ELEMENTARY (K-5)

SCIENCE CURRICULUM

FINAL DRAFT: MARCH 2, 2016

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SCOPE AND SEQUENCE

KINDERGARTEN			
Life Science	**Physical Science**	**Earth & Space Science**	**Engineering Design**
• All animals need food and water in order to live and grow. • Animals obtain their food from plants and/or other animals. • Plants need water and light to live and grow.	• Sunlight warms the Earth's surface. • Pushes and pulls can have different strengths and directions. • Pulling, pushing, or touching an object can change the speed or direction of its motion. • A bigger push or pull makes things speed up or slow down more quickly. • When objects touch, or collide, they push on one another and can change motion.	• Living things need water, air, and resources from the land, and they live in places that have the things they need. • Weather is the combination of sunlight, wind, snow, or rain, and temperature in a region. People measure these conditions to describe and record weather and notice patterns. • Plants and animals can change their environment. • Scientists forecast severe weather so communities can prepare.	• Science and engineering practices are crosscutting concepts that can be taught using any topic at each grade level. These practices are the same for grades kindergarten, first, and second. • Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. • Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. • Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
FIRST GRADE			
• Young animals and plants are very much, but not exactly, like their parents. • Individual of the same kind of plant or animal are similar, but vary in many ways. • All organisms have external parts. Animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food and water.	• Sound can make matter vibrate and vibrating matter can make sound. • Objects can be seen if light is available to illuminate them or if they can give off their own light. • Light travels differently when passing through various objects/materials. • People use a variety of devices to communicate over long distances.	• Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. • Seasonal patterns of sunrise and sunset can be observed, described, and predicted.	• Science and engineering practices are crosscutting concepts that can be taught using any topic at each grade level. These practices are the same for grades kindergarten, first, and second. • Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or

FIRST GRADE (cont.)			
Life Science	**Physical Science**	**Earth & Space Science**	**Engineering Design**
• Plants have different parts (e.g., roots, stems, leaves, flowers, fruits) that help them grow and survive. • Adult plants and animals can have young. In many kinds of animals, parents and offspring engage in behaviors that help the offspring to survive. • Animals and plants have body parts that help them grow and survive.			improved object or tool. • Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. • Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
SECOND GRADE			
Life Science	**Physical Science**	**Earth & Space Science**	**Engineering Design**
• Plants depend on water and light to grow. • Plants depend on animals for pollination or to move their seeds around. • There are many different kinds of living things in any area, and they exist in different places on land and in water.	• Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. • Different properties are suited to different purposes. • A great variety of objects can be built up from a small set of pieces. • Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not.	• Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. • Wind and water can change the shape of the land. • Maps show where things are located. One can map the shapes and kinds of land and water in any area. • Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form.	• Science and engineering practices are crosscutting concepts that can be taught using any topic at each grade level. These practices are the same for grades kindergarten, first, and second. • Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. • Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. • Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

THIRD GRADE			
Life Science	**Physical Science**	**Earth & Space Science**	**Engineering Design**
• Reproduction is essential to the continued existence of all organisms. • Being part of a group helps animals obtain food, defend themselves, and cope with changes. • Plants and animals have traits that are inherited from parents and can be influenced by the environment. • Use fossils to learn about organisms and environments from long ago. • Some variations in individuals provide advantages in surviving. • Habitats are beneficial to some organisms and not others. • When environments change, the plants and animals that live there may change.	• How balanced and unbalanced forces affect an object. • Measure and observe the object's motion and look for patterns to predict the future movements. • Cause and effect relationship of electric or magnetic interactions between two objects.	• Use tables and graphs to describe typical weather patterns and conditions during a specific season. • Describe climates in different regions of the world. • Evaluate solution that reduces the impacts of a weather-related hazard.	• Science and engineering practices are crosscutting concepts that can be taught using any topic at each grade level. These practices are the same for grades third, fourth, and fifth. • Define a simple design problem reflecting a need or a want that includes specified criteria success and constraints on materials, time, or cost. • Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. • Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
FOURTH GRADE			
• Alaskan plants have developed unique adaptations to accommodate their ecological niche in the habitat. • Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. • Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain.	• The faster a given object is moving, the more energy it possesses and energy can be moved from place to place. • Energy is present whenever there are moving objects and energy can be transferred from object or place to another. • When objects collide, the contact forces transfer of energy so as to change the objects' motion. • The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use.	• Local, regional, and global patterns in rock formations reveal changes over time due to earth forces, such as earthquakes. • Rainfall helps to shape the land and affects the types of things living in a region. Water, ice, wind, living organisms, and gravity break down rocks, soils, and sediments into smaller particles and move them around. • Plate Tectonics and Large-Scale System Interactions: The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes,	• Science and engineering practices are crosscutting concepts that can be taught using any topic at each grade level. These practices are the same for grades third, fourth, and fifth. • Define a simple design problem reflecting a need or a want that includes specified criteria success and constraints on materials, time, or cost. • Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. • Plan and carry out fair tests in which variables are controlled and failure points are considered to identify

