

Foresters for the Birds

+ *Climate Adaptation!*



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Jeff Ritterson

3/23/19

Mass Land Trust Conference



Northern Institute of Applied Climate Science

(aka NIACS)

Climate and carbon services

- Climate impacts modeling
- Vulnerability assessment
- Climate adaptation
- Carbon biogeochemistry
- Carbon management



adapationworkbook.org

Climate Change Forest Impacts



Ecosystem Adaptation



Bird Impacts and Adaptation



Effects on Forests

SHIFTING SEASONS | SHIFTING SPECIES | SHIFTING STRESSORS

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SHIFTING SEASONS | SHIFTING SPECIES | SHIFTING STRESSORS

THE GOOD:

Longer growing
seasons.



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THE GOOD:

Longer growing seasons.



THE BAD:

Shorter, warmer winters.



Effects on Forests

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THE GOOD:

Longer growing seasons.



THE BAD:

Shorter, warmer winters.



THE UGLY:

More extreme events.



NY DEC

Effects on Forests

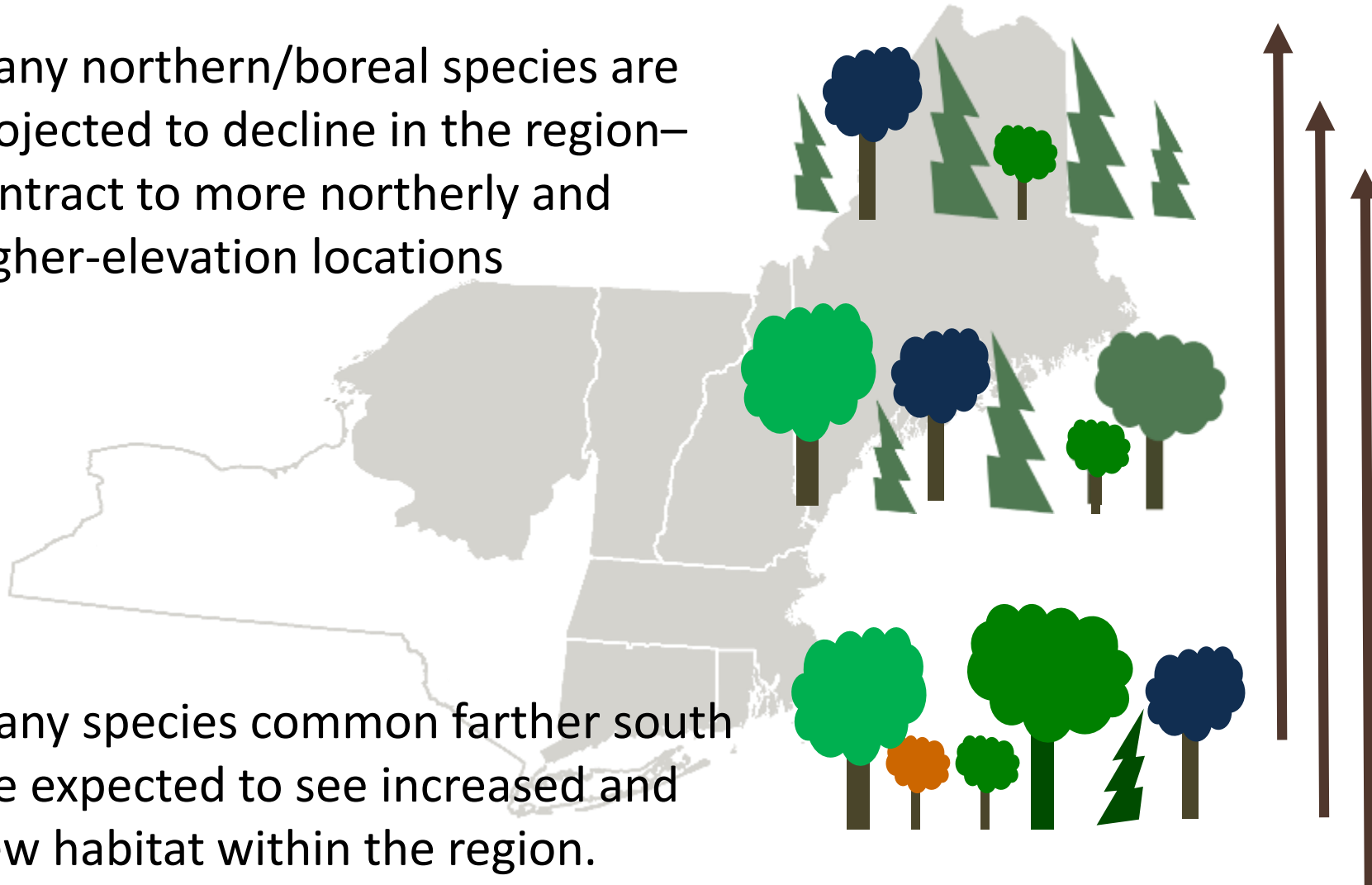
SHIFTING SEASONS | **SHIFTING SPECIES** | SHIFTING STRESSORS

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

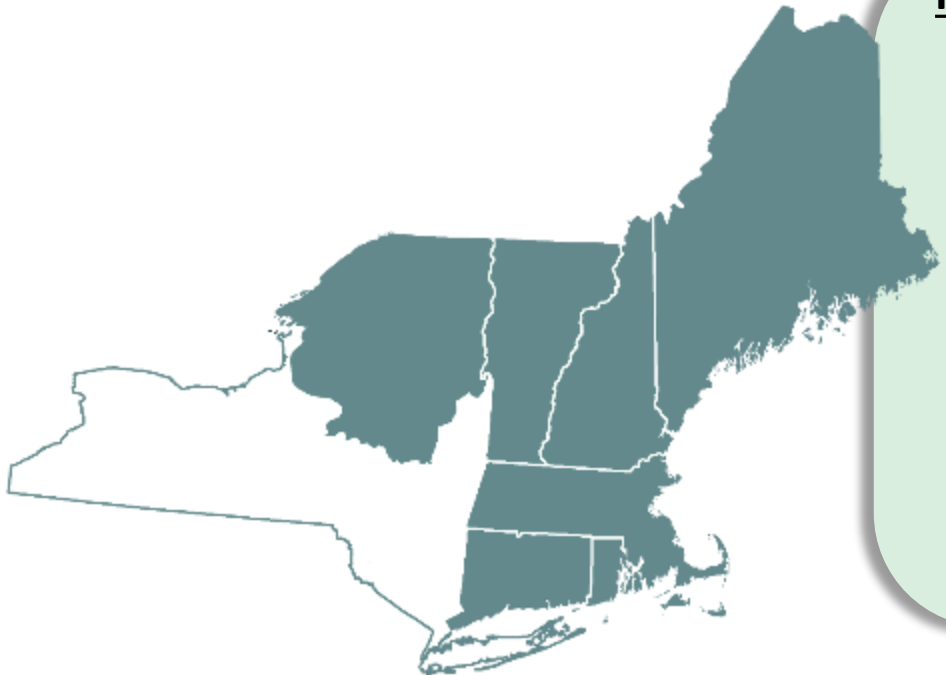
- American beech
- Sugar & red maple
- Yellow birch
- White pine

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



Effects on Forests

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**Climate change is a
“threat multiplier”**

