

## Earth Science Progression

This progression is about the role of water in Earth's systems. Water is essential to the dynamics of most earth systems, and it plays an important role in shaping Earth's landscape.

At elementary, students investigate the rate and effect of weathering. Students will make observations and take measurements to determine how rainfall helps to shape the land (i.e., slope of a hill, the amount of plant materials, wind speed, etc.).

By middle school, students investigate the water cycle through the use of conceptual or physical models. The key to this understanding is not just knowing the "steps", but the role of solar energy in changing the state of water (liquid to solid) and gravity (flow of water on the land and storage within the Earth).

By high school, students will investigate how the properties of water affect the Earth's systems (the rock cycle). For instance, water's ability to expand when it freezes can cause cracks to form in rocks resulting in the weathering and breaking apart of rocks when the water within rocks freezes and thaws. The ability of water to dissolve minerals may result in the rock "breaking apart" and eventually crumbling.

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**Grade 4:**

**Alternate KSA Aligned to KCAS for Science:**

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

4-ESS2-1: 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.]

SEP (Science and Engineering Practices)	DCI (Disciplinary Core Ideas)	CC (Crosscutting Concepts)
Make observations and/or measurements to produce data to serve as the basis for evidence of an explanation of a phenomenon.	Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity breaks, rocks, soils, and sediments into smaller particles and moves them around.	Cause and effect relationships are routinely identified, tested and used to explain change.

**Grade 7:**

**Alternate KSA Aligned to KCAS for Science:**

**Use or revise a model to describe the cycling of water (including changes in state of water) through Earth's systems (land, ocean and atmosphere) driven by energy from the sun and the force of gravity.**

06-ESS2-4: Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. [Clarification Statement: Emphasis is on the ways in which water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.]

SEP (Science and Engineering Practices)	DCI (Disciplinary Core Ideas)	CC (Crosscutting Concepts)
Develop a model to describe unobservable mechanisms.	Water continually cycles among land, ocean and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land.	Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter.

**Grade 11:**

**Alternate KSA Aligned to KCAS for Science:**

**Use evidence from an investigation to explain the interaction between the properties of water (e.g., expansion when freezes, high specific heat, capacity to absorb or release heat, water as a solvent, ability to transport materials) and its effects on Earth’s materials and surface processes.**

HS-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. [Clarification Statement: Emphasis is on mechanical and chemical investigations with water and a variety of solid materials to provide evidence for the connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, and frost wedging by the expansion of water as it freezes. Examples of chemical investigations include chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of moist solids).]

SEP (Science and Engineering Practices)	DCI (Disciplinary Core Ideas)	CC (Crosscutting Concepts)
Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for	The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's	The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the

<p>evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.</p>	<p>dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks.</p>	<p>way their components are shaped and used, and the molecular substructures of its various materials.</p>
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