EEI LIVE!

Liquid Gold: California’s Water

Lucy Christensen
DEVELOPMENT OF EEI CURRICULUM

State Board of Education

Senator Fran Pavley
Dive into an EEI Curriculum Unit
A Perfect Match: EEI and Common Core

Liquid Gold: California’s Water

With Laura Walls, EEI Teacher Ambassador
Session Objectives:

Identify ways the EEI Curriculum helps build student literacy to meet Common Core State Standards for:

- **RST**: Reading Standards for Literacy in Science and Technical Subjects
- **SL**: Speaking and Listening
- **WHST**: Writing Standards for Literacy in Science and Technical Subjects
Agenda

- Stroll through CCSS Correlated Liquid Gold: California’s Water
- An exciting opportunity to use EEI in your classroom!
What subjects do you teach?
5 Key Common Core Strategies

- Lead High-Level, Text-Based Discussions
- Focus on Process, Not Just Content
- Create Assignments for Real Audiences and with Real Purpose
- Teach Argument, Not Persuasion
- Increase Text Complexity

RST.9–12.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases... as they are used in a specific scientific... context...
EEI & Common Core in California

California Aqueduct

Delta Smelt
# Standards Overview:
Common Core English Language Arts, Science and Technical Literacy

<table>
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<tr>
<th></th>
<th>Vocabulary</th>
<th>Reading</th>
<th>Writing</th>
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</table>
Standards Overview: Common Core English Language Arts, Science and Technical Literacy

<table>
<thead>
<tr>
<th>California Connections</th>
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<td>✓</td>
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<td>Traditional Assessment</td>
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## Overview of Unit Planner

### Textbook Alignment

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Learning Objectives</th>
<th>Summary of Activities</th>
<th>Textbook Alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>Who’s in Charge of the Water?</td>
<td></td>
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</tr>
<tr>
<td>Preparation Time: 15 min. Instructional Time: 50 min.</td>
<td>- Describe the spectrum of considerations that are involved in decisions about California's supplies of fresh water.</td>
<td>Students read about the Sacramento-San Joaquin Delta and the establishment of the CALFED Bay-Delta Program to manage its resources. They work in groups to identify elements of California's water management and use issues through analysis of the article.</td>
<td></td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>Supply and Demand for California’s Water</td>
<td></td>
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</tr>
<tr>
<td>Preparation Time: 20 min. Instructional Time: 50 min.</td>
<td>- List major uses of water in California and describe their importance to society. - Identify the sources and locations of major water supplies in California (for example, surface water, reservoirs, and aquifers).</td>
<td>Students review the hydrologic cycle and general climatology, topography, and geology of California, and identify surface water and groundwater sources in California. They analyze the hydrologic regions of the state and discuss California’s water supply and use patterns.</td>
<td></td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Moving California’s Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparation Time: 20 min. Instructional Time: 50 min.</td>
<td>- Describe the methods used to collect, transport, and consume water in California.</td>
<td>Students examine components of the California Aqueduct and then trace how water in California is moved from its origin to areas where it is used. They read about federal, state, and local water projects, including the Central Valley Project, that distribute water throughout California.</td>
<td></td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>Salt and Smith—Feeling the Effects of California’s Thirst</td>
<td></td>
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</tr>
<tr>
<td>Preparation Time: 15 min. Instructional Time: 50 min.</td>
<td>- Provide examples of the direct and indirect effects of the growing human demand for water on the geographic extent, composition, biological diversity, and viability of natural systems.</td>
<td>Students read about the detrimental effect of water transfers on the ecosystem of the Bay-Delta and the simultaneous buildup of salt in soils that are irrigated by that water. Students discuss these causes and describe factors in making decisions about water allocation.</td>
<td></td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>The Watery Decisions We Make</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparation Time: 15 min. Instructional Time: 50 min.</td>
<td>- Describe the spectrum of considerations that are involved in decisions about California’s supplies of fresh water. - Describe the role of scientific knowledge on making policy and management decisions about human activity related to California’s water supply. - Describe the factors that limit knowledge about the scope and potential environmental impacts of water resource policies (for example, economics, environmental costs and benefits, public health, historical and cultural implications, and personal views).</td>
<td>Students revisit the Delta Vision Blue Ribbon Task Force’s purpose, discuss the contributions of the scientific community to management of water in the state, analyze the state’s current “water budget,” and discuss water issues California is likely to face in the future.</td>
<td></td>
</tr>
</tbody>
</table>

**Textbook Alignment**

- **Glencoe:** 
  - *Earth Science: Geology, the Environment, and the Universe* 2005 SE
  - Pages 218, 221, 228–231, 234, 239–243, 249–257, 260, 669–675

