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.

7.4.g.—Extinction: Past and Present

This unit encourages students to consider how evidence of past developments and extinction events in geological time can inform them about one of the biggest changes to natural systems the planet has ever seen: the Holocene Extinction Event. Through a series of lessons in which they interpret and analyze real data, students study how rates of extinction vary over geological time and learn that current extinction rates eclipse extinction rates of the past.

LESSONS	RST.6–8.1	RST.6–8.2	RST.6–8.4	RST.6–8.7	RST.6–8.8	RST.6–8.9	RST.6–8.10	WHST.6–8.1	SL.7.1	SL.7.2
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

- **CCCSS:** 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 page 15 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, small groups
- **Lesson 2:** Whole class, small groups
- **Lesson 3:** Whole class, pairs
- **Lesson 4:** Whole class, small groups
- **Lesson 5:** Whole class, pairs, groups of 8
- **Lesson 6:** Whole class, small groups

National Geographic Resources

- **View from Space** wall map (Lesson 1)

Unit Assessment Options

Assessments	Common Core Standards Applications
Traditional Assessment	
Students answer 10 multiple-choice questions about information from the unit, then answer 6 short-answer questions relating to **Geologic Timeline** and extinction period.	**RST.6–8.4:** 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 6–8 text and topics*.
Alternative Assessment	
Students complete **Extinction Charts** (Alternative Unit Assessment Master) that compare extinction events. Students may use **Geologic Timeline** and their Student Workbook and Student Edition as resources.	**RST.6–8.2:** Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. **WHST.6–8.1:** Write arguments focused on *discipline-specific content*. c) Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. e) Provide a concluding statement or section that follows from and supports the argument presented.

Lesson 1: La Brea Tar Pits: A Case Study of Extinction

Students review a geologic timeline, identifying gradual and rapid changes in geologic time. They read about fossils found in the La Brea Tar Pits and use evidence to explain how rapid environmental change could have contributed to megafauna extinction in the Pleistocene.

Lesson 1

La Brea Tar Pits:
A Case Study of Extinction

National Geographic Resources:

- **View from Space** wall map

Use this correlation in conjunction with the **Procedures** located on pages 36–37 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
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. ***Suggestion:*** *Add these terms to a Word Wall or vocabulary book: formation, fossil, billion, evidence.*	**RST.6–8.4:** 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 6–8 text and topics*.
Steps 2–4: Students refer to the **Geologic Timeline** on the wall to answer teacher-directed questions based on fossils and the age of the earth. Students volunteer to place cards on the **Geologic Timeline**. Students discuss the Pleistocene epoch, looking at the **View from Space** wall map and identifying organisms that lived in what is modern-day Los Angeles 40,000 years ago. They compare modern-day plants and animals, and conclude what happened to the Pleistocene epoch's organisms, plants, and animals. ***Suggestion:*** *This can be a give-one, get-one activity. Students can each find two people to share answers with and take two answers back to their table.*	**SL.7.1:** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners…, building on others' ideas and expressing their own clearly. **WHST.6–8.1e:** Provide a concluding statement or section that follows from and supports the argument presented.
Steps 5–7: Students read ***California Connections: Puzzle in the "Tar" Pits*** (Student Edition, pages 2–5) and use this information to complete **Evidence from the La Brea Tar Pits** (Student Workbook, pages 2–5). ***Suggestion:*** *Refer to the* ***Reading*** **California Connections** ***Using a Common Core Reading and Writing Focus*** *on pages 10–14 to view specific suggestions for integrating Common Core standards while reading the selection not only for content, but for text structure as well.* ***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:* ■ *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.*	**RST.6–8.1:** Cite specific textual evidence to support analysis of science and technical texts. **RST.6–8.2:** Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. **SL.7.1:** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners…, building on others' ideas and expressing their own clearly.

Lesson 2: Change in Geologic Time

Students review gradual and rapid change and interpret data to complete a chart describing changes in different periods of geologic time. Students then add labels to the geologic timeline.

