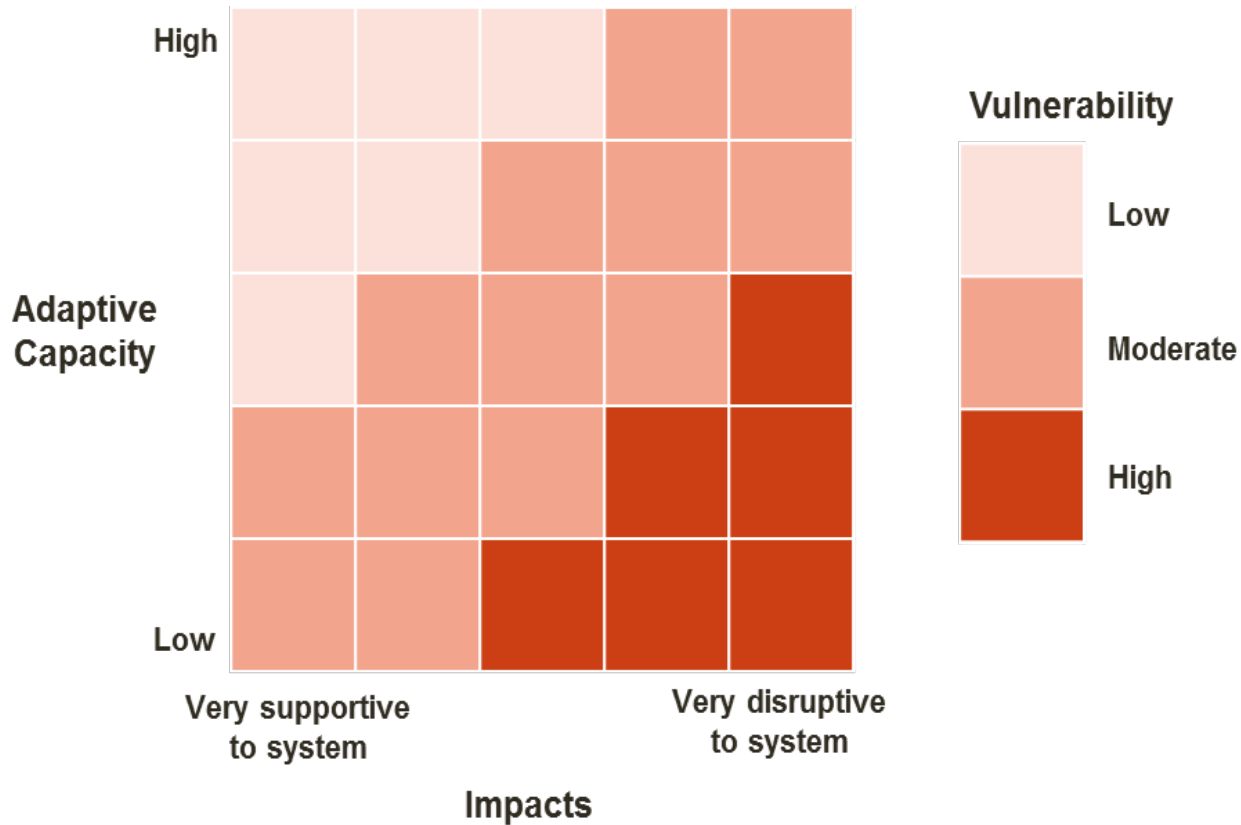
| General Climate Change Impacts | Specific Considerations for the Project Area | Points* (20 Total) |
|---|---|-----------------------|
| <i>General climate change impacts across the Midwest and Northeast US:</i> | <i>How might broad-scale impacts and vulnerabilities be affected by conditions in your project area?</i> | |
| Warmer temperatures across the entire year, particularly warmer winters | | |
| More days with extreme heat | | |
| Fewer days with extreme cold | | |
| Increased winter & spring precipitation | | |
| Slight or large decrease in summer precipitation | | |
| More frequent heavy precipitation events | | |
| Less snow and more variable snowpack | | |
| Shorter winters | | |

- You have 20 points (as a group) to distribute as you see fit.



Step 2: ASSESS site-specific climate change impacts and vulnerabilities.

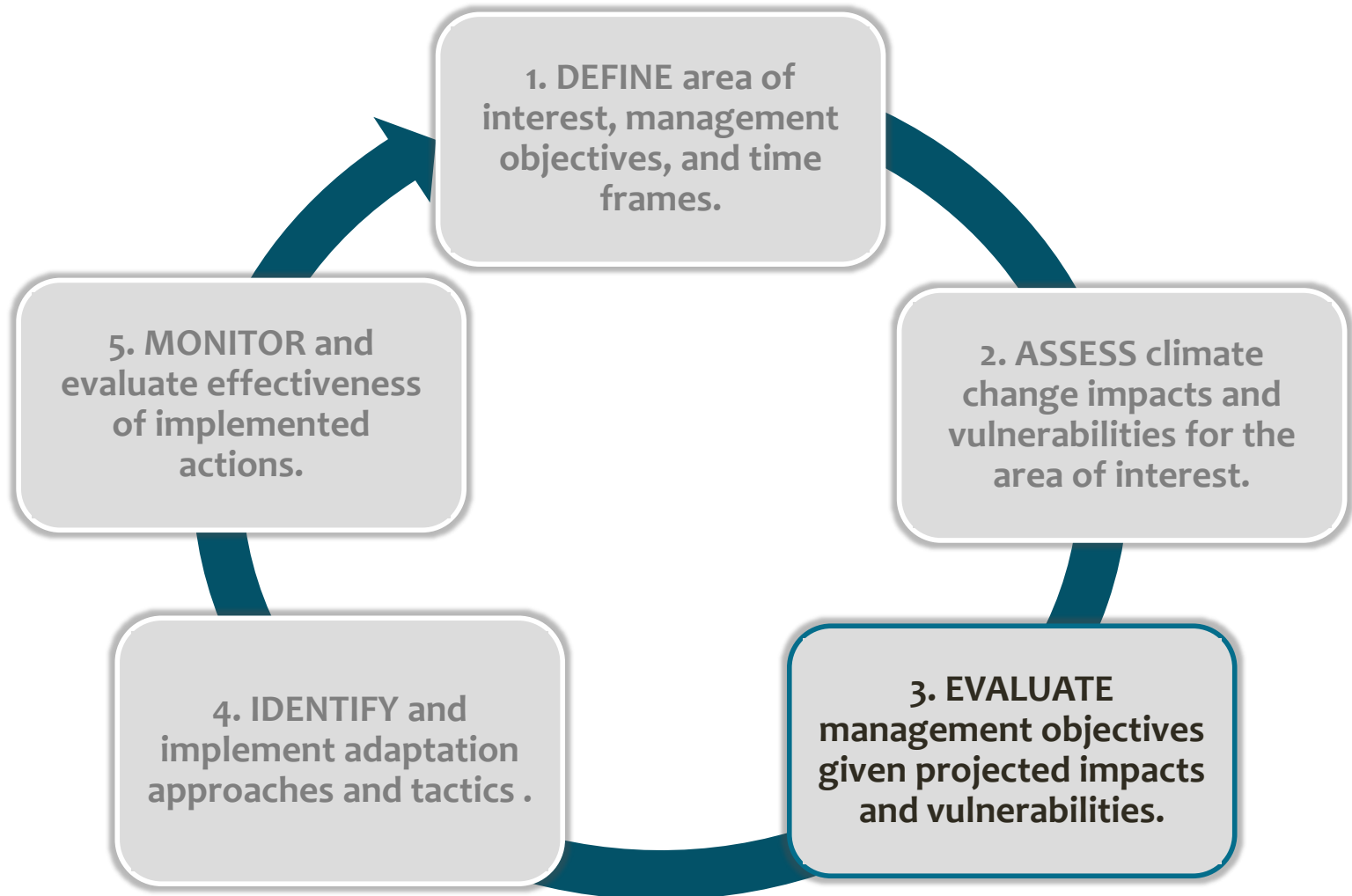
Vulnerability Determination

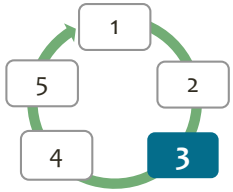




Step 3: EVALUATE management objectives given projected impacts and vulnerabilities.

Workbook Cycle: Step 3



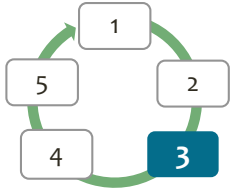


Step 3: EVALUATE management objectives given projected impacts and vulnerabilities.

Purpose:

- Realistically assess the ability to meet goals and objectives under current management.

Can current management achieve goals?



Step 3: EVALUATE management objectives given projected impacts and vulnerabilities.

Management Objective

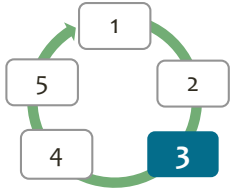
Challenges

Opportunities

Feasibility under
Current Management

Other Considerations

From Step 1



Step 3: EVALUATE management objectives given projected impacts and vulnerabilities.

Management Objective

Challenges

Opportunities

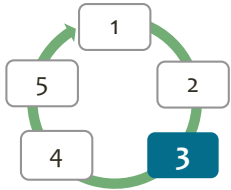
Feasibility under
Current Management

Other Considerations

How climate change impacts and vulnerabilities may make it more difficult to achieve the objective.

For example:

- *Reduced suitable habitat for target species*
- *Reduced winter access*



Step 3: EVALUATE management objectives given projected impacts and vulnerabilities.

Management Objective
Challenges

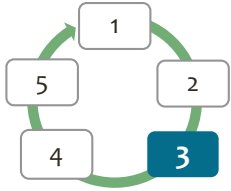
Opportunities

Feasibility under
Current Management
Other Considerations

How climate change impacts and vulnerabilities may make it easier to achieve the objective.

For example:

- *Reduced competition*
- *Increased growth*



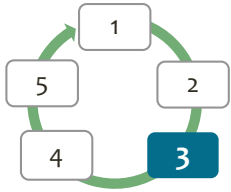
Step 3: EVALUATE management objectives given projected impacts and vulnerabilities.

Management Objective
Challenges
Opportunities
**Feasibility under
Current Management**
Other Considerations

Is current management adequate for meeting the objectives given climate change?

High: We can do it!
Opportunities > Challenges

Low: We'll need more resources or effort.
Challenges > Opportunities



Step 3: EVALUATE management objectives given projected impacts and vulnerabilities.

Management Objective

Challenges

Opportunities

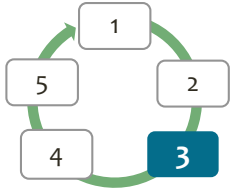
Feasibility under
Current Management

Other Considerations

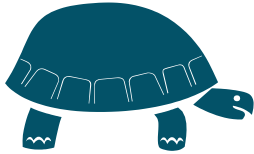
Social, administrative, financial, or other factors that also affect the ability to meet the objectives.

For example:

- *Rare species or high social value—we'll manage for it regardless*
- *Best chance of success—go for the long shot*



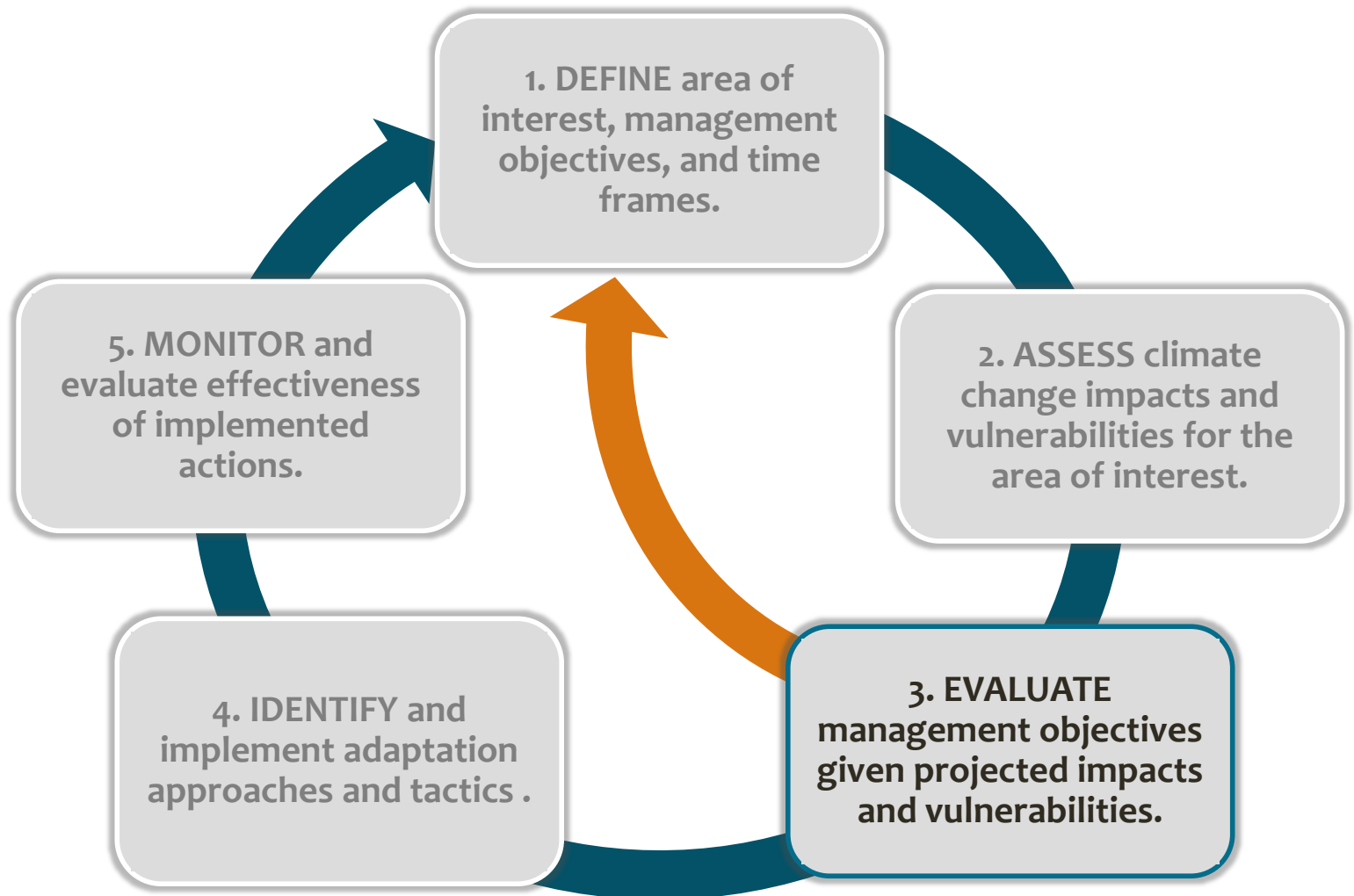
Step 3: EVALUATE management objectives given projected impacts and vulnerabilities.



