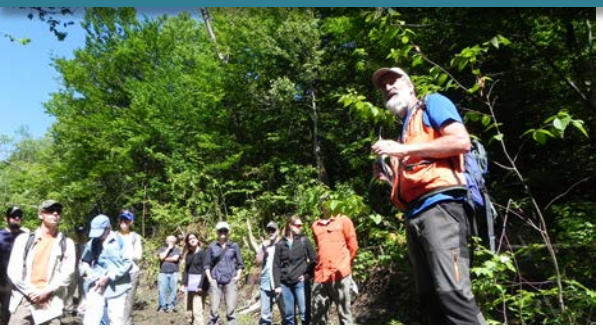
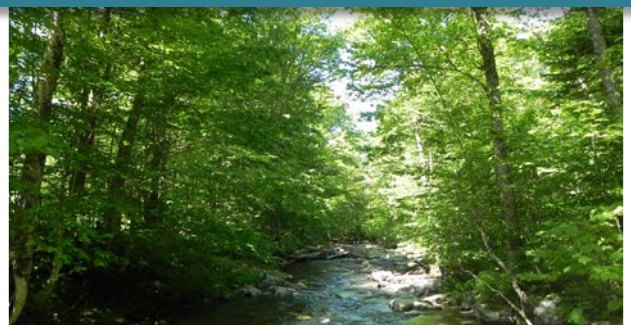
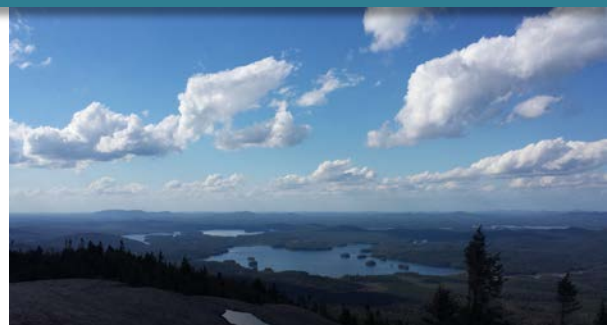
What's at risk?

Implications of climate change in regional forests







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Climate Change Response Framework
www.forestadaptation.org

Effects on Forests

Effects on Forests

SHIFTING SEASONS | SHIFTING SPECIES | SHIFTING STRESSORS

Effects on Forests

SHIFTING SEASONS | SHIFTING SPECIES | SHIFTING STRESSORS

THE GOOD:

Longer growing seasons.

Effects on Forests

SHIFTING SEASONS | SHIFTING SPECIES | SHIFTING STRESSORS

THE GOOD:
Longer growing seasons.

THE BAD:
Shorter, warmer winters.

Effects on Forests

SHIFTING SEASONS | SHIFTING SPECIES | SHIFTING STRESSORS

THE GOOD:
Longer growing seasons.

THE BAD:
Shorter, warmer winters.

THE UGLY:
More extreme events.