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

**Interactions make all
the difference.**

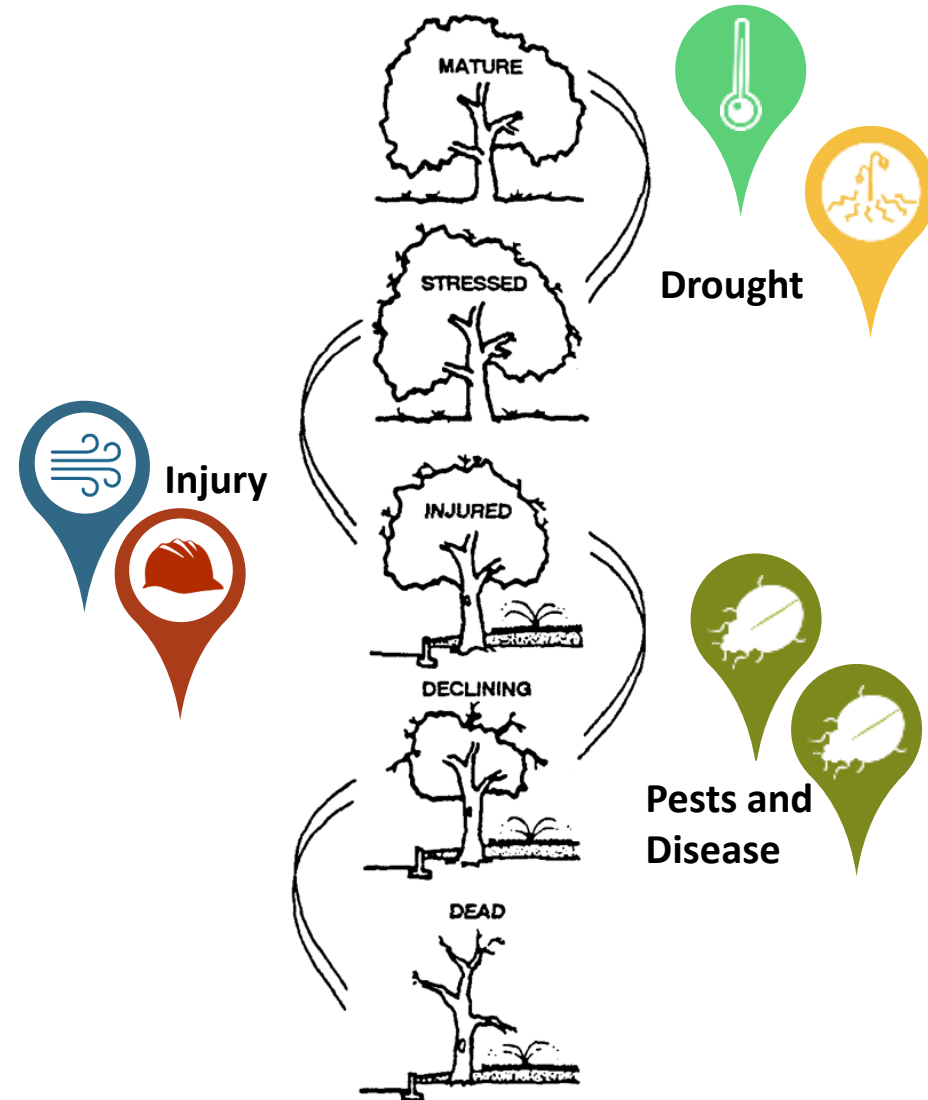


Image: Bartlett Tree Experts

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.

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

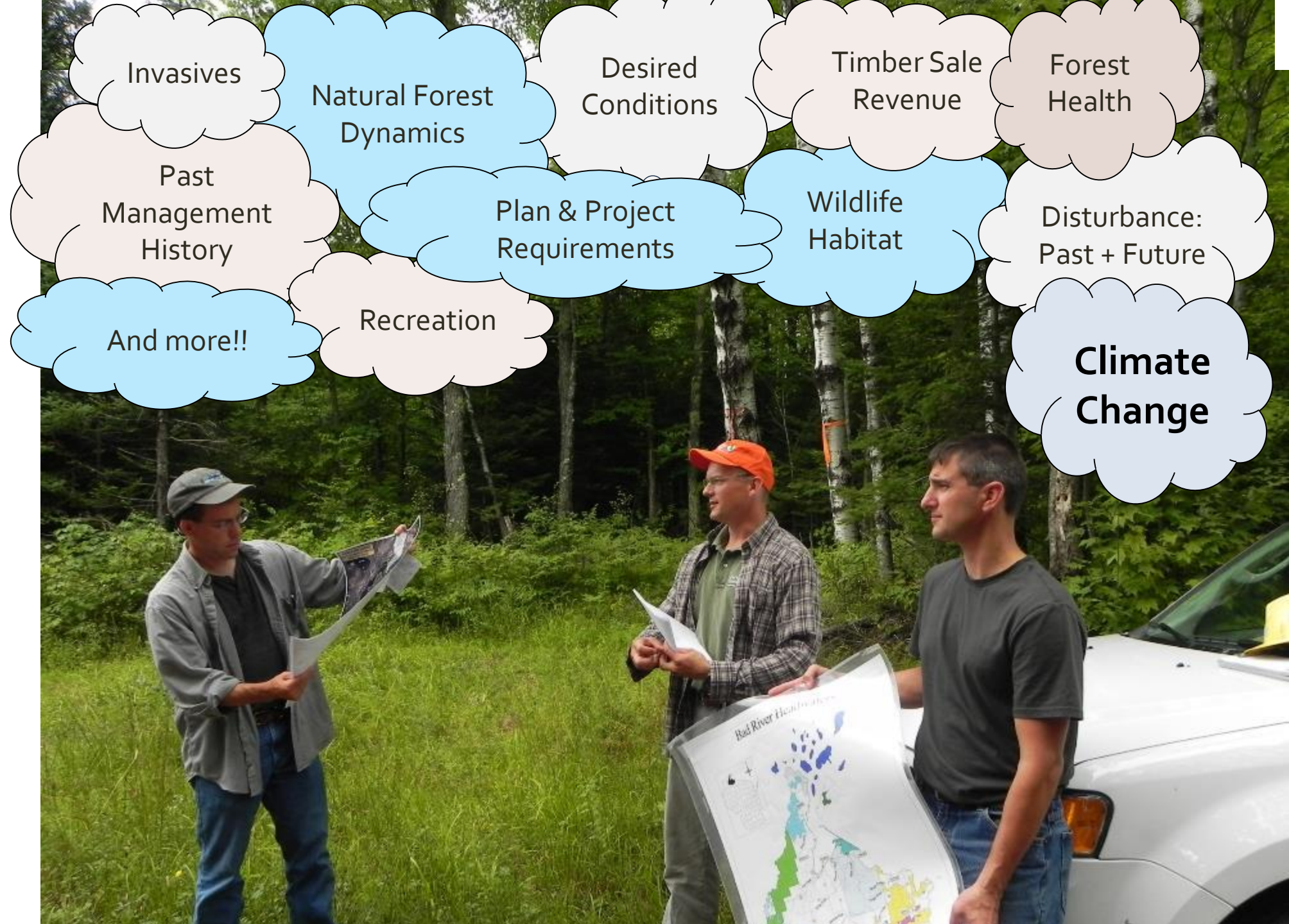


Adaptation actions are designed to specifically address climate change impacts & vulnerabilities in order to meet goals and objectives

