CLIMATE CHANGE PROJECTIONS FOR INDIVIDUAL TREE SPECIES

MISSOURI

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.

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 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.

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	
American elm	Needs a particular type of habitat, affected by Dutch elm disease
Sassafras	Susceptible to fire topkill
Scarlet oak	Susceptible to oak decline
Slippery elm	Susceptible to fire topkill
Sugar maple	Disperses and regenerates easily but drought-intolerant
White oak	Tolerant of fire
MIXED MODEL RESULTS	
Bitternut hickory	Drought-tolerant
Black oak	Drought-tolerant
Black walnut	Susceple to thousand cankers disease
Blackgum	Fire-tolerant
Chinkapin oak	Establishes easily
Flowering dogwood	Shade-tolerant
Hackberry	Drought-tolerant
Northern red oak	Susceptible to some insect pests, oak decline
Pignut hickory	Susceptible to insects and inteolerant of drought

SPECIES	ADDITIONAL CONSIDERATIONS
MIXED MODEL RESULTS (CONT.)	
Post oak	Tolerant of drought, fire
Red mulberry	Dipserses easily
Shagbark hickory	Susceptible to insects and fire topkill
White ash	Susceptible to emerald ash borer
NO CHANGE	
Black cherry	Limited drought tolerance and susceptible to some insect pests
Black hickory	Very specific soil requirements
Common persimmon	Tolerant of shade and a wide range of soils
Eastern red cedar	Drought tolerant, susceptible to fire topkill
Mockernut hickory	Susceptible to fire topkill
Sycamore	Susceptible to anthracnose
MAY INCREASE	
Blackjack oak	Drought tolerant, regenerates with fire
Green ash	Susceptible to emerald ash borer
Red maple	Competitive colonizer tolerant of disturbance and diverse sites
Shortleaf pine	Tolerant of a wide range of soils.
Winged elm	Susceptible to Dutch elm disease.

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	●	▼	·
Bitternut hickory	●	▲	+
Black cherry	●	●	–
Black hickory	●	●	·
Black locust	▲	▲	·
Black oak	●	▼	·
Black walnut	●	▼	·
Black willow	▼	▲	–
Blackgum	▲	●	+
Blackjack oak	▲	▲	+
Blue ash	▼	▼	–
Boxelder	●	▲	+
Bur oak	●	▲	+
Butternut	▼	▼	–
Cedar elm	★	★	–
Cherrybark oak	▼	▼	·
Chestnut oak	▲	▲	+
Chinkapin oak	▲	▼	·
Chittamwood	▼	●	+
Common persimmon	●	●	+
Eastern cottonwood	●	▲	·
Eastern hophornbeam	▲	▲	+
Eastern red cedar	●	●	·
Eastern redbud	●	●	·
Flowering dogwood	●	▼	·
Green ash	▲	▲	·
Hackberry	▲	●	+
Honeylocust	●	▲	+
Jack pine	NA	★	·
Loblolly pine	★	★	·
Longleaf pine	★	NA	·
Mockernut hickory	●	●	+
Northern catalpa	●	●	·
Northern pin oak	NA	★	+
Northern red oak	▲	▼	+
Nuttall 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	●	▲	+
Quaking aspen	NA	★	v
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 tupelo	●	●	–
Swamp white oak	▼	▼	·
Sweetgum	▲	▲	·
Sycamore	●	●	·
Virginia pine	●	●	·
Water oak	★	★	·
White ash	●	▼	–
White oak	▼	▼	+
Wild plum	▲	▲	·
Willow oak	●	●	·
Winged elm	▲	▲	·
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