

# Parks Climate Challenge Lesson

What does the data show?



<i>Age Level:</i>	Grades 6-8
<i>Time Needed:</i>	50-75 minutes
<i>Materials:</i>	Seven sets of materials related to climate change in the National Parks (details in table below) A box to hold each set of materials
<i>Student Learning Outcomes:</i>	<ul style="list-style-type: none"> <li>• Students will make their own interpretations of data that represent different impacts of climate change on National Parks and the Mississippi National River and Recreation Area .</li> <li>• Students will make the connection between 3-D objects and what the data represents.</li> <li>• Students will divide statements about each graph into true or false categories.</li> <li>• Students will share their results.</li> <li>• Students will brainstorm how climate change could affect their biome.</li> </ul>

## Educator Prep:

It is important that the materials for this activity are sorted and organized correctly and together. At the end of this lesson there are 7 figures with corresponding explanations and a true/false statement. Each set of materials needs to be cut out into: figures, individual true/false statements, and figure explanations. The true/false statements for a given set of materials can be put in an envelope and set of figure explanations in another envelope. These envelopes, along with the corresponding two figures and two 3-D objects, should be put in a box. There are two sets of figures that are in some way related. The following table shows which figures should be clustered together, their common theme and a suggested 3-D object or photo. All of the materials may be laminated for long-term usage.

<i>Figure</i>	<i>3-D Object/Photo</i>
<i>Climate Change and National Parks</i>	
Yellowstone National Park	Beetle
Glacier National Park	Ice
Joshua Tree National Park	Joshua Tree
Boat Traffic in Lake Superior	Boat
<i>Climate Change and the Mississippi River</i>	
Minnesota Average Temperature and Precipitation	Thermometer and Umbrella
Changes in Runoff	Arrow Pointing Down/Runoff
Precipitation Changes in Watersheds	Watershed Map

Sometimes when you explore, you find things that you know and then sometimes you find other things that you can figure out and sometimes there's a total unknown. When you don't know something, what I usually do when I go back is go to a library and look it up in a book or ask somebody a question.

—Will Steger in field trip with elementary students, 1995



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## Background Information

In this activity groups of 4 students will be given a set of materials in a box. Each set should contain a set of 3-D objects (or photos if no objects available), their corresponding figures, and true/false statements that correspond to each figure. There are two sets of materials; each set is related to a common theme, Climate Change and the National Parks and Climate Change and the Mississippi River. The table above shows the themes of each set of materials. Depending on the number of students in your class and group size, you may need to replicate sets between groups. The figures will introduce students to different ways that data is represented and will demonstrate different influences climate change may have on the National Parks and the Mississippi National River and Recreation Area.

## Activity Description

### Activity: Data exploration

1. Hand out a box that contains a set of materials to each group of three to five students. Make sure the data sets are face down and only the 3-D objects, or photos if objects are not available, are visible.
2. Students should begin by taking out the 3-D objects without looking at the other papers in the box. In their group, they should brainstorm a list of how each of the objects might relate to climate change in the National Parks and/or the Mississippi River.
3. After the students have finished brainstorming their lists, they should remove the papers that are left in the box. Each student or pair of students should take a figure out and spend some time looking over it. They should think about what 3-D object the figure might be connected to and they should prepare to explain what the figures mean to the other members of their group.
4. Each student will explain their figure to their group and how the object is connected.
5. Students should look in the envelope labeled “figure explanations.” Read each explanation and as a group decide which explanation fits with each figure.
6. Ask students to remove the envelope of true/false statements and take turns reading a statement and aligning it with the graph where they think it belongs. Explain that they don’t need to worry if it is true or false yet.
7. Once they have lined up the statements as a group, read through them again and decide if they are true or false.
8. Ask the groups to look at their completed sets, discuss what they think are common themes, and create a poster that summarizes the information.

### Concluding Activity: Collect the Evidence

1. Ask each group to share their poster and what they learned.
2. Summarize each set as a class and make a list of key messages.