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



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



Invasives

Natural Forest
Dynamics

Desired
Conditions

Timber Sale
Revenue

Forest
Health

Past
Management
History

Plan & Project
Requirements

Wildlife
Habitat

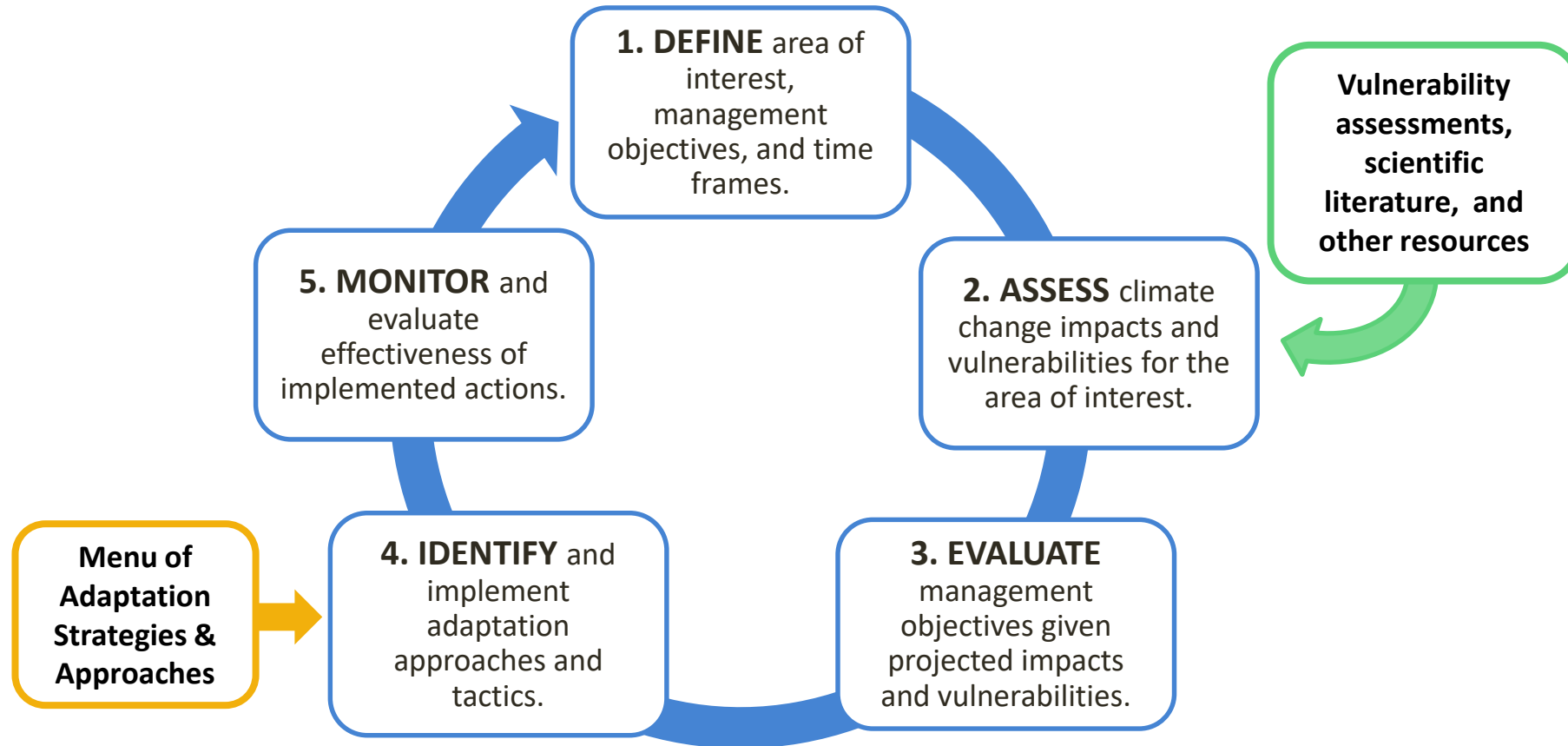
Disturbance:
Past + Future

And more!!

Recreation

**Climate
Change**

Adaptation Workbook



A Spectrum of Adaptation Options

RESISTANCE



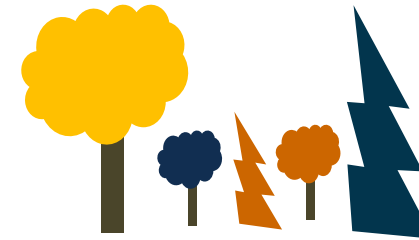
- Improve defenses of forest against change and disturbance
- Maintain relatively unchanged conditions

RESILIENCE



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

TRANSITION



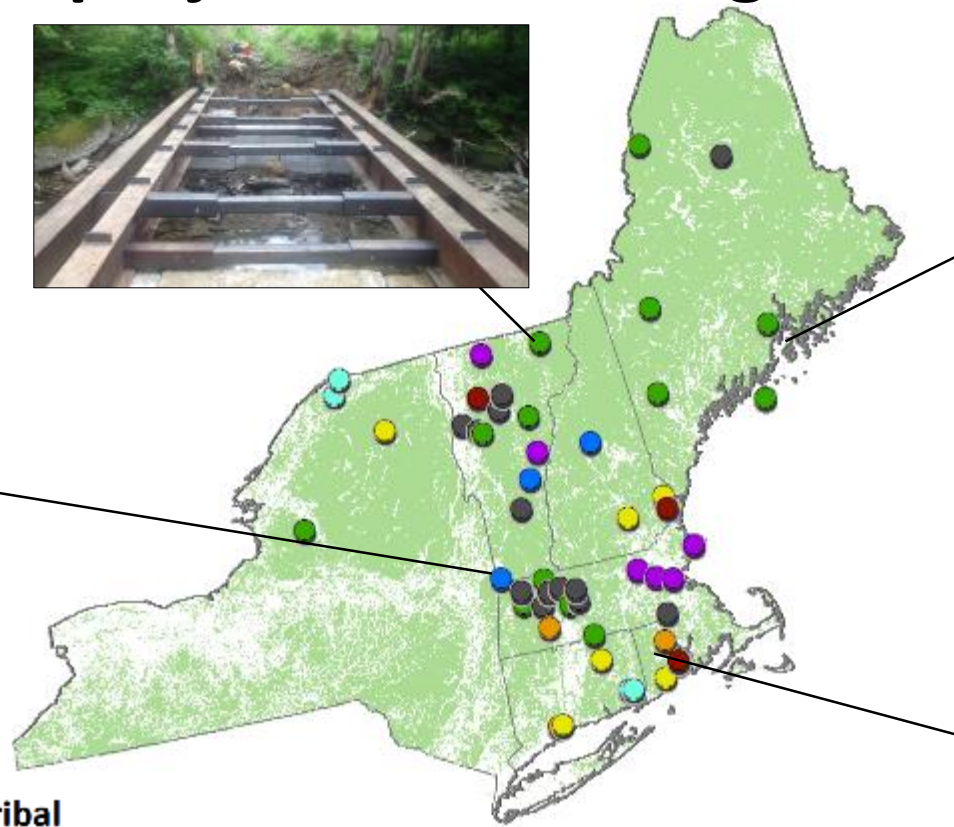
- Intentionally facilitate change
- Enable ecosystem to respond to changing and new conditions



| | | RESISTANCE | RESILIENCE | TRANSITION |
|--------------------------------------|--|------------|------------|------------|
| S T R A T E G Y | ① Sustain fundamental ecological functions | | | |
| | ② Reduce the impact of biological stressors | | | |
| | ③ Reduce the risk and long-term impacts of severe disturbances | | | |
| | 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 Maintain and enhance genetic diversity | | | |
| | ⑨ Facilitate community adjustments through species transitions | | | |
| | ⑩ Realign following severe disturbance | | | |

