

Using the Adaptation Workbook:

A project-level approach to climate adaptation



IAP Climate Assessment Workshop | May 22, 2018

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Northern Institute of Applied Climate Science



Provides **practical** information, resources, and technical assistance related to forests and climate change.

Climate

Carbon

Regional multi-institutional partnership among:



Michigan
Technological
University



AMERICAN
FORESTS



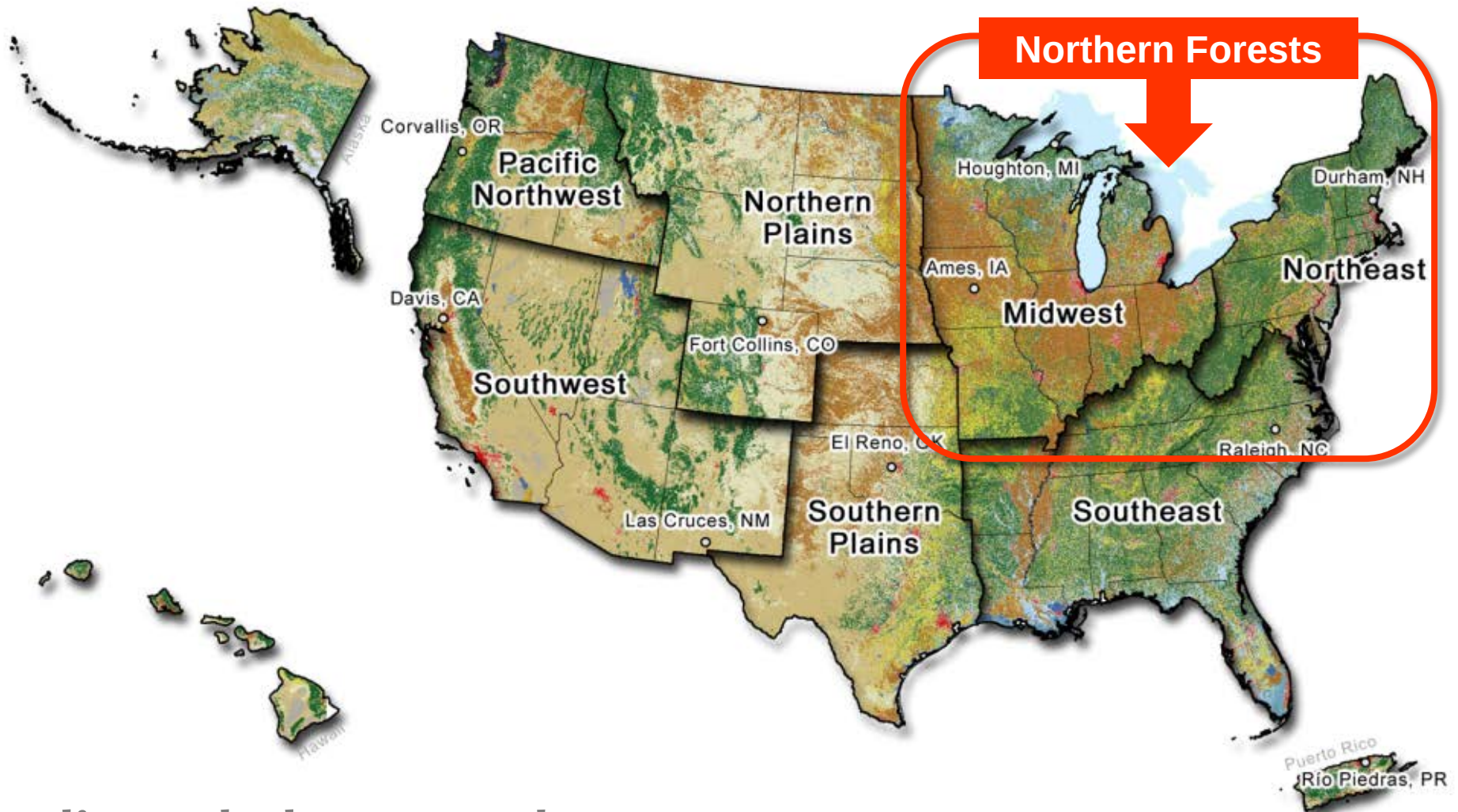
The
UNIVERSITY
of VERMONT



College of Food, Agricultural
and Natural Resource Sciences
UNIVERSITY OF MINNESOTA

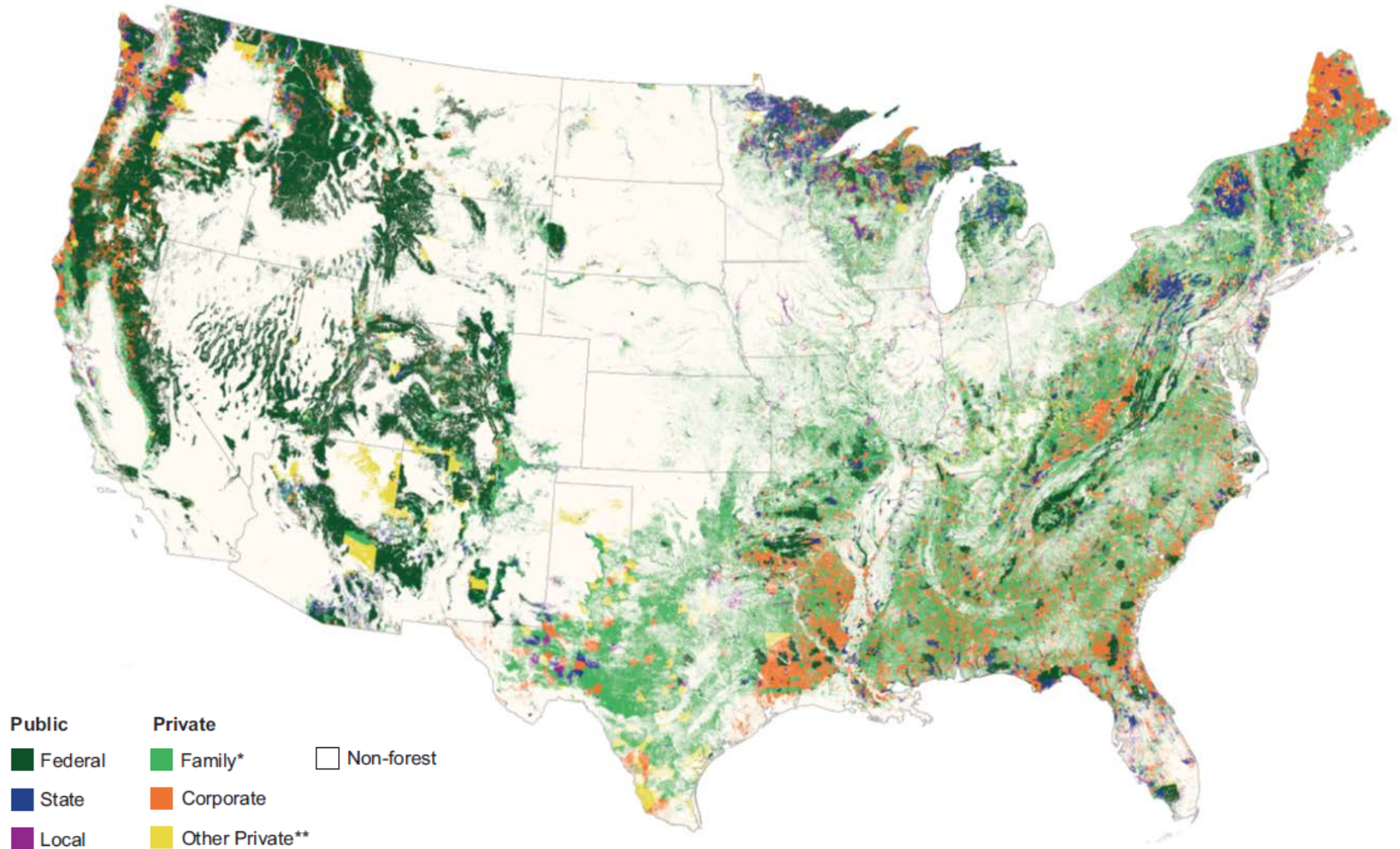
ncasi

USDA Climate Hubs



climatehubs.oce.usda.gov

Diverse Forest Ownership



Hewes et al. 2014

Diverse Forest Values



There isn't a single answer

Every landowner is different



Management
goal



Timber



Wildlife



Carbon

Each decision is unique and will vary based upon:

Place: Location & Site Conditions

Purpose: Goals & Objectives

People: Values, Culture, & Resources

Practices: Equipment, Procedures, & Methods

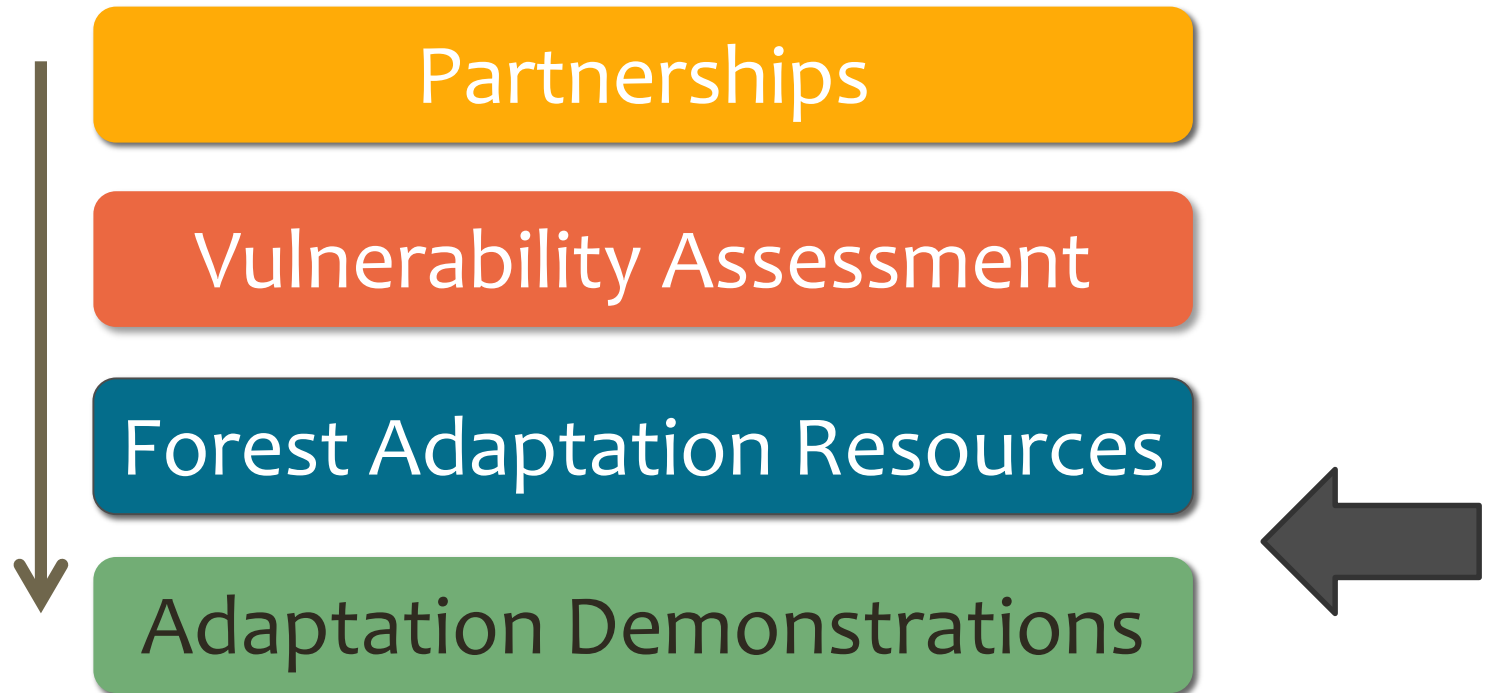
Challenges to Implementation

- Climate change is too big and too complex
- Climate information is not relevant enough
- One-size-fits-all answers are insufficient
- Not enough real-world examples