Slow down!

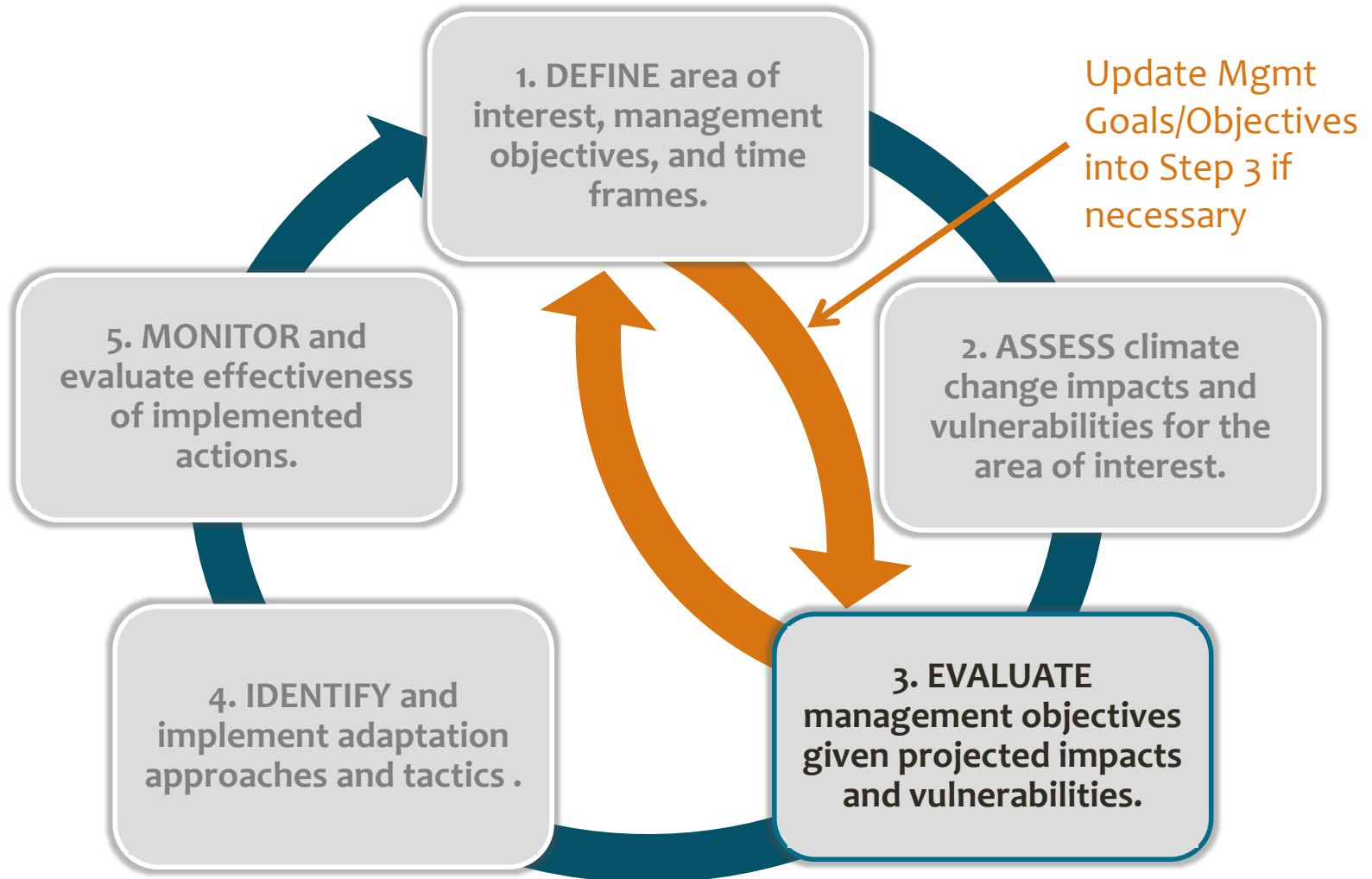
Are you going to continue with the management objectives that you have identified?

Workbook Cycle: Step 3



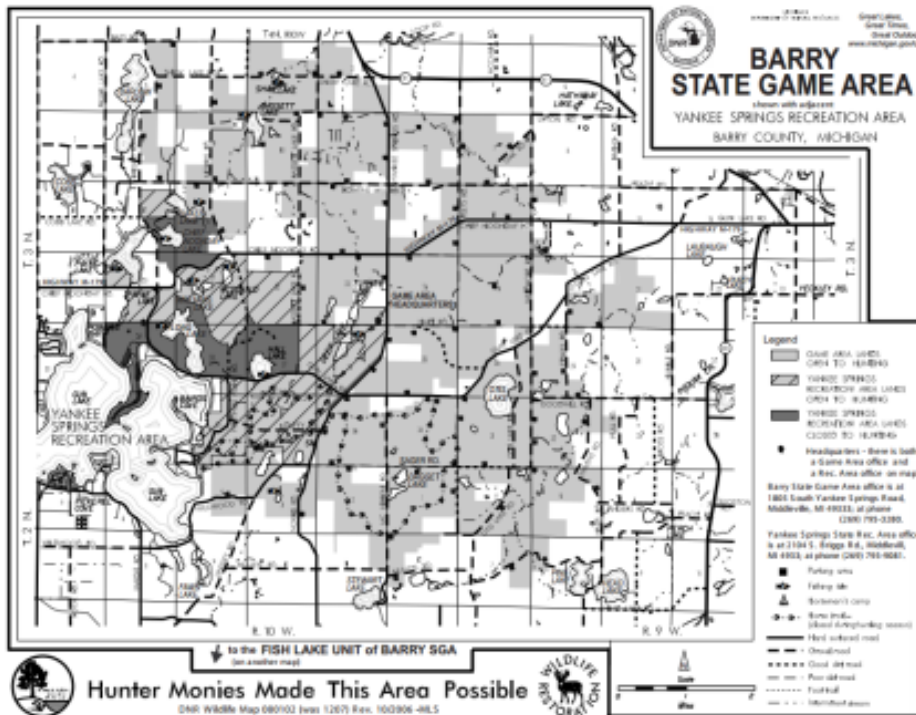
... or, RE-EVALUATE

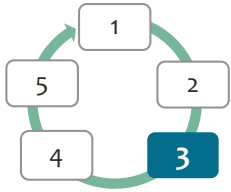
Workbook Cycle: Step 3



Example: Step 3

Michigan DNR: Barry State Game Area





Step 3: EVALUATE management objectives given projected impacts and vulnerabilities.

Mgmt. Obj.

- Regenerate oak spp. to diversify age classes

Challenges

- Competition from mesic spp.
- Lack of natural wildfire
- Deer
- Invasive spp. competition

Opportunities

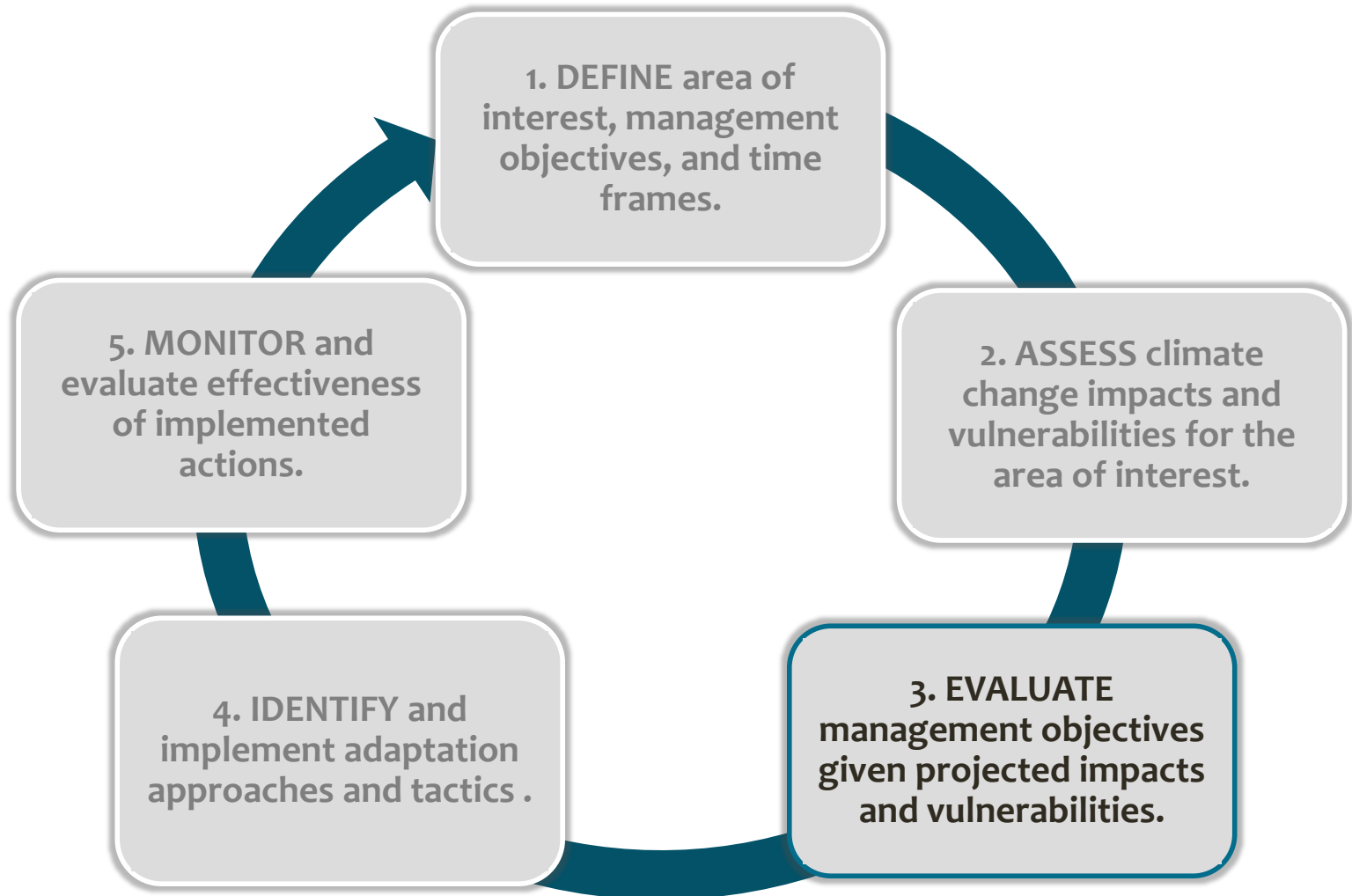
- Mesic spp. less competitive in warmer, drier conditions
- EHD increases, and deer decrease?

Feasibility of Meeting Obj. (Current Mgmt)

- Short term: Low
- Long term: Mod.

Other: Hunter expectation for abundant game. Local population not supportive of active mgmt.

