

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.4.c.—The Greenhouse Effect on Natural Systems



Students investigate the interactions that shape Earth’s climate. They examine Earth’s atmosphere and compare it to the atmospheres of Venus and Mars. Students interpret graphs and charts and consider the significance of greenhouse gases, as well as ice core samples. Students analyze historical data, consider the concept of a carbon footprint, and write about global climate change. Finally, students combine what they have learned to help them explore the history and impact of California’s climate change and global-warming legislation.

		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.9–10.10	RST.11–12.2	RST.11–12.7	RST.11–12.9	WHST.9–10.2	WHST.9–10.8	SL.9–10.1	SL.9–10.4	SL.11–12.1	SL.11–12.4
LESSONS	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:** Whole class
- **Lesson 2:** Groups of 4
- **Lesson 3:** Whole class
- **Lesson 4:** Whole class
- **Lesson 5:** Whole class
- **Lesson 6:** Pairs, whole class

National Geographic Resources

- **View from Space** wall map (Lessons 1 and 5)

Unit Assessment Options

Assessments	Common Core Standards Applications
Traditional Assessment	
<p>Students answer 10 multiple-choice questions, then write paragraphs to answer five more questions.</p>	<p>RST.9–10.2: Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process...or concept; provide an accurate summary of the text.</p> <p>RST.11–12.2: Determine the central ideas...of a text; summarize...information presented in a text by paraphrasing them in simpler but still accurate terms.</p> <p>WHST.9–10.2: Write informative/explanatory texts...</p>
Alternative Assessment	
<p>Students use all their work from the unit to help them create questions and answers for a board game based on a popular television game.</p>	<p>RST.9–10.10: ...read and comprehend science...texts... independently and proficiently.</p> <p>RST.11–12.2: Determine the central ideas...of a text; summarize...information presented in a text by paraphrasing them in simpler but still accurate terms.</p> <p>RST.11–12.7: Integrate and evaluate multiple sources of information...</p> <p>RST.11–12.9: Synthesize information from a range of sources... into a coherent understanding of a...concept...</p> <p>WHST.9–10.2: Write informative/explanatory texts...</p> <p>WHST.9–10.8: Gather relevant information from multiple authoritative print and digital sources...</p>

Lesson 1: Climate, A Changing Environment

Students read about climate change in California. They study a map that introduces them to the concept that Earth's climate results from an interaction between the many complex, dynamic systems that also shape California's landscape and climate regions.



National Geographic Resources

- **View from Space** wall map

Use this correlation in conjunction with the **Procedures** located on pages 40–42 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>Vocabulary Development: 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>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...</p>
<p>Step 1: Students share their ideas on what they know about climate. Their ideas are recorded on the Climate Change Cluster Diagram.</p>	<p>SL.9–10.1: ...participate...effectively in a range of collaborative discussions...</p>
<p>Step 2: While viewing the View from Space wall map and California 18,000 Years Ago (Visual Aid #1), students are asked to compare present day California with California 18,000 years ago.</p>	<p>RST.9–10.7: ...translate information expressed visually...into words.</p> <p>SL.9–10.1c: 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>Step 3: As a class or individually, students read California Connections: Climate Change in the Golden State (Student Edition, pages 2–6).</p> <p>Suggestion: 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.</p> <p>Refer to the Reading California Connections Using a Common Core Reading and Writing Focus on pages 13–18 to view specific suggestions for integrating Common Core standards while reading this selection not only for content, but for text structure as well.</p>	<p>RST.9–10.4: Determine the meaning of...key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context...</p> <p>RST.9–10.5: Analyze the structure of the relationships among concepts in a text, including relationships among key terms...</p> <p>RST.9–10.6: Analyze the author's purpose in providing an explanation;... defining the question the author seeks to address.</p> <p>RST.9–10.10: ...read and comprehend science...texts...independently and proficiently.</p>

