



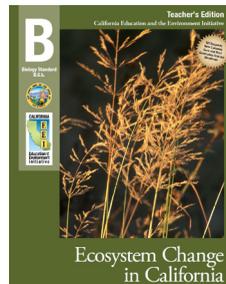
California Education and the Environment Initiative

The EEI Curriculum cohesively integrates science and engineering practices (SEPs), content (disciplinary core ideas/DCIs), and crosscutting concepts (CCs) within its lesson procedures. This preliminary analysis intentionally teases apart the individual SEPs, DCIs, and CCs as a means of correlating the EEI unit with specific performance expectations; however, the EEI lessons weave these components back together to provide three-dimensional learning for students.

High School Biology/Life Science

B.6.b. - Ecosystem Change in California

“Ecosystem Change in California” uses California’s extensive grasslands as a focus for the study of how complex sets of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time or varying under changing conditions. It looks at how extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. “Ecosystem Change in California” looks at how changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species, and the decline—and sometimes extinction—of some species. The analysis of changes to California’s grasslands over the past century provides a context for considering the range of constraints, as well as social, cultural, and environmental impacts, that occur over time.



Next Generation Science Standards* Correlation with the California Education and the Environment Initiative (EEI) Curriculum

The EEI Curriculum is a great choice for transitioning to NGSS and contributes toward achievement of the performance expectations for the standards reflected in the Summary Chart below: HS-LS2 Ecosystems: Interactions, Energy, and Dynamics; HS-LS4 Biological Evolution: Unity and Diversity; and HS-ETS1 Engineering Design. Each EEI unit highlights a small number of performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts. Therefore, the EEI units contribute to students’ overall achievement of the performance expectations by the end of a school year, where they will have had multiple opportunities to engage in all appropriate science and engineering practices, disciplinary core ideas, and crosscutting concepts. While EEI was designed to teach the 1998 California science standards to mastery, it reflects the real world interconnections in science and already incorporates many of the paradigm shifts reflected in the NGSS. To learn more about how EEI supports NGSS, visit <http://californiaeei.org/NGSSGuides/>.



Correlation Chart Key

SEP (Science and Engineering Practices)
DCI (Disciplinary Core Ideas)
CC (Crosscutting Concepts)

	Next Generation Science Standards								
	HS-LS2			HS-LS4			HS-ETS1		
California Connection		✓	✓		✓	✓			
Lesson 1 — Brainstorm examples of ecosystem change and discuss how such changes have affected California’s grasslands.	✓	✓	✓	✓	✓	✓	✓		
Lesson 2 – Collect and analyze data from a grassland study site and predict how the grassland has changed..	✓	✓	✓	✓	✓	✓	✓		
Lesson 3 –Analyze data from tree rings and pollen cores to determine the effects of climate change on grasslands.	✓	✓	✓	✓	✓	✓	✓		
Lesson 4 – Examine historical journals and images from California’s past to infer human-caused changes to grasslands.	✓	✓		✓	✓	✓	✓		
Lesson 5 –Assess the characteristics of species that may outcompete other species in an ecosystem.	✓	✓		✓	✓	✓	✓		
Lesson 6 –Analyze how grasslands are important to people and how management must deal with competing interests.			✓				✓	✓	
Traditional Unit Assessment	✓	✓	✓	✓	✓	✓	✓	✓	
Alternative Unit Assessment	✓	✓	✓	✓	✓	✓	✓	✓	
	SEP	DCI	CC	SEP	DCI	CC	SEP	DCI	CC

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EEI Unit B.6.b. Ecosystem Change in California

