



ADAPTING FORESTS TO CLIMATE CHANGE

Approaches for Action



ADAPTATION VS. MITIGATION

ADAPTATION

- Actions to moderate the vulnerability of forests to climate change
- Promotes forests to become more healthy, resistant, & resilient

MITIGATION

- Use of forests to sequester carbon, provide renewable energy from biomass, & avoid carbon losses from fire, mortality, conversion, etc.

ADAPTATION

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



Adaptation actions *can* –

- Reduce or avoid the loss of forest cover
- Prevent declines in productivity
- Safeguard environmental services

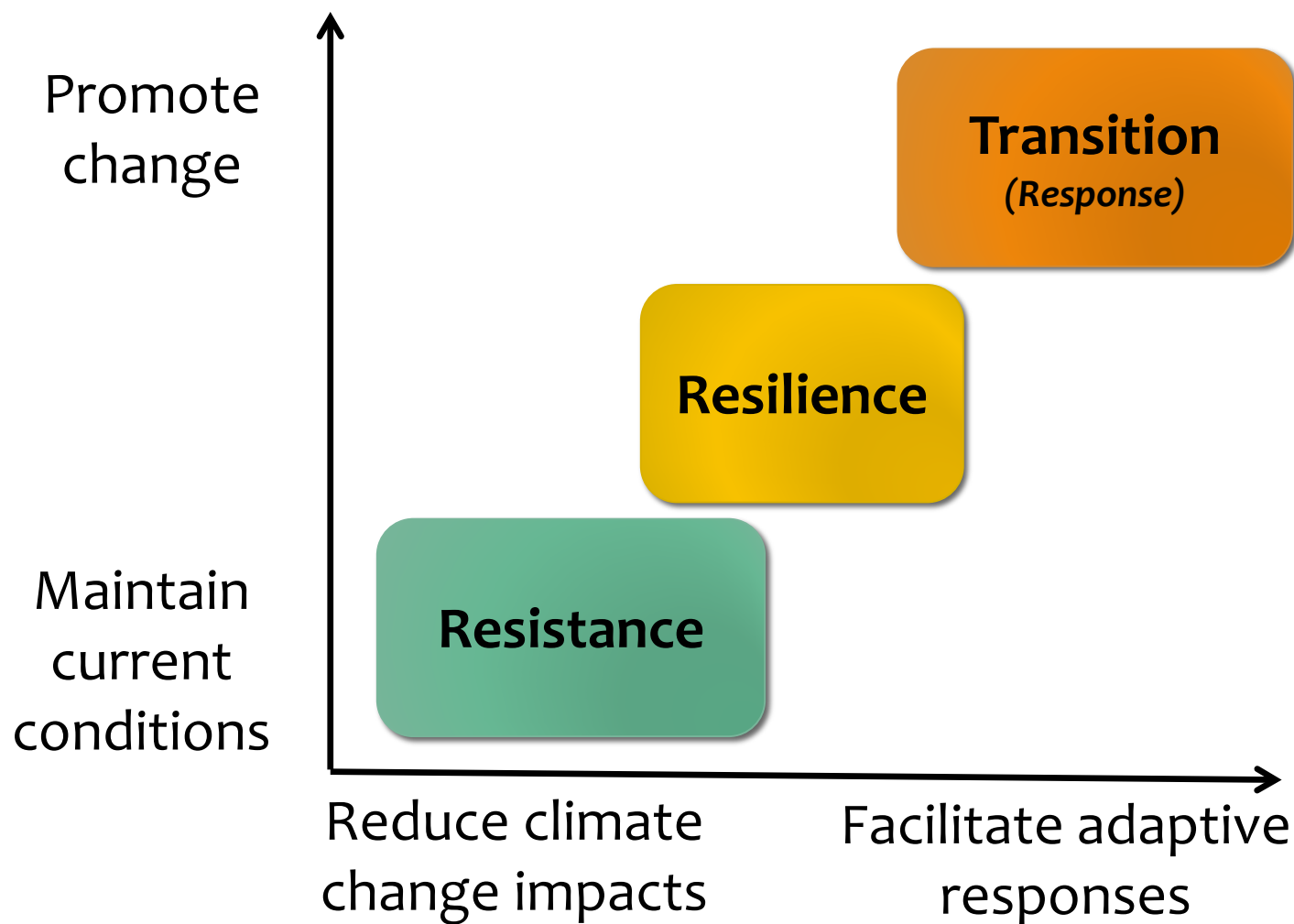
ADAPTATION

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

Adaptation activities can build on and compliment existing **sustainable management** and **conservation** actions



ADAPTATION OPTIONS



ADAPTATION OPTION #1: RESISTANCE

Improve the defenses of the forest against change to maintain relatively unchanged conditions over time.

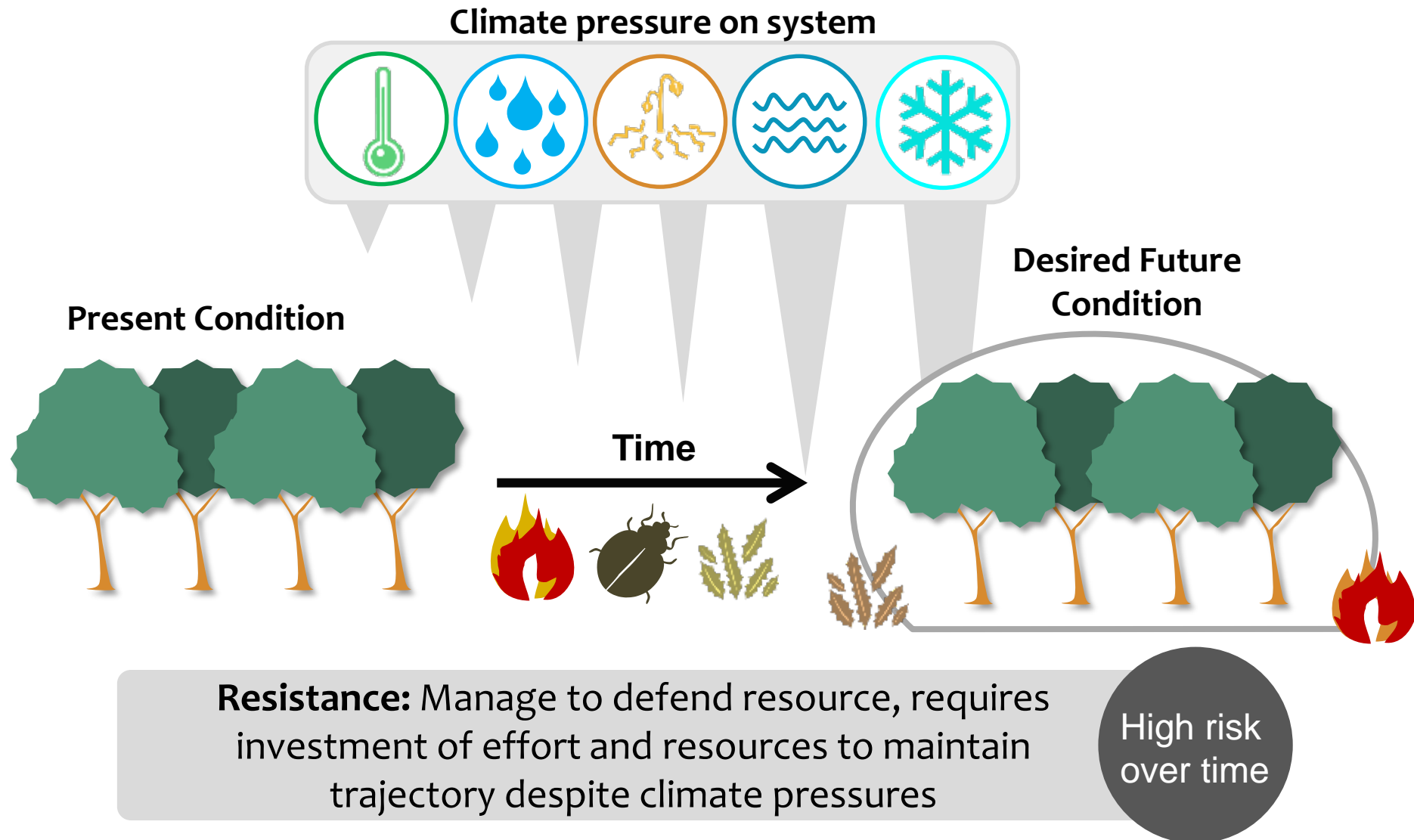
- Short-term approach
- Good for high-value lands that cannot cope with disturbances
- Requires long term investment of resources to maintain course