- **Holt:** 

- **McDougal Littell:** 
  - *Earth Science* (approved CDE 2002) 
  - Pages 280–282, 287–289, 300–307

- **Prentice Hall:** 
  - Pages 523, 712–716

**All Materials Needed**

- **A-V Equipment:**
  - DVD player and TV or computer with DVD-ROM drive and speakers
  - projection system, screen
- **Class Supplies:**
  - colored pencils
  - construction paper
  - pencils or pens
  - tape or thumbtacks
  - writing paper (optional)

**Lesson Textbooks**

- **Glencoe:** 
  - Earth Science: Geology, the Environment, and the Universe 2005 SE
  - Pages 218, 221, 228–231, 234, 239–243, 249–257, 260, 669–675

- **Holt:** 

- **McDougal Littell:** 
  - *Earth Science* (approved CDE 2002) 
  - Pages 280–282, 287–289, 300–307

- **Prentice Hall:** 
  - Pages 523, 712–716
Lesson 1: Who’s in Charge of the Water?

SL.9–10.1: Initiate and participate effectively in a range of collaborative discussions...with diverse partners,...building on others’ ideas and expressing their own clearly and persuasively.

Learning Objective
Describe the spectrum of considerations that are involved in decisions about California’s supplies of fresh water.

Who’s in Charge of the Water?

This lesson introduces the challenges involved in the management of what is arguably the most precious resource in California—fresh water. Students read about California’s reliance on the Sacramento-San Joaquin Delta and the establishment of the CALFED Bay-Delta Program to help manage natural supply and human demand, and restore Delta ecosystems.
California Connections: Taking Charge of the Bay-Delta
Lesson 1 | page 2 of 4

(1,770 kilometers) of levees, and hundreds of thousands of acres of marshes, mudflats, and farmland. It provides habitat for fish, invertebrates, waterfowl, and aquatic mammals. The Delta provides recreational fishing and boating opportunities and supports 80% of the state’s commercial salmon fishery. Drinking water for 25 million Californians and water to irrigate nearly 5 million acres of farmland in the Central Valley flows through the Delta. The Delta also contains a number of communities, representing a unique part of California’s culture and heritage, and supports numerous highways, pipelines, rail routes, and electric transmission lines.

History of the Delta
Prior to the California Gold Rush in 1849, the Delta was mostly an untouched natural environment, consisting of river channels and a million acres of wetland marshes. During the Gold Rush, numerous riverboats traversed the Delta, carrying arriving miners from San Francisco to Sacramento and the gold fields beyond. The legacy of the Gold Rush is still felt today in the Bay-Delta system. For example, toxic mercury, used in gold extraction, still causes ecological harm. The development of the Delta as it

is today began in 1850, when ownership of this waterlogged region was transferred from the federal government to the state. The state sold the land to private interests, and over the next several decades, channels were dredged and the sediments used to build levees to hold back the water and allow farming on Delta “islands” that were at or below sea level. By the mid-1900s, 700,000 acres of farmland, more than 1,000 miles (1,610 kilometers) of levees, and hundreds of miles of waterways had transformed the Delta. Conversion of marsh and riparian habitat affected native plants and animals; nesting populations of shorebirds were eradicated, and habitat that served as nurseries for some fish, shellfish, and crustaceans was drastically reduced.

In the 1940s and early 1950s, the federal government...
Instructions: Create a timeline related to water with events identified in *California Connections: Taking Charge of the Bay-Delta* (Student Edition, pages 2–5). Write the year to the left of the timeline and the water-related events to the right.

- **Year:** 1845  
  **Event:**

Prior to 1849, the Delta was mostly an untouched natural environment.

- **Year:** 1850

In 1850, ownership of the Delta was given to the state, and development began.

- **Year:** 1860

**SL.9–10.1:** Initiate and participate effectively in a range of collaborative discussions…with diverse partners,… building on others’ ideas and expressing their own clearly and persuasively.

- **Year:** 1935

**RST.9–12.5:** Analyze the structure of the relationships among concepts in a text…
- **Chronological**

- **Year:** mid 1900s

By the mid 1900s, 700,000 acres of farmland, more than 1,000 miles (1,610 kilometers) of levees, and hundreds of miles of waterways had transformed the Delta.
Group 2

Jigsaw Activity

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**SL.9–10.1:** Initiate and participate effectively in a range of collaborative discussions...with diverse partners,... building on others’ ideas and expressing their own clearly and persuasively.