### Take It Outside—Connecting With Your Place

1. Ask the students to think about the research that went into the figures they studied. Is there a particular experiment they could design and do in the schoolyard, their backyard or nearby nature area?
2. Contact your local national park and find out ways you can connect or visit.



### Extensions

1. Ask students to develop a report based on the key messages that can be drawn from each set.

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2. Ask students to develop their own sets of figures and true/false statements. Exchange with other classmates.



### *Online Classroom Connection*

Visit <http://www.willstegerfoundation.org/minnesotachangingclimate>  
Visit the climate change basics section and interact with some of the graphs.

Visit the Parks Climate Challenge Website, <http://parksclimatechallenge.org/index.php>, to learn more about climate change impacts in the National Parks.



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*In 1960, when Will Steger was 15 years old, he took a motorboat trip from St. Paul to New Orleans on the Mississippi River with his brother Tom.*



**READY TO LEAVE FOR NEW ORLEANS**—Bill Steger, 15, hands his brother Tom, 17, an empty gas can, preparing to refuel and begin Greenville for New Orleans today. The two teenagers left Minneapolis June 21 in a 11-foot motorboat from Still photos.

**Heading For New Orleans**

## Two Huck Finns Stop Here For Overnight Visit, Tour

Two Huck Finns from Moscow, Minn. and Mrs. White, R. Steger, planned to depart Greenville for New Orleans this morning. They have to spend the first night on a real roof in more than a century.

Tom Steger, 17, and Bill Steger, 15, are the two boys who are the Huck Finns. They have contact with their parents and are leaving home June 11. They met Markey Ashley who decided he could be a better host than the lake for mosquitoes.

Ashley, who is City Tax Assessor, gave the two Minnesotans a tour of Greenville. Then Ashley had them as overnight guests at his home.

Ashley left them at the Marina early Monday morning after they thanked him for a pleasant stay. The two boys are the sons of

**Ruling Will Allow More Vote Studies**

WASHINGTON (UPI) — The Supreme Court cleared the way today for the Civil Rights Commission to resume its Negro voting rights investigations in the South by setting aside rulings which had stopped hearings in Shreveport, La.

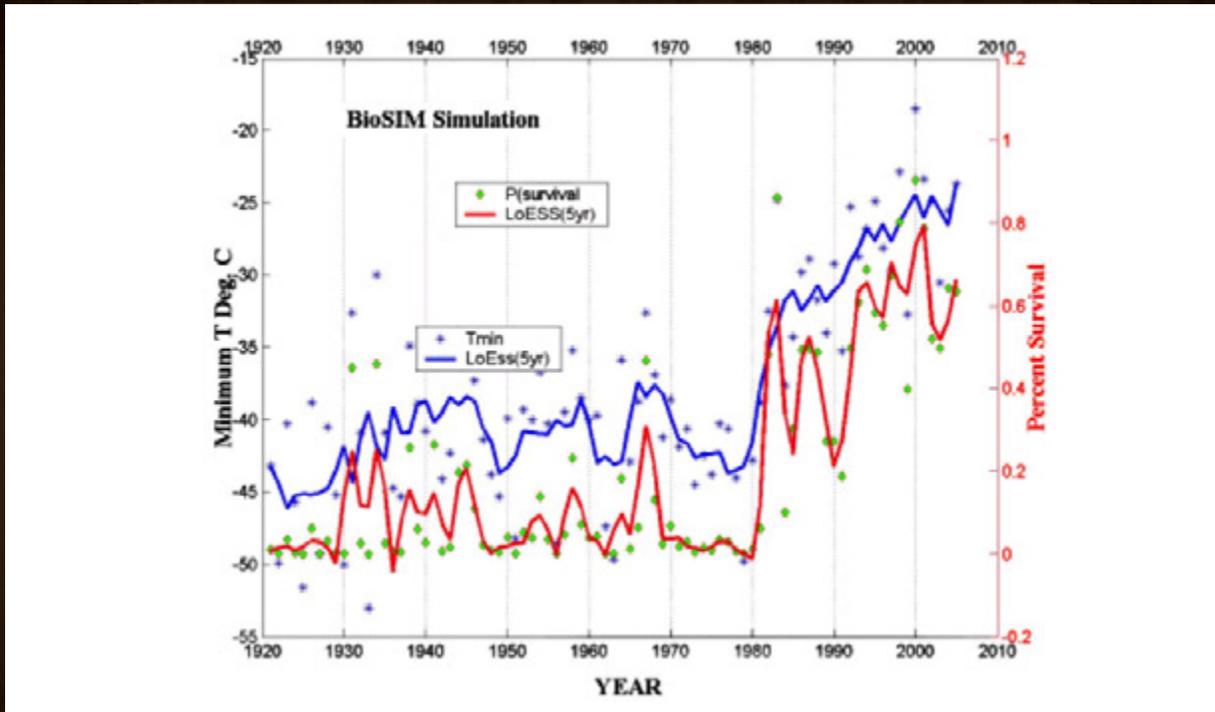
Chief Justice Earl Warren wrote the majority opinion in a 5-4 decision. He said the court should know what they'll do with their boat when they get to New Orleans. They may sell it or try to ship it back. They don't say they won't have to drive it up the river.