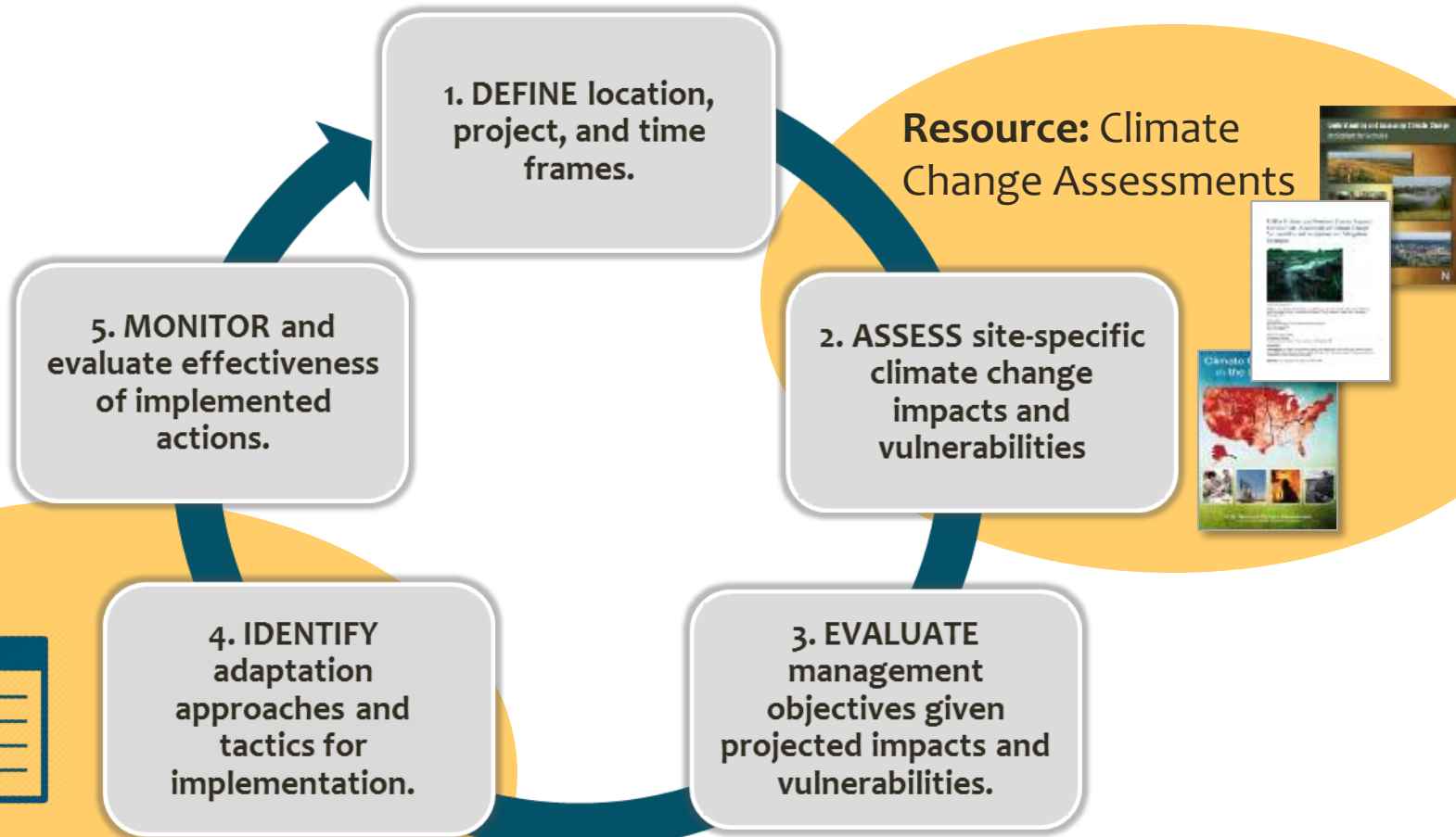
Workbook Cycle: Step 3





Step 4: Identify adaptation approaches and tactics for implementation

Adaptation Workbook Process





**BRIEF
RE-CAP**

Actions for Adaptation

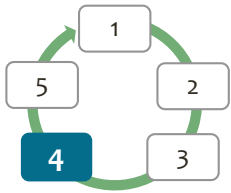
Adaptation = taking action to prepare forests for climate change.



Adaptation activities can build on sustainable management, conservation, and restoration

BUT

its necessary to explore potential modifications to address climate change.



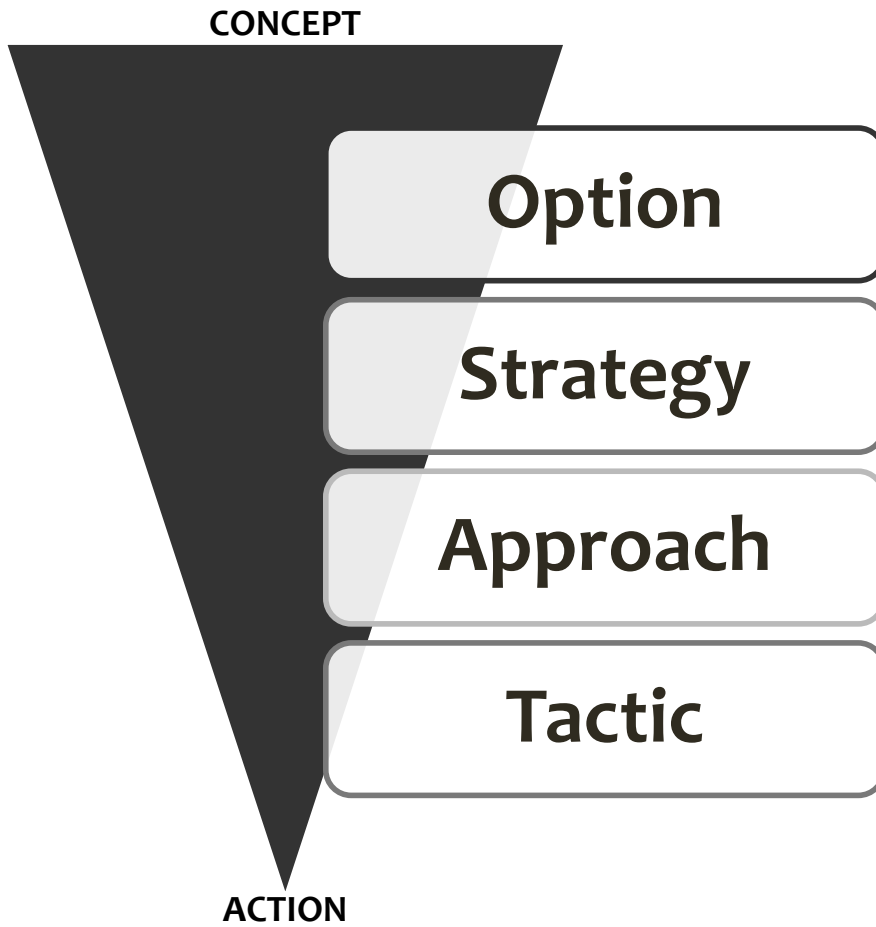
Step 4: IDENTIFY adaptation approaches and tactics for implementation.

Key Questions:

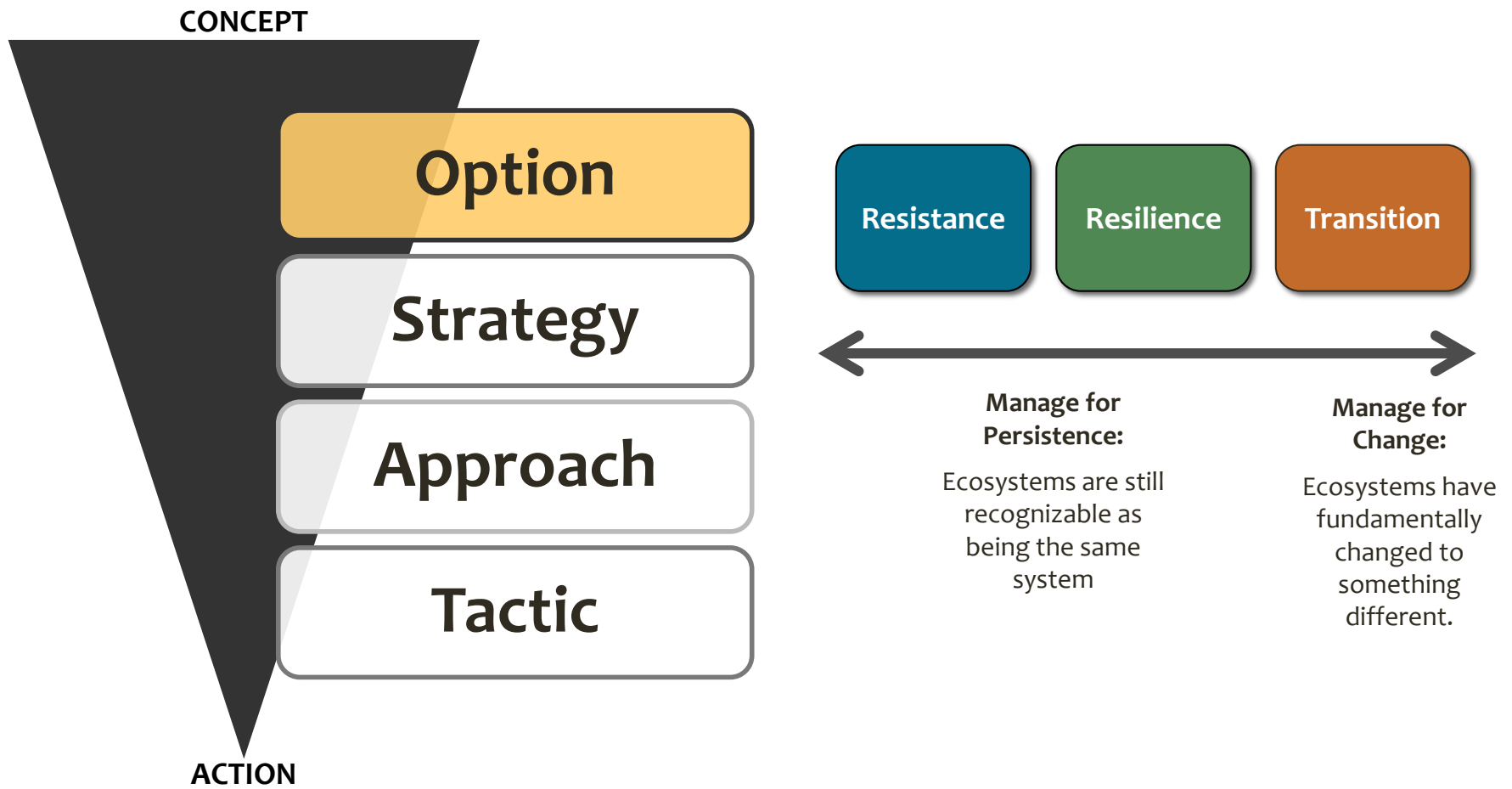
What actions can enhance the ability of the ecosystem to adapt to anticipated changes *and* meet management goals?

Will future managers know what we were trying to do?

Adaptation Strategies and Approaches



Adaptation Strategies and Approaches



Resistance (persistence)

Improve the defenses of the ecosystem against effects of change.

