

# California Education and the Environment Initiative

Increasing Environmental Literacy for K–12 Students...

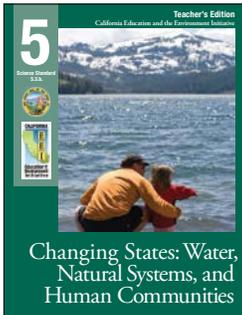
Because the Future is in Their Hands



## 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.

### 5.3.b.—Changing States: Water, Natural Systems, and Human Communities



This unit provides students with the opportunity to explore two primary ways water moves through the water cycle—evaporation and condensation—and how this movement of water is connected to humans and human communities. Through demonstrations, experiments, readings, and discussions, students construct a scientifically accurate understanding of the water cycle. Students use their experiences with the water cycle to build a real-world understanding that natural systems proceed through cycles that humans depend upon, benefit from, and can alter.

		RF.5.4	RI.5.1	RI.5.2	RI.5.3	RI.5.4	RI.5.5	RI.5.6	RI.5.7	RI.5.8	RI.5.9	RI.5.10	W.5.2	W.5.4	W.5.8	W.5.9	SL.5.1	SL.5.2	SL.5.3	SL.5.4	L.5.4
<b>LESSONS</b>	California Connections											✓					✓				
	1				✓	✓						✓	✓		✓		✓				✓
	2					✓		✓					✓				✓	✓		✓	✓
	3			✓		✓				✓			✓	✓			✓		✓		✓
	4	✓	✓	✓	✓	✓				✓	✓		✓		✓		✓	✓	✓		✓
	5	✓				✓	✓						✓		✓		✓		✓		✓
	6	✓				✓					✓		✓	✓	✓	✓	✓			✓	✓
Traditional Assessment													✓								
Alternative Assessment									✓						✓						

**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
- **L:** Language Standards
- **RF:** Reading Foundational Skills Standards
- **RI:** Reading Standards for Informational Text
- **SL:** Speaking and Listening Standards
- **W:** Writing Standards

**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 and 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 25–26 of this document.

## A Note about Common Core Speaking and Listening Standards

Many of the EEI units provide various learning structures, materials, and groupings that lead toward working in pairs or small groups to discuss concepts and ideas. This 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 in collaborative discussion techniques, students can be placed in pairs or small groups to discuss the lesson topics. To aid in teacher planning, the lessons are listed below along with their learning structures for whole class, pairs/partners, and/or small groups:

- **Lesson 1:** Whole class
- **Lesson 2:** Whole class, (optional) partners
- **Lesson 3:** Whole class, (optional) partners
- **Lesson 4:** Whole class, groups of three, (optional) partners
- **Lesson 5:** Whole class, (optional) partners
- **Lesson 6:** Whole class, groups of 4

## National Geographic Resources

- **Natural Regions** wall map (Lesson 6)

## Unit Assessment Options

Assessments	Common Core Standards and Applications
<b>Traditional Assessment</b>	
<p>The traditional assessment is comprised of a diagram, and multiple choice, short answer, fill-in-the-blank, and essay questions that assess students' achievements of the unit's learning objectives.</p>	<p><b>W.5.2b:</b> Develop the topic with facts, definitions, concrete details...or other information and examples...</p>
<b>Alternative Assessment</b>	
<p>Students answer short-answer questions to recall important concepts from the lessons, and they create study cards they can use to prepare for the traditional assessment task.</p>	<p><b>RI.5.7:</b> Draw on information from multiple print...sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.</p> <p><b>W.5.8:</b> Recall relevant information...or gather information from print...sources; summarize or paraphrase information in notes and finished work...</p>

# Lesson 1: Evaporation, the Water Cycle, and Human Communities

Students read *California Connections: Salt Farming on San Francisco Bay*, reflect and build on prior knowledge as they label and describe the water cycle, and observe a classroom demonstration of evaporation to strengthen their understanding of the process.



Use this correlation in place of the **Procedures** on pages 34–37 of the Teacher’s Edition.

Procedures	Common Core Standards and Applications
<b>Vocabulary Development</b>	
<p>Use the <b>Dictionary</b> and the vocabulary <b>Word Wall Cards</b> to introduce new words to students as appropriate. These documents are provided separately.</p> <p><b>Tip: Word Wall Cards</b> may be used at the beginning, as the words come up in the lesson, or as a review at the end.</p> <p><b>Tip: If Dictionary Workbooks</b> need to be reused from year to year, students should not write in them.</p>	<p><b>L.5.4c:</b> Consult reference materials...to...determine or clarify the precise meaning of key words and phrases...</p> <p><b>RI.5.4:</b> Determine the meaning of general academic and domain-specific words and phrases in a text...</p>
<b>Step 1</b>	
<p>Explain to students that they will be discussing the water cycle. Distribute a <b>Student Workbook</b> to each student. Tell students to turn to <b>The Water Cycle</b> (Student Workbook, page 2). Tape the following <b>Word Wall Cards</b> to a central location on the board or wall that is accessible to all. Review the following words with students: Sun, clouds, evaporation, condensation, precipitation, runoff, snowpack, and groundwater. Instruct students to use these words to fill in the boxes on <b>The Water Cycle</b>.</p> <p>When students have completed the labeling, ask, “Is there any starting point or end point in the water cycle?” (<i>No; just as there is no starting or end point on a circle, there is no starting or end point in a cycle.</i>) Ask students to read the question and write their one-paragraph response using the space provided on <b>The Water Cycle</b>.</p> <p><b>Tip: If Student Workbooks</b> 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"> <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>W.5.8:</b> Recall relevant information from experiences...</p>

Procedures	Common Core Standards and Applications
<b>Step 2</b>	
<p>Project <b>Water Cycle</b> (Visual Aid #1). Have students check their own answers and make corrections to their diagrams, if necessary. Point out to students that two of the labels on the diagrams in their <b>Student Workbooks</b> should be blank and will be filled in with what they learn in Lesson 3. (<i>Note: An Answer Key and Samples Answers for <b>Water Cycle</b> are provided on page 37.</i>)</p>	n/a
<b>Step 3</b>	
<p>Show students the two clear plastic cups of water. Explain that one cup contains salt water and the other contains fresh water. Ask students:</p> <ul style="list-style-type: none"> <li>■ How can we find out which cup contains the salt water and which contains the fresh water? (<i>Students may suggest tasting the water.</i>)</li> <li>■ How can we find out without tasting the water? (<i>Letting the cups of water sit on the counter for a few days and seeing which one leaves salt behind, or putting a plant or flower in each cup for a few days and seeing how the water in each affects the plants.</i>)</li> </ul> <p>Tell students that you are going to use one of the processes in the water cycle to help find out which cup has the salt water in it. Turn on the overhead projector and place a blank transparency on it. Write “A” at the top and “B” at the bottom. Dip a paper towel in the salt water in cup “A” and swipe it across the top of the transparency. Dip a second paper towel into the plain water in cup “B” and swipe it on the bottom of the transparency. The water will evaporate in a few seconds.</p> <p>After the water evaporates, ask students:</p> <ul style="list-style-type: none"> <li>■ What did you observe? (<i>Something is left where the water from cup “A” was swiped.</i>)</li> <li>■ What do you think it is? (<i>Salt</i>)</li> <li>■ What happened to the water? (<i>It evaporated, or changed to water vapor [gas].</i>)</li> </ul> <p>If students do not use the word “evaporation,” tell them that the water evaporated and write it on the board. Ask students, “Why was the salt left behind?” (<i>It cannot evaporate.</i>)</p>	<p><b>RI.5.3:</b> Explain the relationships or interactions between... concepts in a...scientific...text...</p> <p><b>SL.5.1:</b> Engage effectively in a range of collaborative discussions (...teacher-led)...building on others’ ideas and expressing their own clearly.</p>

