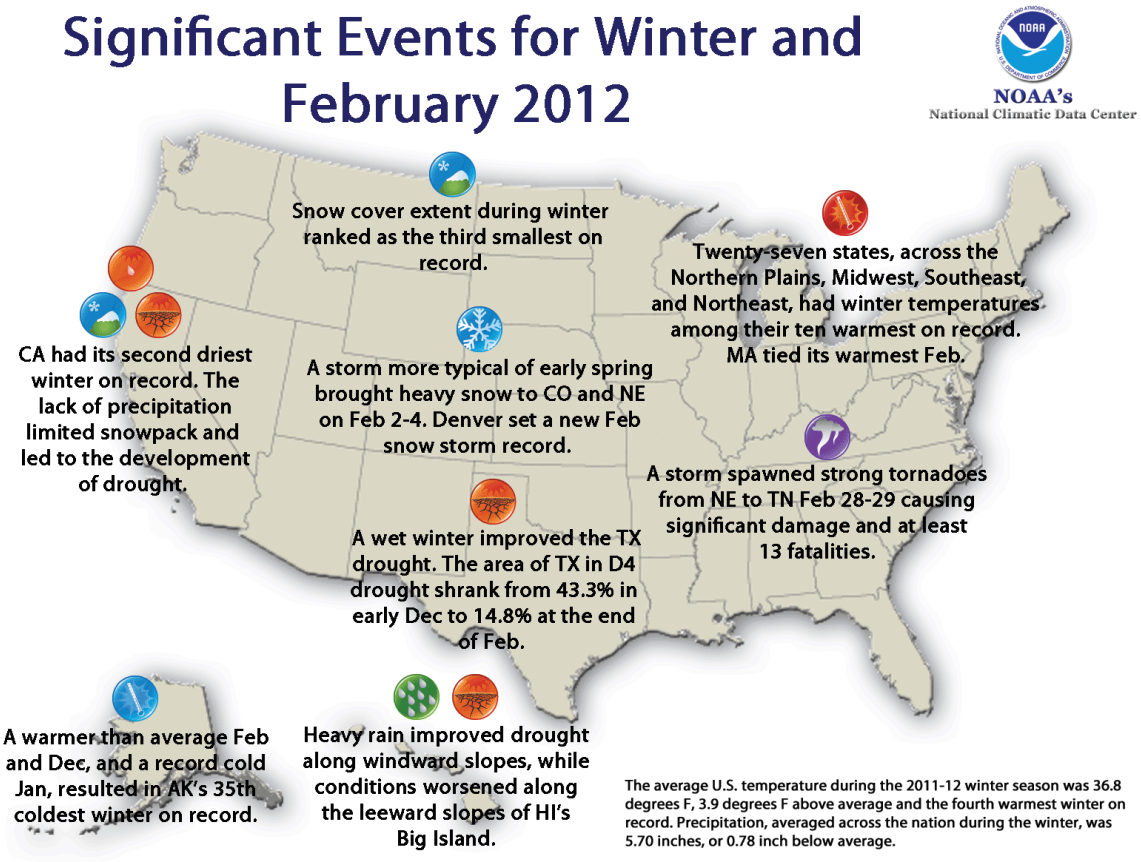
HOW WILL CLIMATE CHANGE AFFECT A GREAT LAKES STATE?

(Background and Teacher Guide)

According to the National Climatic Data Center, the winter of 2011-12 — collectively December, January and February — was the fourth-warmest for the lower 48 states since record-keeping began more than a century ago. For several days in mid-March, the high temperature in Chicago was 85 °F. Weather extremes were not limited to temperature and heat, however, as the NCDC map indicates. Syracuse, NY, where annual snowfall typically exceeds 115", accumulated only 50.6" in the winter of 2011-12. Of the NCDC's list of Top Snowiest Cities in the U.S., eight are in the Great Lakes region.

