

# California Education and the Environment Initiative

Increasing Environmental Literacy for K–12 Students...

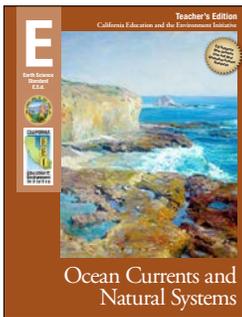
Because the Future is in Their Hands



## TEACH COMMON CORE STANDARDS WITH THE EEI CURRICULUM

Created with your needs in mind, this document shows the correlation between the EEI Curriculum and the California Common Core State Standards. By teaching the EEI unit lessons in your classroom, you will be simultaneously addressing the Common Core standards depicted in this guide.

### E.5.d.—Ocean Currents and Natural Systems



In this unit, students learn how an ecosystem’s physical environment directly determines whether an organism can live there. Students study California’s sardine industry and explore changes in sardine populations. They conduct an experiment on ocean layering and consider how it affects the distribution of coastal and marine organisms. Then they explore Earth’s global ocean currents and patterns of vertical layering in oceans, and how those affect marine organisms. Students learn how jetties and breakwaters influence physical processes in oceans, and examine a case study about how the distribution of a species can influence ecosystems and human communities. Finally, they consider the role of scientific knowledge in making policy and management decisions about the sardine industry.

		RST.9–10.1	RST.9–10.2	RST.9–10.4	RST.9–10.5	RST.9–10.6	RST.9–10.7	RST.9–10.8	RST.9–10.9	RST.9–10.10	WHST.9–10.2	WHST.9–10.8	WHST.9–10.9	SL.9–10.1	SL.9–10.4	SL.11–12.1
<b>LESSONS</b>	California Connections			✓		✓		✓		✓	✓					
	1		✓	✓			✓		✓	✓		✓		✓	✓	
	2			✓			✓				✓	✓	✓	✓		
	3			✓			✓						✓	✓	✓	
	4	✓		✓			✓				✓			✓		
	5		✓	✓	✓		✓	✓			✓	✓	✓	✓		
	6		✓	✓		✓	✓			✓		✓		✓	✓	✓
Traditional Assessment										✓	✓					
Alternative Assessment	✓			✓		✓				✓	✓	✓	✓			

### COMMON CORE STANDARDS

**Note:** For your reference, the list of California Common Core State Standards abbreviations is on the following page.

## Using the EEI-Common Core Correlation Matrix

The matrix on the front page identifies a number of Common Core standards that are supported by this EEI unit. However, the check marks in the matrix do not necessarily signify that the Common Core standards checked will be taught to mastery by using this EEI unit alone. Teachers are encouraged to select which Common Core standards they wish to emphasize, rather than teaching to every indicated standard. By spending more time on selected standards, students will move toward greater Common Core proficiency in comprehension, critical thinking and making reasoned arguments from evidence. Teaching this EEI unit will provide opportunities for teachers to implement the shift in instructional practice necessary for full Common Core implementation.

## California Common Core State Standards Abbreviations

- **CCSS:** California Common Core State Standards
- **RST:** Reading Standards for Literacy in Science and Technical Subjects
- **SL:** Speaking and Listening Standards
- **WHST:** Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects

**Note:** Since each Common Core standard includes a breadth of skills, in this correlation, the portion of the standard description that is featured in the Common Core Standards Applications is cited, using “...” to indicate omitted phrases. For a list of the complete standard descriptions, please see the Common Core Reference Pages located on pages 19–20 of this document.

## A Note about Common Core Speaking and Listening Standards

Throughout this unit, students participate in various learning structures and groups to analyze, discuss, and synthesize data, which supports the skill in Speaking and Listening Standard 1 “Participate effectively in a range of collaborative discussions (one-on-one, groups...) with diverse partners.” With prior instruction on collaborative discussions, these various groupings and the materials students examine lend themselves to prime discussion material for collaborative discussions. Learning structures with tasks for pairs and groups are in the following lessons:

- **Lesson 1:** Pairs, whole class
- **Lesson 2:** Whole class
- **Lesson 3:** Pairs
- **Lesson 4:** Pairs
- **Lesson 5:** Groups, whole class
- **Lesson 6:** Groups, whole class

## National Geographic Resources

No maps or posters are used with this unit.

## Unit Assessment Options

Assessments	Common Core Standards Applications
<b>Traditional Assessment</b>	
<p>Students complete multiple-choice and short-answer questions on the unit topic.</p>	<p><b>RST.9–10.10:</b> By the end of grade 10, read and comprehend science/technical texts...independently and proficiently.</p> <p><b>WHST.9–10.2:</b> Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.</p> <p>d) Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.</p>
<b>Alternative Assessment</b>	
<p>Students read an essay about the Monterey Bay National Marine Sanctuary. Using this information, they complete concept maps.</p>	<p><b>RST.9–10.1:</b> Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.</p> <p><b>RST.9–10.5:</b> Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).</p> <p><b>RST.9–10.7:</b> Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart)...</p> <p><b>RST.9–10.10:</b> ...read and comprehend science...texts... independently and proficiently.</p> <p><b>WHST.9–10.2:</b> Write informative/explanatory texts...</p> <p><b>WHST.9–10.8:</b> Gather relevant information from multiple authoritative print and digital sources...</p> <p><b>WHST.9–10.9:</b> Draw evidence from informational texts to support analysis, reflection, and research.</p>

## Lesson 1: Rise and Fall of the California Sardine Industry

Students read a story about the California sardine industry, build a timeline of events relating to the industry, and create a concept map showing how the components of the industry relate to each other.



