

Species on the Move

What do climate models predict about tree and bird ranges?

EXTENSION ACTIVITY

This presentation is based on “Trees on the Move, Activity A,” a lesson in Ohio Sea Grant’s *Great Lakes Climate Change Curriculum*. The original lesson is available at climategreatlakes.com/curriculum-trees-on-the-move-can-maples-and-buckeyes-migrate, and reading through it might help in adapting this presentation for your needs.

Climate is the general character of the weather that exists over a particular region of the earth for a long period of time. Unlike the weather, which represents hour-to-hour and day-to-day changes in the atmosphere, climate is the average of all weather changes over a region for many years.

The most frequently reported climate change possibilities are based on General Circulation Models (GCMs) that combine atmosphere as well as ocean characteristics: these include GFDL (NOAA’s Geophysical Fluid Dynamics Laboratory), HadCM3 (the Hadley Center in the United Kingdom), and PCM (the National Center for Atmospheric Research’s Parallel Climate Model). From these models, it is possible to calculate the impact of the global climate change on Earth conditions.

Impacts are reported as “scenarios,” which are not predictions, but plausible representations of the potential future. Scenarios may be used to identify possible effects of climate change and to evaluate responses to those effects. By analyzing many scenarios, scientists may be able to determine the direction and relative size of change.

- “High”: worst case, with accelerated greenhouse gas emissions and feedback that enhances warming
- “Low”: might occur if all nations began immediately to take steps to lower emission rates
- “Business as usual”: presumes continuation of present trends

All the models currently in use predict a regional Great Lakes climate that is warmer and drier than today’s.

Planting Map Update

The major factors that are often used to characterize the climate of a region are temperature and precipitation. The U.S. Department of Agriculture uses temperature (especially the lowest temperature expected) and precipitation to establish

planting zones for farmers and gardeners to determine if their area will support certain plants. The maps are printed on seed packets and nursery guides.

At the start of 2012, the USDA announced a new planting zone map, updated to reflect warmer conditions throughout the country. The map was last revised in 1990 based on data since 1976. The newest map recognizes that weather conditions in the years from 1990-2012 changed enough that climate niches justified a new map. While the changes in some areas are subtle, the concept of changing this well-recognized map to reflect climate change is huge for demonstrating the impact of the issue.

NPR story: <http://www.npr.org/2012/02/03/146362934/new-usda-map-may-mean-earlier-planting-in-north>



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Trees (and Birds, and Plants) on the Move

- General Circulation Models (GCMs) are used to predict future climate
- They can also predict future habitat ranges as ecosystems shift and adapt to new conditions
- Most people see these types of maps in a gardening context

