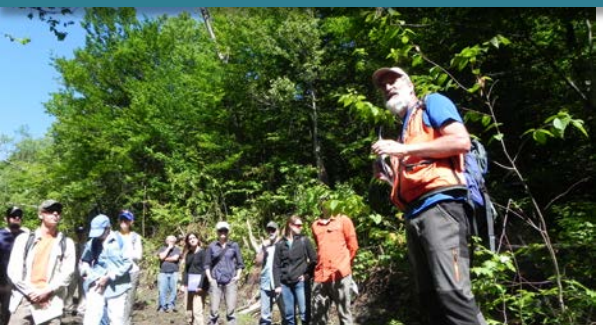
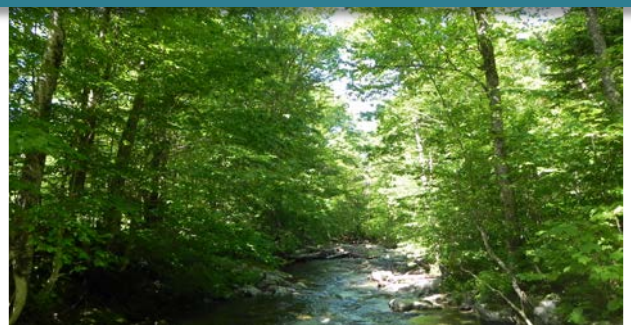
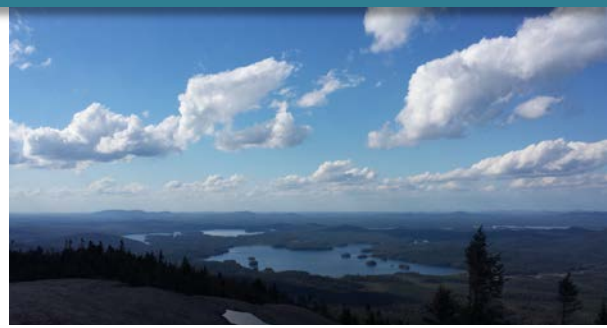
Climate Change & New England Forests

Vulnerability Assessment and Other Resources

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(aka NIACS)

Northern Institute of Applied Climate Science

Chartered by USDA Forest Service, universities, non-profit and tribal conservation organizations

Climate and carbon services

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

20 staff members (Forest Service/universities)

- 9 climate outreach specialists
- 6 research scientists
- 2 web specialists
- 3 GIS/lab specialists