- Short-term
- High-value

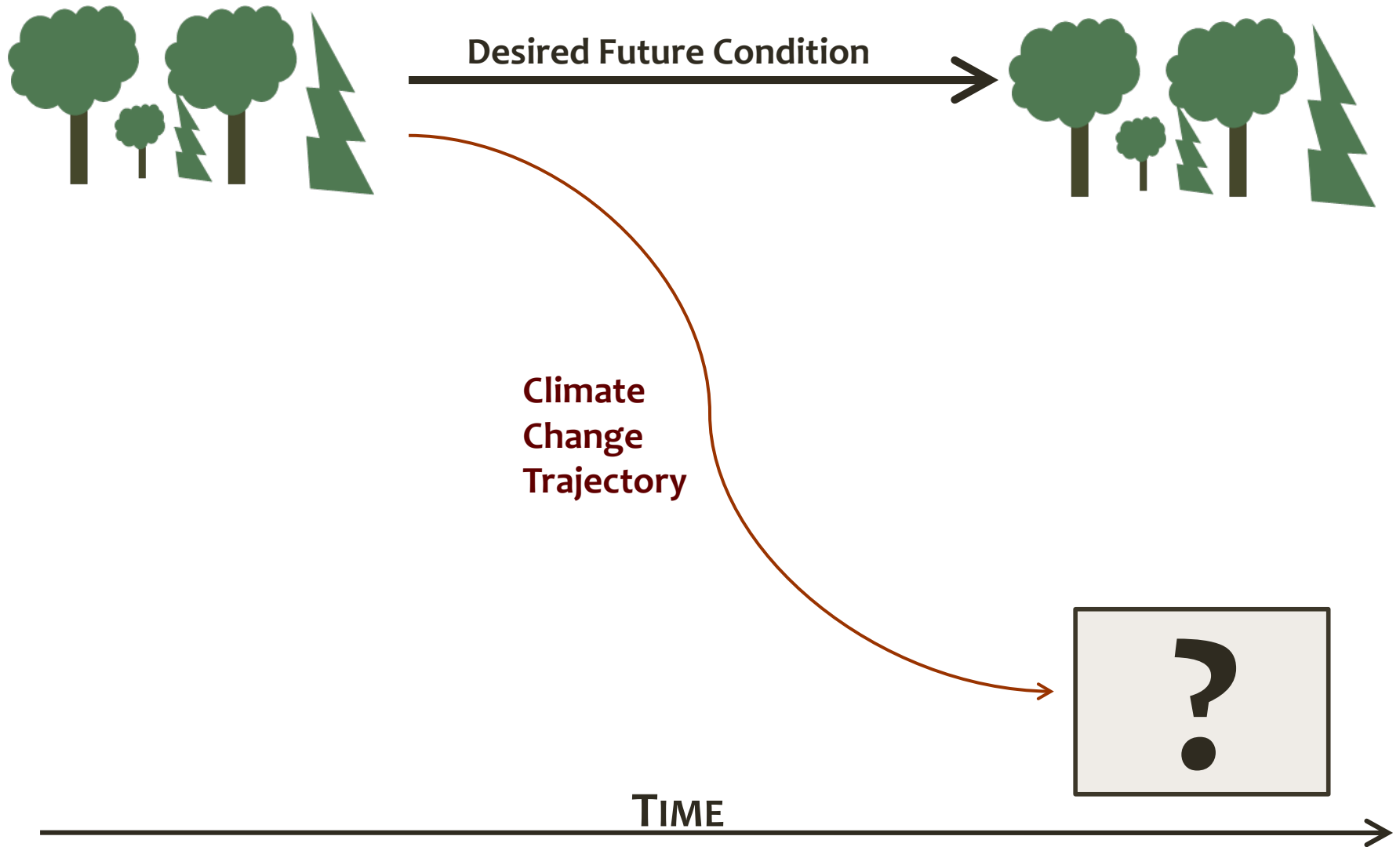
Required, or otherwise worth the risk



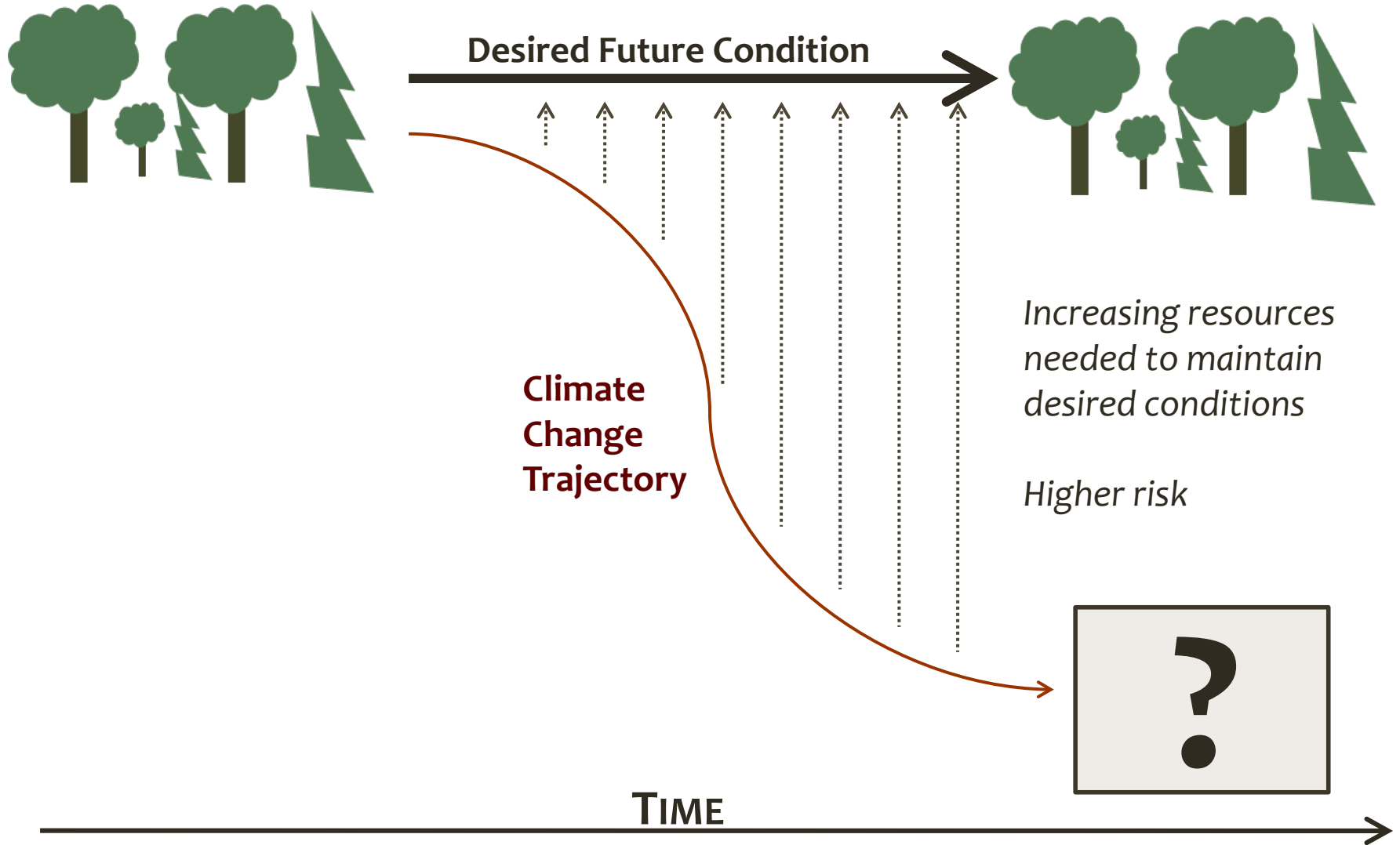
Photo: USFS



Resistance (persistence)



Resistance (persistence)



Resilience (persistence)

Accommodate some degree of change or disruption, but be able to return to a similar condition after disturbance

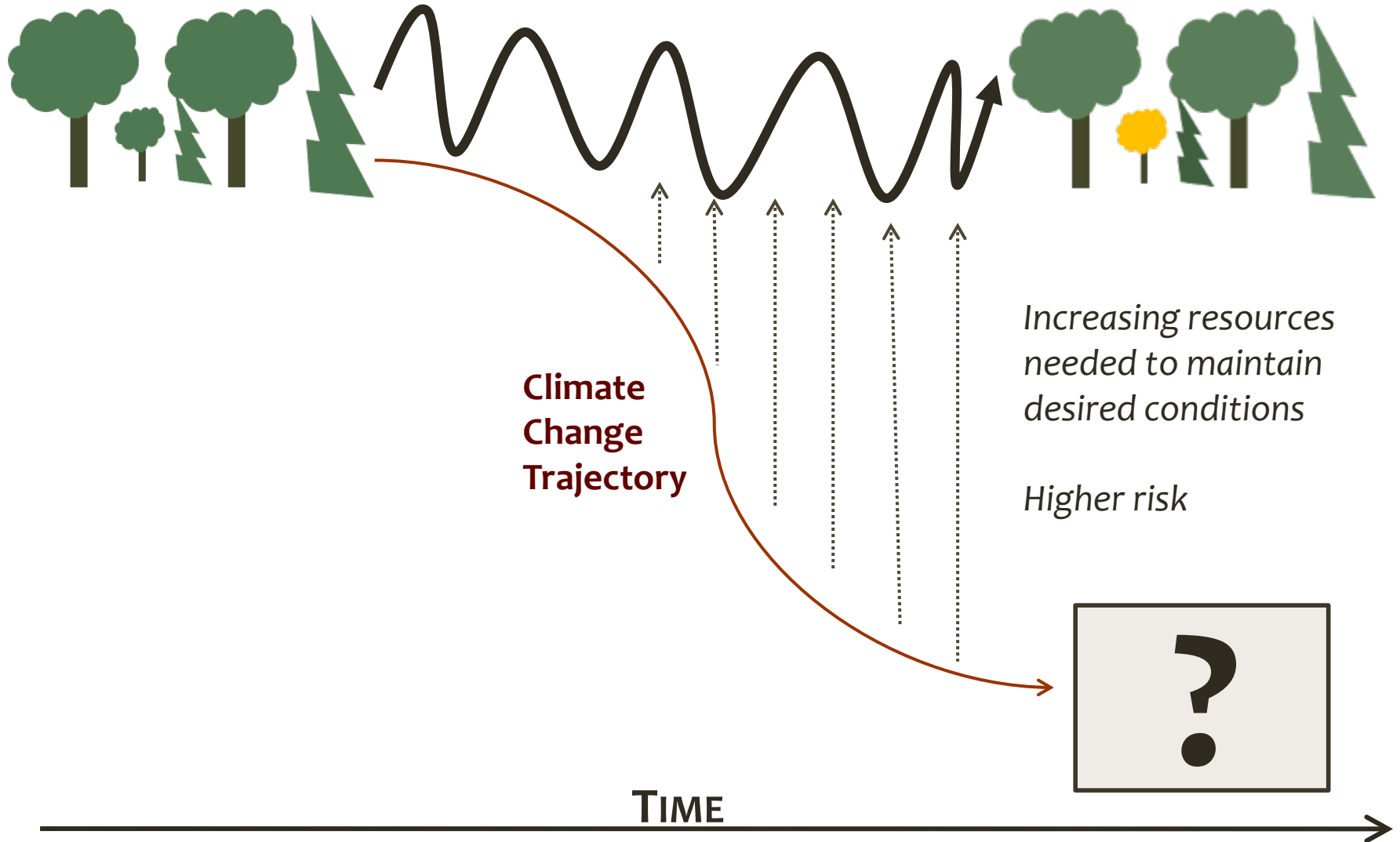
- Thinning stands to improve overall health & vigor
- Management of vegetation following disturbance



Photo: USFS



Resilience (persistence)



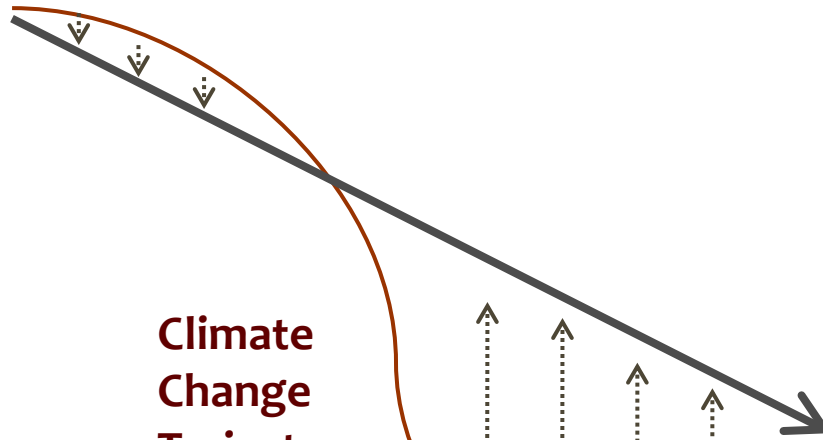
Transition (change)

Intentionally encourage change, help ecosystems respond in a targeted fashion

- Foster future-adapted native species
- Managed relocation/assisted migration
- Increased connectivity for migration



Transition (change)