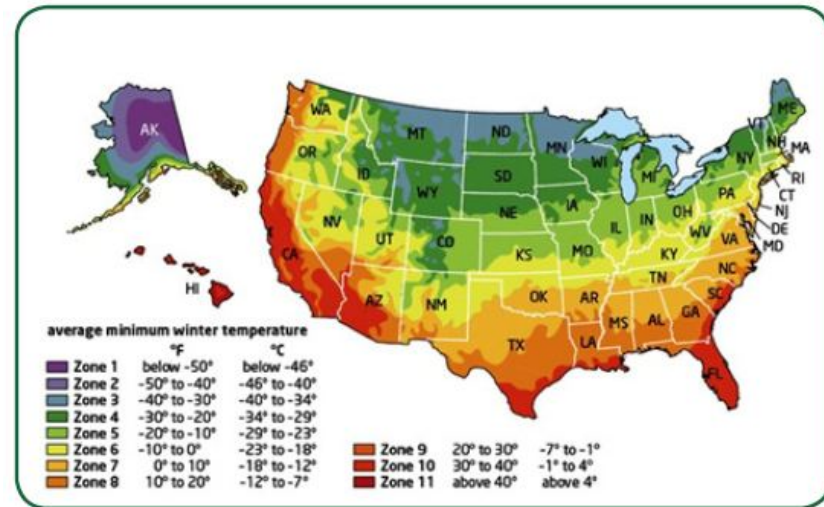


Figure 1a: USDA Planting Zone Map 1990

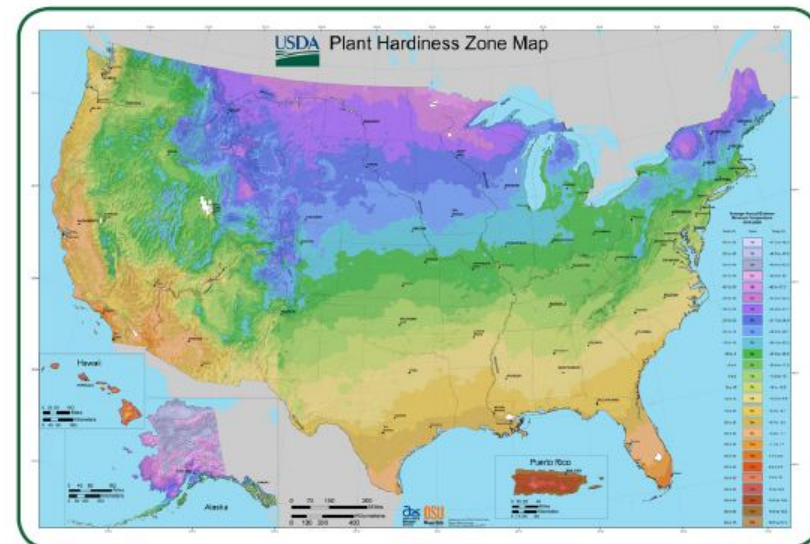


Figure 1b: Planting Zone Map, revised 2012



The US Forest Service Climate Change Atlas

For Trees

- http://www.nrs.fs.fed.us/atlas/tree/tree_atlas.html

The screenshot shows the 'sugar maple (*Acer saccharum*)' page. The header includes the USDA logo, 'United States Department of Agriculture Forest Service', 'Climate Change Tree Atlas', and 'Northern Research Station'. A navigation bar contains links: Bird Atlas, Atlas Background, Acronyms, Caution!, FAQ, Help, and Other Links (DropDownMenu). Below the header, a breadcrumb trail reads: 'You are here: Climate Change Atlas / Tree Atlas / sugar maple page'. The main content area is titled 'sugar maple (*Acer saccharum*) Pick Another Species'. It is divided into two columns: 'Species Information' and 'External Species Links'. The 'Species Information' column lists: Family: Aceraceae, Guild: persistent, slow-growing understory tolerant, Functional Lifeform: large deciduous tree, and a link to 'Life History and Disturbance Response'. The 'External Species Links' column lists: Silvics Manual: Click here for sugar maple, Plant Photos: Photos of the tree in USDA Plants Database, and Google Earth: View current and modelled sugar maple. Below this is a 'Research Products (IMPORTANT: Read this first)' section with two main categories: 'Current Distribution' and 'Modelled Future Habitat'. Each category contains several buttons: 'Abundance & Little's Range Maps', 'HotSpot Maps', 'Niche Maps', 'Geographic Predictors Map', and 'Statistics, Tables & Interpretations'.

For Birds

- <http://www.nrs.fs.fed.us/atlas/bird/index.html>

The screenshot shows the 'Black-capped Chickadee (*Poecile atricapillus*)' page. The header includes the USDA logo, 'United States Department of Agriculture Forest Service', 'Climate Change Bird Atlas', and 'Northern Research Station'. A navigation bar contains links: Bird Atlas Page, Atlas Background, Acronyms, Caution!, Help, and Other Links (DropDownMenu). Below the header, a breadcrumb trail reads: 'You are here: Climate Change Atlas / Bird Atlas / Black-capped Chickadee page'. The main content area is titled 'Black-capped Chickadee (*Poecile atricapillus*) Pick Another Species'. It is divided into two columns: 'Species Information' and 'External Species Links'. The 'Species Information' column lists: Family: PARIDAE, Breeding Status: resident, and Primary Breeding Diet: insects. The 'External Species Links' column lists: Black-capped Chickadee at USGS, Black-capped Chickadee at Cornell, and Black-capped Chickadee at NatureServe. A photo of a Black-capped Chickadee is shown on the right, credited to 'Photo by Kevin T. Karlson'. Below this is a 'Research Products' section with two main categories: 'Current Distribution' and 'Modelled Future Habitat'. Each category contains several buttons: 'Abundance & NatureServe Maps', 'Niche Maps', 'Geographic Predictors Map', and 'Statistics, Tables & Interpretations'.