NIACS
Northern Institute of Applied Climate Science

FOREST SERVICE U.S. DEPARTMENT OF AGRICULTURE

Michigan Technological University 1885

The University of Vermont

University of Minnesota

The Trust for Public Land

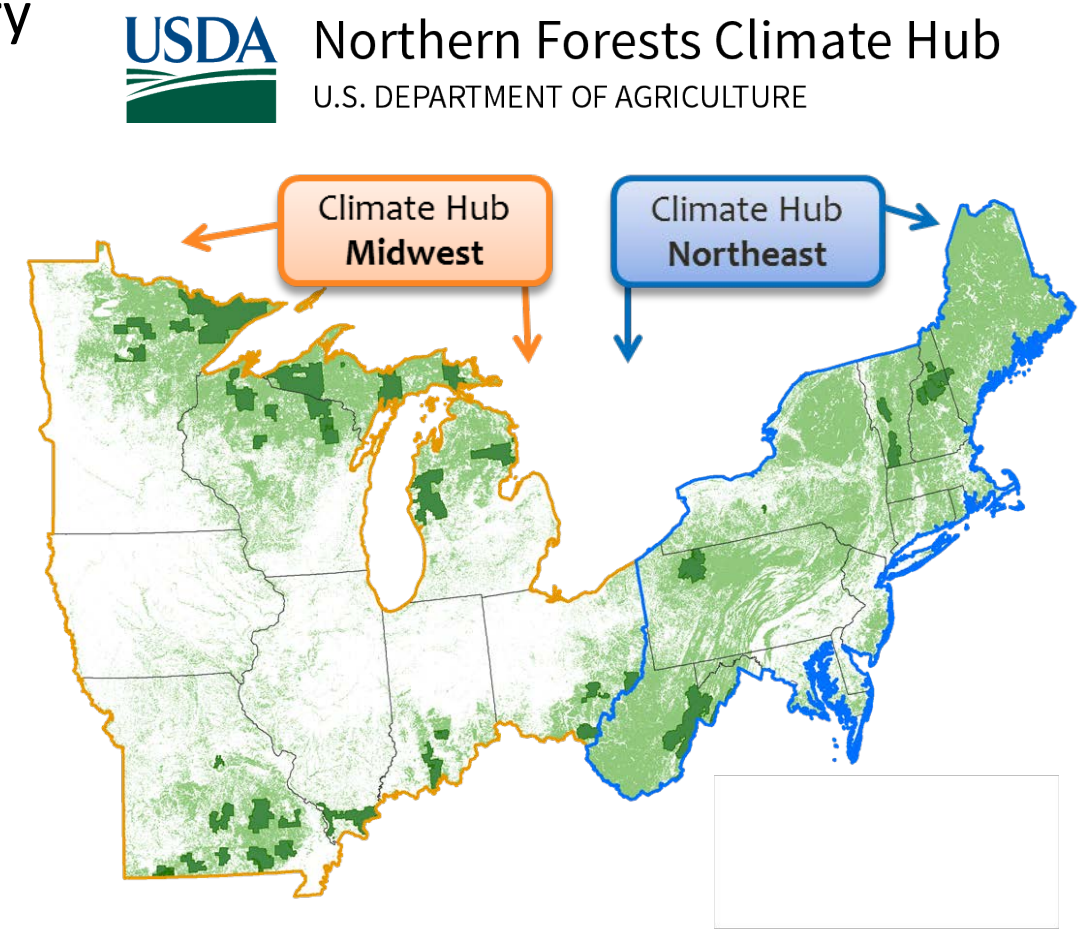
American Forests

ncasi
National Council for Air and Stream Improvement

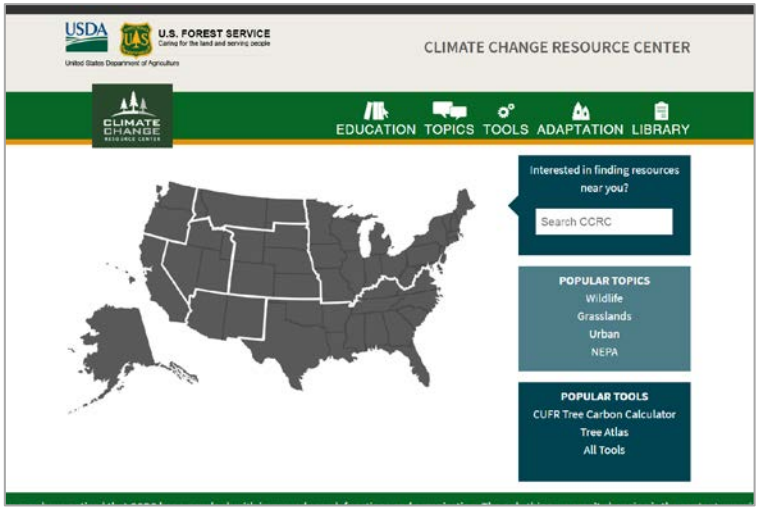
Great Lakes Indian Fish & Wildlife Commission

USDA Northern Forests Climate Hub

- "Specialty Hub" - forestry
  - Support 2 Regional Hubs
- 20 states in NE/MW
  - 42% forested
  - 41% of US population
  - >70% privately owned
- Climate Services
  - Assessment
  - Practical resources
  - Technical assistance
- Operated by NIACS



Additional Efforts We Facilitate



Climate Change Resource Center

USDA Forest Service national online resource that provides science-based information and tools about climate change and ecosystem management options to natural resource managers.
www.fs.usda.gov/ccrc

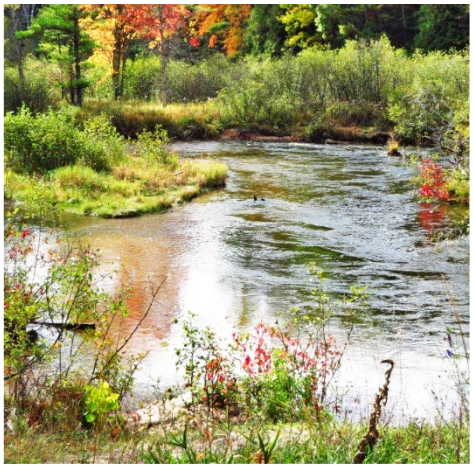
Climate Change Atlas

Documents the current and possible future distribution of 134 tree species and 147 bird species in the eastern United States under climate change for USDA FS Northern Research Station.
www.fs.fed.us/nrs/atlas

Climate Change Response Framework

What actions can help systems adapt to climate change and other threats while also meeting landowner needs?






