

DRAFT - New York State P-12 Science Learning Standards – DRAFT

5. Earth's Systems

Students who demonstrate understanding can:

- 5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.** [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Assessment is limited to the interactions of two systems at a time.]
- 5-ESS2-2. Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.** [Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.]
- 5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect Earth's resources and environment.** [Clarification Statement: Emphasis should be on how communities use information to sustain resources and the environment locally, regionally, nationally, and/or internationally.]

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 experiences 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 a model using an example to describe a scientific principle. (5-ESS2-1) <p>Using Mathematics and Computational Thinking Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.</p> <ul style="list-style-type: none"> ▪ Describe and graph quantities such as area and volume to address scientific questions. (5-ESS2-2) <p>Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.</p> <ul style="list-style-type: none"> ▪ Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. (5-ESS3-1) 	<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. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS2-1) <p>ESS2.C: The Roles of Water in Earth's Surface Processes</p> <ul style="list-style-type: none"> ▪ 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-ESS2-2) <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. (5-ESS3-1) 	<p>Scale, Proportion, and Quantity</p> <ul style="list-style-type: none"> ▪ Standard units are used to measure and describe physical quantities such as weight, and volume. (5-ESS2-2) <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-ESS2-1),(5-ESS3-1) <p style="text-align: center;">-----</p> <p style="text-align: center;"><i>Connections to Nature of Science</i></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-ESS3-1)
<p><i>Connections to other DCIs in fifth grade:</i> N/A</p> <p><i>Articulation of DCIs across grade-levels:</i> 2.ESS2.A (5-ESS2-1); 2.ESS2.C (5-ESS2-2); 3.ESS2.D (5-ESS2-1); 4.ESS2.A (5-ESS2-1); MS.ESS2.A (5-ESS2-1); MS.ESS2.C (5-ESS2-1),(5-ESS2-2); MS.ESS2.D (5-ESS2-1); MS.ESS3.A (5-ESS2-2),(5-ESS3-1); MS.ESS3.C (5-ESS3-1); MS.ESS3.D (5-ESS3-1)</p> <p><i>Common Core State Standards Connections:</i></p> <p><i>ELA/Literacy –</i></p> <p>RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-ESS3-1)</p> <p>RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-ESS2-1),(5-ESS2-2),(5-ESS3-1)</p> <p>RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-ESS3-1)</p> <p>W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-ESS2-2),(5-ESS3-1)</p> <p>W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-ESS3-1)</p> <p>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. (5-ESS2-1),(5-ESS2-2)</p> <p><i>Mathematics –</i></p> <p>MP.2 Reason abstractly and quantitatively. (5-ESS2-1),(5-ESS2-2),(5-ESS3-1)</p> <p>MP.4 Model with mathematics. (5-ESS2-1),(5-ESS2-2),(5-ESS3-1)</p> <p>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-ESS2-1)</p>		

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea. The text in the "Disciplinary Core Ideas" section is reproduced verbatim from *A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas* unless it is preceded by (NYSED).

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5. Space Systems: Stars and the Solar System

Students who demonstrate understanding can:

- 5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.** [Clarification Statement: “Down” is a local description of the direction that points toward the center of the spherical Earth.] [Assessment Boundary: Assessment does not include mathematical representation of gravitational force.]
- 5-ESS1-1. Support an argument that differences in the apparent brightness of the Sun compared to other stars is due to their relative distances from Earth.** [Assessment Boundary: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).]
- 5-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.** [Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the Sun, moon, and some stars that are visible only in particular months.] [Assessment Boundary: Assessment does not include causes of seasons.]

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>Analyzing and Interpreting Data Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.</p> <ul style="list-style-type: none"> ▪ Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. (5-ESS1-2) <p>Engaging in Argument from Evidence Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).</p> <ul style="list-style-type: none"> ▪ Support an argument with evidence, data, or a model. (5-PS2-1),(5-ESS1-1) 	<p>PS2.B: Types of Interactions</p> <ul style="list-style-type: none"> ▪ The gravitational force of Earth acting on an object near Earth’s surface pulls that object toward the planet’s center. (5-PS2-1) <p>ESS1.A: The Universe and its Stars</p> <ul style="list-style-type: none"> ▪ The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (5-ESS1-1) <p>ESS1.B: Earth and the Solar System</p> <ul style="list-style-type: none"> ▪ The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. (5-ESS1-2) 	<p>Patterns</p> <ul style="list-style-type: none"> ▪ Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena. (5-ESS1-2) <p>Cause and Effect</p> <ul style="list-style-type: none"> ▪ Cause and effect relationships are routinely identified and used to explain change. (5-PS2-1) <p>Scale, Proportion, and Quantity</p> <ul style="list-style-type: none"> ▪ Natural objects exist from the very small to the immensely large. (5-ESS1-1)

Connections to other DCIs in fifth grade: N/A

Articulation of DCIs across grade-levels: 1.ESS1.A (5-ESS1-2); 1.ESS1.B (5-ESS1-2); 3.PS2.A (5-PS2-1),(5-ESS1-2); 3.PS2.B (5-PS2-1); MS.PS2.B (5-PS2-1); MS.ESS1.A (5-ESS1-1),(5-ESS1-2); MS.ESS1.B (5-PS2-1),(5-ESS1-1),(5-ESS1-2); MS.ESS2.C (5-PS2-1)

Common Core State Standards Connections:

ELA/Literacy –

- RI.5.1** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-PS2-1),(5-ESS1-1)
- RI.5.7** Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-ESS1-1)
- RI.5.8** Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s). (5-ESS1-1)
- RI.5.9** Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-PS2-1),(5-ESS1-1)
- W.5.1** Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-PS2-1),(5-ESS1-1)
- 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. (5-ESS1-2)

Mathematics –

- MP.2** Reason abstractly and quantitatively. (5-ESS1-1),(5-ESS1-2)
- MP.4** Model with mathematics. (5-ESS1-1),(5-ESS1-2)
- 5.NBT.A.2** Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5-ESS1-1)
- 5.G.A.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-ESS1-2)

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