Procedures	Common Core Standards and Applications
<b>Step 4</b>	
<p>Again, project the <b>Water Cycle</b>. Discuss with students that evaporation is one change of state that occurs as water travels through the water cycle. Ask students, "How else does water change states as it moves through the water cycle?" (<i>It changes from a liquid or a gas to a solid when it freezes [ice]; it changes from a gas to a liquid when it condenses; it changes from a solid to a liquid when it melts.</i>) Tell students that the water cycle processes are important to all living things on Earth and that they have been used by humans throughout history to do very specific things.</p>	n/a
<b>Step 5</b>	
<p>Distribute a <b>Student Edition</b> to each student. Tell them to turn to <b>California Connections: Salt Farming on San Francisco Bay</b> (Student Edition, pages 2–5). Read about the salt production industry in California as a class. When you arrive at the section titled "Salt Production," project <b>Getting Salt From the Water</b> (Visual Aid #2), and read aloud the <b>Getting Salt From the Water</b> script on page 36.</p> <p>Finish reading <b>California Connections: Salt Farming on San Francisco Bay</b>. Conduct a discussion using the following questions:</p> <ul style="list-style-type: none"> <li>■ Where did the early Ohlone people live? (<i>In the San Francisco Bay area</i>)</li> <li>■ Where did they obtain salt? (<i>Along the edge of the bay</i>)</li> <li>■ Why is salt found along the edge of San Francisco Bay? (<i>The Sun shines on the salt ponds and heats the seawater. This heat turns the water into vapor, or steam. Water becomes vapor through the process called evaporation and leaves salt behind.</i>)</li> <li>■ How did the Ohlone people collect salt? (<i>They scraped the salt out of natural hollows called salt flats.</i>)</li> <li>■ How did the Ohlone people use salt? (<i>They used it to preserve meat, prevent hides from rotting, and pack fish.</i>)</li> <li>■ How did early California settlers during the Gold Rush use salt? (<i>Gold miners used salt for making cheese, and like the Ohlone, to keep food from spoiling, prevent hides from rotting, and pack fish.</i>)</li> <li>■ How do winter travelers today use salt? (<i>They spread salt on mountain highways to keep them free from dangerous ice and snow.</i>)</li> </ul>	<p><b>RI.5.10:</b> ...read and comprehend informational texts, including...science...</p> <p><b>SL.5.1:</b> Engage effectively in...discussions...with diverse partners..., building on others' ideas and expressing their own clearly.</p> <ol style="list-style-type: none"> <li>a) Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.</li> <li>b) Follow agreed-upon rules for discussions and carry out assigned roles.</li> <li>c) Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.</li> <li>d) Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.</li> </ol>
<b>Step 6</b>	
<p>Have students complete page 2 of <b>The Water Cycle</b> in class, or as homework if necessary.</p> <p>Gather <b>Student Editions</b>.</p> <p>Collect <b>Student Workbooks</b> and use <b>The Water Cycle</b> for assessment.</p>	<p><b>W.5.2:</b> Write informative/explanatory texts to examine a topic and convey ideas and information clearly.</p> <ol style="list-style-type: none"> <li>b) Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.</li> </ol>

## Lesson 2: Factors Affecting the Evaporation Rate

Three demonstrations illustrate how surface area, water temperature, and wind each affect evaporation rate. Students respond orally to questions regarding how each factor affects evaporation rates; they also respond in writing to questions related to the influence of evaporation on natural systems and human communities.



Use this correlation in place of the **Procedures** on pages 48–50 of the Teacher’s Edition.

Procedures	Common Core Standards and Applications
<b>Vocabulary Development</b>	
<p>Use the <b>Dictionary</b> and the vocabulary <b>Word Wall Cards</b> to introduce new words to students as appropriate.</p>	<p><b>L.5.4c:</b> Consult reference materials...to...determine or clarify the precise meaning of key words and phrases...</p> <p><b>RI.5.4:</b> Determine the meaning of general academic and domain-specific words and phrases in a text...</p>
<b>Step 1</b>	
<p>Project the <b>Water Cycle</b> (Visual Aid #1) and ask students:</p> <ul style="list-style-type: none"> <li>■ What part of the water cycle did we study in the last lesson? (<i>Evaporation</i>)</li> <li>■ What has to happen for evaporation to occur? (<i>Energy or heat has to warm liquid water so it turns into water vapor.</i>)</li> <li>■ Where does this energy or heat come from naturally? (<i>The Sun, or from inside Earth</i>)</li> <li>■ What might affect the rate of evaporation? (<i>The amount of sunlight there is, or how much heat there is</i>)</li> </ul> <p>Explain to the class that today they will explore how three different factors—temperature, surface area, and wind affect the rate of evaporation. They will also consider how changes in evaporation rates can affect people. Explain that they will observe two demonstrations and work in small groups to carry out an experiment.</p>	<p><b>SL.5.2:</b> Summarize...information presented ...visually...</p> <p><b>Suggestion:</b> <i>Have students discuss what they have learned using <b>Water Cycle</b> in partners before addressing the whole class with the questions.</i></p>
<b>Step 2</b>	
<p>Have students carefully gather in the area of <b>Demonstration 1: Temperature</b>. Point out the thermometers near both cups and choose a student to read the temperature of the air around the cups. Explain that since one cup is in an area that is warmer than the other, and since they know that water evaporates when there is sunlight or heat, ask students, “In which cup do you think evaporation is taking place faster?” (<i>Accept any answer.</i>) After students have presented their hypotheses, place a clear plastic lid over the top of each cup. Tell students that they will return to this demonstration area later to check their hypotheses.</p>	<p><b>RI.5.6:</b> Analyze multiple accounts of the same event or topic, noting important similarities and differences...</p> <p><b>Suggestion:</b> <i>Have students take notes and record their hypotheses for each demonstration. This will give students something to refer to when analyzing the different accounts of evaporation.</i></p>