Photo: USFS

Millar et al. 2007

ADAPTATION OPTION #1: RESISTANCE



ADAPTATION OPTION #2: RESILIENCE

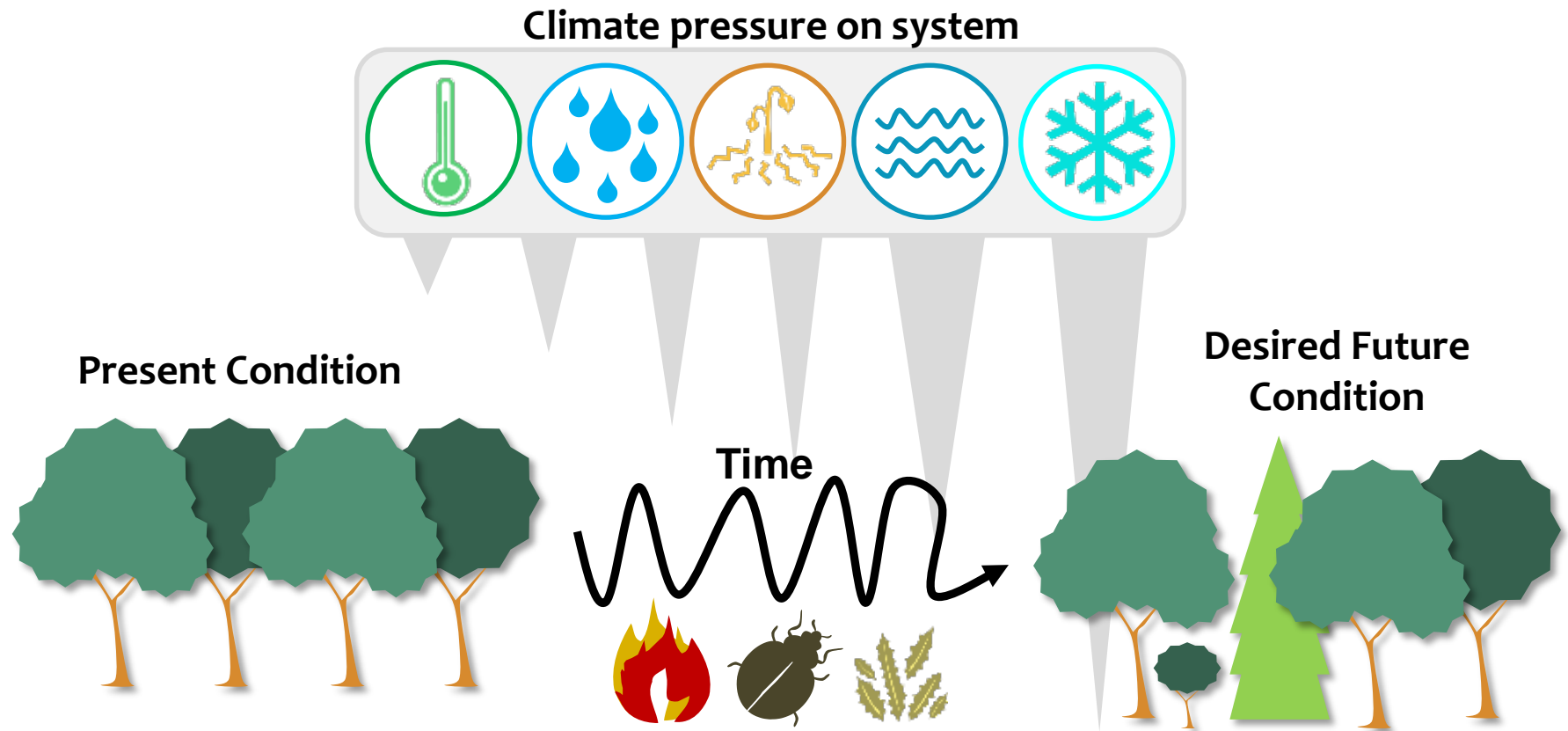
Accommodate gradual change, usually returning to a prior condition after disturbance



Photo: USFS

Millar et al. 2007

ADAPTATION OPTION #2: RESILIENCE



Resilience: Manage to accommodate some change
expect system to resemble prior condition
after disturbance

High Risk
over time

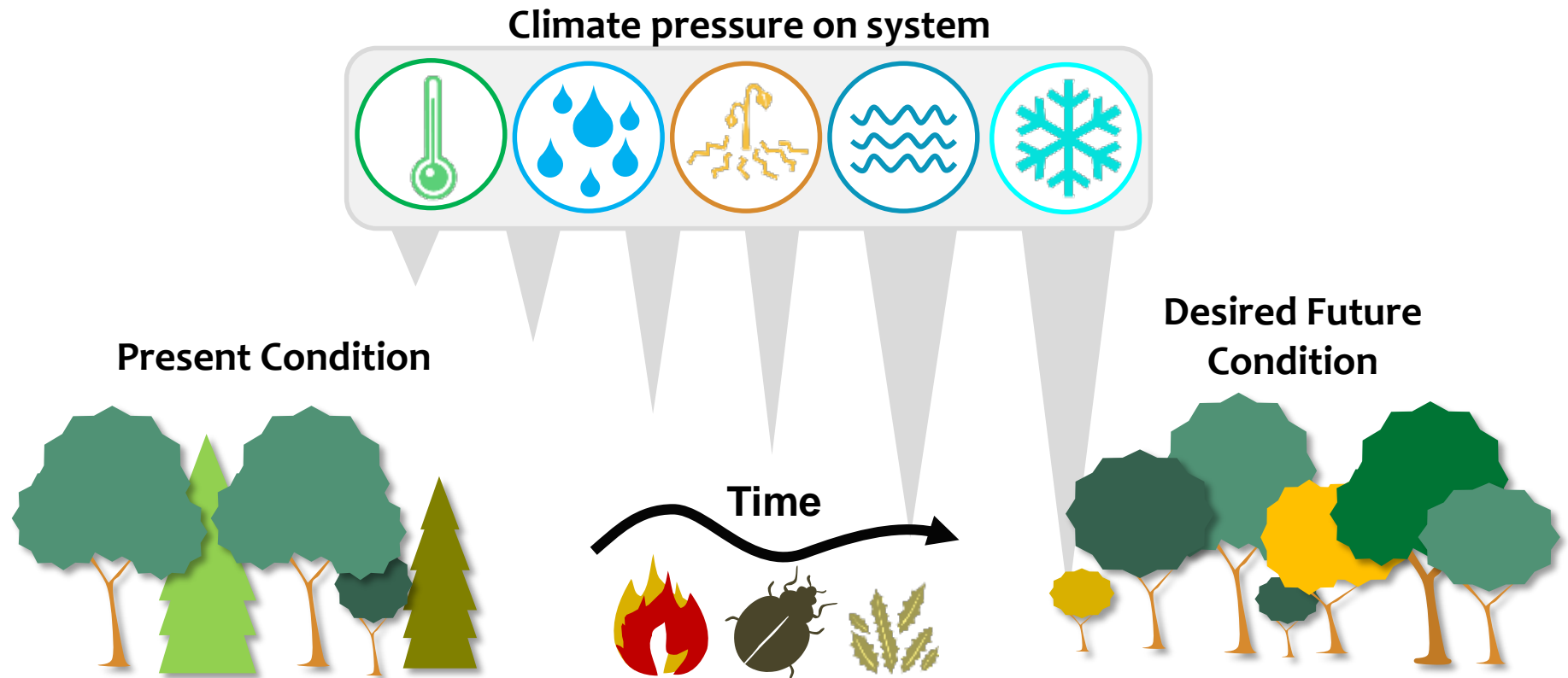
ADAPTATION OPTION #3: TRANSITION

Intentionally encourage change, to help ecosystems adaptively respond in a targeted fashion

- Enhances the ability of forests to cope with changing conditions
- Aligning system with anticipated climate



ADAPTATION OPTION #3: TRANSITION



Transition: Intentionally accommodate change, enables ecosystems to adapt to new conditions

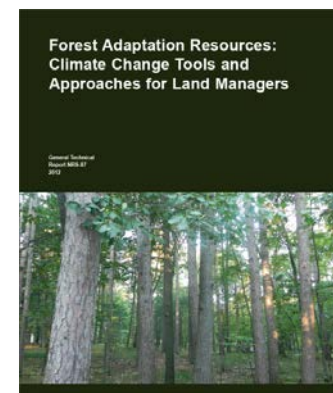
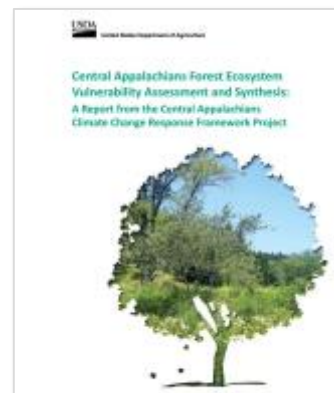
Less risk
over time

WHERE DO I START?