Student Tasks	Common Core Standards Applications
<p>Step 4: Students use the maps, the reading, and what they know about Earth’s climate system to answer questions. Students’ answers are recorded on the Climate Change Cluster Diagram.</p> <p>Suggestion: Create a poster-size diagram to model the process.</p>	<p>RST.9–10.7: ...translate information expressed visually...into words.</p> <p>RST.11–12.7: Integrate and evaluate multiple sources of information...</p> <p>RST.11–12.9: Synthesize information from a range of sources...into a coherent understanding of a...concept...</p> <p>SL.9–10.1c: 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>SL.11–12.1c: ...probe reasoning and evidence...</p> <p>WHST.9–10.8: Gather relevant information from multiple authoritative print and digital sources...</p>
<p>Step 5: Students use Considering Climate Change (Student Workbook, pages 3–4) and information from California Connections: Climate Change in the Golden State to write an essay.</p> <p>Tip: 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:</p> <ul style="list-style-type: none"> ■ Have students use binder paper or other lined or unlined paper. ■ Have students use a sheet protector over the page and write with a whiteboard marker. ■ Do together as a class on a projector or chart paper. ■ Project the digital fill-in version and do together as a class. ■ Students use digital devices to fill in the digital version found on the website. ■ Make student copies when necessary. 	<p>WHST.9–10.2: Write informative/explanatory texts...</p> <ol style="list-style-type: none"> a) Introduce a topic and organize ideas, concepts, and information... b) Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information... 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... f) Provide a concluding statement or section that follows from and supports the information or explanation... <p>WHST.9–10.8: Gather relevant information from multiple authoritative print and digital sources...</p>

Lesson 2: Earth's Greenhouse

Students compare the atmospheric composition and climate conditions of Venus, Earth, and Mars. They learn how a greenhouse works, list Earth's greenhouse gases, and discuss how the greenhouse effect influences Earth's climate.



Use this correlation in conjunction with the **Procedures** located on pages 56–57 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>Vocabulary Development: 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>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...</p>
<p>Steps 1–5: Students view and interpret three visual aids concerning Earth's atmosphere and connect the concepts illustrated in the visual aids with Earth's climate.</p>	<p>RST.9–10.7: ...translate information expressed visually...into words.</p> <p>RST.11–12.7: Integrate and evaluate multiple sources of information...</p> <p>RST.11–12.9: Synthesize information from a range of sources...into a coherent understanding of a...concept...</p> <p>SL.9–10.1: ...participate effectively in a range of collaborative discussions...</p>
<p>Step 6: Students turn to Describing Earth's Greenhouse Effect (Student Workbook, pages 5–7) to complete two short answer questions and one Venn diagram.</p>	<p>WHST.9–10.2d: Use precise language and domain-specific vocabulary to... convey a style appropriate to the discipline and context...</p> <p>WHST.9–10.8: Gather relevant information from multiple authoritative print and digital sources...</p>

Lesson 3: Sources and Sinks of Greenhouse Gases

Students read about the natural sources and sinks of GHGs. They complete a chart that summarizes the reading, add information to the chart about human influences on sources and sinks of GHGs, and discuss still-unknown aspects of the greenhouse effect (GHE).

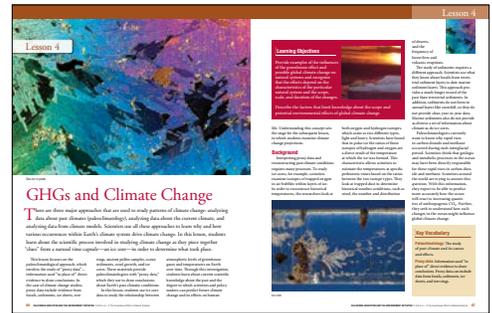


Use this correlation in conjunction with the **Procedures** located on pages 70–71 of the Teacher’s Edition. Only procedure steps with a Common Core correlation are included in the table below.

Student Tasks	Common Core Standards Applications
<p>Vocabulary Development: 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>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...</p>
<p>Step 2: Students work in groups of 4, and each group divides four readings among themselves: Water Vapor: A GHG (Student Edition, pages 7–8), Carbon Dioxide: A GHG (Student Edition, pages 9–10), Methane: A GHG (Student Edition, pages 11–12), and Nitrous Oxide: A GHG (Student Edition, pages 13–14). As students in each group read and discuss their articles, they take notes that will help them answer the discussion questions at the end of each article. Each group prepares to share information about one GHG.</p>	<p>RST.9–10.10: ...read and comprehend science...texts...independently and proficiently.</p> <p>SL.9–10.1: ...participate effectively in a range of collaborative discussions...</p> <p>SL.11–12.1c: ...probe reasoning and evidence...</p> <p>WHST.9–10.2d: Use precise language and domain-specific vocabulary to... convey a style appropriate to the discipline and context...</p>
<p>Step 3: Each group shares information on one GHG, and students fill in Sources and Sinks of Greenhouse Gases (Student Workbook, pages 8–10).</p>	<p>SL.9–10.1: ...participate effectively in a range of collaborative discussions...</p> <p>SL.9–10.4: Present information, findings, and supporting evidence...</p> <p>SL.11–12.4: Present information... conveying a clear and distinct perspective...</p> <p>WHST.9–10.2d: Use precise language and domain-specific vocabulary to... convey a style appropriate to the discipline and context...</p>

Lesson 4: GHGs and Climate Change

Students assume the roles of “detectives” to solve a “climate mystery.” They discuss how scientists use proxy data to learn about Earth’s past, interpret data from ice core samples, and discuss scientific knowledge about GHGs and climate change.



