Climate Change & New England Forests
Vulnerability Assessment and Other Resources

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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
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
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:

- Partnerships
- Vulnerability Assessment
- Forest Adaptation Resources
- Adaptation Demonstrations

Progress:

- 150+ partner organizations (and counting)
- 8 published assessments, 1 in press
- Published 2012, online version 2015, 2nd edition 2016
- 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)

Least Projected Change

GFDL
High emissions (A1FI)

Most Projected Change

Change in Temperature (°F)
## Future Changes in Climate

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

- ●●● = 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

**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
- Sweetgum
# Forest Vulnerability

Forest communities will be affected differently

<table>
<thead>
<tr>
<th>Forest system</th>
<th>Vulnerability</th>
<th>Potential impacts</th>
<th>Adaptive capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-elevation spruce-fir</td>
<td>Moderate-High</td>
<td>Neutral-Negative</td>
<td>Moderate</td>
</tr>
<tr>
<td>Lowland mixed conifer</td>
<td>Moderate-High</td>
<td>Neutral-Negative</td>
<td>Low-Moderate</td>
</tr>
<tr>
<td>Montane spruce-fir</td>
<td>Moderate-High</td>
<td>Neutral-Negative</td>
<td>Moderate</td>
</tr>
<tr>
<td>Lowland/riparian hardwood</td>
<td>Moderate</td>
<td>Positive and Negative</td>
<td>Moderate-High</td>
</tr>
<tr>
<td>Northern hardwood</td>
<td>Low-Moderate</td>
<td>Positive and Negative</td>
<td>Moderate-High</td>
</tr>
<tr>
<td>Transition hardwood</td>
<td>Low-Moderate</td>
<td>Positive and Negative</td>
<td>Moderate-High</td>
</tr>
<tr>
<td>Central hardwood-pine</td>
<td>Low</td>
<td>Neutral-Positive</td>
<td>Moderate-High</td>
</tr>
<tr>
<td>Pitch pine-scrub oak</td>
<td>Low</td>
<td>Neutral-Positive</td>
<td>Moderate</td>
</tr>
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</table>
Check Out Our Story Map!

**Storymap** (interactive “executive summary)

https://arcgis/0eCuOv or via www.forestadaptation.org/ne-assessment
Helping Managers to Respond

Strategies & Approaches

Menu of adaptation actions

Adaptation Workbook

Structured process to integrate climate change considerations into management.

- Workbook approach

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

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
250+ Projects have used the Adaptation Workbook
We Want to Help You!

Climate and carbon services

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