- Define management area, goals and objectives
- Gather Resources -
 1. **Vulnerability assessment**
Conceptualize climate change impacts projected for your region
 2. **Projected resilient location maps**
for terrestrial conservation in the Northeast and Mid-Atlantic region
 3. **Forest Adaptation Resources and workbook** integrate climate change into your work, create tangible actions suited to your goals and objectives



Terrestrial Resilience maps
Find at: nature.ly/TNCResilience

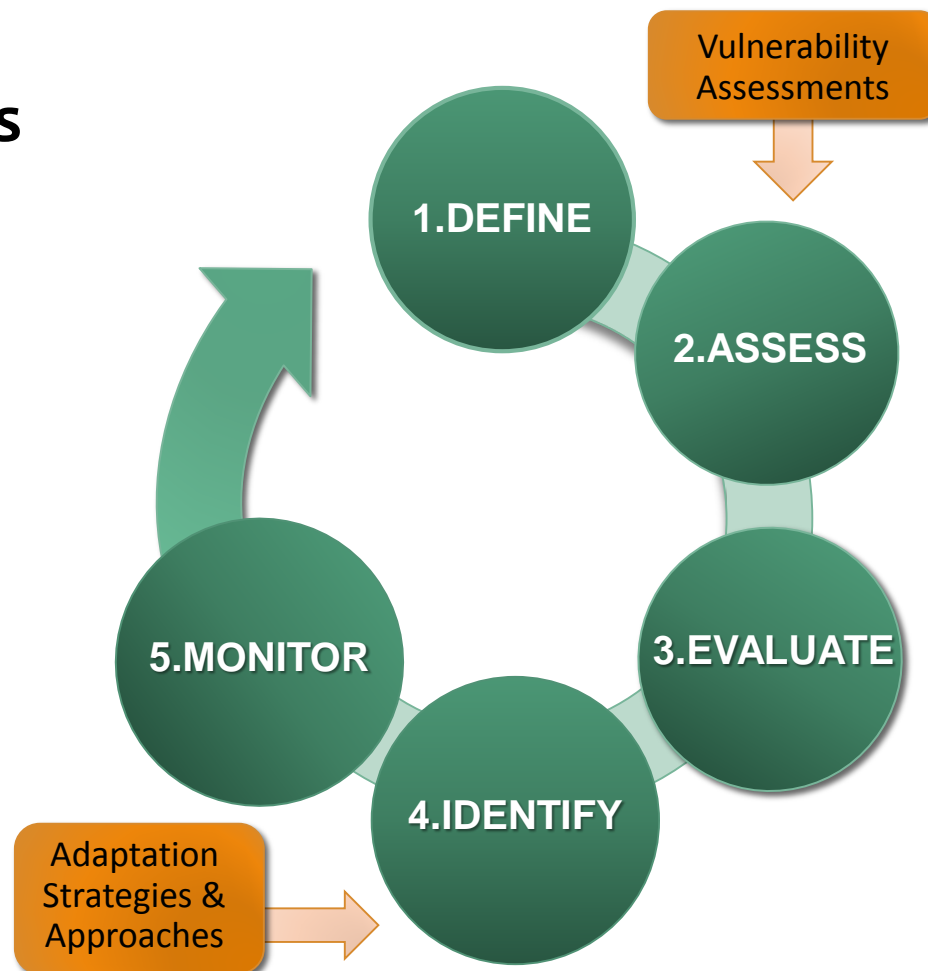


Find at: forestadaptation.org

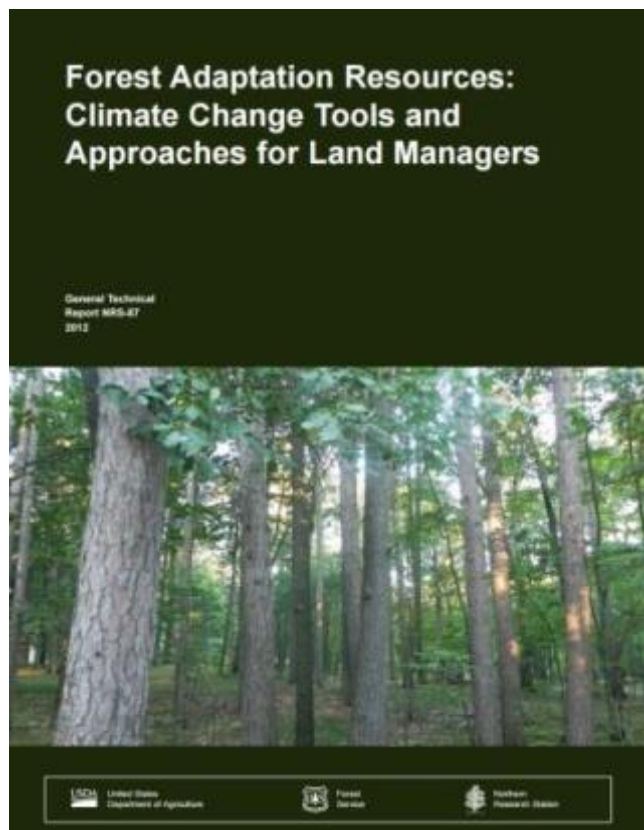
FOREST ADAPTATION RESOURCES

Structured process to identify adaptation options

1. **Define** goals and objectives
2. **Assess** climate impacts and vulnerabilities
3. **Evaluate** objectives considering climate impacts
4. **Identify** adaptation approaches and tactics for implementation
5. **Monitor** effectiveness of implemented actions



FOREST ADAPTATION RESOURCES



Swanston and Janowiak 2012;
www.nrs.fs.fed.us/pubs/40543

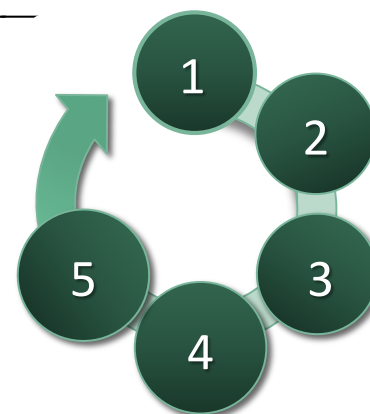
Strategies & Approaches

Menu of adaptation actions

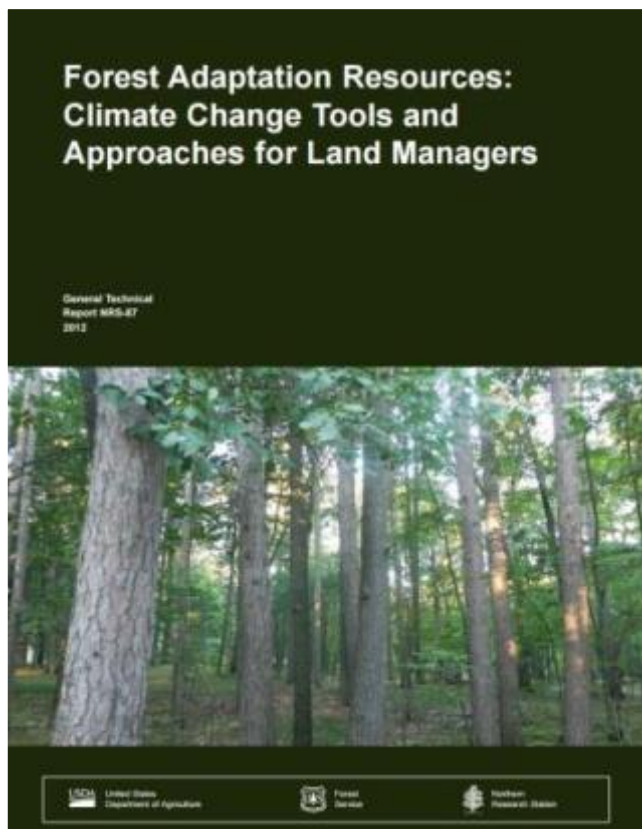


Adaptation Workbook

- Structured process to integrate climate change considerations into management planning
- Workbook approach



