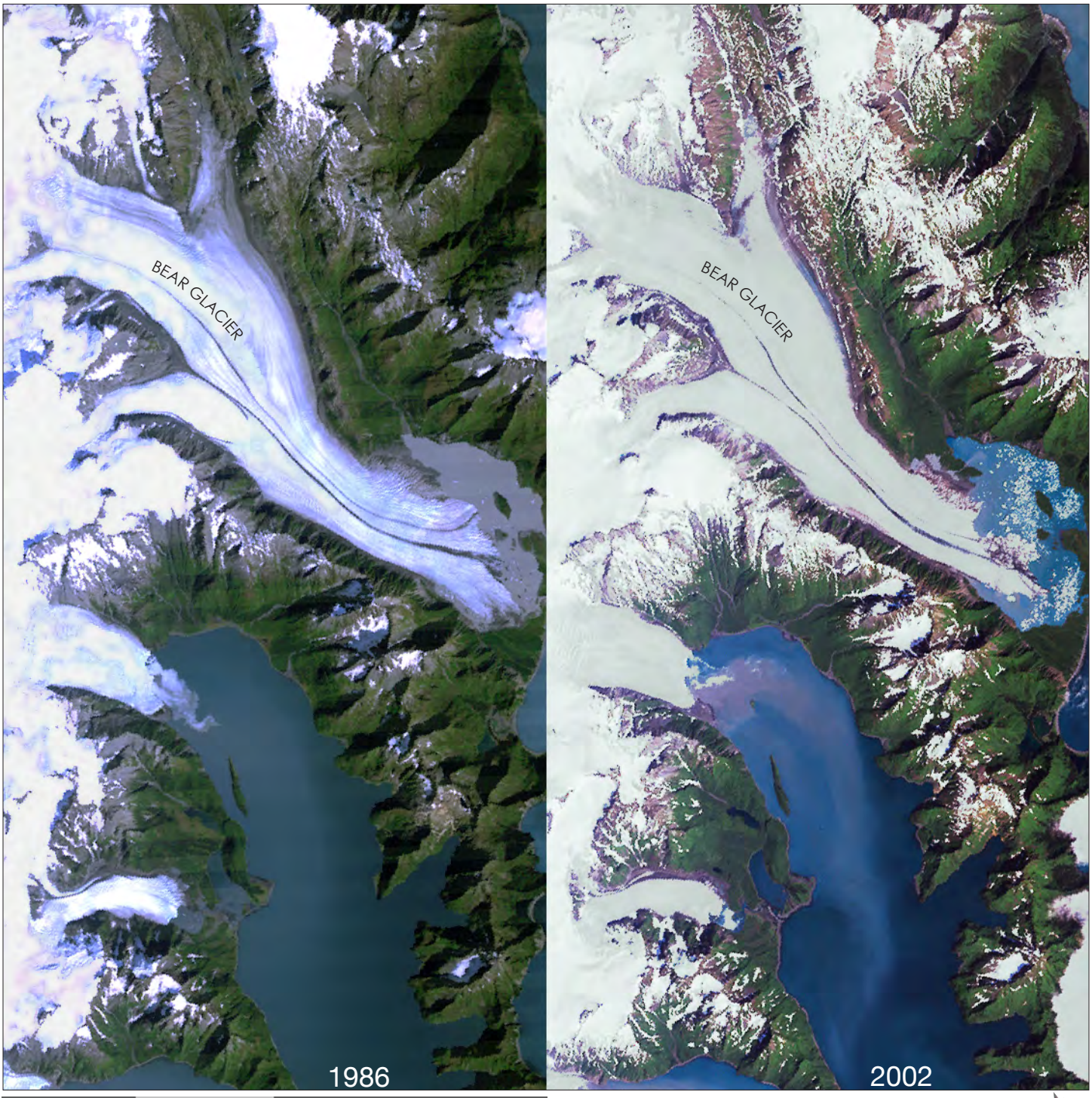
A Sensitive Giant: Alaska's Bear Glacier



Look closely at the massive Bear Glacier shown in these Landsat satellite images and you'll notice significant changes between 1986 and 2002. As the glacier has receded, many pieces of ice have broken off its end. In the 2002 image, you can see them floating like shards of white glass in the blue water. Bear Glacier is shrinking! From the early 1950s–1990s, Bear Glacier thinned about 2.5 feet (0.75 m) per year. Glaciers are particularly sensitive to climate trends, and widespread glacier recession is considered an indicator of global warming.