Real-World Adaptation Projects

More than 50 projects in New England



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

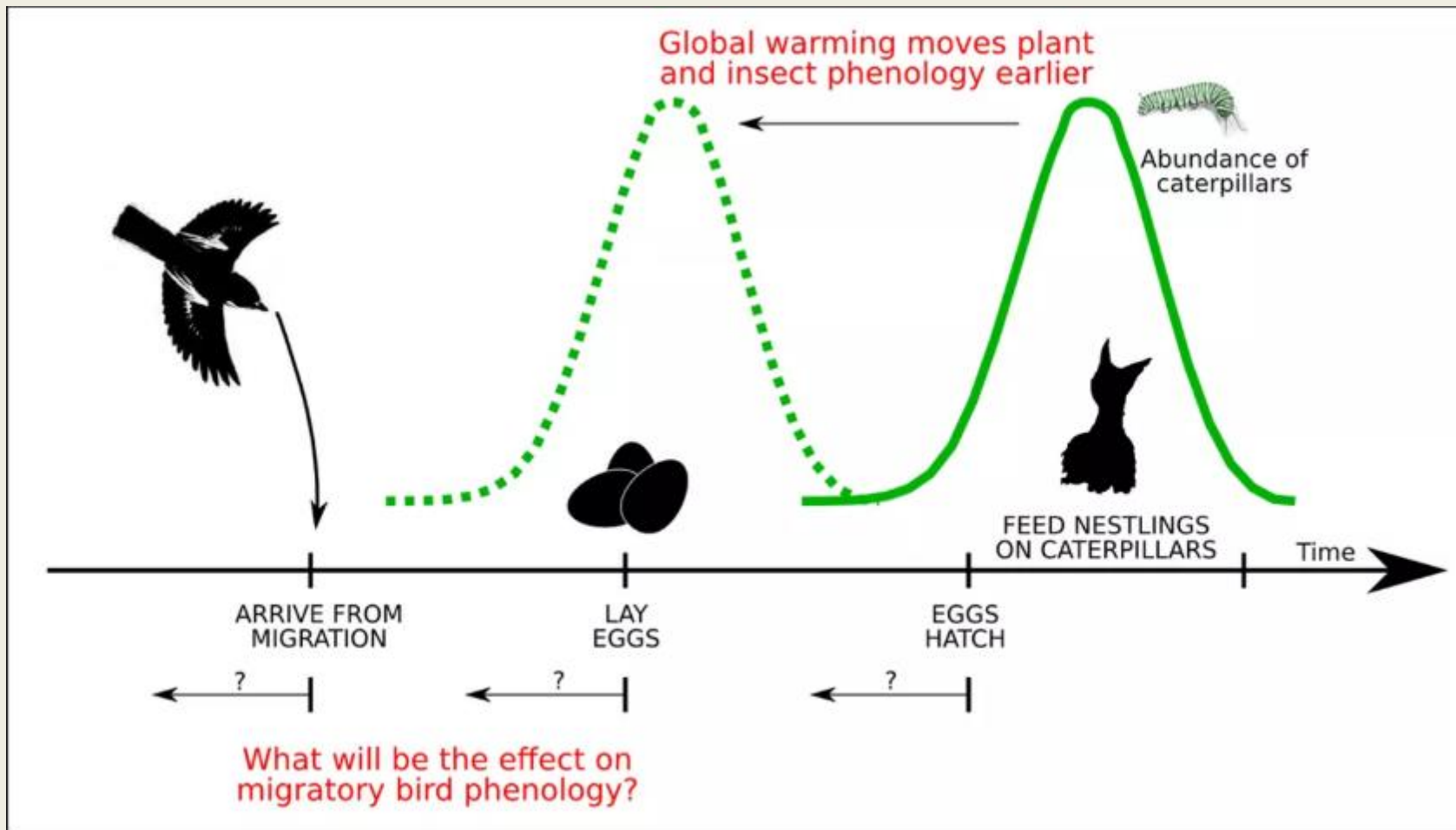
www.forestadaptation.org/demos

Effects on Birds

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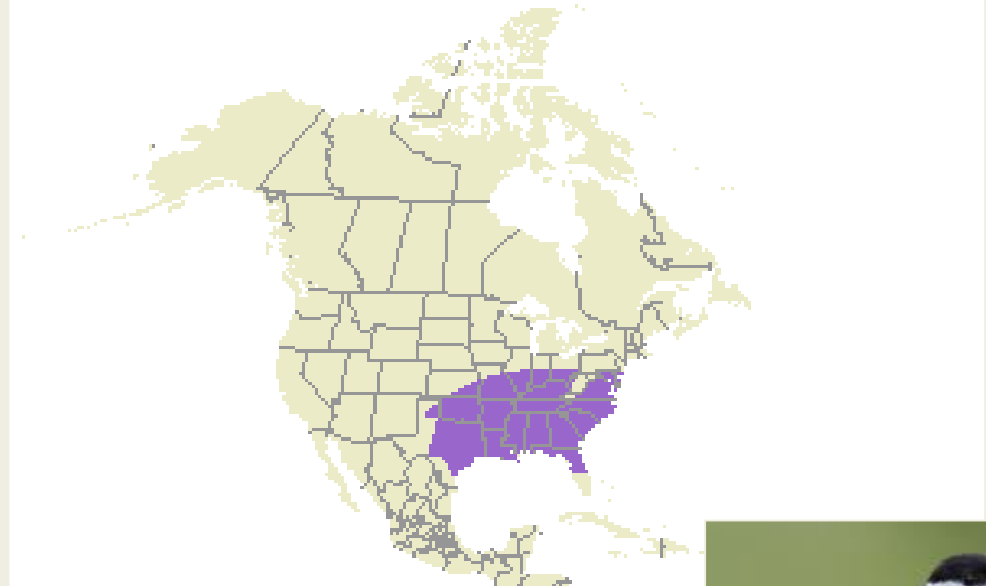
SHIFTING SEASONS | **SHIFTING SPECIES** | SHIFTING STRESSORS

Blackburnian Warbler
Setophaga fusca



John Harrison

Carolina Chickadee
Poecile carolinensis



Effects on Birds

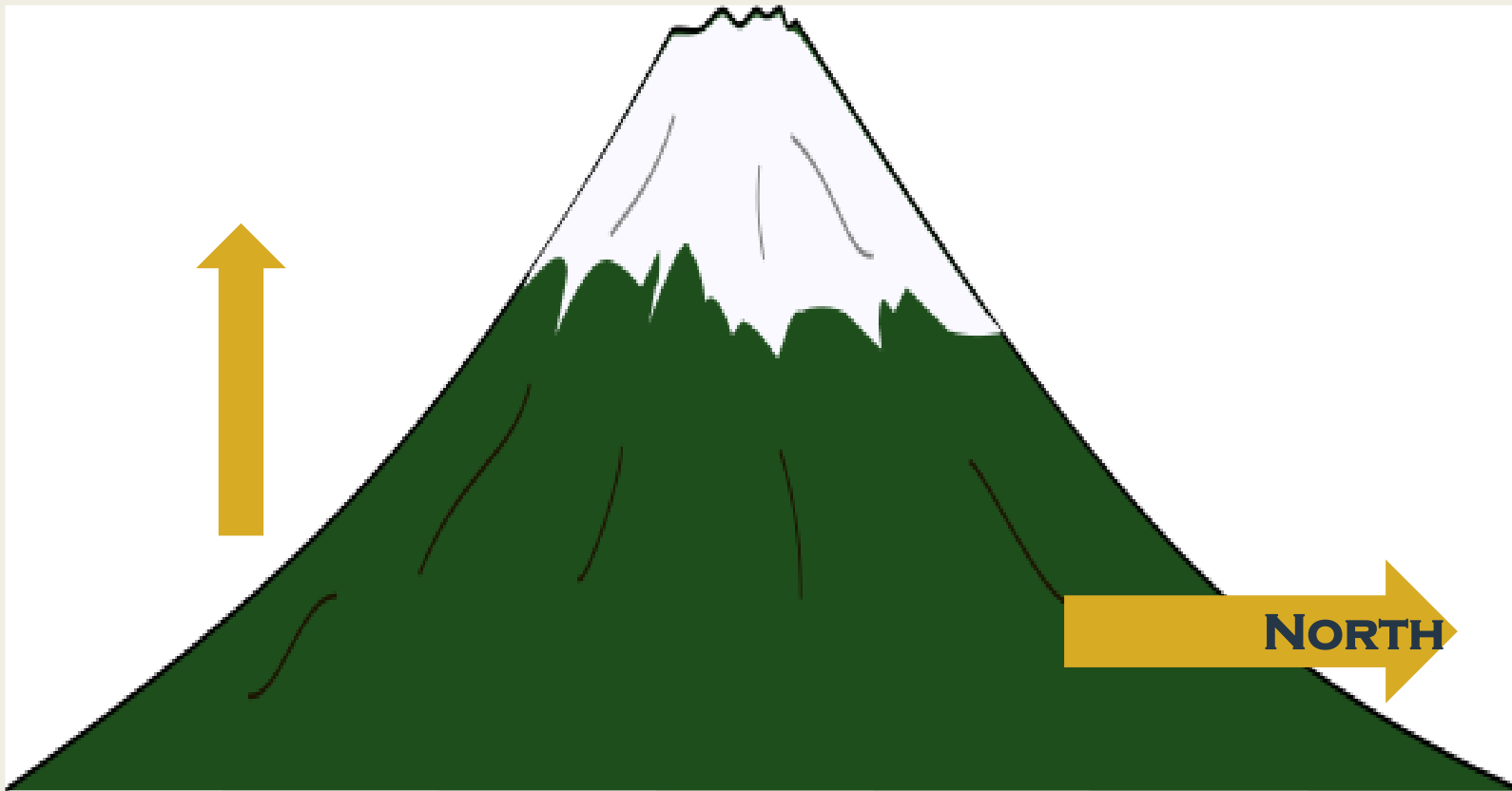
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- Thermoregulation and maintenance
 - Feeding
 - Courtship and breeding
- Reduced survival and reproductive success