Use this correlation in conjunction with the **Procedures** located on pages 38–39 of the Teacher’s Edition. Only procedure steps with a Common Core correlation are included in the table below.

Student Tasks	Common Core Standards Applications
<p><b>Vocabulary Development:</b> For depth of understanding, vocabulary may be featured within the context of the unit instead of or in addition to the beginning of the lesson.</p>	<p><b>RST.9–10.4:</b> Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context...</p>
<p><b>Step 2:</b> Students use pre-reading strategies to preview the article <b>California Connections: Packed Like a Can of Sardines</b> (Student Edition, pages 2–5). Students’ goal in reading this piece is to determine what factors caused changes to the California sardine industry. Students read through the article and make notes about any passages that indicate changes to sardine populations or to the sardine industry.</p> <p><b>Suggestion:</b> <i>In addition to reading California Connections for content, students should look at several key elements on how the writing is structured. This can be done while they are reading or during a second reading of the material. Students who have been familiarized with this process can identify these structural elements as they read by themselves, and then they can be discussed as a class.</i></p> <p>Refer to the <b>Reading California Connections Using a Common Core Reading and Writing Focus</b> on pages 14–18 to view specific suggestions for integrating Common Core standards while reading the selection not only for content, but for text structure as well.</p>	<p><b>RST.9–10.2:</b> Determine the central ideas or conclusions of a text...  <b>RST.9–10.10:</b> ...read and comprehend science/technical texts...independently and proficiently.</p>
<p><b>Step 3:</b> Students work in pairs to complete <b>California Sardine Industry Timeline</b> (Student Workbook, pages 4–5) based on their readings. Have students work together to collect at least 10 major events in the history of the California sardine industry. When students have completed the assignment, project the <b>California Sardine Industry Timeline</b> (Visual Aid #2) and review the answers with students, recording their ideas on the Visual Aid.</p> <p><b>Tip:</b> <i>If Student Workbooks need to be reused from year to year, students should not write in them. Some strategies teachers use to preserve the workbooks are:</i></p> <ul style="list-style-type: none"> <li>■ Have students use binder paper or other lined or unlined paper.</li> <li>■ Have students use a sheet protector over the page and write with a whiteboard marker.</li> <li>■ Do together as a class on a projector or chart paper.</li> <li>■ Project the digital fill-in version and do together as a class.</li> <li>■ Students use digital devices to fill in the digital version found on the website.</li> <li>■ Make student copies when necessary.</li> </ul>	<p><b>SL.9–10.1:</b> Initiate and participate effectively in a range of collaborative discussions...  c) Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.</p> <p><b>WHST.9–10.8:</b> Gather relevant information from multiple authoritative print and digital sources...</p>

Student Tasks	Common Core Standards Applications
<p><b>Step 4:</b> Students turn to <b>Physical Environment and Sardine Fisheries Concept Map</b> (Student Workbook, page 6). Students consider what kinds of human activities might have affected the sardine industry. Students work in pairs to complete the top half of the concept map associated with “Human Uses.” Project <b>Physical Environment and Sardine Fisheries</b> (Visual Aid #3) and review the top portion with students.</p> <p><b>Suggestion:</b> Create a poster-size diagram to model the process and to encourage class discussion.</p>	<p><b>RST.9–10.9:</b> Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.</p> <p><b>SL.9–10.1:</b> ...participate...in a range of collaborative discussions...</p> <p><b>WHST.9–10.8:</b> Gather relevant information from multiple authoritative print and digital sources...</p>
<p><b>Step 5:</b> While viewing <b>Monterey Bay and Surrounding Areas</b> (Visual Aid #4), students interpret and discuss the map. Students work with their partners to complete the bottom half of <b>Physical Environment and Sardine Fisheries Concept Map</b>, referring to their notes from the readings for information.</p>	<p><b>RST.9–10.7:</b> ...translate information expressed visually...into words.</p> <p><b>RST.9–10.9:</b> Compare and contrast findings presented in a text to those from other sources...</p> <p><b>SL.9–10.1:</b> ...participate effectively in a range of collaborative discussions...</p> <p><b>WHST.9–10.8:</b> Gather relevant information from multiple authoritative print and digital sources...</p>
<p><b>Step 6:</b> Students discuss <b>California Connections: Packed Like a Can of Sardines</b>, using focus questions to guide their discussion.</p> <p><b>Suggestion:</b> The discussion outlined in the Teacher’s Guide can be conducted as a collaborative discussion. Rather than the teacher presenting them, assign the questions to discussion leaders, who facilitate a discussion in which students are challenged to back up their ideas with evidence or clarifying thoughts rather than simply a question/answer session. Students should also be encouraged to generate their own questions related to the data and explore possible explanations.</p>	<p><b>RST.9–10.7:</b> ...translate information expressed visually...into words.</p> <p><b>SL.9–10.1:</b> ...participate...in a range of collaborative discussions (...in groups...).</p> <p>c) Propel conversations by posing and responding to questions...; actively incorporate others into the discussion; and clarify, verify and challenge ideas and conclusions.</p> <p><b>SL.9–10.4:</b> Present information, findings, and supporting evidence clearly, concisely, and logically...</p>