Climate Change Response Framework

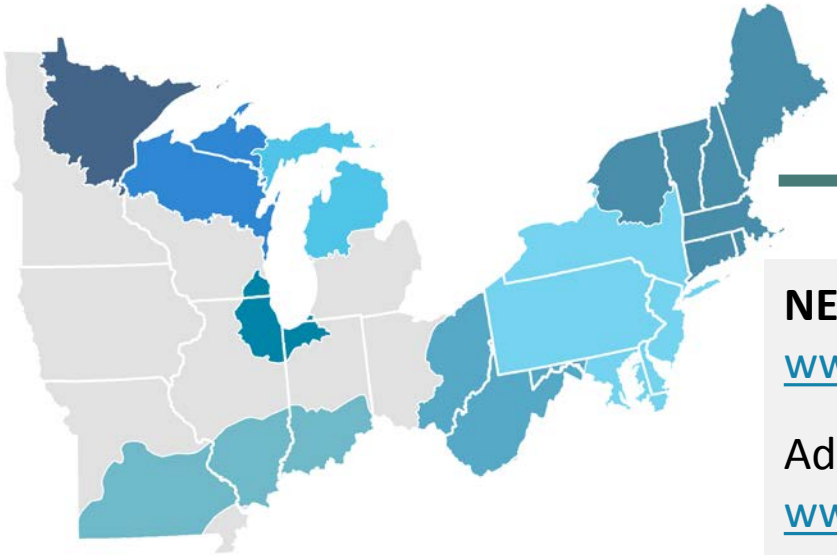
Structured, process oriented, works on multiple scales

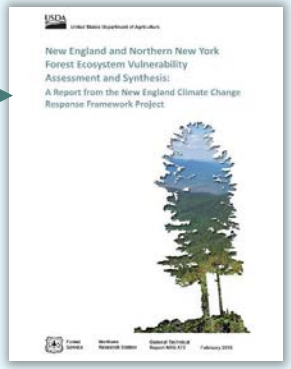
Components:	**Progress:**
Partnerships	150+ partner organizations (and counting)
Vulnerability Assessment	8 published assessments, 1 in press
Forest Adaptation Resources	Published 2012, **online** version 2015, 2nd edition 2016
Adaptation Demonstrations	250+ demonstrations underway

FY17: 85 presentations, 35 workshops, 20 publications, 3 courses

Vulnerability Assessment & Synthesis

- Series of reports for **natural resource professionals**
- Focus on **tree species and forest ecosystems**
- Examine a **range** of future climates
- Evaluate **key ecosystem vulnerabilities** to climate change
- Does **not make recommendations** or assess vulnerability to changes in mgmt., land use, policy



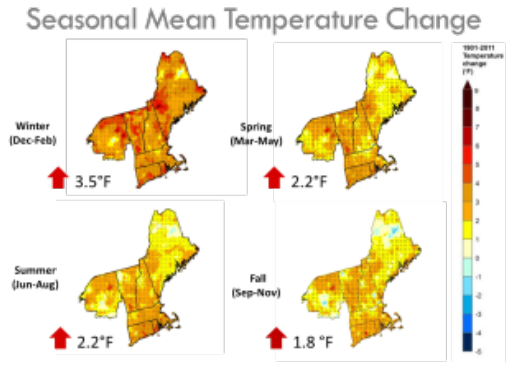


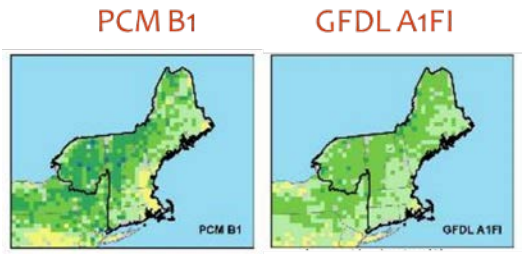
NEW REPORT!
www.nrs.fs.fed.us/pubs/55635

Additional resources & story map:
www.forestadaptation.org/ne-assessment

Vulnerability Assessment & Synthesis

- Synthesize state/regional assessments and scientific literature
  - Identify areas of agreement regarding ecosystems and species at greatest risk
  - Describe state-of-knowledge for anticipated changes in climate and response of forest ecosystems
- Incorporate new results from forest impact models: **Climate Change Tree Atlas, LINKAGES, LANDIS**
- Draw on local expertise of **scientists and land managers**