Climate Change Response Framework

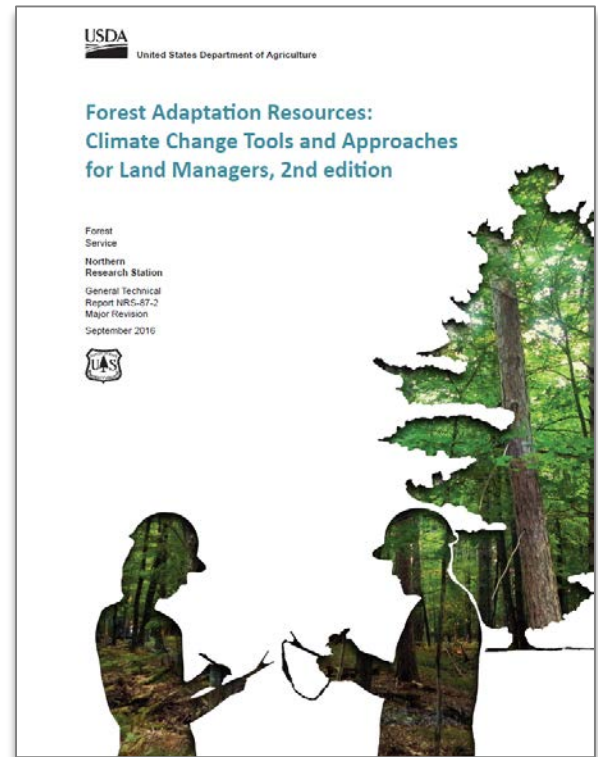
Structured, process oriented, works on multiple scales

Components:

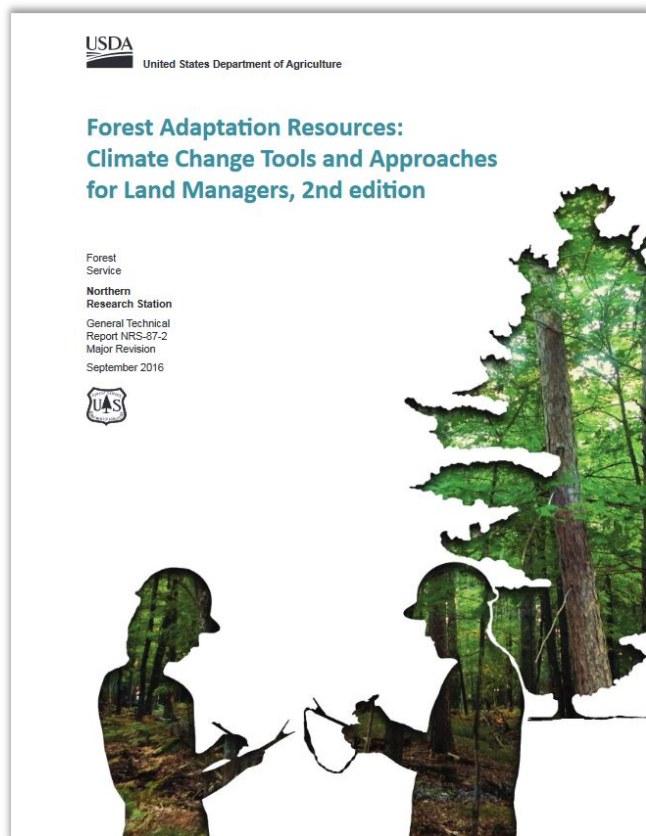


Forest Adaptation Resources

- Process to intentionally consider climate & customize adaptation actions
- Designed to be flexible – for diverse goals, and values
- Works at the project level
- Does not make recommendations



Forest Adaptation Resources



Swanston et al. 2016;
www.nrs.fs.fed.us/pubs/52760

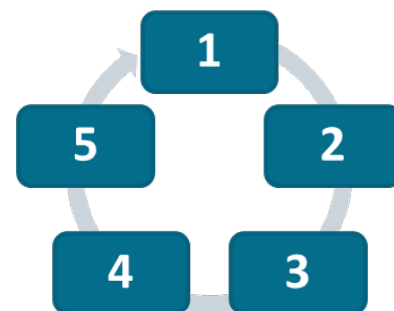
Strategies & Approaches

Menu of adaptation actions

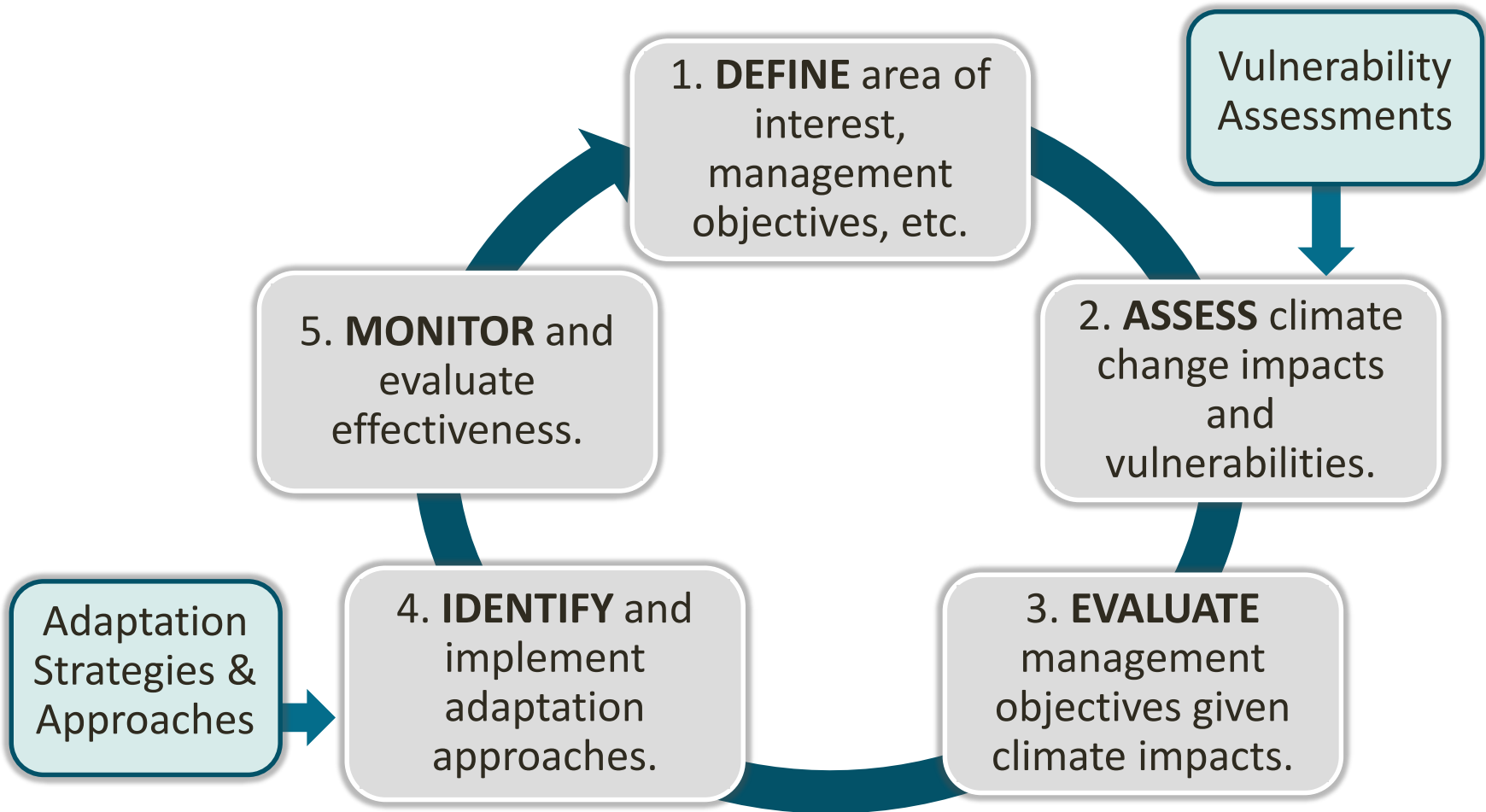


Adaptation Workbook

- Structured process to integrate climate change considerations into management



Adaptation Workbook



Translating adaptation to actions



Q: What are the management goals?

Q: How can you meet these goals in the context of a changing climate?

Feasible on-the-ground actions

Adaptation Workbook

Structured process to identify adaptation actions

Management Objectives	Challenges	Opportunities	Feasibility	Other Considerations

Adaptation Actions			Benefits	Drawbacks/ Barriers	Recommend Tactic?
Approach (From Chapter 2)	Tactic	Time Frame			

Adaptation Workbook

www.adaptationworkbook.org

 Adaptation Workbook

 My dashboard

 Log out

 Resources ▾

Lambert Restoration Project

 Progress Summary

Step 1

Define Management Topics

Management Goals and Objectives 

Step 2

Climate Impacts and Vulnerability

Vulnerability Determination

Step 3

Goal #1

Restore spruce and spruce-hardwood communities by achieving spruce and mixed hardwood species composition, as well as developing the multi-age stand structure that likely existed in this community prior to exploitation.

Objective

Maintain spruce/hardwood forest with at least 30% spruce in the overstory.

Long-term.

Objective

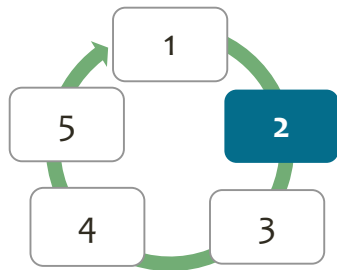
Enhance structure composition by creating small openings (selective removal of trees to provide source for coarse woody material).

2 to 10 year.

