

5-LS2-1 Ecosystems: Interactions, Energy, and Dynamics

California Science Test—Item Content Specifications

# 5-LS2-1 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

[Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.] [*Assessment Boundary: Assessment does not include molecular explanations.*]

Continue to the next page for the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts.

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
| --- | --- | --- |
| Developing and Using Models  Modeling in 3–5 builds on K–2 models and progresses to building and revising simple models and using models to represent events and design solutions.  Develop a model to describe phenomena.  Connections to Nature of Science  Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena  Science explanations describe the mechanisms for natural events. | LS2.A: Interdependent Relationships in Ecosystems  3. 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.” 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 the balance of an ecosystem.  LS2.B: Cycles of Matter and Energy Transfer in Ecosystems  1. 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. | Systems and System Models  A system can be described in terms of its components and their interactions. |

## Assessment Targets

Assessment targets describe the focal knowledge, skills, and abilities for a given three-dimensional Performance Expectation. Please refer to the Introduction for a complete description of assessment targets.

### Science and Engineering Subpractice(s)

Please refer to appendix A for a complete list of Science and Engineering Practices (SEP) subpractices. Note that the list in this section is not exhaustive.

2.1 Ability to develop models

### Science and Engineering Subpractice Assessment Targets

Please refer to appendix A for a complete list of SEP subpractice assessment targets. Note that the list in this section is not exhaustive.

2.1.1 Ability to determine components of a scientific event, system, or design solution

2.1.2 Ability to determine the relationships among multiple components of a scientific event, system, or design solution

2.1.4 Ability to represent mechanisms, relationships, and connections to illustrate, explain, or predict a scientific event

### Disciplinary Core Idea Assessment Targets

#### LS2.A.3

* Trace energy flow and biomass transfer in a food web from plants to animals to decomposers
* Identify nutrients required to support plant life
* Identify the role of decomposers as organisms that recycle the nutrients stored in animals/plants back into the environment (usually into the soil)
* Describe the interconnected relationships between organisms in a food web
* Model the flow of energy and the transfer of biomass between organisms in a food web

#### LS2.B.1

* Identify how matter cycles between the atmosphere, living things, and soil
* Describe how newly introduced organisms affect the cycling of matter/flow of energy among the original plants, animals, decomposers in the ecosystem
* Describe how changes in a previously stable environment affect the matter flow/energy cycle among the original plants, animals, decomposers in the system

### Crosscutting Concept Assessment Target(s)

CCC4 Describe a system in terms of its components and their interactions

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides a model of a food web:

* Identifies the producers/consumers/decomposers in the ecosystem (2.1.1, LS2.A.3, and CCC4)
* Describes the role of producers in the ecosystem (2.1.1, LS2.A.3, and CCC4)
* Describes the flow of energy from one trophic level to another within the food web (2.1.1, LS2.A.3, and CCC4)
* Describes the cycling of matter in the food web (2.1.1, LS2.A.3, and CCC4)
* Completes the model (2.1.1, LS2.A.3, and CCC4)
* Identifies evidence for relationships represented among different components of the food web (2.1.3, LS2.A.3, and CCC4)

Task provides a model of a food web with a newly introduced species:

* Interprets model to predict impact of introduction of new species (2.1.1, LS2.B.1, and CCC4)
* Selects the explanation/prediction the provided model is trying to convey (2.1.3, LS2.B.1, and CCC4)

## California Environmental Principles and Concepts

* EP3: Natural systems proceed through cycles that humans depend upon, benefit from, and can alter.
* EP4: The exchange of matter between natural systems and human societies affects the long-term functioning of both.

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* Models of energy or matter exchange (e.g., food web, food pyramid)
* Ecosystem responses to abiotic change
* Food chain interactions (e.g., identifying the role of decomposers in a food chain)
* Introduction of a new or invasive species or population
* Loss of an existing species or population

## Common Misconceptions

Note that the list in this section is not exhaustive.

* Soil is the primary source of energy for plants.
* Dead things do not have energy/nutrients and do not have value to an ecosystem.
* Small changes to an ecosystem only have small impacts.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

5-LS2-1 Evidence Statement [https://www.nextgenscience.org/sites/default/files/evidence\_statement/black\_white/5-LS2-1 Evidence Statements June 2015 asterisks.pdf](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/5-LS2-1%20Evidence%20Statements%20June%202015%20asterisks.pdf)

Environmental Principles and Concepts <http://californiaeei.org/abouteei/epc/>

California Education and the Environment Initiative <http://californiaeei.org/>

The *2016 Science Framework for California Public Schools Kindergarten through Grade 12*

Appendix 1: Progression of the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts in Kindergarten through Grade 12 <https://www.cde.ca.gov/ci/sc/cf/documents/scifwappendix1.pdf>

Appendix 2: Connections to Environmental Principles and Concepts <https://www.cde.ca.gov/ci/sc/cf/documents/scifwappendix2.pdf>

Posted by the California Department of Education, March 2021 (updated February 2024)