Lesson 2

Change in Geologic Time

Use this correlation in conjunction with the **Procedures** located on pages 54–55 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
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. ***Suggestion:*** *Add these terms to a Word Wall or vocabulary book: rapid, gradual, atmospheric, climate.*	**RST.6–8.4:** 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 6–8 text and topics.*
Steps 2–6: In groups of 4, students analyze data from **Data on Global Temperature** (Student Edition, page 6), **Data on Atmospheric CO_2** (Student Edition, page 7), and **Fossil Data by Era and Period** (Student Edition, page 8). They use this data to complete **Changes Across Time** (Student Workbook, pages 6–7). ***Suggestion:*** *Put headings on chart paper, and have groups of 4 display evidence around the room. Then have groups present the evidence orally.*	**RST.6–8.1:** Cite specific textual evidence to support analysis of science and technical texts. **RST.6–8.2:** Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. **RST.6–8.10:** By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently. **SL.7.1:** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners…, building on others' ideas and expressing their own clearly.
Step 7: Students analyze **Changes Across Time** to determine when extinction events occurred. They then use **Geologic Timeline Labels—Set 2** to attach extinction event labels on the class timeline. ***Suggestion:*** *Have students pair-share their reasons for placing their cards in particular places on the timeline. Sentence frame: I placed my card on the _____ period because the evidence shows _____.*	**RST.6–8.7:** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). **RST.6–8.9:** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Lesson 3: Extinction: Rates and Possible Causes

Students work in pairs to read and discuss three case studies about organisms that became extinct. They complete a graphic organizer summarizing environmental changes, changes in species, and types and rates of extinctions. Students discuss their findings as a class.

Use this correlation in conjunction with the **Procedures** located on pages 76–77 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
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.	**RST.6–8.4:** 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 6–8 text and topics.*
Steps 2 and 3: Students answer questions about **Extinction Rates** (Visual Aid #7). They also use **Geologic Timeline** to answer questions about mass extinction orally.	**SL.7.1:** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners…, building on others' ideas and expressing their own clearly.
Steps 4–6: Students use **Extinction Case Studies** (Student Edition, pages 9–11) to complete **Cases and Causes of Extinction** (Student Workbook, pages 9–10).	**WHST.6–8.1:** Write arguments focused on *discipline-specific content.* c) Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. e) Provide a concluding statement or section that follows from and supports the argument presented.

Lesson 4: Digging Up the Past

Students participate in a simulated paleontological dig, excavating fossils to identify mass extinction, gradual extinction, or the diversification of species. They collect and discuss data about significant events on Earth in geologic time.

Lesson 4

Digging Up the Past

Learning Objective

Background

Key Vocabulary

Lesson 4

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
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. ***Suggestion:*** *Add these terms to a Word Wall or vocabulary book: extinction, rate.*	**RST.6–8.4:** 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 6–8 text and topics.*
Step 1: Students use **Late-Permian Extinction Evidence** (Visual Aid #9) to answer questions from **Digging Up the Past** (Student Workbook, pages 11–12).	**WHST.6–8.1e:** Provide a concluding statement or section that follows from and supports the argument presented.
Steps 3 and 4: Student pairs are given a core sample, and they use **Fossil Resource Information** (Student Edition, pages 12–13) to help classify fossils from their core sample. They record data in **Digging Up the Past**.	**WHST.6–8.1e:** Provide a concluding statement or section that follows from and supports the argument presented.

Lesson 5: Extinctions in the Present

Students think about human activities and how they can affect plant and animal life. As a class, they organize these ideas into categories. They read about endangered species in California and describe human activities that threaten the populations of these species.

Lesson 5

Dry Antelope, Salt Valley, Utah

Extinctions in the Present

Extinction events are not confined to the ancient past of geologic time; most scientists believe we are currently living through a mass extinction event both in California and around the globe. This lesson addresses current and potential future extinctions in California, focusing on the role of humans in these real and hypothetical events.