## Lesson 2: Ocean Water’s Influence on the Distribution of Organisms

Students conduct an experiment about ocean layering. They draw conclusions from observations and class discussions, and write responses to questions that demonstrate their understanding of ocean properties that affect geographic distribution of coastal and marine organisms.



Use this correlation in conjunction with the **Procedures** located on pages 56–59 of the Teacher’s Edition. Only procedure steps with a Common Core correlation are included in the table below.

Student Tasks	Common Core Standards Applications
<p><b>Vocabulary Development:</b> For depth of understanding, vocabulary may be featured within the context of the unit instead of or in addition to the beginning of the lesson.</p>	<p><b>RST.9–10.4:</b> Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context...</p>
<p><b>Step 2:</b> Students turn to <b>Ocean Layering Data Sheet</b> (Student Workbook, pages 7–9), and begin a discussion about the layers and temperature in the ocean, using questions to focus their discussion. Students turn to page 2 of <b>Ocean Layering Data Sheet</b> and write a hypothesis.</p>	<p><b>SL.9–10.1:</b> Initiate and participate effectively in a range of collaborative discussions...</p> <p><b>WHST.9–10.2:</b> Write informative/explanatory texts...</p> <p>a) Introduce a topic...</p> <p>d) Use precise language and domain-specific vocabulary to... convey a style appropriate to the discipline and context...</p>
<p><b>Step 4:</b> Students discuss the experiment performed in Step 3, using focus questions to guide the discussion. Students fill in the answers to the results questions on page 3 of <b>Ocean Layering Data Sheet</b>.</p>	<p><b>SL.9–10.1:</b> Initiate and participate effectively in a range of collaborative discussions...</p> <p><b>WHST.9–10.2d:</b> Use precise language and domain-specific vocabulary to... convey a style appropriate to the discipline and context...</p> <p><b>WHST.9–10.8:</b> Gather relevant information from multiple authoritative print and digital sources...</p>
<p><b>Step 5:</b> While viewing the graph on the top half of <b>Structured Layering of the Ocean</b> (Visual Aid #6), students update and discuss the “Structured Ocean Layering Diagram” by adding the line that describes the thermocline.</p>	<p><b>RST.9–10.7:</b> Translate quantitative or technical information expressed in words in a text into visual form...</p>
<p><b>Step 7:</b> While viewing <b>Phytoplankton</b> (Visual Aid #7) students brainstorm with a partner and answer the question: “What variables do you think are important to life in the ocean, and what resources do plants or animals need to survive?”</p>	<p><b>RST.9–10.7:</b> Translate quantitative or technical information expressed in words in a text into visual form ...</p> <p><b>SL.9–10.1:</b> Initiate and participate effectively in a range of collaborative discussions...</p>

Student Tasks	Common Core Standards Applications
<p><b>Step 8:</b> While viewing the graph on the bottom of <b>Structured Layering of the Ocean</b> (Visual Aid #6), and <b>Seasonal Productivity in Surface Waters</b> (Visual Aid #8), students discuss the patterns seen at different latitudes.</p>	<p><b>RST.9–10.7:</b> Translate quantitative or technical information expressed in words in a text into visual form...</p> <p><b>SL.9–10.1:</b> Initiate and participate effectively in a range of collaborative discussions...</p>
<p><b>Step 9:</b> Students turn to <b>Ocean Layers</b> (Student Workbook, page 10), and use observations and notes from <b>Ocean Layering Data Sheet</b> to answer questions.</p>	<p><b>WHST.9–10.8:</b> Gather relevant information from multiple authoritative print and digital sources...</p> <p><b>WHST.9–10.9:</b> Draw evidence from informational texts to support analysis, reflection, and research.</p>

## Lesson 3: Ocean Currents' Influences on Coastal and Marine Organisms

Students learn about major ocean currents and vertical layering of ocean water. They then explore how these factors influence the geographic distribution of marine and coastal organisms.



Use this correlation in conjunction with the **Procedures** located on pages 74–75 of the Teacher’s Edition. Only procedure steps with a Common Core correlation are included in the table below.