FOURTH GRADE (cont.)			
Life Science	**Physical Science**	**Earth & Space Science**	**Engineering Design**
	• Waves are regular patterns of motion and can be made in water by disturbing the surface. Waves of the same type can differ in amplitude. • An object can be seen when light reflected from its surface enters the eyes. • Digitized information can be transmitted over long distances without significant degradation.	and volcanoes occur in patterns. • Living things affect the physical characteristics of their regions. • Energy and fuels that humans use are derived from natural sources. • A variety of hazards result from natural processes that humans cannot eliminate.	aspects of a model or prototype that can be improved.
FIFTH GRADE			
• Plants acquire their material for growth chiefly from air and water. • Organisms have interdependent relationships in ecosystems. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. • Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die.	• All matter has mass, weight, volume, and density which can be measured and compared. Matter can undergo physical and chemical changes. • The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. • The energy released from food was once energy from the sun that was captured by the planets in the chemical process that forms plant matter. • Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion.	• The sun is a star that appears larger and brighter than other stars because it is closer. • The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between north and south poles, causes observable patterns. • Earth's major systems, the geosphere, the hydrosphere, and the biosphere, interact in multiple ways to affect Earth's surface materials and processes. • Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is streams, lakes, wetlands, and the atmosphere. • Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean air, and even outer space.	• Science and engineering practices are crosscutting concepts that can be taught using any topic at each grade level. These practices are the same for grades third, fourth, and fifth. • Define a simple design problem reflecting a need or a want that includes specified criteria success and constraints on materials, time, or cost. • Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. • Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

KINDERGARTEN

Performance Expectations:
In the kindergarten performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

NGSS Summary:
The performance expectations in kindergarten help students formulate answers to questions such as: "What happens if you push or pull an object harder? Where do animals live and why do they live there? What is the weather like today and how is it different from yesterday?" Kindergarten performance expectations include PS2, PS3, LS1, ESS2, ESS3, and ETS1.

Disciplinary Core Ideas from the *NCR Framework*:
Students are expected to develop understanding of patterns and variations in local weather and the purpose of weather forecasting to prepare for, and respond to severe weather. Students are able to apply an understanding of the effects of different strengths or different directions of pushes and pulls on the motion of an object to analyze a design solution. Students are also expected to develop a relationship between their needs and where they live.

Crosscutting Concepts:
Crosscutting concepts of patterns: technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas.