**RST.9–12.2:** Determine the central ideas or conclusions of a text...

**RST.9–12.10:** ...Read and comprehend science texts...independently and proficiently.
Instructions: Fill in the graphic with information about what the Delta Vision Blue Ribbon Task Force was charged with doing about securing and conserving water supplies for the future, as identified in *California Connections: Taking Charge of the Bay-Delta* (Student Edition, pages 2–5).

Group 3
Jigsaw Activity

Make sure enough water gets to agriculture, a major part of the economy.

Maintain the health of the Delta ecosystem.

Help the federal and state agencies work together better in managing the Delta.

In the face of drought and water shortages, find a way to help communities.

**SL.9–10.1:** Initiate and participate effectively in a range of collaborative discussions...with diverse partners,...building on others’ ideas and expressing their own clearly and persuasively.

**SL.9–12.4:** Present information, findings, and supporting evidence clearly, concisely, and logically...
Instructions: Fill in the chart with any problems and solutions related to water use and supply identified in *California Connections: Taking Charge of the Bay-Delta* (Student Edition, pages 2–5).

<table>
<thead>
<tr>
<th>Problems</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water is not always available where and when we need it</strong>—more falls</td>
<td><strong>Build dams to store water and canals and aqueducts to transport it to</strong></td>
</tr>
<tr>
<td><strong>in northern and eastern California while more people live in the</strong></td>
<td><strong>the San Joaquin Valley, the San Francisco Bay Area, Central Coast, and</strong></td>
</tr>
<tr>
<td><strong>and western (coast) part of the state.</strong></td>
<td><strong>Southern California.</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>A six-year drought beginning in 1987 reduced</strong></td>
<td><strong>Find a way to increase cooperation between local, state, and federal</strong></td>
</tr>
<tr>
<td><strong>the water supply in the state.</strong></td>
<td><strong>agencies overseeing California’s water supply.</strong></td>
</tr>
</tbody>
</table>

*RST.9–12.2: Determine the central ideas or conclusions of a text...*  
*RST.9–12.10: ...Read and comprehend science texts...independently and proficiently.*
QuickPoll

- Do you use Interactive Science Notebooks or Science Journals with your students?
Lesson 2: Supply and Demand for California’s Water

SL.9–10.1: Initiate and participate effectively in a range of collaborative discussions...with diverse partners,... building on others’ ideas and expressing their own clearly and persuasively.

Learning Objectives

- List major uses of water in California and describe their importance to society.
- Identify the sources and locations of major water supplies in California (for example, surface water, reservoirs, and aquifers).

In this lesson, students identify the hydrologic and geologic factors that determine how fresh water in California collects and flows. Using data from the Water for Life wall map, students learn about the state’s hydrologic regions and realize that most of the fresh water we use originates in the northern part of the state (north of Sacramento in the Sierra Nevada). They study the geographic...
Lesson 2: Supply and Demand for California’s Water
Lesson 2: Supply and Demand for California’s Water

Part 1: Where does our water come from?
Instructions: Complete the following tasks using California’s Water Supply (Student Edition, page 6). (5 points each)

1. What is/are the source(s) of California’s water supply?
   
   Global climate and ocean cycles driven by solar energy supply water as precipitation in the form of rainfall or snow. Precipitation gathers in basins from runoff. Most of the rainfall is in the northern...
Lesson 2:
Supply and Demand for California’s Water

- Agriculture is #1 for Water Use
Lesson 2: Supply and Demand for California’s Water

Water in California
Lesson 2 | page 3 of 3

Part 3: So, what’s the “water” problem?
Instructions: Use information from this lesson to write two to three paragraphs in response to the prompt below. Include discussion of California’s fresh water sources, supply, and uses.

8. Consider a specific region within northern California and another region within Southern California. Is there typically enough water supply within each chosen region to meet that region’s demand? Why or why not? (10 points)

_There is an uneven distribution of water in the state. Most of the water is located in northern California. The water supply in the northern part of the state is mostly surface water, which is located in streams and rivers. The Sacramento River and Tulare Lake hydrologic regions are areas with groundwater (the South Coast region has groundwater too, but not as much). One problem is transporting the water from areas with excess water to areas with less water that need it._

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**SL.9–10.1:** Initiate and participate effectively in a range of collaborative discussions…with diverse partners,…building on others’ ideas and expressing their own clearly and persuasively.

**HS–ESS 3–1,** Construct an explanation based on Evidence

**HS–ESS 2–2,** Analyze Data
Lesson 3: Moving California Water

Moving California’s Water

In this lesson, students learn about the methods used in California to move large amounts of water great distances. Students examine the California Aqueduct and note its major components to learn about the physical aspects and structures that function to move fresh water from its origins in northern California south to the Los Angeles Basin.
Lesson 3: Moving California’s Water

Water moves great distances within and between California’s ten hydrologic regions, some through natural waterways and some through constructed water systems. Numbers shown are the regional inflows and outflows of water in thousand acre feet for 2000, an average water year.

