



## Drought in Colorado - Teacher Guide

### Setting the Stage

The 2012-13 North American Drought originated in the midst of a record-breaking heat wave, and was an extension of the 2010-13 Southern United States Drought. In 2018, Colorado drought conditions were the worst since that time. By the end of 2018, the Southwest Region was experiencing “exceptional drought,” which is the most severe intensity of drought. The 2018 drought is part of a trend towards increasing frequency and severity of drought globally.



Impacts of drought on the Colorado River in the Southwest U.S. Photo Credit: USGS  
<https://pubs.usgs.gov/fs/2004/3062/>

### Lesson Overview

In this lesson, students will investigate the causes, effects, and impacts of drought in Colorado.

- **Part 1 – Engage (20 minutes) Drought in Colorado**  
As a class, watch videos about drought in Colorado, and have a class discussion on what students know and wonder about drought.
- **Part 2 – Explore (50 minutes) Drought & Case Study Data Analysis**  
In teams, analyze drought information and data to build understanding of the causes, impacts, location, and frequency of drought in Colorado.
- **Part 3 – Explain (65 minutes) Local Drought News Story**  
In teams, create a communication product educating your community about the causes and impacts of drought, past and current drought status, and tips on preparing and responding to drought.

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Instructional Overview	
<b>Grade Level</b>	Middle School
<b>Instructional Time</b>	135 minutes
<b>Unit Driving Question</b>	How can we make our community more resilient to drought?
<b>Lesson Driving Question</b>	What can we learn from past drought events to prepare for future drought?
<b>Building Toward</b>	NGSS: <a href="#">MS-ESS3-2</a> CDE: <a href="#">MS3.ESS.GLE9</a>
<b>Three Dimensions</b>	<p><b>Science and Engineering Practices:</b></p> <ul style="list-style-type: none"> <li>Analyzing and Interpreting Data</li> <li>Obtaining, Evaluating, and Communicating Information</li> </ul> <p><b>Disciplinary Core Ideas:</b></p> <ul style="list-style-type: none"> <li>ESS3.B: Natural Hazards</li> </ul> <p><b>Crosscutting Concepts:</b></p> <ul style="list-style-type: none"> <li>Patterns</li> <li>Cause and effect</li> </ul>
<b>What Students Will Do</b>	<ul style="list-style-type: none"> <li><b>Analyze drought data</b> to identify <b>patterns</b> of <b>drought history and risk</b> in Colorado.</li> <li><b>Communicate information</b> about the <b>causes and effects</b> of <b>drought</b> in your community. Explain what community members should do in response to a drought.</li> </ul>
<b>Materials</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> <a href="#">Drought Student Worksheet</a></li> <li><input type="checkbox"/> <a href="#">Drought Student Worksheet Key</a></li> <li><input type="checkbox"/> <a href="#">Lesson Slides</a></li> <li><input type="checkbox"/> Individual student computer devices or classroom computer with projector, and internet</li> <li><input type="checkbox"/> Materials for Part 3, depending on the format each group chooses (e.g., poster paper, audio/video recording, internet, etc.)</li> </ul>
<b>Material Preparation</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Print <a href="#">student worksheets</a> if needed</li> <li><input type="checkbox"/> For Part 2 stations: If internet access is available, use student worksheets with embedded activity links with student personal devices or two to four shared devices with activity links bookmarked at each station. If internet access is unavailable, print slides 9-22 of the <a href="#">lesson slides</a> to put at tables around the room.</li> </ul>
<b>Vocabulary</b>	<u>Natural hazards</u> are naturally occurring phenomena such as drought, wildfire, extreme heat, or flood, which may disrupt or damage a