These strands are not to be taught in a sequential order, but should be integrated throughout the year.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Life Science Concepts	**Students who demonstrate understanding will:**	
K-LS1: From Molecules to Organisms: Structures and Processes **LS1.C: Organization for Matter and Energy Flow in Organisms** All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (K-LS-1) **GLEs:** SA.1-3; SC.1-3; SE.2; SG2, 4	**K-LS1.1**: Use observations to describe patterns of what plants and animals (including humans) need to survive. *[Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kind of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]*	• Use science notebooks to sketch living and non-living things in a local environment. *(Note differences. Discuss with partner. Share with whole group. Document observations on chart paper.)* • Use a Double Bubble Map to compare/contrast plants and animals. • Plant seeds. Observe daily. Document observations in science notebook. Draw and label parts of the plant. Brainstorm in small group what plants need to survive and grow. • Follow the life cycle of a butterfly. Document all stages of the life cycle, using pictures and words. Note habitat: food, temperature, lighting, and surroundings. Visit school library to locate non-fiction books. Read books aloud. Document information. • Have each student choose an Alaskan animal. Read book on animal habitat. Have students draw animal in its habitat. Have students present picture sharing type of animal, habitat, and food they eat.
Physical Science Concepts	**Students who demonstrate understanding will:**	
K-PS2: Motion and Stability: Forces and Interactions **PS2.A: Forces and Motion** • Pushes and pulls can have different strengths and directions. (K-PS2.1-2) • Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K-PS2.1-2) **PS2.B: Types of Interactions** When objects touch or collide, they push on one another and can change motion. (K-PS2.1)	**K-PS2.1**: Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. *[Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.] [Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.]* **K-PS2.2**: Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull. *[Clarification Statement: Examples of problems requiring a solution could include tools such as a ramp to increase the speed of the object and a structure that would cause an object*	• Using balls, race cars, and/or marbles to experiment with motion; move objects to collide with one another, cause objects to speed up and slow down. Work with a partner, note patterns and changes in movement, make observations and note possible explanations. • Build a variety of ramps-experiment with the speed of objects moving on an incline. Make predictions. Encourage students to study data, change variables, and analyze results. • Participate in numerous Tug-of-War activities. Analyze strategies. • Participate in a game of kickball. Experiment with gentle kicks and hard kicks. What happens when your foot swings harder, connecting with the ball? What happens when the ball bumps into something? • Brainstorm words to describe the sun. Create a Circle Map.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Physical Science Concepts (cont.)	**Students who demonstrate understanding will:**	
PS3.C: Relationship Between Energy and Forces A bigger push or pull makes things speed up or slow down more quickly. (Secondary to K-PS2.1) **ETS1.A: Defining Engineering Problems** A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. (Secondary to K-PS2.2) **K-PS3: Energy** **PS3.B: Conservation of Energy and Energy Transfer** Sunlight warms Earth's surface. (K-PS3.1-2) **GLEs:** SA.1-2; SB.1-4; SG.1-4	*as a marble or ball to turn.] [Assessment Boundary: Assessment does not include friction as a mechanism for change in speed.]* **K-PS3.1**: Make observations to determine the effect of sunlight on Earth's surface. *[Clarification Statement: Examples of Earth's surface could include sand, soil, rocks, and water.] [Assessment Boundary: Assessment of temperature is limited to relative measures such as warmer/cooler.]* **K-PS3.2**: Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area. *[Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.]*	• Write a *Sun* poem. • Create a list of natural resources heated by the sun (e.g., soil, water, rocks) • Draw a picture of yourself outside on a hot, sunny day. • Describe where you are and what you are doing. • Draw a picture of yourself on a cold day, with no sunshine. Describe how the pictures are different. • Measure and record temperatures of objects placed in light. • Conduct experiments that illustrate the movement of heat from one object to another.
Earth & Space Concepts	**Students who demonstrate understanding will:**	
K-ESS2: Earth's Systems **ESS2.D: Weather and Climate** Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. (K-ESS2.1) **ESS2.D: Biogeology** Plants and animals can change their environment. (K-ESS2.2)	**K-ESS2.1**: Use and share observations of local weather conditions to describe patterns over time. *[Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny day versus cloudy days in different months.] [Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.]* **K-ESS2.2**: Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. *[Clarification Statement: Examples of plants and*	• Participate in classroom practices that conserve natural resources. • Explore ways Alaska Natives conserve natural resources. • Take a walking field trip to record instances of human impact. • Track temperature daily, sunlight, wind, snow, rain, and clouds. Use the data to build graphs for use in analyzing and interpreting weather data. Describe patterns and draw conclusions based on data. • Take a daily nature walk. Observe and record descriptions of the weather. Document behavior of people, animals, and plants. Note patterns. Discuss patterns with table partners. • Choose a plant, animal, or person you observed on the nature walk. Explain to partner how it was impacted by the weather, and how it adapted to the environment.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Earth & Space Concepts (cont.)	**Students who demonstrate understanding will:**	
ESS3.C: Human Impact on Earth Systems Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impact on the land, water, air, and other living things. (Secondary to K-ESS2.2)	*animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.]*	• Pictorially record weather observations and label. • Draw and dress a paper doll for a specific Alaskan season. Name the season and explain why you chose the clothing you did. Discuss the clothing necessary for the Alaskan outdoors in each of the four seasons.
K-ESS3: Earth and Human Activity **ESS3.A: Natural Resources** Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. (K-ESS3.1) **ESS3.B: Natural Hazards** Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. (K-ESS3.2) **ESS3.C: Human Impacts on Earth Systems** Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (K-ESS3.3) **ETS1.A: Defining and Delimiting an Engineering Problem** Asking questions, making observations, and gathering information are helpful in	**K-ESS.1**: Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live. *[Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.]* **KESS3.2**: Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather. *[Clarification Statement: Emphasis is on local forms of severe weather.]* **K-ESS3.3**: Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment. *[Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Example of solutions could include reusing paper and recycling cans and bottles.]*	• Visit a school garden. Have student choose a plant to study and research. Take a photo of student and plant. Draw a picture. Research plant care and use. Measure plant growth weekly. Document data. Share observations with others. • Write a class story that depicts a setting with severe Alaskan weather. Act out the story using appropriate props for given weather. • Gather information on the four seasons. Create a weather poem for each season. Illustrate each poem.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Earth & Space Concepts (cont.)	**Students who demonstrate understanding will:**	
thinking about problems. (Secondary to K-ESS3.2) **ETS1.B: Developing Possible Solutions** Designs can be conveyed through drawings or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (Secondary to K-ESS3.3) **GLEs:** SA.1, 3; SB.1; SD.2-3; SE.1-3; SF.1; SG.2, 4; CS.D.5		