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Alaska's Bear Glacier: Change Over Time

Goddard Space Flight Center

Inside Kenai Fjords National Park south of Seward in the Chugach Mountains, the long, graceful curves of Bear Glacier trend southeast to its terminus adjacent to Resurrection Bay. Whales, bears, puffins, and seals make their home in this coastal region of constant change. A dark stripe in this massive glacier's interior shows rocks and debris picked up by its downhill journey under the weight of ice and the undeniable force of gravity. Glaciers form when more snow accumulates in winter than is lost in summer. The accumulating snow is compressed into ice, which flows to lower elevations. Ice that melts on the lower end of a glacier tends to be replaced by snow and ice from above. Glaciers that end on land, such as Bear Glacier, become thinner over time if less snow falls, or if temperatures rise. They become thicker if snowfall increases and/or temperatures decrease. Glaciers are sensitive to changes in regional and global climate.

Landsat and other satellites enable scientists to study changing glaciers no matter how cold or inaccessible the landscape. Landsat provides landscape-scale repeat images of each place on the global land surface every 16 days, year after year, cloud-cover permitting. Would you rather observe glaciers from the warmth and comfort of your desk using satellite imagery, or are you the adventuresome type who likes to explore such remote locations in person? (NASA scientists do both!) In any case, you can use these satellite images of Bear Glacier to compare and consider the glacier's extent in 1986 versus 2002. Look specifically at the terminus of the glacier in both images, and then read on.

Local Change, Global Meaning

Though a relatively small number of people may live near Alaskan glaciers, shrinking ice on that northern land may indicate bigger changes for millions of people living elsewhere because the meltwater from shrinking glaciers flows to the ocean and raises sea level. Studies with Landsat and other satellites have revealed that almost all mountain glaciers in the world are retreating. Why? Scientists believe that the thinning ice is caused by warming on a global scale. According to the Intergovernmental Panel on Climate Change (2007) Earth's climate has warmed about 1.3°F (0.74 °C) during the last 100 years. Warmer global temperatures mean warmer oceans, and water expands when it warms, leading to global sea level rise. In addition, Earth's mountain glaciers contain enough water to raise sea level 18 inches (.45 meter) if they should melt.

Concerns with sea level rise include flooding and increasing storm damage in coastal areas worldwide. Half the world's people live in low-lying places next to the sea. Glacial melting also impacts glacier-fed streams that provide water for important ecosystems, and for human endeavors such as farming.

Fortunately, use of satellite data together with other information is leading to a greater understanding of our climate system, climate change, and effects of global warming. This critically important information provides us all with an opportunity to adapt to our changing world. We continue to keep records of Earth so people of the future can compare tomorrow's landscapes with today's, and explore and learn about our fascinating planet.

About Landsat

Landsat satellites provide an unparalleled record of Earth's varying landscapes to help us understand how Earth is changing and what those changes mean for life on our planet. The consistency of Landsat's data from sensor to sensor and year to year, makes it possible to trace land cover changes from 1972 to the present. Landsat sensors have captured over two million digital images of Earth's continents and surrounding coastal regions. These digital images include information from wavelengths of light both visible and invisible to human eyes. NASA designs the Landsat Earth-observing satellites; USGS manages the satellites, archives the imagery, and makes the data available to all interested users.

Location of Kenai Fjords National Park and Bear Glacier in south central Alaska.

Landsat Program

http://landsat.gsfc.nasa.gov
http://landsat.usgs.gov

National Snow and Ice Data Center

All About Glaciers
http://nsidc.org/glaciers

Kenai Fjords National Park

http://www.nps.gov/kefj

Intergovernmental Panel on Climate Change

http://www.ipcc.ch

Quantifying Changes in the Land Over Time

Classroom Activity, Grades 7-10
http://landsat.gsfc.nasa.gov/education/resources/Landsat_QuantifyChanges.pdf

For more products like this one:
http://landsat.gsfc.nasa.gov/education/resources.html
(Scroll down to "Landsat Lithographs.")

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