"We'll probably hitchhike back and Bill."



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The warming climate has made conditions suitable for a massive outbreak of mountain pine beetles, which are now infesting the whitebark pine forests in Yellowstone National Park. The beetle infestation has other ecological consequences such as devastation of forests in the region, loss of a critical food supply for grizzlies and other wildlife, negative impacts on water and watersheds, deterioration of biodiversity and decline in the aesthetic value of an iconic ecosystem.

TRUE STATEMENTS	FALSE STATEMENTS
Some pine beetles have survived every winter since 1981.	Pine beetles never survived winter in Yellowstone National Park prior to 1980.

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Glaciers that no longer exceed 100,00m <sup>2</sup> in area			
Glacier Name	1966 Area (m <sup>2</sup> )	2005 Area (m <sup>2</sup> )	1966-2005 % change
Gem Glacier **	29,135	20,379	-30.1%
Baby Glacier	117,111	77,510	-33.8%
Boulder Glacier	230,913	55,159	-76.1%
Harris Glacier **	152,694	34,526	-77.4%
Herbst Glacier **	170,162	53,550	-68.5%
Hudson Glacier	101,288	34,197	-66.2%
Lupfer Glacier	138,523	67,369	-51.4%
Miche Wabun Glacier ^^	296,139	131,298	-55.7%
N. Swiftcurrent Glacier	116,651	79,117	-32.2%
Red Eagle Glacier **	206,576	97,149	-53.0%
Shepard Glacier ^^	250,609	110,254	-56.0%
Siyeh Glacier	215,420	56,698	-73.7%
<b>TOTAL</b>	<b>2,025,221</b>	<b>817,205</b>	<b>-59.70%</b>

\*\* Area calculated due to poor quality 2005 aerial photo. Area calculated by applying the average rate of change for 1998-2005 (14.2%) to 1998 area derived from aerial photos.

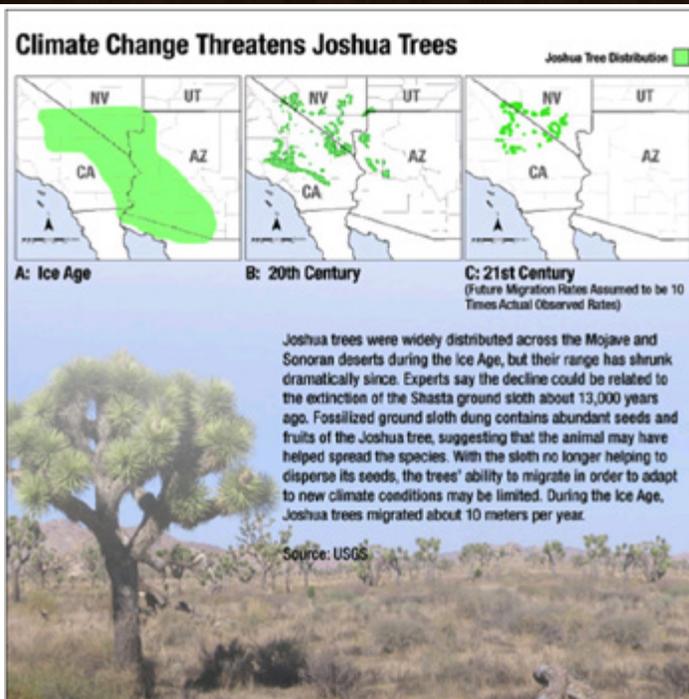
^^ At current rates of retreat it is assumed that in 2010 this glacier no longer exceeds 100,000m<sup>2</sup>.