RST.9–10.7: …translate information expressed visually…into words.
Lesson 3: Moving California’s Water

How does your water project serve the needs of all Californians?

WHST.9–10.2: Write informative/explanatory texts...

b) Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples
QuickPoll

Are your students aware of the controversy surrounding the Delta Smelt?
Lesson 4: Salt and Smelt

Learning Objective
Provide examples of the direct and indirect effects of the growing human demand for water on the geographic extent, composition, biological diversity, and viability of natural systems.

Salt and Smelt—Feeling the Effects of California’s Thirst

Use of the water resources in and around California has some unwanted side effects. In this lesson, students learn about two of the consequences of using and managing the state’s fresh water supplies: the endangerment of species that are part of the Bay-Delta ecosystem and the buildup of salt in irrigated croplands in the San Joaquin Valley.
Lesson 4: Salt and Smelt – Feeling the Effects of California’s Thirst

**Key Vocabulary**

**Impaired waterbodies:** Lakes, streams, and rivers that do not meet water quality standards set by the U.S. Clean Water Act. The standards vary with the usage of the water—drinking water, recreation, or health of aquatic ecosystems. California currently has over 500 bodies of water on this impaired list.

**Indicator species:** An organism whose survival is representative of the health of a habitat or ecosystem.

**Salinity:** The total amount of salts dissolved in water; sea water averages 35 parts per thousand.

**Salinization:** The accumulation of salts in soil to levels that are above normal.
Lesson 4: Salt and Smelt – Feeling the Effects of California’s Thirst

The Delta Smelt

The California Department of Fish and Game has been casting nets in the Delta for the last couple of weeks. It is not so much about what they catch, as what they do not catch. Since 1967, biologists have searched the murky waters of the Delta

A Salty Situation

Irrigation of arid regions in California, such as the San Joaquin Valley over the past century, has helped fuel California, through agriculture, to become a world-leading economy. But irrigation of arid lands has some side effects. Increasing salinity

Delta Smelt

Salty Lands
## Lesson 4:
Salt and Smelt – Feeling the Effects of California’s Thirst

<table>
<thead>
<tr>
<th>How is our water use affecting:</th>
<th>The Bay-Delta ecosystem?</th>
<th>The San Joaquin Valley?</th>
</tr>
</thead>
<tbody>
<tr>
<td>[R] Reading</td>
<td><em>Fresh water required for fish to spawn has been diverted to the Central Valley and Southern California for human uses. Some species are dying off, like the delta smelt, longfin smelt, and</em></td>
<td><em>Continued irrigation with inadequate drainage or flushing has caused salinization of the soils, reducing soil productivity and affecting wildlife.</em></td>
</tr>
<tr>
<td>[W] Writing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[S] Speaking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[L] Listening</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Delta Smelt**

![Image of Delta Smelt]

**Salty Lands**
Lesson 5:
The Watery Decisions We Make

SL.9–10.2: Integrate multiple sources of information presented in diverse media or formats...

Learning Objectives

Describe the spectrum of considerations that are involved in decisions about California’s supplies of fresh water.

Describe the role of scientific knowledge on making policy and management decisions about human activity related to California’s water supply.
Lesson 5: The Watery Decisions We Make

Step 3

Present the video of the Chairman’s Address to the Association of California Water Agencies (ACWA), pausing as needed to have students take notes on information that answers the questions in Part 1 on Visions of California’s Water Future. After presenting the video, project Delta Vision Recommendations (Visual Aid #10). Review the questions students were asked about the Task Force’s mission and their recommendations. (Note: An Answer Key and Sample Answers for Visions of California’s Water Future are provided on pages 103–105.)

Video Files:
- Chairman’s Address to the Association of California Water Agencies (ACWA), provided separately
Lesson 5: The Watery Decisions We Make

Student Workbook Assignment

2. Name some of the stakeholders that feel strongly about water issues in the Delta, and who gave feedback to the Task Force.