[Add Objective for this Goal](#)

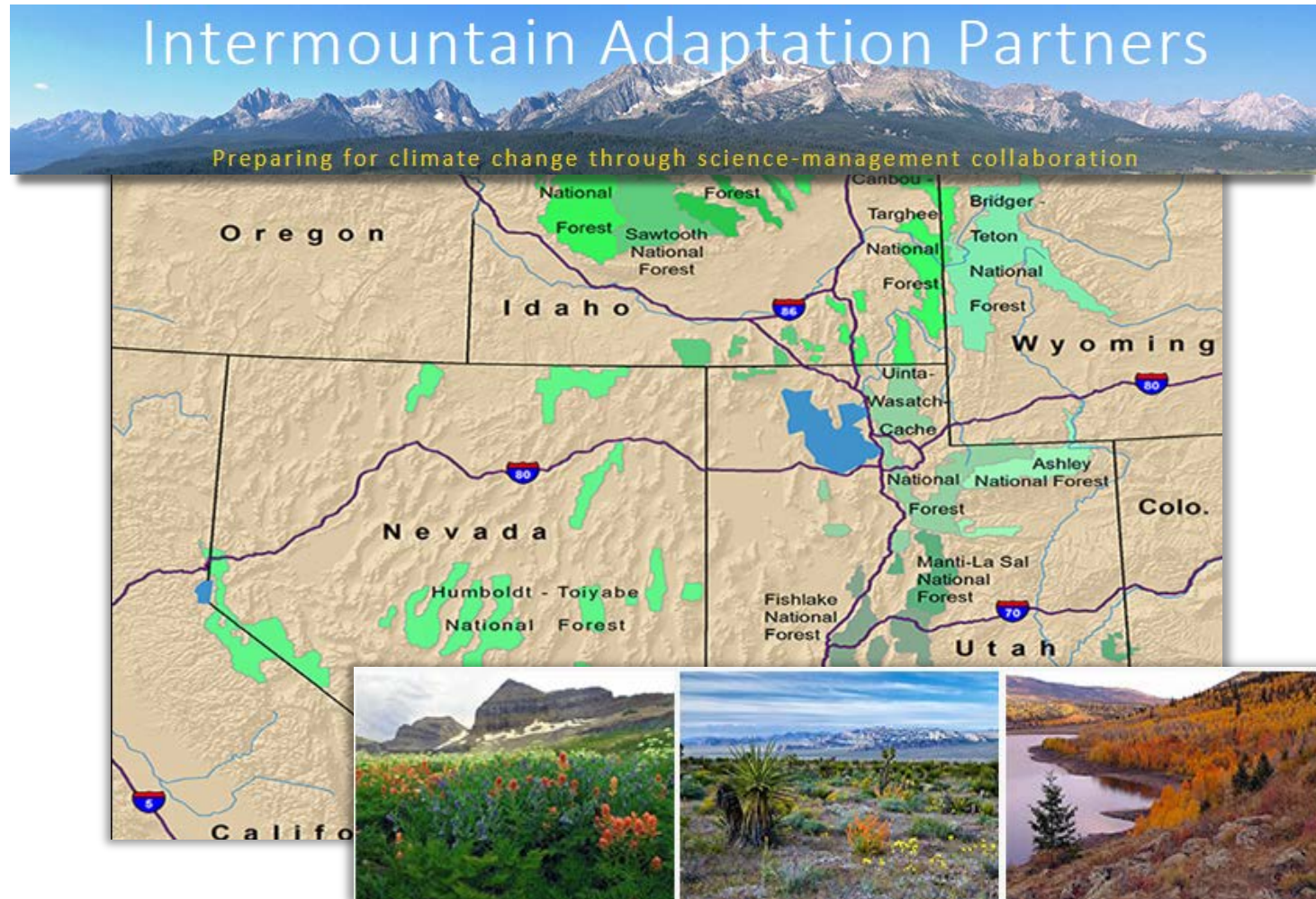
Adaptation Workbook

Can incorporate regionally specific information



ASSESS

climate change
impacts and
vulnerabilities

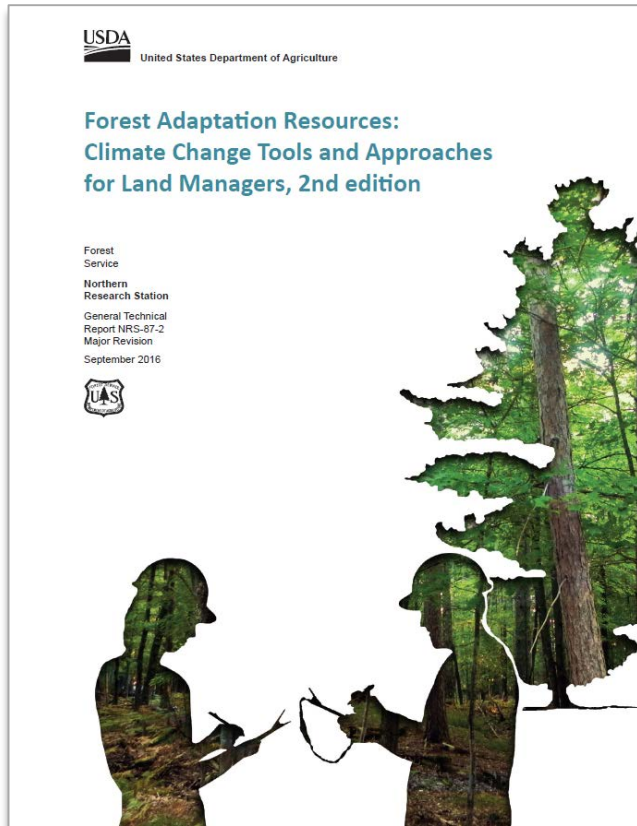


Adaptation Strategies & Approaches

Strategies & Approaches

Menus of adaptation actions

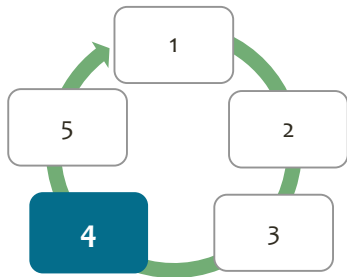
- Forests
- Urban Forests
- Agriculture
- Forest Watersheds (draft)
- Tribal perspectives (in prep)
- Wetlands (in prep)
- Coastal ecosystems (in prep)



Swanston et al. 2016;
www.nrs.fs.fed.us/pubs/52760

Using the Menus - Adaptation Workbook

Adaptation strategies and approaches for forest watersheds



IDENTIFY and
implement
adaptation
approaches.

Strategy 1: Maintain and enhance hydrologic processes

- Approach 1.1: Maintain or enhance infiltration and water storage capacity of forest soils
- Approach 1.2: Protect and restore hydrologic connectivity
- Approach 1.3: Restore stream channel form and function to mimic natural channel design
- Approach 1.4: Enhance floodplain connectivity between streams and wetlands
- Approach 1.5: Protect or restore hydrologic function of forested wetlands

Strategy 2: Protect water quality

- Approach 2.1: Moderate stream temperature increases
- Approach 2.2: Reduce nutrient loading and other pollutants
- Approach 2.3: Reduce soil erosion and sediment loading

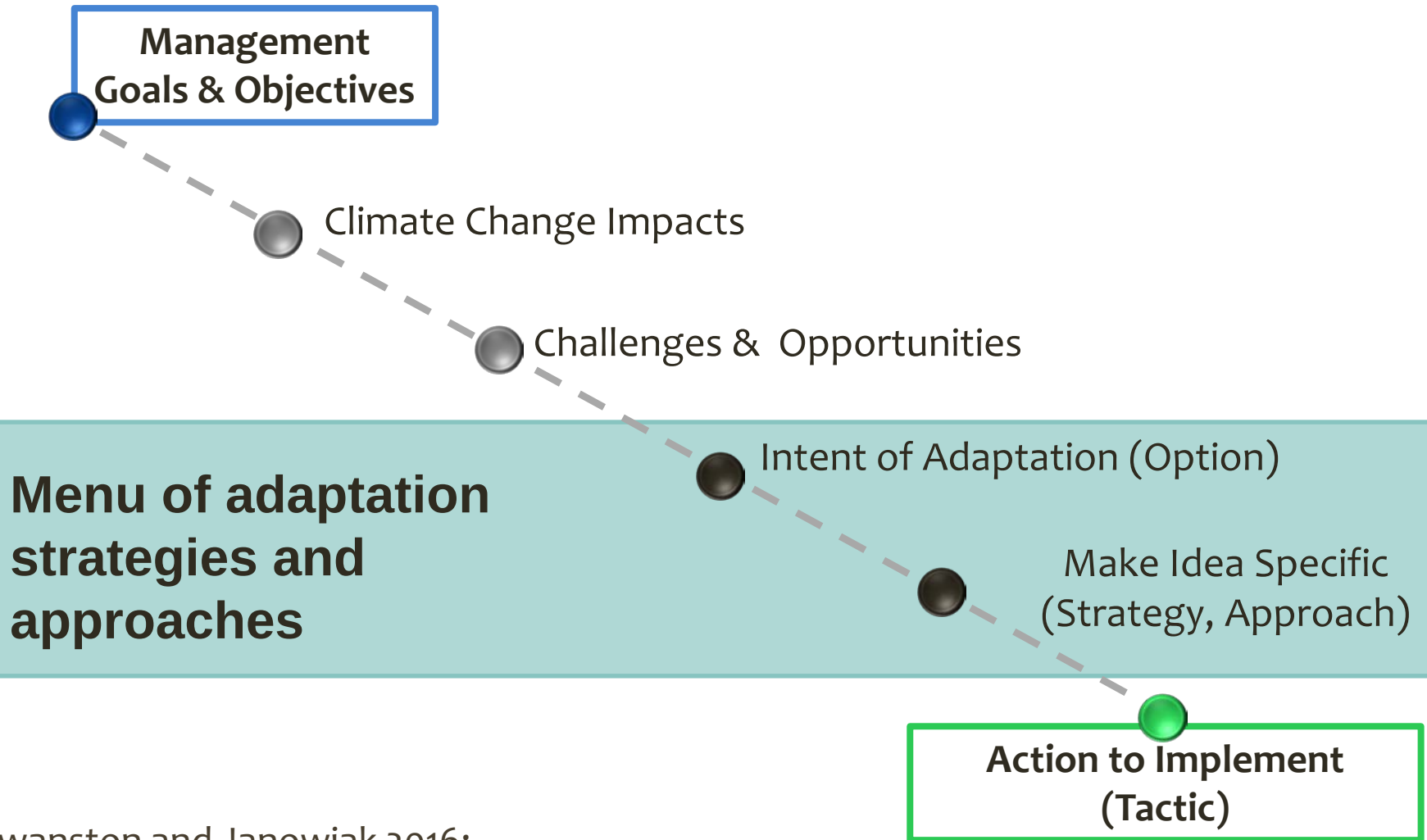
Strategy 3: Protect and restore forests and vegetative cover

- Approach 3.1: Maintain and enhance forest and vegetative cover in uplands, wetlands, and riparian areas
- Approach 3.2: Revegetate areas impacted by disturbance
- Approach 3.3: Prevent invasive species establishment
- Approach 3.4: Protect sensitive areas and unique habitats
- Approach 3.5: Enhance species and structural diversity in forests

Strategy 4: Facilitate forest community adjustments through tree species transitions

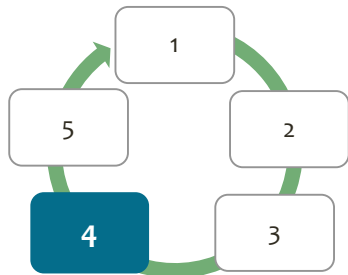
- Approach 4.1: Favor or restore native species that are expected to be adapted to future conditions
- Approach 4.2: Establish or encourage new mixes of native species.
- Approach 4.3: Disfavor species that are distinctly maladapted.
- Approach 4.4: Move at-risk species to locations that are expected to provide habitat.
- Approach 4.5: Introduce species that are expected to be adapted to future conditions

Connecting the Dots



Adaptation Workbook

Can incorporate regionally specific information



IDENTIFY and
implement
adaptation
approaches.

