

**GUHSD Lesson [LINK](#) to Water Ideas**  
**Next Generation Science Standards and California CTE Model Curriculum Standards**  
**[5E Phenomenon Planning Tool-SDCOE](#)**

**Exploring Career Pathways in California's Water Utilities**  
**Created by: Water Curriculum Committee**

**[California CTE Model Curriculum Standards -- Performance Expectations\(s\)](#)**

**[Standards for Career Ready Practice](#)**

- 3-Develop an education and career plan aligned with personal goals
- 5-Utilize critical thinking to make sense of problems and persevere in solving them
- 7-Act as a responsible citizen in the workplace and the community
- 8-Model integrity, ethical leadership and effective management
- 10-Demonstrate creativity and innovation
- 12-Understand the environmental, social and economic impacts of decisions

**[Energy, Environment and Utilities](#)**

- A9.0 – Research drinking-water sources, systems, treatment and conservation
- Academic Alignment Matrix, pp. 17-35

**Background Information**

This lesson plan introduces grade 9-12 students to career pathways in California's water utilities. It accompanies 5E lesson plans developed to lead grade 9-12 students through an exploration of water in California and worldwide, from Earth Sciences, Chemistry and Physics perspectives. These lesson plans were developed by high school STEM teachers from Grossmont Union High School District and Helix Charter High School, with funding and support from a National Science Foundation Grant awarded to the Center for Water Studies at Cuyamaca College.

**Science and Engineering Practices**

**Disciplinary Core Ideas**

**Crosscutting Concepts**

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**Guiding Question(s)**  
Include as many guiding questions as needed

**Guiding Question 1:** How are California’s water utilities adapting to a changing climate?  
**Guiding Question 2:** What career pathways do water utilities offer?

**CCSS Connections Support Reading, Writing, Speaking, Listening and Mathematics**

Students construct an explanation that includes specific cause and effect relationships between a changing climate and water resources, water demand, and the mission of water utilities.

## Instructional Sequence for Guiding Question 1: How are California’s water utilities adapting to a changing climate?

*Performance Expectations for Instructional Sequence 1:  
(overview concepts/description at-a-glance)*

Guiding Phenomenon:					
5E Stage (Time Frame)	3-D Concepts: SEP’s, CCC’s, DCI’s	Driving Question(s)	What the Teacher Does <i>Please include adaptations for language and special needs learners</i>	What the Student Does <i>Please include adaptations for language and special needs learners</i>	Use <a href="#">Evidence Statements</a> to Assess Learning
<b>Engage</b> Phenomenon should promote curiosity, elicit students’ prior knowledge, make connections between past and present learning experiences, expose prior conceptions, and organize students’ thinking.		How will water utilities provide a sustainable water supply for California?	Show video <a href="#">Triple bottom line &amp; sustainability: the science of good business</a> and elicit questions about the video, sustainability, the triple bottom line, and what it means to provide a sustainable water supply for California.	Students ask questions and develop a definition for “sustainable water supply for California” and create their own questions and basis for inquiry.	
<b>Explore:</b> Students work through activities using science and engineering practices to make sense of the phenomenon, generating new ideas and exploring questions. Students will design and conduct investigations rather than following set directions for labs.		What do water utilities do?	Show video <a href="#">Water: What You Pay For, Helix Water District</a> and elicit questions about the video and the “fresh water cycle” that utilities manage -- collecting water from the environment for human use and returning it to the environment. What is the cycle?  Show video <a href="#">You Can’t Live a Day Without Me, SFPUC</a> and elicit questions about the value of sewer systems.	Students ask questions and brainstorm to create a diagram(s) of the freshwater cycle and the services utilities provide.	