34 authors – General Technical Report – 234 pages

Assessment Process & Expert Panel

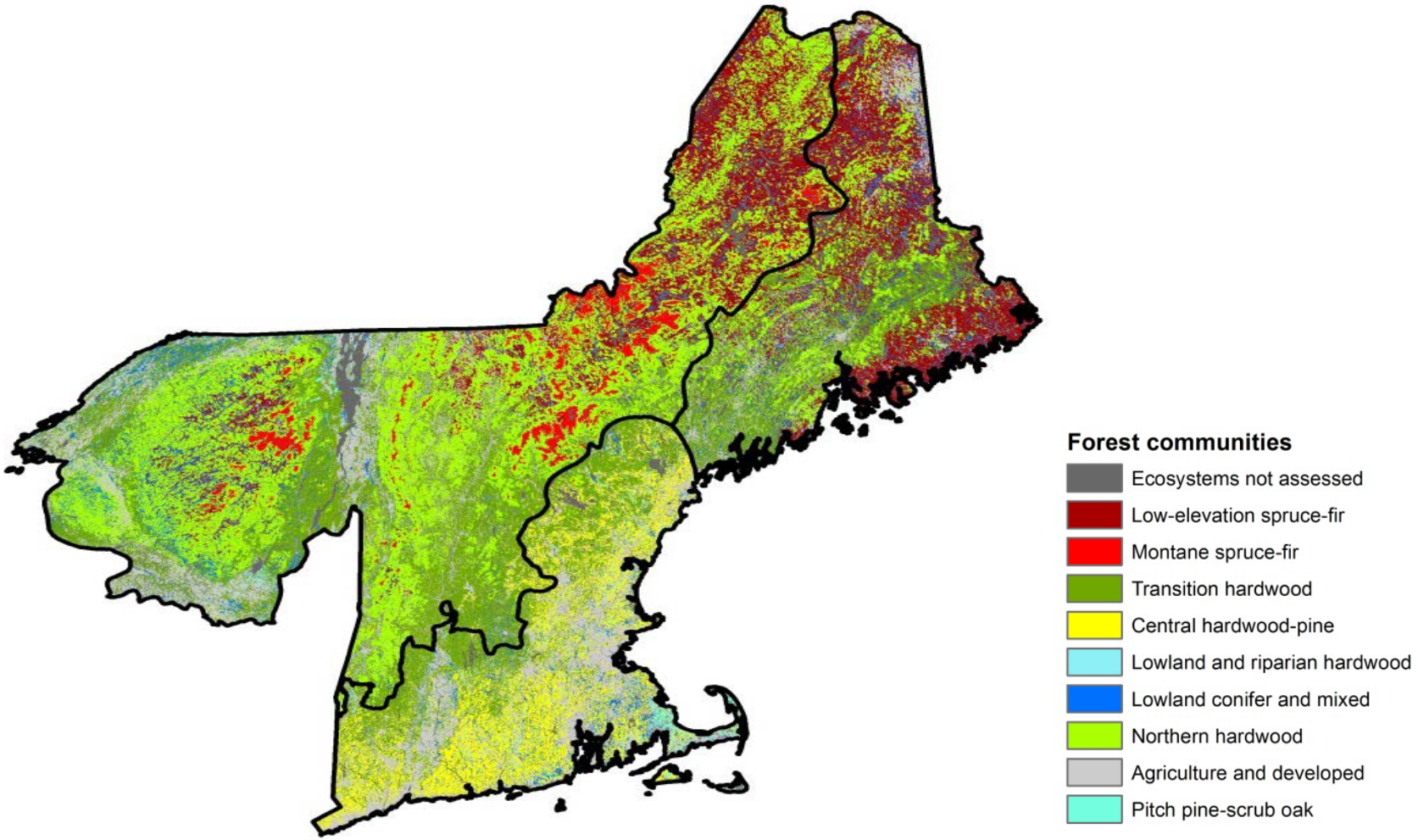
Local Info
- *Current forest conditions*
- *Climate trends*

Potential Forest Change
- *Future climate*
- *Published research*
- *Model results*

Expert Knowledge & Experience
(via workshop)

Forest Vulnerability
& Confidence

Forest Communities (n=8)