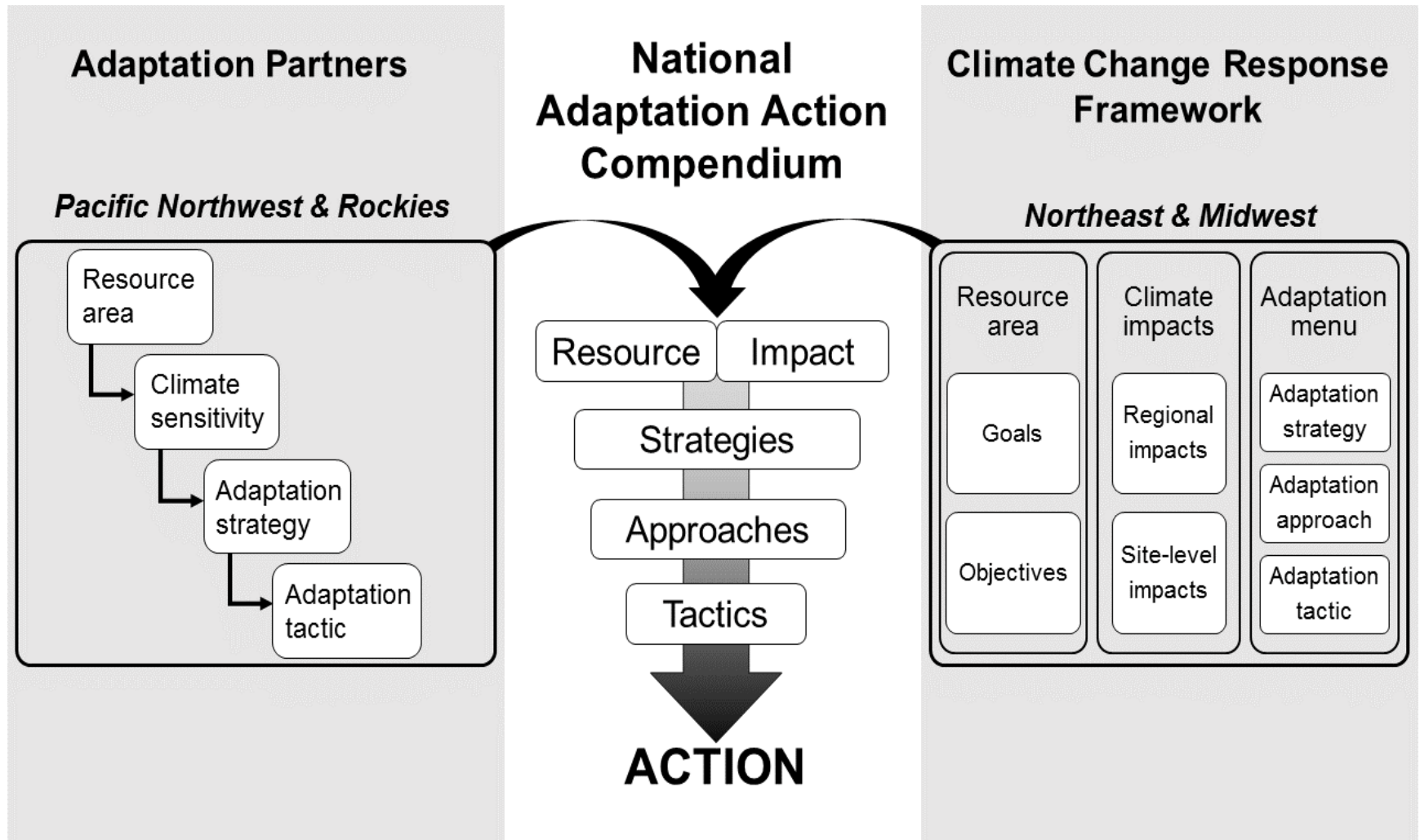


- ▶ Publications
- ▶ Adaptation Synthesis: Forest Vegetation
- ▶ Adaptation Synthesis: Non-Forest Vegetation
- ▶ Adaptation Synthesis: Riparian/Wetland
- ▶ Adaptation Synthesis: Water Resources
- ▶ Adaptation Synthesis: Fisheries
- ▶ Adaptation Synthesis: Wildlife
- ▶ Adaptation Synthesis: Recreation

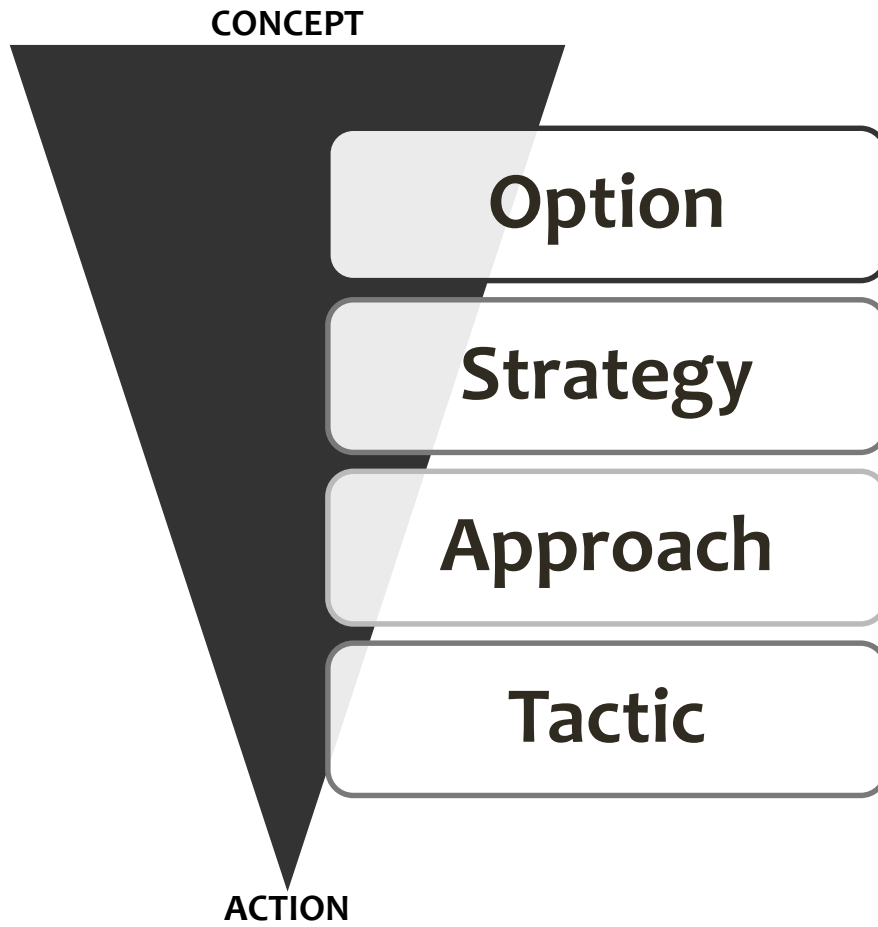
<http://adaptationpartners.org/library.php>

Adaptation strategies and tactics for the western U.S.