Today (2011) Glacier National Park contains 25 glaciers larger than 25 acres in size. Scientists estimate that there were approximately 150 glaciers present in 1850, and most glaciers were still present in 1910 when the park was established. The glaciers described in the above table are all located in Glacier National Park.

TRUE STATEMENTS	FALSE STATEMENTS
In 1966 the Boulder Glacier was more than 200,000 square meters in area.	The area of the Red Eagle Glacier was easily determined from high quality photographs.

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Feb 4, 2008

Joshua Tree National Park protects the unique assembly of natural resources brought together by the junction of three of California's ecosystems. The Mojave Desert reaches across the northern part of the park. It is the habitat of the park's namesake: the Joshua tree.

TRUE STATEMENTS	FALSE STATEMENTS
Joshua trees may be found growing in Arizona, California, Nevada and Utah.	Scientists predict that Joshua trees will only be found in California and Arizona during the 21st century.

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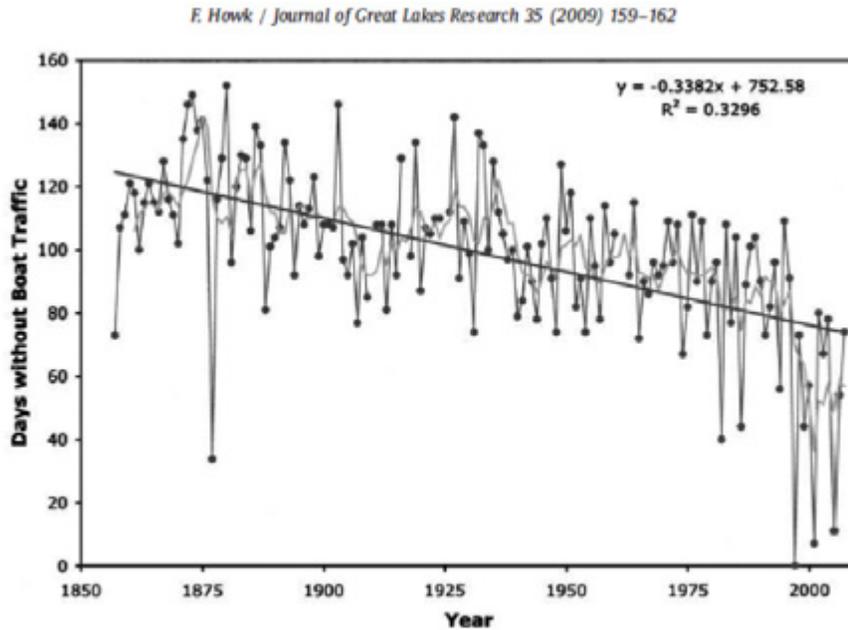


Fig. 3. Duration of closed navigation for Bayfield harbor from 1857 to 2007. The 5-year running mean is shown in gray and the trend line in black.

