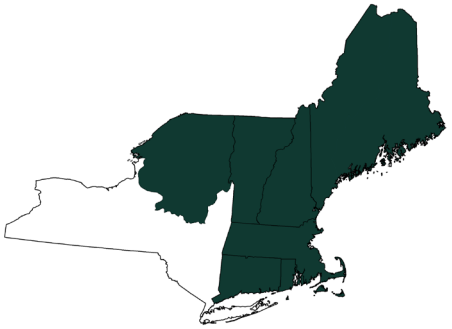
CLIMATE CHANGE PROJECTIONS FOR INDIVIDUAL TREE SPECIES

NEW ENGLAND AND NORTHERN NEW YORK

The region's forests will be affected by a changing climate during this century. A team of forest managers and researchers created an assessment that describes the vulnerability of forests in New England and northern New York (Janowiak et al. in press). This report includes information on the current landscape, observed climate trends, and a range of projected future climates. It also describes many potential climate change impacts to forests and summarizes key vulnerabilities for major forest types. This handout is summarized from the full assessment.



Remember that models are just tools, and they're not perfect. Model projections don't account for some factors that could be modified by climate change, like droughts, wildfire activity , and invasive species. If a species is rare or confined to a small area, Tree Atlas results may be less reliable. These factors, and others, could cause a particular species to perform better or worse than a model projects. Human choices will also continue to influence forest distribution, especially for tree species that are projected to increase. Planting programs may assist the movement of future-adapted species, but this will depend on management decisions.

TREE SPECIES INFORMATION:

This assessment uses two climate scenarios to "bracket" a range of possible futures. These future climate projections were used with two forest impact models (Tree Atlas and LANDIS) to provide information about how individual tree species may respond to a changing climate. More information on the climate and forest impact models can be found in the assessment. Results for "low" and "high" climate scenarios can be compared on page 2 of this handout.

Despite these limits, models provide useful information about future expectations. It's perhaps best to think of these projections as indicators of possibility and potential change. The model results presented here were combined with information from published reports and local management expertise to draw conclusions about potential risk and change in the region's forests.

SPECIES	ADDITIONAL CONSIDERATIONS
LIKELY TO DECREASE	
Black ash	Emerald ash borer causes mortality
Black spruce	Requires cold climate, susceptible to insect pests and drought
Eastern hemlock	Hemlock woolly adelgid causes mortality
Mountain maple	Able to grow across a variety of sites and tolerate shade
Northern white-cedar	Requires cold climate and susceptible to fire and herbivory
Paper birch	Early-sucessional colonizer, but susceptible to insects and drought
Red spruce	Needs a particular type of habitat, limited seedling establishment
Tamarack	Requires cold climate and susceptible to drought, fire, and insects
White spruce	Requires cold climate, susceptible to insect pests
MAY DECREASE	
Bigtooth aspen	Early-sucessional colonizer, but susceptible to drought
Gray birch	Disperses easily, but susceptible to drought, fire, and insects
Pin cherry	Fast-establishing colonizer following fire and disturbance
Quaking aspen	Early-sucessional colonizer, but susceptible to heat and drought
Striped maple	Shade tolerant and easily established, but susceptible to drought
Yellow birch	Good disperser, but susceptible to fire, insects, and disease

SPECIES	ADDITIONAL CONSIDERATIONS
MIXED MODEL RESULTS	
American beech	Affected by beech bark disease, extremely shade tolerant
Balsam fir	Requires cold climate and susceptible to drought, fire, and insects
Eastern white pine	Good disperser, but susceptible to drought and insects
Red maple	Competitive colonizer tolerant of disturbance and diverse sites
Sugar maple	Grows across a variety of sites and tolerates shade
Yellow birch	Good disperser, but susceptible to fire, insects, and disease
MAY INCREASE	
American basswood	Tolerates shade but susceptible to fire
American elm	Affected by Dutch elm disease, grows across a variety of sites
Black cherry	Susceptible to insects and fire, tolerates some drought
Black oak	Drought-tolerant, but susceptible to insects and diseaset
Eastern hophornbeam	Grows across a variety of sites and tolerates shade
Northern red oak	Susceptible to some insect pests
Sweet birch	Susceptible to drought, fire topkill, and insects
White ash	Emerald ash borer causes mortality
White oak	Fire-adapted and grows on a variety of sites

NIACS
Northern Institute of Applied Climate Science

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SOURCE: Janowiak et al. in review. New England and New York forest ecosystem vulnerability assessment and synthesis: a report from the New England Climate Change Response Framework. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. ***www.forestadaptation.org/new-england/vulnerability-assessment***

FUTURE PROJECTIONS

Data for the end of the century are summarized for two forest impact models under two climate change scenarios. The Climate Change Tree Atlas (www.fs.fed.us/nrs/atlas) models future suitable habitat, while LANDIS models changes in forest growth over time (future tree density presented in this table; additional data are available in the assessment).