Procedures	Common Core Standards and Applications
<b>Step 3</b>	
<p>Have students move to <b>Demonstration 2: Surface Area</b>. Remind students that when they were learning how salt was produced from saltwater, they saw that the saltwater was moved from large, deep ponds to small, shallow ponds along the way. Ask students, “How do you think surface area affects how fast evaporation happens?” (<i>Answers may include the idea that the larger the surface, the more evaporation happens.</i>)</p> <p>Explain to students that in this demonstration they will be looking at evaporation from two “ponds” with different surface areas. Point out the shape of the Petri dish and the shape of the graduated cylinder in the pie pan. Tell students that the lamp will simulate the Sun’s energy and help evaporate the water from these two “ponds,” but it will be up to them to see if there is a difference in how much or how quick the water in each “pond” evaporates.</p> <p>Using the eyedropper, place 5 drops of water from the bottle in each “pond.” Make sure that the lamp is still shining directly onto both “ponds” in the pie pan. Ask students to hypothesize about which pond’s water will evaporate quicker, the Petri dish “pond” with the large surface area or the cylinder “pond.” Tell students that they will return to <b>Demonstration 2</b> in a few minutes to observe what has happened.</p>	<p><b>RI.5.6:</b> Analyze multiple accounts of the same event or topic, noting important similarities and differences...</p> <p><b>Suggestion:</b> <i>Have students take notes and record their hypotheses for each demonstration. This will give students something to refer to when analyzing the different accounts of evaporation.</i></p>
<b>Step 4</b>	
<p>Have students return to their seats and explain that they will now observe <b>Demonstration 3: Wind</b> to learn how wind affects evaporation rates. Point to the chart papers on the opposite sides of the room.</p> <p>Choose one student to be an observer at each evaporation area (at each chart paper) and have them stand next to each. Then choose a student to provide the “wind” at one of the evaporation areas. Give that student the piece of cardboard and tell them to start fanning the evaporation area when you say so, using the cardboard. Explain to the rest of the class that when you say “Go” to the student doing the fanning, the rest of the class should watch the clock to see whether or not the fanning affects the evaporation that is happening.</p> <p>Wet the sponge with water from the bottle and quickly wet a six-square inch area on each chart paper. When done, say “Go” so that the “wind” student begins fanning the wet area on one of the chart papers with a piece of cardboard. Others in class should start timing the evaporation rates, using the clock. The observers at each chart paper should watch the wet areas carefully, and inform the class when all the water on their chart paper has evaporated.</p> <p>The water on the chart paper being fanned will evaporate first. When the observer there says that it has, note on the board the time it took for the water to evaporate. Have the student volunteers return to their seats.</p>	<p><b>RI.5.6:</b> Analyze multiple accounts of the same event or topic, noting important similarities and differences...</p> <p><b>Suggestion:</b> <i>Have students take notes and record their hypotheses for each demonstration. This will give students something to refer to when analyzing the different accounts of evaporation.</i></p>

Procedures	Common Core Standards and Applications
<b>Step 5</b>	
<p>Redistribute students' individual <b>Student Workbooks</b>. Tell them to turn to <b>Evaporation Rates</b> (Student Workbook, page 4). Explain that, after short class discussions, they will record information and answer questions about what they have observed about evaporation rates.</p> <p>Return students' attention to <b>Demonstration 1: Temperature</b>. Ask a few students to come up and take a close look at the sides and tops of the cups and report what they observe to the rest of the class.</p> <p>Use the questions below to focus student discussion on how temperature affects the rate of evaporation:</p> <ul style="list-style-type: none"> <li>■ Is there a difference in what is happening in the cups in the different temperatures? (Yes)</li> <li>■ What is the difference? (<i>The cup in the warmer temperature has water drops on the lid and on the sides inside the cup. The cup in the cooler temperature does not look like it has changed at all.</i>)</li> <li>■ Why do you think there is a difference? (<i>More evaporation is occurring in the cup with the warmer surrounding temperature.</i>)</li> </ul> <p>Tell students to read and write answers to the questions in the "Temperature" section of <b>Evaporation Rates</b>. Give them five minutes to do so. If time permits, have them share their answers with the class.</p>	<p><b>SL.5.1:</b> Engage effectively in a range of collaborative discussions (...teacher-led)...on <i>grade 5 topics and texts</i>, building on others' ideas and expressing their own clearly.</p> <p><b>SL.5.4:</b> Report on a topic ...using appropriate facts and relevant, descriptive details to support main ideas...</p> <p><b>Suggestion:</b> <i>Select one student from each group to observe the results of <b>Demonstration 1</b> and have them report to their group prior to the whole class discussion.</i></p> <p><b>W.5.2:</b> Write informative/explanatory texts to examine a topic and convey ideas and information clearly.</p> <p>b) Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.</p> <p>d) Use precise language and domain-specific vocabulary to inform about or explain the topic.</p>
<b>Step 6</b>	
<p>Now turn the class' attention to <b>Demonstration 2: Surface Area</b>. Ask two students to take a close look at the two "ponds" in the pie pan and report what they observe to the rest of the class.</p> <p>Use the questions below to focus student discussion on how surface area affects the rate of evaporation:</p> <ul style="list-style-type: none"> <li>■ Is there a difference in how the water evaporated from the "ponds"? (Yes)</li> <li>■ What is the difference? (<i>The water in the Petri dish evaporated, but there is still water in the graduated cylinder.</i>)</li> </ul> <p>Carefully pour the remaining water from the two containers onto separate paper towels. Ask students, "Which water spot is larger and, therefore, which container had more water remaining?" (<i>There should be more water left in the cylinder.</i>)</p> <p>Use the questions below to continue the discussion of: how surface area affects the rate of evaporation; how surface area and evaporation could affect large fields or crops; and, how surface area and evaporation can affect the availability of water in lakes and reservoirs. Ask students:</p> <ul style="list-style-type: none"> <li>■ Why did more water evaporate from one container than the other? (<i>When the surface area is larger, more water molecules are exposed to the air. More water molecules can escape from the surface of the water in the form of water vapor.</i>)</li> </ul>	<p><b>SL.5.1:</b> Engage effectively in a range of collaborative discussions (...teacher-led)...on <i>grade 5 topics and texts</i>, building on others' ideas and expressing their own clearly.</p> <p><b>SL.5.4:</b> Report on a topic ...using appropriate facts and relevant, descriptive details to support main ideas...</p> <p><b>Suggestion:</b> <i>Select a different student from each group to observe the results of <b>Demonstration 2</b> and have them report to their group prior to the whole class discussion.</i></p> <p><b>W.5.2:</b> Write informative/explanatory texts to examine a topic and convey ideas and information clearly.</p> <p>b) Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.</p> <p>d) Use precise language and domain-specific vocabulary to inform about or explain the topic.</p>

Procedures	Common Core Standards and Applications
<b>Step 6 (Continued):</b>	
<ul style="list-style-type: none"> <li>■ How could surface area and evaporation affect large fields or crops? (<i>There could be a decrease in soil moisture and an increased demand for irrigation.</i>)</li> <li>■ What happens to the water in a reservoir when it is hot? (<i>Since the reservoir has a large surface area, large quantities of water will evaporate.</i>)</li> </ul> <p>Tell students to read and write answers to the questions in the “Surface Area” section of <b>Evaporation Rates</b>. Give them five minutes to do so. If time permits, have them share their answers with the class.</p>	<p><b>SL.5.1:</b> Engage effectively in a range of collaborative discussions (...teacher-led)...on <i>grade 5 topics and texts</i>, building on others’ ideas and expressing their own clearly.</p> <p><b>SL.5.4:</b> Report on a topic ...using appropriate facts and relevant, descriptive details to support main ideas...</p> <p><b>Suggestion:</b> <i>Select a different student from each group to observe the results of <b>Demonstration 2</b> and have them report to their group prior to the whole class discussion.</i></p> <p><b>W.5.2:</b> Write informative/explanatory texts to examine a topic and convey ideas and information clearly.</p> <p>b) Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.</p> <p>d) Use precise language and domain-specific vocabulary to inform about or explain the topic.</p>
<b>Step 7</b>	
<p>Return students’ attention to the chart paper that was not being fanned and ask them to describe what they see. (<i>The water may or may not have evaporated by this time.</i>) Ask students:</p> <ul style="list-style-type: none"> <li>■ What effect does wind seem to have on the evaporation rate? (<i>The wind [fanning] seemed to make the water evaporate faster.</i>)</li> <li>■ Describe the weather on a day when the evaporation rate would be high. (<i>On a hot, sunny, windy day.</i>)</li> <li>■ Does this mean that on a cold, cloudy day with no wind there is no evaporation taking place? (<i>No, but it is not happening as fast as it would on a hot, sunny, windy day</i>)</li> </ul> <p>Direct students to read and answer the questions in the “Wind” section of <b>Evaporation Rates</b> in class, or as homework if necessary.</p> <p>Collect <b>Student Workbooks</b> and use <b>Evaporation Rates</b> for assessment.</p>	<p><b>SL.5.1:</b> Engage effectively in a range of collaborative discussions (...teacher-led)...on <i>grade 5 topics and texts</i>, building on others’ ideas and expressing their own clearly.</p> <p><b>W.5.2:</b> Write informative/explanatory texts to examine a topic and convey ideas and information clearly.</p> <p>b) Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.</p> <p>d) Use precise language and domain-specific vocabulary to inform about or explain the topic.</p>