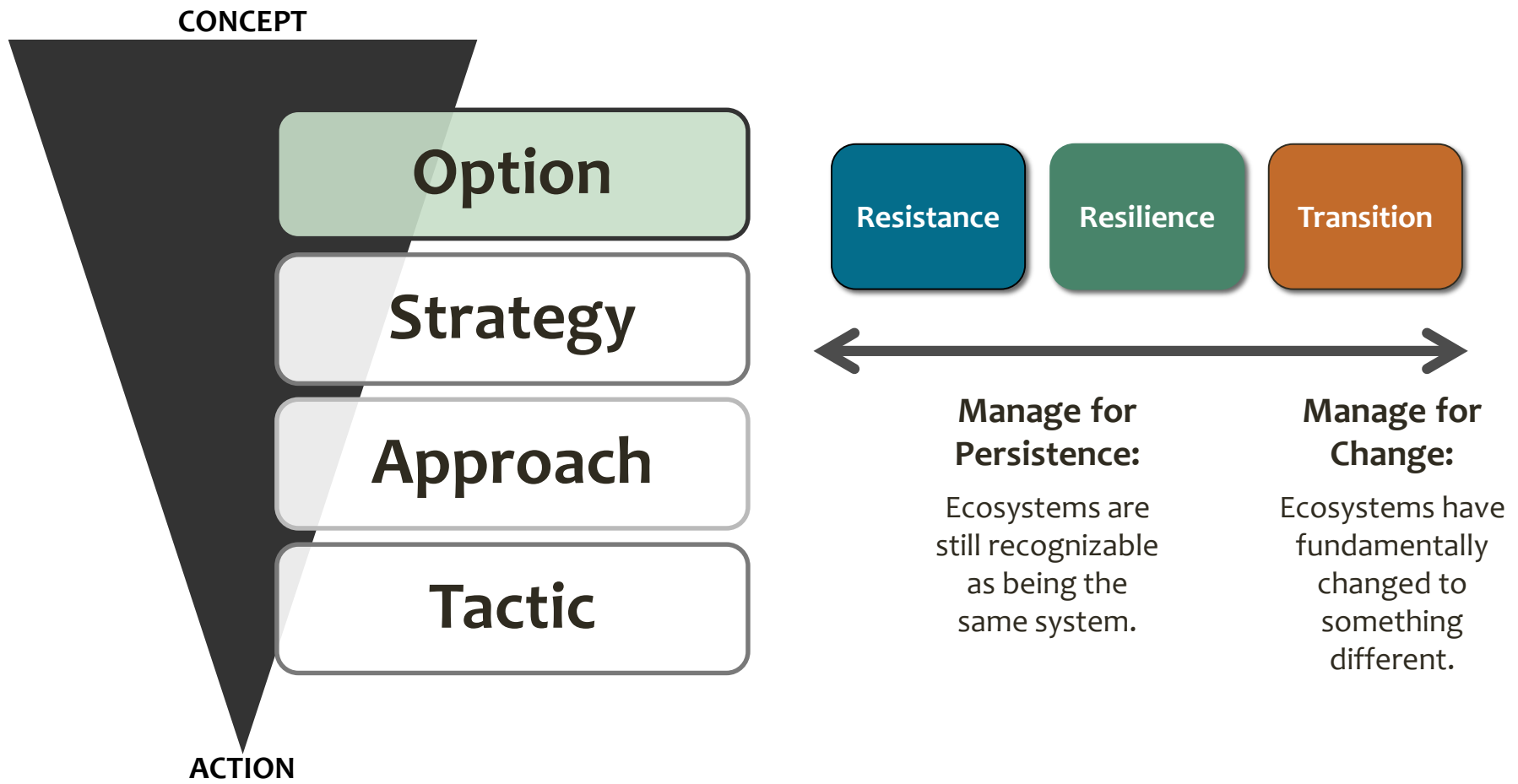
Aligning Resources



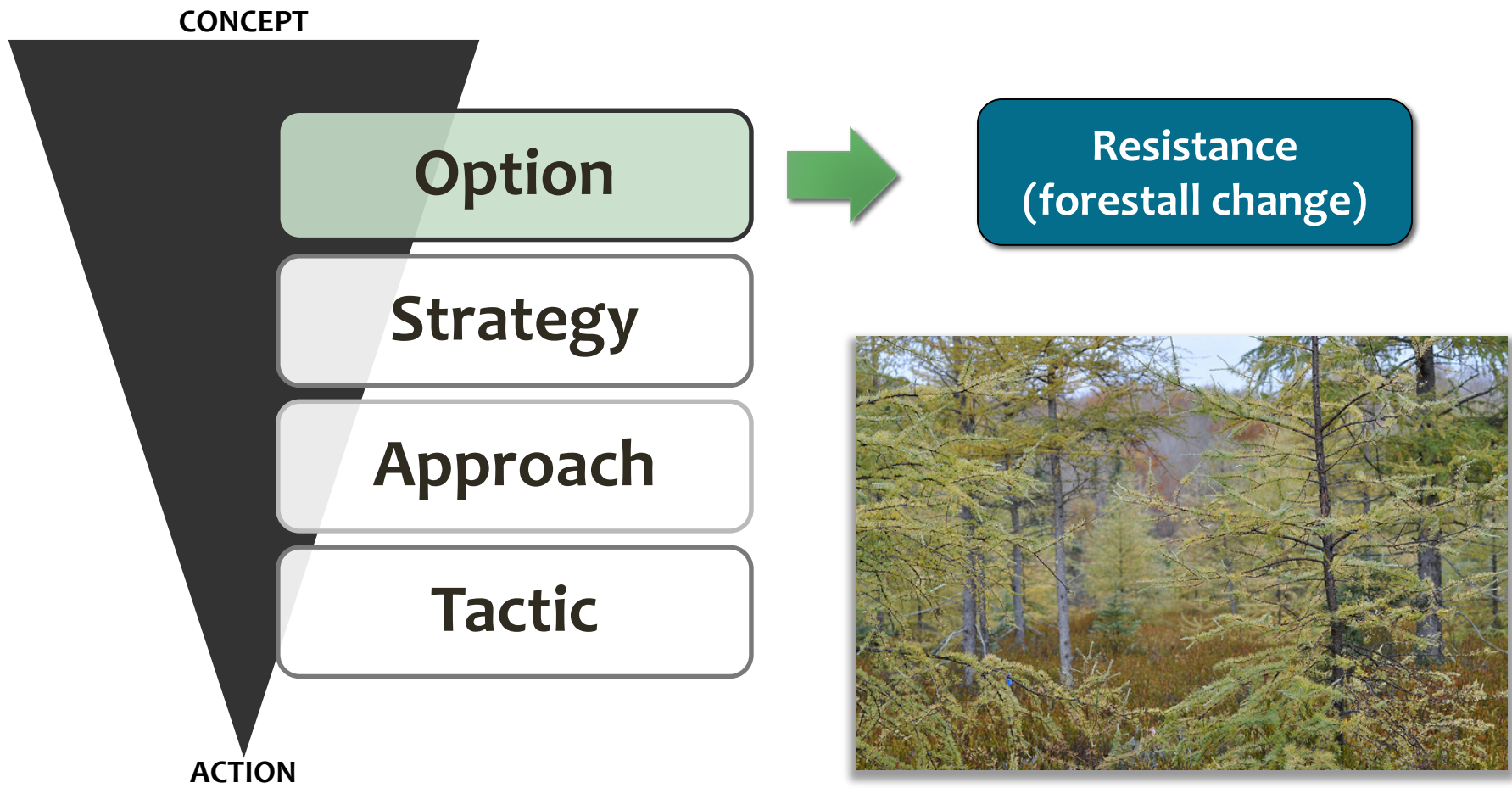
Adaptation Strategies and Approaches



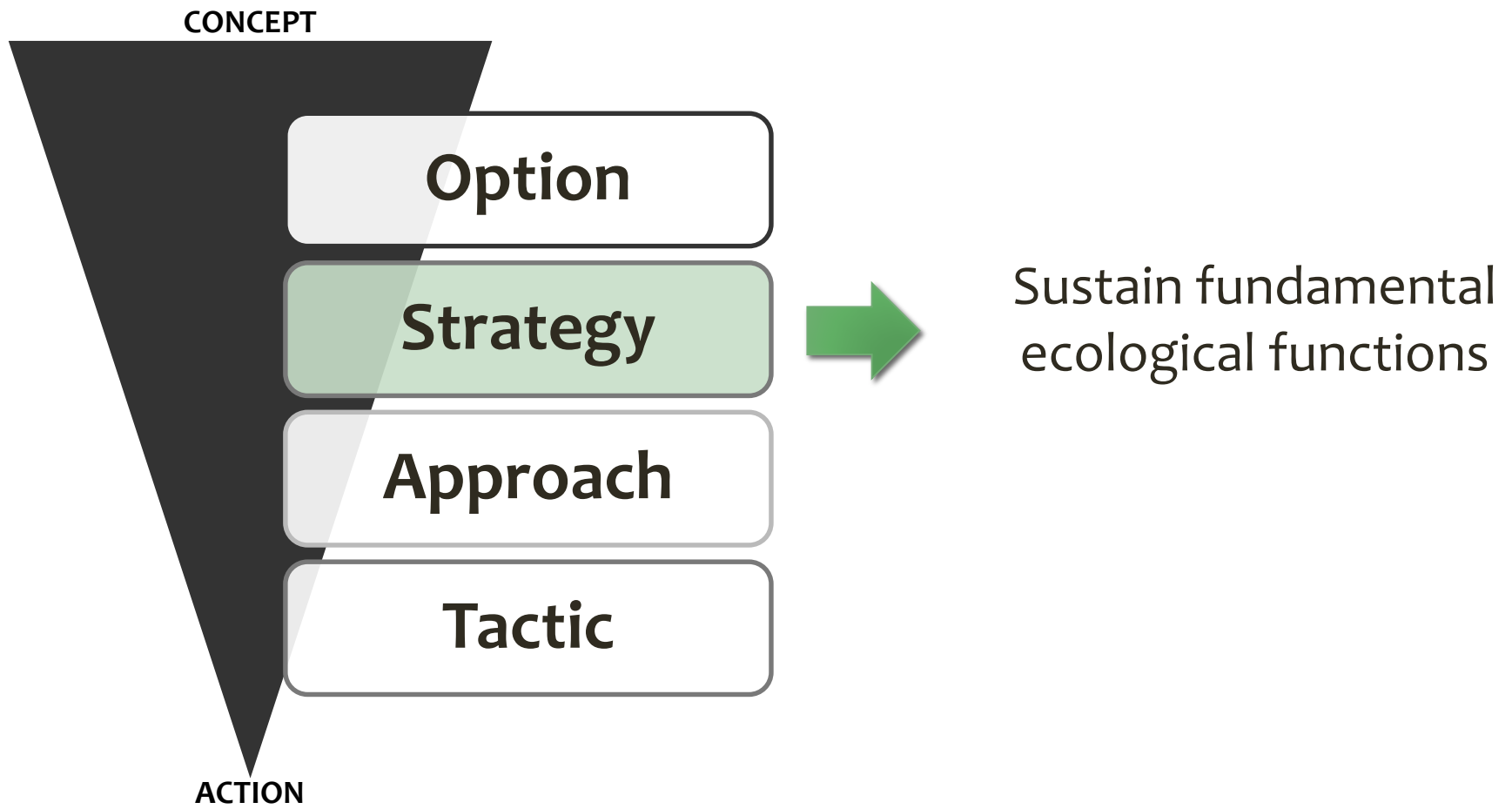
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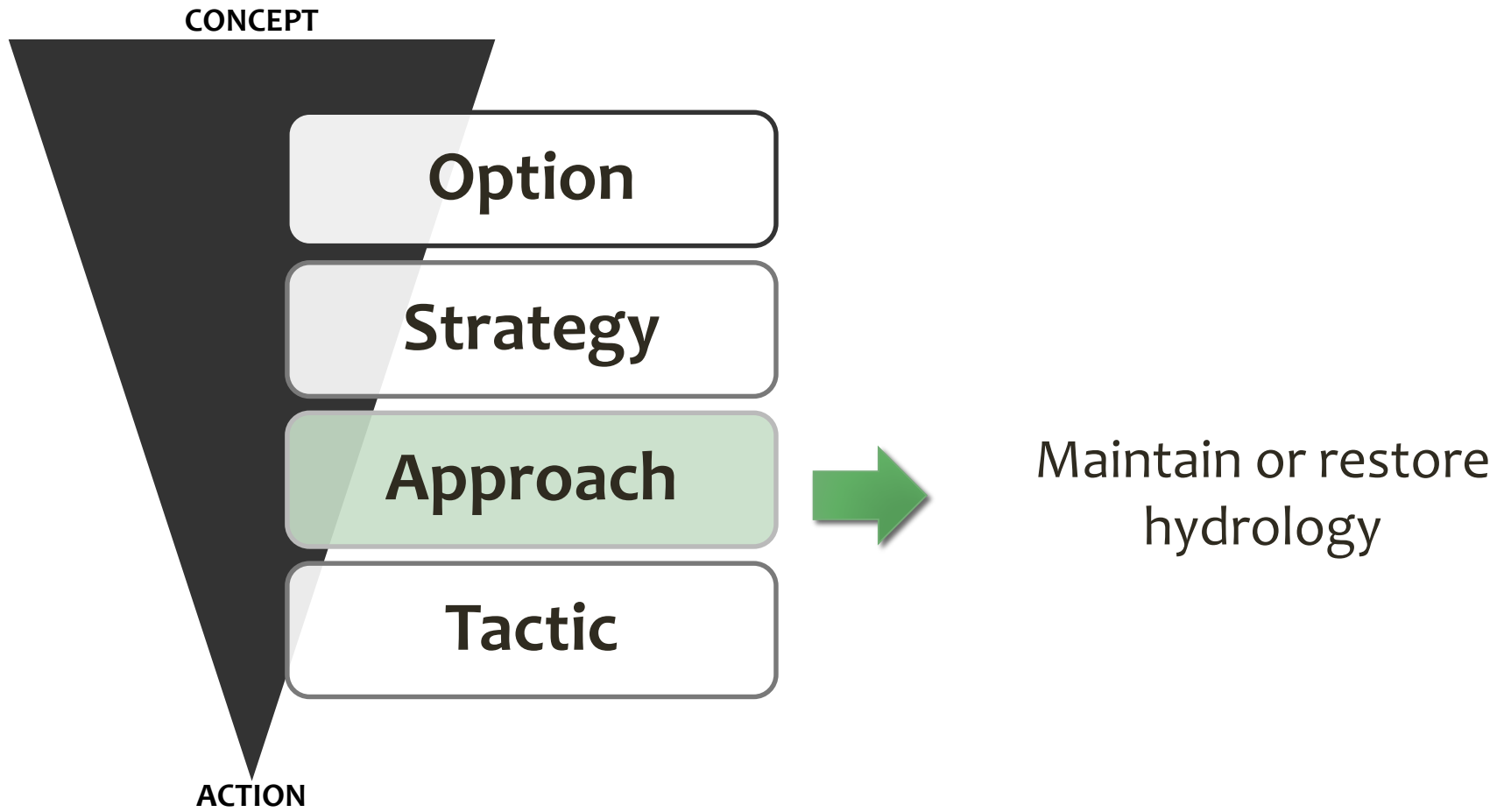
Adaptation Strategies and Approaches



