

## CLASSROOM ACTIVITY

# The Ecology of Climate Change

The boreal biome, the sweeping band of conifer forest just south of the Arctic Circle, is a key region for studying climate change—and not just the impacts. Certainly, with boreal forest fires growing more frequent and boreal permafrost melting faster than ever, the area is responding very visibly to the rise of carbon in the atmosphere. Yet the trees and permafrost themselves are vast reservoirs of carbon. Ecologists like Scott Goetz of Woods Hole Research Center and Ted Schuur of the University of Florida are keen to understand how climate change is altering the way the boreal biome adds to and takes up carbon from the atmosphere. This Science Bulletins video highlights ongoing experiments in Alaska that aim to unravel these complex feedbacks so scientists can better predict future outcomes as climate change continues.

## CLASS DISCUSSION

### Establish Prior Knowledge

Call on students to share what they know about the carbon cycle. To start the discussion point out that carbon is found in Earth's major reservoirs: the atmosphere, oceans, living organisms, and solid Earth. The processes by which carbon cycles through these reservoirs include photosynthesis, decomposition, respiration, sedimentation, erosion, and volcanism. Call on students to explain how these processes add or remove carbon. If necessary, direct them to this online resource:

[http://www.amnh.org/exhibitions/climatechange/images/today-cycle\\_carbon\\_graphic.jpg](http://www.amnh.org/exhibitions/climatechange/images/today-cycle_carbon_graphic.jpg)

Tell students that in the video they are about to see, scientists are looking at how climate change is affecting boreal forests and permafrost in Alaska, and how these changes, in turn, impact both the absorption and release of carbon.

### Exploration

Before watching the feature have students read the synopsis. As they watch they should take notes about the data WISE will collect. After viewing, use the following questions to guide a class discussion.

- What types of trees make up the boreal forest? (*Answer: The trees are mostly conifers, but deciduous trees such as aspen and birch are also found there.*)
- Why are scientists studying boreal forests? (*Answer: They want to know how the forests are changing due to warming temperatures and how these changes might affect climate.*)
- How have more frequent fires altered these forests over the last ten years? (*Answer: Because of drying, the fires have become more frequent and more severe. After the burn, deciduous trees tend to grow back, out-competing the conifers.*)
- How does an increased number of deciduous trees affect climate? (*Answer: They grow faster than conifers, are more productive, and take up more carbon through their productivity. They also reflect more light back into the atmosphere, rather than absorbing it. This helps lessen the warming effects of climate change.*)
- What is permafrost? (*Answer: Permafrost is permanently frozen ground that contains pockets of carbon, the remains of plants and animals that have accumulated over thousands of years.*)
- What would happen if the permafrost melts? (*Answer: The carbon stored in the permafrost would be released.*)

### Wrap-Up

Use this question to wrap-up the discussion:

- What do scientists hope to discover through the data they collect from the forests and their experiments? (*Answer: They want to get an idea of the annual movement of carbon between the ecosystem and the atmosphere in order to better understand the future outcomes of climate change.*)