<p><b>Explore</b></p>	<p><b>SEP:</b> <b>CCC:</b> <b>DCI/concepts:</b></p>	<p>How much water do we need?</p>	<p>Show video <a href="#">Water Supply, PPIC</a> and elicit questions.</p> <p>Challenge student groups to estimate one person's average annual water use:</p> <ul style="list-style-type: none"> <li>● Based on the video -- the 40 million acre feet of water stored in California's reservoirs is roughly the amount of water cities and farms use in a typical year</li> <li>● Based on the data in the reports</li> </ul>	<p>Students break into groups to explore the following reports and topics within the reports, and present their findings to the class in a powerpoint and handout.</p> <ul style="list-style-type: none"> <li>● <a href="#">Water Use in California, PPIC, 1p.</a></li> <li>● <a href="#">California's Water: Water for Cities, PPIC, 4pp.</a></li> <li>● <a href="#">California's Water: Water for Farms, PPIC, 4pp.</a></li> <li>● <a href="#">California's Water: Water for the Environment, PPIC, 4pp.</a></li> </ul> <p>Student groups brainstorm and estimate the average annual water use of one person, in acre feet and in gallons, based on the video and reports.</p>	
<p><b>Explore</b></p>	<p><b>SEP:</b> <b>CCC:</b> <b>DCI/concepts:</b></p>	<p>How is climate change impacting California's water supply and our demand?</p>	<p>Show video <a href="#">Drought, PPIC</a> and elicit and discuss student questions.</p> <p>Introduce students to <a href="http://cal-adapt.org/tools">cal-adapt.org/tools</a>, which presents data describing climate change in California in an interactive format. Elicit questions about the data and what it tells us about future water supply and demand in California.</p>	<p>Student groups explore and map the connections between climate change and California's water needs, using the climate tools on <a href="http://cal-adapt.org/tools">cal-adapt.org/tools</a> and the data in the PPIC reports they already reviewed.</p> <p>Student groups explore and discuss effect of climate change on annual precipitation more deeply, analyzing and interpreting <a href="#">results of 2018 UCLA study summarized on study author's blog.</a></p>	

<p><b>Explore</b></p>	<p><b>SEP:</b> <b>CCC:</b> <b>DCI/concepts:</b></p>	<p>How are California’s water utilities adapting to climate change?</p>	<p>Lead a class discussion about <a href="#">California’s Water: Paying for Water, PPIC, 4pp</a>. Discuss the graph “Local Utilities Raise Most of the Money Spent on Water in California. Where does this money come from? Who is going to lead California’s adaptation to a sustainable water supply?</p>	<p>Students explore, ask questions and discuss case studies:</p> <p>San Diego County’s <a href="#">Water Supply Diversification Plan</a></p> <p>Orange County’s <a href="#">Groundwater Replenishment System</a></p> <p>San Francisco PUC’s <a href="#">Headquarters and Non-Potable Water Program</a></p>	
<p><b>Explain:</b> Students demonstrate their understanding as they make sense of the phenomenon and build academic language. Students explain to other students. The teacher or other resources may guide learners toward a deeper understanding, which is a critical part of this phase.</p>	<p><b>SEP:</b> <b>CCC:</b> <b>DCI/concepts:</b></p>	<p>How will water utilities provide a sustainable water supply for California?</p>	<p>.</p>	<p>Students explain and debate what water utilities and Californians need to do to assure that cities, farms and the environment have a sustainable water supply.</p>	
<p><b>Elaborate</b> Students apply what they have learned in a new way.</p>	<p><b>SEP:</b> <b>CCC:</b> <b>DCI/concepts:</b></p>				
<p><b>Evaluate</b> Students demonstrate their mastery of the performance expectations through the use of science and engineering practices.</p>	<p><b>SEP:</b> <b>CCC:</b> <b>DCI/concepts:</b></p>				

