



Climate & Water Teaching Box

Topic: Climate & Water

Level: Secondary Grades (6-12)

How to use this resource:

This teaching box is designed to foster understanding of the impacts of climate change on aspects of the water cycle. The first part (The Big Picture) provides an overview and should be covered first. Subsequent parts can be used as time allows and in any order. Note that there are other aspects of how climate change impacts water that are not covered in this teaching box including flooding, ocean acidification, permafrost thaw, and changes to ice shelves and sea ice.

Teaching Boxes are themed collections of classroom-ready educational resources to build student understanding of science, technology, engineering, and math (STEM). Resources highlighted within teaching boxes are from various science education programs and all have been vetted by the Spark education team.

This page provides an overview of the Teaching Box contents and associated standards.

Explore this Teaching Box and its educational resources at:

scied.ucar.edu/climate-water

The Big Picture

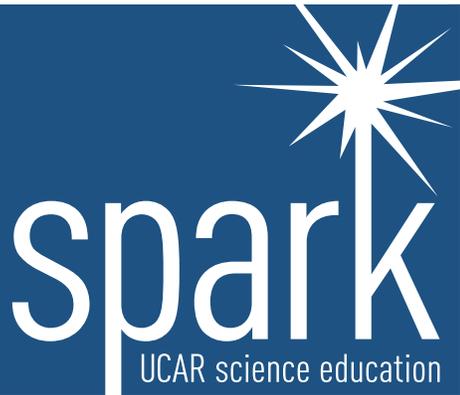
- Goal: Students learn that climate change and its impacts are already being observed.
- Activity: Students analyze data about climate impacts over the 20th Century.
- Performance Expectation: Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems (HS-ESS2-2).
- Standards:
 - NGSS: Science and Engineering Practices: Analyzing and Interpreting Data, Asking Questions and Defining Problems
 - NGSS: DCI HS and MS-ESS3.D: Global Climate Change
 - NGSS: DCI HS and MS-ESS3.C: Human Impacts on Earth Systems
 - NGSS: Crosscutting Concepts: Patterns, Cause and Effect, Stability and Change
 - CCSS.Math.Practice.MP2: Reason Abstractly and Quantitatively
 - CCSS.Math.Practice.MP3: Critique the Reasoning of Others
 - CCSS.ELA-Literacy.RST.6-8.8: Distinguish Among Facts, Judgment, Speculation.
 - CCSS.ELA-Literacy.RST.9-10.7: Translate Information Expressed Visually or Mathematically into Words

Melting Glaciers

- Goal: Students learn that alpine glaciers are shrinking due to warmer atmospheric temperatures associated with climate change.
- Activity: Students explore data about documented change in glaciers and explore how glaciers move, grow, and shrink using models.
- Performance Expectation: Students interpret data and use models to understand why glaciers are shrinking.
- Standards:
 - NGSS: Science and Engineering Practices: Analyzing and Interpreting Data, Asking Questions and Defining Problems, Developing and Using Models
 - NGSS: DCI HS and MS-ESS3.D: Global Climate Change
 - NGSS: DCI HS and MS-ESS2.C: The Role of Water in Earth Surface Processes
 - NGSS: Crosscutting Concepts: Patterns, Cause and Effect, Stability and Change

Sea Level Rise

- Goal: Students learn how projected sea level rise threatens coastal areas.
- Activity: Students learn about the potential consequences of sea level rise in different geographic areas through exploration of data and maps.
- Performance Expectation: Students interpret data to learn how sea level rise due to global climate change is projected to impact cities and towns.
- Standards:
 - NGSS: Science and Engineering Practices: Analyzing and Interpreting Data
 - NGSS: DCI HS and MS-ESS3.D: Global Climate Change
 - NGSS: Crosscutting Concepts: Cause and Effect, Stability and Change
 - National Geography Standard 18: How to Apply Geography to Interpret the Present and Plan for the Future
 - CCSS.ELA-Literacy.RST.9-10.7: Translate Information Expressed Visually or Mathematically into Words



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(cont.)

Less Rainfall

- Goal: Students learn that droughts, increasing in intensity due to climate change, impact people in the United States.
- Activity: Students learn about the impact of drought on agriculture and then explore how current and future projected drought impacts U.S. agriculture.
- Performance Expectations: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity (HS-ESS3-1).
- Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems (HS-ESS3-5)
- Standards:
 - NGSS: Science and Engineering Practices: Analyzing and Interpreting Data
 - NGSS: DCI HS and MS-ESS3.D: Global Climate Change
 - NGSS: DCI HS and MS-ESS2.C: The Role of Water in Earth Surface Processes
 - NGSS: Crosscutting Concepts: Patterns, Cause and Effect, Stability and Change
 - National Geography Standard 18: How to Apply Geography to Interpret the Present and Plan for the Future
 - CCSS.ELA-Literacy.RST.9-10.7: Translate Information Expressed Visually or Mathematically into Words

Dwindling Sea Ice

- Goal: Students learn that Arctic sea ice is shrinking due to warmer atmospheric and ocean temperatures and the ice-albedo feedback.
- Activity: Students learn how sea ice is changing by exploring sea ice data, researching questions about sea ice, and hypothesizing how sea ice change is affecting polar bears.
- Performance Expectation: Students interpret data, ask questions, define problems, and explore a model to learn how and why sea ice is melting rapidly in the Arctic. Students use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. (HS-ESS2-4)
- Standards:
 - NGSS: Science and Engineering Practices: Analyzing and Interpreting Data, Asking Questions and Defining Problems, Constructing Explanations, using Models
 - NGSS: DCI HS and MS-ESS3.D: Global Climate Change
 - NGSS: DCI HS and MS-ESS2.C: The Role of Water in Earth Surface Processes
 - NGSS: Crosscutting Concepts: Patterns, Cause and Effect, Stability and Change