NY DEC

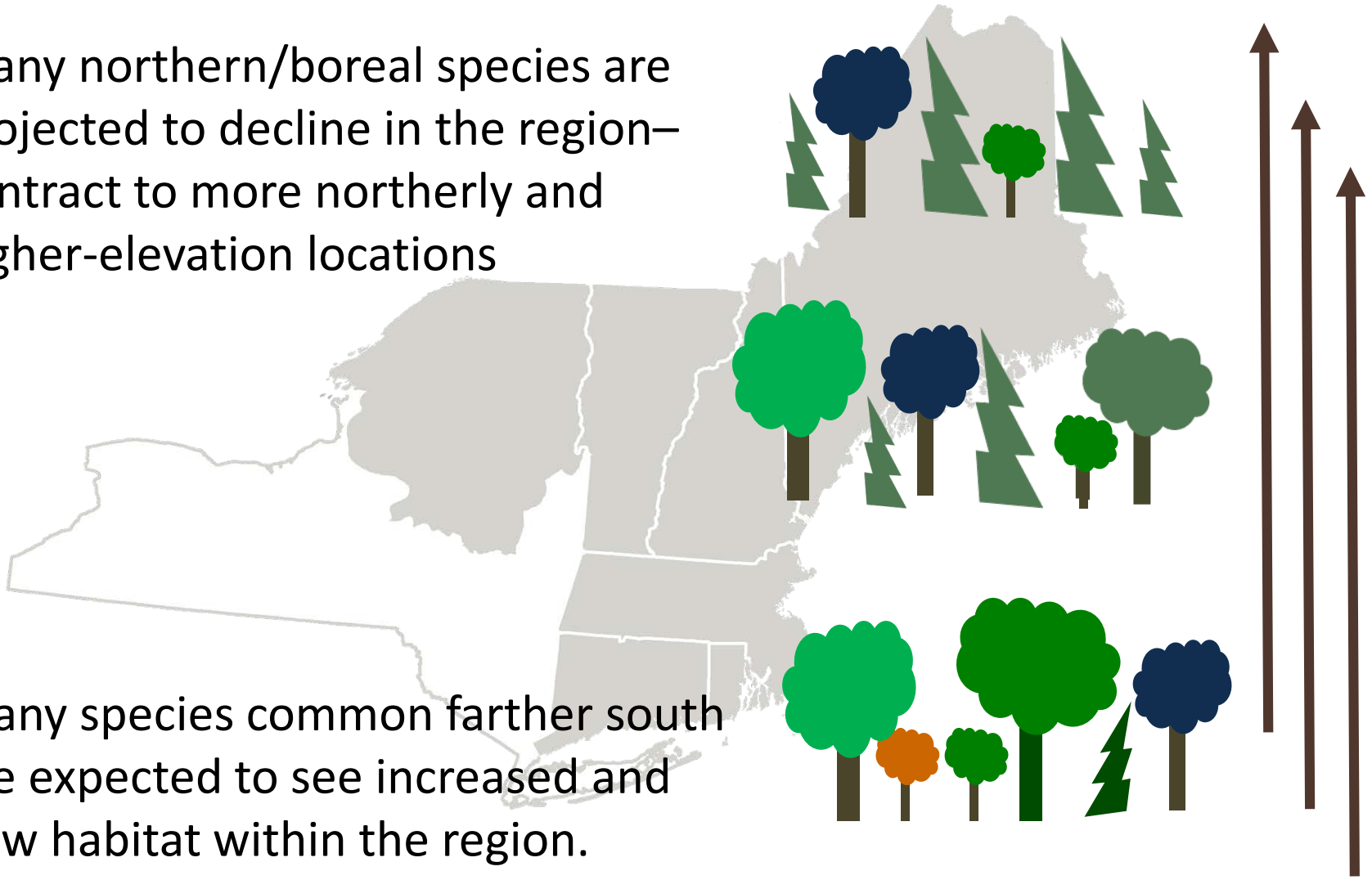
Effects on Forests

SHIFTING SEASONS | **SHIFTING SPECIES** | SHIFTING STRESSORS

Effects on Forests

SHIFTING SEASONS | **SHIFTING SPECIES** | SHIFTING STRESSORS

Many northern/boreal species are projected to decline in the region– contract to more northerly and higher-elevation locations



Many species common farther south are expected to see increased and new habitat within the region.