FOREST ADAPTATION RESOURCES



Swanston and Janowiak 2012;
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Strategies & Approaches

Menu of adaptation actions

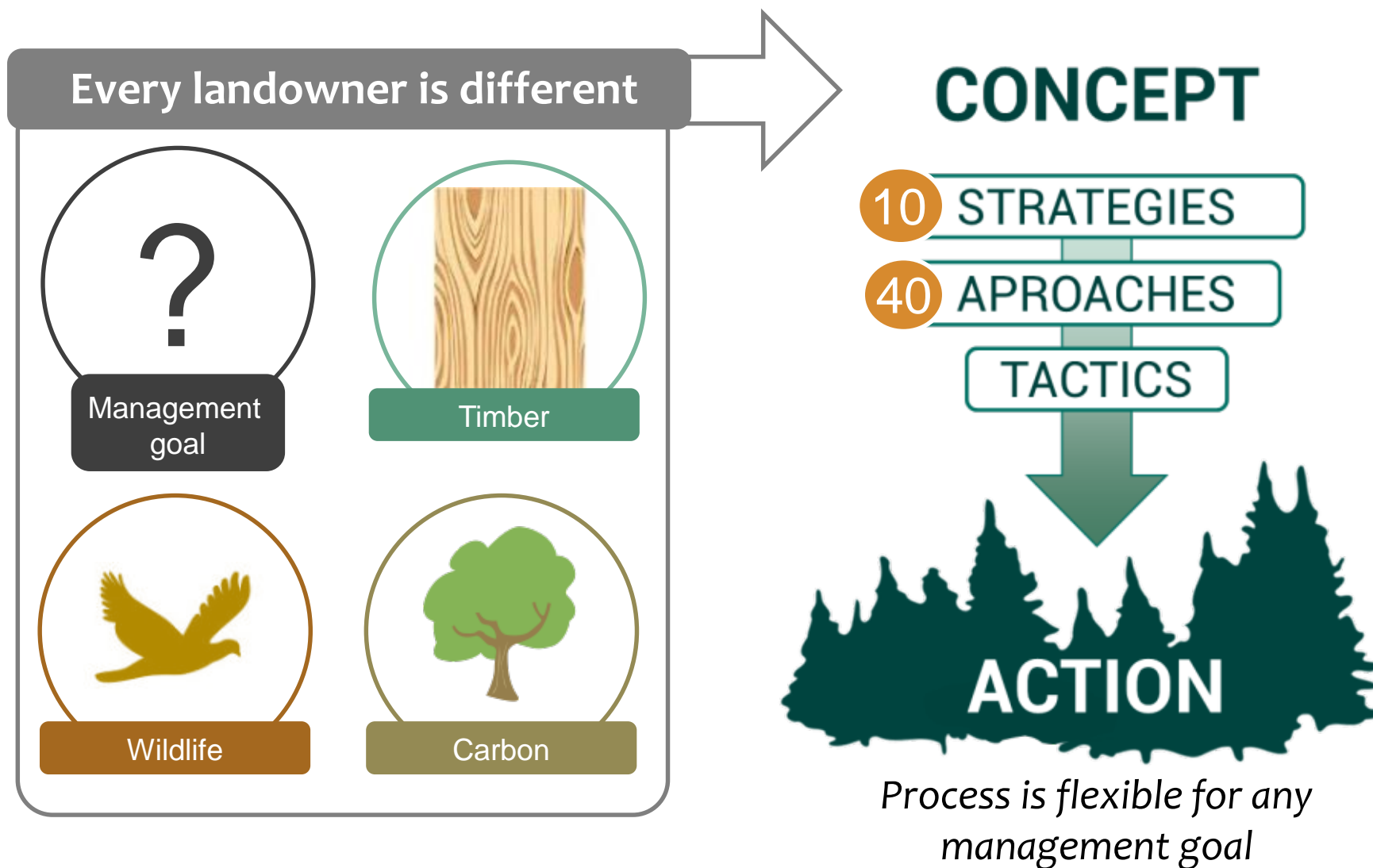
- **10 strategies, 40 approaches**
- Result of adaptation literature review
- Refined for applicability in forests by experts (forest managers, planners, academics, other)
- **Does not make recommendations!!**

GETTING FROM GOALS TO ACTION

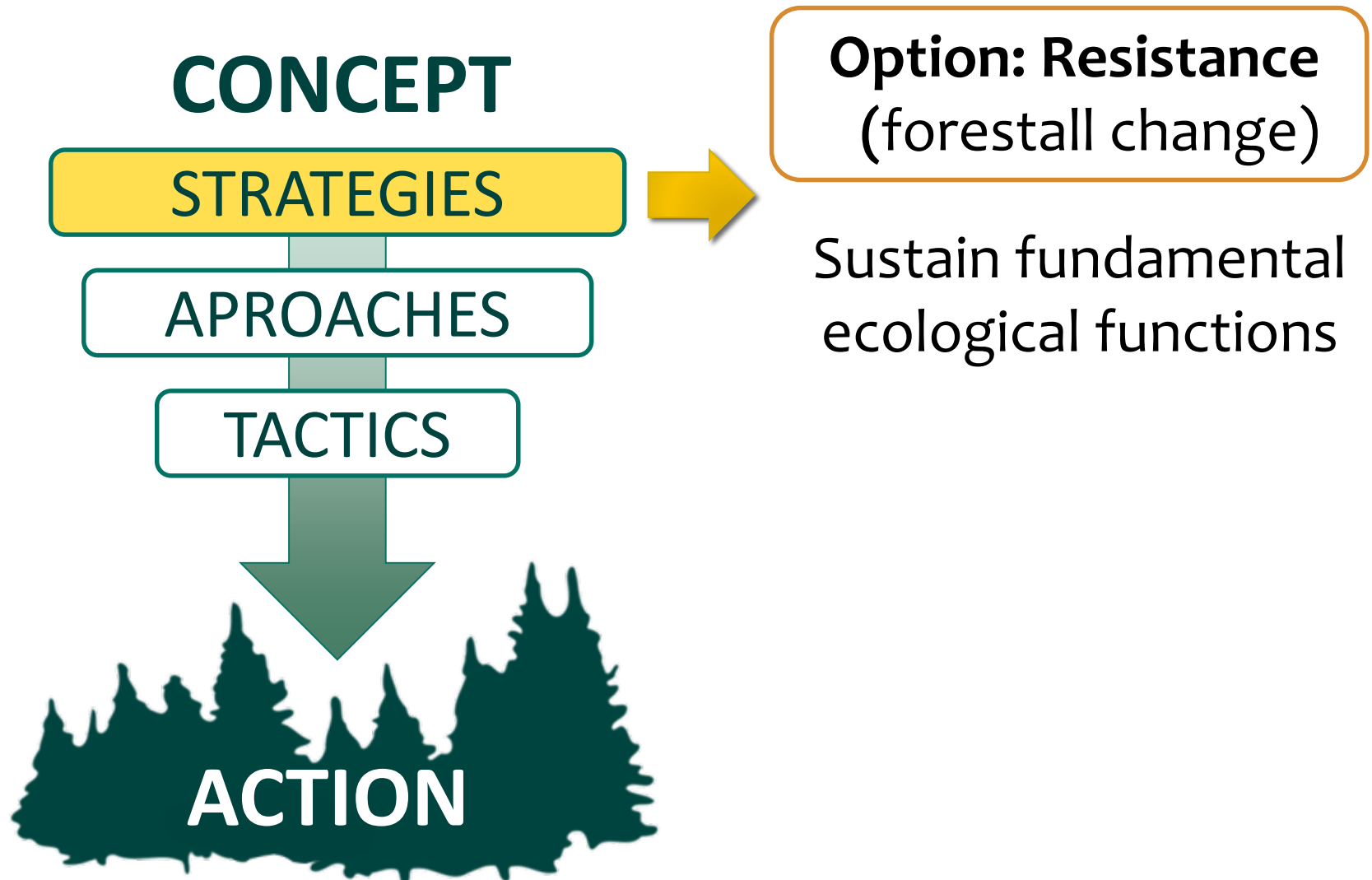
The **Workbook** helps you create **clear rationale** for your actions by connecting them to broader adaptation ideas.



