CLIMATE CHANGE PROJECTIONS FOR INDIVIDUAL TREE SPECIES

PIEDMONT (SUBREGION 5)

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 Mid-Atlantic region (Butler-Leopold et al. in review). 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 - 30 MOST COMMON SPECIES
LIKELY TO DECREASE	
Eastern hemlock	Hemlock woolly adelgid causes mortality
Eastern white pine	Good disperser, but susceptible to drought and insects
Yellow birch	Good disperser, susceptible to fire, insects, and disease
MAY DECREASE	
American beech	Susceptible to beech bark disease, very shade tolerant
Chestnut oak	Establishes from seed or sprout, adapted to fire
Northern red oak	Susceptible to insect pests
Red maple	Competitive colonizer, tolerant of disturbance
Serviceberry	Competitive colonizer, susceptible to drought
Sugar maple	Grows across a variety of sites, tolerates shade
Sweet birch	Susceptible to drought, fire topkill, and insects
White ash	Emerald ash borer causes mortality
NO CHANGE	
American hornbeam:musclewood	Tolerates shade, susceptible to fire and drought
Black locust	Early-successional colonizer, susceptible to insect pests
Blackgum	Shade tolerant, fire adapted
Boxelder	Drought and shade tolerant, competitive in many sites

SPECIES	ADDITIONAL CONSIDERATIONS - 30 MOST COMMON SPECIES
NO CHANGE CONTINUED	
Pignut hickory	Susceptible to insect pests and drought
Sassafras	Early-successional colonizer, susceptible to fire topkill
MIXED MODEL RESULTS	
Black cherry	Susceptible to insects and fire, mildly drought-tolerant
Tulip tree	Competitive colonizer tolerant of diverse sites
MAY INCREASE	
American elm	Susceptible to Dutch elm disease
Black oak	Drought tolerant, susceptible to insect pests & diseases
Black walnut	Good disperser, but intolerant of shade and drought
Eastern hophornbeam	Grows across a variety of sites, tolerates shade
Flowering dogwood	Shade tolerant
Mockernut hickory	Susceptible to fire topkill
Scarlet oak	Seeds and sprouts, susceptible to fire & disease
White oak	Fire-adapted, grows on a variety of sites
LIKELY TO INCREASE	
Eastern red cedar	Drought tolerant, shade intolerant, susceptible to fire
Pin oak	Susceptible to insect pests and disease
Sweetgum	Seeds and sprouts, susceptible to fire & drought

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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 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) 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 hornbeam:musclewood	●		●		.
Balsam fir	▼	▼	▼	▼	-
Bear oak:scrub oak	▲		▲		.
Bigtooth aspen	▼		▼		.
Bitternut hickory	▲		▲		+
Black ash	▼		▼		-
Black cherry	▼	●	▼	▲	-
Black locust	●		●		.
Black oak	●	●	▲	●	.
Black walnut	▲		●		.
Black willow	●		▲		-
Blackgum	●		●		+
Blackjack oak	★		★		+
Boxelder	●		●		+
Bur oak	●		▲		+
Butternut	▼		▼		-
Chestnut oak	●	●	▼	●	+
Chinkapin oak	●		▲		.
Chokecherry	▼		▼		.
Eastern cottonwood	●		▲		.
Eastern hemlock	▼	▼	▼	▼	-
Eastern hophornbeam	●		▲		+
Eastern red cedar	▲		▲		.
Eastern redbud	▲		▲		.
Eastern white pine	▼	▼	▼	▼	.
Flowering dogwood	●		▲		.
Gray birch	▼		▼		.
Green ash	▼		▲		.
Hackberry	▲		▲		+
Honeylocust	●		▲		+
Loblolly pine	▲	●	▲	▲	.
Mockernut hickory	●		▲		+
Mountain maple	●		▼		+
Northern catalpa	▲		▲		.
Northern red oak	●	●	▼	●	+
Northern white-cedar	▼	▼	▼	▼	.

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
Osage-orange	●		▲		+
Paper birch	▼		▼		.
Pawpaw	▲		▲		.
Persimmon	▲		▲		+
Pignut hickory	●	●	●	●	.
Pin cherry	▼		▼		.
Pin oak	▲		▲		-
Pitch pine	▼	●	▼	●	.
Post oak	▲		▲		+
Quaking aspen	▼	▼	▼	▼	.
Red maple	●	●	▼	●	+
Red mulberry	●		▲		.
Red pine	▼		▼		.
Red spruce	▼	▼	▼	▼	-
River birch	●		▲		.
Sassafras	●		●		.
Scarlet oak	▲	●	●	●	.
Serviceberry	●		▼		.
Shagbark hickory	▲	●	▲	●	.
Shellbark hickory	N/A		▲		.
Shingle oak	●		▲		.
Silver maple	●		▲		+
Slash pine	★		★		.
Slippery elm	●		▲		.
Southern red oak	●		▲		+
Striped maple	▼		▼		.
Sugar maple	●	●	▼	▼	+
Swamp white oak	▲		▲		.
Sweet birch	●		▼		-
Sweetbay	●		▼		.
Sweetgum	▲		▲		.
Sycamore	▲		▲		.
Tamarack (native)	●		●		-
Tulip tree	●	●	▼	▲	+
Virginia pine	●	●	▼	●	.
Water tupelo	●		●		-
White ash	●	●	▼	●	-
White oak	●	●	▲	▲	+
White spruce	▼		▼		.
Yellow birch	▼	▼	▼	▼	.

SOURCE: Butler-Leopold et al. (in review). Mid-Atlantic forest ecosystem vulnerability assessment and synthesis: a report from the Mid-Atlantic Climate Change Response Framework, Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. ***www.forestadaptation.org/mid-atlantic/vulnerability-assessment***

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