Effects on Forests

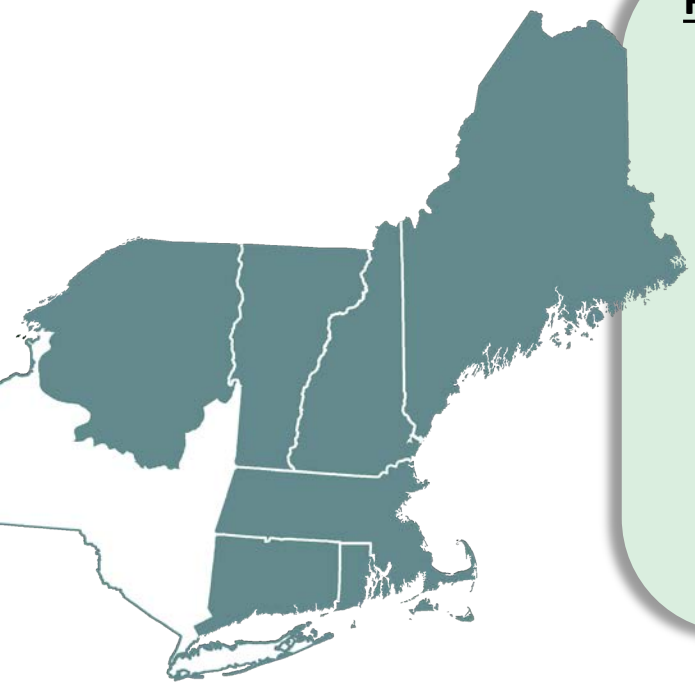
SHIFTING SEASONS | **SHIFTING SPECIES** | SHIFTING STRESSORS

Likely to decline

- Balsam fir
- Black, red, & white spruce
- Northern white-cedar
- Eastern hemlock
- Black ash
- Paper birch
- Quaking aspen
- Tamarack

Mixed model results

- American beech
- Sugar & red maple
- Yellow birch
- White pine



Potential "winners"

- American elm
- American basswood
- Black cherry
- Eastern hophornbeam
- Gray birch
- Northern red oak
- Serviceberry
- Silver maple
- Sweet birch
- White oak

New habitat (esp. south)

- Black hickory
- Chinkapin oak
- Common persimmon
- Hackberry
- Loblolly pine
- Osage-orange
- Shortleaf pine
- Southern red oak
- Sweetgum
- Virginia pine

www.forestadaptation.org/ne-species

Effects on Forests

SHIFTING SEASONS | **SHIFTING SPECIES** | SHIFTING STRESSORS

Location, Location, Location

Research and assessments describe **broad trends** but **local conditions** and **management** make the difference.

Effects on Forests

SHIFTING SEASONS | SHIFTING SPECIES | **SHIFTING STRESSORS**

Effects on Forests

SHIFTING SEASONS | SHIFTING SPECIES | **SHIFTING STRESSORS**

Climate change is a "threat multiplier"

- Chronic stress
- Disturbances
- Insect pests
- Forest diseases
- Invasive species

Interactions make all the difference.

