



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.8.b. – Biological Diversity: The World’s Riches

“Biological Diversity: The World’s Riches” introduces students to biodiversity and the dynamics of ecosystems through an exploration of the richness of California’s coastal wetlands. They then examine different biomes and ecosystems to learn how the availability of ecosystem goods and services influences the biodiversity in any particular location. As students explore the comparative richness of different ecosystems they discover that some species have very broad distributions while others, which have very specific survival requirements, may be found in only limited areas. After considering various ways that human activities can change ecosystems, they have the opportunity to think about how these human-caused changes can affect an ecosystem’s biodiversity. Finally, they evaluate how the scope, duration, and severity of any given disturbance, whether naturally occurring or human-caused, will influence the likelihood of different species surviving or becoming extinct.



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 disciplinary core ideas reflected in the Summary Chart below: HS-LS2 Ecosystems: Interactions, Energy, and Dynamics; and HS-LS4 Biological Evolution: Unity and Diversity. 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/curriculum/correlations/nextgenscience/>.



Correlation Chart Key

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

	Next Generation Science Standards					
	HS-LS2			HS-LS4		
California Connection						
Lesson 1 – Explore maps and background information about biological diversity in various biomes.		✓		✓	✓	
Lesson 2 – Investigate biological diversity in three deserts and assess data about species distribution and diversity.	✓	✓	✓	✓		
Lesson 3 – Analyze the capacity of ecosystems to recover from disturbance.	✓	✓	✓	✓	✓	✓
Lesson 4 – Examine the role of biodiversity in determining the likelihood that species will survive environmental changes.		✓	✓	✓	✓	✓
Traditional Unit Assessment		✓	✓	✓	✓	✓
Alternative Unit Assessment		✓	✓	✓	✓	✓
	SEP	DCI	CC	SEP	DCI	CC

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EEI Unit B.8.b. Biological Diversity: The World’s Riches

Disciplinary Core Ideas Supported by this EEI Unit					
HS-LS2 Ecosystems: Interactions, Energy, and Dynamics HS-LS4 Biological Evolution: Unity and Diversity					
Performance Expectations			Suggestions for Using the EEI Unit to Support NGSS		
HS-LS2-1: Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.			Use this unit to have students represent how different ecosystems have different capacities for biodiversity, and that the levels of biodiversity depend on the type and amount of available ecosystem goods and services, such as food, water, and habitat, as well as other attributes necessary to support living organisms, for example the temperature range.		
HS-HS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.			Use the unit to have students discover that ecosystems can have different levels of biodiversity and that ecosystems with a high biological diversity have a greater chance of surviving human-caused changes. Have them realize that as humans alter ecosystems extensively, biodiversity may change as the result of the loss of plant and animal species, and that these changes may influence the functioning of the entire ecosystem.		
HS-LS4-3: Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait			Use this unit to have students evaluate information about a variety of biomes and discover that some organisms have a broad distribution within an ecosystem and some have very specific needs and are found in only limited areas within that ecosystem. Have them consider how species with traits that are more adaptable to change are more likely to survive when an ecosystem is disturbed.		
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 this unit to have students analyze examples of both natural and human-caused changes to ecosystems and determine that the survival or local extinction of any given species depends on a variety of environmental factors, including the level of biodiversity in an ecosystem, as well as the duration and severity of a particular disturbance.		
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
Analyzing and Interpreting Data (HS-LS4-3)	Use the unit to have students examine data on three separate deserts to determine the varying levels of biodiversity found in those ecosystems (Lesson 2). Have them analyze data on six different species of kingfishers and decide if particular characteristics, such as beak size or overall height, can be a determinate factor in their survival if their habitats are significantly disturbed (Lesson 4).	LS2.A: Interdependent Relationships in Ecosystems: Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease.	Use the unit to have students compare ecosystems that have limited resources (deserts) and ecosystems with an abundance of resources (rainforests) to evaluate how an ecosystem’s biodiversity is linked to the ecosystem goods and services that it produces (Lessons 1, 2, and 3). (HS-LS2-1)	Patterns (HS-LS4-3)	Use the unit to have students study patterns of statistics and probability related to organisms living in specific ecosystems and determine the relationship between biodiversity and a species’ likelihood of survival (Lesson 3 and 4).