Student Tasks	Common Core Standards Applications
<p><b>Vocabulary Development:</b> For depth of understanding, vocabulary may be featured within the context of the unit instead of or in addition to the beginning of the lesson.</p>	<p><b>RST.9–10.4:</b> Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context...</p>
<p><b>Step 5:</b> Working in pairs, students discuss and answer Questions 1 to 6 on <b>Ocean Layers, Currents, and Distribution of Marine Organisms</b> (Student Workbook, pages 11–12).</p>	<p><b>RST.9–10.7:</b> Translate quantitative or technical information expressed in words in a text into visual form...</p> <p><b>SL.9–10.1:</b> Initiate and participate effectively in a range of collaborative discussions...</p>
<p><b>Step 6:</b> Project <b>Monterey Bay and Surrounding Areas</b> (Visual Aid #4) and ask students to identify the areas of high productivity influenced by these upwellings. Have pairs of students discuss and answer Question 7 on <b>Ocean Layers, Currents, and Distribution of Marine Organisms</b>.</p>	<p><b>RST.9–10.7:</b> Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.</p> <p><b>SL.9–10.1:</b> Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners...</p> <p><b>SL.9–10.4:</b> Present information, findings, and supporting evidence clearly, concisely, and logically...</p> <p><b>WHST.9–10.9:</b> Draw evidence from informational texts to support analysis, reflection, and research.</p>

## Lesson 4: Human Connections to Ocean Processes

Students take notes and interpret diagrams of the effects of jetties and breakwaters on the physical environment. Working in pairs, they read and answer questions about two Southern California structures built to protect or make better use of the coastline.



Use this correlation in conjunction with the **Procedures** located on pages 86–87 of the Teacher’s Edition. Only procedure steps with a Common Core correlation are included in the table below.

Student Tasks	Common Core Standards Applications
<p><b>Vocabulary Development:</b> For depth of understanding, vocabulary may be featured within the context of the unit instead of or in addition to the beginning of the lesson.</p>	<p><b>RST.9–10.4:</b> Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context...</p>
<p><b>Step 4:</b> Students work in pairs to read and take notes on <b>Case Studies: Santa Monica Breakwater and Huntington Harbor</b> (Student Edition, pages 6–7). Students turn to <b>Jetties, Breakwaters, and Currents</b> (Student Workbook, pages 13–15), and use notes from class and the readings to answer the questions.</p>	<p><b>RST.9–10.1:</b> Cite specific textual evidence to support analysis of science and technical texts...</p> <p><b>RST.9–10.7:</b> Translate quantitative or technical information expressed in words in a text into visual form...</p> <p><b>SL.9–10.1:</b> Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners...</p> <p><b>WHST.9–10.2:</b> Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.</p>

## Lesson 5: Marine Organism Distribution and Human Economies

Students read a case study that illustrates how changes to the distribution of a species can influence ecosystems and human communities. Students answer questions about the case study.



Use this correlation in conjunction with the **Procedures** located on pages 102–103 of the Teacher’s Edition. Only procedure steps with a Common Core correlation are included in the table below.

Student Tasks	Common Core Standards Applications
<p><b>Vocabulary Development:</b> For depth of understanding, vocabulary may be featured within the context of the unit instead of or in addition to the beginning of the lesson.</p>	<p><b>RST.9–10.4:</b> Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context...</p>
<p><b>Steps 1 and 2:</b> While viewing <b>Structure of Kelp</b> (Visual Aid #15), <b>Surface Kelp Forest Canopy</b> (Visual Aid #16), and <b>Products Containing Alginate</b> (Visual Aid #17), students discuss the information provided.</p>	<p><b>RST.9–10.7:</b> Translate quantitative or technical information expressed in words in a text into visual form...</p> <p><b>SL.9–10.1:</b> ...participate effectively in a range of collaborative discussions...</p>
<p><b>Step 3:</b> Working in nine small groups, students examine several sides of an issue surrounding kelp harvesting. Using <b>Perspectives on the Kelp Harvest Ban</b> (Teacher’s Masters, page 2), each group reads the perspective of their assigned interest group and builds an argument for their side of the issue.</p>	<p><b>RST.9–10.2:</b> Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.</p> <p><b>RST.9–10.5:</b> Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., <i>force, friction, reaction force, energy</i>).</p> <p><b>SL.9–10.1:</b> ...participate effectively in a range of collaborative discussions...</p>

