



California Education and the Environment Initiative

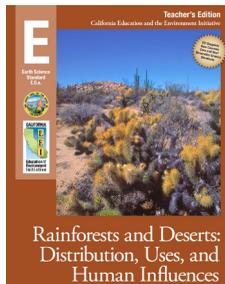
The EEI Curriculum cohesively integrates science and engineering practices (SEPs), content (disciplinary core ideas/DCIs), and crosscutting concepts (CCs) within its lesson procedures. This preliminary analysis intentionally teases apart the individual SEPs, DCIs, and CCs as a means of correlating the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

High School Earth Science and Life Science

E.5.e. Rainforests and Deserts: Distribution, Uses, and Human Influence

“Rainforests and Deserts: Distribution, Uses, and Human Influence” engages students in studying the relationship between natural resources and human activities by introducing them to the California Desert Protection Act. Examining this national success story provides students with a basis for learning about the effects of natural resource availability on human societies at the same time as it introduces them to the impacts of human activities on natural systems and the ecosystems goods and services they supply. Through this unit students also have the opportunity to study how electromagnetic radiation from the Sun and ocean currents influence the global distribution of tropical rainforest and desert ecosystems. In addition, they have an opportunity to analyze how these ecosystems are affected by human activities and other dynamic elements of Earth’s systems. This unit also helps students make the important connection between Earth systems science and the biological diversity represented in tropical rainforest and desert ecosystems. Finally, they analyze a major government study in order to gather and use scientific data related to the conservation and restoration of the Mojave

Desert ecosystem. This provides the basis for students discussing the role of scientific knowledge in making policy and management decisions about human activity related to ecosystems.



Correlation Chart Key

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

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 disciplinary core ideas reflected in the Summary Chart below: HS-ESS2 Earth’s Systems, HS-ESS3 Earth and Human Activity, and HS-LS2 Ecosystems: Interactions, Energy, and Dynamics. 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://www.californiaeei.org/curriculum/correlations/nextgenscience/>.

	Next Generation Science Standards								
	HS-ESS2			HS-ESS3			HS-LS2		
California Connection		✓	✓		✓	✓		✓	✓
Lesson 1 – Examine global weather patterns and geographic features related to the location of rainforests and deserts.				✓	✓		✓	✓	
Lesson 2 – Identify latitudes associated with the geographic distribution of the world’s rainforests and deserts.	✓	✓	✓			✓			
Lesson 3 – Discuss the ecosystem goods and ecosystem services provided by Rainforests.			✓	✓	✓	✓	✓	✓	✓
Lesson 4 – Investigate the effects of human activities on the functioning and local distribution (presence) of rainforests and deserts.			✓	✓		✓	✓	✓	✓
Lesson 5 – Analyze how global temperature change can influence the distribution of biomes.	✓	✓	✓		✓	✓		✓	✓
Lesson 6 – Review the role of scientific knowledge in making policy decisions about ecosystems.	✓	✓	✓	✓	✓	✓	✓		
Traditional Unit Assessment		✓	✓		✓	✓		✓	✓
Alternative Unit Assessment	✓	✓	✓	✓	✓	✓	✓	✓	✓
	SEP	DCI	CC	SEP	DCI	CC	SEP	DCI	CC

*The “Next Generation Science Standards” logo is a registered trademark of Achieve. Except for the State of California, neither Achieve nor the lead states and partners that developed the Next Generation Science Standards, was involved in the production of, and does not endorse, this product.