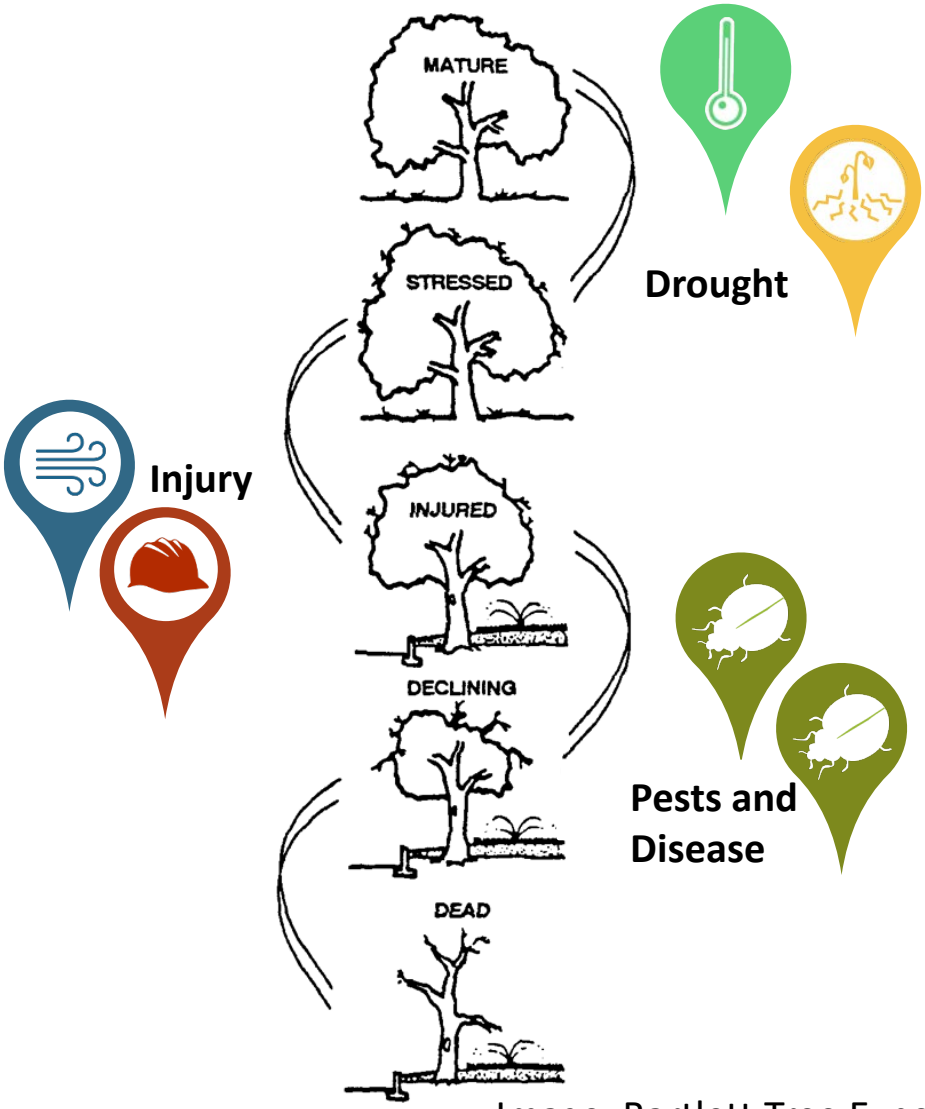


Image: Bartlett Tree Experts

Responding to Change

Responding to Change

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




Adaptation actions are designed to specifically address climate change impacts and vulnerabilities in order to meet goals and objectives

A Spectrum of Adaptation Options

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

Millar et al. 2007, Swanston et al. 2016, Nagel et al. 2017

Real-World Adaptation Projects

More than 50 projects in New England

- Federal
- State
- Local
- Multi-ownership
- Tribal
- University
- NGO
- Private

www.forestadaptation.org/demos

Adaptation Options in Projects

RESISTANCE

RESILIENCE

TRANSITION

Northern New England:

Southern New England:

Preliminary data via T. Ontl

Learning by Doing

Every action becomes an experiment in an era of change, increasing the need to record and evaluate our actions.

