Teacher Guide
Climate Change and Biomes

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Activity Focus: Students analyze and interpret maps involving climates and biomes. Students create a biome map for the decade of 2050’s.

Major Concepts: Greenhouse gases (CO₂, methane, water vapor and nitrous oxides) may be increasing global warming. Global warming may be creating climate change. Climates help determine natural habitats (biomes). Biome maps need to be changed as climate change occurs.

Objectives: After completing this activity, students will be able to:

- state that precipitation and temperature determine climates.
- explain how climates help determine biomes.
- explain how biomes effect climates.
- explain how greenhouse gases increase global warming which may create climate change
- compare temperatures and precipitation to different time periods to see climate changes.
- explain similarities between climate zones and biome maps.
- create a new biome map for the 2050’s decade using predicted temperature and precipitation variance maps.

Materials and Preparation: You will need to prepare the following materials before conducting this activity.

- Copy the Climate Change and Natural Habitats (Biomes) data interpretation and visualization activity (make 1 copy per student).
- Provide each student/group with a blank North American map and colored pencils for redrawing the biomes for the 2050 decade.
- Make a transparency or PowerPoint slide for each map and figure.

Procedures: Students may work individually or as a group to complete the remaining aspects of the activity.

1. Introduce the activity by asking students to identify some of the factors that influence climates. How do these climatic factors affect natural habitats (biomes)? Answer the “What I currently know and think” questions before starting the activity. You may want to discuss these as a class.
2. To complete the *Explore and Explain* portion of the activity, students will need to look at figure 1 to try and understand the relationships between temperature, precipitation, and biomes. Figure 2 show a map of the current biomes.

3. For the *Extend* portion of the activity, greenhouse gas emissions and how they may contribute to global warming are explained. Changes in surface temperature and precipitation maps for the time period of 1976-2006 will be provided to see if there are any increases or decreases in those climatic factors.

4. Two new maps are shown in the *Apply* section. These maps show increases/decreases in precipitation and temperature for the 2050 decade. Discuss these new maps to help student understanding of the climatic changes. Have students create a new biome map for the 2050 decade. Blank maps of North America as well as colored pencils will be provided. Have students complete the questions in the *Apply* section after they complete their maps. Discuss the activity as a class; asking students to share their responses. Have several groups share their maps with their explanations.

Extra web site on biome changes:
http://www.oznet.ksu.edu/johnson/hort/articles/confusing_hardy_zones.htm

5. Have students reflect on their ideas by re-answering the engage questions writing their responses to the “what I now know and think” questions and have them reflect on their own thinking by completing the “how my ideas and thinking have changed” question.


**Assessments:** The following assessments may be used as a pre/post activity assessment or as part of a module assessment.

- What climate features affect biomes?
- How do biomes affect climates?
- How do climate features change with increase of greenhouse gases?
- How will (prediction) new biome maps change in the next decade if climate change is happening?
**Quiz:** The following quiz may be used as a post activity assessment.

The burning of fossil fuels which increase greenhouse gases contributes to what?

Temperature predictions for North America (2050 decade) are:
- A. Staying the same
- B. Increasing
- C. Decreasing
- D. Increasing and decreasing in different areas.

Precipitation predictions for North America (2050 decade) are:
- A. Staying the same
- B. Increasing
- C. Decreasing
- D. Increasing and decreasing in different areas.

**Bibliography**

Environmental Science/Eleventh Edition/G. Tyler Miller,Jr.
Brooks/Cole 2006

Greenhouse gases and climate changes
[http://www.epa.gov/climatechange/basicinfo.html](http://www.epa.gov/climatechange/basicinfo.html)

Climate Zone Map
Earth Science, Prentice Hall Science, 2005

Biome Map
[http://www.mobot.org/education/02programsresources…biomes.htm](http://www.mobot.org/education/02programsresources…biomes.htm)

Temperature and Precipitation Maps
Midwestern Regional Climate Center (MRCC)
[http://mcc.sws.uiuc.edu/](http://mcc.sws.uiuc.edu/)

Biomes and Climates
[http://www.blueplanetbiomes.org/world_biomes.htm](http://www.blueplanetbiomes.org/world_biomes.htm)
Appendix:
The Greenhouse Effect

Some of the infrared radiation passes through the atmosphere, and some is absorbed and re-emitted in all directions by greenhouse gas molecules. The effect of this is to warm the Earth's surface and the lower atmosphere.

Solar radiation passes through the clear atmosphere.

Some solar radiation is reflected by the Earth and the atmosphere.

Most radiation is absorbed by the Earth's surface and warms it.

Infrared radiation is emitted from the Earth's surface.