EEI Unit E.5.e. Rainforests and Deserts: Distribution, Uses, and Human Influence

Disciplinary Core Ideas Supported by this EEI Unit					
HS-ESS2 Earth's Systems HS-ESS3 Earth and Human Activity HS-LS2 Ecosystems: Interactions, Energy, and Dynamics					
Performance Expectations			Suggestions for Using the EEI Unit to Support NGSS		
HS-ESS2-4: Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.			Use the unit to have students analyze tropical rainforest and desert ecosystems as a model for evaluating the effects on climate of the energy flowing from the Sun. Have them describe how the resulting convection currents interact with the ocean, land masses, and atmosphere near the equator, and drive the precipitation patterns that influence the geographical location of tropical rainforests and deserts.		
HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.			Use this unit to have students analyze evidence that humans have historically lived where their needs for survival are best met. Have them explain how a change in resource availability or in climate, or both, can affect human activity in rainforests and deserts.		
HS-ESS3-3: Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity.			Use this unit to have students evaluate the impacts on natural systems that result from the decisions humans make regarding the management of natural resources, sustainability, and biodiversity. Have them identify and describe human activities that have influenced the local distribution of deserts, rainforests, and the diversity of organisms within those systems.		
HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.			Use the unit to have students identify and compare ways humans improve on technological solutions to help ecosystem sustainability, such as increasing the use of alternative energy sources or reducing the impact of mining, farming, and agricultural practices.		
HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.			Use the unit to have students analyze and discuss changes to rainforests and desert ecosystems that have resulted from human activities and natural events. Have them evaluate the extent to which the implementation of various solutions to the impacts resulting from human activities have helped conserve and restore the Mojave Desert in California.		
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
Developing and Using Models (HS-ESS2-4)	Use this unit to have students use a global latitude map to show the location of deserts and rainforests worldwide (Lesson 2). Have them examine global temperature change models and determine what effect those changes have had on the boundaries of the Sahara Desert (Lesson 5). Have students analyze current models showing soil compaction in the Mojave Desert ecosystem and	ESS2.A: Earth Materials and Systems: The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to	Use this unit to have students recognize that scientists have used information based on the study of past cultures and past climates (paleoclimatology) to determine that past cultures once thrived in what is now the Sahara Desert. Have them consider how the climate in that region changed over thousands of years, partly due to a change in Earth's orbit (Lesson 5).	Cause and Effect (HS-ESS2-4, HS-ESS3-1)	Use this unit to have students recognize the difference between cause and effect relationships and correlations. Have them discuss the need for empirical evidence, collected through scientific investigations, as the basis for establishing cause and effect relationships (Lessons 2, 4, and 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>Analyzing and Interpreting Data <i>(Not associated with a Performance Expectation identified above)</i></p> <p>Constructing Explanations and Designing Solutions (HS-ESS3-1, HS-ESS3-4, HS-LS2-7)</p>	<p>relate the compaction to past human activity (Lesson 6).</p> <p>Use this unit to have students examine data and describe how ecosystem boundaries and biodiversity are a result of both naturally-occurring events and human activities (Lessons 1, 4, and 5).</p> <p>Use this unit to have students gather information and use it to explain how human activities have influenced the distribution of deserts and rainforests and the biodiversity within those ecosystems (Lessons 1, 3, and 4). Have them analyze the solutions implemented to help mitigate human impacts on the Mojave Desert (Lesson 6).</p>	<p>intermediate (ice ages) to very long-term tectonic cycles. (HS-ESS2-4)</p> <p>ESS2.D: Weather and Climate:</p> <ul style="list-style-type: none"> The foundation for Earth’s global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy’s re-radiation into space. (HS-ESS2-4) Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. (HS-ESS2-4) <p>ESS3.A: Natural Resources: Resource availability has guided the development of human society. (HS-ESS3-1)</p> <p>ESS3.C: Human Impacts on Earth’s Systems:</p> <ul style="list-style-type: none"> The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (HS-ESS3-3) 	<p>Use this unit to have students recognize that global convection currents, resulting from energy flowing from the Sun, drive the weather patterns which in turn influence the global distribution of tropical rainforests and deserts (Lesson 2). Have them analyze how Earth’s historical climate changes have affected past human civilizations (Lesson 5).</p> <p>Use this unit to have students identify how the resources available to indigenous people in the rainforests have allowed them to be successful for thousands of years (Lesson 3). Have them explain that the rich availability of natural resources allowed two different cultures to occupy portions of what is now the Sahara Desert, and that those cultures disappeared from what is now referred to as the Green Sahara (Lesson 5).</p> <p>Use this unit to have students analyze the impacts humans have had on desert ecosystems as a result of agriculture, grazing, recreation, and other practices (Lesson 1). Have them recognize that the activities of human communities and societies have reduced the amount</p>	<p>Systems and system models <i>(Not associated with a Performance Expectation identified above)</i></p> <p>Stability and Change (HS-ESS3-3, HS-ESS3-4, HS-LS2-7)</p> <p>Influence of engineering, technology, and science on society and the natural world (HS-ESS3-1, HS-ESS3-3, HS-ESS3-4)</p>	<p>Use this unit to have students recognize the difference between cause and effect relationships and correlations. Have them discuss the need for empirical evidence, collected through scientific investigations, as the basis for establishing cause and effect relationships (Lessons 2, 4, and 6).</p> <p>Use this unit to have students analyze the components of desert systems and use models to explain how past natural and human events have changed desert ecosystems (Lessons 1, 3, 5, and 6). Have them identify and describe how global precipitation patterns influence the geographical distribution of Earth’s tropical rainforests and deserts (Lesson 2).</p> <p>Use this unit to have students analyze how human activities have changed the boundaries of rainforests and deserts, and identify how those changes have influenced the populations of various plant and animal species (Lessons 3, 4, and 5).</p> <p>Use this unit to have students describe how humans use science and technology to help manage resources and create public policy that is intended to reduce the impact of human activities on California’s deserts (Lessons 4 and 6).</p>

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
		<ul style="list-style-type: none"> • Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (HS-ESS3-4) <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. (secondary to HS-ESS3-4)</p> <p>LS2.C: Ecosystem Dynamics, Functioning, and Resilience: 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>	<p>of tropical rainforests worldwide, and that appropriate management of these rainforests is necessary if they are to be available to meet future demands for the ecosystem goods and services they contain (Lesson 3). Have them evaluate the importance of making decisions about resource management policies related to tropical rainforest and desert ecosystems on the basis of sound scientific knowledge (Lesson 6).</p> <p>Use this unit to have students examine the processes involved in changing the human activities that affect ecosystems, such as tropical rainforests and deserts, in part because of the time required to collect the relevant scientific data, analyze alternative possible solutions, and evaluate the resulting societal changes (Lessons 1 and 6).</p> <p>Use this unit to have students determine how the resilience of deserts and other ecosystems are influenced when they undergo environmental changes (Lesson 1). Have them describe how the availability of ecosystem goods and ecosystem services in rainforests and deserts is affected by human activities that impact those natural systems (Lesson 3). Have students identify how human-caused (anthropogenic) destruction of rainforests and deserts has altered those ecosystems and has threatened or endangered the survival of many species (Lesson 4).</p>		