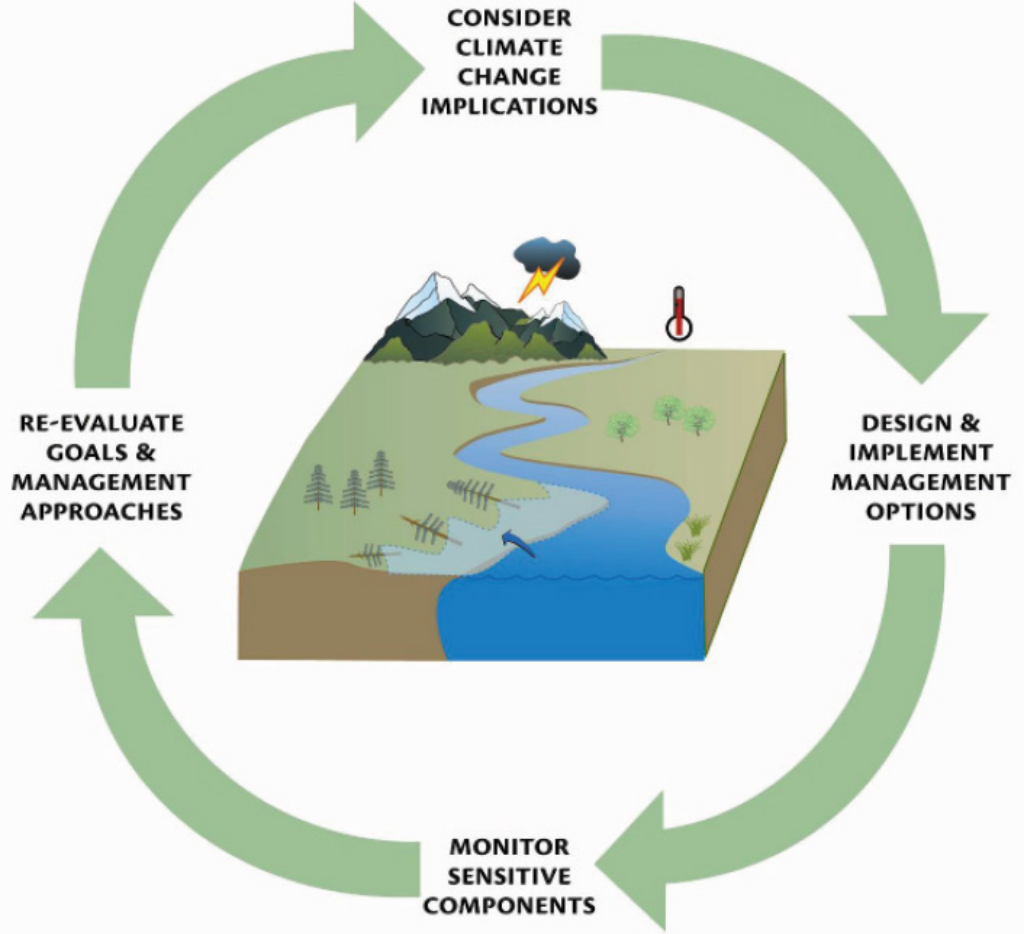


Image: USGCRP/Kareiva et al. 2010

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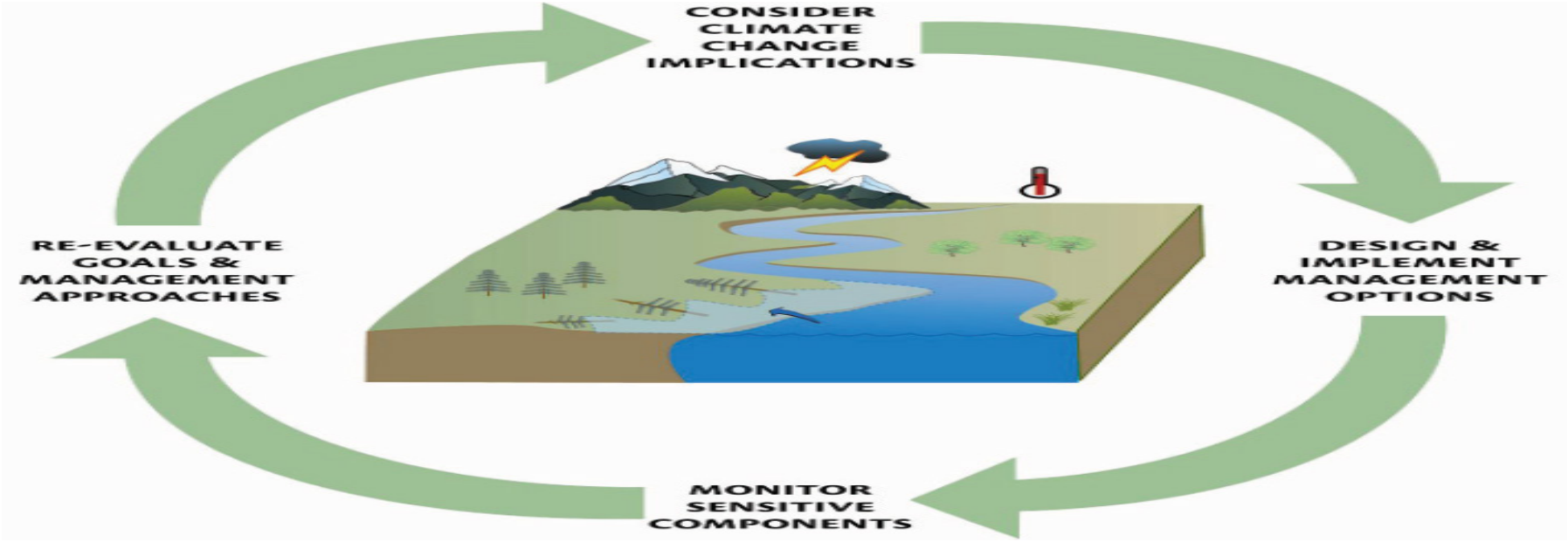

Image: USGCRP/Kareiva et al. 2010

Thank you!

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Summary

Forests are changing.

