

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

California Science Test—Item Content Specifications

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

Students who demonstrate understanding can:

Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

[Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.]

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 |
| --- | --- | --- |
| Engaging in Argument from EvidenceEngaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. | LS2.C: Ecosystem Dynamics, Functioning, and Resilience3. Biodiversity describes the variety of species found in Earth’s terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem’s biodiversity is often used as a measure of its health.LS4.D: Biodiversity and Humans3. Changes in biodiversity can influence humans’ resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (*secondary to MS-LS2-5*)ETS1.B: Developing Possible Solutions7. There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (*secondary to MS-LS2-5*) | Stability and ChangeSmall changes in one part of a system might cause large changes in another part.Connections to Engineering, Technology, and Applications of ScienceInfluence of Science, Engineering, and Technology on Society and the Natural WorldThe use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time.Connections to Nature of ScienceScience Addresses Questions About the Natural and Material WorldScientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. |

## 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.

7.2 Ability to compare, evaluate, and critique competing arguments

### 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.

7.2.1 Ability to evaluate arguments about a natural phenomenon based on scientific concepts, principles, and big ideas

7.2.2 Ability to respond to a critique from others by revising an argument after analysis of the reasoning and evidence

7.2.3 Ability to evaluate competing perspectives/claims using reasoning and evidence

### Disciplinary Core Idea Assessment Targets

#### LS2.C.3

* Identify biodiversity as the variety of species found in an ecosystem
* Describe factors that affect the stability of the biodiversity of a given ecosystem

#### LS4.D.3

* Identify resources (e.g., food, energy, and medicines) and ecosystem services (e.g., water purification and recycling) that benefit humans
* Describe how changes in biodiversity influence resources and ecosystem services

#### ETS1.B.7

* Apply systematic processes for evaluating design solutions
* Define and describe scientific, social, and economic criteria and constraints of a problem

### Crosscutting Concept Assessment Target(s)

CCC7 Identify that small changes in one part of a system might cause large changes in another part

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides multiple design solutions for maintaining biodiversity/ecosystem resources:

* Selects the best design based on a prioritized list of criteria (7.2.3, LS2.C.3, ETS1.B.7, and CCC7)
* Ranks the design solutions based on how well they meet the criteria and constraints of the defined problem (7.2.3, LS2.C.3, ETS1.B.7, and CCC7)
* Selects the best design and provides justification for the selection based on a prioritization of criteria (7.2.3, LS2.C.3, ETS1.B.7, and CCC7)
* Selects the best design and provides justification for the selection based on science principles and/or evidence (7.2.1, LS2.C.3, ETS1.B.7, and CCC7)

Task provides a design solution for maintaining ecosystem resources:

* Identifies tradeoffs that would have been necessary with the design (7.2.1, LS4.D.3, ETS1.B.7, and CCC7)
* Identifies the scientific ideas, principles, or evidence that support the effectiveness of a given design (7.2.1, LS2.C.3, and CCC7)
* Identifies possible unanticipated effects of a design solution (7.2.1, LS2.C.3, and CCC7)
* Indicates ways to improve the design solution (7.2.2, LS2.C.3, ETS1.B.7, and CCC7)

Task provides a description of a design solution for maintaining biodiversity/ecosystem resources that was selected over alternative designs:

* Identifies the criteria or constraints that resulted in the selection of the design (7.2.1, LS2.C.3, ETS1.B.7, and CCC7)

## California Environmental Principles and Concepts

* EP1: The continuation and health of individual human lives and of human communities and societies depend on the health of the natural systems that provide essential goods and ecosystem services.
* EP2: The long-term functioning and health of terrestrial, freshwater, coastal, and marine ecosystems are influenced by their relationships with human societies.
* 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.
* EP5: Decisions affecting resources and natural systems are based on a wide range of considerations and decision-making processes.

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* Nutrient recycling
* Carbon sequestration
* Waste decomposition
* Prevention of soil erosion
* Methods of water conservation

## Common Misconceptions

Note that the list in this section is not exhaustive.

* Biodiversity means only the number of species in an ecosystem.
* Human intervention always improves ecosystems.
* Ecosystem services are inexhaustible.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

MS-LS2-5 Evidence Statement <https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/MS-LS2-5%20Evidence%20Statements%20June%202015%20asterisks.pdf>

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

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