Student Tasks	Common Core Standards Applications
<p><b>Step 4:</b> Students work in three large groups, with each group containing representatives from all three interest groups. Students take notes while listening to a representative from each industry present their perspective to the group. When each side has heard the others' arguments, the following questions are used to focus a discussion of what points are to be considered, and how this issue might be resolved.</p> <ul style="list-style-type: none"> <li>■ Which interest groups want to harvest kelp? Why?</li> <li>■ Which interest groups oppose harvesting kelp? Why?</li> <li>■ If kelp plants disappeared from Monterey Bay, how would this affect the economies of the region?</li> <li>■ Discuss with students how they would resolve this issue.</li> </ul> <p><b>Suggestion:</b> Have students prepare a visual display to accompany their presentation. A web-based collaborative tool such as Prezi can add dimension to the presentations.</p>	<p><b>RST.9–10.2:</b> Determine the central ideas or conclusions of a text...</p> <p><b>RST.9–10.7:</b> ...translate information expressed visually...into words.</p> <p><b>RST.9–10.8:</b> Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.</p> <p><b>SL.9–10.1:</b> ...participate effectively in a range of collaborative discussions...</p> <p><b>WHST.9–10.2:</b> Write informative/explanatory texts, including...scientific procedures/experiments, or technical processes.</p> <p><b>WHST.9–10.9:</b> Draw evidence from informational texts to support analysis, reflection, and research.</p>
<p><b>Step 5:</b> Students turn to <b>Plan Extends Kelp Harvest Ban</b> (Student Edition, pages 8–9). Students read the article, then discuss the outcome of the actual meeting, and whether the outcome was fair. Project <b>Kelp Forest</b> (Visual Aid #18). Emphasize that changing kelp's geographic distribution by removing it from an area can greatly influence other species in a kelp forest.</p>	<p><b>RST.9–10.7:</b> Translate quantitative or technical information expressed in words in a text into visual form...</p> <p><b>SL.9–10.1:</b> ...participate effectively in a range of collaborative discussions...</p>
<p><b>Step 6:</b> Students turn to <b>Kelp Harvest Ban Discussion Questions</b> (Student Workbook, pages 16–17), and answer the questions.</p> <p><b>Suggestion:</b> For <i>Common Core Connections</i>, have students include textual evidence from the reading selections. Create a rubric that includes the use of textual evidence as an assessment item.</p>	<p><b>WHST.9–10.2:</b> Write informative/explanatory texts...</p> <p><b>WHST.9–10.8:</b> Gather relevant information from multiple authoritative print and digital sources...</p>

## Lesson 6: Management of California's Sardine Industry

Students work in small groups to review *California Connections: Packed Like a Can of Sardines* and work from previous lessons. Through lecture and class discussions, they consider the role of scientific knowledge in making policy and management decisions about the sardine industry.



Use this correlation in conjunction with the **Procedures** located on pages 118–119 of the Teacher’s Edition. Only procedure steps with a Common Core correlation are included in the table below.

Student Tasks	Common Core Standards Applications
<p><b>Vocabulary Development:</b> For depth of understanding, vocabulary may be featured within the context of the unit instead of or in addition to the beginning of the lesson.</p>	<p><b>RST.9–10.4:</b> Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context...</p>
<p><b>Steps 1 and 2:</b> In groups of four, students use <i>California Connections: Packed Like a Can of Sardines</i> (Student Edition, pages 2–5), <i>California Sardine Industry Timeline</i> (Student Workbook, pages 4–5), <i>California’s Sardine Fishery 1945–1963</i> (Visual Aid #19), <i>California’s Sardine Fishery 1964–1985</i> (Visual Aid #20), and <i>California’s Sardine Fishery 1986–1999</i> (Visual Aid #21) to review, share, and discuss their <i>California Sardine Industry Timeline</i> (Student Workbook, pages 4–5).</p>	<p><b>RST.9–10.2:</b> Determine the central ideas...; trace the text’s explanation or depiction of a complex process, phenomenon, or concept...</p> <p><b>RST.9–10.7:</b> ...translate information expressed visually...into words.</p> <p><b>RST.9–10.10:</b> ...read and comprehend science...texts...independently and proficiently.</p> <p><b>SL.9–10.1:</b> ...participate effectively in a range of collaborative discussions...</p>
<p><b>Step 3:</b> Students turn to <b>Scientific Knowledge, Policy, and Management Decisions</b> (Student Workbook, pages 18–20), and consider three categories of information, all of which have a direct relationship to the sardine industry. Students brainstorm possible relationships with their groups. Students read the table and work together to categorize each event with the following labels: “Scientific Knowledge,” “Management Policy” (rules and regulations established by government agencies), and “Management Decisions” (decisions made by the individuals and groups responsible for day-to-day operations). Some events fall into multiple categories.</p>	<p><b>RST.9–10.2:</b> Determine the central ideas...; trace the text’s explanation or depiction of a complex process, phenomenon, or concept...</p> <p><b>RST.9–10.10:</b> ...read and comprehend science...texts...independently and proficiently.</p> <p><b>SL.9–10.1:</b> ...participate effectively in a range of collaborative discussions...</p> <p><b>SL.9–10.4:</b> Present information, findings, and supporting evidence clearly, concisely, and logically...</p>