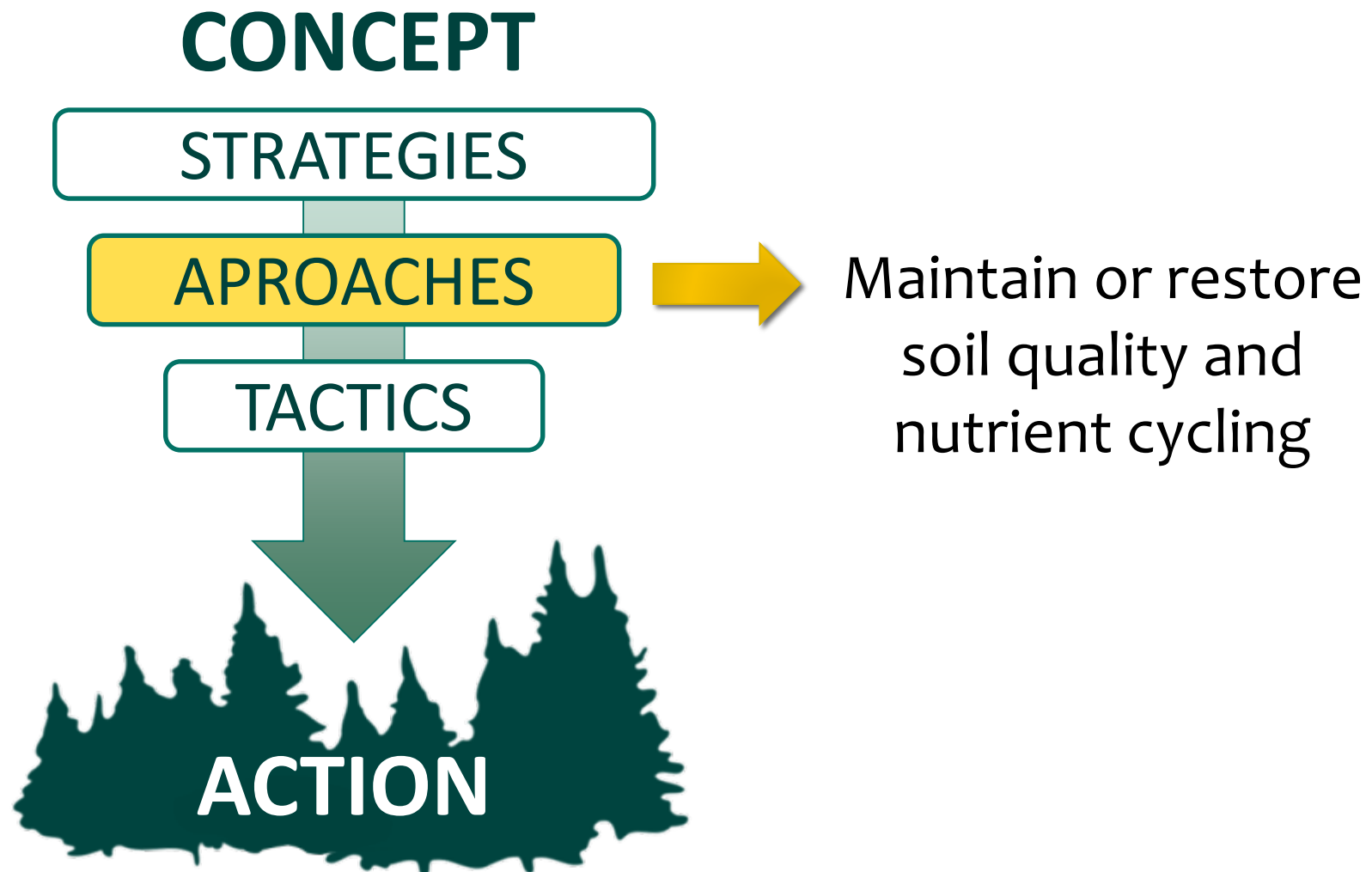
GETTING FROM GOALS TO ACTION



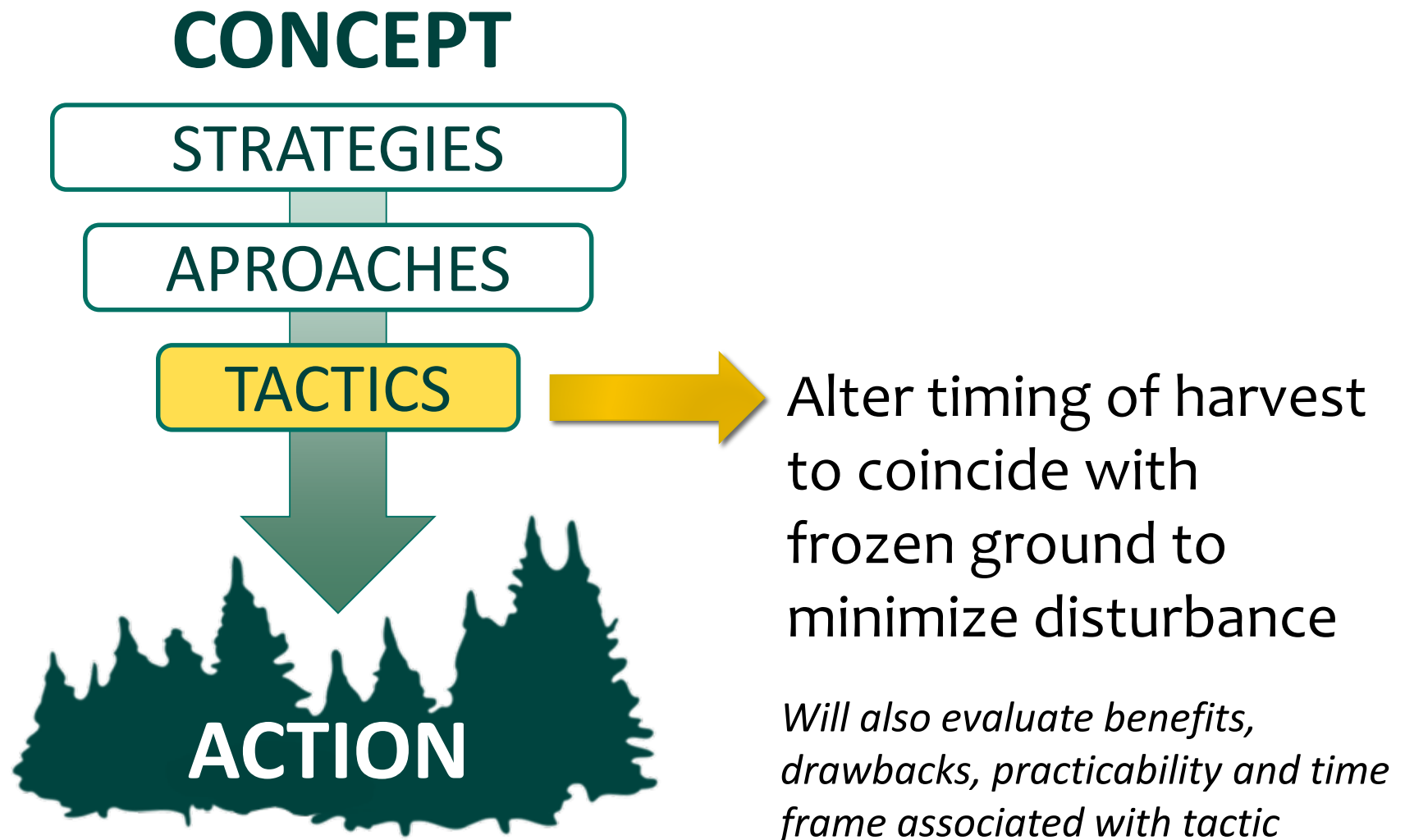
ADAPTATION STRATEGIES AND APPROACHES



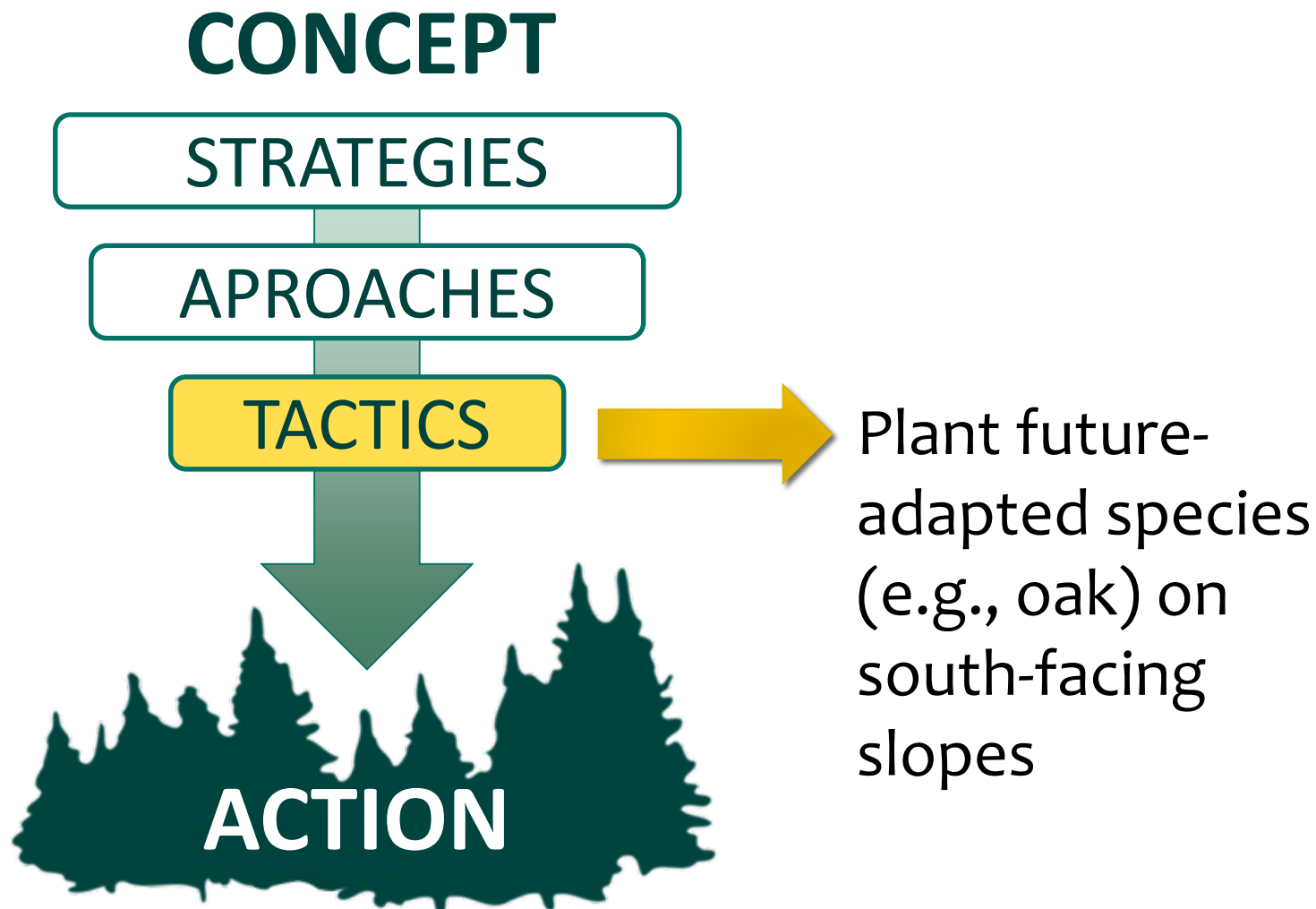