The Tree Atlas



United States Department of Agriculture
Forest Service



Climate Change
Tree Atlas

Northern
Research Station



[Atlas Background](#) [Acronyms](#) [Caution!](#) [Atlas Help](#) [Other Links \(DropDownMenu\)](#)

You are here: [Climate Change Atlas](#) / [Tree Atlas](#) / [sugar maple page](#) / [Future IV Page](#)

sugar maple (*Acer saccharum*)

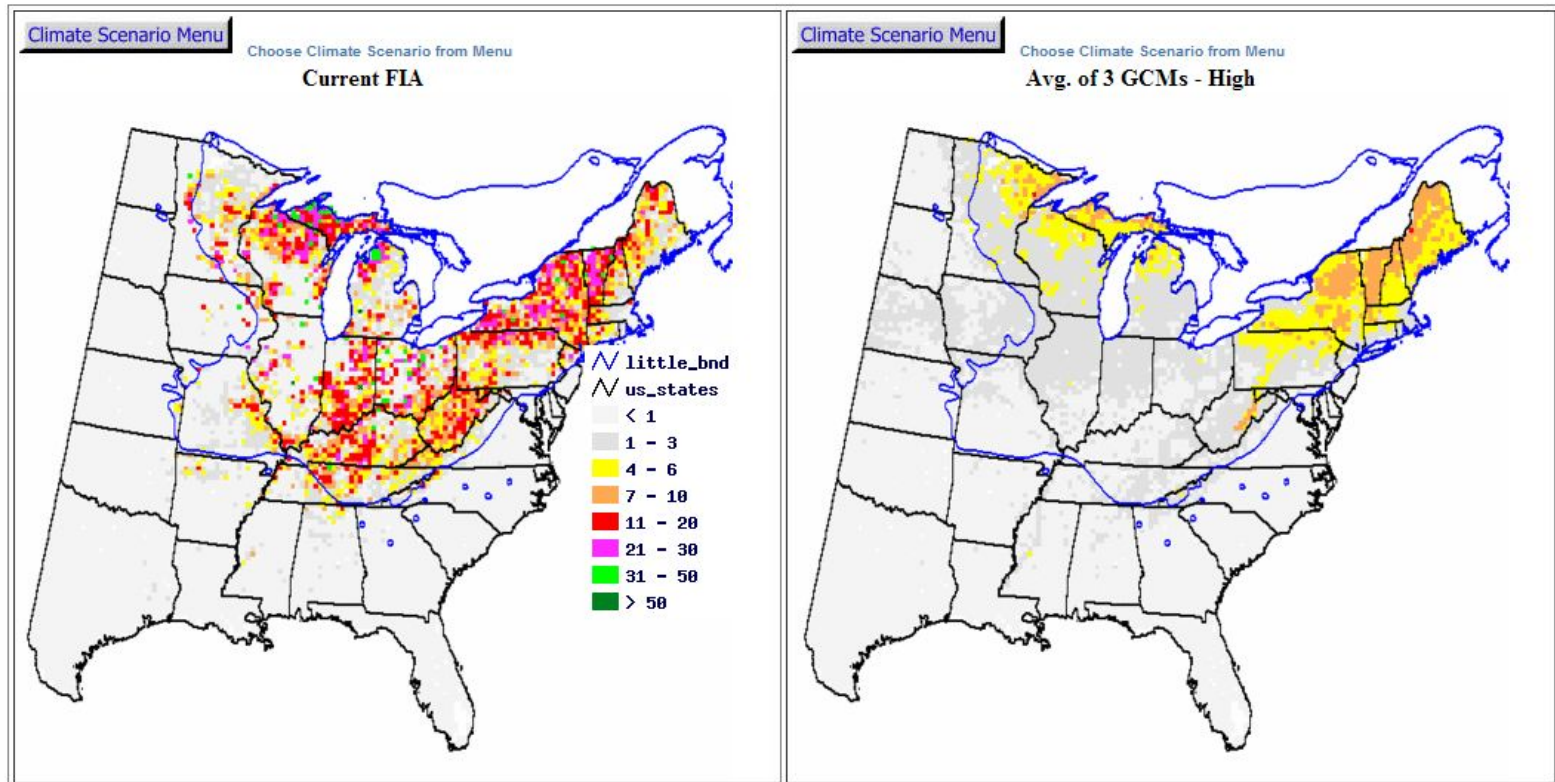
Model Reliability: ● (High)

Abundance Change Maps by GCM Scenario

Importance value maps under five climate scenarios and two emission levels. You can also animate the scenarios to visualize change.



[Animate Scenarios](#)



The Bird Atlas

 United States Department of Agriculture
Forest Service

 Climate Change
Bird Atlas

Northern
Research Station



Atlas Background

Acronyms

Caution!