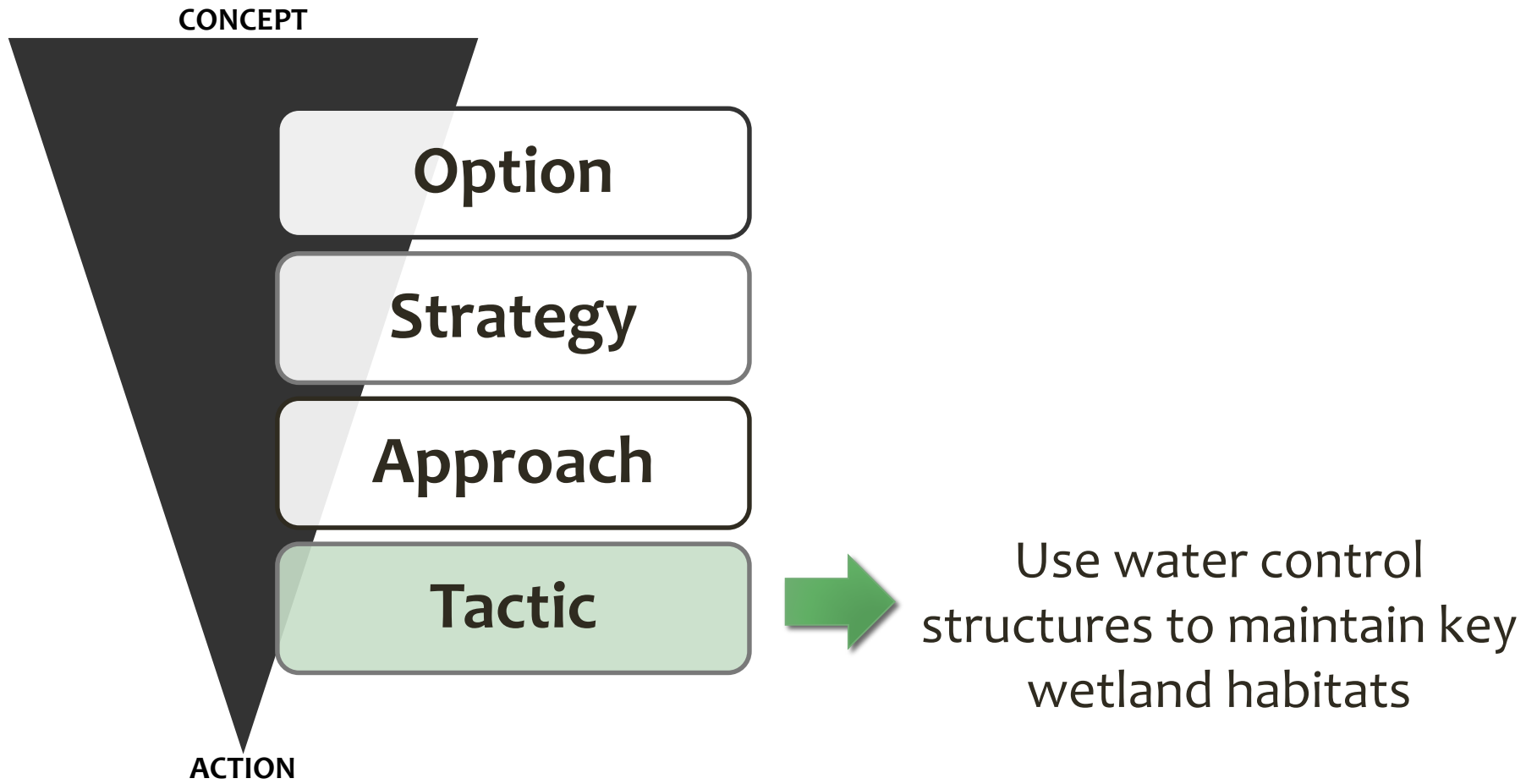
Adaptation Strategies and Approaches



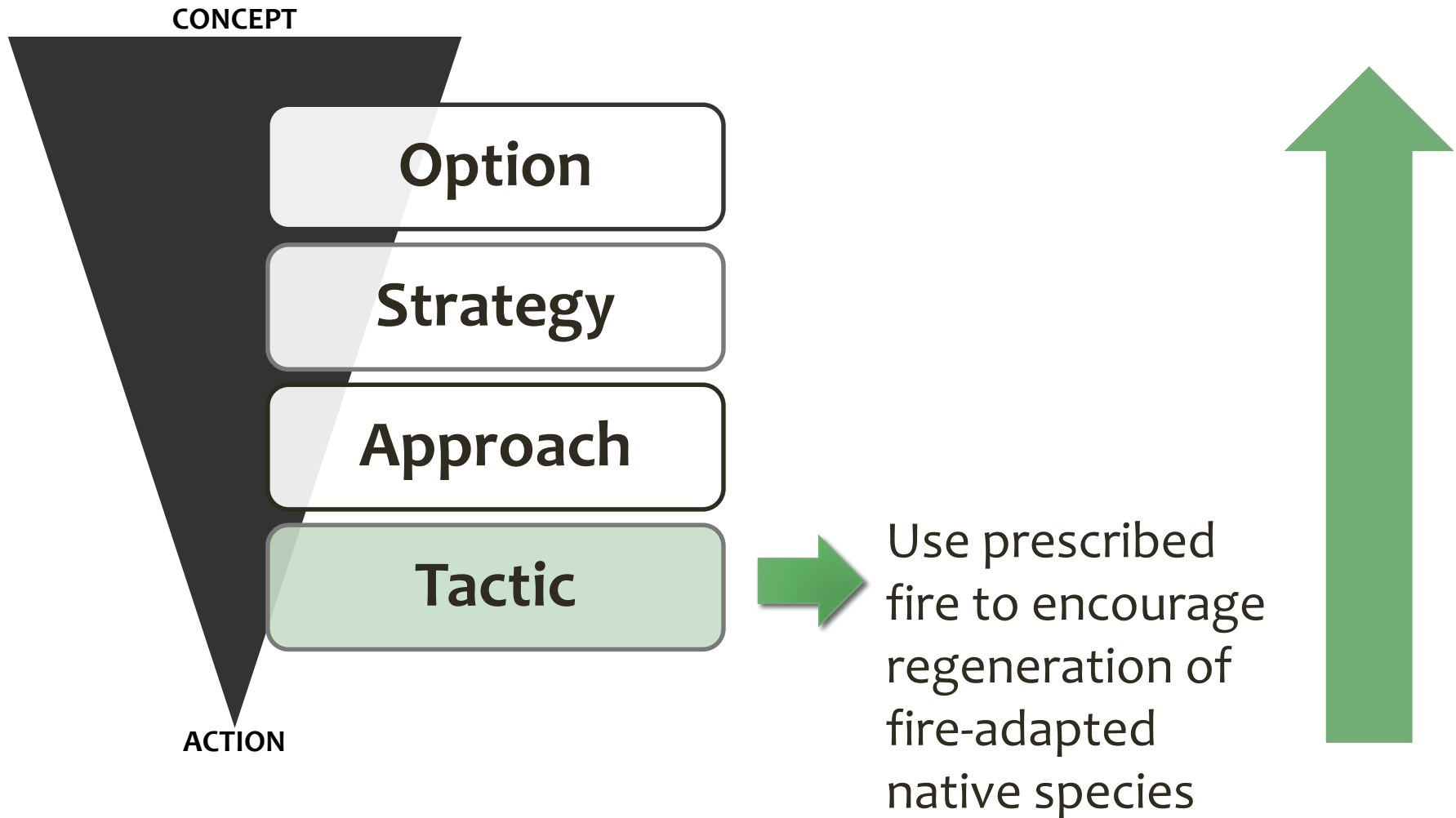
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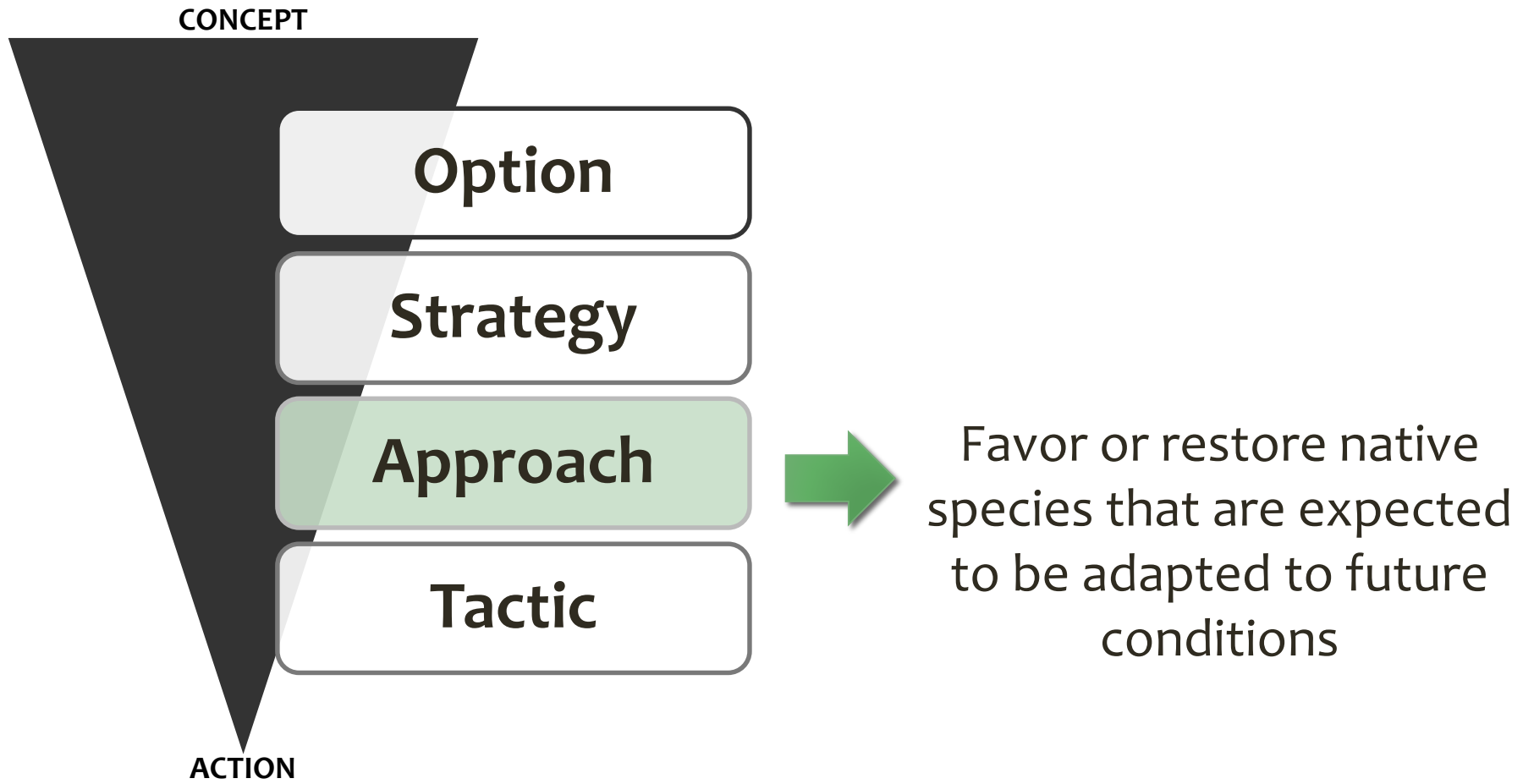
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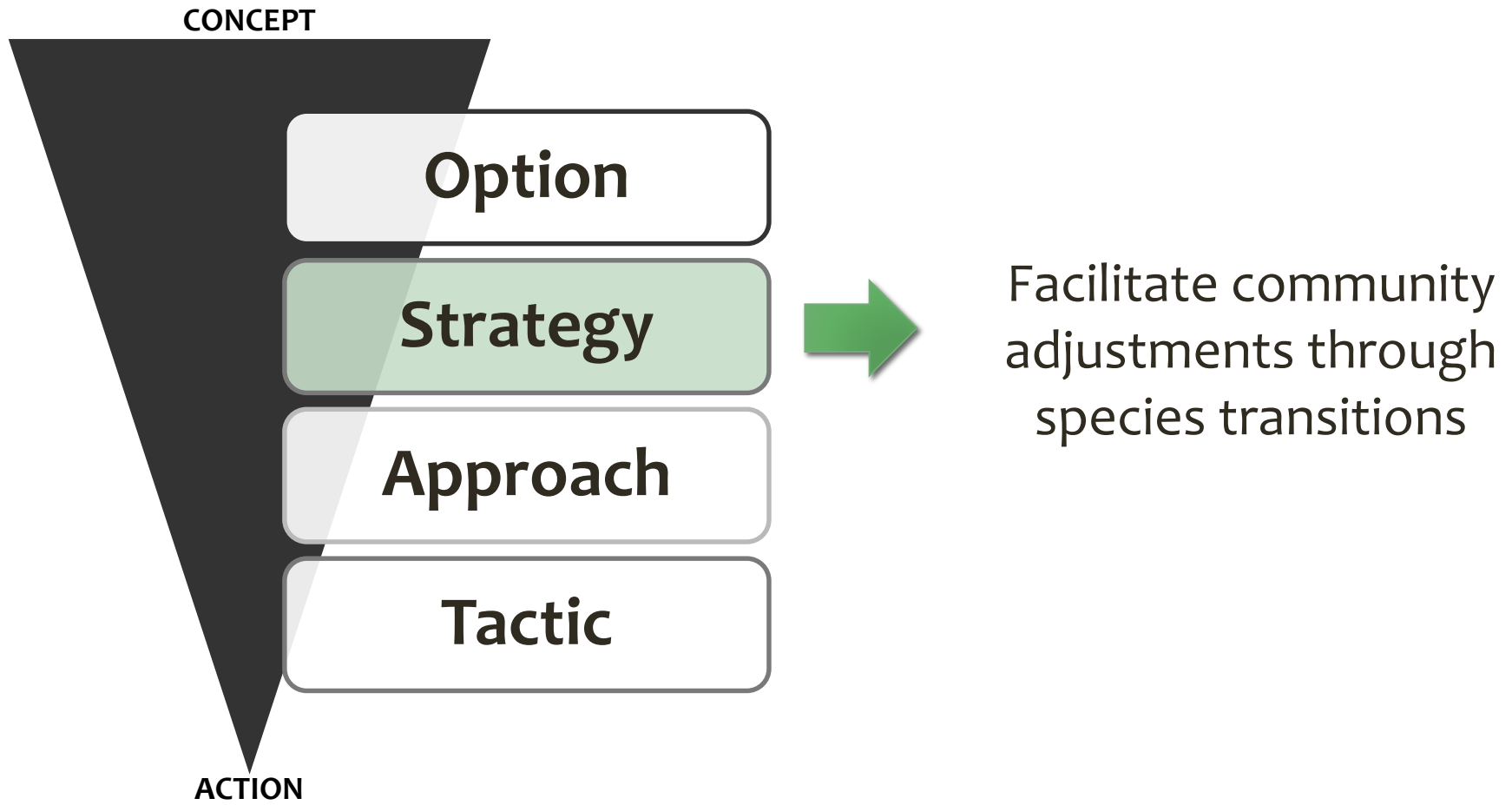
Adaptation Strategies and Approaches