FIRST GRADE

Performance Expectations:
In the first grade performance expectations, students are expected to demonstrate grade appropriate proficiency in planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

NGSS Summary:
The performance expectations in first grade help students formulate answers to questions such as: "What happens when materials vibrate? What happens when there is no light? What are some ways plants and animals meet their needs so that they can survive and grow? How are parents and their children similar and different? What objects are in the sky and how do they seem to move?" First grade performance expectations include PS4, LS1, LS3, and ESS1.

Disciplinary Core Ideas from the *NRC Framework*:
Students are expected to develop understanding of the relationship between sound and vibrating materials as well as between the availability of light and ability to see objects. The idea that light travels from place to place can be understood by students at this level through determining the effect of placing objects made with different materials in the path of a beam of light. Students are also expected to develop understanding of how plants and animals use their external parts to help them survive, grow, and meet their needs as well as how behaviors of parents and offspring help the offspring survive. The understanding is developed that young plants and animals are like, but not exactly the same as, their parents. Students are able to observe, describe, and predict some patterns of the movement of objects in the sky.

Crosscutting Concepts:
The crosscutting concepts of patterns: cause and effect; structure and function; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas.

These strands are not to be taught in a sequential order, but should be integrated throughout the year.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Life Science Concepts	**Students who demonstrate understanding will:**	

NGSS-1-LS1: From Molecules to Organisms: Structures and Processes
 	
LS1.A: Structure and Function
All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have parts (roots, stems, leaves, flowers, fruits) that help them survive. (1-LS1.2)
 	
LS1.B: Growth and Development of Organisms
Adult plants and animals can have young. In many kinds of animals, parents, and the offspring themselves engage in behaviors that help the offspring to survive. (1-LS1.1)
 	
LS1.D: Information Processing
Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond external inputs. (1-LS1.1)
 	
GLEs: SA.1; SC.1-2
	1-LS1.1: Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. *[Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears].*
	