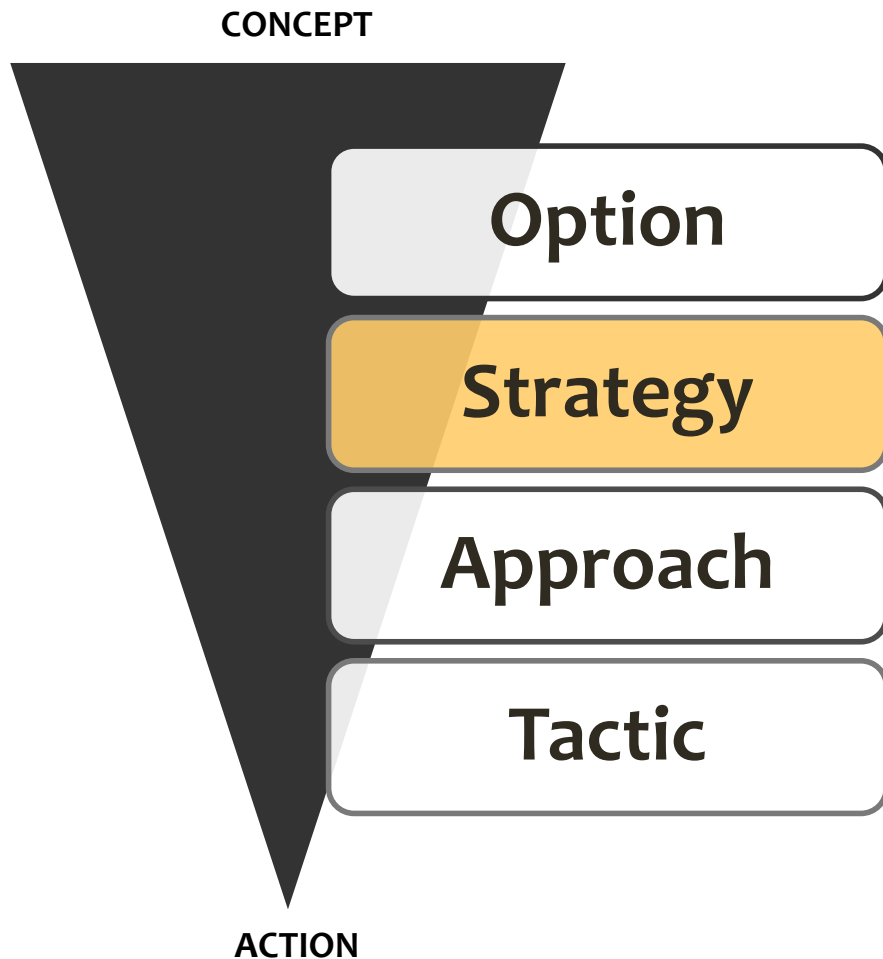
Climate
Change
Trajectory



TIME

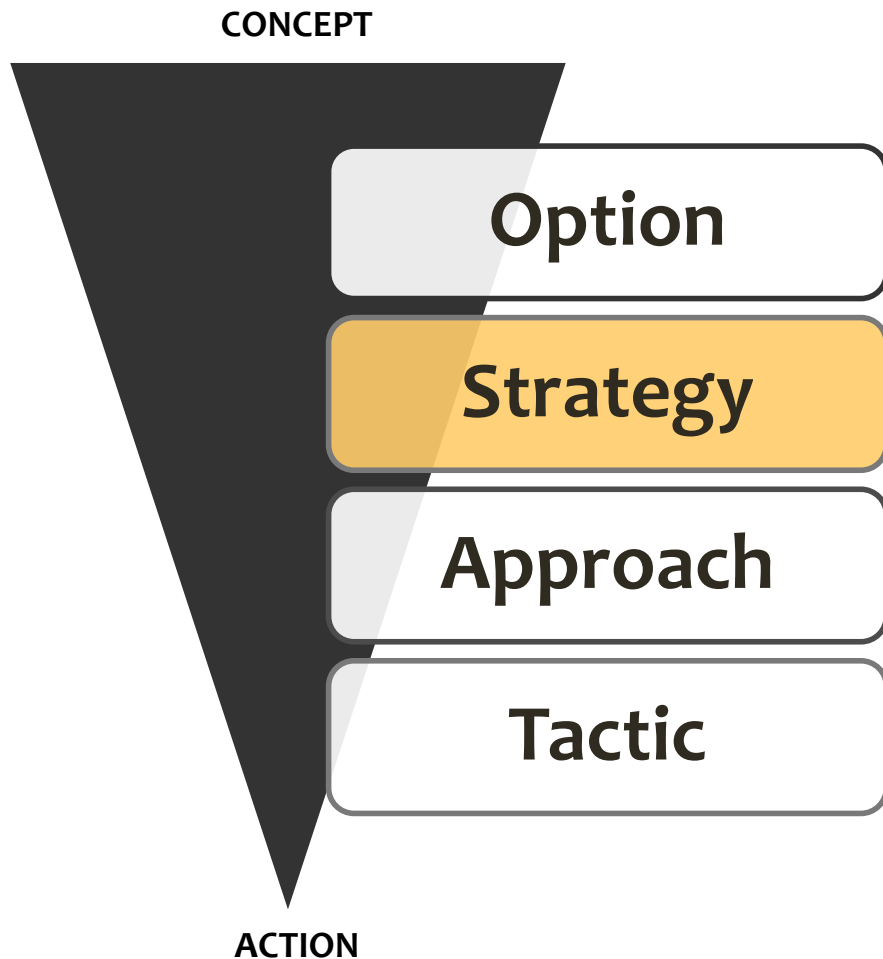


Adaptation Strategies and Approaches



Broad adaptation responses that consider regional ecology & management

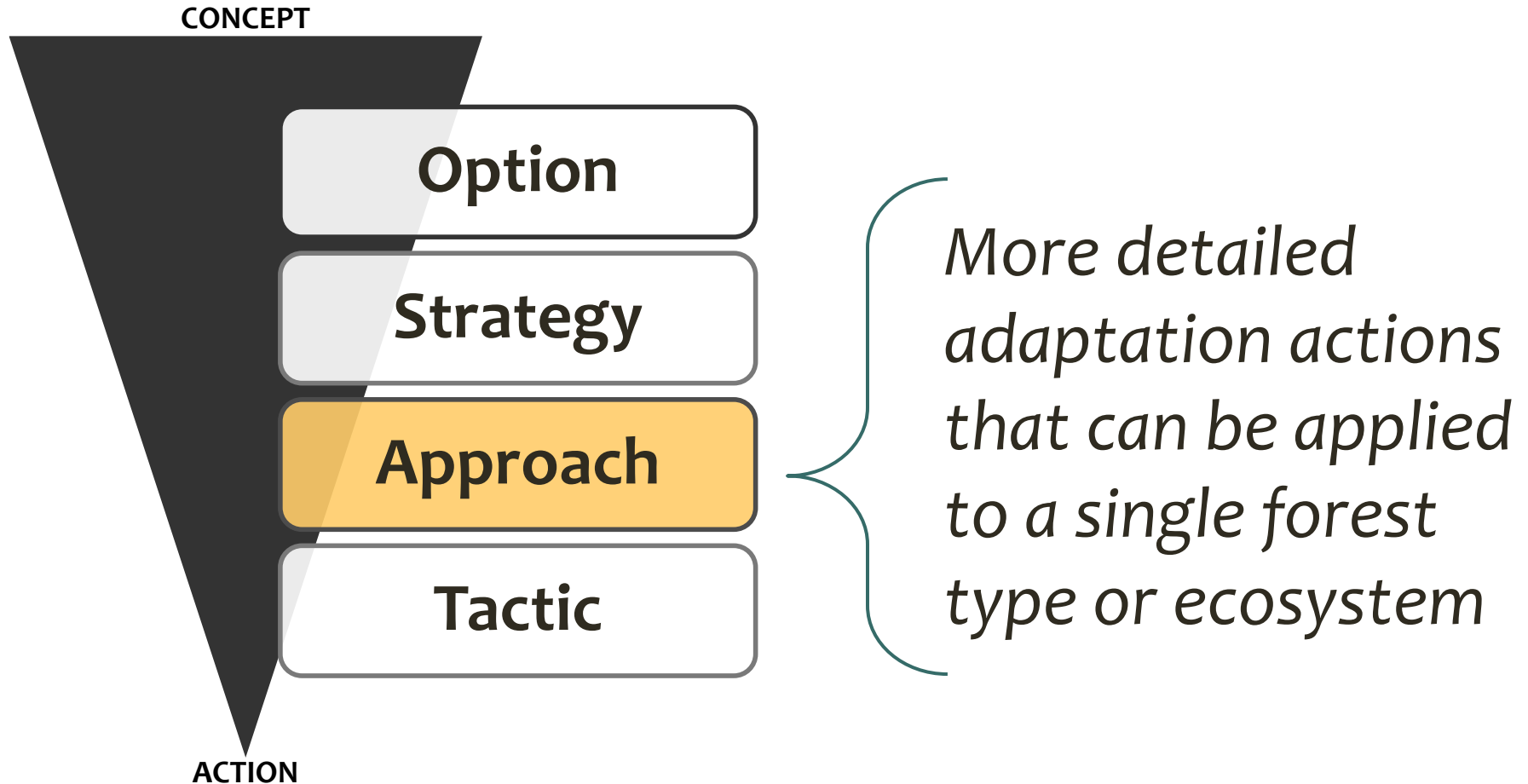
Adaptation Strategies and Approaches



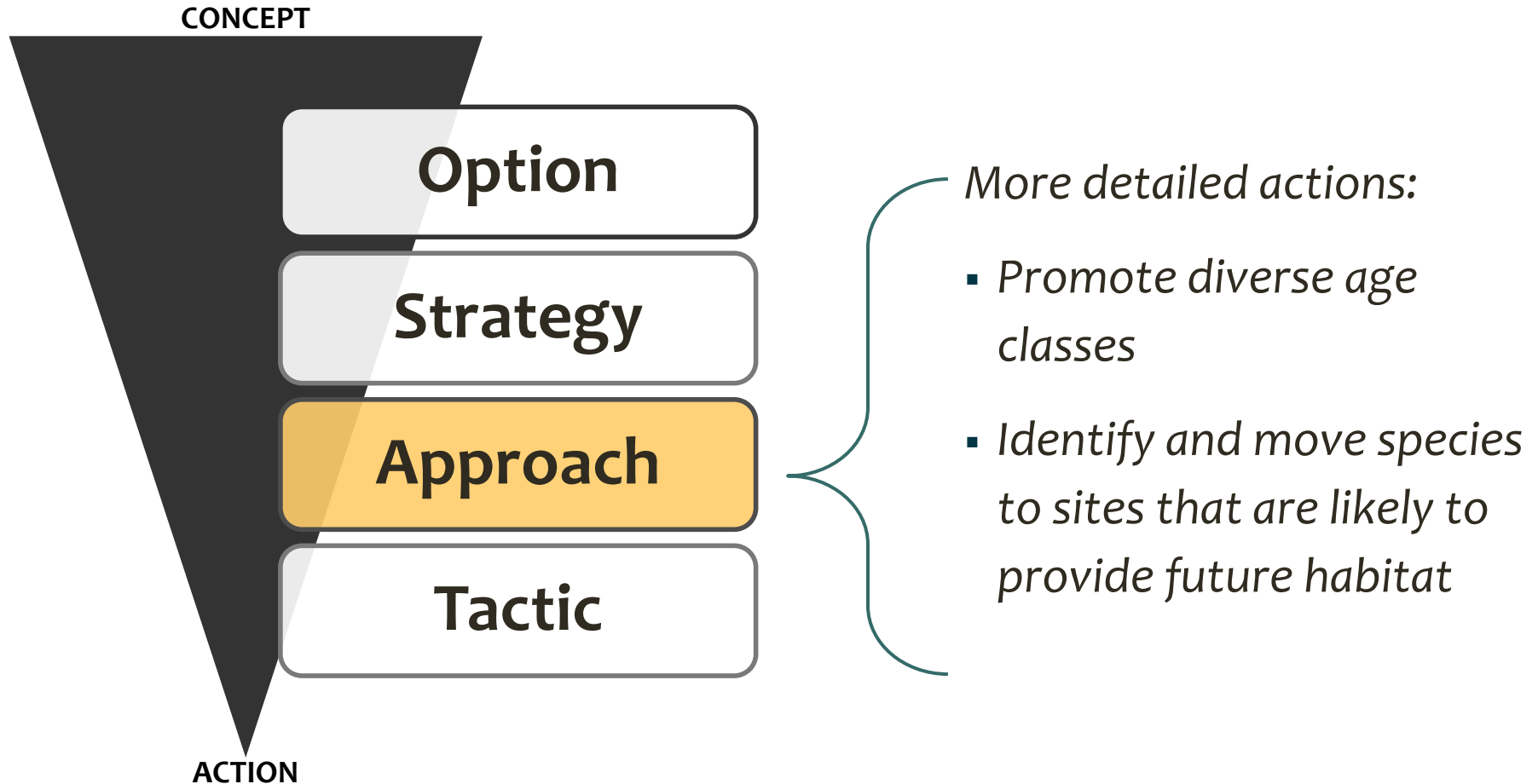
Broad adaptation responses:

- *Maintain and enhance species and structural diversity*
- *Facilitate community adjustments through species transitions*

Adaptation Strategies and Approaches



Adaptation Strategies and Approaches



Adaptation Strategies and Approaches

← → ↻ 🏠 adaptationworkbook.org/niacs-strategies#strategy-77

- Prepare to realign management of significantly altered ecosystems to meet expected future environmental conditions
- Promptly revegetate sites after disturbance
- Allow for areas of natural regeneration after disturbance.
- Maintain seed or nursery stock of desired species for use following severe disturbance

Strategy 1: Sustain fundamental ecological functions.

Climate change will have substantial effects on a suite of ecosystem functions, and many managers are working to adaptively manage forests to indirectly maintain the integrity of ecosystems in the face of climate change. This strategy includes those related to soil and hydrologic conditions. Adaptation approaches under this strategy include those that focus on maintaining ecosystem productivity and health, as well as to meet management objectives.

Maintain or restore soil quality and nutrient cycling

Many forests are experiencing increased temperatures (Kucharik et al. 2010), which can affect soil water and soils. Maintaining both soil quality and nutrient cycling in forest ecosystems is important for forest management (e.g., Wisconsin Department of Natural Resources [WDNR] 1995), and can help forests to persist under new conditions. Re-evaluation of the timing and intensity of soil management activities as both ecosystem vulnerabilities and the duration of seasons change.

Examples

- altering the timing of forest operations to reduce potential impacts on water, soil, and residual trees.
- modifying forest operations techniques and equipment (i.e., using pallets, debris piles, etc.) to reduce rutting, or other impacts on water, soils, and residual trees.
- using soil amendments to restore or improve soil quality (i.e., using lime to increase soil pH to counteract long-term acid deposition).

Maintain or restore hydrology

Some forest types, such as lowland hardwoods and lowland conifers, are very susceptible to drought. Conversely, other forest types are susceptible to flooding and more frequent severe weather events. In order to maintain appropriate hydrologic regimes, management activities that divert water or otherwise alters hydrology can be reevaluated to compensate for changes in hydrology.