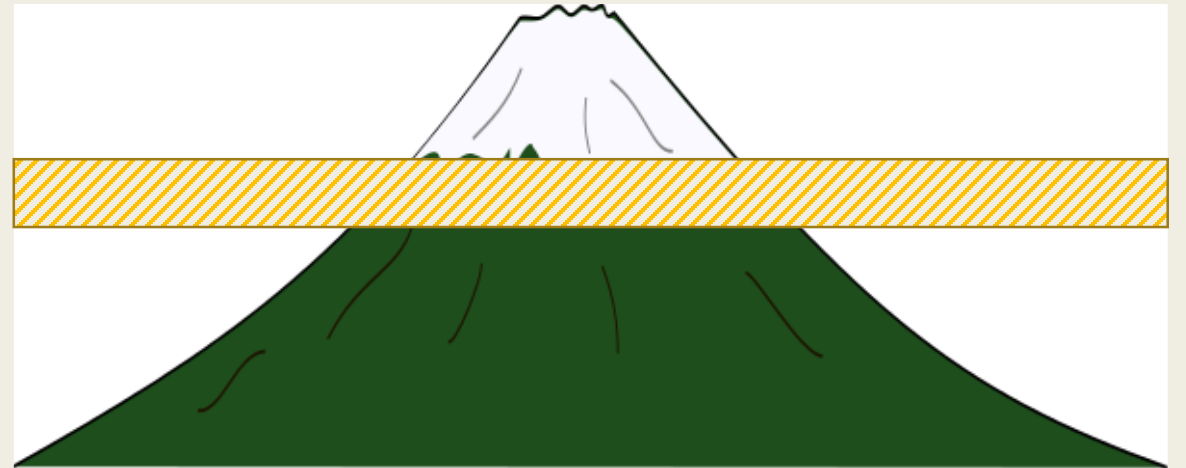
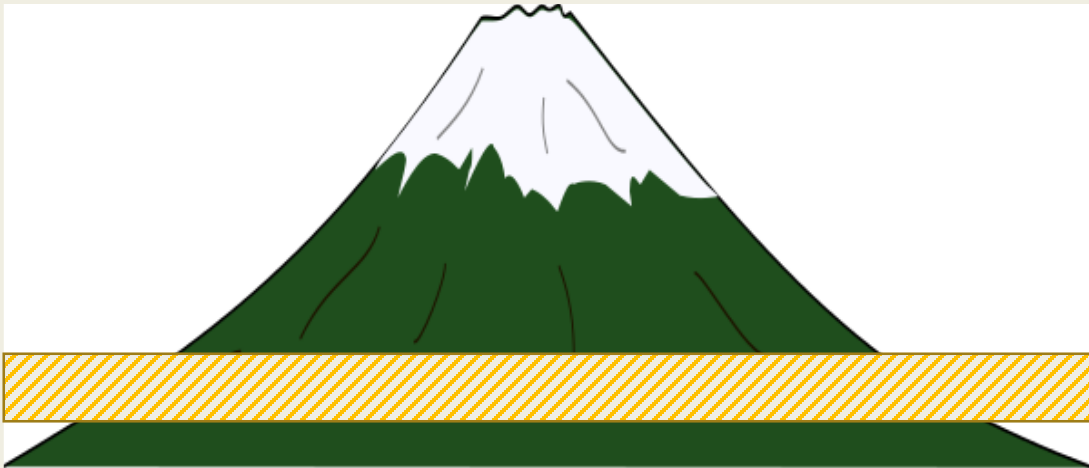
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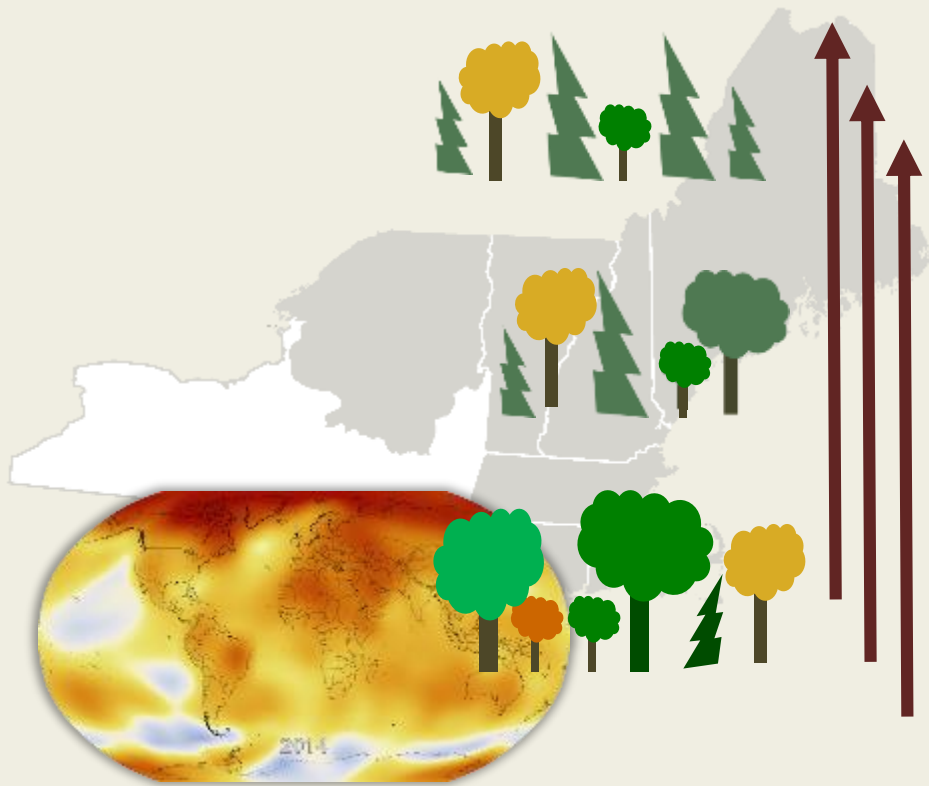
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Effects on Birds

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Suckers...

Who are you?



I don't know!



