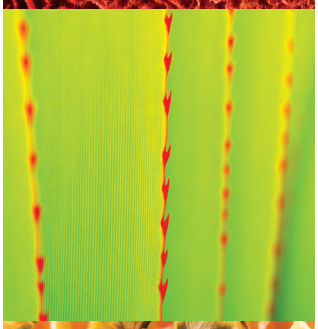
ECOREGION: EASTERN FORESTS AND WOODLANDS



Standing at the peak of Mount Mansfield in Vermont on a crisp October day, crimson reds, golden yellows, and brilliant greens form a blanket on the surrounding mountains and the valley floor, right up to the edge of Lake Champlain. The eastern forests and woodlands are known for this colorful fall display of leaves. Covering from Maine to Florida and west to the Mississippi River, these forests once stretched almost unbroken across the region, but now coexist with people in some of the most heavily populated areas of the world.[1] The deciduous trees that make these forests famous include oaks, maples, beech, birches, and hickories.[2] While evergreen **conifers**, such as spruce and firs, do live in the eastern forest, they are not as common or dominant as the **deciduous** trees except under particular types of local conditions.[3]

The eastern forests ecoregion includes a range of landscapes from the rugged Adirondack Mountains in New York and the Appalachian Mountains that span the entire eastern seaboard, to rolling hills, valleys, and plains.[4] Each of these landscapes has varying climates, soils, altitudes, and frequencies of fire, all of which play key roles in determining the composition of trees that make up forest stands.

In general, the eastern United States has cold winters and long warm summers. Possibly the most important feature in determining the makeup of the eastern forests is precipitation in the form of rain and snow. Total precipitation throughout the year is higher in the eastern forests than anywhere else in North America, except for the tropical and subtropical areas to the south and the temperate rain forest found along the Pacific Coast.[5]

These **deciduous** forests are rich in species due to the abundance of food and shelter provided by the trees that produce fruits, nuts, and berries to eat, and multiple forest layers in which animals can live. Species include migratory birds on their journeys north and south, as well as year-round residents such as red northern cardinals, gray squirrels, black bears, white-tailed deer, raccoons, red foxes, and opossums.

All of these species depend on the trees to provide them with food and shelter. Changes in climate that affect the eastern forests will thus also affect the plants and animals that live in and use them.

IMPACTS OF CLIMATE CHANGE

Higher temperatures and changes in precipitation patterns are projected to have large, wide-ranging impacts on the eastern forests' composition, productivity, and

sustainability. Already, the eastern United States has seen an increase of about 1°F (about 0.6°C) in average annual temperature since 1900.[6] This temperature increase means increased summer high temperatures and winter low temperatures, both of which are key factors in determining tree species' geographical range. In turn, this temperature change will also affect the timing of fall cooling and spring warming.[7] Already, we have seen that winters in the Northeast have warmed an average of 1.3°F (0.7°C) per decade since 1970 and extreme heat during the summer is becoming more frequent.[8]

These changes in temperature and precipitation alter the typical conditions that the trees in the forests have experienced in the past. Depending on the specific region and the tree species present, some tree species will fare better in the new conditions while others will be stressed and fare worse. Thus, over the long term the composition of tree species by region will change, which will in turn affect all of the animals in the forests that depend on the specific types of habitats and foods provided by each tree species.[9]

SPOTLIGHT ON A SPECIES

Woodpeckers are one of the many groups of animals that call the eastern forests home and are being affected by climate change. Generally known for their propensity for pecking noisily at trees, the different species within this subfamily of birds are expected to react in a variety of ways to the changes in the eastern forests brought about by climate change.

To better understand the potential impacts of climate change, researchers from the U.S. Forest Service and the University of Maine used computer modeling to predict the future distribution of 150 common bird species. Because bird distributions are influenced mainly by climate and the availability of suitable habitat, the researchers used predicted future distributions of tree species types (representing their habitat and food source) and temperature changes to inform their model. What the researchers found was that, just as some tree species will expand their geographic range and others will decrease their range, so too will the different species of woodpeckers. For example, the model predicted that the red-headed woodpecker, *Melanerpes erythrocephalus*, will increase in abundance throughout the eastern region while the yellow-bellied sapsucker, *Sphyrapicus varius*, will decrease in abundance.[10,11]

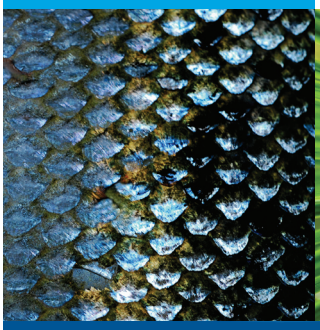
Did you know?