Use this correlation in conjunction with the **Procedures** located on pages 90–91 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>Vocabulary Development: 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>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...</p>
<p>Steps 3–5: Students read What Can Ice Tell Us About Past Climate? (Student Edition, page 15) and Vostok Ice Core Data (Visual Aid #9) to help them interpret and compare present levels of two GHGs with past levels.</p>	<p>RST.9–10.7: ...translate information expressed visually...into words.</p> <p>RST.9–10.10: ...read and comprehend science...texts...independently and proficiently.</p> <p>RST.11–12.7: Integrate and evaluate multiple sources of information...</p> <p>RST.11–12.9: Synthesize information from a range of sources...into a coherent understanding of a...concept...</p> <p>SL.9–10.1: ...participate effectively in a range of collaborative discussions...</p> <p>SL.11–12.1c: ...probe reasoning and evidence...</p>
<p>Step 7: Students use graphs and what they learned in What Can Ice Tell Us About Past Climate? to complete Reading the Ice (Student Workbook, pages 11–12).</p> <p>Suggestion: <i>The teacher can model the completion of this activity using an interactive whiteboard or transparencies.</i></p>	<p>RST.9–10.7: ...translate information expressed visually...into words.</p> <p>RST.9–10.10: ...read and comprehend science...texts...independently and proficiently.</p> <p>SL.9–10.1: ...participate effectively in a range of collaborative discussions...</p> <p>SL.11–12.1c: ...probe reasoning and evidence...</p> <p>WHST.9–10.2d: Use precise language and domain-specific vocabulary to... convey a style appropriate to the discipline and context...</p> <p>WHST.9–10.8: Gather relevant information from multiple authoritative print and digital sources...</p>

Lesson 5: Too Much of a Good Thing?

Students analyze data on global temperature and atmospheric carbon levels since 1850, discuss the concept of a carbon footprint, and analyze the prevailing hypothesis that increasing atmospheric carbon results in global warming and thus climate change.



National Geographic Resources

- **View from Space** wall map

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>Vocabulary Development: 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>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...</p>
<p>Steps 1 and 2: Students view Antarctic Temperature and Atmospheric CO₂ (Visual Aid #10) and Historical Sea Levels for San Francisco and San Diego (Visual Aid #11). As a class, students interpret and discuss the data shown in the graphs.</p> <p>Suggestion: Review CO₂ and the chemical characteristics of this greenhouse gas.</p>	<p>RST.9–10.7: ...translate information expressed visually...into words.</p> <p>SL.9–10.1: ...participate...in a range of collaborative discussions...</p> <p>SL.11–12.1c: ...probe reasoning and evidence...</p>
<p>Steps 4 and 5: Students refer to Climate Change Cluster Diagram from Lesson 1, Projected Global Warming Effects in California (Visual Aid, #12), and the View from Space wall map, as the class discusses climate change.</p>	<p>RST.9–10.7: ...translate information expressed visually...into words.</p> <p>RST.11–12.7: Integrate and evaluate multiple sources of information...</p> <p>RST.11–12.9: Synthesize information from a range of sources...into a coherent understanding of a...concept...</p> <p>SL.9–10.1: ...participate effectively in a range of collaborative discussions...</p>

Student Tasks	Common Core Standards Applications
<p>Step 6: Students use what they have learned in previous lessons to write an essay in Predicting a Warming Trend (Student Workbook, pages 13–14).</p> <p>Suggestion: 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>WHST.9–10.2: Write informative/explanatory texts...</p> <ul style="list-style-type: none"> a) Introduce a topic and organize ideas, concepts, and information... b) Develop the topic with well-chosen, relevant, and sufficient facts... c) Use varied transitions and sentence structures to link the major sections of the text... d) Use precise language and domain-specific vocabulary... f) Provide a concluding statement or section... <p>WHST.9–10.8: Gather relevant information from multiple authoritative print and digital sources...</p>

Lesson 6: Deciding About the Atmosphere

Students read about California’s Global Warming Solutions Act (AB 32), trace policies and events leading up to the bill’s passage, and revise the essay they wrote in Lesson 1 to include new information about current decision making and climate change.



