GREAT LAKES
CLIMATE CHANGE CURRICULUM

An Earth Systems Education effort of the Ohio Sea Grant College Program and Ohio State University

These lessons and activities introduce students to the effects of climate change on the Great Lakes region through classroom activities and outdoor labs. The lessons are developed for classroom teachers, but most can be adapted for informal education settings. Materials are available for download at *go.osu.edu/climatelessons*. Webinar presentations related to many of the lessons are available at *changingclimate.osu.edu/webinars/archives*.

Greenhouse Gases
How do greenhouse gases affect heat absorption?

The Earth's climate depends on the amount of solar radiation received and the atmospheric abundance of clouds and greenhouse gases. Certain gases have been increasing in concentration in the atmosphere on a timeline concurrent with increasing global temperature. In this hands-on lab, students simulate a portion of the greenhouse system using carbon dioxide.

Global and Great Lakes Climate Change
Is the globe warming? Is there evidence in the Great Lakes region?

Groups of students graph data reflecting temperature anomalies over a short period in the recorded climate history of the world or in part of the Great Lakes region. Using only their own data, they predict how their actual temperature anomaly trend might continue; then student groups assemble and observe the trend of the 130-year data set. In addition to the science of the lesson, important conclusions can be drawn about how the construction of a graph scale can influence how data are interpreted.

Visualizing Changes in the Great Lakes

Teacher Activity A: Which Great Lakes factors will increase and which will decrease as a result of climate change?
As we consider the impacts of climate change on the Great Lakes, there are a number of ways of visualizing those effects. In this activity, students construct a concept map of things that may increase or decrease as a result of a changing climate.

Teacher Activity B: What will people see on the long walk to the water's edge?
Students examine information about how climate change will likely impact the Great Lakes of North America and assume that they are in a part of the region experiencing a water level decline of over two meters! They listen to [or read] a story in which they imagine that they have spent a lifetime visiting the Great Lakes. With their "memories" and their science information, they describe the changes they have noticed in the Lakes during their lifetime.

Learning with Google Earth
How Will Climate Change Affect a Great Lakes State?

To make climate change relevant to students, they need examples of changes that are occurring or are expected in areas near them. This lesson uses examples of climate change from one Great Lakes state, Ohio, to determine local relevance of climate change. An online source provides similar information for other states.

Climate Change and Aquatic Invaders
What do scientists know about aquatic nuisance species of the Great Lakes and effects that climate change will have on them?

Students use references, inference, and observation to match cards that identify aquatic nuisance species and explain the effects of global climate change on these species.

Trees on the Move: Can Maples and Buckeyes Migrate?

Activity A: What do climate models predict about tree ranges?
This lesson introduces examples of how General Circulation Models [GCMs] predict possible scenarios of climate change. Three methods of visualizing change are introduced, and students compare how the climate niches of sugar maples and buckeye trees are likely to be altered.

Activity B: How can trees migrate?
The seeds of maples and buckeyes are "dispersed" in an outdoor simulation of how far a tree species might be able to spread over several tree generations.

Activity C: How does temperature affect maple seed germination?
Students examine research data on seed germination at different temperatures to infer some of the impacts of temperature on species survival.

Activity D: After the maples, then what?
Students study an outdoor area that has sugar maples and other species. They catalog the size and relative abundance of species in the plot and infer what species is likely to succeed if maples disappear.

Cars on Trial
How Do Energy Use Decisions Influence Global Climate Change?

This activity encourages discussion about energy use decisions, greenhouse gases, and global warming. Students role play a courtroom trial to discuss energy use as it is related to climate change: Cars are accused of emitting a dangerous gas (carbon dioxide) into the atmosphere, and students (the jury) must decide how harmful they think automobiles really are and what, if anything, should be done about them.

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