Adaptation for Birds

Habitat adaptation

- Forest birds are inextricably linked to forest habitat
 - Adapted forests will provide better habitat

Population adaptation

- Adaptation strategies apply directly to wildlife as well
 - Reduce other stressors – poor habitat quality
 - Maintain and enhance genetic diversity
 - Growing populations more likely to adapt

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Forest Succession

Nicolle R. Fuller



Time





Francesco Veronesi



Charles J Sharp



Reago & McClarren



Simon Pierre Barrette



Simon Pierre Barrette



Kelly Colgan Azar



Nicolle R. Fuller

Time

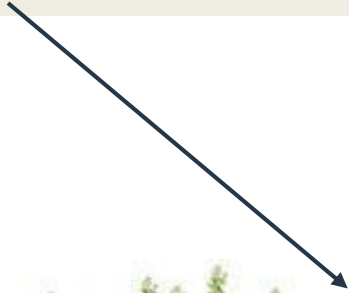
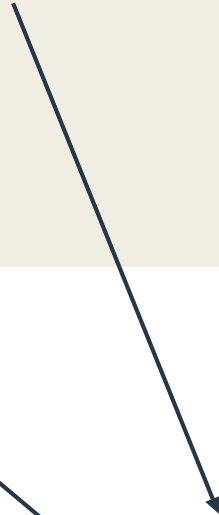




Francesco Veronesi



Simon Pierre Barrette



Nicolle R. Fuller



Time

|-----20 years -----|



Charles J Sharp



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Kelly Colgan Azar

Nicolle R. Fuller



Time



Complex Vertical Structure



Complex Vertical Structure



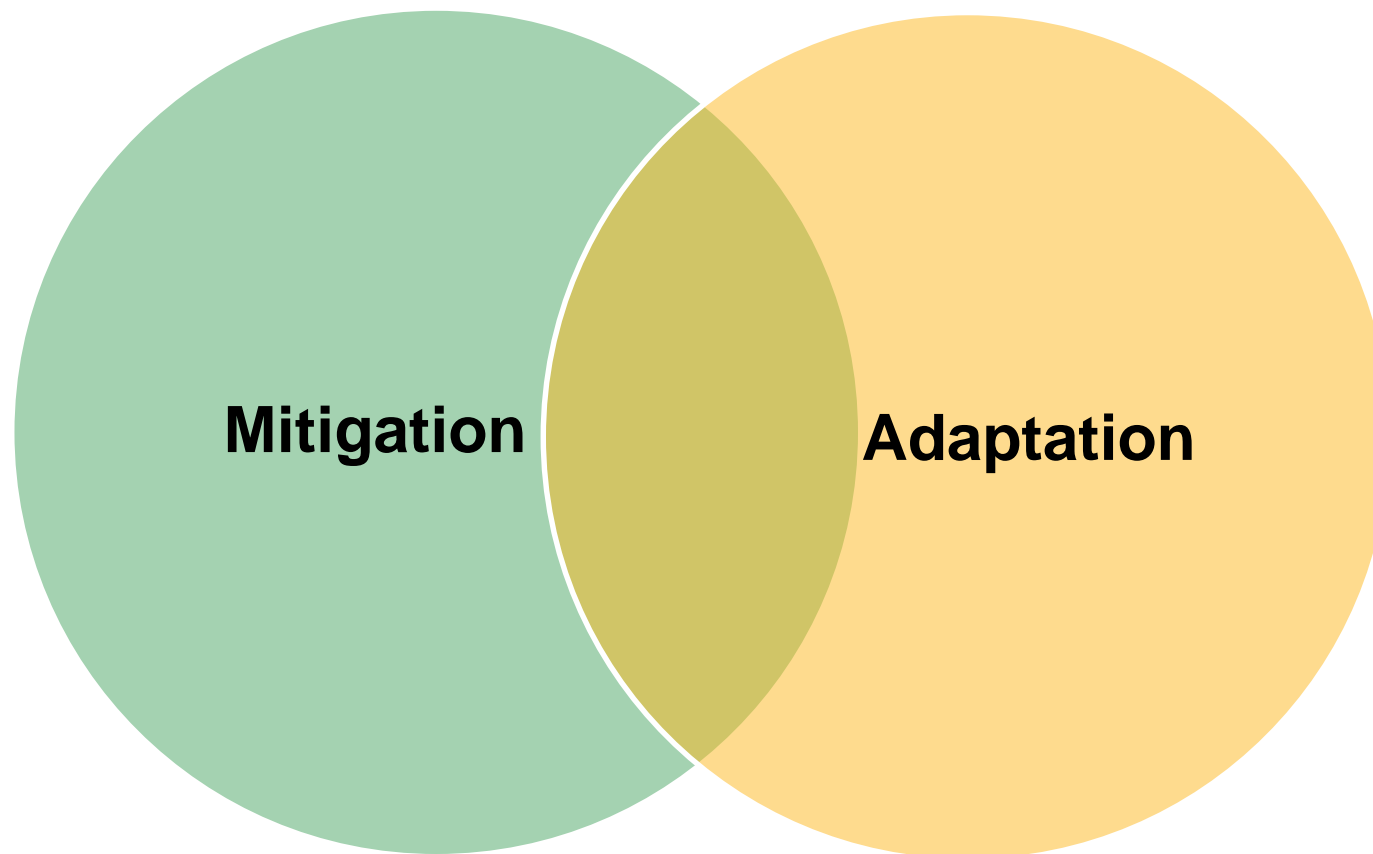
What about carbon?



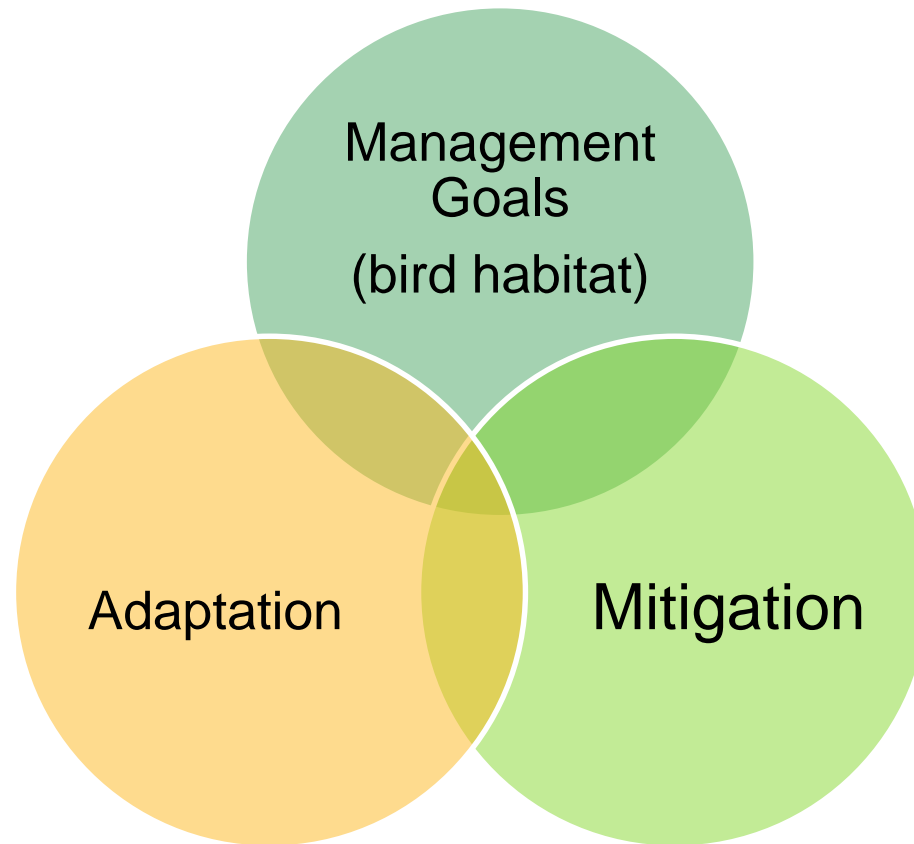
Mitigation

Adaptation

What about carbon?