Adaptation Strategies and Approaches

Strategy 1: Sustain fundamental ecological functions

- 1.1 — Maintain or restore soil quality and nutrient cycling
- 1.2 — Maintain or restore hydrology
- 1.3 — Maintain or restore riparian areas

Strategy 2: Reduce the impact of existing 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 invasives
- 2.3 — Manage herbivory to protect or promote regeneration

Strategy 3: Protect forests from severe fire and wind disturbance

- 3.1 — Alter forest structure or composition to reduce risk or severity of fire
- 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

Strategy 4: Maintain or create refugia

- 4.1 — Prioritize and protect existing populations on unique sites
- 4.2 — Prioritize and protect 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 tree species
- 5.3 — Retain biological legacies
- 5.4 — Restore fire to fire-adapted ecosystems
- 5.5 — Establish reserves to protect 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 — Use landscape-scale planning and partnerships to reduce fragmentation and enhance connectivity
- 7.2 — Establish and expand reserves and reserve networks to link habitats and protect key communities
- 7.3 — Maintain and create habitat corridors through reforestation or restoration

Strategy 8: 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
- 8.3 — Increase diversity of nursery stock to provide those species or genotypes likely to succeed

Strategy 9: Facilitate community adjustments through species transitions

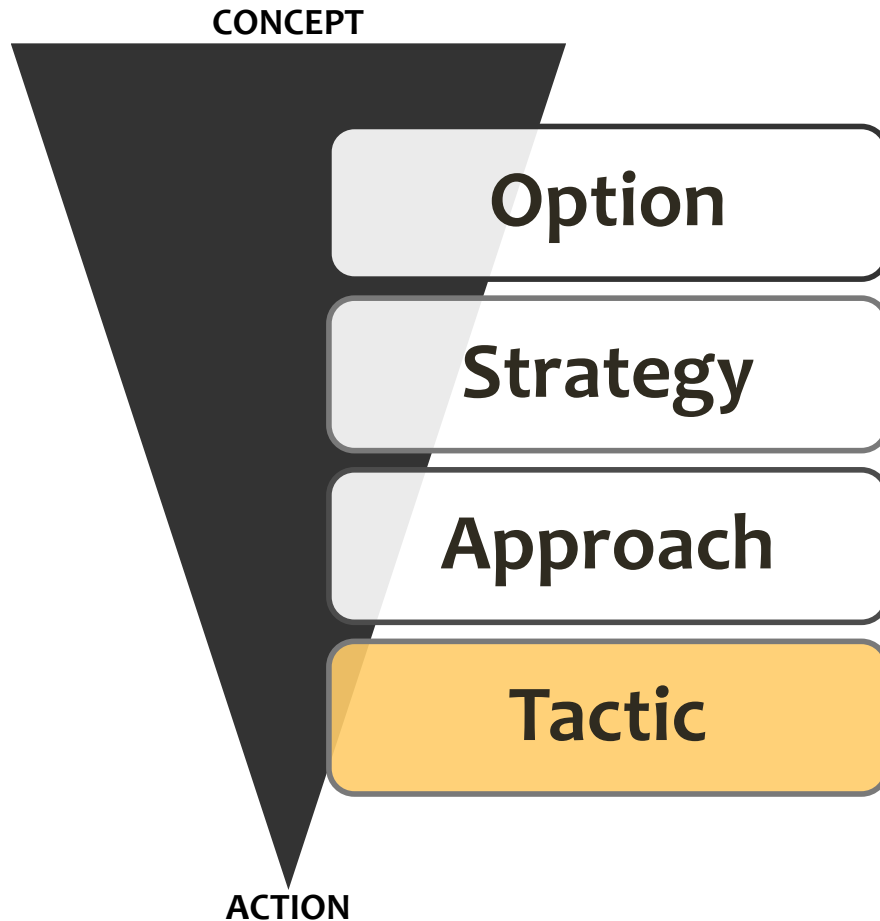
- 9.1 — Anticipate and respond to species decline
- 9.2 — Favor or restore native species that are expected to be better adapted to future conditions
- 9.3 — Manage for species and genotypes with wide moisture and temperature tolerances
- 9.4 — Emphasize drought- and heat-tolerant species and populations
- 9.5 — Guide species composition at early stages of stand development
- 9.6 — Protect future-adapted regeneration from herbivory
- 9.7 — Establish or encourage new mixes of native species
- 9.8 — Identify and move species to sites that are likely to provide future habitat

Strategy 10: Plan for and respond to disturbance

- 10.1 — Prepare for more frequent and more severe disturbances
- 10.2 — Prepare to realign management of significantly altered ecosystems to meet expected future environmental conditions
- 10.3 — Promptly revegetate sites after disturbance
- 10.4 — Allow for areas of natural regeneration after disturbance
- 10.5 — Maintain seed or nursery stock of desired species for use following severe disturbance
- 10.6 — Remove or prevent establishment of invasives and other competitors following disturbance

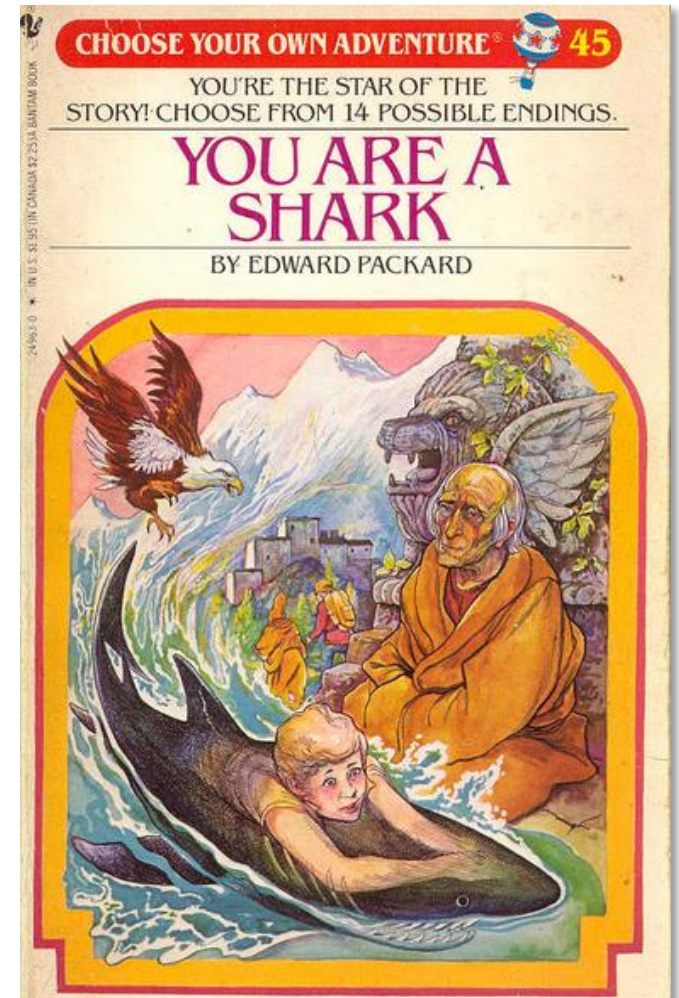
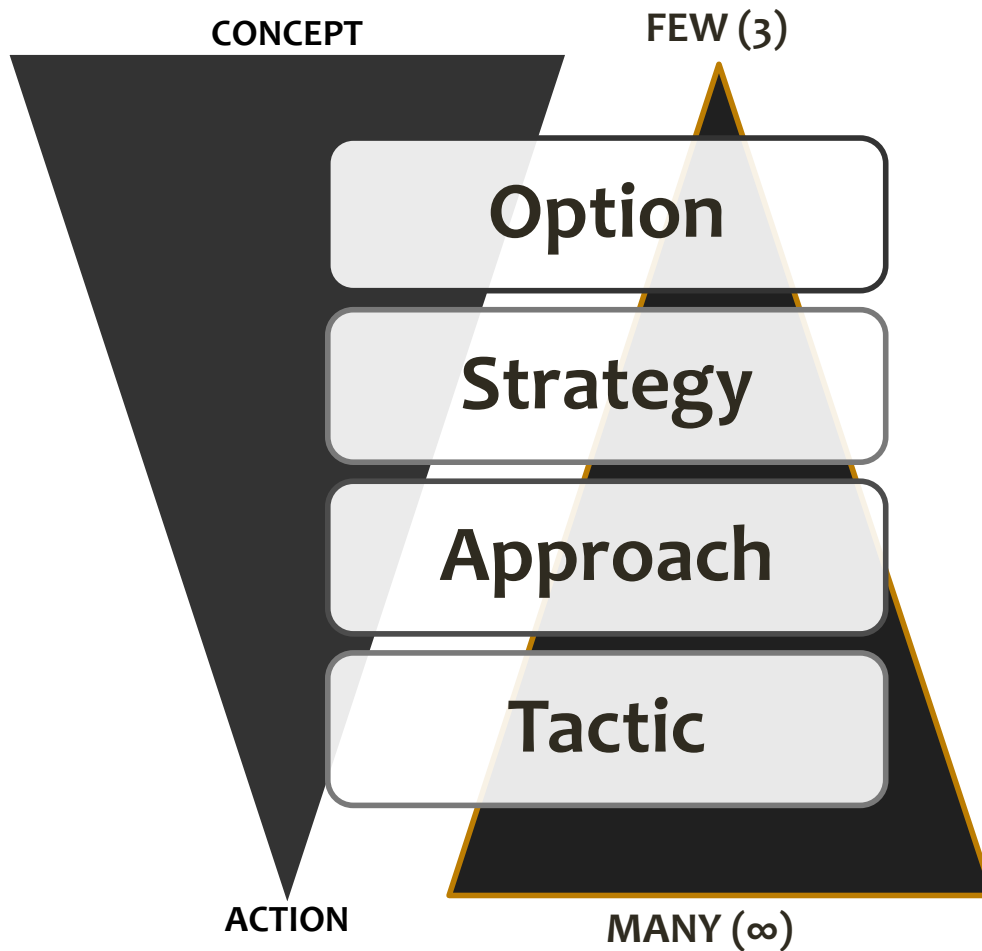
Source: Butler, P.B., C.W. Swanson, M.J. Janowiak, L.R. Parker, M.J. St. Pierre, and L.A. Brandt. 2012. Adaptation Strategies and Approaches. In: C.W. Swanson and M.J. Janowiak, editors. Forest Adaptive Resources: Climate change tools and approaches for land managers. Gen. Tech. Rep. NRS-87. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station, p 15-34. www.nrs.fs.fed.us/pubs/87179

Adaptation Strategies and Approaches

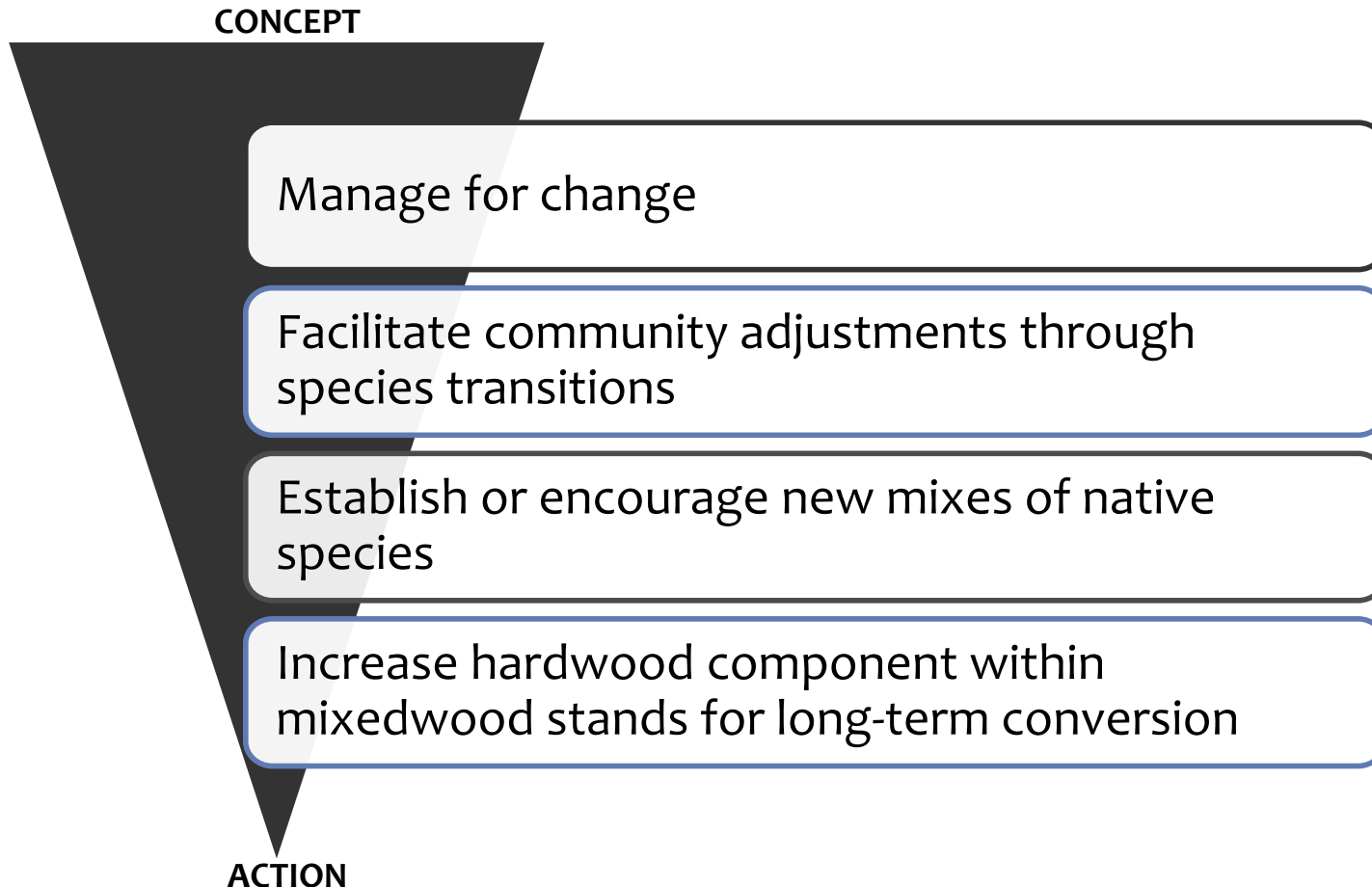


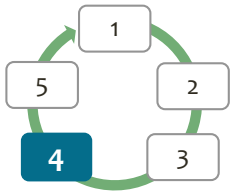
Prescriptive actions designed for individual site conditions and management objectives

Adaptation Strategies and Approaches



Adaptation Strategies and Approaches



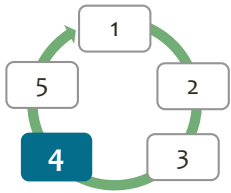


Step 4: IDENTIFY adaptation approaches and tactics for implementation.