Future Changes in Climate

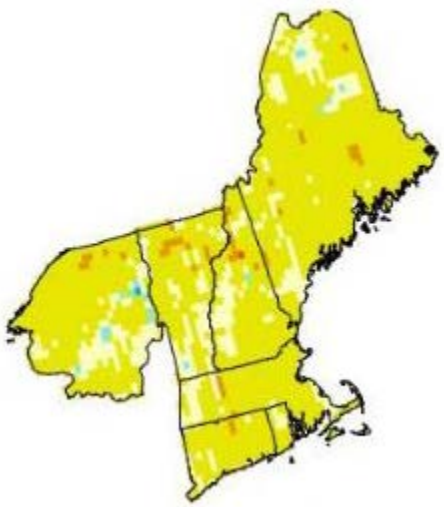
Models and Emissions Scenarios

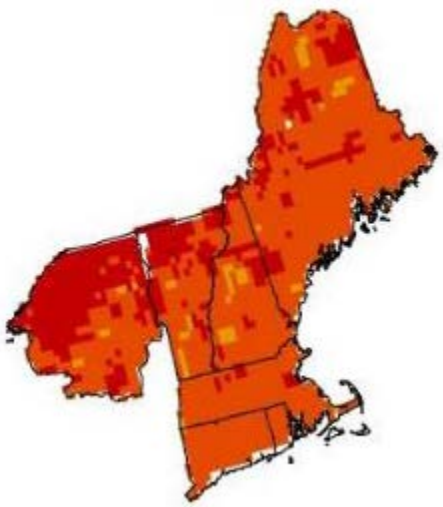
PCM
Low emissions (B1)

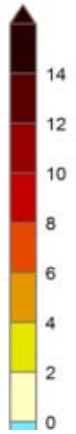
GFDL
High emissions (A1FI)

Least Projected Change

Most Projected Change







Change in Temperature (°F)