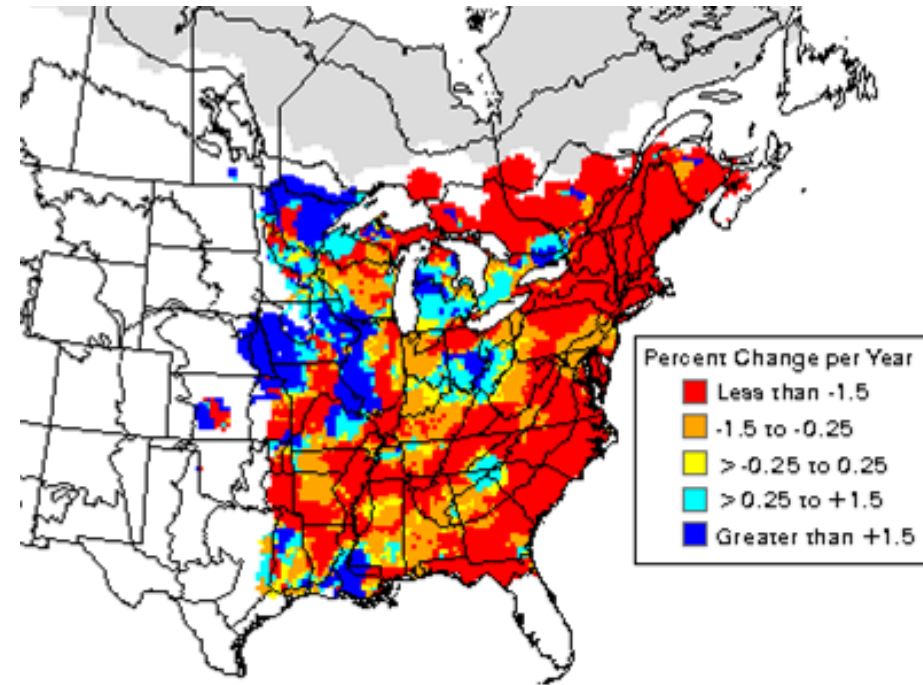
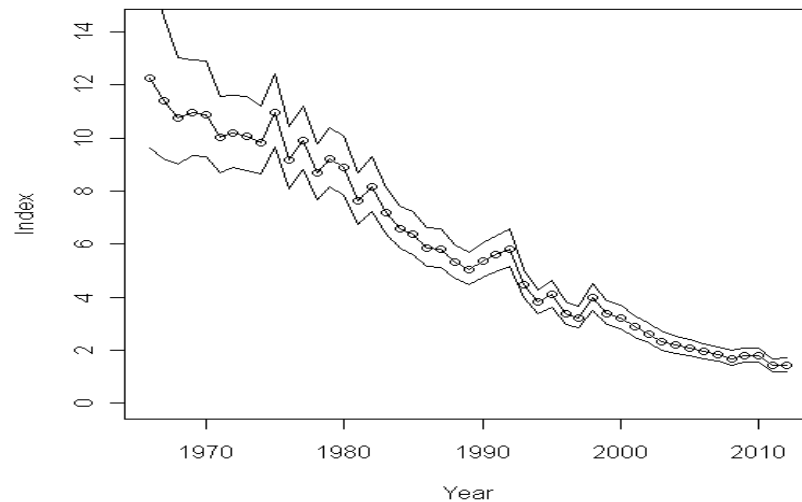
Can all these goals be accomplished?



Wood Thrush



Wood Thrush



Wood Thrush

WOTH



⊙ + SE C W

Hylocichla mustelina



ID Tips Brown back, heavily spotted on white breast; large thrush a little smaller than an American Robin.

Song A flute-like *ee-oh-layyy*, ending in a sound like shattering glass.

Habitat Interior and edges of hardwood and mixedwood forest. Prefers stands with canopy >50 feet in height, a diversity of hardwood tree species, moderate midstory closure and shrub density, shade, fairly open forest floor, moist soil, and decaying leaf litter.

Territory 0.2-7 acres.

Nest Open cup of leaves and grasses lined with mud, placed on lower limb of a tree or shrub 10-13 feet off the ground and well-hidden among leaves in a shady area.

Food Mostly soil invertebrates; some fruits. Primarily forages on ground in leaf litter or on semi-bare ground under forest canopy.

Silvicultural Considerations

Desired Condition Maintain or create well-stocked, uneven-aged, sawtimber hardwood stands with >80% canopy cover and moist leaf litter.

⚠ WOTH are area sensitive. In a heavily forested (90+%) landscape, a patch of at least 70 acres is needed for successful breeding. Larger patches are needed in less forested landscapes.

⚠ Avoid disturbance and desiccation of leaf litter and soil conditions; consider operating in winter.

Management decisions will be based on existing conditions

| Silvicultural Options | Compatible Silviculture Treatments | Tips and Considerations |
|----------------------------------|--|--|
| Option 0 Do nothing | <ul style="list-style-type: none">• Increase dead woody material• Promote or plant soft mast• Control invasive plants | |
| Option 1 Low intensity | <ul style="list-style-type: none">• Crop Tree Release with Gap Formation• Small Group and Single Tree Selection• Variable Retention Thinning | Favor or retain a diversity of hardwood species. |

The Forest Bird Umbrella

| Action | Bird Habitat | Adaptation | Mitigation |
|---|--------------|------------|------------|
| Maintain large, unfragmented forests | | | |
| Forest harvest, including group selection and gaps; retain snags | | | |
| Promote or plant red oak in harvested areas | | | |
| Long rotations | | | |