We have heard the reports about sea levels rising, glaciers melting and the consequences of climate change to animals, like polar bears, in the Arctic. For climate change to be relevant to students, they need examples of change from nearby. What are the consequences of climate change in a Great Lakes state like Ohio?



Activity developed by high school teacher Susan Wasmund for a course on Teaching with Google Earth, Summer 2010. Updated 2012.

Teacher Activity: How will climate change affect a Great Lakes state?

BACKGROUND

To make climate change relevant to students, they need examples of changes that are occurring or are expected in areas and enterprises near them. If it doesn't snow, what happens to winter recreation? If it doesn't rain, what happens to production of corn and dairy products? If the water levels change, will fish be able to find places to spawn? This lesson uses examples of climate change from one Great Lakes state, Ohio, to determine local relevance of climate change. To customize the information for other states, you may wish to use the information at ***http://www.cier.umd.edu/climateadaptation/*** and have tech-savvy students develop a Google Earth tour like this one! The developers of this lesson would be pleased to attach your kmz along with Ohio's!

Objectives: When students have completed this activity, they will

- recognize that global climate change will have consequences for the environment and economy of individual states
- be able to give examples of state issues and the consequences of global climate change

Materials:

Per team of 2-3 students: Student handout, computer with current Google Maps application, Ohio Climate Change Effects Tour.kmz file

Teacher's Note:

Be sure Google Earth's latest version is downloaded to computers in advance [free at ***http://earth.google.com***]. Video tutorials are available on the download site if you need some basic training. Within the application, choose File > Open and navigate to the "Ohio Climate Change Effects Tour.kmz" file included with this lesson. This will insert the file as a "Temporary Place." If you wish to leave the climate change tour in Google Earth for later use, you will get an opportunity to save it within "My Places" when you close the program. To shorten the time needed for the computer part of the lesson, minimize Google Earth on the computers rather than closing it.

Time Required 1 class period, for Google Earth activity, 1 class period for Write Around and wrap-up activity

ALIGNMENT WITH STANDARDS

National Framework for K-12 Science Education:
CC2: Cause and Effect: Progression
CC7: Stability and Change: Progression
Core Idea LS2: Ecosystems dynamics, functioning and resilience
Core Idea ESS3: Human impacts on Earth systems; global climate change

Great Lakes Literacy Principles:
#1E, G, H, I: Changes in water systems, lake levels, stratification, finite resources
#3A, E: The Great Lakes influence weather and climate, and are influenced by larger climate change patterns.
#5F, I: Great Lakes habitats are defined by environmental factors. Life in the Great Lakes has been altered by non-native plant and animal species.
#6A, C, D, E, F: The Great Lakes and humans in their watersheds are inextricably interconnected.
#7C, F: The future sustainability of Great Lakes resources depends on our understanding of resources and their potential and limitations. This requires collaboration among professionals in science, technology, engineering and math, as well as public outreach and education.
#8A, D, E, F: The Great Lakes are socially, economically and environmentally significant to the region, the nation and the planet.

Climate Literacy Principles:
#2D: The abundance of CO_2 is increased through deforestation and the burning of fossil fuels as well as through other processes.
#3A, D: Life on Earth depends on, is shaped by, and affects climate.
#6C: Human activities are impacting the climate system.
#7B, C, E, F: Climate change will have consequences for the Earth system and human lives.

ENGAGE

Ask students to brainstorm some climate change impacts. Typically these will include sea level rise, polar bear impacts, melting ice sheets, warmer temperatures. For each item on the list, check whether it is a local, state, national or regional impact. Chances are most impacts will be global or national, rather than something that might be expected in Ohio! Challenge students to think about Ohio impacts during the lesson to come.

EXPLORE

Students use Google Earth to learn how climate change affects Ohio industries, animals and people, following the steps below. The lesson can be altered to other states by anyone with appropriate technology skills.