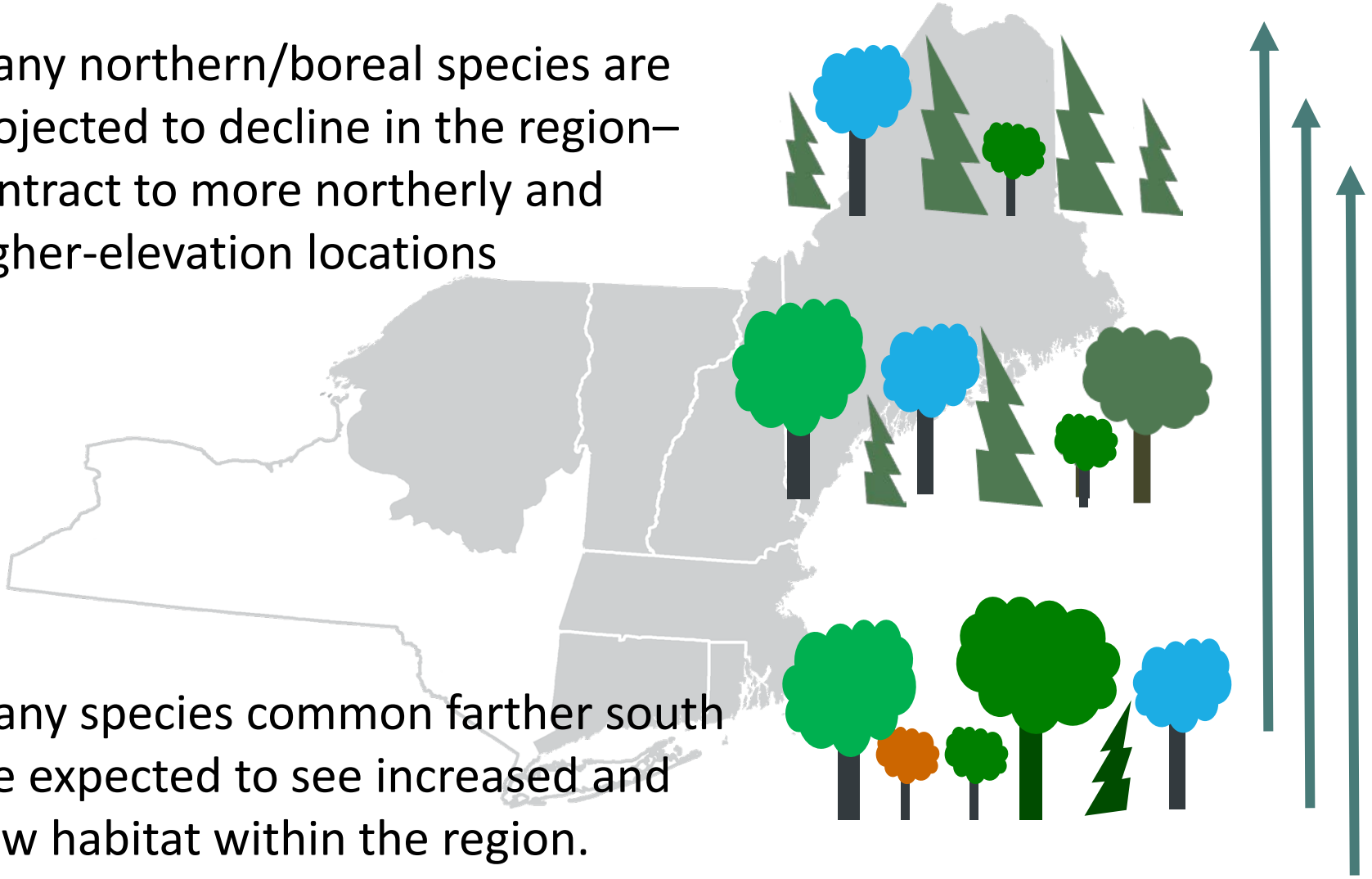
Future Changes in Climate

Anticipated Change in Climate	Evidence	Confidence
Warmer temperatures increasing another 3.5 to 8.5 °F	●●●	●●●
Longer growing season increasing another 20+ days	●●●	●●●
Shorter, warmer winters with less snow fall and snow cover	●●●	●●●
Sea levels rising by another 7 to 23 inches	●●●	●●●
Altered precipitation patterns with increased annual rainfall	●●●	●●●
Intense precipitation events that are more frequent and severe	●●●	●●●
Altered soil moisture potentially both wetter and drier	●●	●●●
Increased risk of drought stress during the growing season	●●	●●

●●● = *robust/high*
●● = *medium*

Effects on Forests

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.