## Lesson 3: How the Water Cycle Affects Natural Systems

Students observe a demonstration of transpiration from a plant in sunlight versus one in shade. They discuss how transpiration is vital to the survival of plants and relates to evaporation. They read an article about how transpiration, as part of the water cycle, affects natural systems, specifically plants and climate.



Use this correlation in place of the **Procedures** on pages 58–59 of the Teacher’s Edition.

Procedures	Common Core Standards and Applications
<b>Vocabulary Development</b>	
<p>Use the <b>Dictionary</b> and the vocabulary <b>Word Wall Cards</b> to introduce new words to students as appropriate.</p>	<p><b>L.5.4c:</b> Consult reference materials...to...determine or clarify the precise meaning of key words and phrases...</p> <p><b>RI.5.4:</b> Determine the meaning of general academic and domain-specific words and phrases in a text...</p>
<b>Step 1</b>	
<p>Project <b>Water Cycle</b> (Visual Aid #1). Draw students’ attention to the arrows showing evaporation and ask a student to explain evaporation. Then point to the trees on the diagram and ask students to think about what role the trees might play in the water cycle.</p> <p>Point to the blank boxes on the arrows going and coming from the group of trees on the diagram. Tell students that today they will learn about these two additional processes in the water cycle and that both are related to evaporation. Write “transpiration” in the box above the trees on the diagram. Redistribute students’ individual <b>Student Workbooks</b>. Tell them to turn to <b>The Water Cycle</b> (Student Workbook, pages 2–3). Tell students to fill in the blank box, above the trees, on the water cycle diagram.</p>	n/a
<b>Step 2</b>	
<p>Ask students to think about plant parts and what they do, specifically the roots, leaves, and stems (trunk) of a plant (tree). “What is the function of the leaves on a tree?” (<i>The leaves help the tree take in the Sun’s energy for photosynthesis.</i>) Remind students that the leaves are also where the plant takes in carbon dioxide from the surrounding air to complete the process of photosynthesis, and where the plant gives off oxygen, which is left over from photosynthesis taking place inside the plant.</p> <p>Show students <b>Open and Closed Stomata</b> (Visual Aid #3) and explain that they are seeing a magnified view of the surface of a plant leaf. Point out the guard cells and explain that when water enters the guard cells, they swell, creating an opening between them. Tell students that these openings are the stomata.</p>	<p><b>SL.5.1:</b> Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on <i>grade 5 topics and texts</i>, building on others’ ideas and expressing their own clearly.</p>

Procedures	Common Core Standards and Applications
<b>Step 2 (Continued):</b>	
<p>Ask students:</p> <ul style="list-style-type: none"> <li>■ When are the stomata most likely to be wide open? <i>(When the plant is photosynthesizing, taking in carbon dioxide and releasing oxygen through these openings.)</i></li> <li>■ Is it sunny at this time? (Yes)</li> <li>■ What other process also happens when it is sunny out? <i>(Evaporation)</i></li> </ul> <p>Explain to students that because evaporation occurs when the stomata on a plant are open, water from the plant evaporates into the air. This taking of water from the plant by evaporation is called “transpiration.”</p>	<p><b>SL.5.1:</b> Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on <i>grade 5 topics and texts</i>, building on others’ ideas and expressing their own clearly.</p>
<b>Step 3</b>	
<p>Tell students that transpiration does not harm the plant if there is enough water around; in fact, transpiration has to happen for a plant to live. This is the “circulation” system for plants, they do not have “hearts” like most animals. Project <b>Transpiration</b> (Visual Aid #4) and show students how, during transpiration, water moves from the soil, into the roots of the tree, to the stems (trunk and branches), to the leaves of the tree, and then out through the stomata into the surrounding air. Explain to students that the plant uses part of the water it takes in, but 90% of that water evaporates through its leaves. Explain that the force of the water evaporating through the stomata is what pulls water up from the soil and into the plant, and then it is what moves the water and nutrients around in the plant. Tell students that transpiration is necessary to the survival of plants, which means evaporation is also necessary.</p>	<p><b>SL.5.3:</b> Summarize the points a speaker...makes and explain how each claim is supported by reasons and evidence...</p> <p><b>Suggestion:</b> <i>Have students summarize with their partner the key points of transpiration and why it is necessary.</i></p>
<b>Step 4</b>	
<p>Point out the two containers with the celery stalks in them and explain to students that the demonstration was set up the day before. The same amount of water was poured in each container, food coloring was added to the water, and then cooking oil was poured over the surface of the water in both containers to prevent evaporation from the surface. Point out where you marked the initial water level in each container, and that the water level in each container is now lower. Ask students, “Where do you think the water in the containers went?” <i>(The water could not evaporate from the surface area because oil was covering the water. The water must have been taken up by the celery and transpired/evaporated from the leaves.)</i></p> <p>Explain that one container was placed in sunlight the day before, while the other was placed in a dark place. The color of the paper under each container shows them which container is which (yellow = sunny spot, black = dark place).</p>	<p><b>SL.5.1:</b> Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on <i>grade 5 topics and texts</i>, building on others’ ideas and expressing their own clearly.</p>