**Instructional Sequence for Guiding Question 2: What career pathways do water utilities offer?**

**Performance Expectation(s) for Instructional Sequence 2:**

*(overview concepts/description at-a-glance)*

Guiding Phenomenon:					
5E Stage (Time Frame)	3-D Concepts: SEP's, CCC's, DCI's	Guiding Question(s)	What the Teacher Does	What the Student Does	Use <u>Evidence Statements</u> to Assess Learning
Engage	SEP: CCC: DCI/concepts:	What is the jobs outlook in water utilities?	Show video <a href="#">Why Water, ACWA</a> and lead discussion: what are water utilities saying to you?	<p><a href="#">Explore Baby Boomer retirement statistic</a> from Pew Research</p> <p><a href="#">Explore Baby Boomer and workforce statistics</a> for California's water utilities</p>	
Explore	SEP: CCC: DCI/concepts:	What are the qualifications for entry-level jobs in water utilities?	Introduce students to career pathways into a water utility. Explain that these entry-level jobs do not require a bachelor's degree.	<p>Student groups explore, ask questions and discuss the career pathways in:</p> <ul style="list-style-type: none"> <li>• <a href="#">Water treatment</a></li> <li>• <a href="#">Wastewater treatment</a></li> <li>• <a href="#">Water distribution</a></li> <li>• <a href="#">Wastewater collection</a></li> <li>• <a href="#">Water conservation</a></li> </ul> <p>Students ask questions and discuss options and strategies for gaining required one year of experience.</p> <p>Students ask questions and discuss options and strategies for taking and passing required certification exam:</p> <ul style="list-style-type: none"> <li>• <a href="#">Water treatment or distribution certification</a></li> <li>• <a href="#">Wastewater treatment certification</a></li> <li>• <a href="#">Wastewater collection</a></li> </ul>	