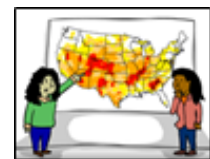
	<p>community.</p> <p><u>Drought</u> is a prolonged drier-than-normal period in a natural climate cycle that results in water-related problems.</p> <p><u>GIS</u> is an abbreviation for <i>Geographic Information System</i>, which is a computer-based process that gathers, manages, analyzes, and visualizes spatial data.</p> <p><u>Precipitation</u> is any type of water that forms in the Earth's atmosphere and then drops onto the surface of the Earth (e.g., rain, snow, sleet, or hail).</p> <p><u>Snow Water Equivalent (SWE)</u> is the amount of water contained in the snowpack at a location (if the entire snowpack were to melt).</p> <p><u>Water Year</u> is a 12-month period that runs from October 1 through September 30 each year.</p>
<p><b>Instructional Strategies</b></p>	<ul style="list-style-type: none"> <li>• Jigsaw (optional, used in Part 2): A cooperative learning strategy in which each group is responsible for learning one “piece of the puzzle” and then sharing that information with other groups to complete the whole picture. Consider using Part 3 for students to present the information they learned at their stations. Teachers can choose to use this strategy if time is limited, and stations can be differentiated for different student abilities and levels of teacher assistance.</li> <li>• <u>Mind mapping</u> (optional; used in Part 2): A creative way to “map out” students’ thoughts and ideas. Similar to a concept map, multiple formats can be used to develop students’ trains of thought and make connections between main ideas or concepts.</li> </ul>

**Part 1 (Engage) Drought in Colorado (20 minutes)**

Drought, wildfire, and weather: What’s the connection in Colorado?

Begin the lesson with a warm-up KWL Chart (Know, Want to Know, Learned) on the first page of the [student worksheet](#). Use Think, Pair, Share for students to share out what they already know and what they want to learn.

First, watch the [drought news clip](#) (2:43) to get a feel for the impacts of drought on people and the environment, and how drought conditions are mapped. Next, watch [Assessing Drought in the United States](#) to learn how scientists assess the causes and impacts of drought in our country, including Colorado.



Review the four categories of drought and their color coding with slide 7 of the [lesson slides](#) .



## **Part 2 (Explore) Drought Data Analysis Jigsaw** (50 minutes)

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Part 2 is designed as a jigsaw in which students work in small groups to complete the activities at six different stations and then share their findings in a class discussion. Consider giving the small groups expert names, like “hydrologists,” “irrigation district managers,” etc. Alternatively, you may decide to run some stations as whole-class, teacher-led activities before assigning the remaining stations as a student-led, small-group jigsaw.

Use the [student worksheet](#) pages 2-7 for the jigsaw. [Lesson slides](#) 9-22 have larger versions of the graphs and can be used to introduce the stations or for the class discussion.

Once students have completed the jigsaw, lead a 10-minute [mind mapping](#) session or consensus discussion session about your findings and learning from the jigsaw stations. Start the class mind map with “Drought” labeled in the center of a large Post-It, poster paper, or shared digital document.

Ask students to share their findings from the station to check and correct your responses, as needed, and add key information to the drought mind map.

Suggested discussion questions:

- What are the causes and impacts of drought?
- Is the severity of drought changing because of actions humans have taken?
- How would you describe the 2018 drought?
- Does drought affect everyone?
- How should people prepare for and respond to droughts?
- What can we learn from past drought events to prepare for future drought?

Collect student worksheets and/or have them digitally share their copy with you. Student worksheets will be used for Part 3 and it is important for students to have complete and correct responses to communicate information.

## **Part 3 (Explain) Local Drought News Story** (65 minutes)

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How can communities know about and manage their drought risk in Colorado?

For Part 3, students will work in new groups, or hazard expert teams after watching a video as a class. Each hazard expert team is made up of one student from each of the jigsaw groups, so that the team consists of students that collectively completed each of the Part 2 stations. The goal is to have an expert from each station in order to communicate key drought information to



your (or another) community that faces wildfire risk and/or had experienced a drought in the past.

**Drought Expert Interview** (5 min)

First, watch the short video with Doug Kluck, who is the NOAA Regional Climate Services Director for the Central Region of the country. The video is a good summary of the topics covered in the jigsaw.



[Drought Expert Video](#)

**Local Drought News Story** (60 min)

Give students page 8-11 of the [student worksheet](#) with the prompt to create a local news story as their summative assessment.

Additional drought resources:

[Colorado Planning for Hazards—Drought](#)  
[Drought for Kids](#)

After students have completed the assignment, lead a class gallery walk, where teams share and learn from other groups' News Stories.

Finish the lesson by returning to the KWL Chart on page 1 of the student worksheet, and have students complete the “What I Learned” section.

Find more HEART Force Curriculum here:

<https://cires.colorado.edu/outreach/projects/HEARTForce>