In this lesson students engage in a discussion about human activities after the environments in which they live, and how these activities affect plant and animal life within these systems. In a whole class discussion students organize their thoughts into categories of different types of human activities that can influence extinctions. Students then read about the current status of endangered species in California that have in the past experienced, or are currently experiencing, significant population changes. Next, students apply the class categories to an analysis of the factors that may have contributed to these changes.

This lesson prepares students to read about the Pleistocene Extinction Event in the culminating lesson of the unit.

Background

Humans have dramatically changed natural systems since the Pleistocene, when they likely

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Lesson 5

Learning Objective

Provide examples of human activities, and the resulting hypothesis, that have caused or have the significant a changes to plant and animal life that might result in extinction.

Kirtus Lake, Tulare, California

contributed to the extinction of numerous megafauna. Human activity influences rates of extinction in a variety of ways; conservation biology has identified six, along with the common HIPPO (habitat destruction, introduced species, pollution, population growth, overexploitation). Habitat destruction occurs when humans alter landscapes and ecosystems in order to support their populations, to obtain resources, such as timber, coal, or minerals, and/or control water systems through the construction of dams and aqueducts. In the arrivals in California, human activities have resulted in the loss of approximately 90 percent of wetlands, and many of our remaining species influence food webs, endangering native species.

as both competitors and predators. Pollution, such as the pesticide DDT, which has nearly destroyed many bird populations, alters the fundamental chemistry of the environment, rendering them uninhabitable for some species. Population growth stresses ecosystems by increasing demand for water and land for their growing needs. Overexploitation, illegal wildlife trade, and the introduction of non-native species, have threatened species for thousands of years.

Combined, HIPPO factors extinction and rising rapidly with growing human populations. In California alone, 118 animal and 109 plant species are considered threatened or endangered by either state or federal agencies.

Scientists consider extinctions in aquatic ecosystems, such as those found in California, to be among the most vulnerable to extinction, and particularly to the consequences of human activity. These experts state that species may not be able to adapt to human generated influences. For Bioregions, the fragmentation of ecosystems makes it difficult for species to migrate in search of better habitat, or to adapt to climate change or migrate; they risk extinction. The accumulation of all of these factors, combined with the fact that, now, some extinction rates in California to rise, a providence many scientists have made about California's remember future.

Key Vocabulary

Background: The legal status of a plant or animal species that is in danger of becoming extinct.

Habitat destruction: Damaging a place where plants and animals live and meet the needs of organisms that live and meet their needs there.

HIPPO: An acronym for the phrase "habitat destruction, introduced species, pollution, population growth, and overexploitation."

Native species: Organisms that were not originally found in a place but have arrived there through human activity.

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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
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. ***Suggestion:*** *Add these terms to a Word Wall or vocabulary book: endangered, habitat, HIPPO, species, non-native species.*	**RST.6–8.4:** 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 6–8 text and topics.*
Step 3: Students fill in categories on the **Human Activities and Extinction** concept map (Visual Aid #13). ***Suggestion:*** *After completing* ***Human Activities and Extinction****, have students complete this sentence frame as an exit slip: Reasons for habitat destruction include* _____.	**WHST.6–8.1e:** Provide a concluding statement or section that follows from and supports the argument presented.
Step 4: In groups of 8, students select a **California Threatened and Endangered Species** card (Information Cards, #14–21). Each group will read their card to the class. Groups will then complete the **HIPPO in California: Endangering Species** chart (Student Workbook, pages 13–15).	**RST.6–8.1:** Cite specific textual evidence to support analysis of science and technical texts. **RST.6–8.8:** Distinguish among facts… **SL.7.1:** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners…, building on others' ideas and expressing their own clearly.

Lesson 6: Holocene Extinction Event

Students use statistical data to identify a relationship between the scope of human-caused alterations to natural systems and the current rate of extinction. They calculate current extinction rates and discuss the effects of extinction on human societies.