Use this correlation in conjunction with the **Procedures** located on pages 114–115 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>Vocabulary Development: 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>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...</p>
<p>Step 1: Students work in pairs and choose one action they would take to alter the course of climate change, based on what they have learned in previous lessons. Students then share their ideas with the class.</p> <p>Suggestion: 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>SL.9–10.1: ...participate effectively in a range of collaborative discussions...</p> <p>SL.11–12.1c: ...probe reasoning and evidence...</p>
<p>Step 2: Students view Governor Schwarzenegger Signs Landmark Legislation to Reduce Greenhouse Gas Emissions (Video file, provide separately). As a class, students read California’s Global Warming Solutions Act of 2006 (Student Edition, page 16). The class then discusses the Air Resources Board.</p>	<p>RST.9–10.7: ...translate information expressed visually...into words.</p> <p>SL.9–10.1: ...participate effectively in a range of collaborative discussions...</p>
<p>Step 3: In pairs, students read A Timeline of Climate Discovery and Decision Making (Student Edition, pages 17–20) and work together to identify policies taken by world leaders.</p>	<p>RST.9–10.2: Determine the central ideas;...trace the text’s explanation or depiction of a complex process, phenomenon, or concept...</p> <p>RST.9–10.10: ...read and comprehend science...texts...independently and proficiently.</p> <p>SL.9–10.1: ...participate effectively in a range of collaborative discussions...</p>

Student Tasks	Common Core Standards Applications
<p>Step 4: Students participate in a class discussion based on what they have learned in this lesson.</p> <p>Suggestion: <i>The class discussion should be structured to allow for all students to participate. One suggestion is for students to use sentence stems to further the discussion. Examples include:</i></p> <p><i>The main idea is...</i></p> <p><i>The most important details are...</i></p> <p><i>I learned...</i></p> <p><i>My partner pointed out...</i></p> <p><i>My partner mentioned that...</i></p> <p><i>We agreed that...</i></p> <p><i>We decided that...</i></p>	<p>SL.9–10.1: ...participate effectively in a range of collaborative discussions...</p> <p>SL.11–12.1C: ...probe reasoning and evidence...</p>
<p>Step 5: Students use California Connections: Climate Change in the Golden State (Student Edition, pages 2–6) and Reconsidering Climate Change (Student Workbook, pages 15–16) to reexamine the “Reconstructed Temperature” graph and consider all other information from Lessons 2 through 6. Students then write an essay, or revise the one they wrote in lesson 1.</p>	<p>RST.9–10.2: Determine the central ideas;...trace the text’s explanation or depiction of a complex process, phenomenon, or concept...</p> <p>RST.9–10.7: ...translate information expressed visually...into words.</p> <p>SL.9–10.1: ...participate...in a range of collaborative discussions...</p> <p>SL.11–12.1C: ...probe reasoning and evidence...</p> <p>WHST.9–10.2: Write informative/explanatory texts...</p> <p>a) Introduce a topic...</p> <p>b) Develop the topic with well-chosen, relevant, and sufficient facts...</p> <p>c) Use varied transitions and sentence structures...</p> <p>d) Use precise language and domain-specific vocabulary...</p> <p>f) Provide a concluding statement or section...</p> <p>WHST.9–10.8: 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: Throughout the reading, note comprehension strategies for understanding the text.

RST.9–10.2: ...trace the text’s explanation...of a...concept...

RST.9–10.5: Analyze the structure of the relationships among concepts in a text...

Suggestion: This sentence sets up the structure of this text. Have students trace its development while reading.

California Connections: Climate Change in the Golden State
Lesson 1 | page 1 of 5

Climate Change in the Golden State



Earth has experienced natural climate changes since the planet formed billions of years ago. Many of these climate changes have been slow, occurring over centuries or millennia. Subtle differences in Earth’s orbit around the Sun, or shifting landmasses (for example, moving tectonic plates or the uplift of mountain ranges) cause these slow climatic changes. Rapid changes in climate, those that happen over decades or even a few years, are triggered by sudden events, such as volcanic eruptions, collisions with meteors, or drastic shifts in ocean currents.