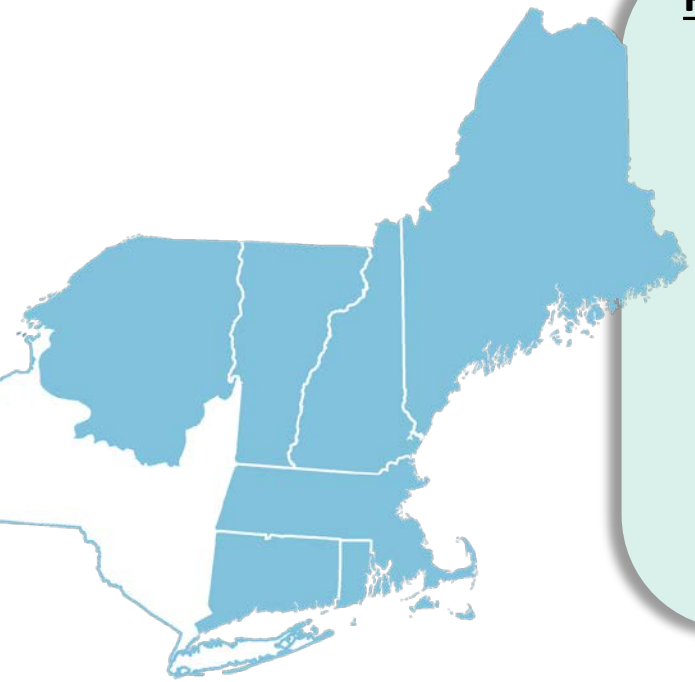
Effects on Forests

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

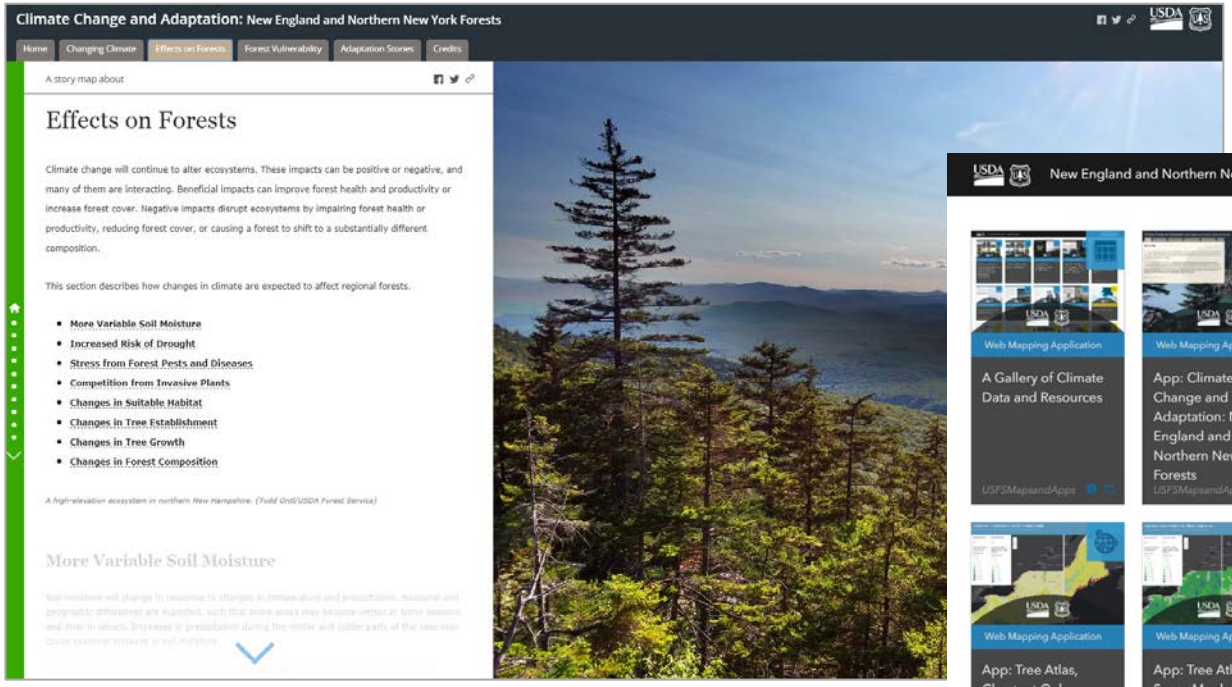
Forest Vulnerability

Forest communities will be affected differently

Forest system	Vulnerability	Potential impacts	Adaptive capacity
Low-elevation spruce-fir	Moderate-High	Neutral-Negative	Moderate
Lowland mixed conifer	Moderate-High	Neutral-Negative	Low-Moderate
Montane spruce-fir	Moderate-High	Neutral-Negative	Moderate
Lowland/riparian hardwood	Moderate	Positive and Negative	Moderate-High
Northern hardwood	Low-Moderate	Positive and Negative	Moderate-High
Transition hardwood	Low-Moderate	Positive and Negative	Moderate-High
Central hardwood-pine	Low	Neutral-Positive	Moderate-High
Pitch pine-scrub oak	Low	Neutral-Positive	Moderate

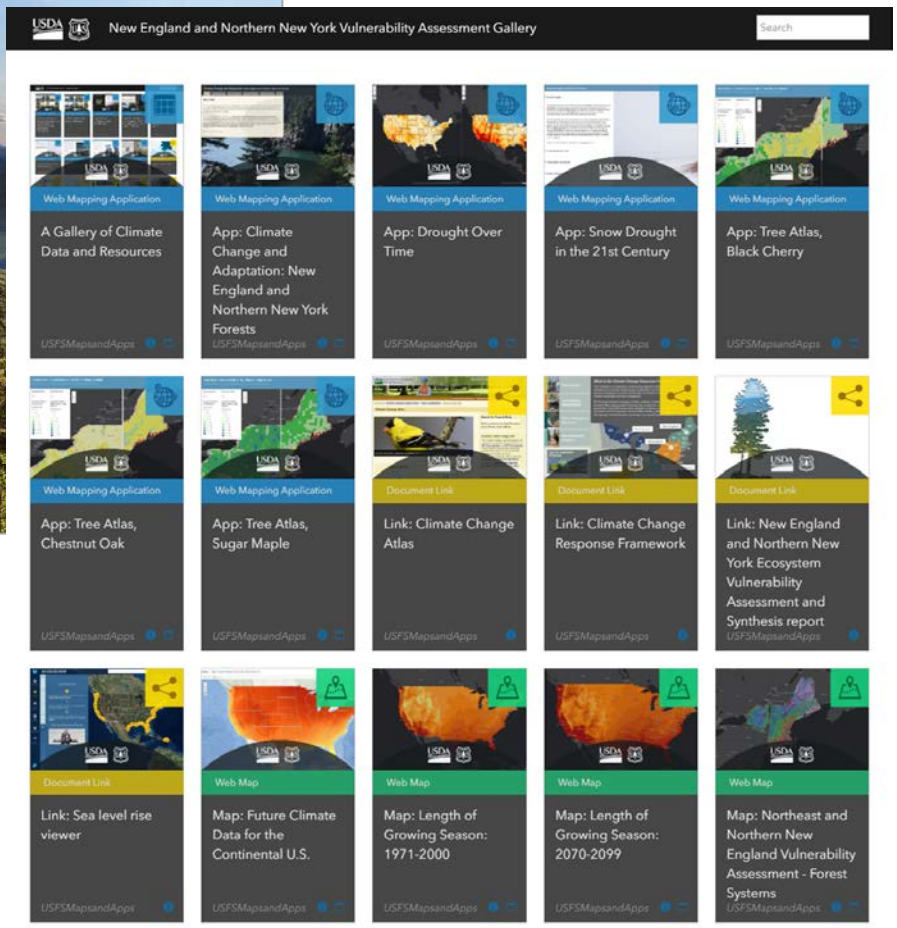
Check Out Our Story Map!