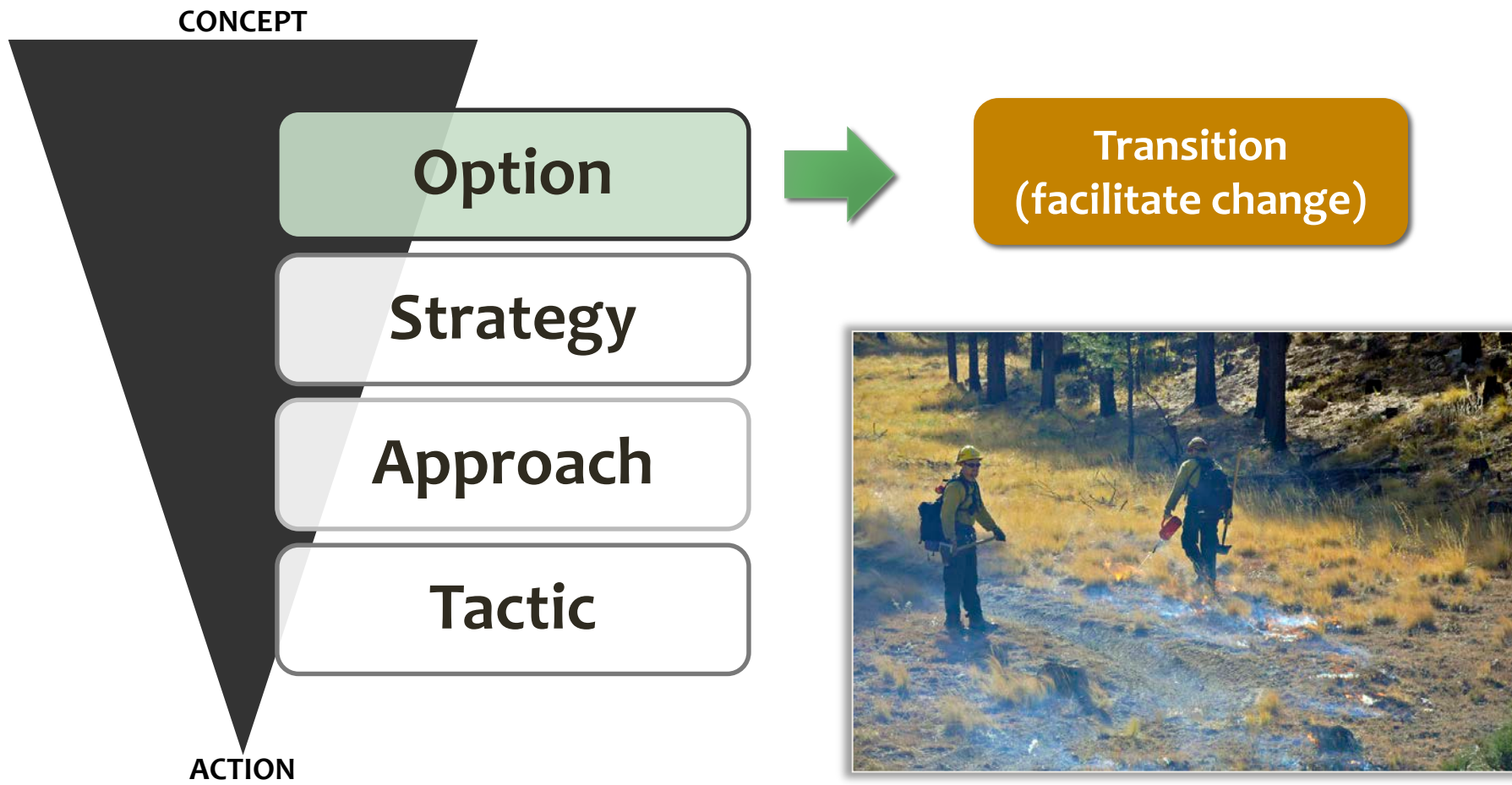
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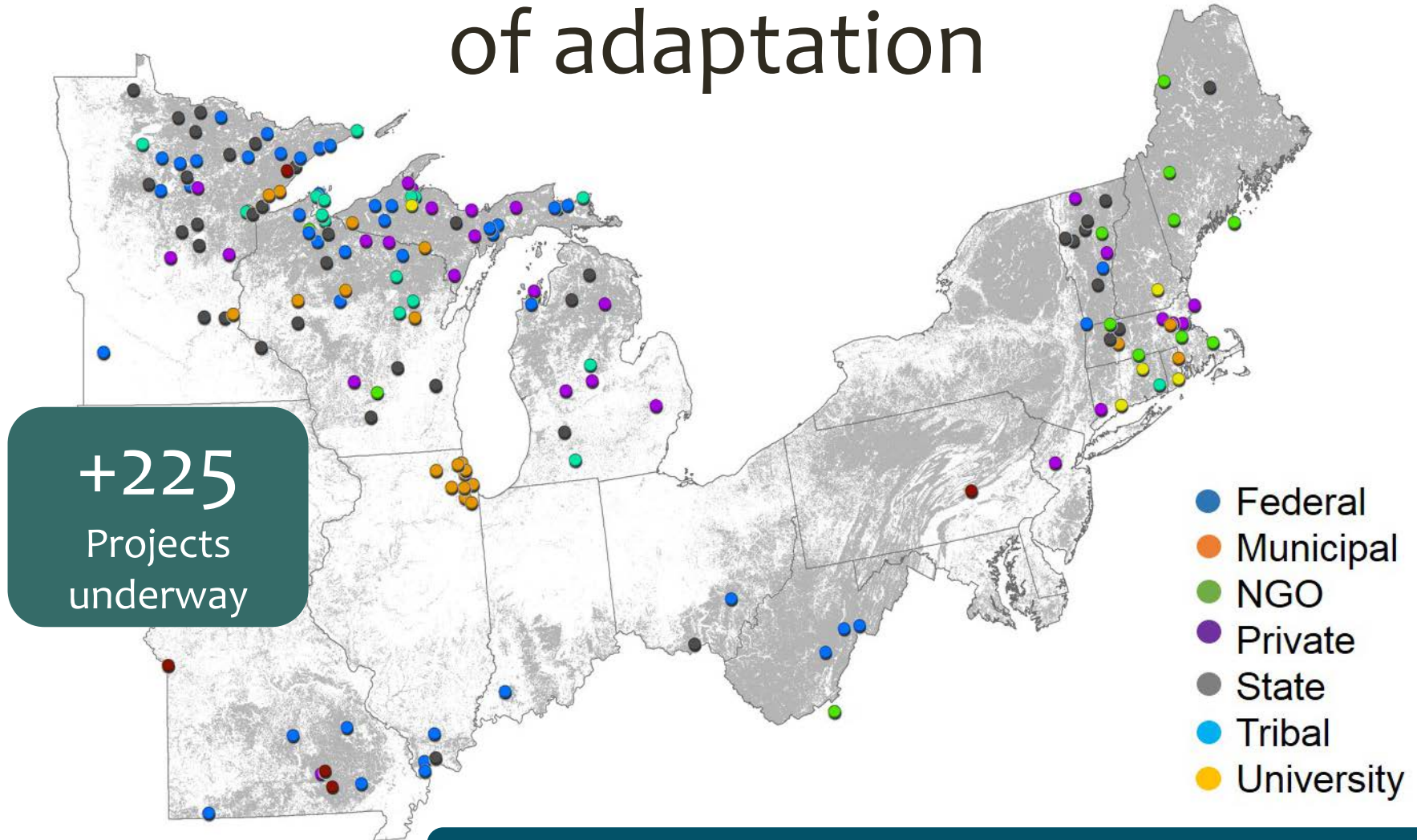
Adaptation Strategies and Approaches