Constantly Changing Climate
Climate change is a shift in the “average weather” that a given region experiences. This is measured by changes in

the features we associate with weather, such as temperature, wind patterns, precipitation, and storms. Global climate change means change in the climate of

Earth as a whole. Global climate change can occur naturally; an ice age is an example of naturally occurring climate change. Earth’s natural climate has always been, and still is, constantly changing. The climate change we are seeing today, however, differs from previous climate change in both its rate and its magnitude.



Greenhouse Effect
To understand climate change, you have to know that Earth’s climate is regulated by the greenhouse effect, without which life as we know it would be impossible. The greenhouse effect occurs when greenhouse gases are released on the planet, where they build up in Earth’s atmosphere. This forms a layer

Snow melting in Sierra Nevada Mountains, California

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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.

in the upper atmosphere that allows heat and light in; then some of the heat/light energy is absorbed near and at Earth's surface. The rest escapes out into space. Without the effect of these naturally occurring gases, the average temperature on Earth would be -0.4° F (-18° C), instead of the current average 59° F (15° C). Life as we know it would be impossible.

The last 10,000 years has been a warm and stable period, and the last millennium, over which current societies have developed, has been one of the most stable climates observed. Yet, during the 20th century, we have observed a rapid change in the climate and atmospheric concentration of greenhouse gases attributable to human activities. These recent changes in greenhouse gases far exceed the extremes of the ice ages, and the global mean temperature is warming at a rate that cannot be explained by natural causes alone. The natural archives of Earth's climate, such as fossils, ocean sediments, and ice cores, record global temperature fluctuations that have resulted in ice ages and warm periods. During the last ice age, Earth was approximately 10° F (5.6° C) cooler than it is now. Sheets of ice a mile thick covered the

poles and the northern United States. Now we are in a warm period. The global temperature has risen almost 2° F (1.1° C) in the last century. And the rate of warming is increasing.

Observing Climate Change in California

Changes in California's own climate are in line with the warming trends in many other places. Our winter and spring temperatures have risen steadily in the last 50 years. This rise has caused the snowpack in the Sierra Nevada Mountains to melt earlier every spring. Even the wildflowers bloom two weeks earlier. Scientists predict that if the warming trend continues, the state's temperatures will rise as much as 10.5° F (5.8° C) by 2100. This increase will put a great deal of extra stress on both the people and natural systems of California.

In January 2007, the National Oceanic and Atmospheric Administration (NOAA) announced that 2006 was the warmest year on record in the United States. In 2006, NASA confirmed that 2005 was the warmest year recorded in human history. As the climate changes and periods of higher temperatures increase, there

can be detrimental effects for people who suffer from heat-related illnesses. For example, elderly people, young children, and people who are already sick are at the greatest risk for heat-related dehydration, heatstrokes, heart attacks, or strokes.

Most of the rain and snow that falls in California falls in the northern part of the state. The greatest demand for water, however, comes from drier Southern California, home to two-thirds of the state's population. A system of reservoirs, aqueducts, and pipelines move massive amounts of water to the crowded cities of the Los Angeles Basin. This water comes from melting snow in the Sierra Nevada Mountains each spring.

If the climate continues to warm, more precipitation will fall as rain, and less will fall as snow. The snow that does fall will melt sooner. The snowpack could decrease by 70–90% by the year 2100. This loss of snow would cause huge problems for the people who manage the state's water resources. If not enough water is stored in the winter, people may not have enough drinking water or water for agriculture. Without enough water to flow through dams, power operators might

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.

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

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

Suggestion: Define global mean temperature and atmospheric concentration.

RST.11-12.7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Suggestion: Ask students to analyze why the authors included this picture in the text. What mood were the authors attempting to elicit?

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Lesson 1 | page 3 of 5



California Water Project

not be able to generate as much electricity. Without lots of snow, winter tourism (including skiing) would decline, causing hard times for snow-related businesses.

Effects of Climate Change in California
Climate change will also affect California's agricultural regions, which are considered to be some of the world's

most productive and diverse growing regions. California produces 50% of the nation's fruits, vegetables, and nuts. If climate change continues, the state could experience severe drought. Many fruit and nut trees would not produce good crops if they were exposed to extreme heat. In order to develop healthy buds, these trees need "chill hours" with temperatures

below 45° F (7.2° C). Loss of these cold conditions and the greater number of hot days could mean a great loss for California farmers.