- Shifting seasons, species, and stressors

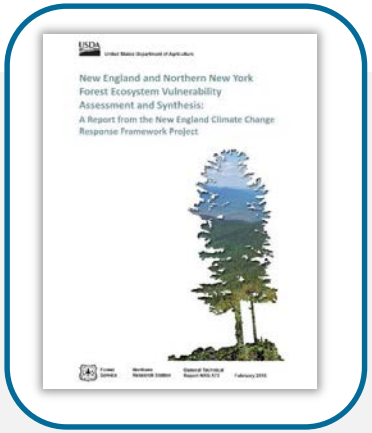
Match adaptation actions to the need.

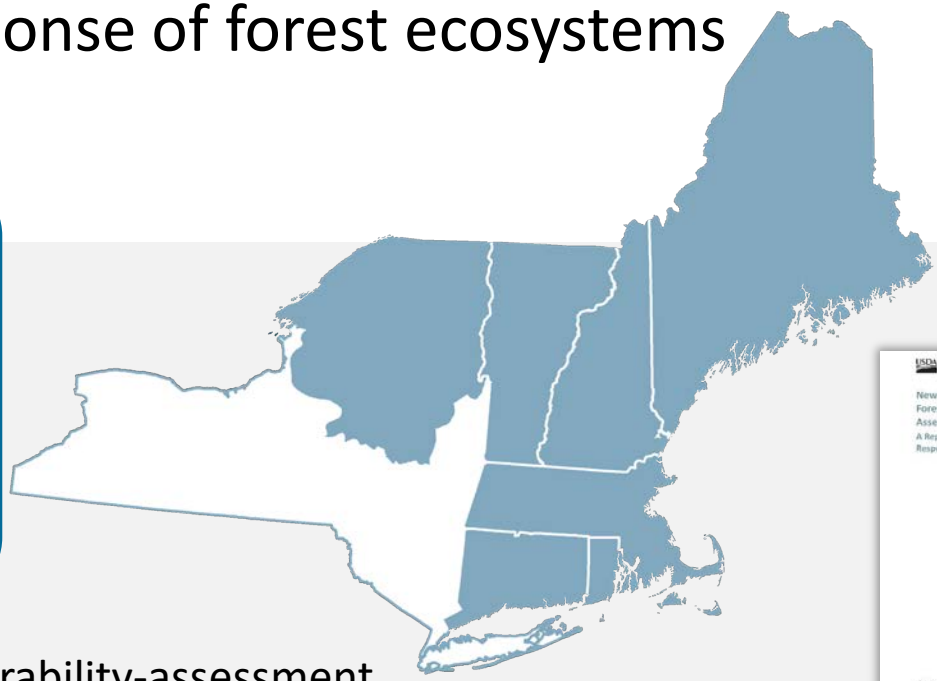
- Resistance, resilience, and transition

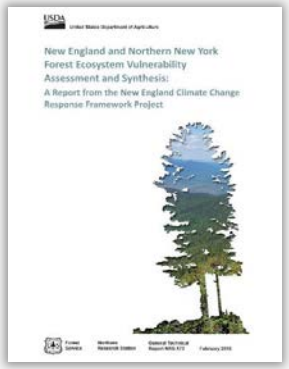
Vulnerability Assessment

- **Synthesize** existing assessments and scientific literature
- Incorporate new results from **forest impact models**
- Draw on local expertise of **scientists and land managers**
- Describe **state-of-knowledge** for anticipated changes in climate and response of forest ecosystems

NEW Mid-Atlantic Report!!







www.forestadaptation.org/vulnerability-assessment

The Process of Adaptation

1. • DEFINE project area and management goals.
2. • ASSESS climate impacts and vulnerabilities.
3. • EVALUATE challenges and opportunities.
4. • IDENTIFY adaptation actions for implementation.
5. • MONITOR whether actions were effective.

Swanston et al. 2016

Adaptation Actions in Projects

1. Sustain fundamental ecological functions.
2. Reduce existing biological stressors.
3. Reduce impacts of severe disturbances.
4. Maintain or create refugia.
5. Enhance species and structural diversity.
6. Promote ecosystem redundancy.
7. Increase landscape connectivity.
8. Enhance genetic diversity.
9. Facilitate species transitions.
10. Realign after disturbance.

Preliminary data via T. Ontl

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

“It depends”

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