Adaptation Strategies and Approaches



Our goal: Develop local examples of adaptation



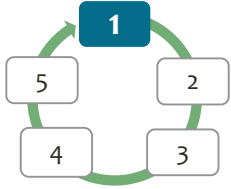
+225
Projects
underway

Forestadaptation.org/demos

ADAPTATION EXAMPLE: TROUT UNLIMITED

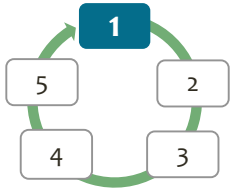


More information: forestadaptation.org/tu-ne



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

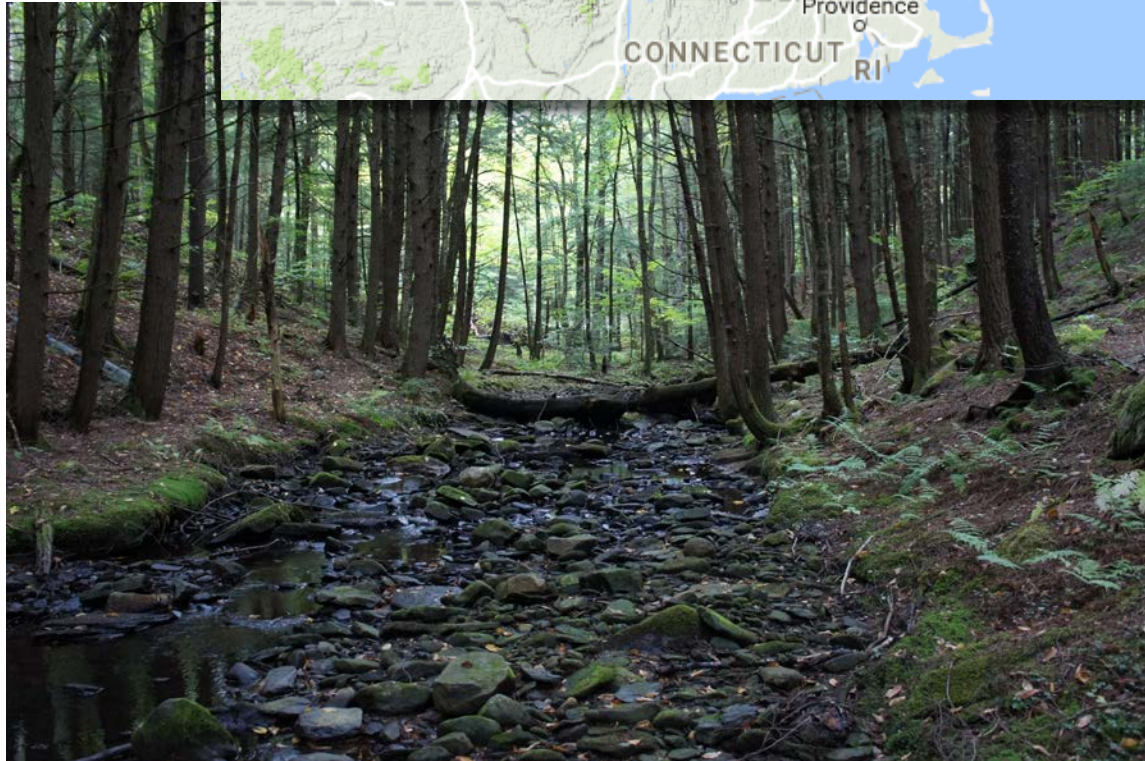
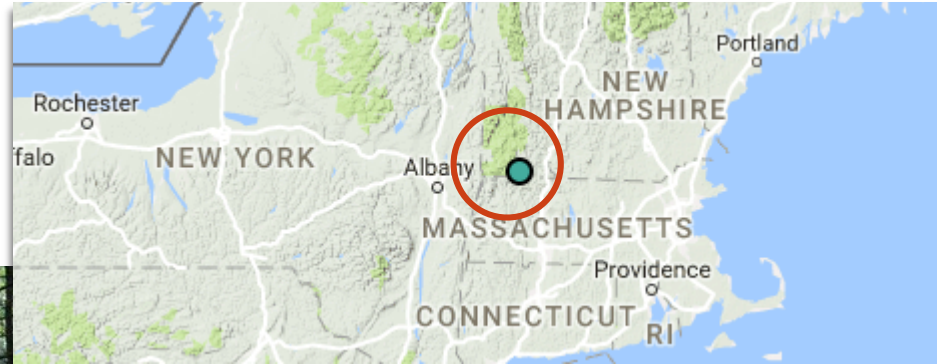
- **Where are you working?**
- **What are your management goals and plans for this area?**

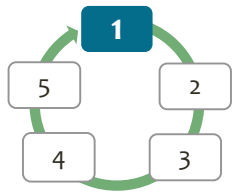


Step 1: DEFINE area of interest, management goals and objectives, and time frames.

North River Watershed

- 93 sq miles in Massachusetts
 - 83% forest, 13% agricultural lands, and 4% urban
- Land owners:
 - State, land trusts, and private



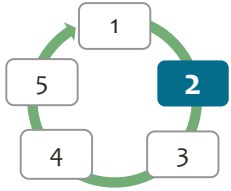


Step 1: DEFINE area of interest, management goals and objectives, and time frames.

Goals

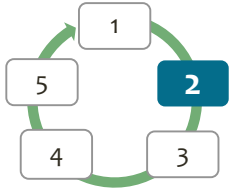
1. Maintain healthy and productive forests
2. Maintain and improve the integrity of the watershed
3. Improve habitat and stream connectivity to benefit trout and other aquatic organisms
4. Enhance the ability of the watershed to cope with extreme precipitation events.





Step 2: ASSESS climate change impacts and vulnerabilities for the area of interest.

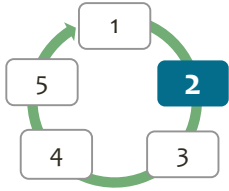
How might the area be uniquely affected by climatic change and subsequent impacts?



Step 2: ASSESS climate change impacts and vulnerabilities for the area of interest.

Broad-scale Impacts & Vulnerabilities

- Changing winter precipitation (snow -> rain)
- Longer growing seasons
 - Late season moisture stress
- More frequent/intense heavy rains
- Declines in many northern species



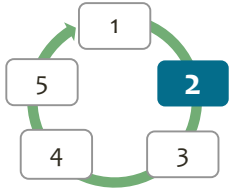
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How might broad impacts be different in the area of interest?





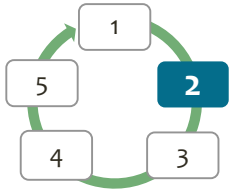
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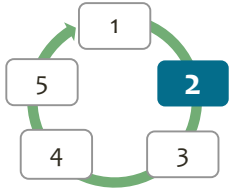
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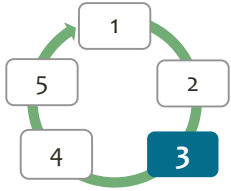
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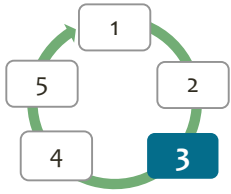
How might broad impacts be different in the area of interest?





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

- **What management challenges or opportunities might occur?**
- **Can current management meet management goals?**
- **Do goals need to change?**



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

Goal/ Obj.

- ↑ watershed integrity
- Improve instream fish habitat, connectivity
- ↑ ability to cope with extreme precipitation

Challenges

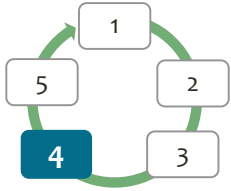
- Stream warming (loss of thermal refugia)
- Severe erosion, sedimentation
- Loss of road-stream infrastructure (undersized)
- Riparian forest tree mortality (hemlock wooly adelgid)

Opportunities

- Some areas may stay buffered from warming temperatures – refugia opportunity
- Tree mortality could increase dead wood in streams

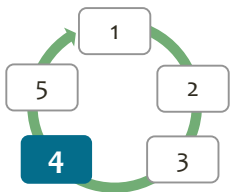
Feasibility (Current Mgmt)

- Short term: Mod
- Long term: Mod



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

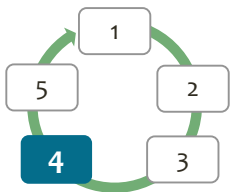
What actions can help cope with change and meet management goals?



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

Area/Topic: **In-Stream & Infrastructure**

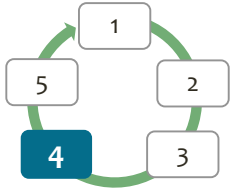
Adaptation Approach	Tactic	Consider:	Recommend Tactics?
1.3 Restore stream channel form and function	• Enhance stream habitat by burying large wood additions in stream.	• Barriers • Benefits • Drawbacks	Yes
6.1 Reinforce infrastructure to meet expected conditions	• Evaluate crossings for failure risk for 100yr storm. Redesign structures to meet these conditions.		
6.3 Incorporate natural or low impact development into designs	• Remove aged and failing structure on low-use road, replace with a reinforced ford.		



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

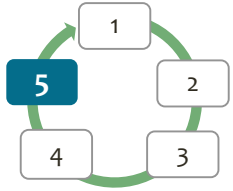
Area/Topic: **Riparian forests**

Adaptation Approach	Tactic	Consider:	Recommend Tactics?
3.1 Maintain or restore forest and vegetative cover	• Facilitate riparian vegetation in reconnected floodplain.	• Benefits • Drawbacks • Barriers	Yes
3.3 Maintain or improve the ability of forests to resist pests/pathogens	• Implement forest mgmt practices to reduce adelgid and maintain stream shading.		Yes
4.2 Establish new mixes of native species	• Establish riparian species assemblage with climate-adapted conifer and hardwoods.		Yes



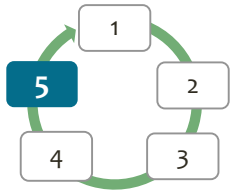
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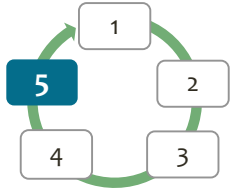
Step 5: MONITOR and evaluate effectiveness of implemented actions.

- **How do we know if the selected actions were effective?**
- **What can we learn from these actions to inform future management?**



Step 5: MONITOR and evaluate effectiveness of implemented actions.

Goal / Obj	Monitoring Variable	Criteria for evaluation	Implement
• Improve instream fish habitat, connectivity • ↑ ability to cope with extreme precipitation • Maintain healthy & productive forests	• Aquatic organism presence • Mesohabitat (riffle, run, and pool) from wood installations • Bank stabilization • Riparian forest areas	• Abundance: no change or improvement • Habitat improvement downstream of added wood segments • Increased stabilization and reduced erosion • Species composition, basal area	• Invertebrate survey, etc. • Annual survey upstream & downstream • Permanent rebar • Regular forest inventory



Step 5: MONITOR and evaluate effectiveness of implemented actions.



Final Thoughts

- Find a planning tool that works for you.
- There is no single “right” way to respond .
- Emphasize actions that maintain flexibility.
- Learn by doing, learn together.





Thank you!