



Impact of Climate Change on Ecosystems Webquest

Overview

In this webquest, students use maps to relate global temperature change to changes in the range of insects and birds and projected changes in tree range. The activity could be used to teach a lesson via class discussion and/or written response; it could be completed by students in cooperative groups on paper or with shared computers; on the other hand, it could be completed by individual students with separate computers or paper.

Objectives

1. Students will use internet sources to investigate climate change.
2. Students will relate temperature change to changes in insect, bird, and tree ranges.

Lesson Preparation

Students should have a basic understanding of ecosystem interactions.
Students should understand how to follow instructions to do an internet search.
Students should be able to interpret data from line graphs.
Students should be able to interpret data from maps.

Procedure

1. Go to NASA's "Global Climate Change: Vital Signs of the Planet" at <http://climate.nasa.gov/vital-signs/global-temperature/>
2. Read the introduction, observe the graph, and activate the map animation.
3. Discuss the data shown on the graph. Guide students to understand that the graph shows divergence from a baseline. Identify trends for 1880-1930, 1940-1980, and post-1980.
4. Discuss the data shown on the map animation which shows the global warming trend.
5. Go to "Agricultural Adaptation to Climate Change in Yolo County" at <http://agadapt.ucdavis.edu/pestsdiseases/> and read the first two paragraphs.
6. Discuss how climate change affects agricultural pests and disease.
7. Go to UCAR's "Climate Change and Vector-Borne Disease" at <http://scied.ucar.edu/longcontent/climate-change-and-vector-borne-disease> and read the first five

Details

- Lesson
- Arctic
- About 1 period
- Download, Share, and Remix
- Middle School and Up

Materials

Access to a computer and the Internet

Standards

Next Generation Science Standards

Disciplinary Core Idea

MS-LS2-2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

Practices

Analyzing and Interpreting Data
Obtaining, Evaluating, and Communicating Information

Cross-Cutting Concepts

Patterns
Cause and Effect
Stability and Change

paragraphs.

8. Discuss why climate is important for understanding where and when parasitic diseases cause illness in humans and why climate change can cause a change in disease distribution. Use the malaria map to observe change in disease range.
9. Go to the EPA's "Climate Change Indicators" at <https://www.epa.gov/climate-indicators/bird-> (<https://www.epa.gov/climate-indicators/bird->) wintering-ranges and read the graph caption and 'Background' section.
10. Discuss the meaning of latitude first. Then use the graph and discuss the relationship of bird range to latitude. How might bird species be affected by climate change?
11. Go to the EPA's "Climate Change" at <https://www3.epa.gov/climatechange/impacts/forests.html> (<https://www3.epa.gov/climatechange/impacts/forests.html>) and read the first two paragraphs.
12. Discuss how forests benefit society.
13. Enlarge the eastern United States tree range maps. Discuss the projected changes in tree range for various types of trees.
14. Go to Ecology "Effects of Climate Change on Biodiversity" at <http://sites.sinauer.com/ecology3e/ccc24.html> (<http://sites.sinauer.com/ecology3e/ccc24.html>) Discuss projected tree diversity for your state.
15. Finally, discuss climate change in general. Have students write a paragraph in which they discuss the impact of climate change on natural communities. Ask them to support their claims with evidence taken from the readings, graphs, and maps.

Resources

"Agricultural Adaptation to Climate Change in Yolo County". University of California Davis. <http://agadapt.ucdavis.edu/pestsdiseases/> (<http://agadapt.ucdavis.edu/pestsdiseases/>)

Cain, Michael L., Bowman, William D., Hacker, Sally D. "Effects of Climate Change on Biodiversity". Ecology. Third Edition. Sinauer Associates. 2014. <http://sites.sinauer.com/ecology3e/ccc24.html> (<http://sites.sinauer.com/ecology3e/ccc24.html>)

"Climate Change". Environmental Protection Agency. August 2, 2016. <https://www3.epa.gov/climatechange/impacts/forests.html> (<https://www3.epa.gov/climatechange/impacts/forests.html>)

