

## Climate Hotspots with Google Earth Teacher Guide

In this activity, students will use Google Earth to explore several locations where rapid climate change is occurring. They will:

1. Use Google Earth to explore 5 hotspot locations indicating recent changes in climate patterns.
2. Understand that climate change is not restricted to North America and is happening on a global scale.
3. Understand that climate warming has already caused changes in landscape features (glaciers) and organisms' habitats.

Model the following procedural instructions with your students. It is recommended that you display your computer image at the front of the classroom.



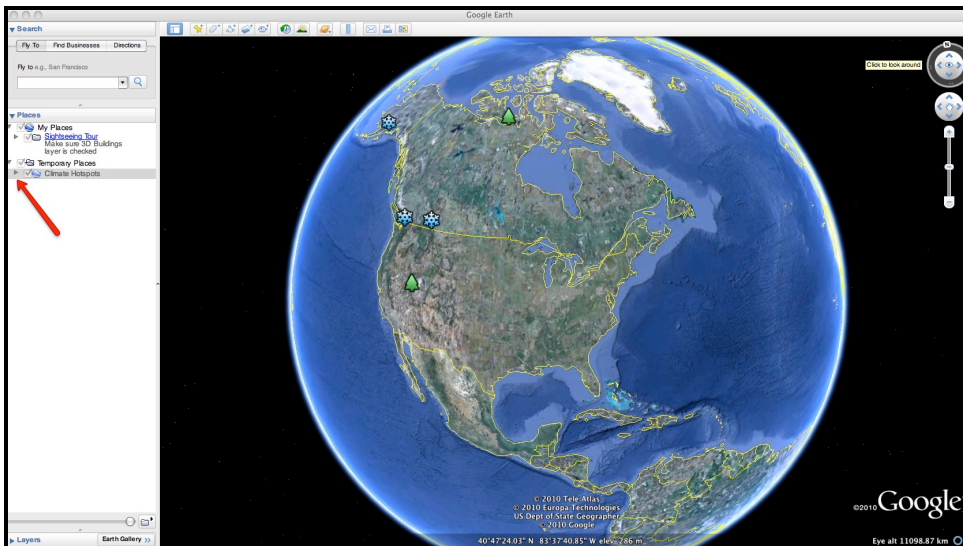
### Step 1: Download Data

- a. Open your Web browser. Go to [www.ei.lehigh.edu/learners/cc/](http://www.ei.lehigh.edu/learners/cc/).
- b. Under Climate Hotspots, click on **Google Earth file: climatehotspots.kmz**.

The file is displayed in Google Earth.

Note: If the file download does not automatically launch Google Earth, double-click on the downloaded file **climatehotspots.kmz** to launch Google Earth.

- c. Click the arrow to the left of “**Climate Hotspots**” in the left panel (see red arrow below).



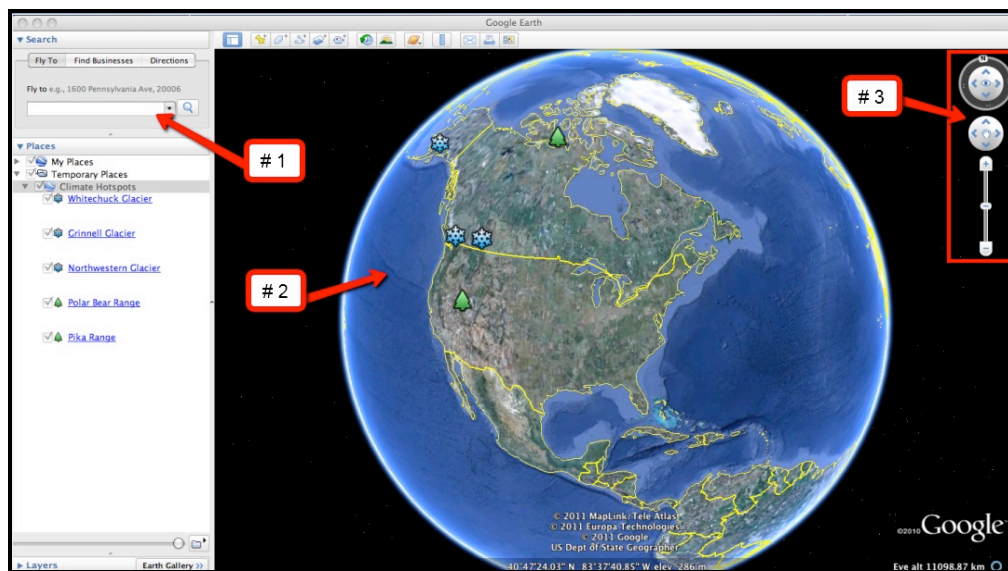
d. The “Climate Hotspots” drop-down list will extend (see below). If you cannot see the whole list, scroll down.



### Step 2: Basic Features of Google Earth

Note the following Google Earth features, tools, and navigation controls in the figure below.