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>Constructing Explanations and Designing Solutions (HS-LS2-7)</p> <p>Using Mathematics and Computational Thinking (HS-LS2-1)</p> <p>Engaging in Argument from Evidence (HS-LS4-5)</p>	<p>Use the unit to have students explain what factors cause the differences in biodiversity among three deserts and a rainforest (Lesson 2). Have them analyze how both human and naturally-caused changes to ecosystems can have substantial effects on biodiversity, then have them consider possible solutions to help mitigate this problem (Lesson 3).</p> <p>Use the unit to have students determine the levels of biodiversity in ecosystems through a species grid activity and rank the level of diversity in each ecosystem (Lesson 2).</p> <p>Use the unit to have students gather evidence to support claims about how human activities can affect the biodiversity in ecosystems (Lessons 1 and 3). Have them argue that high biological diversity increases the chances of species survival when there are large-scale changes to ecosystems (Lesson 4).</p>	<p>Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS2-1)</p> <p>LS2.C: Ecosystem Dynamics, Functioning, and Resilience</p> <ul style="list-style-type: none"> Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. (HS-LS2-7) <p>LS4.B: Natural Selection</p> <p>Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (HS-LS4-3)</p>	<p>Use the unit to have students analyze how human-caused disturbances to the environment, such as logging and farming, can change ecosystems so significantly that the populations of some species may decrease to the extent that their local survival is threatened (Lessons 3 and 4).</p> <p>Use the unit to have students realize that the greater the genetic diversity of an individual species in a particular location, the more likely it is to have the trait or traits that will allow it to survive a particular disturbance or other environmental change. Have them consider how greater biodiversity in an ecosystem increases the likelihood that some organisms will survive an environmental change (Lessons 3 and 4).</p>	<p>Scale, Proportion, and Quantity (HS-LS2-1)</p> <p>Stability and Change (HS-LS2-7)</p>	<p>Use the unit to have students analyze several ecosystems that have undergone environmental changes to evaluate how the scale, scope, and duration of the events causing the changes, in combination with the ecosystem’s overall biodiversity (the number of different species in an area), are significant determining factors in the ability of the ecosystem to recover or function as it did prior to the changes (Lessons 3 and 4).</p> <p>Use the unit to have students assess several natural and human-caused factors that cause changes to ecosystems, such as logging, mining, and tropical storms, and determine the extent to which an ecosystem’s biodiversity influences its stability, or the likelihood that it will change significantly when some species go locally extinct and are no longer a component of the system (Lessons 2, 3, and 4).</p>

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<p>Obtaining, Evaluating, and Communicating Information <i>(Not associated with a specific Performance Expectation identified above)</i></p>	<p>Use the unit to have students discover that California’s rich biodiversity results from the state’s wide variety of climatic and topographical characteristics (Lesson 1)., have them evaluate information on a variety of ecosystems and determine that there are differences in biodiversity between ecosystems, and that the greater the severity of a disturbance to an ecosystem the more likely it becomes that some species may go locally extinct in that ecosystem (Lessons 2 and 3).</p>	<p>LS4.C: Adaptation</p> <ul style="list-style-type: none"> • 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) • Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species’ evolution is lost. (HS-LS4-5) <p>LS4.D: Biodiversity and Humans</p> <ul style="list-style-type: none"> • Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (secondary to HS-LS2-7) • Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. (Secondary to HS-LS2-7) 	<p>Use the unit to have students examine the adaptations that help organisms survive in extreme conditions, such as wetland plants adaptability to survive differing levels of salt and oxygen (Lesson 1). Have them determine that the duration and severity of an ecosystem disturbance, such as the case with a hurricane, mining operation, or deforestation, can affect certain species to the point where they can no longer survive. However, certain species may survive if they have traits that are adaptable to diverse environmental conditions (Lessons 3 and 4).</p> <p>Use the unit to have students examine how humans can cause changes to biodiversity in an ecosystem through activities, such as the conversion of habitat forest of land to other purposes, like farming, forestry activities, and urban sprawl (Lessons 1 and 3). Have them evaluate how human activities can alter ecosystems so that some species may not survive (Lessons 3 and 4).</p>		