Disciplinary Core Ideas Supported by this EEI Unit					
HS-LS2 Ecosystems: Interactions, Energy, and Dynamics HS-LS4 Biological Evolution: Unity and Diversity HS-ETS1 Engineering Design					
Performance Expectations			Suggestions for Using the EEI Unit to Support NGSS		
HS-LS2-6: Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.			Use the unit to give students multiple opportunities to discuss and analyze that the California grassland ecosystem has changed dramatically over time, and that invasive species have reduced the number of native species to the brink of extinction.		
HS-LS4-5: Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.			Use the unit to have students study population changes of many species of native and invasive grasses in California, and use evidence that supports claims that population changes have both environmental and human causes.		
HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.			Use the unit to have students evaluate existing and potential examples of human impacts on native grasslands, and consider that complex challenges, involving multiple stakeholders, can make the design and implementation of a solution difficult.		
Science and Engineering Practices (SEPs)	Suggestions for Using EEI to Support SEPs	Disciplinary Core Ideas (DCIs)	Suggestions for Using EEI to Support DCIs	Crosscutting Concepts (CCs)	Suggestions for Using EEI to Support CCs
Constructing explanations and designing solutions (HS-ETS1-3)	Use the unit to have students construct explanations to support their claims that, over time, both human and natural causes have changed the number and types of species in California’s grassland ecosystems, and that those changing conditions, over time, may change the ecosystem itself (Lessons 1-5). Have students review the complexities involved in alternative solutions to saving remaining grasslands (Lesson 6).	LS2.C: Ecosystem Dynamics, Functioning, and Resilience: A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. . If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS2-6)	Use the unit to have students discover that changes in the populations of species can occur naturally over time (Lessons 1 and 2). Ask students to examine how cumulative changes in conditions, such as climate and the introduction of invasive species, affect resource and habitat availability within an ecosystem and may result in a new ecosystem (Lessons 3, 4, and 5).	Cause and Effect (HS-LS4-5) Stability and Change (HS-LS2-6)	Use the unit to have students analyze empirical evidence as the basis for claims that changing conditions in an ecosystem can lead to new species and changes in existing species (Lessons 1 and 2). Have students use evidence that explains how cumulative, changing conditions in an ecosystem may result in a new ecosystem (Lessons 3, 4, and 5). Use the unit to have students construct explanations of how individual species can change within an ecosystem due to both human and natural causes (Lessons 1, 2, and 3). Have students consider how human intervention may help an ecosystem become more stable (Lesson 6).

Science and Engineering Practices (SEPs)	Suggestions for Using EEI to Support SEPs	Disciplinary Core Ideas (DCIs)	Suggestions for Using EEI to Support DCIs	Crosscutting Concepts (CCs)	Suggestions for Using EEI to Support CCs
<p>Engaging in argument from evidence (HS-LS2-6, HS-LS4-5)</p>	<p>Use the unit to have students evaluate evidence that grasslands in California have changed over thousands of years, and to consider how changing conditions have affected different plant species (Lesson 1, 2, and 3). Give students the opportunity to study how grasslands have changed since the arrival of Europeans through the mid-nineteenth century (Lesson 2). Have students gather information, through the study of historical evidence (journals) and through the study of invasive plant species before and after the year 1825, that allows them to make claims as to the long-term effects humans have had on ecosystems (Lessons 4 and 5).</p>	<p>LS4.C: Adaptation: Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline – and sometimes the extinction - of some species. (HS-LS4-5)</p> <p>ETS1.B: Developing Possible Solutions: When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (HS-ETS1-3)</p>	<p>Use the unit to have students analyze evidence that supports the claim that changes in a physical environment, both human and natural, have contributed to the expansion of some species and to the decline of other species (Lessons 1-5).</p> <p>Use the unit to have students evaluate the variety of issues surrounding a proposed solution to the loss of California’s grasslands, considering the interests of decision makers, scientists, environmental agencies, and other stakeholders interested in managing a particular ecosystem (Lesson 6).</p>		<p>Influence of science, engineering, and technology on society and the natural world (HS1-ETS1-3)</p> <p>Use the unit to have students examine historical and empirical evidence to consider how prior human activities, from introducing invasive grasses and using fires to control the environment, have had a cumulative impact on both the environment and on society (Lessons 1-6).</p>