Atlas Help

Other Links (DropDownMenu)

You are here: Climate Change Atlas / Bird Atlas / Black-capped Chickadee page / Future IV Page

Black-capped Chickadee (*Poecile atricapillus*)

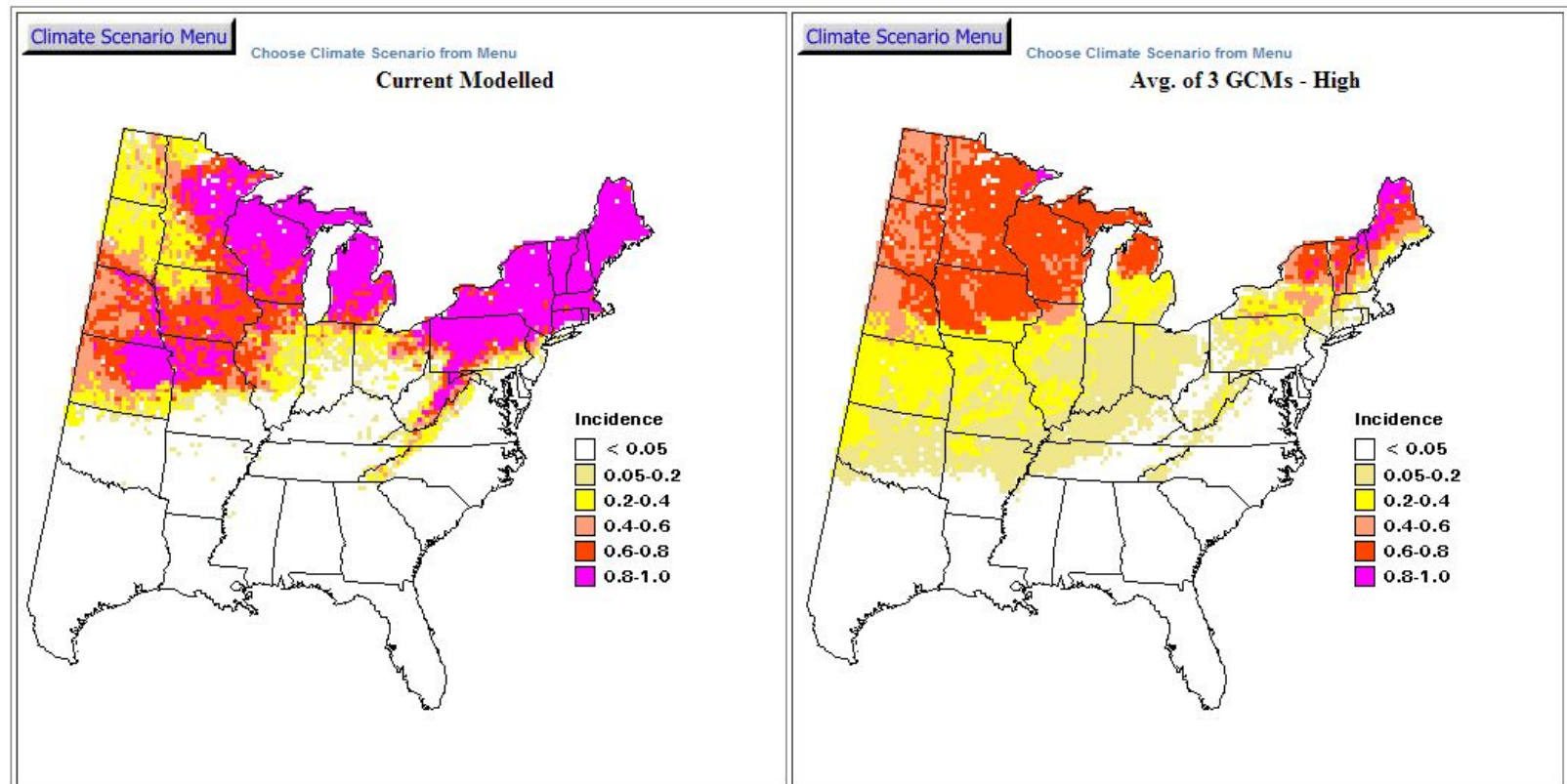
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[Animate Scenarios](#)



Resources

- Tree Atlas

http://www.nrs.fs.fed.us/atlas/tree/tree_atlas.html

- Bird Atlas

<http://www.nrs.fs.fed.us/atlas/bird/index.html>

- “Regional Impacts of Climate Change on Forests and Bird Communities” webinar presentation

<http://changingclimate.osu.edu/webinars/archives/2011-09-29/>