Key Questions:

What actions can enhance the ability of the ecosystem to adapt to anticipated changes *and* meet management goals?

Will future managers know what we were trying to do?



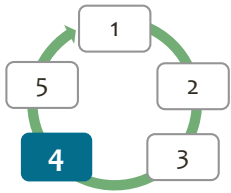
Step 4: IDENTIFY adaptation approaches and tactics for implementation.

Approach – Select from the menu. Pick any that seem to make sense and help address the challenges.

Tactic – Describe a specific action you can take.

These details should ideally answer what, where, and how you will implement the actions.



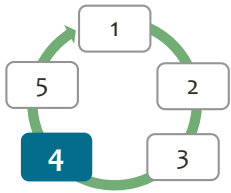


Step 4: IDENTIFY adaptation approaches and tactics for implementation.

Timeframe – Specify when you will implement the tactic.

For example:

- Summer 2016
- Winter 2016-7
- Within 3 years of...
- After...

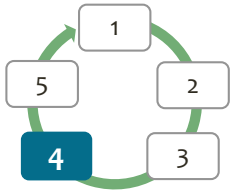


Step 4: IDENTIFY adaptation approaches and tactics for implementation.

Benefits – Describe why the tactic is good.

For example:

- addresses biggest or multiple challenges
- is cheap and easy
- has co-benefits
- is likely to succeed

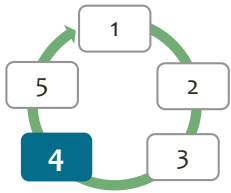


Step 4: IDENTIFY adaptation approaches and tactics for implementation.

Drawbacks and Barriers – Describe why it's not so good.

For example:

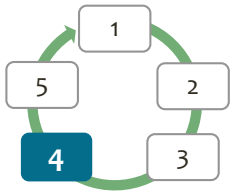
- it may have negative side effects,
- Requires high cost or effort
- may not be successful
- has social, financial, or other barriers



Step 4: IDENTIFY adaptation approaches and tactics for implementation.

Practicability – Is it both *effective* (will meet desired intent) and *feasible* (capable of being implemented)?

- **High:** Yes to both!
- **Moderate:** Yeah, but it will take some additional effort or planning...
- **Low:** No, the barriers/drawbacks seem too big or the benefits too small.



Step 4: IDENTIFY adaptation approaches and tactics for implementation.

Recommend Tactic– Given all this, is this tactic likely to be helpful?

Also consider: trade-offs, urgency, likelihood of success, cost, and effort...

Yes: look to integrate into plan, prescription, or other activities

No: not useful at this time

ADAPTATION EXAMPLE: MENOMINEE TRIBAL ENTERPRISES — OAK WILT & REFORESTATION



OAK WILT DISEASE POCKET

This area was logged and stumps overturned in 2011 to prevent the spread of the non-native oak wilt fungal disease. The objective is to protect the health of the remaining oak trees in the forest.

MTE

For further information contact:
MTE Forestry Center 715-730-3895

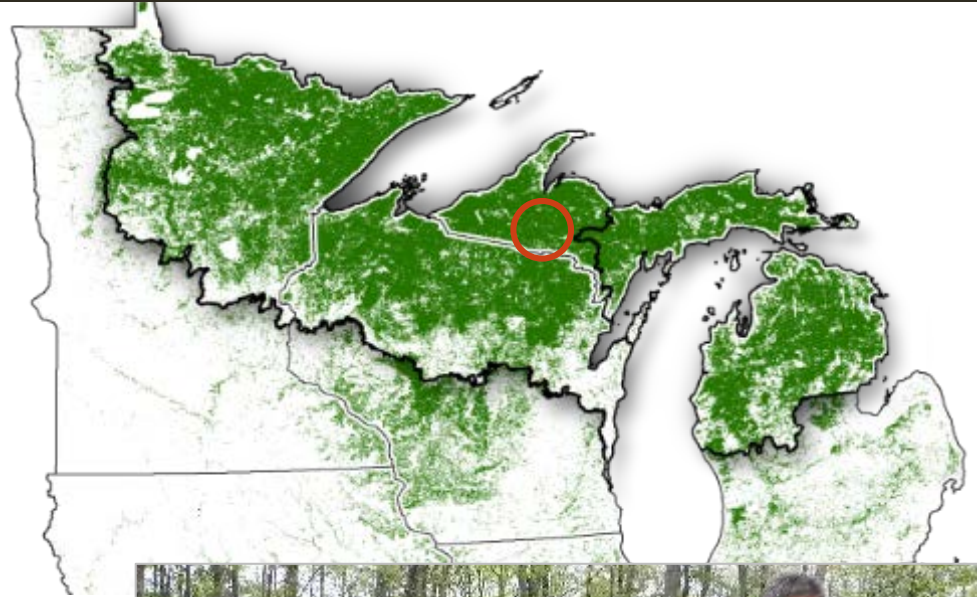
Menominee Tribal Enterprises
1400 E. Green Lake Road
Menominee, WI 54751
(715) 730-3895

ADAPTATION EXAMPLE:

MENOMINEE TRIBAL ENTERPRISES — OAK WILT & REFORESTATION

The Menominee Forest

- 220,000 acres of forest
- Managed by Menominee Tribal Enterprises for Menominee Indian Tribe
- Long history of sustainable management
- Current management issue: **Oak wilt disease**



More information: www.forestadaptation.org/mte

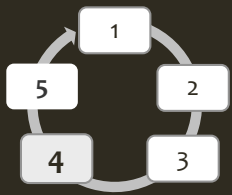
Goal: Reforest oak wilt pockets

- Treatment: harvest oaks & adjacent trees, pull oak stumps
- Identified 10 sites for climate-informed reforestation



General Management Goals

- Foster diversity
- Favor sawtimber species
- Provide for cultural uses



Step 4: IDENTIFY and adaptation approaches and tactics for implementation.

Adaptation Approach

- **5b/ 9h – Maintain a diversity of native tree species, move species to sites likely to provide future habitat.**

Tactic

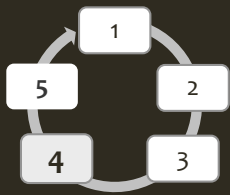
- Plant a subset of 10 oak wilt pockets (largest, best access)
- Plant tree species projected to increase

Consider:

- Benefits
- Drawbacks
- Barriers
- Practicability

Recommend Tactics?

Yes



Step 4: IDENTIFY and adaptation approaches and tactics for implementation.

Climate Change Tree Atlas

Projected Habitat Increases

American beech

American elm

American hornbeam

Bitternut hickory

Black cherry

Black locust

Black oak

Black willow

Boxelder

Bur oak

Eastern cottonwood

Silver maple

Slippery elm

White ash

White oak

Projected New Habitat

Black hickory

Black walnut

Blackjack oak

Chinkapin oak

Eastern red cedar

Eastern redbud

Flowering dogwood

Hackberry

Honeylocust

Mockernut hickory

Ohio buckeye

Osage-orange

Post oak

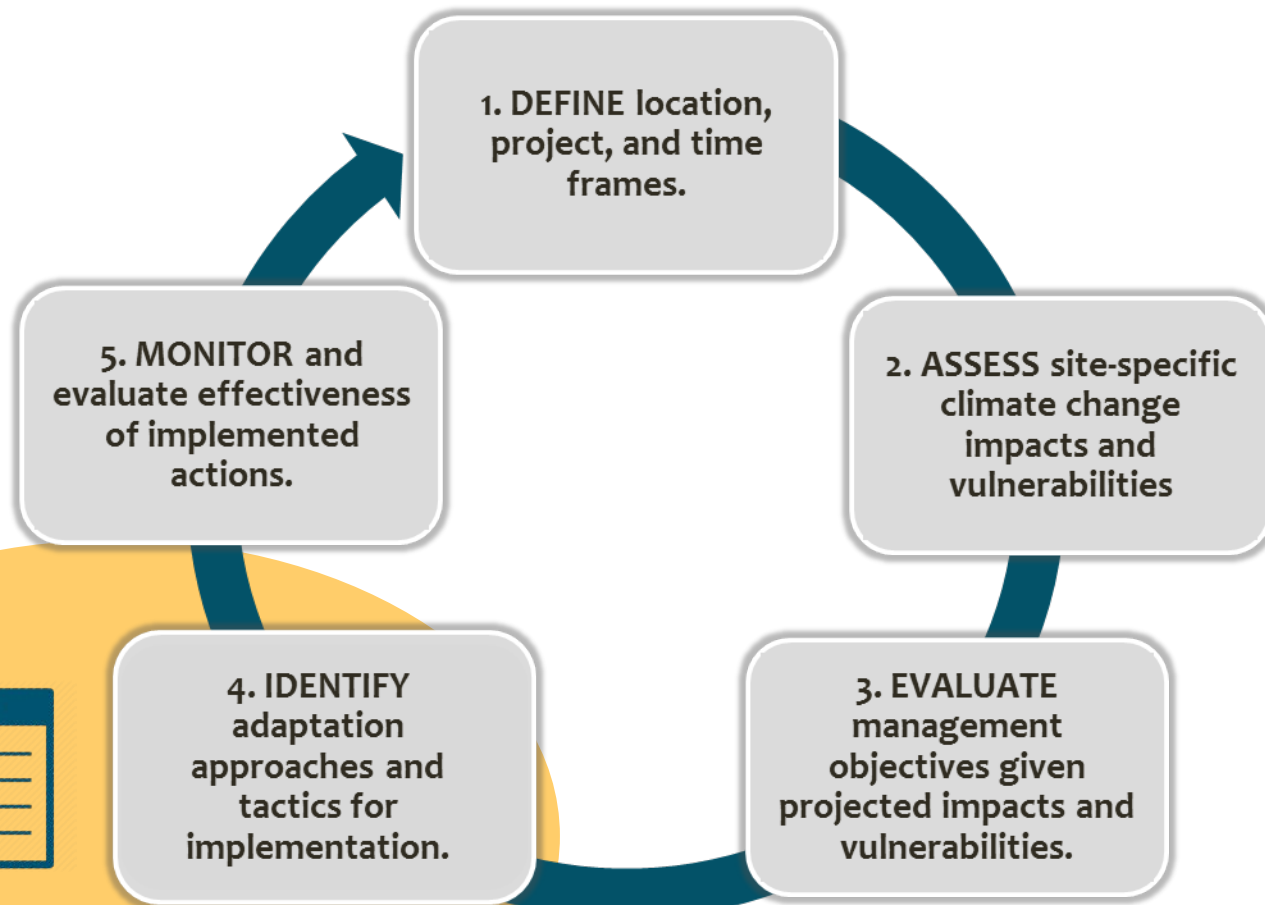
Shingle oak

**Also shrub &
understory
plants**



LUNCH!

Adaptation Workbook Process



Resource: Adaptation Strategies & Approaches

Brainstorming: Getting Started



Take advantage
of **Opportunities**

Minimize as much
Risk as you can

Poster

Project Name

Objective

Challenge/ Opportunity

Adaptation Tactics

Be as creative as you like (and have time for)!

Report out:

- Share your poster/Action Plan for one of your Management Objectives.

3 min max!