Warming temperatures would also increase the number of pests and the frequency of plant diseases that affect California crops. Pest breeding seasons would become longer, and pests that like warmer weather will spread to new areas. For example, a certain type of leafhopper, the glassy-winged sharpshooter, spreads Pierce's disease when they eat grape leaves. Pierce's disease is a bacterial disease that destroys grapevines. These leafhoppers love hot, dry weather, so they would prosper with rising temperatures, leaving vineyard owners in northern California to deal with an increase of this damaging disease.

Rising temperatures, hot winds, and drought conditions could cause a 55% increase in destructive wildfires. Low-intensity fires actually help regenerate certain ecosystems. They clear woody debris and underbrush, release nutrients into the soil, crack open heat-dependent seed coats, and allow light to penetrate through thick foliage. However,

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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.

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

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.

Suggestion: Ask students why fire is connected with climate change.

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Lesson 1 | page 4 of 5



Forest fire

current trends are to not allow low-intensity fires to burn, so fuel sources like underbrush build up. Earth’s warming trend could spark intense firestorms from this underbrush, destroying property and wildlife habitat. These fires could also cause the disappearance of plant and animal species in ecosystems already affected by human activity. Wildfires also have severe consequences for human health because they can cause air pollution to spike to unhealthy levels across a broad area. Climate change already affects California’s native trees and plants. Warmer weather in the north is causing cold-loving Douglas firs to die off. Drought-resistant madrone and oak are taking the place of these firs. Nonnative grasses are replacing burned-out forests with dry weeds that can spark dangerous fires. In the Sierra Nevada, the fragile plants that make up the alpine tundra are receding to higher and higher elevations. Scientists predict these plants will decline 60–80% by the end of this century. Future effects would include an increase in extreme heat days, additional rise in sea level, significant loss of snowpack, and increases in forest fires and energy use. The magnitude of these effects depends on the temperature increase. Perhaps the greatest effect of climate change in the future will be felt along the coasts of California. Known for its beaches and recreation, the state attracts people from all over the world. During the last 100 years, sea levels along the California coast have risen seven inches. As Earth continues to warm, sea levels could rise as much as 35 inches by the year 2100. In this case, inland areas will flood with sea water, breaching levees and degrading freshwater supplies

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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.9–10.2: Determine the central ideas;...trace the text’s explanation or depiction of a complex process, phenomenon, or concept...

for drinking. Animal and plant habitats would also change, causing many species to move out of the area or disappear entirely. Severe storms, pushed inland by high winds, can erode beaches and cause billions of dollars of damage to property, water supplies, utilities, and businesses.

The natural systems of California have seen many climate changes. For example, the La Brea Tar Pits formed many thousands of years ago, trapping plant matter and animals that were part of the ancient Los Angeles ecosystem that existed during the last ice age, more than 10,000 years ago. The 3.5 million fossils collected in the Tar Pits give a glimpse of life before California’s ancient native plants and animals had to either adapt to a different climate, or become extinct. The giant sequoia and the now-endangered California condor both survived this period. The question is: will we survive the changes of the future? The better we understand the causes and effects of climate change, the better we can predict how Earth will be affected. This understanding is key to our planetary and personal survival as the global climate continues to change.

Making Choices

The challenge of ensuring clean air and a healthy climate can be met. Choices made by businesses, communities, and individuals can lead to meaningful reductions in air pollutants and greenhouse gas emissions. Home energy improvements, tree planting programs, alternative transportation, beverage container recycling, and increased use of public transit are

just some of the choices that can be acted upon at the individual, business, and community levels. In many cases, one action will reduce both air pollutants and greenhouse gas emissions. Many actions will save money in the short- and long-term. Actions taken now and continued over the long-term can make a significant difference in ensuring clean air and a healthy climate for California.



Storm surge

RST.9–10.7: ...translate information expressed visually...into words.

Suggestion: Have students provide textual evidence to support the use of this picture.

California Common Core State Standards Descriptions for Grades 9–10

Reading Standards for Literacy in Science and Technical Subjects

- **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.9–10.10:** 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.

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.
 - f) Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).
- **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**

California Common Core State Standards Descriptions for Grades 11–12

Reading Standards for Literacy in Science and Technical Subjects

- **RST.11–12.2:** Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- **RST.11–12.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- **RST.11–12.9:** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

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.
- **SL.11–12.4:** Present information, findings, and supporting evidence (**e.g., reflective, historical investigation, response to literature presentations**), conveying a clear and distinct perspective **and a logical argument**, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks. **Use appropriate eye contact, adequate volume, and clear pronunciation. CA**