Climate change

Lesson Map: https://esriurl.com/earthgeoinquiry15mv

Engage

How can we determine very slow changes in the environment?

➔ Click the map URL above to open the map.

➔ Ask students if they have heard somebody older speak about when the first snowfall occurred when they grew up, when leaves started to change, or which months were the rainiest as they grew up. *[Answers vary but often include: first snow was before Halloween, or it was usually rainier in the fall.]*

➔ Click **Layers** on the dark toolbar.

? What was the winter of 2014 like where you live?

➔ One at a time, turn on the four seasonal anomaly layers that show how different the temperature was in 2014 from the 30-year average (1950-1980) in Celsius. (See tooltip on next page.)

➔ Click **Legend** on the dark toolbar.

? How can 2014 be the hottest year on record when most of central and eastern North America experienced the very cold "polar vortex" during the winter season?

Download student worksheet here.

Time
30 minutes

Activity

Find areas that are predicted to change because of climate change.

Learning Outcome

Students will be able to:

- Describe changes in global temperature and precipitation amounts and infer their consequences on current bioregions.

ACARA Curriculum Link (8.4)

Year 10 Science: Science as a Human Endeavour

ACSHE194

Unit 4 Senior Curriculum: The changing Earth – the cause and impact of earth hazards

ACSES106| ACSES108

Teacher Feedback:

To share your feedback on this, or any Spatial Activity, please contact education@esriaustralia.com.au

Explore

What's the big deal with a few-degree increase in temperature? 10-50 degrees?

→ A 3° Celsius increase in temperature can make a big difference. The last ice age ended because of a 4° C rise.

? What regions of the planet had the greatest increases in temperature during 2014? *[the polar extremes].*

→ Turn off the four seasonal anomaly layers. (See tooltip on net page.)

Explain

Why would some areas of the earth warm more than others?

? If the sun is not brighter and the sun-to-earth distance has not decreased, where does this extra heat come from? *[Less light energy is reflected (less snow/ice to reflect light), and more is absorbed and re-radiated as infrared. Infrared light is more easily absorbed by the atmosphere, thereby heating up]*

? Where are the areas farthest above the normal? *[The areas toward the poles are farthest above the normal.]*

? Why would areas normally covered in snow and ice experience much higher than normal temperatures? *[If the snowfall starts later and melts earlier, then the dark earth absorbs more sunlight]*

Elaborate

How would warmer conditions affect precipitation?

→ Click Bookmarks on the dark toolbar. Select North America.

→ Turn on the layer Climate Shifts Koeppen-Geiger. (See tooltip below.)

→ Click **Time** on the light toolbar if not already selected.

→ The data set allows for global, time-based animation of climate patterns from 1900 to 2100. The default display shows the last 100 years, using an increment of 5 years. (See tooltip below to modify the increment.)

→ Click the **Play** button.

? What happens to the dark green warm temperature zones? (These are wetter, forested areas.) *[Most move toward the poles and expand.]*

? What happens to the dry climate zones of desert and neighbouring grasslands in the U.S.? *[Arid grasslands expand and move northward. The deserts expand north through the western Plains states]*

? What economic activity do grasslands provide in North America? *[farming, especially wheat].*

Evaluate

Can the concepts in North America be extended to other continents or regions?

? Which countries would appear to have the most concern about losing their grassland food production areas (tan) to desert (brown)? *[Countries on Africa's southern Saharan border continue to lose grassland grazing to poor grazing practices, combined with climate changes. Australia's eastern crescent area contains large areas of grain farms and would be very susceptible to warmer, drier conditions]*

? Do you think the Steppes (prairies) of Asia in southern Russia and Kazakhstan have as much to worry about with grassland loss as the southern Great Plains of North America? *[No. They do not appear to be affected in the same way.]*

Next Steps:

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