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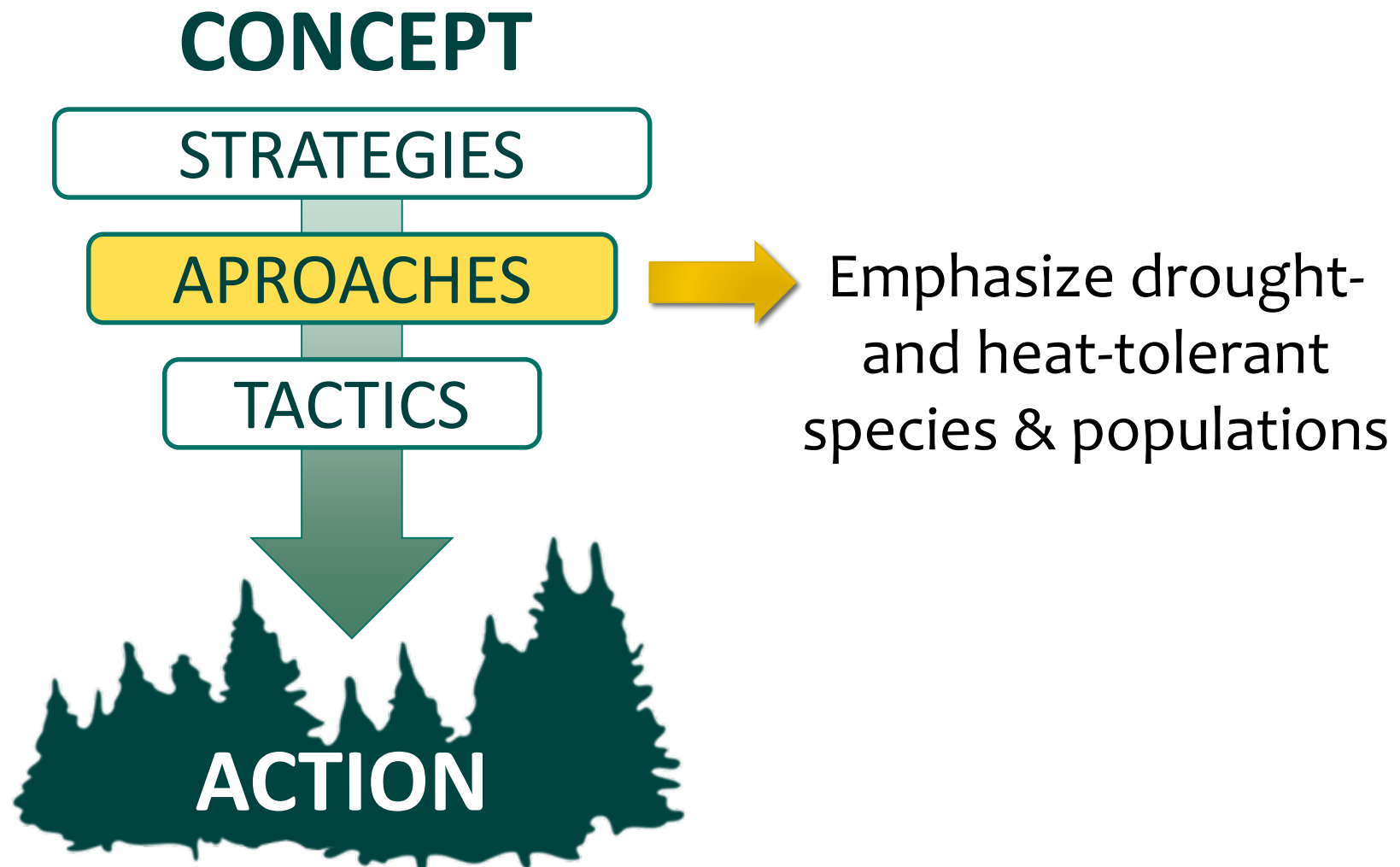
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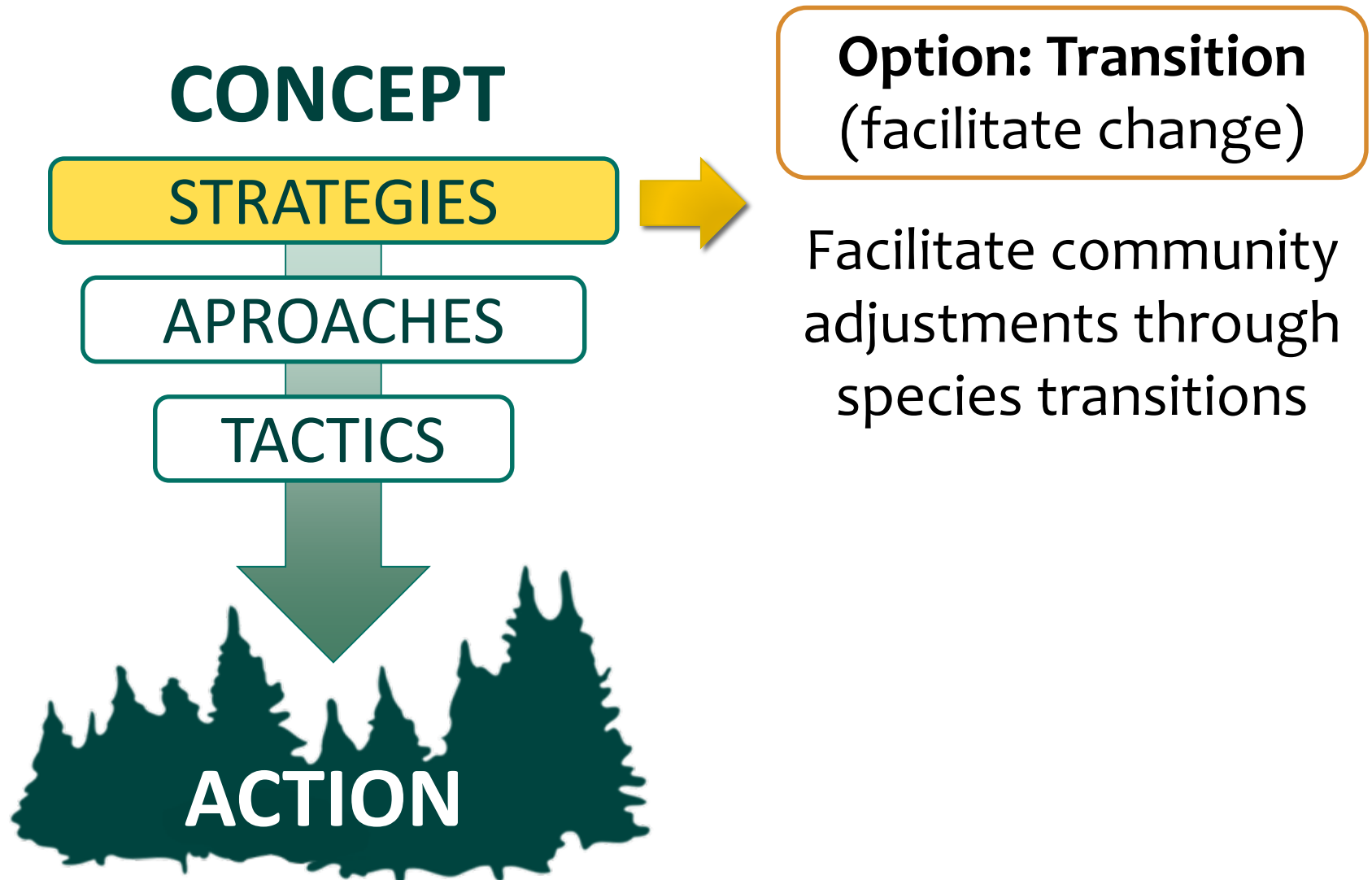
ADAPTATION STRATEGIES AND APPROACHES