The yellow-bellied sapsucker frequently uses man-made objects to amplify its territorial drumming. Street signs and metal chimney flashing are just several objects pounded on by territorial sapsuckers. The sapsucker seems to suffer no ill effects from whacking its bill on metal, and a bird will return to a favorite sign day after day to pound out its Morse code-like message.

This potential decrease in abundance of the yellow-bellied sapsucker could have a large impact on the eastern forests due to the unique role that the bird plays within this ecosystem. The yellow-bellied sapsucker creates its nest in balsam fir trees by pecking a hole into the side of the tree. The sapsucker also maintains smaller holes, called "sapwells," from which it eats tree sap for nutrients. This unique behavior creates new food sources and habitats for creatures that live near sapsuckers. The sapwells attract and support various insects, which in turn support other animals.[12] And, because the sapsucker is the only woodpecker in eastern North America that is completely migratory, other birds and mammals, such as the flying squirrel, use the sapsucker's nesting cavities as roost sites when the sapsuckers leave in autumn. For example, the ruby-throated hummingbird, *Archilochus colubris*, appears to be an ally of the sapsucker. This hummingbird places its nest near sap wells, is known to follow sapsuckers during their daily movements, and may time its migration to coincide with that of the sapsuckers.[13] However, models predict greatly reduced abundance of balsam fir trees in the eastern forests due to climate change, and as a consequence, less suitable habitat for the sapsucker.[14] Thus, as climate changes affect the distribution of tree species, the animals that depend on these specific trees for food and habitat will be affected as well.

PROFILING A CLIMATE STEWARD

Every February, adults and children alike team up with others across the United States and Canada to document the kinds of birds in their local communities. This program is called the The Great Backyard Bird Count. Many kinds of birds migrate throughout the year, moving southward to warmer areas during the winter time, and moving northward to cooler regions during the summer time. Every year, the patterns of bird migration are a little bit different, based on factors like how much food is available to the birds and the weather of that particular year. As global warming becomes more severe, it is expected that the migratory patterns of birds will change to reflect the changes in temperature. In fact, these changes in migratory patterns may already be occurring.[15]



The Great Backyard Bird Count is a fun activity that can be done very easily. All you have to do is go out into your backyard or a nearby park, and count what kind of birds you see! You can spend as little as 15 minutes counting birds on one day, or go out hiking and count birds for each of the 4 days of the event. To get involved, check out www.birdsource.org/gbbc/kids. Here you will find information about what kinds of birds live near you, how to identify the birds and how to report the results of the birds you spot.

In addition to having fun, you also will be taking on the role of a "climate steward." Every year, the results of the Bird Count are tallied up and scientists are able to get a snapshot of where each species of bird is most concentrated in North America at that time. After comparing results from year to year, scientists can get an idea of how the migratory patterns of different species are changing through time to adapt to global climate change. You can participate in this activity no matter where you live, and make a real difference in helping us understand the way our ecosystems are changing due to climate change.

FOR MORE INFORMATION

- The Eastern Forest Partnership offers a great map of the eastern forest. www.easternforest.org/resources/EFP_poster.pdf
- A scientific paper by Louis Iverson of the U.S. Forest Service describes potential impacts of climate change on eastern U.S. forests. www.fs.fed.us/ne/newtown_square/publications/other_publishers/OCR/ne_2002_iverson001.pdf
- The Forest Service Northern Research Station Climate Change Bird & Tree Atlas allows you to examine current distributions and modeled future-climate habitats for 134 tree species and 150 bird species. www.nrs.fs.fed.us/atlas
- The U.S. Forest Service Climate Change website provides links to Forest Service programs and websites that offer additional information and materials. www.fs.fed.us/climatechange
- The U.S. Forest Service Climate Change Resource Center provides information on climate change and its impacts on forests. www.fs.fed.us/ccrc/
- The Natural Inquirer Science Education Journal is a middle-school science education journal that brings U.S. Forest Service research to life. The Climate Change Collection has articles with hands-on activities on climate change topics. www.naturalinquirer.usda.gov/
- The U.S. Forest Service Eastern Forests Environmental Threats website helps you learn more about forest threat topics such as invasive species, climate change, and fire. www.forestthreats.org/

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