1. **Search Panel** (arrow #1) – Type in the white box to find a location.
2. **3-dimensional (3D) Viewer** (arrow #2) – This window shows the Earth and its terrain.
3. **Navigation Controls** (arrow #3) – Use these controls to zoom, look, and move around. If the navigation controls are not visible, click on View>Show Navigation>Always.



### Step 3: Climate Hotspots Activity

Your students will explore 5 different climate hotspot locations in Google Earth to better understand the effects of climate change. Students will analyze evidence of global climate change and answer analysis questions on their **Climate Hotspots with Google Earth Investigation Sheet**.



Distribute the **Climate Hotspots with Google Earth Investigation Sheet** to each student. Instruct students to navigate to the six hotspot locations in Google Earth.

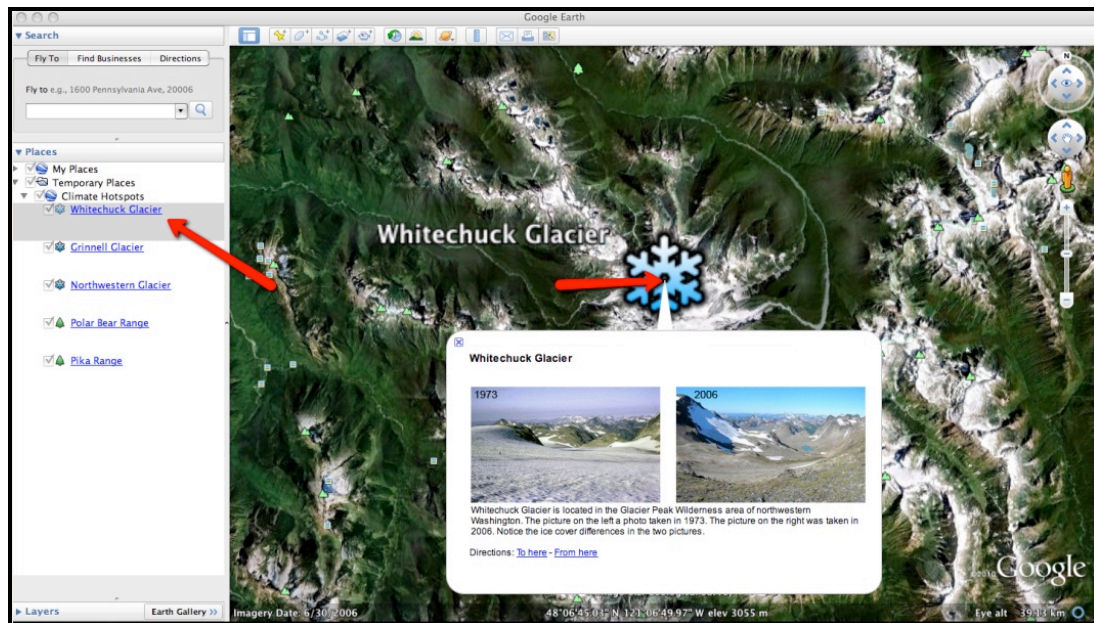


The students can navigate from one location to the next by selecting the hotspot location from the drop-down menu in the Places window or by using the Google Earth navigational tools.

**Note:** If you are zoomed out far enough to view multiple push-pins in the 3D Viewer, you can view the data by selecting the snowflake or tree push-pins.

At each location, students should read the text, observe changes in time-sequence images of glaciers, and observe changes in the habitat range maps of polar bears and pikas. Explain to your students that the glacial images were taken at similar locations during two different time periods. This type of photographic evidence helps scientists observe large changes in a landscape over time. Instruct students to answer the analysis questions on their Investigation Sheet.

- a. Have the students start by investigating changes in glacial coverage. These locations are indicated by “snowflake” push-pins. The students should begin by examining the time-sequence images of the Whitechuck Glacier. This is shown in the picture below. In these Google Earth displays, the older image of the time-sequence pair will be on the left and a more recent image will be on the right. Instruct students to read the displayed text and observe the differences in the land cover between the two pictures. Have students take note of the years associated with each picture.



- b. Next, instruct students to navigate to the Grinnell Glacier location and analyze the differences in the land cover of the two images. Then, they should navigate to the Northwestern Glacier location and observe the land cover changes at that location. Have the students fill in the associated table for the 3 glacier locations. Instruct students to complete **Analysis Questions #1-2** on their Investigation Sheet.
- c. Instruct students to observe changes in polar bear and pika habitats that have occurred over the last century in North America using the navigation tools in Google Earth.
- d. The blue outline indicates the extent of the polar bear habitat range in 1900. The red outline indicates the extent of the polar bear habitat range in 2005. Note to students that the red color is overlaid on top of the blue color. You may need to remind that students that polar bears spend most of their time on sea ice.

- e. When viewing the Pika Range habitat map, students may need to use the scroll bars in the pop up window to read the associated text underneath the picture.
- f. Instruct students to complete **Analysis Questions #3-5** on their Investigation Sheet.