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ADAPTATION STRATEGIES AND APPROACHES



PRINCIPLES OF ADAPTATION

- May need to prioritize actions based on vulnerability and ability to manage/adapt
- Reduce risk and plan ahead, not just for climate change, but for extreme events and disturbance
- Adaptive management maintains flexibility and incorporates new information over time



THANK YOU!

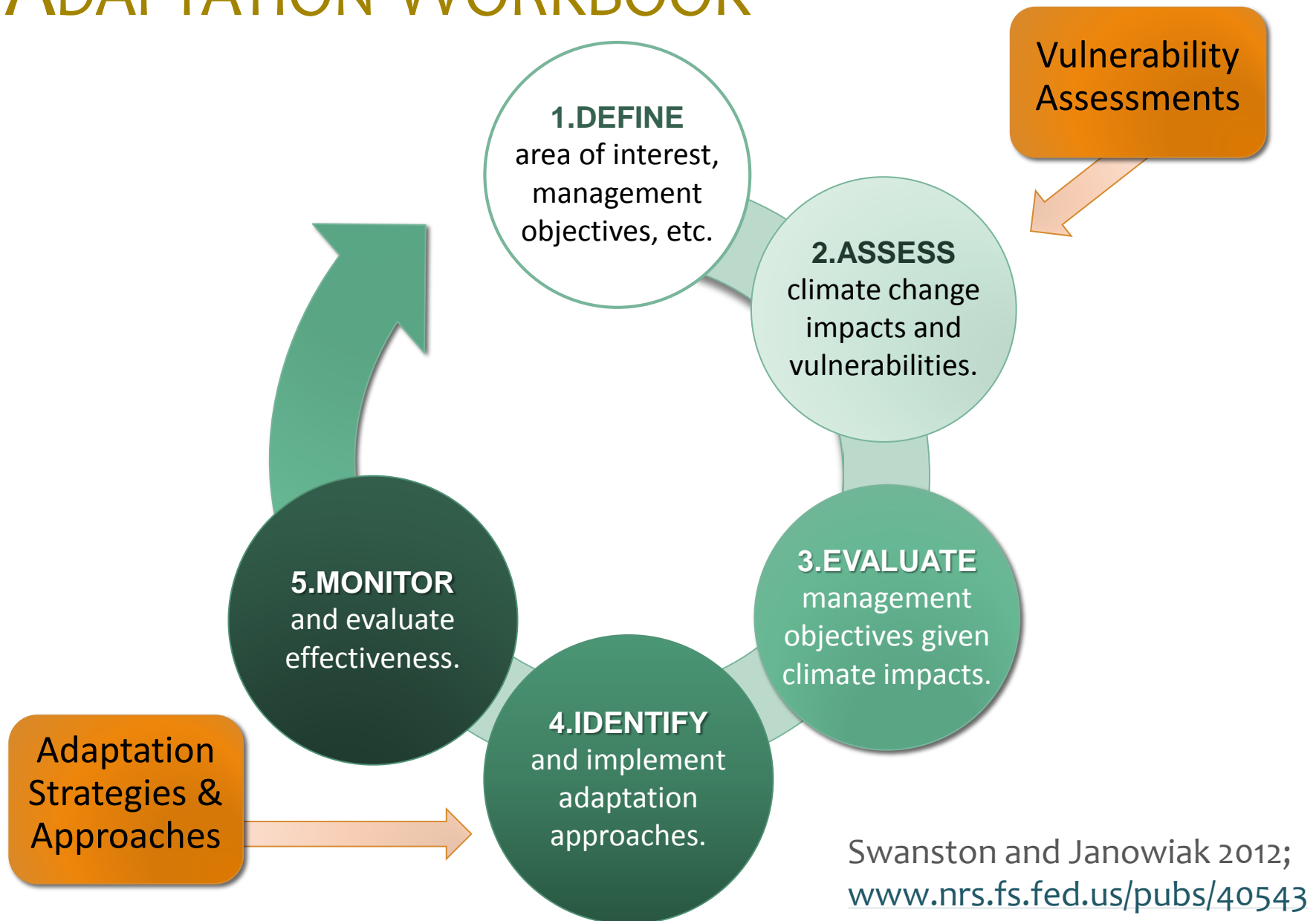


For more information visit -

Forestadaptation.org



ADAPTATION WORKBOOK



FOREST ADAPTATION RESOURCES

Strategy

- 1 Sustain fundamental ecological functions.
- 2 Reduce the impact of existing biological stressors.
- 3 Protect forests from severe fire and wind disturbance.
- 4 Maintain or create refugia.
- 5 Maintain and enhance species and structural diversity
- 6 Increase ecosystem redundancy across the landscape.
- 7 Promote landscape connectivity
- 8 Enhance genetic diversity
- 9 Facilitate community adjustments through species transitions.
- 10 Plan for and respond to disturbance.

