CLIMATE CHANGE PROJECTIONS FOR INDIVIDUAL TREE SPECIES
BIG SIOUX WATERSHED IN NORTH WESTERN IOWA

The region's forests will be affected by a changing climate and other stressors during this century. The National Climate Assessment describes how a changing climate can increase the vulnerability of forests in the Midwest (NCA 2018). This report includes information on the current landscape, observed climate trends, and a range of projected future climates.

The Landscape Change Research Group recently updated the Climate Change Tree Atlas, and this handout summarizes that information for select HUC 6 watersheds in Iowa. More Tree Atlas results are available online at **www.fs.fed.us/nrs/atlas/**. In this handout, two climate scenarios are presented to "bracket" a range of possible futures. These future climate projections (2070 to 2099) provide information about how individual tree species may respond to a changing climate. Results for "low" and "high" emissions scenarios can be compared on the reverse side of this handout.

The updated Tree Atlas presents additional information helpful to interpret tree species changes:

- **Suitable habitat** - calculated based on 39 variables that explain where optimum conditions exist for a species, including soils, landforms, and climate variables.
- **Adaptability** - based on life-history traits that might increase or decrease tolerance of expected changes, such as the ability to withstand different forms of disturbance.
- **Capability** - a rating of the species' ability to cope or persist with climate change in this region based on suitable habitat change (statistical modeling), adaptability (literature review and expert opinion), and abundance (FIA data). The capability rating is modified by abundance information; ratings are downgraded for rare species and upgraded for abundant species.
- **Migration Potential Model** - when combined with habitat suitability, an estimate of a species' colonization likelihood for new habitats. This rating can be helpful for assisted migration or focused management (see the table section: "New Habitat with Migration Potential").

Remember that models are just tools, and they're not perfect. Model projections can't account for all factors that influence future species success. If a species is rare or confined to a small area, model 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.

CLIMATE CHANGE CAPABILITY

POOR CAPABILITY
Boxelder

Eastern hophornbeam

Red pine

Silver maple

FAIR CAPABILITY
American basswood

American elm

Hackberry

Honeylocust

Red mulberry

Slippery elm

GOOD CAPABILITY
Bur oak

Eastern redcedar

MIXED RESULTS
Eastern cottonwood

Green ash

NEW HABITAT WITH MIGRATION POTENTIAL
Bitternut hickory

Black walnut**

Eastern redbud

Northern red oak

Osage-orange

** *Species is likely present but not currently included in the FIA databse.*

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ADAPTABILITY: Life-history factors, such as the ability to respond favorably to disturbance, that are not included in the Tree Atlas model and 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*

ABUNDANCE: Based on Forest Inventory Analysis (FIA) summed Importance Value data, calibrated to a standard geographic area.

- **+** **ABUNDANT**
- **·** **COMMON**
- **–** **RARE**

HABITAT CHANGE: Projected change in suitable habitat between current and potential future conditions.

- ▲ **INCREASE** *Projected increase of >20% by 2100*
- ▼ **DECREASE** *Projected decrease of >20% by 2100*
- ● **NO CHANGE** *Projected change of <20% by 2100*
- ★ **NEW HABITAT** *Tree Atlas projects new habitat for species not currently present*

CAPABILITY: An overall rating that describes a species' ability to cope or persist with climate change based on suitable habitat change class (statistical modeling), adaptability (literature review and expert opinion), and abundance within this region.

- △ **GOOD** *Increasing suitable habitat, medium or high adaptability, and common or abundant*
- ○ **FAIR** *Mixed combinations, such as a rare species with increasing suitable habitat and medium adaptability.*
- ▽ **POOR** *Decreasing suitable habitat, medium or low adaptability, and uncommon or rare*

SPECIES	ADAPT	ABUN	LOW CLIMATE CHANGE (RCP 4.5)		HIGH CLIMATE CHANGE (RCP 8.5)	
			HABITAT CHANGE	CAPABILITY	HABITAT CHANGE	CAPABILITY
American basswood	·	–	●	●	●	●
American elm	·	–	●	●	●	●
Bitternut hickory*	+	–	★		★	
Black walnut* **	·	–	★		★	
Boxelder*	+	–	▼	▽	▼	▽
Bur oak	+	–	▲	△	▲	△
Eastern cottonwood*	·	–	●	●	▲	
Eastern hophornbeam; ironwood*	+	–	▼	▽	▼	▽
Eastern redbud*	·	–			★	
Eastern redcedar	·	–	▲	△	▲	△
Green ash*	·	·	▼	●	▼	●
Hackberry	+	–	●	●	●	●
Honeylocust*	+	–	●	●	●	●
Northern red oak	+	–	★		★	
Osage-orange	+	–	★		★	
Red mulberry*	·	–	●	●	●	●
Red pine	–	–	▼	▽	▼	▽
Silver maple*	+	–	▼	▽	▼	▽
Slippery elm*	·	–	●	●	●	●

*Species with low model reliability based on five statistical metrics of the habitat models that affect change class. See maps and tables for more information (**www.fs.fed.us/nrs/atlas/combined/resources/summaries**).

** *Species is likely present but not currently included in the FIA databse.*

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