	1-LS1.2: Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. *[Clarification Statement: Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring)].*
		• Create a model or drawing which represents the parts of a plant.
		• Choose an animal/habitat. Draw a picture of the animal in its habitat, camouflaged. Have students share pictures, find camouflaged animals, and discuss camouflage techniques.
		• Create a shoebox diorama. Include plants/animals living in their habitat. How do they protect themselves? How do they find food and water?
		• Using animal cards, one with animal and one with a body part, have students participate in the following activities:
		  ○ "I have... Who has..." (I have porcupine, who has quills)
		  ○ Kagan Quiz Trade
		  ○ Memory
		  ○ Alaska Department of Fish & Game, Division of Wildlife Conservation: www.wildlife.alaska.gov

NSGG 1-LS3: Heredity: Inheritance and Variation of Traits **LS3.A: Inheritance of Traits** Young animals are very much, but not exactly like, their parents. Plants also are very much, but not exactly like their parents. (1-LS3.1) **LS3.B: Variation of Traits** Individuals of the same kind of plant or animal are recognizable as similar but can	**1-LS3.1**: Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. *[Clarification Statement: Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plants are the same shape but can differ in size, and a particular breed of dog looks like its parents but is not exactly the same.] [Assessment Boundary: Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.]*	• Interview or listen to a Native elder presentation on the uses and importance of local plants and animals, including changes over time.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Life Science Concepts (cont.)	**Students who demonstrate understanding will:**	
also vary in many ways. (1-LS3.1) **GLEs**: SA.1; SC.1-2		
Physical Science Concepts	**Students who demonstrate understanding will:**	
1.PS4: Waves and their Applications in Technologies for Information Transfer **PS4.A: Wave Properties** Sound can make matter vibrate and vibrating matter can make sound. (1-PS4.1) **PS4.B Electromagnetic Radiation** • Objects can be seen if light is available to illuminate them or if they give off their own light. (1-PS4.2) • Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (*Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.*) (1-PS4.3) **PS4.C: Information Technologies and Instrumentation** People also use a variety of devices to communicate (send and receive information) over long distances. (1-PS4.4) **GLEs**: SA.1; SB.2, 4; SF.2-3; CS.D.4	**1-PS4.1**: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sounds can make materials vibrate. *[Clarification Statement: Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and hold an object near a vibrating tuning fork.]* **1-PS4.2**: Make observations to construct an evidence-based account that can be seen only when illuminated. *[Clarification Statement: Examples of observation could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.]* **1-PS4.3**: Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light. *[Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string "telephones," and a pattern of drum beats.] [Assessment Boundary: Assessment does not include technological details for how communication devices work.]* **1-PS4.4**: Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance. *[Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string "telephones," and a pattern of drum beats.] [Assessment Boundary: Assessment does not include technological details for how communication devices work.]*	• Create shadows of various styles, shapes, and colors. • Explore how shadows change their shape and size. • Have students trace their shadows with chalk. Measure and document time of day. Repeat activity, noting time of day and location of sun in the sky. • Discover properties and uses of prisms. • Read *Raven: A Trickster Tale From the Pacific Northwest* by Gerald McDermott (Harcourt 1993). • Explore how to reflect, refract, and absorb light. • PBS Learning Media: www.pbslearningmedia.org

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Earth & Space Concepts	**Students who demonstrate understanding will:**	
1-ESS1 Earth's Place in the Universe **ESS1.A: The Universe and its Stars** Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1.1) **GLEs**: SA.1-2; SB.2, 4	**1-ESS1.1**: Use observations of the sun, moon, and stars to describe patterns that can be predicted. *[Clarification Statement: Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day.] [Assessment Boundary: Assessment of star patterns is limited to stars being seen at night and not during the day.]*	• Visit a Star Lab. Have students write a descriptive paragraph sharing what they saw and learned. Illustrate using realistic colors and drawings. • Track the temperature and weather daily on a classroom chart. Include sunrise and sunset. Use the data to build graphs for use in predictive reasoning.
ESS1.B: Earth and the Solar System Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (1-ESS1.2) **GLEs**: SA.1-2, SB.2, 4	**1-ESS1.2**: Make observations at different times of year to relate the amount of daylight to the time of year. *[Clarification Statement: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.] [Assessment Boundary: Assessment is limited to relative amounts of daylight, not qualifying the hours or time of daylight.]*	• Name three conclusions that can be made by reading a class graph of the weather (e.g., there are three more rainy days than cloudy days, there was a gain of five minutes of sunlight today). • Invite a meteorologist to speak to the class. Following the interview, have students write a sentence or two sharing why they would like to be a meteorologist. Share with partner. • Paint a sunset picture using watercolors. Describe the picture using complete sentences. Include adjectives. Paint a sunrise picture using watercolors. Describe the picture using complete sentences. Include adverbs.