Student Tasks	Common Core Standards Applications
<p><b>Step 4:</b> While viewing <b>Sardine Catch Data, 1981–2004</b> (Visual Aid #22), students discuss the levels of the sardine catch over that time period. While viewing <b>Sardine Landings from Monterey Bay, 1919–1929</b> (Visual Aid #23), students discuss the levels of the sardine catch over that time period. Students discuss in their groups and report to the class at least one variable that could influence the data.</p>	<p><b>RST.9–10.2:</b> Determine the central ideas or conclusions of a text...</p> <p><b>RST.9–10.7:</b> ...translate information expressed visually...into words.</p> <p><b>SL.9–10.1:</b> ...participate effectively in a range of collaborative discussions...</p> <p><b>SL.9–10.4:</b> Present information, findings, and supporting evidence clearly, concisely, and logically...</p>
<p><b>Step 5:</b> While viewing <b>Sardine Catch and Ocean Temperature</b> (Visual Aid #24), students are asked questions and discuss the answers as a class.</p>	<p><b>RST.9–10.7:</b> ...translate information expressed visually...into words.</p> <p><b>SL.9–10.1:</b> ...participate effectively in a range of collaborative discussions...</p> <p><b>SL.11–12.1c:</b> ...probe reasoning and evidence...</p>
<p><b>Step 6:</b> Students develop alternative hypotheses about the decline of the sardine population. When developing hypotheses to share with the class, students should make notes and show the data that supports them. Students share a few of their alternative hypotheses.</p>	<p><b>RST.9–10.6:</b> Analyze the author’s purpose in...discussing an experiment in a text, defining the question the author seeks to address.</p> <p><b>SL.9–10.1:</b> ...participate effectively in a range of collaborative discussions...</p> <p><b>SL.9–10.4:</b> Present information, findings, and supporting evidence clearly, concisely, and logically...</p> <p><b>WHST.9–10.8:</b> Gather relevant information from multiple authoritative print and digital sources...</p>
<p><b>Step 7:</b> Students list the variables involved in the management and recovery of the California sardine industry and the teacher writes the list on the board. Students turn to <b>Management of a Natural Resource</b> (Student Workbook, pages 21–22) and discuss the information they will need to answer the questions.</p>	<p><b>SL.9–10.1:</b> ...participate effectively in a range of collaborative discussions...</p> <p><b>SL.9–10.4:</b> Present information, findings, and supporting evidence clearly, concisely, and logically...</p> <p><b>WHST.9–10.8:</b> Gather relevant information from multiple authoritative print and digital sources...</p>

## Unit Assessment

Refer to the introduction pages at the front of this document for information regarding the Traditional and Alternative Assessments for this unit and their Common Core correlations.

### Reading *California Connections* using a Common Core Reading and Writing Focus

#### Reading

Science teachers can further enhance the teaching of Common Core Reading Literacy Standards by noting the suggestions below and in the following pages while reading the *California Connections* selection for content. Explicitly teach students to pay attention to the structure of the text by noting the following:

- Note how the author cites evidence to support main points; note any gaps or inconsistencies. **(RST.9–10.1 and RST.11–12.1)**
- Note how the author sets up the central ideas or conclusions; trace the text’s explanation or depiction of a process or concept; summarize concepts, processes, and information by paraphrasing the text. **(RST.9–10.2 and RST.11–12.2)**
- Note how the author explains multi-step procedures. **(RST.9–10.3 and RST.11–12.3)**
- Note how the author explains the meaning of key terms, symbols, domain specific words, and phrases. **(RST.9–10.4 and RST.11–12.4)**
- Analyze the structure of the relationships among concepts in a text, and the relationships among key terms, including categories or hierarchies. **(RST.9–10.5 and RST.11–12.5)**
- Analyze the author’s purpose in providing an explanation or describing a procedure, and how this defines the question the author seeks to address; identify important unresolved issues. **(RST.9–10.6 and RST.11–12.6)**
- Note how the information in the *California Connections* text integrates with information provided throughout the unit in diverse formats, including tables, charts, maps, and quantitative data. **(RST.9–10.7 and RST.11–12.7)**
- Assess the extent to which the reasoning and evidence in a text support the author’s claim; evaluate the analysis and conclusions in the text. **(RST.9–10.8 and RST.11–12.8)**
- When other documents are included, compare and contrast findings presented in this text to those in other sources, noting when the findings support or contradict previous explanations. **(RST.9–10.9 and RST.11–12.9)**
- Note comprehension strategies for understanding science texts. **(RST.9–10.10 and RST.11–12.10)**

**Note:** Standard descriptions are paraphrased, using terminology that applies to reading a *California Connections* selection.

#### Writing

Many *California Connections* selections can be used as a model for future student writing tasks applying the Writing Literacy Standards by noting how the author structures the text, organizes the ideas, and provides well-chosen relevant and sufficient facts, extended definitions, concrete details, quotations, or other information and examples.

#### Using the *California Connections* Selection

The following pages note specific places where the *California Connections* selection provides examples for specific Writing Literacy Standards for Science and Technical Subjects, using this selection as a writing model. They also provide suggestions for teaching students to analyze text structure using the Reading Literacy Standards for Science and Technical Subjects. Teachers can incorporate more suggestions from the list above.

**RST.9–10.10:** ...read and comprehend science/technical texts... independently and proficiently.

**Suggestion:** Provide students opportunities to reread the text with a partner, looking for academic vocabulary. If time allows, have students reread a third time, looking at how the author develops the claim through the text.