Procedures	Common Core Standards and Applications
<b>Step 4 (Continued):</b>	
<p>Ask students:</p> <ul style="list-style-type: none"> <li>■ What do you notice about the water levels in the two containers? (<i>The container that was in sunlight has less water in it now.</i>)</li> <li>■ Why do you think this happened? (<i>In the sunlight, photosynthesis took place inside the celery. The guard cells in the celery leaves swelled and the stomata opened so carbon dioxide could enter into the leaves. When the stomata were open, water vapor evaporated from the plant, pulling more water from the container into the celery stem [stalk].</i>)</li> <li>■ Will more water transpire from plants on a hot day or on a cold day? (<i>The evaporation rate is higher when the temperature is higher, so more water will transpire on a hot day.</i>)</li> <li>■ What would happen if the soil dried out where a plant is growing? (<i>If plants have too little water, the stomata will close, stopping the transpiration process. But then the plant will not be able to photosynthesize, and may wilt, dry out, or die.</i>)</li> </ul>	<p><b>SL.5.1:</b> Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on <i>grade 5 topics and texts</i>, building on others' ideas and expressing their own clearly.</p>
<b>Step 5</b>	
<p>Project <b>Water Cycle</b> again and write "plant uptake" in the box remaining to be filled, below the patch of trees. Tell students that as plants transpire, more and more water is taken up by the roots of the plant, and put into the atmosphere as water vapor. Tell them to turn to <b>The Water Cycle</b> and to fill in the blank box, below the trees, on the water cycle diagram. Ask students, "How would this change the air around the plants?" (<i>It would make the air feel wet.</i>) Tell students that this "wetness" in the air is called "humidity." Explain to students that some areas have low humidity and some areas have high humidity. Tell students that deserts are areas that usually have low humidity. Ask students to think of a place that would have high humidity (<i>Answers may include forests or jungles.</i>)</p>	<p><b>SL.5.3:</b> Summarize the points a speaker makes and explain how each claim is supported by reasons and evidence...</p> <p><b>Suggestion:</b> <i>Have students summarize with their partner why some areas have low humidity and some areas have high humidity. Have students brainstorm places with high and low humidity.</i></p>
<b>Step 6</b>	
<p>Project <b>Amazon Rainforest</b> (Visual Aid #5) and explain that rainforests are areas of high humidity. Redistribute <b>Student Editions</b>. Tell them to turn to <b>How the Water Cycle Affects Plants and Climate</b> (Student Edition, page 6). Explain that the reading is about some of the research scientists are doing in the Amazon rainforest to find out about the water cycle and plants. Read <b>How the Water Cycle Affects Plants and Climate</b> with students.</p> <p>Tell students to turn to <b>Questions About How the Water Cycle Affects Plants and Climate</b> (Student Workbook, page 5). Have students answer the first three questions. Review the answers as a class. (<i>Note: An Answer Key and Sample Answers for Questions About How the Water Cycle Affects Plants and Climate are provided on page 61.</i>)</p>	<p><b>RI.5.2:</b> Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.</p> <p><b>RI.5.8:</b> Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s).</p> <p><b>W.5.2:</b> Write informative/explanatory texts to examine a topic and convey ideas and information clearly.</p> <p>b) Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.</p> <p>d) Use precise language and domain-specific vocabulary to inform about or explain the topic.</p>

Procedures	Common Core Standards and Applications
<b>Step 7</b>	
<p>For homework, have students write a paragraph to answer the last question on <b>How the Water Cycle Affects Plants and Climate</b>.</p> <p>Collect <b>Student Workbooks</b> and use <b>Questions About How the Water Cycle Affects Plants and Climate</b> for assessment.</p>	<p><b>W.5.2:</b> Write informative/explanatory texts to examine a topic and convey ideas and information clearly.</p> <p>b) Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.</p> <p>d) Use precise language and domain-specific vocabulary to inform about or explain the topic.</p> <p><b>W.5.4:</b> Produce clear and coherent writing...in which the development and organization are appropriate to task, purpose, and audience...</p>

## Lesson 4: The Cooling Effects of Evaporation

Students review the relationship between heat energy and states of water. They measure temperatures in different areas of their school campus, and read about the cooling effects of evaporation and transpiration. They demonstrate understanding of the effect of evaporation on natural systems and human communities.



Use this correlation in place of the **Procedures** on pages 70–71 of the Teacher’s Edition.

Procedures	Common Core Standards and Applications
<b>Vocabulary Development</b>	
<p>Use the <b>Dictionary</b> and the vocabulary <b>Word Wall Cards</b> to introduce new words to students as appropriate.</p>	<p><b>L.5.4c:</b> Consult reference materials...to...determine or clarify the precise meaning of key words and phrases...</p> <p><b>RI.5.4:</b> Determine the meaning of general academic and domain-specific words and phrases in a text...</p>
<b>Step 1</b>	
<p>Explain to students that temperature measures the average heat energy of a substance’s molecules. Ask students to think about what happens to matter when the temperature goes up and when the temperature goes down. Project <b>States of Water</b> (Visual Aid #6) and explain to students the following points, beginning with “water vapor:”</p> <ul style="list-style-type: none"> <li>■ Water in the gaseous state (water vapor) has molecules that are far apart and are moving very fast.</li> <li>■ Water as a liquid has molecules that are closer together and that move around together, even though they are not connected. It is a force called cohesion that keeps them moving together.</li> <li>■ Water as a solid (ice) has molecules that are locked into a certain shape. They vibrate, but they do not move around.</li> </ul> <p><i>(Note: The state of water is determined by what the molecules in the water are doing, and that is measured by temperature. When molecules have little heat energy, they are not moving much, are locked into a particular shape (ice), and will measure a very low temperature. As the molecules gain heat energy and begin to move around, making the ice “melt” into liquid water, the temperature rises. When the molecules gain even more heat energy, they move around more and more until they are moving so quickly that the bonds holding the like molecules together break away from each other completely and form water vapor that moves into the air. Each of these changes in water takes or gives off heat energy into the surroundings, which, in turn, affects natural systems and humans.)</i></p>	<p><b>SL.5.3:</b> Summarize the points a speaker...makes and explain how each claim is supported by reasons and evidence...</p> <p><b>Suggestion:</b> Have students summarize the states of water with their partner.</p>

Procedures	Common Core Standards and Applications
<b>Step 2</b>	
<p>Explain to students that energy is what makes the molecules in any material move around or not. The temperature goes up as water takes in the heat energy and the molecules start to move. The temperature goes down as water loses heat energy and the molecules move less and less.</p> <p>Tell students that temperature is a measure of how fast molecules are moving, which is a result of how much energy there is in something.</p> <p>Ask students the following questions to check for understanding:</p> <ul style="list-style-type: none"> <li>■ When water changes from a liquid to a gas through evaporation, where do the molecules get the heat they need to move around very quickly? (<i>From the Sun and surroundings</i>)</li> <li>■ When the water molecules take this energy from the surroundings, what do you think happens to the temperature of the surroundings? (<i>It goes down; it becomes less hot.</i>)</li> <li>■ If the temperature goes down, how will the surroundings feel? (<i>They will feel cooler.</i>)</li> </ul>	<p><b>RI.5.3:</b> Explain the relationships or interactions between... concepts in...scientific...based...information...</p>
<b>Step 3</b>	
<p>Tell students that they are going to go to different areas around the school and record the temperatures in those places. Point to the list (or map) of the areas that students will visit on the board. Explain that students will record temperature measurements at each of the locations you have identified. Ask students to predict which areas will have the highest temperatures and the lowest temperatures, encouraging them to support their answers.</p> <p>Place students in groups of three. Give one of the students in each group a thermometer. Instruct another student in each group to bring a piece of paper and a pencil to record the temperature measurements. Give the third student in each group a stopwatch and tell them to make sure that the temperature at the location that their group is assigned to is monitored for 10 minutes.</p> <p>Assign each group to an area. Caution students to go immediately to their assigned area and begin working to take an accurate measurement of the temperature in that area. After 10 minutes, have the groups return to class.</p>	<p>n/a</p>