Use this correlation in conjunction with the **Procedures** located on pages 134–135 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
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. ***Suggestion:*** *Add these terms to a Word Wall or vocabulary book: ecosystem, evaluate, depletion, generations.*	**RST.6–8.4:** 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 6–8 text and topics.*
Step 3 Students complete **Why Extinction Matters** (Student Workbook, pages 16–18) as they listen to information being read from **Extinction Cards** (Teacher's Masters, pages 6–13).	**RST.6–8.1:** Cite specific textual evidence to support analysis of science and technical texts. **SL.7.2:** Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.
Step 4: Students look at data from **Human Influence on Earth's Natural Systems** (Visual Aid #14) and **Holocene Extinction Statistics** (Visual Aid #15).	**SL.7.1:** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners…, building on others' ideas and expressing their own clearly.

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 and analysis. **(RST.6–8.1)**
- Note how the author sets up the central ideas or conclusions; provide an accurate summary of the text distinct from prior knowledge or opinions. **(RST.6–8.2)**
- Analyze how the author describes a scientific process or a multi-step procedure. **(RST.6–8.3)**
- Note how the author explains the meaning of key terms, symbols, domain specific words, and phrases. **(RST.6–8.4)**
- Analyze the structure the author uses to organize the text, including how the major sections contribute to the whole and to an understanding of the topic. **(RST.6–8.5)**
- Analyze the author's purpose in providing an explanation or describing a procedure. **(RST.6–8.6)**
- Note how the information in the ***California Connections*** text integrates with information provided visually throughout the unit in diverse formats, including tables, charts, graphs, diagrams, maps, and quantitative data. **(RST.6–8.7)**
- Distinguish among facts, reasoned judgment based on research findings, and speculation in a text, noting the reasoning and evidence used to support the author's claim. **(RST.6–8.8)**
- When other documents or media sources are included, compare and contrast the information presented in the various formats and resources with that from the text, noting how the information contributes to a coherent understanding. **(RST.6–8.9)**
- Note comprehension strategies for understanding the text. **(RST.6–8.10)**

Note: *Standard descriptions from the Reading Standards for Literacy in Science and Technical Subjects are paraphrased and combined, using terminology that applies to reading a* ***California Connections*** *selection.*

Writing

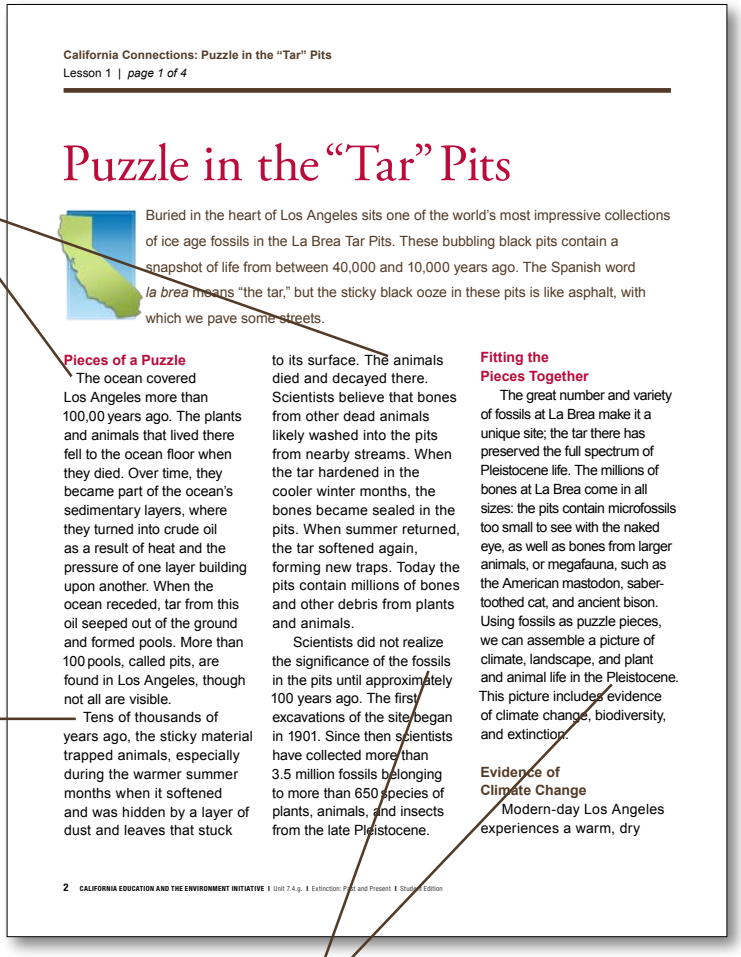
Many ***California Connections*** selections can be used as a model for future student writing tasks applying the Writing Literacy Standards by noting how the author structures the text, organizes the ideas, and provides well-chosen relevant and sufficient facts, extended definitions, concrete details, 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. In addition, for teachers of self-contained classrooms, ELA standards are included.