SECOND GRADE

Performance Expectations:
In the second grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

NGSS Summary:
In second grade, help students formulate answers to questions such as: "How does land change and what are some things that cause it to change? What are the different kinds of land and bodies of water? How are materials similar and different from one another, and how do the properties of the materials relate to their use? What do plants need to grow? How many types of living things live in a place?" Second grade performance expectations include PS1, LS2, LS4, ESS1, ESS2, and ETS1.

Disciplinary Core Ideas from the *NRC Framework*:
Students are expected to develop an understanding of what plants need to grow and how plants depend on animals for seed dispersal and pollination. Students are also expected to compare the diversity of life in different habitats. An understanding of observable properties of materials is developed by students at this level through analysis and classification of different materials. Students are able to apply their understanding of the idea that wind and water can change the shape of the land to compare design solutions to slow or prevent such change. Students are able to use information and models to identify and represent the shapes and kinds of land and bodies of water in an area and where water is found on Earth.

Crosscutting Concepts:
The crosscutting concepts of patterns; cause and effect; energy and matter; structure and function; stability and change; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the second grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

These strands are not to be taught in a sequential order, but should be integrated throughout the year.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Life Science Concepts	**Students who demonstrate understanding will:**	

2-LS2: Ecosystems: Interactions, Energy, and Dynamics
 	
LS2.A: Interdependent Relationships in Ecosystems
• Plants depend on water and light to grow. (2-LS2.1)
• Plants depend on animals for pollination or to move their seeds around. (2-LS2.2)
 	
ETS1.B: Developing Possible Solutions
Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (Secondary to 2-LS2-2)
 	
GLEs: SA.1-2; SC.1-3; SE.2
	2-LS2.1: Plan and conduct an investigation to determine if plants need sunlight and water to grow. *[Assessment Boundary: Assessment is limited to testing one variable at a time.]*
	
	2-LS2.2: Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. (2-LS4-1.) Make observations of plants and animals to compare the diversity of life in different habitats. *[Clarification Statement: Emphasis is on the diversity of living things in each of a variety of different habitats.] [Assessment Boundary: Assessment does not include specific animal and plant names in specific habitats.]*
		• Grow lima beans in bags: Students will see which liquid will allow a lima bean to grow the fastest. Students will place bean seeds and cotton balls in plastic baggies. Set up four different test areas:
		  ○ sunlight and water
		  ○ sunlight and no water
		  ○ water and no sunlight
		  ○ no water and no sunlight

2-LS4: Biological Evolution: Unity and Diversity
 	
LS4.D: Biodiversity and Humans
There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4.1)
 	
