

4-ESS2-1 Earth's Systems

California Science Test—Item Content Specifications

# 4-ESS2-1 Earth's Systems

Students who demonstrate understanding can:

Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

[Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.] [*Assessment Boundary: Assessment is limited to a single form of weathering or erosion.*]

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
| --- | --- | --- |
| Planning and Carrying Out Investigations  Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.  Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. | ESS2.A: Earth Materials and Systems   1. Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.   ESS2.E: Biogeology   1. Living things affect the physical characteristics of their regions. | Cause and Effect  Cause and effect relationships are routinely identified, tested, and used to explain change. |

## 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.

3.3 Ability to collect the data for the investigation

### 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.

3.3.1 Ability to use appropriate tools for accurate and precise measurements

3.3.2 Ability to make observations according to the investigation plan

3.3.3 Ability to evaluate the quality of data to determine if the evidence meets the goals of the investigation

### Disciplinary Core Idea Assessment Targets

#### ESS2.A.2

* Describe how the change in the relative steepness of slope of an area affects the rate of erosion
* Describe the types of weathering or erosion that affect the land
* Describe how moving water changes the shape of land
* Describe how freezing and melting changes the shape of land
* Describe how wind changes the shape of land
* Identify cause-and-effect relationships between weathering, erosion, and Earth materials using evidence
* Describe how vegetation can alter water, rocks, soil, and sediment

#### ESS2.E.2

* Explain the role of vegetation in increasing or decreasing rates of weathering and erosion

### Crosscutting Concept Assessment Target(s)

CCC2 Identify and test cause and effect relationships to explain change

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides a description of a scenario in which students are using tools to collect measurements related to the effects of weathering or the rate of erosion:

* Identifies gaps in the way the tools are being used to gather data (3.3.1, ESS2.A.2, and CCC2)

Task describes a scenario of weathering or erosion:

* Identifies tools and techniques to collect measurements that are relevant to investigating the effects of weathering or the rate of erosion (3.3.1, ESS2.A.2, and CCC2)
* Uses measuring tools to get accurate and precise measures related to the effects of weathering or the rate of erosion (3.3.1, ESS2.A.2, and CCC2)
* Describes and identifies observations that are relevant to investigating the effects of weathering or the rate of erosion (3.3.2, ESS2.A.2, and CCC2)

Task provides a video or simulated model of weathering or erosion, such as time-lapse photographs of two similar scenes, but one with and one without vegetation:

* Records observations, noting the difference between the two scenarios (3.3.2, ESS2.E.2, and CCC2)

Task provides the details of an investigation by a group of researchers to determine what type of weathering is occurring in a given region:

* Evaluates the quality of data and correctly determines if the evidence is sufficient to distinguish between wind-based or water-based weathering (3.3.3, ESS2.A.2, and CCC2)

Task provides the details of an investigation by a group of researchers to determine the average annual rate of erosion taking place in a region:

* Evaluates the amount of data and correctly determines if the data are sufficient to answer the scientific question under investigation (3.3.3, ESS2.A.2, and CCC2)

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* Amount of vegetation (e.g., to reduce erosion of sandy beaches)
* Wind speed
* Relative rate of deposition
* Cycles of freezing and thawing or heating and cooling
* Volume of water flow

## Common Misconceptions

Note that the list in this section is not exhaustive.

* Erosion/weathering only occurs during extreme weather events.
* Earth features (like rivers, waterfalls, or canyons) eroded at some point in the past but do not erode in the present.
* The magnitude of erosional/weathering causes must be equal to erosional/weathering effects (i.e., small effects cannot add up to one sudden erosion event).
* Flowing water cannot carry sediment or other particulate matter.
* Weathering and erosion are the same process.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

[4-ESS2-1 Evidence Statement](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/4-ESS2-1%20Evidence%20Statements%20June%202015%20asterisks.pdf) <https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/4-ESS2-1%20Evidence%20Statements%20June%202015%20asterisks.pdf>

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>

Posted by the California Department of Education, March 2021