"Climate Change and Vector-Borne Disease". Center for Science Education. 2011 <http://scied.ucar.edu/longcontent/climate-change-and-vector-borne-disease> (<http://scied.ucar.edu/longcontent/climate-change-and-vector-borne-disease>)

"Climate Change Indicators". Environmental Protection Agency. August 2, 2016. <https://www.epa.gov/climate-indicators/bird-wintering-ranges> (<https://www.epa.gov/climate-indicators/bird-wintering-ranges>)

"Global Climate Change: Vital Signs of the Planet". NASA. August 3, 2016. <http://climate.nasa.gov/vital-signs/global-temperature/> (<http://climate.nasa.gov/vital-signs/global-temperature/>)

Assessment

Assessment will depend on how the activity is implemented. If it is used as a lesson with discussion, then there may be no written product. If there is a written product (see the Student Investigation Sheet), then answers can be assessed for accuracy. The final paragraph should make at least one reasonable claim and be supported with facts from any of the resources.

Author/Credits

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CLIMATE CHANGE IMPACT WEBQUEST - STUDENT INVESTIGATION SHEET

Name: _____ Date: _____
Lab role: _____

Objectives:

Students will use internet sources to investigate climate change.

Students will relate temperature change to changes in insect, bird, and tree ranges.

Activity:

1. Go to "NASA Global Climate Change Vital Signs of the Planet"
<http://climate.nasa.gov/vital-signs/global-temperature/>
2. Read the introduction and observe the graph.
3. Describe the temperature changes displayed on the graph. Be sure you understand what the graph actually displays; look carefully at the y-axis.
 - a. Specifically, what general statement can you make about the average global temperature between 1880 and 1930 compared the the baseline?
 - b. What general statement can you make about the average global temperature between 1940 and 1980 compared to the baseline?
 - c. What general statement can you make about the average global temperature after 1980 compared to the baseline?
4. Activate the map animation.
 - a. What color does yellow represent on the map? _____
 - b. What color does blue represent on the map? _____
 - c. How does the map change between 1884 and 2015? Make a general statement about the shift in map color over that period of time.
5. Go to "Agricultural Adaptation to Climate Change in Yolo County"
<http://agadapt.ucdavis.edu/pestsdiseases/> and read the first two paragraphs.
6. How are pests and diseases able to survive in new environments?
7. Go to UCAR's "Climate Change and Vector-Borne Disease"
<http://scied.ucar.edu/longcontent/climate-change-and-vector-borne-disease>
8. Read the first five paragraphs.
 - a. Why is climate important for understanding where and when parasitic diseases cause illness in humans?

- b. Look at the malaria map. Why can climate change cause a change in where malaria occurs?

9. Go to the EPA's "Climate Change Indicators" at <https://www.epa.gov/climate-indicators/bird-wintering-ranges> and read the graph caption and 'Background' section.

10. Be sure that you remember what 'latitude' means.
 - a. Study the graph. How has the relationship of winter-time bird population and latitude changed since 1965?

 - b. List three different ways that bird species might react to climate change?

11. Go to the EPA's "Climate Change" at: <https://www3.epa.gov/climatechange/impacts/forests.html>

12. Read the first two paragraphs and describe some ways in which forests benefit society.

13. Enlarge the eastern United States tree range maps. Discuss the projected change in tree range for
 - a. Longleaf-slash pine:

 - b. Loblolly-shortleaf pine:

 - c. Oak and pine:

 - d. Oak and hickory:

 - e. Maple, beech, and birch:

14. Go to Ecology "Effects of Climate Change on Biodiversity" at: <http://sites.sinauer.com/ecology3e/cc24.html>

Look at projected tree diversity for your state. Is it expected to increase or decrease? _____

15. Write a conclusion paragraph to explain the impact of climate change on natural

communities. Support your claims with evidence taken from the readings, graphs, and maps.