GLEs: SA.1-2; SC.1-3
	2-LS4.1: Make observations of plants and animals to compare the diversity of life in different habitats. *[Clarification Statement: Emphasis is on the diversity of living things in each of a variety of different habitats.] [Assessment Boundary: Assessment does not include specific animal and plant names in specific habitats.]*	• Habitat Elements: Hike and Games. Students will identify the five components of habitat:
		  ○ food
		  ○ water
		  ○ shelter
		  ○ air
		  ○ space
		• Students will identify ways in which living things depend on one another for survival. Discussion will include:
		  ○ food webs
		  ○ Shat kinds of animals and homes are found in this local habitat?
		  ○ How does that differ from animals in other habitats (i.e., desert, ocean, polar regions)?
		  ○ Compare the diversity of life within different habitats.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Life Science Concepts (cont.)	**Students who demonstrate understanding will:**	
		• Students may match animals with their homes using picture cards. • Games exemplify the struggle for survival in the wild and may include *Predator/Prey*; *Bat and Moth*; *Hibernate, Migrate, Stay Active*; *Shrinking Habitat*; or *Oh Deer!*
Physical Science Concepts	**Students who demonstrate understanding will:**	
2-PS1: Matter and its Interactions **PS1.A: Structure and Properties of Matter** • Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. (2-PS1.1) • Different properties are suited to different purposes. (2-PS1.2-3) • A great variety of objects can be built up from a small set of pieces. (2-PS1.4) **PS1-B: Chemical Reactions** Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not. (2-PS1.4) **GLEs:** SA.1-2; SB.1-3; SE.1-2	**2-PS1.1**: Plan and conduct an investigation to describe and classify different kids of materials by their observable properties. **2-PS1.2**: Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. *[Assessment Boundary: Assessment of quantitative measurements is limited to length.]* **2-PS.-3**: Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. **2-PS1.4**: Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.	• Using observable similarities and differences, sort leaves, shells, coins, books, and/or other classroom accessible objects into morphological groupings of relatedness. Students present their classification scheme and explain the sorting criteria they used. • Learn about the three states of matter (solids, liquids, gases). Use knowledge of a gas to complete the following challenge: design and build a model of a hot air balloon, using the materials provided. www.resa.net • Explore the three states of matter by observing an ice sculpture snowman through the frozen form, melting, and finally evaporation.
Earth & Space Concepts	**Students who demonstrate understanding will:**	
2-ESS1: Earth's Place in the Universe **ESS1.C: The History of Planet Earth** Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1.1) **AKSS:** SA.1-2; SD.2	**2-ESS1.1**: Use information from several sources to provide evidence that Earth events can occur quickly or slowly. *[Assessment Boundary: Assessment does not include quantitative measurements of timescales.]*	• Models of volcanoes and earthquakes. • Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Earth & Space Concepts (cont.)	**Students who demonstrate understanding will:**	
2-ESS2: Earth's Systems **ESS2.A: Earth Materials and Systems** Wind and water can change the shape of the land. (2-ESS2.1) **ESS2.B: Plate Tectonics and Large-Scale System Interactions** Maps show where things are located. One can map the shapes and kinds of land and water in any area. (2-ESS2.2) **ESS2.C: The Roles of Water in Earth's Surface Processes** Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (2-ESS2.3) **ETS1.C: Optimizing the Design Solution** Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (Secondary to 2-ESS-2.1) **GLEs:** S.A.1-2, S.E.1-3, S.G.3-4	**2-ESS2.1**: Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. **2-ESS2.2**: Develop a model to represent the shapes and kinds of land and bodies of water in an area. *[Assessment Boundary: Assessment does not include quantitative scaling in models.]* **2-ESS2.3**: Obtain information to identify where water is found on Earth and that it can be solid or liquid.	• Investigate erosion revealing how human-made devices can mitigate impact of erosion. • Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.

THIRD GRADE

Performance Expectations:
In the third grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions and defining problems; developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations, and designing solutions, engaging in argument from evidence, and obtaining evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

NGSS Summary:
The performance expectations in third grade help students formulate answers to questions such as: What is typical weather in different parts of the world and during different times of the year? How can the impact of weather-related hazards be reduced? How do organisms vary in their traits? How are plants, animals, and environments of the past similar or different from current plants, animals, and environments? What happens to organisms when their environment changes? How do equal and unequal forces on an object affect the object? How can magnets be used?

Disciplinary Core Ideas from the *NRC Framework*:
Third grade performance expectations include PS2, LS1, LS3, LS4, ESS2, and ESS3 Disciplinary Core Ideas from the *NRC Framework.* Students are able to organize and use data to describe typical weather conditions expected during a particular season. By applying their understanding of weather-related hazards, students are able to make a claim about the merit of a design solution that reduces the impacts of such hazards. Students are expected to develop an understanding of the similarities and differences of the organisms' life cycles. An understanding that organisms have different inherited traits, and that the environment can also affect the traits that an organism develops, is acquired by the students at this level. In addition, students are able to construct an explanation using evidence for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

Students are expected to develop an understanding of types of organisms that lived long ago and also about the nature of the environments. Third graders are expected to develop an understanding of the idea that when the environment changes, some organisms survive and reproduce, some move to new locations, some move into the transformed environment, and some die. Students are able to determine the effects of balanced and unbalanced forces on the motion of an object and the cause and effect relationships of electric or magnetic interactions to define a simple design problem that can be solved with magnets.