RST.6–8.1: Cite specific textual evidence to support analysis of science and technical texts.

SL.7.1a: Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect ideas under discussion.



California Connections: Puzzle in the "Tar" Pits
Lesson 1 | *page 1 of 4*

Puzzle in the "Tar" Pits

Buried in the heart of Los Angeles sits one of the world's most impressive collections of ice age fossils in the La Brea Tar Pits. These bubbling black pits contain a snapshot of life from between 40,000 and 10,000 years ago. The Spanish word *la brea* means "the tar," but the sticky black ooze in these pits is like asphalt, with which we pave some streets.

Pieces of a Puzzle

The ocean covered Los Angeles more than 100,00 years ago. The plants and animals that lived there fell to the ocean floor when they died. Over time, they became part of the ocean's sedimentary layers, where they turned into crude oil as a result of heat and the pressure of one layer building upon another. When the ocean receded, tar from this oil seeped out of the ground and formed pools. More than 100 pools, called pits, are found in Los Angeles, though not all are visible.

Tens of thousands of years ago, the sticky material trapped animals, especially during the warmer summer months when it softened and was hidden by a layer of dust and leaves that stuck to its surface. The animals died and decayed there. Scientists believe that bones from other dead animals likely washed into the pits from nearby streams. When the tar hardened in the cooler winter months, the bones became sealed in the pits. When summer returned, the tar softened again, forming new traps. Today the pits contain millions of bones and other debris from plants and animals.

Scientists did not realize the significance of the fossils in the pits until approximately 100 years ago. The first excavations of the site began in 1901. Since then scientists have collected more than 3.5 million fossils belonging to more than 650 species of plants, animals, and insects from the late Pleistocene.

Fitting the Pieces Together

The great number and variety of fossils at La Brea make it a unique site; the tar there has preserved the full spectrum of Pleistocene life. The millions of bones at La Brea come in all sizes: the pits contain microfossils too small to see with the naked eye, as well as bones from larger animals, or megafauna, such as the American mastodon, saber-toothed cat, and ancient bison. Using fossils as puzzle pieces, we can assemble a picture of climate, landscape, and plant and animal life in the Pleistocene. This picture includes evidence of climate change, biodiversity, and extinction.