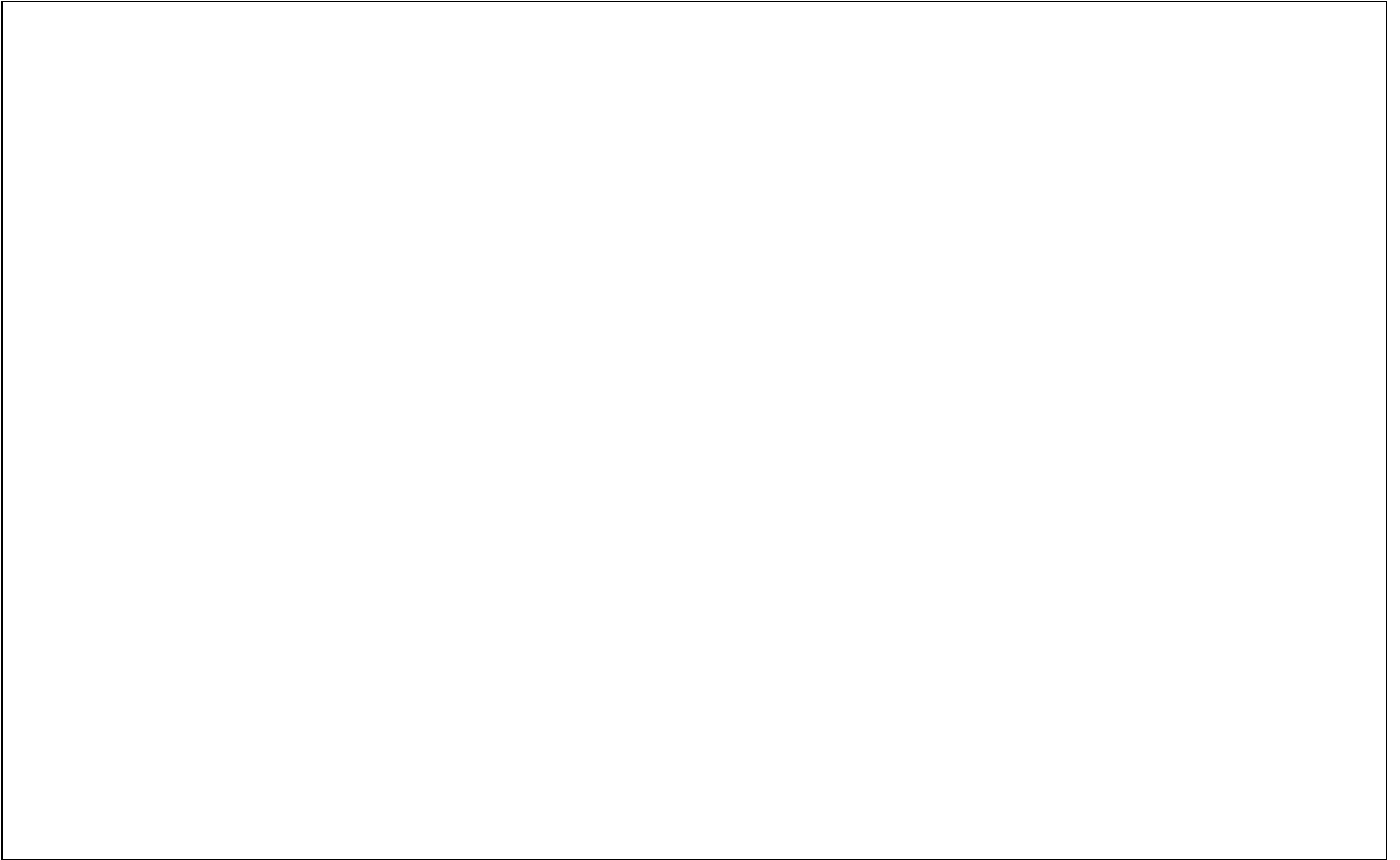
				<a href="#">certification</a> <ul style="list-style-type: none"> <li>• <a href="#">Water conservation certification</a></li> </ul>	
<b>Explore</b>	<b>SEP:</b> <b>CCC:</b> <b>DCI/concepts:</b>	What if you could pay your own way through college?	<a href="#">Paying for College with a Water Career</a> - Individual & Team Research	Students will fill out the <a href="#">research guide</a> (individual) and complete a graphic poster (team - digital or pen & paper) on the types of careers in the water industry, and how they can have their college tuition paid for through this process.	
<b>Explain</b>	<b>SEP:</b> <b>CCC:</b> <b>DCI/concepts:</b>	What would your career pathway in a water utility be?		Students develop an education and career plan aligned with their personal goals. Plan should include: <ul style="list-style-type: none"> <li>• Career pathway in operations or conservation</li> <li>• Community college they will attend</li> <li>• Bachelor's degree they want to complete</li> <li>• Post-degree career pathway in water utility</li> <li>• Timeline and milestones like when to take certification exam(s)</li> </ul>	
<b>Elaborate</b>	<b>SEP:</b> <b>CCC:</b> <b>DCI/concepts:</b>				
<b>Evaluate</b>	<b>SEP:</b> <b>CCC:</b> <b>DCI/concepts:</b>				

Note: Add additional rows as needed.

## **Performance Task/Assessment**

*Note: The performance task should include elements from the three dimensions from the NGSS (knowing AND doing)*





<b>Supporting English Learners</b>			
<b>Reading, Writing, or Scaffolding</b> <i>(listed in Learning and Instructional Sequence)</i>	<b>Substantial supports for EMERGING English learners:</b>	<b>Moderate supports for EXPANDING English learners:</b>	<b>Light supports for BRIDGING English learners:</b>

*Note: Add additional rows as needed.*

<b>Supporting Struggling Learners</b>		
<b>Activity</b> <i>(listed in Learning and Instructional Sequence)</i>	<b>Supports for Students who Need Minor Support</b>	<b>Supports for Students who Need Intensive Support</b>

*Note: Add additional rows as needed.*

<b>Supporting Advanced Learners</b>	
<b>Activity</b> <i>(listed in Learning and Instructional Sequence)</i>	<b>Extensions for Advanced Students</b>

*Note: Add additional rows as needed.*