Procedures	Common Core Standards and Applications
<b>Step 4</b>	
<p>When the students are back in the classroom, have each group record their temperature measurements next to the area they were assigned on the list (or map) on the board. Discuss the results as a class. Ask students:</p> <ul style="list-style-type: none"> <li>■ Which areas were cooler? (<i>Areas with vegetation or in the shade were cooler.</i>)</li> <li>■ Why do you think this is so? (<i>Areas in the shade do not have as much energy in them as areas in the sunlight; in areas with plants, transpiration and evaporation are occurring, which means heat energy is being taken by the water vapor, making the area cooler.</i>)</li> </ul> <p>Collect the thermometers from each group.</p>	<p><b>SL.5.1:</b> Engage effectively in a range of collaborative discussions...</p> <ul style="list-style-type: none"> <li>a) Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.</li> <li>c) Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.</li> <li>d) Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.</li> </ul>
<b>Step 5</b>	
<p>Distribute a <b>Student Edition</b> to each student. Tell them to turn to <b>Keeping Cool</b> (Student Edition, pages 7–8) and read individually. When they are finished reading the article, ask students:</p> <ul style="list-style-type: none"> <li>■ Why does your body sweat to help you cool down? (<i>The water [sweat] evaporates from your skin reducing heat energy and making the temperature go down, cooling you down.</i>)</li> <li>■ Why do park fountains spraying water into air make the park cooler? (<i>When water sprays into the air, some of it evaporates and takes heat from the air.</i>)</li> <li>■ How can plants help keep an area cooler? (<i>Plants can shade an area and also take heat from an area as the water they transpire evaporates into the air.</i>)</li> </ul>	<p><b>RF.5.4:</b> Read with sufficient accuracy and fluency to support comprehension.</p> <p><b>RI.5.1:</b> Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.</p> <p><b>RI.5.2:</b> Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.</p> <p><b>RI.5.8:</b> Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s).</p> <p><b>SL.5.2:</b> Summarize a written text...</p> <p><b>Suggestion:</b> Have students partner read the article <b>Keeping Cool</b> (Student Edition, pages 7–8), orally summarize the article, and discuss the suggested questions.</p>
<b>Step 6</b>	
<p>Project <b>Roof Garden</b> (Visual Aid #7). Ask students, “How might a roof garden help to keep a city building and its surroundings cooler?” (<i>Transpiration from the plants and evaporation will cool the air on the roof.</i>) Tell students to turn to <b>Cooling Urban Heat Islands</b> (Student Edition, pages 9–10). Have them read how transpiration and evaporation are being used to cool cities down.</p> <p>Redistribute students’ individual <b>Student Workbooks</b>. Tell them to turn to <b>Questions About Cooling Urban Heat Islands</b> (Student Workbook, page 6) and complete <b>Questions About Cooling Urban Heat Islands</b> in class, or as homework if necessary.</p> <p>Gather <b>Student Editions</b>.</p> <p>Collect <b>Student Workbooks</b> and use <b>Questions About Cooling Urban Heat Islands</b> for assessment.</p>	<p><b>RF.5.4:</b> Read with sufficient accuracy and fluency to support comprehension.</p> <p><b>RI.5.7:</b> Draw on information from multiple print...sources, demonstrating the ability to locate an answer to a question...</p> <p><b>W.5.2:</b> Write informative/explanatory texts to examine a topic and convey ideas and information clearly.</p> <ul style="list-style-type: none"> <li>b) Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.</li> <li>d) Use precise language and domain-specific vocabulary to inform about or explain the topic.</li> </ul> <p><b>W.5.8:</b> Recall relevant information from experiences or gather relevant information from print...sources; summarize or paraphrase information in notes and finished work...</p>

## Lesson 5: The Role of Condensation in Natural Systems

Students observe condensation, discover the dew point, and discuss how condensation happens and why the dew point changes. In a class discussion, they focus on the role of condensation in natural systems as a process that influences the availability of fresh water for all natural and human communities.



Use this correlation in place of the **Procedures** on pages 84–85 of the Teacher’s Edition.

Procedures	Common Core Standards and Applications
<b>Vocabulary Development</b>	
<p>Use the <b>Dictionary</b> and the vocabulary <b>Word Wall Cards</b> to introduce new words to students as appropriate.</p>	<p><b>L.5.4c:</b> Consult reference materials...to...determine or clarify the precise meaning of key words and phrases...</p> <p><b>RI.5.4:</b> Determine the meaning of general academic and domain-specific words and phrases in a text...</p>
<b>Step 1</b>	
<p>Project <b>Water Cycle</b> (Visual Aid #1). Remind students that as a result of the evaporation process, water changes into water vapor which goes into the atmosphere. Ask the class, “Once water has been put into the atmosphere by evaporation, what happens to it? Does it stay there?” (<i>Students most likely will say no, that it falls out of the atmosphere as rain or snow [precipitation].</i>)</p> <p>Review the term humidity, which was introduced in Lesson 3. Ask students, “What is humidity?” (<i>The amount of water vapor in the air.</i>) Explain that at any given temperature, the air can hold a certain amount of water vapor. When the air is holding all the water vapor that it can at that temperature, it is said to be saturated (100% humidity.)</p>	<p><b>RI.5.4:</b> Determine the meaning of general academic and domain-specific words...</p> <p><b>Suggestion:</b> Have students refer to the <b>Dictionary</b> to review the definition of humidity.</p>
<b>Step 2</b>	
<p>Demonstrate saturation by showing students the pie pan of water and the dry sponge. Tell students to imagine that the sponge is a section of the atmosphere, and the water in the pie pan is water vapor. Dip one end of the dry sponge into the water in the pie pan and explain that the sponge is soaking up the water vapor, just as dry, hot air would. Pull the sponge end out of the water and show students that some of the sponge is still dry. Also point out that that the water in the sponge is staying there.</p>	<p><b>SL.5.3:</b> Summarize the points a speaker...makes and explain how each claim is supported by reasons and evidence...</p> <p><b>Suggestion:</b> Have students orally summarize saturation by retelling the sponge demonstration to their partner.</p>

Procedures	Common Core Standards and Applications
<b>Step 2 (Continued):</b>	
<p>Now place the sponge all the way into the pie pan and let it become completely soaked. Tell students that this section of the atmosphere is now taking in as much water vapor as it can. When you are sure the sponge is completely full of water, lift it out of the pie pan (without wringing it) and show students how the extra water drips from the sponge. Explain that the sponge is now saturated, which means it can hold no more water. Point out that they can see the extra water falling away from the sponge. Ask students, "In the atmosphere, where does this "extra" water vapor go when the air becomes saturated?" (<i>Students will probably say rain or snow.</i>) Tell students that rain and snow are one way, but that there is another way.</p>	<p><b>SL.5.3:</b> Summarize the points a speaker...makes and explain how each claim is supported by reasons and evidence...</p>
<b>Step 3</b>	
<p>Project <b>Dew</b> (Visual Aid #8). Ask students if they have ever walked through grass on a cold morning. Tell the class that what most likely got their shoes wet as they walked through the grass was dew. Explain that dew is water from saturated air. Tell students that, most often, dew naturally appears at night or in the early morning, but not in the middle of the day or in the afternoon. Ask them to think about why that might be while several students help set up a demonstration that will produce "dew" in the classroom in the middle of the day.</p> <p>Choose three students and direct them to go to the "dew" demonstration area. Have one student fill one of the glasses 2/3 of the way with ice and water. Have another student fill the middle glass 2/3 of the way with water at room temperature. Have the third student fill the remaining glasses 2/3 of the way with hot water from the vacuum bottle. When all three glasses have been prepared, ask the three students to take their seats and tell the class that they will return to the demonstration in a few minutes.</p>	<p>n/a</p>
<b>Step 4</b>	
<p>Redistribute <b>Student Editions</b> and students' individual <b>Student Workbooks</b>. Tell them to turn to <b>Condensation in Natural Systems</b> (Student Edition, page 11). Project <b>Water Cycle</b> once again and tell students that the water cycle process that produces dew is called condensation. Explain that dew is water vapor (gas) that has become liquid again. Tell students that condensation has to happen for liquid water to be available.</p> <p>Read <b>Condensation in Natural Systems</b> as a class.</p> <p>Have students turn their attention back to the "dew" demonstration and describe what they see (<i>On the glass with the ice, there are water droplets on the outside of the glass; on the glass with the hot water, there are water droplets inside the glass above the hot water; the glass with the water at room temperature is unchanged.</i>)</p>	<p><b>RF.5.4:</b> Read with sufficient accuracy and fluency to support comprehension.</p> <p>a) Read on-level text with purpose and understanding.</p> <p><b>RI.5.5:</b> Compare and contrast...concepts...</p> <p><b>Suggestion:</b> <i>Have students sketch the three cups to show how they compare to each other. Students will share with a partner how temperature affects condensation. Randomly select students to share with the whole class.</i></p> <p><b>SL.5.1:</b> Engage effectively in a range of collaborative discussions...</p> <p>c) Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.</p>