▲ **INCREASE**
Projected increase of >20% by 2100

● **NO CHANGE**
Little change (<20%) projected by 2100

▼ **DECREASE**
Projected decrease of >20% by 2100

★ **NEW HABITAT**
Tree Atlas projects new habitat for species not currently present

ADAPTABILITY

Factors not included in the models, such as the ability to respond favorably to disturbance, may make a species more or less able to adapt to future stressors.

\+ high
Species may perform better than modeled

. medium

– low
Species may perform worse than modeled

SPECIES	LOW CLIMATE CHANGE (PCM B1) TREE ATLAS	LOW CLIMATE CHANGE (PCM B1) LANDIS	HIGH CLIMATE CHANGE (GFDL A1FI) TREE ATLAS	HIGH CLIMATE CHANGE (GFDL A1FI) LANDIS	ADAPT
American basswood	●		▲		.
American beech	●	●	▼	▲	.
American chestnut	●		●		.
American elm	▲		▲		.
American holly	●		▲		.
American hornbeam	●		▲		.
American mountain-ash	●		▼		–
Baldcypress	★		★		.
Balsam fir	▼	▲	▼	▲	–
Balsam poplar	▼		▼		.
Bigtooth aspen	●		▼		.
Black ash	▼		▼		–
Black cherry	●	●	▲	▲	–
Black hickory			★		.
Black oak	▲	●	▲	●	.
Black spruce	▼	▼	▼	▼	.
Black walnut	▲		▲		.
Blackgum	●		▲		+
Blackjack oak			★		+
Boxelder	●		▲		+
Bur oak	●		▲		+
Cherrybark oak	★		★		.
Chestnut oak	▲	▲	▲	●	+
Chinkapin oak			★		.
Common persimmon	★		★		+
Eastern hemlock	●	●	▼	▼	–
Eastern hophornbeam	●		▲		+
Eastern red cedar	▲		▲		.
Eastern redbud	▲		▲		.
Eastern white pine	●	▼	▼	▲	.
Flowering dogwood	▲		▲		.
Gray birch	●		▼		.
Green ash	●		▲		.
Hackberry	●		▲		+
Jack pine	▼		▲		.
Loblolly pine	★	●	★	●	.
Longleaf pine	★				.
Mockernut hickory	▲		▲		+
Mountain maple	▼		▼		+
Northern pin oak	●		▲		+

SPECIES	LOW CLIMATE CHANGE (PCM B1) TREE ATLAS	LOW CLIMATE CHANGE (PCM B1) LANDIS	HIGH CLIMATE CHANGE (GFDL A1FI) TREE ATLAS	HIGH CLIMATE CHANGE (GFDL A1FI) LANDIS	ADAPT
Northern red oak	▲	●	▲	●	+
Northern white-cedar	▼	▼	▼	▼	.
Osage-orange			★		+
Paper birch	▼		▼		.
Pignut hickory	▲	●	▲	▼	.
Pin cherry	●		▼		.
Pin oak	▲		▲		–
Pitch pine	●	●	▲	●	.
Pond pine	★		★		–
Post oak	▲		▲		+
Quaking aspen	●	●	▼	●	.
Red maple	●	●	▼	▲	+
Red pine	●		▲		.
Red spruce	▼	▼	▼	▼	–
Sand pine	★		★		–
Sassafras	▲		▲		.
Scarlet oak	▲	●	▲	▼	.
Serviceberry	●		▲		.
Shagbark hickory	▲	●	▲	●	.
Shingle oak			★		.
Shortleaf pine	★		★		.
Silver maple	▲		▲		+
Slippery elm	▲		▲		.
Southern red oak	★		★		+
Striped maple	●		▼		.
Sugar maple	●	●	▼	▲	+
Sugarberry			★		.
Swamp chestnut oak	●		▲		.
Sweet birch	▲		▲		–
Sweetgum	★		★		.
Sycamore	●		▲		.
Tamarack	▼		▼		–
Virginia pine	★	★	★	★	.
White ash	▲	●	●	▲	–
White oak	▲	●	▲	●	+
White spruce	▼		▼		.
Willow oak			★		.
Winged elm	●		▲		.
Yellow birch	●	▼	▼	▲	.
Yellow-poplar	▲	▲	▲	▲	+

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