1. Open Google Earth.
2. Open "*Ohio Climate Change Effects Tour.kmz*". It should open with the state of Ohio framed on the screen.
3. In the Places menu on the left side of the screen, students click on Placemark A. The map will fly to that area. Still in the Places menu, they click on the blue title for that placemark. In each placemark, students should read the information, look at the image and answer the question. They will probably need to click on the links in the placemarks to help find the answer.
4. Students visit all 14 locations and answer questions on the student handout.

EXPLAIN

The next part of this activity is called Write Around. In groups of 5, students complete the Introductory Phrase as a sentence. When students appear to have a sentence written, direct them to pass their paper to the left. They read the complete first sentence and add another complete sentence to strengthen the topic sentence. Watch for completion, then direct students pass that paper to the left and continue the process until they have their own paper. Depending on class maturity and attention span, you may be able to let the groups continue at their own pace. Finally, each is to write a concluding sentence to complete her/his original idea.

EXTEND

Discuss with the students the kinds of things people in Ohio could do to deal with [or prevent] the changes that are occurring in various industries or with climate in general. For instance, farmers could change to drought-resistant crops; individuals could limit their driving to prevent CO_2 from entering the atmosphere. With various suggestions, discuss the costs and benefits of the action. Maintain a focus on using science as the basis for responding to the issues.

EVALUATE

Students may be assessed on the completion of the answers to 14 questions on the tour and subjectively on their Write Around activity.

ADDITIONAL RESOURCES

Climate Change Outreach Team, The Ohio State University and partners. Archived webinars and resources for learning about climate change impacts in the Great Lakes region. ***http://changingclimate.osu.edu/***

Economic Impacts of Climate Change on Ohio, CIER - University of Maryland, July 2008. ***http://www.cier.umd.edu/climateadaptation***
Clickable map leads to information on other states.

Effects of global warming on the state of Ohio. ***www.e2.org/ext/document.jsp?docId=5410***

Climate change health threats in Ohio. ***http://www.nrdc.org/health/climate/oh.asp***

Climate change myths and misconceptions. ***http://www.newscientist.com/article/dn11462-climate-change-a-guide-for-the-perplexed.html***

Additional Great Lakes Climate Change lessons are available from Ohio Sea Grant.
Please call 614.292.8949 for more information.

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Name _____ Period _____

Student Activity: How will climate change affect a Great Lakes state?

In this lesson you will use a Google Earth tour of Ohio with Placemarks identifying environmental and economic issues of climate change in Ohio.

1. Open Google Earth.
2. Open the Ohio Climate Change Effects tour. Be sure the state of Ohio is framed on your screen.
3. In the Places menu on the left side of the screen, click on Placemark A. The map will fly to that area. Still in the Places menu, click on the blue title for that placemark. Read the information, look at the image and answer the question. You may need to click on a link to help you find the answer.

Record your answers in the following spaces.

A. Northwest Ohio [precipitation, flooding]

B. Farming

C. Reservoirs and drinking water

D. Dairy products

E. Shipping

F. Sediments and pollution

G. Wildlife

H. Invasive species

I. Forestry

J. Human health

K. Energy

L. Forest fires

M. State budgets

N. Fishing

HOW WILL CLIMATE CHANGE AFFECT A GREAT LAKES STATE?

Name _____ Period _____

Write Around

1. In a group of five students, complete the Introductory Phrase as a sentence. When directed, you will pass your paper to the left. Read the complete first sentence. Add another complete sentence to strengthen the topic sentence. When done, pass that paper to the left and continue the process until you have your own paper. Write a concluding sentence to complete your original idea.
2. As a group, discuss your papers.
3. Write several sentences about what could be done to help our state and planet.

Climate change will affect me by:

1. _____

_____

_____

2. _____

_____

_____

3. _____

_____

_____

4. _____

_____

_____

5. _____

_____

_____

6. _____

_____

_____

This is what could be done:

REFERENCE

National Climatic Data Center, national climate report by month [url for February 2012]: ***http://www.ncdc.noaa.gov/sotc/national/2012/2***