Procedures	Common Core Standards and Applications
<b>Step 4 (Continued):</b>	
<p>Ask students:</p> <ul style="list-style-type: none"> <li>■ What is the water on the outside of the glass with the ice water? (<i>Dew; water vapor from the warmer air in the classroom that has condensed on the cooler glass.</i>)</li> <li>■ What is the water on the inside of the glass with the hot water? (<i>Dew; water vapor from the warmer water that condensed on the cooler glass before spreading into the air of the classroom.</i>)</li> <li>■ Why is there no dew on the glass in the middle? (<i>Answers may include the idea that the temperature gradient is not right for condensation to occur.</i>)</li> </ul>	<p><b>RF.5.4:</b> Read with sufficient accuracy and fluency to support comprehension.</p> <p>a) Read on-level text with purpose and understanding.</p> <p><b>RI.5.5:</b> Compare and contrast...concepts...</p> <p><b>SL.5.1:</b> Engage effectively in a range of collaborative discussions...</p> <p>c) Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.</p>
<b>Step 5</b>	
<p>Call on three students to go to the demonstration area and measure the temperature of the liquid in each glass, using the thermometers there. Explain to students that because glass is a good conductor of heat, the temperature of the glass is the same as the temperature of the liquid in the glass. On the board, record the temperature of the liquid in each glass. Ask students, "What does this information tell us about when condensation happens?" (<i>That a difference in temperature has something to do with condensation.</i>)</p> <p>Explain to students that warm air can hold more water vapor than cold air. Cooler air holds less water, so it becomes saturated more quickly. The water vapor must condense out of the saturated air.</p> <p>Point out that the air around the glass with the ice water cooled down and the water vapor in it condensed on the cold glass. Explain that what happened in the glass with the hot water was the same, the water vapor leaving the surface area of the hot water below, suddenly cooled before going too far into the air, and condensed on the inside of the glass.</p> <p>Tell students that the temperature at which water starts to condense is called the dew point. Explain that the dew point is not a specific temperature, but is any temperature at which the air becomes saturated with water vapor and the vapor must condense. Ask, "Why do we usually see dew at night or in the early morning?" (<i>At these times, air is cooling down, so this is when condensation takes place.</i>)</p>	n/a
<b>Step 6</b>	
<p>Instruct students to complete <b>Questions About Condensation in Natural Systems</b> (Student Workbook, page 7) in class, or as homework if necessary.</p> <p>Gather <b>Student Editions</b>.</p> <p>Collect <b>Student Workbooks</b> and use <b>Questions About Condensation in Natural Systems</b> for assessment.</p>	<p><b>W.5.2:</b> Write informative/explanatory texts to examine a topic and convey ideas and information clearly.</p> <p>b) Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.</p> <p>d) Use precise language and domain-specific vocabulary to inform about or explain the topic.</p> <p><b>W.5.8:</b> Recall relevant information from experiences or gather relevant information from print...sources; summarize or paraphrase information in notes and finished work...</p>

# Lesson 6: Freezing in Natural Systems and Human Communities

Students discuss frost, define frost point, and determine which areas of California normally receive frost and why. They distinguish frost from snow and discuss the location and importance of California’s seasonal snowpack. They read and write about the role that freezing plays in lake ecosystems, and how winter snowpack affects humans and human communities.



## National Geographic Resources

- **Natural Regions** wall map

Use this correlation in place of the **Procedures** on pages 94–95 of the Teacher’s Edition.

Procedures	Common Core Standards and Applications
<b>Vocabulary Development</b>	
Use the <b>Dictionary</b> and the vocabulary <b>Word Wall Cards</b> to introduce new words to students as appropriate.	<p><b>L.5.4c:</b> Consult reference materials...to...determine or clarify the precise meaning of key words and phrases...</p> <p><b>RI.5.4:</b> Determine the meaning of general academic and domain-specific words and phrases in a text...</p>
<b>Step 1</b>	
<p>Project <b>Frost</b> (Visual Aid #9). Ask students:</p> <ul style="list-style-type: none"> <li>■ Have you ever seen frost? (<i>Accept any answer.</i>)</li> <li>■ When and where? (<i>Frost is commonly seen on plants and other objects in the autumn and spring when air temperatures go below freezing and there is a lot of moisture in the air.</i>)</li> <li>■ What did it look like? (<i>Frosted plants can look like they have been sprinkled with white crystals. Frost can also form on windows in winter.</i>)</li> </ul> <p>Explain that frost forms in the same way that dew forms, except frost forms at temperatures below freezing. Ask students, “What conditions are necessary for dew to form?” (<i>The air must be saturated; that is, it has reached the point where it cannot hold any more water vapor. When water vapor in the air cools down, it condenses.</i>) Tell students that when frost forms the air is saturated and water condenses, but the temperature at the time is cold enough to freeze water, which is 32° F (0° C) or below. This is called the frost point, rather than the dew point, because frost appears, not liquid water.</p>	<p><b>W.5.8:</b> Recall relevant information from experiences...</p>

