

5.Earth's Surface Systems

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Students who demonstrate understanding can:

- 5-ESS2-a. Use models to describe interactions between the geosphere, hydrosphere, atmosphere, and biosphere and identify the limitations of the models.** [Clarification Statement: The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Students should only be assessed on the interactions of two systems at a time.]
- 5-ESS2-b. Use evidence from observations to explain the role of the ocean in supporting ecosystems and their organisms, shaping landforms, and influencing climate.** [Clarification Statement: Evidence for supporting ecosystems could include distribution of fish. Evidence for shaping landforms could include pictures of coastal erosion. Evidence for influencing climate could include temperature patterns in coastal vs. continental regions.] [Assessment Boundary: Students should only be assessed on the role of the ocean in supporting ecosystems in general, not on specific ecosystems.]
- 5-ESS2-c. Develop and revise models to describe how wind and clouds interact with landforms to determine patterns of weather.** [Clarification Statement: An example could be when clouds go over mountains, they release their water as precipitation.] [Assessment Boundary: Assessment should not include weather maps.]
- 5-ESS3-b. Construct explanations for how humans and other organisms will be affected if Earth's temperature continues to rise.** [Clarification Statement: Examples of effects on humans and other organisms could include local area changes in crop growing seasons, coral reefs, and habitats for polar organisms.] [Assessment Boundary: The Greenhouse effect and details of climate change are not assessed.]
- 5-ESS3-a. Design and evaluate a solution to an environmental problem that decreases risks, increases benefits, or better meets societal demands for new or improved technologies.*** [Clarification Statement: Examples of solutions could be designing a cost-effective water filtration system that reduces pollutants in a river, conducting an energy audit, and developing a plan to reduce energy use.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>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.</p> <ul style="list-style-type: none"> Develop and revise models collaboratively to measure and explain frequent and regular events. (5-ESS2-c) Use simple models to describe or support explanations for phenomena and test cause and effect relationships or interactions concerning the functioning of a natural or designed system. (5-ESS2-a) Identify limitations of models. (5-ESS2-a) <p>Analyzing and Interpreting Data Analyzing data in 3–5 builds on K–2 and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations.</p> <ul style="list-style-type: none"> Use data to evaluate and refine design solutions. (5-ESS3-a) <p>Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on prior experiences in K–2 and progresses to the use of evidence in constructing multiple explanations and designing multiple solutions.</p> <ul style="list-style-type: none"> Use evidence (e.g., measurements, observations, patterns) to construct a scientific explanation or design a solution to a problem. (5-ESS2-b), (5-ESS3-b) 	<p>ESS2.A: Earth Materials and Systems</p> <ul style="list-style-type: none"> Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. (5-ESS2-a) The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. (5-ESS2-b) Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS2-c) Human activities affect Earth's systems and their interactions at its surface. (5-ESS3-a) <p>ESS2.C: The Roles of Water in Earth's Surface Processes</p> <ul style="list-style-type: none"> Water is found almost everywhere on Earth: as vapor; as fog or clouds in the atmosphere; as rain or snow falling from clouds; as ice, snow, and running water on land and in the ocean; and as groundwater beneath the surface. (5-ESS2-a), (5-ESS2-c) Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (5-ESS2-a) <p>ESS3.C: Human Impacts on Earth Systems</p> <ul style="list-style-type: none"> 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. For example, they are treating sewage, reducing the amounts of materials they use, and regulating sources of pollution such as emissions from factories and power plants or the runoff from agricultural activities. (5-ESS3-a) <p>ESS3.D: Global Climate Change</p> <ul style="list-style-type: none"> If Earth's global mean temperature continues to rise, the lives of humans and other organisms will be affected in many different ways. (5-ESS3-b) 	<p>Patterns</p> <ul style="list-style-type: none"> Similarities and differences in patterns can be used to sort, classify, and analyze simple rates of change for natural phenomena and designed products. (5-ESS2-c) <p>Cause and Effect</p> <ul style="list-style-type: none"> Cause and effect relationships are routinely identified, tested, and used to explain change. (5-ESS3-b) <p>Systems and System Models</p> <ul style="list-style-type: none"> A system can be described in terms of its components and their interactions. (5-ESS2-a), (5-ESS2-b), (5-ESS3-a) <p>-----</p> <p>Connections to Engineering, Technology, and Applications of Science</p> <p>-----</p> <p>Influence of Engineering, Technology, and Science on Society and the Natural World</p> <ul style="list-style-type: none"> Over time, people's needs and wants change, as do their demands for new and improved technologies. (5-ESS3-a) Engineers improve existing technologies or develop new ones to increase their benefits (e.g., better artificial limbs), to decrease known risks (e.g., seatbelts in cars), and to meet societal demands (e.g., cell phones). (5-ESS3-a) <p>-----</p> <p>Connections to Nature of Science</p> <p>-----</p> <p>Science Addresses Questions About the Natural and Material World.</p> <ul style="list-style-type: none"> Science findings are limited to questions that can be answered with empirical evidence. (5-ESS3-b)

Connections to other DCIs in this grade-level: will be added in future version.

Articulation of DCIs across grade-levels: will be added in future version.

Common Core State Standards Connections:

ELA/Literacy –	
RI.5.3	Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text. (5-ESS2-b), (5-ESS3-b), (5-ESS3-a)
RI.5.9	Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-ESS3-b)
RI.5.10	By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 4–5 text complexity band independently and proficiently. (5-ESS2-b), (5-ESS2-c), (5-ESS3-b), (5-ESS3-a)
W.5.2	Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (5-ESS3-b)
W.5.7	Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (5-ESS2-b), (5-ESS3-b)
SL.5.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on <i>grade 5 topics and texts</i> , building on others' ideas and expressing their own clearly. (5-ESS2-b), (5-ESS2-c), (5-ESS3-b), (5-ESS3-a)
SL.5.2	Summarize a written text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally. (5-ESS3-b)
SL.5.4	Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace. (5-ESS3-b)
SL.5.5	Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice, Disciplinary Core Idea, or Crosscutting Concept.

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(5-ESS2-b), (5-ESS3-b)

Mathematics –

MP.1

Make sense of problems and persevere in solving them. (5-ESS3-a)

MP.3

Construct viable arguments and critique the reasoning of others. (5-ESS2-b),(5-ESS2-c),(5-ESS3-b)

5.G.2

Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS2-b)

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