Evidence of Climate Change

Modern-day Los Angeles experiences a warm, dry

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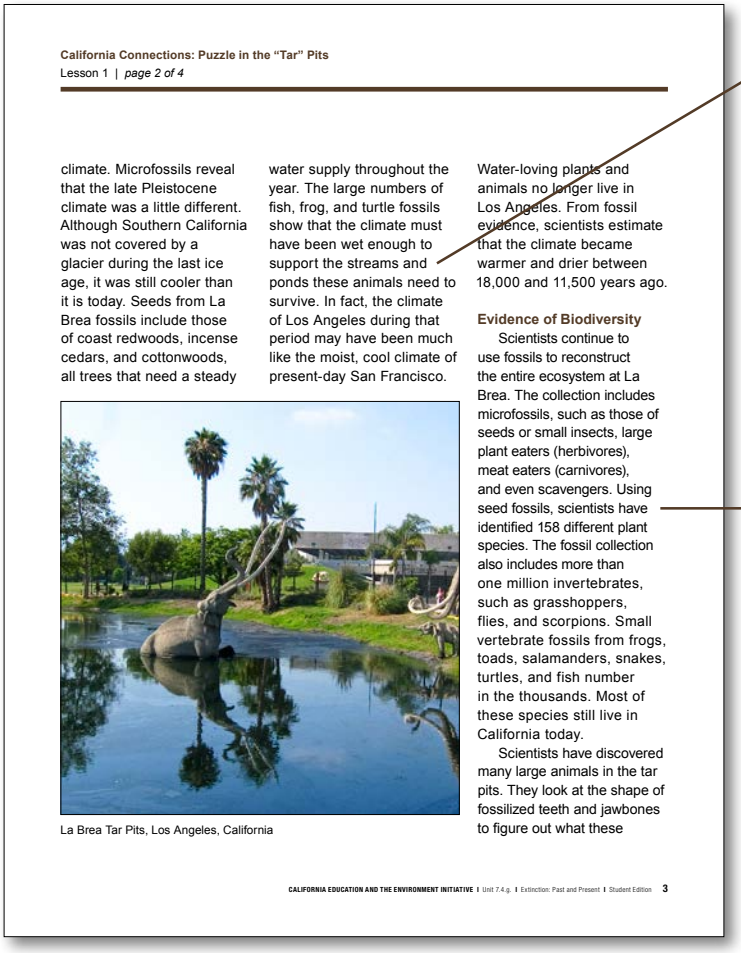
RST.6–8.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context to *grades 6–8 texts and topics*.



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climate. Microfossils reveal that the late Pleistocene climate was a little different. Although Southern California was not covered by a glacier during the last ice age, it was still cooler than it is today. Seeds from La Brea fossils include those of coast redwoods, incense cedars, and cottonwoods, all trees that need a steady water supply throughout the year. The large numbers of fish, frog, and turtle fossils show that the climate must have been wet enough to support the streams and ponds these animals need to survive. In fact, the climate of Los Angeles during that period may have been much like the moist, cool climate of present-day San Francisco.

La Brea Tar Pits, Los Angeles, California

Water-loving plants and animals no longer live in Los Angeles. From fossil evidence, scientists estimate that the climate became warmer and drier between 18,000 and 11,500 years ago.

Evidence of Biodiversity

Scientists continue to use fossils to reconstruct the entire ecosystem at La Brea. The collection includes microfossils, such as those of seeds or small insects, large plant eaters (herbivores), meat eaters (carnivores), and even scavengers. Using seed fossils, scientists have identified 158 different plant species. The fossil collection also includes more than one million invertebrates, such as grasshoppers, flies, and scorpions. Small vertebrate fossils from frogs, toads, salamanders, snakes, turtles, and fish number in the thousands. Most of these species still live in California today.

Scientists have discovered many large animals in the tar pits. They look at the shape of fossilized teeth and jawbones to figure out what these

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SL.7.1a: Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect ideas under discussion.

RST.6–8.4: 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 to *grades 6–8 texts and topics*.

RST.6–8.4: 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 to *grades 6–8 texts and topics*.

animals ate. For example, the broad, flat molars of the Columbian mammoth were ideal for grinding grasses. Its relative, the American mastodon, probably dined on leaves and twigs. Other herbivores in the tar include the ancient bison, western camel, and giant ground sloth.

Among the large fossils at La Brea, carnivores outnumbered herbivores almost nine to one. Scientists believe this ratio results from the fact that plant eaters trapped in the tar attracted meat eaters to the pits. The carnivores became trapped while feeding on the carcasses. Scavengers, in turn, also became stuck while feeding. The most common mammal fossil in the pits is a carnivore called the dire wolf. Scientists believe this wolf hunted in packs, as a result many of them got trapped at one time. Researchers have found other carnivore fossils too, including short-faced bears, American lions, and saber-toothed cats. Some types of carnivores found in the pit, such as the bobcat, coyote, and weasel, still live in California today.