Procedures	Common Core Standards and Applications
<b>Step 2</b>	
<p>Explain that water vapor forms frost (it turns directly to a solid) rather than dew at a temperature called the frost point. Conduct a classroom demonstration to find the frost point as follows:</p> <ul style="list-style-type: none"> <li>■ Place a drop of food coloring in water in a tin can and stir.</li> <li>■ Observe and record the starting temperature of the water on the board.</li> <li>■ Make sure the outside of the can is clean.</li> <li>■ Place a thermometer in the water and slowly add ice a little at a time while stirring with a spoon.</li> <li>■ Ask a student to note the temperature of the water at which frost forms on the outside of the can.</li> <li>■ Wipe the outside of the can with a paper towel and note the color of the frost.</li> </ul> <p>Ask students the following questions:</p> <ul style="list-style-type: none"> <li>■ What did you see forming on the outside of the can? (<i>Frost</i>)</li> <li>■ Where did the frost come from? (<i>From water vapor in the air that changed directly from a gas to a solid.</i>)</li> <li>■ Why did frost form on the can, rather than dew? (<i>The water and ice mixture is below the freezing point, so water vapor in the air changed to a solid rather than a liquid.</i>)</li> <li>■ Did the frost form from water inside or outside the can? (<i>Outside</i>)</li> <li>■ How do you know? (<i>It was not the color of the water inside the can.</i>)</li> </ul> <p>Call students' attention to the <b>Natural Regions</b> wall map. Tell the class that frost can occur anywhere the frost point is reached, but is not something that is expected to happen everywhere in California. Ask students to look at the wall map and describe where they think frost would most likely be found in the fall, winter, or spring. (<i>Answers should include the higher elevations and inland areas of the state.</i>) Ask students why they think frost is more likely to occur in these areas. (<i>Because they are areas that get very cold, or have snow, in the fall, winter and spring.</i>)</p> <p>Project <b>Climate Zones of California</b> (Visual Aid #10). Have students identify the regions which typically get "cold" in the winter time. Tell students that these areas are more likely to have frost, but remind them that frost can appear anywhere the frost point is reached.</p>	<p><b>SL.5.1:</b> Engage effectively in a range of collaborative discussions...</p> <p><b>SL.5.4:</b> Report on a topic...using appropriate facts and relevant, descriptive details...</p> <p><b>Suggestion:</b> <i>Present questions to students after the demonstration and have students discuss the answers in their groups. Assign each group an answer to report to the whole class.</i></p>

Procedures	Common Core Standards and Applications
<b>Step 3</b>	
<p>Explain that in areas with cold winters, the growing season is between the last frost in the spring and the first long frost in the fall. After a frost, plants begin to die off. Project <b>Plants After a Freeze</b> (Visual Aid #11).</p> <p>Ask students to describe what it would be like to be in an area covered with frost. Then ask, “How is being in a place with frost different than being in a place with snow?” (<i>Answers should include the idea that there is more snow than frost in a place.</i>)</p> <p>Project <b>Sierra Nevada Snowpack</b> (Visual Aid #12). Tell students that they are looking at the snowpack in the Sierra Nevada. Have students locate the Sierra Nevada on the <b>Natural Regions</b> wall map and describe why so much snow and frost is likely to build up there. (<i>Because of the high elevation; the air is colder and the frost point is more likely to be reached.</i>)</p> <p>Ask students, “Why is the Sierra snowpack important? What happens to this snow when it melts?” (<i>Accept all reasonable answers.</i>) Project <b>Water Cycle</b> (Visual Aid #11) and explain that the snow that accumulates in the Sierra Nevada is like a frozen reservoir of fresh water. It will melt slowly and over time, and then will become runoff that fills reservoirs and other bodies of water in the lower elevations. Tell students that Californians rely on the Sierra snowpack for most of the water that we use every day, and that we use to grow crops.</p>	<p><b>RI.5.9:</b> Integrate information from several texts on the same topic in order to...speak about the subject knowledgeably.</p> <p><b>W.5.8:</b> Recall relevant information from experiences...</p> <p><b>W.5.9:</b> Draw evidence from...informational texts to support analysis, reflection, and research.</p>
<b>Step 4</b>	
<p>Again, project <b>Plants After a Freeze</b> and tell students that freezing temperatures are not always good for people. Explain that this picture shows an orange tree damaged by frost. If frosts occur in places where they are not expected, or if the frosts last for longer than they normally do, plants and animals living in those areas can be affected. Tell students that most plants and animals living in areas where frost and snowpack occur benefit from the freezing temperatures and the ice in many ways.</p>	n/a
<b>Step 5</b>	
<p>Redistribute <b>Student Editions</b> and students’ individual <b>Student Workbooks</b>. Tell them to turn to <b>Castle Lake Under Ice</b> (Student Edition, pages 12–13). Read the article as a class.</p> <p>Instruct students to complete <b>Questions About Castle Lake Under Ice</b> (Student Workbook, page 8) in class or as homework.</p> <p>Gather <b>Student Editions</b>.</p> <p>Collect <b>Student Workbooks</b> and use <b>Questions About Castle Lake Under Ice</b> for assessment.</p>	<p><b>RF.5.4:</b> Read with sufficient accuracy and fluency to support comprehension.</p> <p>a) Read on-level text with purpose and understanding.</p> <p><b>W.5.2:</b> Write informative/explanatory texts to examine a topic and convey ideas and information clearly.</p> <p>b) Develop the topic with facts, definitions, concrete details,... or other information and examples related to the topic.</p> <p>c) Link ideas within and across categories of information using words, phrases, and clauses (e.g., <i>in contrast, especially</i>).</p> <p>d) Use precise language and domain-specific vocabulary to inform about or explain the topic.</p> <p>e) Provide a concluding statement or section related to the information or explanation presented.</p>

Procedures	Common Core Standards and Applications
<b>Step 5 (Continued):</b>	
	<b>W.5.4:</b> Produce clear and coherent writing...in which the development and organization are appropriate to task, purpose, and audience...

## 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.

### California Common Core State Standards Descriptions

#### Language Standards

- **L.5.4:** Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade 5 reading and content*, choosing flexibly from a range of strategies.
  - c) Consult reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation and determine or clarify the precise meaning of key words and phrases **and to identify alternate word choices in all content areas. CA**

#### Reading Foundational Skills Standards

- **RF.5.4:** Read with sufficient accuracy and fluency to support comprehension.
  - a) Read on-level text with purpose and understanding.

#### Reading Standards for Informational Text

- **RI.5.1:** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.
- **RI.5.2:** Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.
- **RI.5.3:** Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.
- **RI.5.4:** Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a *grade 5 topic or subject area. (See grade 5 Language standards 4–6 for additional expectations.) CA*
- **RI.5.5:** Compare and contrast the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in two or more texts.
- **RI.5.6:** Analyze multiple accounts of the same event or topic, noting important similarities and differences in the point of view they represent.
- **RI.5.7:** Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.
- **RI.5.8:** Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s).
- **RI.5.9:** Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.
- **RI.5.10:** By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 4–5 text complexity band independently and proficiently.

#### Speaking and Listening Standards

- **SL.5.1:** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 5 topics and texts*, building on others' ideas and expressing their own clearly.
  - a) Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.
  - b) Follow agreed-upon rules for discussions and carry out assigned roles.
  - c) Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.
  - d) Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.
- **SL.5.2:** Summarize a written text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.
- **SL.5.3:** Summarize the points a speaker **or media source** makes and explain how each claim is supported by reasons and evidence, **and identify and analyze any logical fallacies. CA**

## Common Core Reference Pages

- **SL.5.4:** Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

### Writing Standards

- **W.5.2:** Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
  - b) Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.
  - c) Link ideas within and across categories of information using words, phrases, and clauses (e.g., *in contrast, especially*).
  - d) Use precise language and domain-specific vocabulary to inform about or explain the topic.
  - e) Provide a concluding statement or section related to the information or explanation presented.
- **W.5.4:** Produce clear and coherent writing (**including multiple-paragraph texts**) in which the development and organization are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.) **CA**
- **W.5.8:** Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.
- **W.5.9:** Draw evidence from literary or informational texts to support analysis, reflection, and research.