**WHST.9–10.2a:**  
Introduce a topic and organize ideas...

**Suggestion:** Discuss with students how the introduction sentences are used to capture the reader's attention.

California Connections: Packed Like a Can of Sardines  
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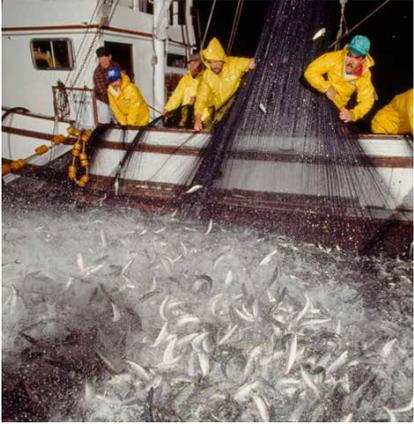
## Packed Like a Can of Sardines



From the late 1800s to the mid-1900s, the sardine industry dominated the coastal town of Monterey, California. John Steinbeck described the scene in his novel *Cannery Row*:  
"In the morning when the sardine fleet has made a catch, the purse-seiners waddle heavily into the bay blowing their whistles. The deep-laden boats pull in against the coast where the canneries dip their tails into the bay... The whole street rumbles and groans and screams and rattles while the silver rivers of fish pour in out of the boats and the boats rise higher and higher in the water until they are empty. The canneries rumble and rattle and squeak until the last fish is cleaned and cut and cooked and canned and then the whistles scream again..."

Visit Cannery Row in Monterey today, and you no longer smell the fishy odors of industry. Instead, tourists explore shops, restaurants, and museums that now live in former canneries. Why did the sardine industry boom in this town, and what happened to it? The story of sardines in California goes back well beyond the 19<sup>th</sup> century, perhaps even further than recorded history. The roots of the sardine's initial abundance in Monterey Bay can be discovered in part by exploring the region's natural history.

**The Natural History of Monterey Bay**  
On the West Coast of North America strong winds in spring and summer blow from the north



Sardine fishermen

2 CALIFORNIA EDUCATION AND THE ENVIRONMENT INITIATIVE | Unit E.5.d | Ocean Currents and Natural Systems | Student Edition

**RST.9–10.8:** Assess the extent to which the reasoning and evidence in a text support the author's claim...

**Suggestion:** Ask, "Are these claims supported in the text?"

**RST.9–10.6:** Analyze the author's purpose in providing an explanation...

**Suggestion:** Ask what the author's purpose is for including this explanation.

**RST.9–10.4:** Determine the meaning of symbols, key terms, and other domain-specific words...

- *upwelling*
- *phytoplankton*

**RST.9–10.10:** ...read and comprehend science/technical texts... independently and proficiently.

**Suggestion:** Throughout the reading, note comprehension strategies for understanding the text.

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and continue south down the coast. The spinning of Earth influences the direction of these winds and causes the upper 10 to 30 meters of the ocean's surface to move offshore. This same force makes sea levels drop. The nutrient-rich waters from the ocean depths then move upward in a process called upwelling. When upwelling occurs, nutrients become available to support the growth of phytoplankton, microscopic organisms that drift in the ocean. (Although they are too small to be seen individually, when clustered, phytoplankton look like algae and give the ocean a greenish or reddish tint.) The blooms of plankton that result from upwelling support major

elements of ocean food chains. Large populations of filter-feeding fish, such as sardines, benefit from the nutritious plankton.

The ocean, controlled by tides and currents, has its own rhythms and unique cycles. The size of the sardine population represents just one of these many cycles. The sardine population temporarily declines every 30 to 60 years. Researchers have identified evidence of this cycle from deposits of fish scales in sediment in the Santa Barbara Basin and on the northwest coast of the Pacific Ocean near Vancouver, British Columbia. Significant sardine populations existed but varied in size. The fish scales near Vancouver indicate that fish on the northern Pacific

Coast have regularly declined and recovered for at least 1,700 years. Scientists generally agree that these fluctuations occur in periods of 30 to 60 years. Thus, sardine populations naturally go through "booms" and "busts" every so often.

**History of the Sardine Industry**  
California's sardine industry, or fishery, began in the late 1800s. It grew in part due to the need to feed soldiers stationed in Europe during World War I. The small, protein-rich sardine proved ideal for shipping. Since the threat of attack by German submarines in the North Atlantic off the coast of New England prevented harvesting sardines in those waters, California became an alternate supplier to feed the troops. The war also prevented England and France from exporting sardines to the United States; prior to the start of the war Europe had been the main supplier of sardines to the United States. Even after the war ended in 1918, California's sardine fishery kept growing.

By the early 1920s, fishermen in Monterey were heavily fishing sardines. The industry learned that the fish was a profitable species. At first the industry caught sardines for



Sardines in "quarter-oil" cans

CALIFORNIA EDUCATION AND THE ENVIRONMENT INITIATIVE | Unit E.5.d | Ocean Currents and Natural Systems | Student Edition 3

**WHST.9–10.2b:** Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details...or other information and examples...

**WHST.9–10.2c:** Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.

**RST.9–10.8:** Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

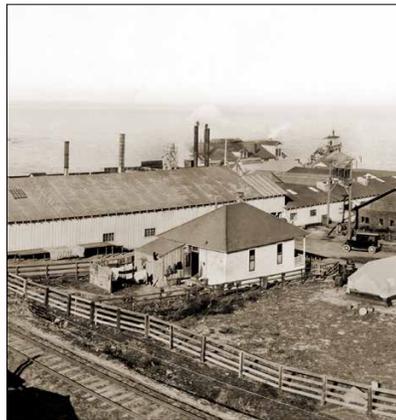
California Connections: Packed Like a Can of Sardines

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human consumption, though it had trouble selling sardines in Monterey.

