CLIMATE CHANGE PROJECTIONS FOR INDIVIDUAL TREE SPECIES
INDIANA

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 Hardwoods region (Brandt et al. 2014). 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.

TREE SPECIES INFORMATION:

This assessment uses two climate scenarios to "bracket" a range of possible futures. These future climate projections were used with one forest impact model (Tree Atlas) 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.

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.

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 cherry	Limited drought tolerance and susceptible to some insect pests
MAY DECREASE	
White ash	Susceptible to emerald ash borer
NO CHANGE	
Red maple	Competitive colonizer tolerant of disturbance and diverse sites
Black oak	Drought tolerant, but susceptible to pest and disease
Pignut hickory	Susceptible to insects and inteolerant of drought
MAY INCREASE	
Hackberry	Drought tolerant
Eastern redbud	Tolerant of a wide range of site conditions
Boxelder	Disperses and regenerates easily
Sweetgum	Susceptible to drought and fire topkill
Eastern cottonwood	Susceptible to insects, disease, and fire topkill
Bitternut hickory	Drought tolerant
Pin oak	Susceptible to insects, disease, and fire topkill

SPECIES	ADDITIONAL CONSIDERATIONS
MIXED MODEL RESULTS	
American beech	Extremely shade tolerant, but affected by beech bark disease
American elm	Needs a particular type of habitat, affected by Dutch elm disease
American hornbeam	Regenerates easily, but drought-intolerant
Black locust	Susceptible to some insect pests
Black walnut	Susceple to thousand cankers disease
Eastern redcedar	Drought tolerant but susceptible to firetopkill
Flowering dogwood	Shade-tolerant
Green ash	Susceptible to emerald ash borer
Northern red oak	Susceptible to some insect pests
Sassafras	Susceptible to fire topkill
Shagbark hickory	Susceptible to insects and fire topkill
Silver maple	Disperses and regenerates easily but drought-intolerant
Slippery elm	Susceptible to fire topkill
Sugar maple	Shade-tolerant
Sycamore	Susceptible to anthracnose
White oak	Tolerant of fire
Yellow-poplar	Disperses and regenerates easily but drought-intolerant

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FUTURE PROJECTIONS

Data for the end of the century are summarized for the Climate Change Tree Atlas (www.fs.fed.us/nrs/atlas) under two climate change scenarios. Tree Atlas models future suitable habitat; 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.

+ high
Species may perform better than modeled

· medium

− low
Species may perform worse than modeled

SPECIES	LOW CLIMATE CHANGE (PCM B1)	HIGH CLIMATE CHANGE (HAD A1FI)	ADAPT
American basswood	▼	▼	·
American beech	●	▼	·
American elm	●	▼	·
American hornbeam	●	▲	·
Baldcypress	●	●	·
Bigtooth aspen	▼	▼	·
Bitternut hickory	▲	▲	+
Black cherry	▼	▼	−
Black hickory	▲	▲	·
Black locust	●	▼	·
Black maple	●	▼	+
Black oak	●	●	·
Black walnut	▲	▼	·
Black willow	▲	▲	−
Blackgum	▲	●	+
Blackjack oak	▲	▲	+
Blue ash	●	●	−
Boxelder	▲	▲	+
Bur oak	▲	▲	+
Butternut	▼	▼	−
Cedar elm	★	★	−
Cherrybark oak	▲	●	·
Chestnut oak	●	▼	+
Chinkapin oak	▲	▼	·
Common persimmon	▲	▲	+
Eastern cottonwood	▲	▲	·
Eastern hophornbeam	●	▲	+
Eastern red cedar	●	▼	·
Eastern redbud	▲	▲	·
Eastern white pine	●	▼	−
Flowering dogwood	●	▼	·
Green ash	▲	▲	·
Hackberry	▲	●	+
Honeylocust	▲	▲	+
Jack pine	▼	●	·
Kentucky coffeetree	▼	▼	·
Loblolly pine	★	★	·
Mockernut hickory	●	▲	+
Northern catalpa	●	●	·
Northern pin oak	▼	●	+
Northern red oak	●	▼	+

SPECIES	LOW CLIMATE CHANGE (PCM B1)	HIGH CLIMATE CHANGE (HAD A1FI)	ADAPT
Ohio buckeye	●	▼	·
Osage-orange	▲	▲	+
Overcup oak	●	▲	−
Pawpaw	▲	▼	−
Pecan	▼	●	−
Pignut hickory	●	●	·
Pin oak	▲	▲	−
Post oak	▲	▲	+
Red maple	●	●	+
Red mulberry	▲	▲	·
River birch	▲	▲	·
Rock elm	▲	▼	−
Sassafras	●	▼	·
Scarlet oak	▲	▼	·
Shagbark hickory	●	▼	·
Shellbark hickory	▲	●	·
Shingle oak	●	▲	·
Shortleaf pine	▲	▲	·
Shumard oak	▼	▲	+
Silver maple	●	▲	+
Slash pine	★	★	·
Slippery elm	●	▼	·
Sourwood	▲	●	+
Southern red oak	▲	▲	+
Sugar maple	●	▼	+
Sugarberry	▲	▲	·
Swamp chestnut oak	▼	▼	·
Swamp tupelo	●	▼	−
Swamp white oak	▲	▼	·
Sweetgum	▲	▲	·
Sycamore	●	▼	·
Virginia pine	▲	●	·
Water oak	★	★	·
White ash	●	▼	−
White oak	●	●	+
Wild plum	●	●	·
Willow oak	★	★	·
Winged elm	▲	▲	·
Yellow birch	▼	▼	·
Yellow buckeye	●	▼	−
Yellow-poplar	●	▼	+

SOURCE: Brandt, L.; He, H.; Iverson, L.; Thompson, F.R., III; Butler, P.; Handler, S.; Janowiak, M.; Shannon, P.D.; Swanston, C.; Albrecht, M.; Blume-Weaver, R.; Deizman, P.; DePuy, J.; Dijak, W.D.; Dinkel, G.; Fei, S.; Jones-Farrand, D.T. Leahy, M.; Matthews, S.; Nelson, P. Oberle, B.; Perez, J.; Peters, M.; Prasad, A.; Schneiderman, J.E.; Shuey, J.; Smith, A.B.; Studyvin, C.; Tirpak, J.M.; Walk, J.W.; Wang, W.J.; Watts, L.; Weigel, D.; Westin, S. 2014. Central Hardwoods ecosystem vulnerability assessment and synthesis: a report from the Central Hardwoods Climate Change Response Framework project. Gen. Tech. Rep. NRS-124. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 254 p. https://www.nrs.fs.fed.us/pubs/45430

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