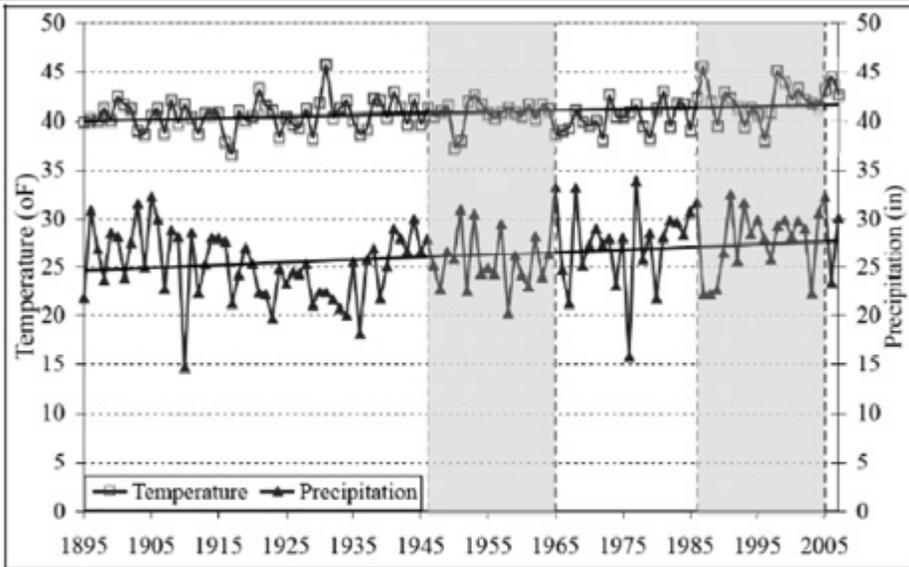
Bayfield, WI was founded in 1856. It is a significant port on Lake Superior. Located on a peninsula, Bayfield is surrounded by a twenty-two island archipelago known as the Apostle Islands. Apostle Islands National Lakeshore is a national park located within this cluster of islands. Boat traffic ends for the season when Lake Superior freezes over.

TRUE STATEMENTS	FALSE STATEMENTS
The trend line on this graph shows a decreasing number of days without boat traffic.	1981 was the first year with fewer than 40 days without boat traffic.

Source:  
 Changes in Lake Superior ice cover at Bayfield, Wisconsin by Forrest Howk  
 Journal of Great Lakes Research 35 (2009) 159–162

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Note: 1 in = 25.4 mm and 1.8 °F = 1.0 °C

**Figure A.1: Annual average temperatures and annual precipitation in Minnesota for the period 1895-2007. Study time periods 1946-1965 and 1986-2005 are highlighted in gray. (From Dadaser-Celik and Stefan (2009)).**

This line graph displays both rainfall and temperature records from Minnesota. The first 673 miles of the Mississippi River flow through Minnesota. The Mississippi River also contains water from 30 other states and a portion of Canada.

TRUE STATEMENTS	FALSE STATEMENTS
This graph contains a trend line for temperature.	The graph shows precipitation increasing every single year.

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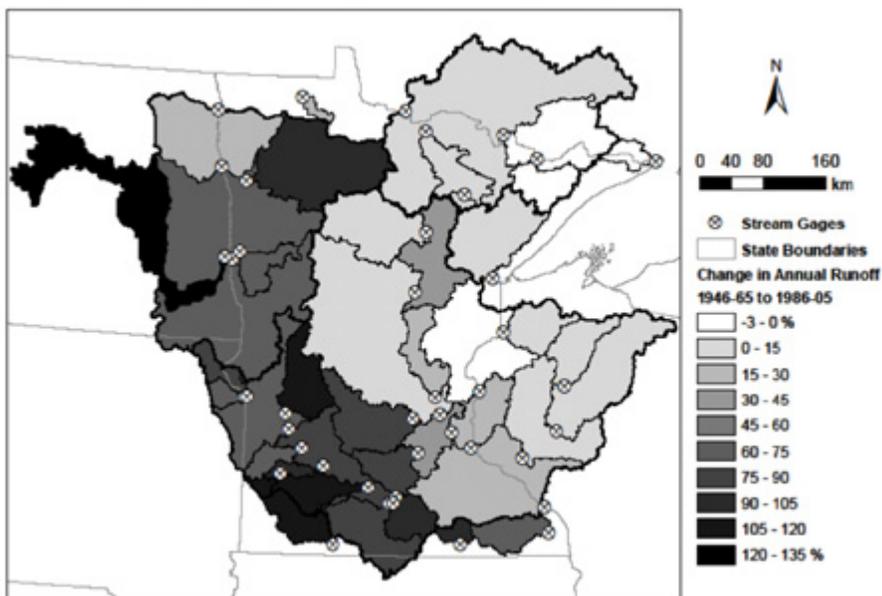


Figure 36: Geographic distribution of average annual runoff change (in percent) between the 1946-1965 and 1986-2005 time periods.

