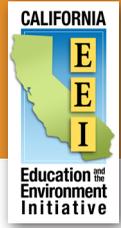


California Education and the Environment Initiative

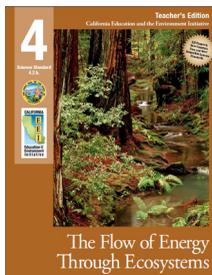
The EEI Curriculum cohesively integrates science and engineering practices (SEPs), content (disciplinary core ideas/DCIs), and crosscutting concepts (CCs) within its lesson procedures. This preliminary analysis intentionally teases apart the individual SEPs, DCIs, and CCs as a means of correlating the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



Grades 4 and 5

4.2.b. - The Flow of Energy Through Ecosystems

“The Flow of Energy Through Ecosystems” gives students the opportunity to examine the flow of energy through ecosystems as they study the roles of plants and animals in different natural systems. They begin to recognize that organisms, including humans, can be classified by the sources of energy and matter (food) they consume. Based on this knowledge they study the potential consequences when components of an ecosystem are changed or eliminated, whether as a result of natural or human causes. Students explore the ways individual communities can use scientific ideas to protect the Earth’s resources and environment. As a culminating activity, they consider different events and discuss the effects that disruptions to the food web would have on the entire ecosystem, ultimately identifying the similarity of the effects of natural ecosystem changes and human activities.



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: 4-LS1 From Molecules to Organisms: Structure and Processes; 5-LS2 Ecosystems: Interactions, Energy, and Dynamics; and 5-ESS3 Earth and Human Activity. 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 | | | | | | | | |
|---|-----------------------------------|-----|----|-------|-----|----|--------|-----|----|
| | 4-LS1 | | | 5-LS2 | | | 5-ESS3 | | |
| California Connection | | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ |
| Lesson 1 – Examine the Humboldt squid and identify producers and consumers in the squid’s ecosystem. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| Lesson 2 – Explore the roles of herbivores, carnivores, and omnivores in California’s other natural regions. | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| Lesson 3 – Analyze food chains and food web in a marine ecosystem and discuss competition food sources. | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| Lesson 4 – Observe the range of the Humboldt squid and consider its role in California’s coastal ecosystems. | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Lesson 5 – Analyze and discuss how healthy food webs can be influenced by human actions. | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Traditional Unit Assessment | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| Alternative Unit Assessment | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| | SEP | DCI | CC | SEP | DCI | CC | SEP | DCI | CC |

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EEI Unit 4.2.b. - The Flow of Energy Through Ecosystems

| Disciplinary Core Ideas Supported by this EEI Unit | | | | | |
|---|--|---|--|--|--|
| 4-LS1 From Molecules to Organisms: Structure and Processes | | | | | |
| 5-LS2 Ecosystems: Interactions, Energy, and Dynamics | | | | | |
| 5-ESS3 Earth and Human Activity | | | | | |
| Performance Expectations | | | Suggestions for Using the EEI Unit to Support NGSS | | |
| 4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. | | | Use this unit to have students identify and know that plants and animals have structures, such as specialized leaves and roots (in plants) and large ears or sharp tentacles (in animals) that help them survive within their ecosystems. | | |
| 5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. | | | Use this unit to have students study models that depict food webs in several different natural regions within California to show how energy and matter move between different organisms. Use this unit to help students realize that a species newly introduced into an ecosystem can change the balance of that ecosystem. | | |
| 5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment. | | | Use this unit to have students realize that as humans interact with natural systems to meet their own needs, there can be major effects on Earth’s ecosystems. | | |
| 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>Developing and Using Models (5-LS2-1)</p> <p>Engaging in Argument from Evidence (4-LS1-1)</p> | <p>Use the unit to have students use models to recognize the different roles plants and animals have in a variety of ecosystems (Lessons 1 and 2). Have students evaluate multiple food webs as they investigate how animals compete for food (Lesson 3). Have students use models and predict the consequences if certain components of an ecosystem are changed (Lessons 4 and 5).</p> <p>Use this unit to have students identify and discuss characteristics of the Humboldt squid that allow it to survive (Lesson 1). Have students gather evidence that shows the Humboldt squid’s ability to compete for food over an expanded range, which may affect the ability of other organisms in that system to survive (Lesson 4).</p> | <p>LS1.A: Structure and Function: Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)</p> <p>LS2.A: Interdependent Relationships in Ecosystems: The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as “decomposers.”</p> | <p>Use this unit to have students discover that when animals in an energy web compete for food, some species have characteristics that allow it to be more successful than others (Lessons 1 and 2).</p> <p>Use the unit to have students establish that plants and plankton are the basis for food for almost any kind of animal (Lesson1). Have students discover that in food chains and food webs, animals are dependent upon finding food to survive, and that they may compete for the same food source (Lessons 2 and 3). Have students recognize that a healthy ecosystem has multiple species of different types of organisms, and that if there is a disturbance to that system,</p> | <p>Structure and Function (1-LS1-1)</p> | <p>Use the unit to have students investigate Use each lesson in this unit to have students use models of food chains and food webs to determine how energy and matter flow through a variety of ecosystems (Lessons 1, 2, and 3). Have students determine the effects caused by the introduction or elimination of a species in an ecosystem (Lessons 3, 4, and 5). Have students predict the consequences of natural and human impacts on natural systems within California (Lesson 4 and 5).</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 |
|---|--|---|---|--|--|
| <p>Obtaining, Evaluating, and Communicating Information (5-ESS3-1)</p> | <p>Use the unit to have students gather information about plants and animals in a variety of ecosystems (Lessons 1, 2, and 3). Have students consider how changes in ecosystem components can affect ecosystems and share their ideas with others (Lessons 4 and 5).</p> | <p>Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage balance of an ecosystem. (5-LS2-1)</p> <p>LS2.B: Cycles of Matter and Energy Transfer in Ecosystems: Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1)</p> <p>ESS3.C: Human Impacts on Earth Systems: Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth’s resources and environments. (5-ESS3-1)</p> | <p>whether natural or man-made, changes in the balance of that ecosystem can occur (Lessons 4 and 5).</p> <p>Use each lesson in this unit to have students investigate, through a study of different ecosystems, that matter and energy transfer from plants to all other organisms within those ecosystems.</p> <p>Use the unit to have students consider that human activities contributing to global warming may have an effect on the range of the Humboldt Squid, thereby changing marine ecosystems (Lesson 4). Have students predict that human activities can have both positive and negative effects upon ecosystems (Lesson 5).</p> | <p>Systems and System Models (4-LS1-1, 5-LS2-1, 5-ESS3-1)</p> | <p>Use each lesson in this unit to have students use models of food chains and food webs to determine how energy and matter flow through a variety of ecosystems (Lessons 1, 2, and 3). Have students determine the effects caused by the introduction or elimination of a species in an ecosystem (Lessons 3, 4, and 5). Have students predict the consequences of natural and human impacts on natural systems within California (Lesson 4 and 5).</p> |