

HS-LS2-4 Ecosystems: Interactions, Energy, and Dynamics

California Alternate Assessment for Science—Item Content Specifications

# HS-LS2-4 Ecosystems: Interactions, Energy, and Dynamics

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Using a graphical representation, identify the changes in the amount of matter or energy as it travels through an energy pyramid or food web. | 1. Ability to identify using a graphical representation the changes in the amount of matter as it travels through an energy pyramid or food web. 2. Ability to identify using a graphical representation the changes in the amount of energy as it travels through an energy pyramid or food web. | Recognize that there are generally fewer organisms at higher levels of an energy pyramid or food web (e.g., a graphical representation) than at lower levels. |

## **CA NGSS Performance Expectation**

Students who demonstrate understanding can:

**Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.** [Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen, and nitrogen being conserved as they move through an ecosystem.] *[Assessment Boundary: Assessment is limited to proportional reasoning to describe the cycling of matter and flow of energy.]*

## Mastery Statements

Students will be able to:

* Recognize that there are fewer organisms at higher levels in an energy pyramid, food chain, or food web
* Recognize that energy or matter decreases when moving to higher levels in an energy pyramid or food web

## California Environmental Principles and Concepts

Principle 2—The long-term functioning and health of terrestrial, freshwater, coastal, and marine ecosystems are influenced by their relationships with human societies.

Principle 4—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 or prescriptive.*

**Possible contexts include the following:**

* The flow of energy through a food web or ecosystem, e.g. plants obtain energy from the Sun, an insect obtains energy by eating the plant, another animal obtains energy by eating the insect
* The cycling of matter through a food web or ecosystem, e.g. the matter produced by photosynthesis in plants is consumed by an animal such as a rabbit and then the rabbit is consumed by another animal, such as a coyote
* The numbers of organisms found at each trophic level, e.g. one mouse eats many plants, and one bobcat eats many mice, so the number of organisms decreases as you move up a matter or energy pyramid

## Additional Assessment Boundaries

* None listed at this time

## Additional References

California Science Test Item Specification for HS-LS2-4

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-hs-ls2-4.docx>

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

The *2016 Science Framework for California Public Schools Kindergarten through Grade Twelve* <https://www.cde.ca.gov/ci/sc/cf/cascienceframework2016.asp>

Appendix 1: Progression of the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts in Kindergarten through Grade Twelve

<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, July 2025