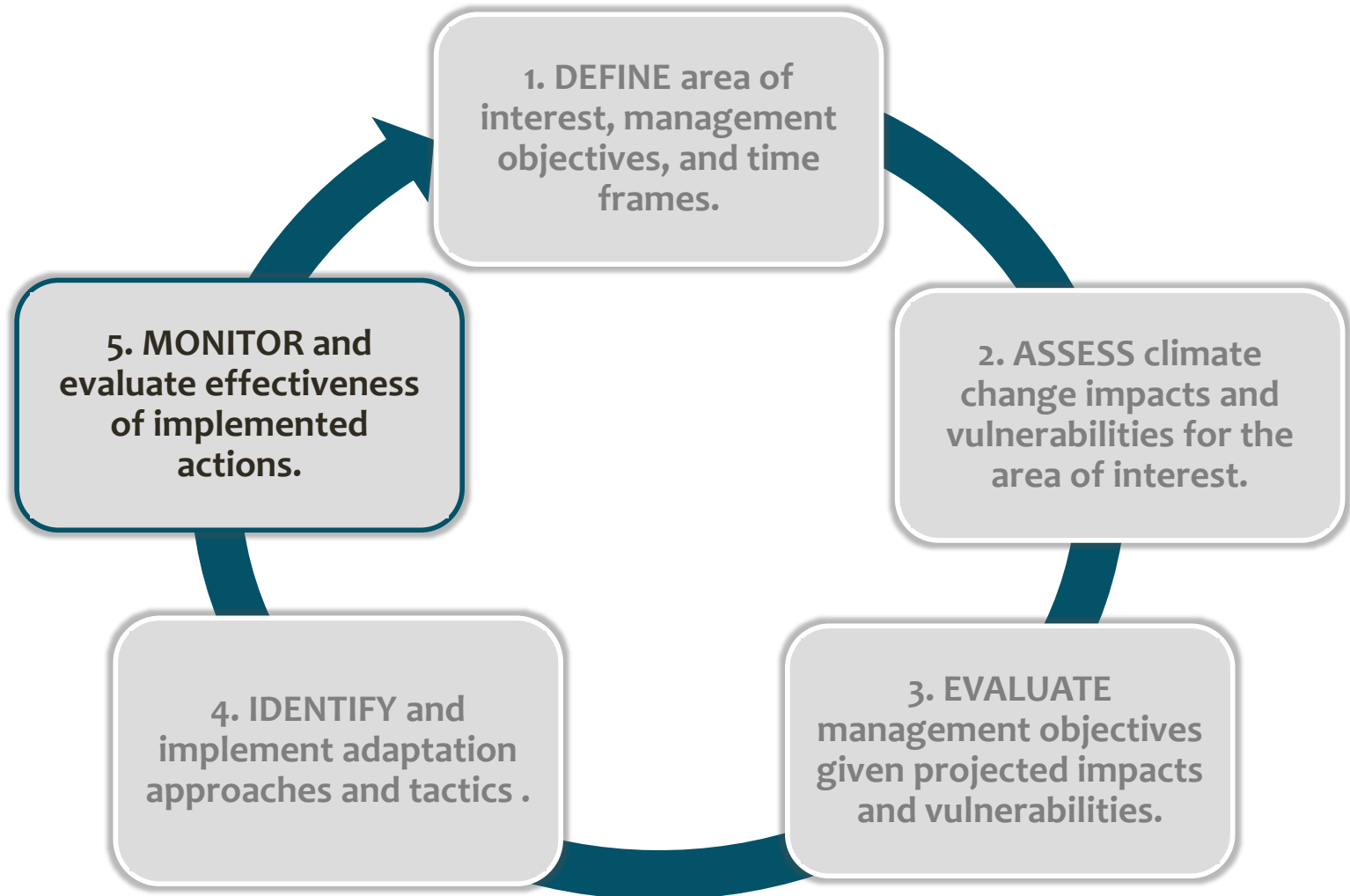
A few *brief* comments, please!

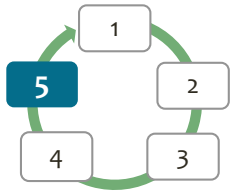




Step 5: MONITOR and evaluate effectiveness of implemented actions.

Workbook Cycle: Step 5





Step 5: MONITOR and evaluate effectiveness of implemented actions.

Purpose:

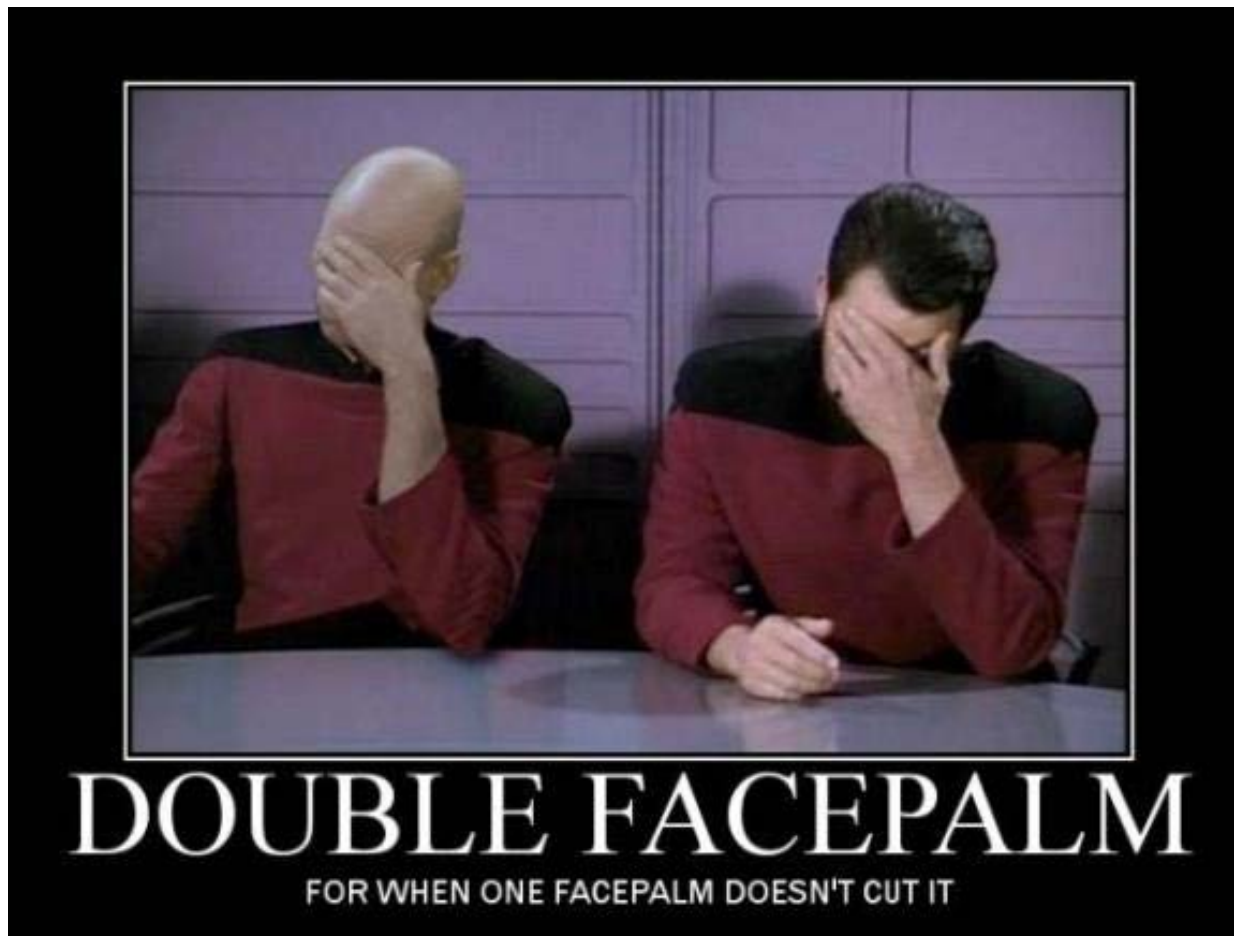
- Practice adaptive management

How do we know if the selected actions were effective?

What can we learn from these actions to inform future management?

A Few Thoughts About Monitoring...

- Learning about our actions is useful
- Our track record is not very good

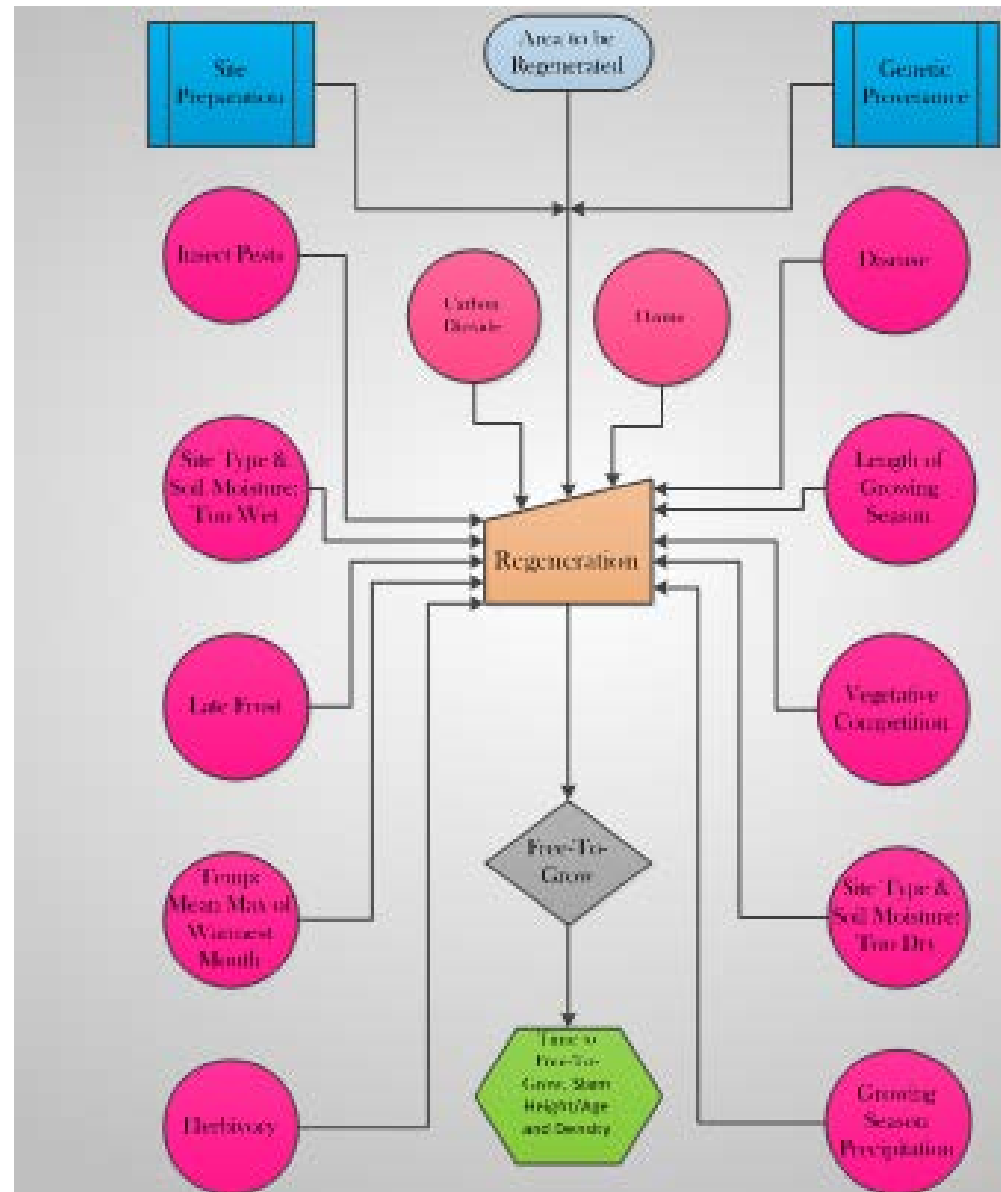


A Few Thoughts About Monitoring...

- Be VERY CLEAR about your information needs and the kind of monitoring that might help you get that information:
 - **Implementation monitoring** = Did we do the action?
 - **Surveillance/impact monitoring** = What change is occurring over time?
 - **Effectiveness/adaptation monitoring** = Did our action actually have the desired effect?

Conceptual Model – Aspen Regen

- Pests
- Soil moisture
- Late frost
- High temps
- Herbivory
- Disease
- Growing season length
- Competition
- Precip

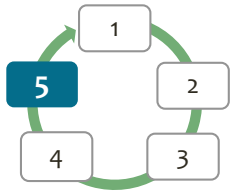


A Few Thoughts About Monitoring...

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 - **Implementation monitoring** = Did we do the action?
 - **Surveillance/impact monitoring** = What change is occurring over time?
 - **Effectiveness/adaptation monitoring** = Did our action actually have the desired effect?
 - **Scientific research** = Is this outcome statistically significant compared to a control? Could we expect similar results elsewhere?

“Climate change monitoring”

- Are you going to monitor climate change?
 - Nope.
- Are you going to monitor climate change impacts?
 - Not necessarily.
- Are you going to monitor the success of your management?
 - That’s the ticket!
 - You’re already doing that (or trying).
- “Climate change monitoring” is not climate science



Step 5: MONITOR and evaluate effectiveness of implemented actions.

Monitoring Variable

Criteria for Evaluation

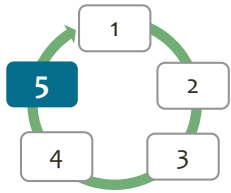
Monitoring
Implementation

Item that can tell you whether management goals/objectives were achieved .

If possible, use an item that also helps evaluate the effectiveness of the tactics.

For example:

- *Planted seedling survival at 1, 2, 5, and 10 years after planting*



Step 5: MONITOR and evaluate effectiveness of implemented actions.

Monitoring Item

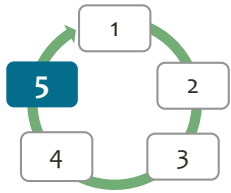
Criteria for Evaluation

Monitoring
Implementation

Evaluation of success

For example:

- *60% survival of non-local genotypes*



Step 5: MONITOR and evaluate effectiveness of implemented actions.

Monitoring Item

Criteria for Evaluation

Monitoring Implementation

How the monitoring will actually get done?

Note: use existing monitoring when possible

For example:

- *Regular post-planting stocking surveys.*
- *Supplemental surveys at 10 years.*



YOU MADE IT!
(Congrats!)

To-do list:

You folks:

- Complete Next Steps sheets (and let us get a photo)
- Evaluations (please!)
- Can we have a copy of your Workbook?
- Keep moving these ideas forward!
- Follow up with questions or ideas
- Can we share your idea on www.ForestAdaptation.org?

NIACS:

- Share contact list & presentations from today
- Check in soon!
- Other ideas?

Thanks everyone!