The amount of water running from land into streams and rivers (runoff) fluctuates over time. Changes in runoff cause changes in stream flow. Stream flow is measured by stream gauges located within each watershed.

## TRUE STATEMENTS

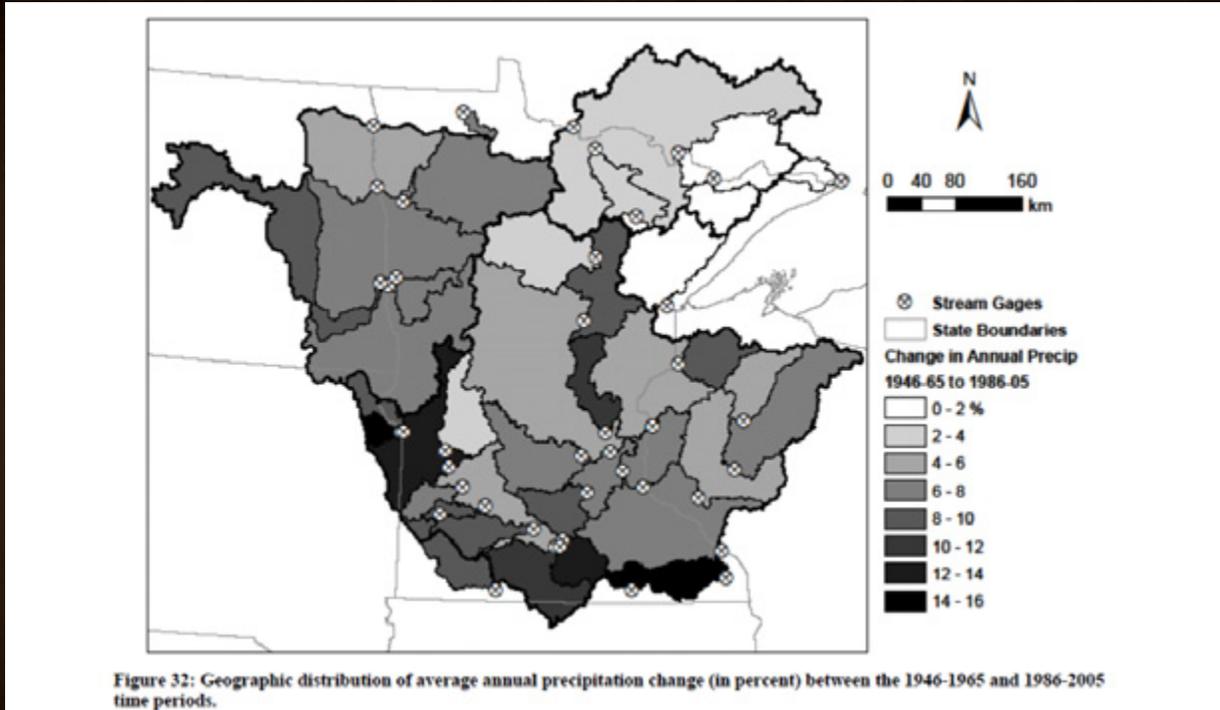
## FALSE STATEMENTS

This map shows changes between the periods 1946-1965 and 1986-2005.

Each watershed contains exactly one stream gauge.

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This map organizes precipitation information by watershed. A watershed is an area of land where all of the water that is under it or drains off of it goes into the same place. Large watersheds are usually made up of smaller watersheds.

TRUE STATEMENTS	FALSE STATEMENTS
This map displays geographic distribution of average annual precipitation change.	This map identifies rain guage locations.

Source:  
 University of Minnesota, St. Anthony Falls Laboratory  
 Engineering, Environmental and Geophysical Fluid Dynamics Project Report No. 543  
 Annual Stream Runoff and Climate in Minnesota's River Basins by Todd R. Vandegrift and Heinz G. Stefan  
 September 2010 Minneapolis, MN