Soon the industry found other ways to sell fish. Fish byproducts, including oil, fertilizer, and meal, produced excellent profits. The poultry industry, which used fish meal in chicken feed, also enjoyed huge profits as the cost of raising chickens dramatically declined and poultry reached markets in record numbers. At its peak in the 1930s, California's sardine industry was the largest fishery in the Western Hemisphere, accounting for almost 25% of all fish caught in the United States. The statewide catch in 1937 was 790,000 tons, compared with 16,000 in 1917. Of course, these numbers do not reflect the number of fish available, but rather the number that the industry could catch at the time.

In the 1940s, the fishery began to decline. The California Department of Fish and Game noticed a drop in both the size and number of sardines. Eventually the California Assembly passed laws prohibiting the use of the sardines in fish meal. This move pitted the state's regulatory power against the fishing industry. In response, the industry continually sought



Hovden Cannery building (ca. 1918)

loopholes in the laws that they felt jeopardized their profits—California had already imposed a tax on each ton of edible fish produced. For every ton of sardines canned the state of California received \$0.50. In a peak year, such as those of the 1930s, the state earned approximately \$400,000 from sardines. Prohibition of fish meal and fish oil manufacturing hurt the fishing industry but not state revenue. Soon the California Department of Fish and Game

set another standard, requiring that a fixed number of sardines be canned before they were made into other products, such as oil and fertilizer. Even so, the population of sardines continued to drop, and canneries began to close.

In February of 1973 the last California cannery closed its doors. That cannery was the Hovden Cannery, now home to the Monterey Bay Aquarium. Those employed in the sardine

**RST.9–10.10:** ...read and comprehend science/technical texts...independently and proficiently.

**Suggestion:** Throughout the reading, note comprehension strategies for understanding the text.

**WHST.9–10.2b:**

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

**WHST.9–10.2c:**

Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.

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Monterey Bay Aquarium

industry faced unemployment. Due to the unique geographic beauty of Monterey Bay, however, city planners sought to capitalize on yet another growing industry: tourism. Many of the unemployed cannery workers eventually found employment in tourism-related businesses, such as retail shops, restaurants, and other entertainment venues.

**What Caused the Decline?**  
When the sardine population in Monterey Bay began to decline in the 1940s, was it simply nature at work? Did the fish populations plummet due to natural cycles, or did overfishing, contribute to a naturally occurring cycle of decline? Scientists and industry continue to discuss the effects of fishing, especially in situations such as that of the sardine, where the industry fished so heavily. Some scientists think that if people continue to overfish, the industry could influence natural fish cycles.

Over the past 30 years California resource managers have more carefully managed fisheries. Researchers have observed dramatic increases in the Pacific sardine population, with current estimates of the biomass of sardines in U.S. waters at 3.8 billion pounds, the highest level in recent history. By 2002, the sardine catch was over 110,000 tons. Although these levels do not reach as high as in the sardine heyday of the 1930s, they represent an unsurpassed increase over the levels of the 1950s through 1970s. Scientists attribute these high numbers to the role of management changes resulting from better scientific data, assessment surveys, monitoring of fish landings (catches), and the subsequent enactment of laws to protect fish.

CALIFORNIA EDUCATION AND THE ENVIRONMENT INITIATIVE | Unit E.5.d | Ocean Currents and Natural Systems | Student Edition 5

**WHST.9–10.2a:** ...include formatting (e.g., headings),... when useful to aiding comprehension.

**Suggestion:** Note headings and their purpose.

## California Common Core State Standards Descriptions for Grades 9–10

### Reading Standards for Literacy in Science and Technical Subjects

- **RST.9–10.1:** Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- **RST.9–10.2:** Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
- **RST.9–10.4:** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*.
- **RST.9–10.5:** Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force, friction, reaction force, energy*).
- **RST.9–10.6:** Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
- **RST.9–10.7:** Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- **RST.9–10.8:** Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem.
- **RST.9–10.9:** Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
- **RST.9–10.10:** By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

### Speaking and Listening Standards

- **SL.9–10.1:** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues*, building on others’ ideas and expressing their own clearly and persuasively.
  - c) Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.
- **SL.9–10.4:** Present information, findings, and supporting evidence clearly, concisely, and logically (**using appropriate eye contact, adequate volume, and clear pronunciation**) such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose (**e.g., argument, narrative, informative, response to literature presentations**), audience, and task. **CA**

### Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects

- **WHST.9–10.2:** Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
  - a) Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
  - b) Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.
  - c) Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
  - d) Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

## Common Core Reference Pages

- **WHST.9–10.8:** Gather relevant information from multiple authoritative print and digital sources (**primary and secondary**), using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. **CA**
- **WHST.9–10.9:** Draw evidence from informational texts to support analysis, reflection, and research.

## California Common Core State Standards Descriptions for Grades 11–12

### Speaking and Listening Standards

- **SL.11–12.1:** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues*, building on others' ideas and expressing their own clearly and persuasively.
  - c) Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.