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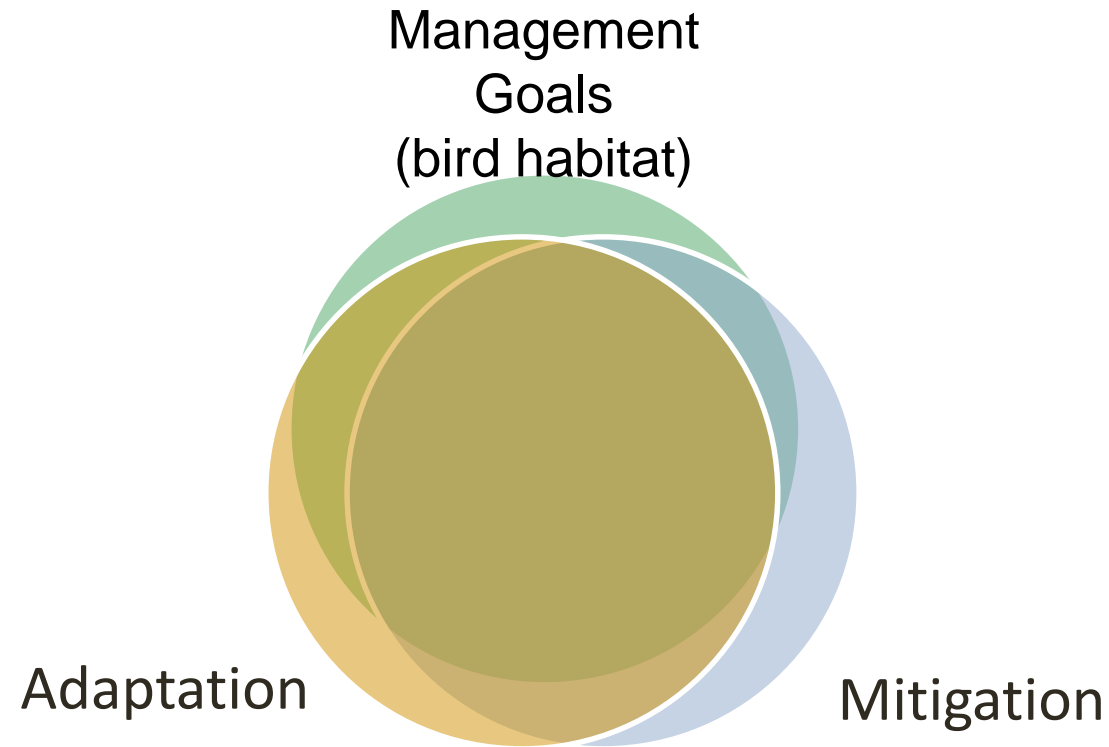
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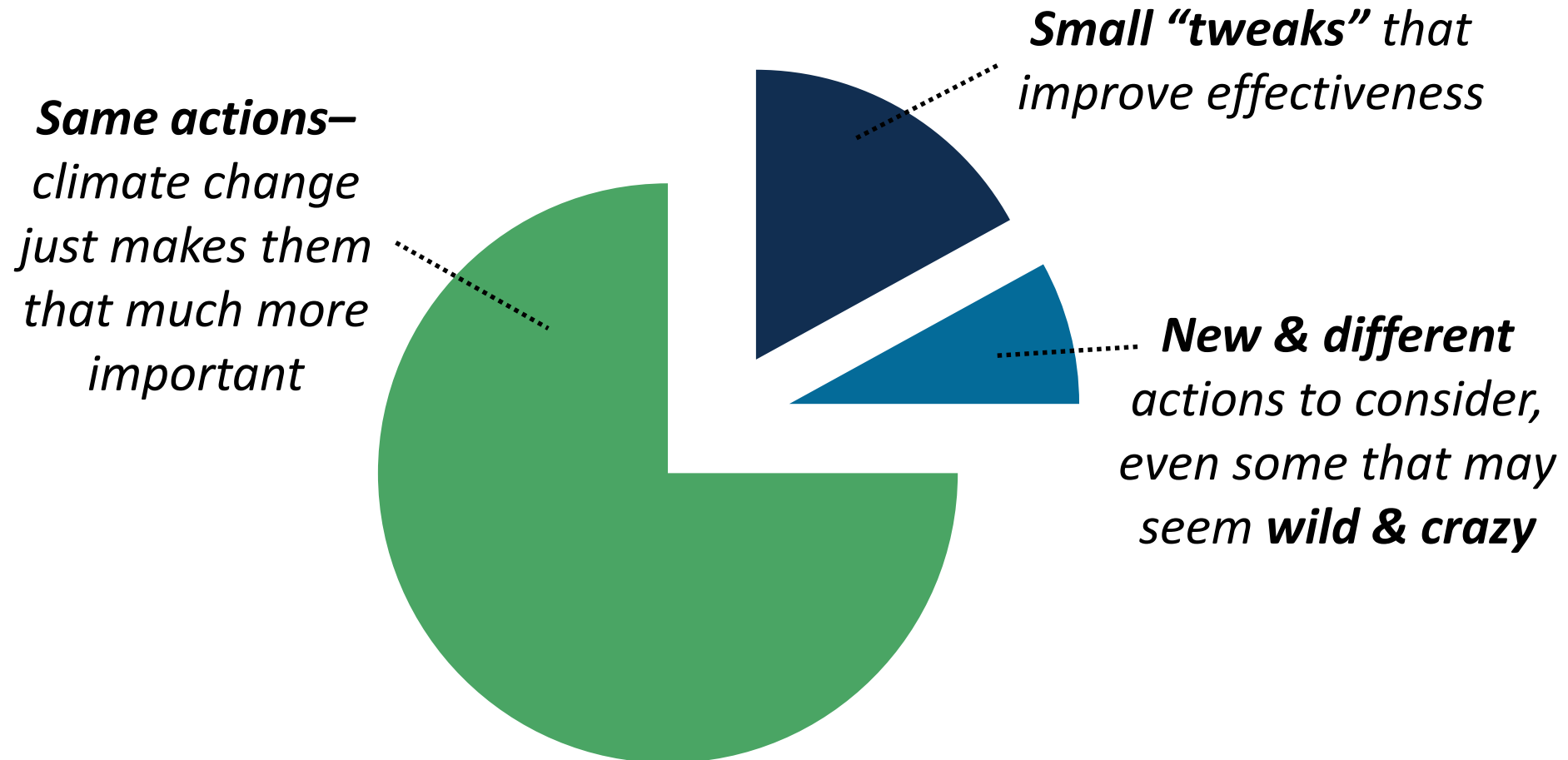
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| Long rotations | Minimize disturbance, impact on understory | Maintain seed source of select species | Allows trees to grow larger; forest retains carbon |

Can all these goals be accomplished?



Final Thoughts

Be intentional in considering climate change.

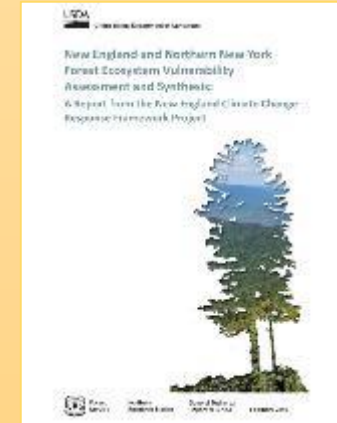


**individual results will vary*

How is this place vulnerable to climate change?

- Review resources to understand regional impacts from climate change
- Consider your local site conditions to understand unique vulnerabilities and risks.

New report!



www.forestadaptation.org/ne-assessment

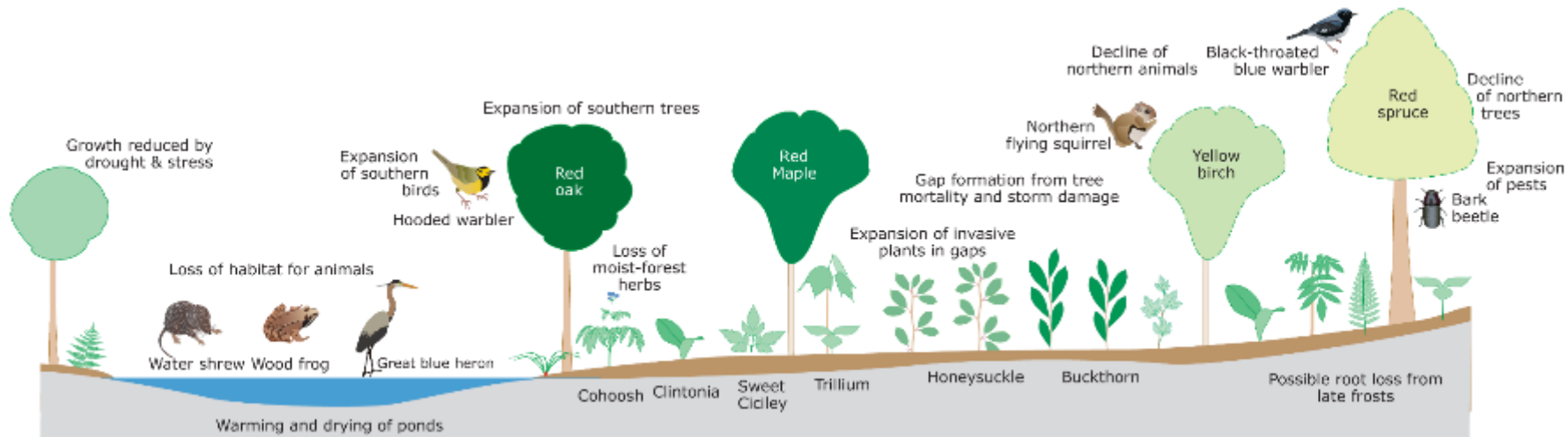


Illustration by Jerry Jenkins, from Rustad et al. 2012

What actions can be taken to
enhance the ability of a system
to cope with change

and

meet land management goals
and objectives?

What actions can help systems adapt to change?



Thinning:

Favor mast-producing species, increase diversity
Improve growth & health of remaining trees

What actions can help systems adapt to change?



Retain: Den trees, snags, coarse woody debris for habitat

Protect: Establish riparian wetland reserve

What actions can help systems adapt to change?



Infrastructure

Replace undersized culverts and bridges