Hunter in the ice age

Bird fossils are less common than fossils of many other animals because their bones are hollow and fragile, making them less likely to be preserved. Even so, scientists have discovered more than 100,000 bird fossils in La Brea's tar, comprising one of the largest collections in the world. These remains include ancestors of birds, such as the California condor, that still live in California. Others, such as the Merriam's teratorn, are now extinct. The teratorn is the largest bird fossil pulled from La Brea; it stood more than two-feet tall with a wingspan of more than 10 feet.

Evidence of Extinction

The fossil record at La Brea bears witness to the demise of many species at the end of the last ice age. Around 12,000 years ago many animals began dying out. Scientists know these animals died out

RST.6–8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

RST.6–8.1: Cite specific textual evidence to support analysis of science and technical texts.

RST.6–8.4: 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 to *grades 6–8 texts and topics*.

WHST.6–8.1: Provide a concluding statement or section that follows from and supports the argument presented.

California Connections: Puzzle in the "Tar" Pits
Lesson 1 | *page 4 of 4*

then because there are no fossils of these animals in the youngest, uppermost parts of the tar pits. The most affected were large mammals. Large herbivores, such as the mammoth, mastodon, ground sloth, ancient bison, and western camel, disappeared. Carnivores like the dire wolf, short-faced bear, American lion, and saber-toothed cat also went extinct. Scientists believe one or more of three factors—disease, overkill by humans, and climate change—may explain this extinction event.

People brought diseases with them when they began settling North America about 500 years ago. Some scientists think the pets of these settlers spread the diseases to vulnerable wild animals. The second possible factor, nicknamed the "overkill theory," suggests that humans caused extinctions through hunting too much. Perhaps humans killed large herbivores for food, starving the predators that ate the herbivores? Scientists at La Brea do not have much evidence for these theories, especially because they have found only one human skeleton there. At other fossil sites in North America, scientists have found sharpened stone points they believe were used for hunting. Scientists wonder about a connection between the extinctions and the arrival of humans because the two events happened at around the same time.

Scientists who believe the third factor, climate change, is responsible for extinctions think that as the climate warmed, streams and ponds dried up. The plants near the water died or adapted to a more arid environment. A chain reaction went all the way up the food web, starting with the herbivores. As the herbivores struggled to survive, the carnivores had fewer prey to hunt. Some scientists believe a combination of all three factors contributed to the extinctions.

Mammoth and Mastodon

What Does This Mean for the Future?

The La Brea Tar Pits offer a unique glimpse of changes around the end of the last the ice age. The fossil record excavated from the tar pits helps us understand climate change during Earth's past. Scientists can apply this knowledge to their study of current climate changes. Dr. Blaire Van Valkenburgh, a UCLA researcher, describes how understanding the ice age climate can help scientists predict the influence of present-day global climate change. "When environmental change happens very rapidly, animals cannot adapt. They have nowhere to move and competition becomes fierce. Some will become extinct."

CALIFORNIA EDUCATION AND THE ENVIRONMENT INITIATIVE | Unit 7.4.g. | Extinction: Past and Present | Student Edition 5

California Common Core State Standards Descriptions

Reading Standards for Literacy in Science and Technical Subjects

- **RST.6–8.1:** Cite specific textual evidence to support analysis of science and technical texts.
- **RST.6–8.2:** Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
- **RST.6–8.4:** 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 6–8 texts and topics*.
- **RST.6–8.7:** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
- **RST.6–8.8:** Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
- **RST.6–8.9:** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
- **RST.6–8.10:** By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.

Speaking and Listening Standards

- **SL.7.1:** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 7 topics, texts, and issues,* building on others' ideas and expressing their own clearly.
  a) Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
- **SL.7.2:** Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.

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

- **WHST.6–8.1:** Write arguments focused on *discipline-specific content*.
  c) Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
  e) Provide a concluding statement or section that follows from and supports the argument presented.