

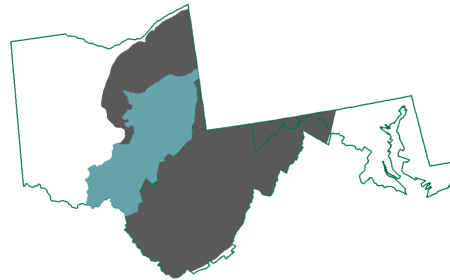


# CLIMATE CHANGE PROJECTIONS FOR INDIVIDUAL TREE SPECIES

## CENTRAL APPALACHIANS SOUTHEAST OHIO



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 the Central Appalachians (Butler et al. 2015). 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 (see table below), 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.

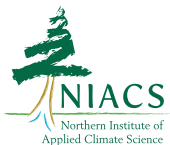
### TREE SPECIES INFORMATION:

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 - 30 MOST COMMON SPECIES
<b>MAY DECREASE</b>	
American beech	Susceptible to beech bark disease, extremely shade tolerant
American elm	Grows on a variety of sites, Affected by Dutch elm disease
Bigtooth aspen	Early-successional colonizer, susceptible to drought
Black cherry	Susceptible to insects and fire, somewhat drought-tolerant
Black locust	Early-successional colonizer, susceptible to insect pests
Black walnut	Good disperser, but intolerant of shade and drought
Chestnut oak	Establishes from seed or sprout, adapted to fire
Eastern white pine	Good disperser, but susceptible to drought and insects
Flowering dogwood	Shade tolerant
Pawpaw	Shade tolerant; susceptible to drought
Red maple	Competitive colonizer in diverse sites, disturbance-adapted
Sassafras	Early-successional colonizer, susceptible to fire topkill
Slippery elm	Shade-tolerant, susceptible to disease and fire topkill
Sugar maple	Grows across a variety of sites, tolerates shade
Tulip tree	Competitive colonizer tolerant of diverse sites
White ash	Emerald ash borer causes mortality

SPECIES	ADDITIONAL CONSIDERATIONS - 30 MOST COMMON SPECIES
<b>NO CHANGE</b>	
American hornbeam	Tolerates shade, susceptible to fire and drought
<b>MIXED MODEL RESULTS</b>	
Scarlet oak	Establishes from seed or sprout, susceptible to fire and disease
Silver maple	Early-successional colonizer, susceptible to fire topkill and drought
<b>MAY INCREASE</b>	
Black oak	Drought tolerant, susceptible to insect pests and diseases
Blackgum	Shade tolerant, fire adapted
Eastern hophornbeam	Grows across a variety of sites, tolerates shade
Eastern redcedar	Drought tolerant, shade intolerant, susceptible to fire and insects
Mockernut hickory	Susceptible to fire topkill
Northern red oak	Susceptible to insect pests
Pignut hickory	Susceptible to insect pests and drought
Shagbark hickory	Susceptible to insect pests and fire topkill
Sourwood	Competitive in a range of site conditions
Virginia pine	Intolerant of shade and pollution
White oak	Fire-adapted, grows on a variety of sites



## FUTURE PROJECTIONS

Data for the end of the century are summarized for the Climate Change Tree Atlas ([www.fs.fed.us/nrs/atlas](http://www.fs.fed.us/nrs/atlas)) under two climate change scenarios. Tree 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 assesment).

### ▲ 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 Tree Atlas model, such as the ability to respond favorably to disturbance, may make a species more or less able to adapt to future stressors (see reverse page for considerations for the 30 most common species).

- + high  
Species may perform better than modeled
- medium
- low  
Species may perform worse than modeled

SPECIES	LOW CLIMATE CHANGE (PCM B1)		HIGH CLIMATE CHANGE (GFDL A1FI)		ADAPT
	TREE ATLAS	LANDIS	TREE ATLAS	LANDIS	
American basswood	●		▼		·
American beech	●		▼		·
American elm	▼		▼		·
American hornbeam	●		●		·
Bigtooth aspen	▼		▼		·
Bitternut hickory	▲		▲		·
Black cherry	▼	●	▼	▼	-
Black hickory	★		★		·
Black locust	▼		▼		-
Black maple	●		▼		-
Black oak	●	●	▲	●	·
Black walnut	●		▼		·
Black willow	▼		▲		·
Blackgum	▲		●		·
Blackjack oak	▲		▲		·
Boxelder	▼		▲		-
Bur oak	▲		★		+
Cedar elm	★		★		+
Chestnut oak	●	●	▼	●	+
Chinkapin oak	▲		▲		+
Common persimmon	▲		▲		-
Cucumbertree	▲		●		·
Eastern cottonwood	▼		▲		+
Eastern hemlock	▼	●	▼	▼	·
Eastern hophornbeam	●		▲		+
Eastern red cedar	▲	●	▲	●	·
Eastern redbud	▲		▲		-
Eastern white pine	▼	●	▼	▼	+
Flowering dogwood	●		▼		·
Green ash	▲		▲		·
Hackberry	▲		▲		·
Honeylocust	●		▲		·
Loblolly pine	★	●	★	▼	·
Mockernut hickory	●		▲		+
Northern catalpa	●		●		+
Northern red oak	●	▲	●	▲	·

SPECIES	LOW CLIMATE CHANGE (PCM B1)		HIGH CLIMATE CHANGE (GFDL A1FI)		ADAPT
	TREE ATLAS	LANDIS	TREE ATLAS	LANDIS	
Ohio buckeye	●		▼		+
Osage-orange	●		▲		+
Pawpaw	●		▼		+
Pignut hickory	●	▲	●	●	+
Pin oak	●		▲		+
Pitch pine	▲		●		·
Post oak	▲		▲		·
Quaking aspen	▼		▼		·
Red maple	●	●	▼	●	-
Red mulberry	★		★		·
Red pine	▼		▼		+
River birch	●		▲		·
Sassafras	●		▼		+
Scarlet oak	▲	●	▼	●	·
Serviceberry	●		●		-
Shagbark hickory	▲		▲		·
Shingle oak	●		▲		·
Shortleaf pine	▲		▲		·
Shumard oak	★		★		·
Silver maple	▼		▲		·
Slippery elm	●		▼		·
Sourwood	▲		▲		+
Southern red oak	★		★		·
Sugar maple	●	●	▼	●	+
Sugarberry	★		★		·
Sweet birch	●		▼		+
Sweetgum	▲		▲		·
Sycamore	●		●		+
Tulip tree	●	●	▼	●	+
Virginia pine	▲		●		·
Water locust	★		★		·
Water oak	★		★		-
White ash	●	●	▼	●	·
White oak	▲	●	●	●	·
Winged elm	★		★		+
Yellow buckeye	●		●		-

SOURCE: Butler, et al. 2015. Central Appalachians forest ecosystem vulnerability assessment and synthesis: a report from the central Appalachians climate change response framework project. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 322p. Available at [https://www.fs.fed.us/nrs/pubs/gtr/gtr\\_nrs146.pdf](https://www.fs.fed.us/nrs/pubs/gtr/gtr_nrs146.pdf).