- Business leaders
- Ecologists and other scientists
- Environmental groups
- Farmers
- Residents of the Delta area and other areas
- Taxpayers
- State agencies
Lesson 5: The Watery Decisions We Make

### VA #11 California’s Annual Water Budget

<table>
<thead>
<tr>
<th>California’s Water Budget</th>
<th>Quantity of Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precipitation and Imported Water</td>
<td>200 million acre-feet</td>
</tr>
<tr>
<td>Used in Evaporation/Transpiration (plants)</td>
<td>-130 million acre-feet</td>
</tr>
<tr>
<td>Total Runoff</td>
<td>70 million acre-feet</td>
</tr>
<tr>
<td>Available from Runoff</td>
<td>70 million acre-feet</td>
</tr>
<tr>
<td>Outflow to Pacific Ocean</td>
<td>-21 million acre-feet</td>
</tr>
<tr>
<td><strong>Total Runoff Stored in Reservoirs</strong></td>
<td>49 million acre-feet</td>
</tr>
<tr>
<td>Stored in Reservoirs</td>
<td>49 million acre-feet</td>
</tr>
<tr>
<td>Used for Agriculture</td>
<td>-&gt; 20 million acre-feet</td>
</tr>
<tr>
<td>Used for Urban Purposes</td>
<td>-&gt; 5 million acre-feet</td>
</tr>
<tr>
<td>Allocated to Ecosystems (Instream)</td>
<td>-&gt; 25 million acre-feet</td>
</tr>
</tbody>
</table>

*Note: By the year 2030, experts believe that California’s water use will increase by 4 million acre-feet. Current precipitation amounts have remained unchanged for thousands of years. In the future, climate change may influence the amount of water produced by natural sources, and Californians should be prepared for less water from natural sources.*
Unit Assessment Options for Project Based Learning

California’s Liquid Gold: Our Limited Water Resources

Bay-Delta, the water is pumped down the California Aqueduct where it is delivered to agencies and customers in central and Southern California.

What Happens to Natural Systems
When people divert water from its original source, the organisms that rely on that water and the services it provides sometimes suffer. For example, diverting water from the Delta to Southern California has reduced fresh water for fish. Some fish species, like the delta smelt or Chinook salmon, need fresh water to spawn and reproduce. Their populations have gone down, likely due to the lack of fresh water.

Moving California’s Water
California has a water problem: most of the supply of water is in the northern part of the state, but most of the demand is in the southern part. Multiple federal, state, and local projects move water to arid regions for agriculture and urban use. These projects include pipelines, canals, aqueducts, dams, pumps, and hydroelectric stations. Overall, California moves millions of acre-feet of water a year through these projects.

One example is the California Aqueduct, which is part of the State Water Project. The California Aqueduct comes from the Tehama reservoir on the Feather River and traveled down the Sacramento River and then into the Bay-Delta.

SL.9–10.2: Integrate multiple sources of information presented in diverse media or formats…
Unit Assessment Options

Traditional Assessment

Answer Key and Sample Answers

Liquid Gold: California’s Water
Traditional Unit Assessment Master | page 1 of 4

Name: ____________________________

Part 1

Instructions: Select the best answer and circle the correct letter. (2 points each)

1. In California, which of the following uses the greatest amount of the freshwater supply?
   a. recreation
   b. agriculture
   c. industry
   d. domestic
   
17. Explain what California’s “water budget” is and why it is important.

   California receives a certain amount of water through precipitation and import from other states on an annual basis. Some of this water is controlled and stored for human use. The amount that is available and the amount that are used can be accounted for, like money. For instance, agriculture uses about 34 million acre-feet per year, while urban use is about 9 million acre-feet. Fifty percent of the water is reserved for environmental use (streams, ocean outflow, wetlands).
At a Glance

1. Who's In Charge of the Water?
   Identify elements of California's water management and use issues by analyzing a case study.

2. Supply and Demand for California's Water
   Analyze California's hydrologic regions and identify the state's surface and groundwater sources.

3. Moving California's Water
   Trace how water in California is moved from its origin to areas where it is used via local and state water projects.

4. Salt and Smelt—Feeling the Effects of California's Thirst
   Discuss case studies about the effect of water transfers on ecosystems and describe factors in water allocation decisions.

5. The Watery Decisions We Make
   Evaluate the contributions of the scientific community to the management of water in California.
“Can school always be this way? I feel like I’m learning important stuff for my life.”
Sixth Grade Student
California Education and the Environment Initiative (EEI)

1,656 likes · 22 talking about this · 5 were here

Education
The Education and the Environment Initiative (EEI) is a movement to increase environmental literacy and reach up to 6.2 million K-12 students and 150,000 teachers in
Next Steps

Receive an e-mail from me tomorrow

- Complete our online form that gathers your information
- Next, complete our online EEI Curriculum Unit order form
- After you teach the EEI Unit, please complete the post-survey to receive a second unit of your choice
www.CaliforniaEEI.org

Are There Any Questions?

kirk.amato@calrecycle.ca.gov

Thank you!