FOREST ADAPTATION RESOURCES

Strategy 1: Sustain fundamental ecological functions.

1. Maintain or restore soil quality and nutrient cycling
2. Maintain or restore hydrology
3. Maintain or restore riparian areas

Strategy 2: Reduce the impact of biological stressors.

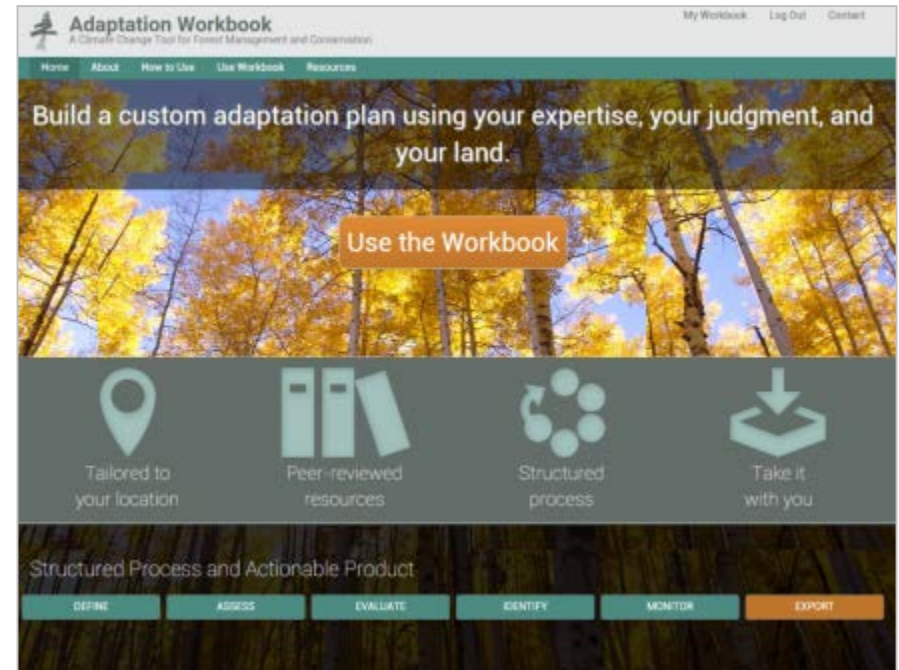
1. Maintain or improve the ability of forests to resist pests and pathogens
2. Prevent the introduction and establishment of invasive plant species and remove existing invasives
3. Manage herbivory to protect or promote regeneration

Download the entire list at
adaptationworkbook.org/niacs-strategies



Online Adaptation Workbook

- Interactive, self-guided
- Flexible
- Tailored by location
- Built using peer-reviewed resources
- Creates custom adaptation plan based on inputs

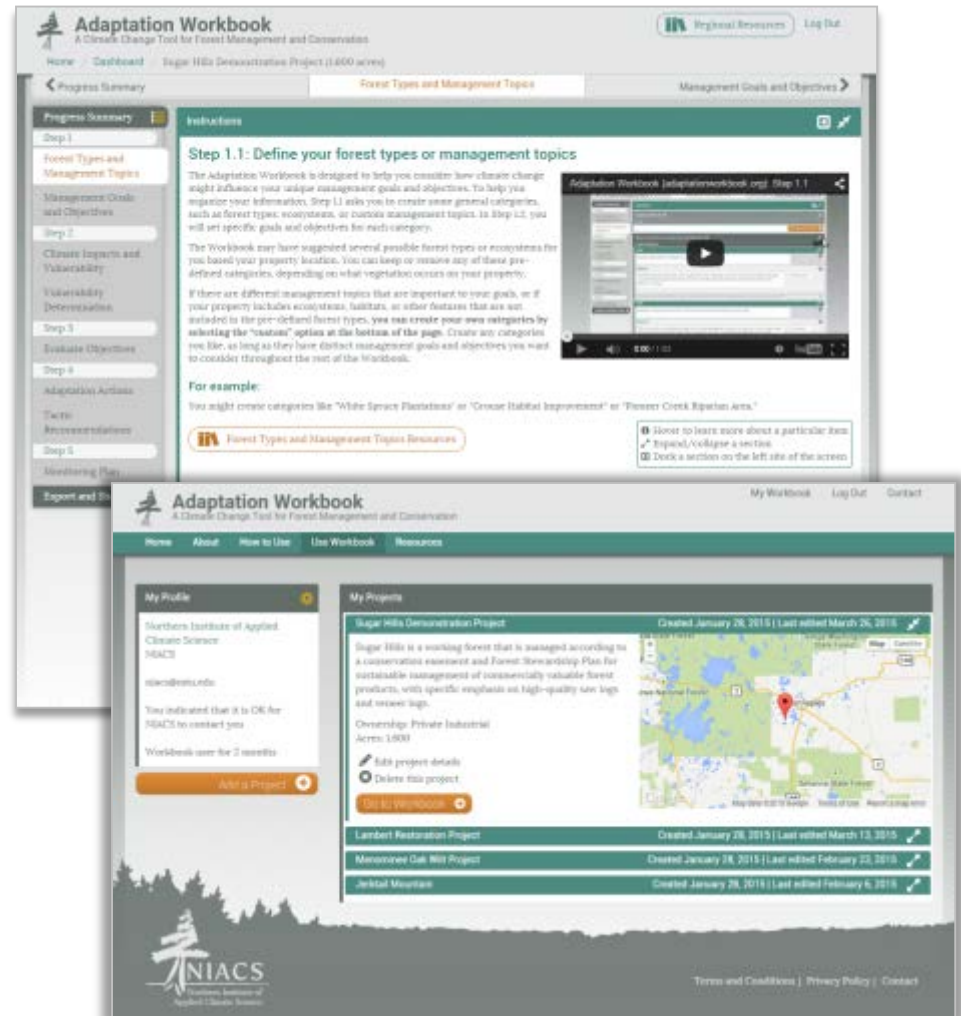


Adaptationworkbook.org

Online Adaptation Workbook

Before using a person needs:

- Local knowledge
- cursory understanding of climate impacts
- Goals and Objectives
- **Time!**
 - Beta testers:
3 -4 hours per project



Online Adaptation Workbook

- Regional climate impact statements
- Forest type vulnerability statements
- Working to fill out info for the entire country
 - Regional climate trends: National Climate Assessment (2014)
 - Ecosystem impacts - Collaboration opportunity?

Climate information sources

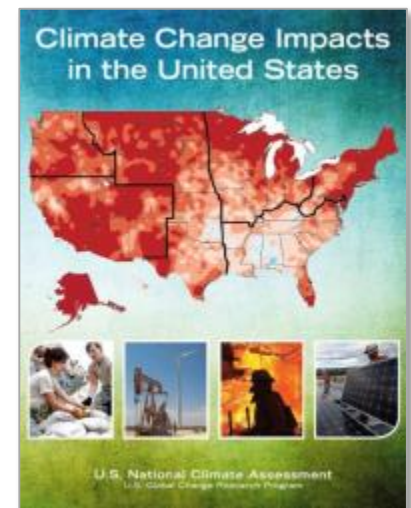
Climate Change Response Framework (CCRF) footprint



Ecosystem Vulnerability Assessment and Synthesis pubs

Regional and Forest Type specific vulnerability statements based on CCRF footprint

Areas outside of CCRF footprint



2014 National Climate Assessment

Regional impact statements by NCA region

Online Adaptation Workbook

- Improve user experience
 - **BASED ON USER FEEDBACK**
- Expand education opportunities
 - Education modules
 - Demonstration project videos
- Fill the gap - integrate info and resources for areas outside of CCRF region
- Beef up technological whiz bang features
 - GIS component
 - Tree atlas/Bird atlas
 - Climate data

We have tutorials!



Each step is explained <2 minutes

Watch them all on YOUTUBE
<http://tinyurl.com/adaptationworkbook>