Storymap (interactive "executive summary)

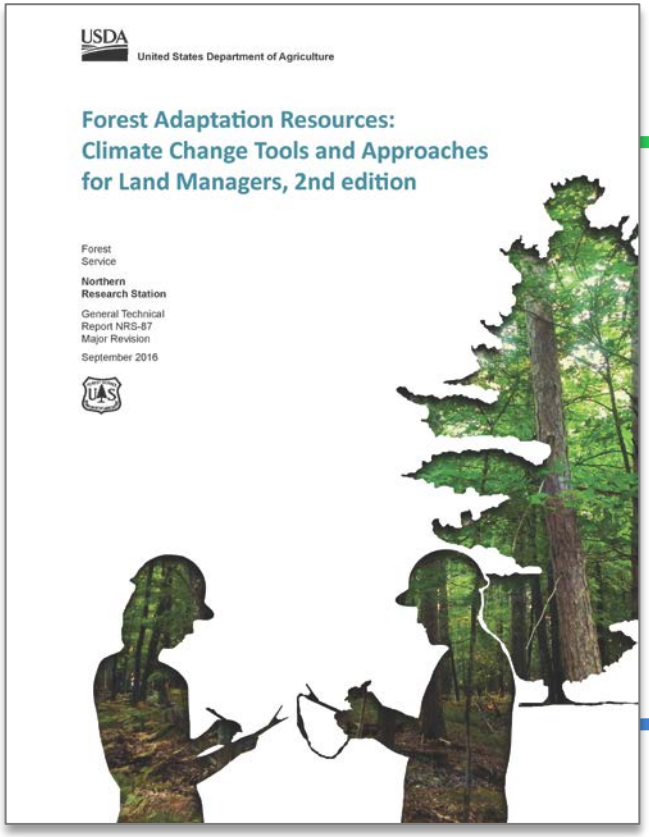


https://arcg.is/0eCuOv or via www.forestadaptation.org/ne-assessment

ESRI Gallery of GIS maps and applications



Helping Managers to Respond



Order a copy at:
www.nrs.fs.fed.us/pubs/52760

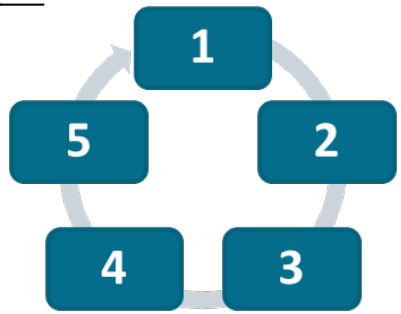
Strategies & Approaches

Menu of adaptation actions

Adaptation Workbook

Structured process to integrate climate change considerations into management.

- Workbook approach



Also online: AdaptationWorkbook.org

Helping Managers to Respond

- Adaptation Demonstrations provide **real-world examples** of forest management activities that:
  - Enhance the ability of forests to cope with changing conditions
  - Achieve land owner management goals
- Foster **cross-ownership** dialogue and learning
- Illustrate **diverse goals** and approaches



Adaptation Demonstrations

Real-world examples of climate-informed forest management

250+ Projects
have used the
Adaptation Workbook

www.forestadaptation.org/demos

We Want to Help You!

Climate and carbon services

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

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