Crosscutting Concepts:
The crosscutting concepts of patterns: cause and effect; scale, proportion, and quantity; systems and system models; interdependence of science, engineering and technology; and influence of engineering, technology and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas.

These strands are not to be taught in a sequential order, but should be integrated throughout the year.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Life Science Concepts	**Students who demonstrate understanding will:**	
3-LS1: From Molecules to Organisms: Structures and Processes **LS1.B: Growth and Development of Organisms** Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1.1) **GLEs**: SA.1-3; SC.1-3; SE.2; SF.1; SG.4; CS.D.3	**3-LS1.1**: Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. *[Assessment Boundary: Assessment of plant life cycles Is limited to those of flowering plants. Assessment does not include details of human reproduction.]*	• Model plant life cycles of lowering plants. • Show how the changes of organisms go through in their lives forms a pattern. • Use information gained from illustration and the words in a text to model a life cycle. • Model with mathematics.
3-LS2: Ecosystems: Interactions, Energy, and Dynamics **LS2.D: Social Interactions and Group Behavior** Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically is size. (3-LS2.1) **GLEs**: SA.1-3; SC.1-3; SE.2; SF.1; SG.4; CS.D.3	**S-LS2.1**: Construct an argument that some animals form groups that help members survive.	• Engage in an argument from evidence. • Construct an argument with evidence, data, and/or a model.
3-LS3: Heredity: Inheritance and Variation of Traits **LS3.A: Inheritance of Traits** • Many characteristics of organisms are inherited from their parents. (3-LS3.1) • Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (3-LS3.2) **LS3.B: Variation of Traits** • Different organisms vary in how they	**3-LS3.1**: Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. *[Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.]* **3-LS3.2**: Use evidence to support the explanation that traits can be influenced by the environment.	• Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans. • Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and a pet dog that is given too much food and little exercise may become overweight.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Life Science Concepts (cont.)	**Students who demonstrate understanding will:**	
look and function because they have different inherited information. (3-LS3.1) • The environment also affects the traits that an organism develops. (3-LS3.2) **GLEs**: SA.1-3; SC.1-3; SE.2; SF.1; SG.4; CS.D.3		
3-LS4: Biological Evolution: Unity and Diversity **LS2.C: Ecosystem Dynamics, Functioning, and Resilience** When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. (Secondary to 3-LS4.4) **LS4.A: Evidence of Common Ancestry and Diversity** • Some kinds of plants and animals that once lived on Earth are no longer found anywhere. (3-LS4.1) • Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. (3-LS4.1) **LS4.B: Natural Selection** Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (3-LS4.2) **LS4.C: Adaptation** For any particular environment, some kinds	**3-LS4.1**: Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. *[Assessment Boundary: Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages.]* **3-LS4.2**: Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. **3-LS4.3**: Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. **3-LS4.4**: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change. *[Assessment Boundary: Assessment is limited to a single environmental change. Assessment does not include the greenhouse effect or climate change.]*	• Examples of data could include type, size, and distributions of fossil organisms. • Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms. • Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and animals that have better camouflage coloration than other animals may be more likely to survive and therefore, more likely to leave offspring. • Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other. • Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Life Science Concepts (cont.)	**Students who demonstrate understanding will:**	
of organisms survive well, some survive less well, and some cannot survive at all. (3-LS4.3) **LS4.D: Biodiversity and Humans** Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (3-LS4.4) **GLEs**: SA.1-3; SC.1-3; SE.2; SF.1; SG.4; CS.D.3		
Physical Science Concepts	**Students who demonstrate understanding will:**	
3-PS2: Motion and Stability: Forces and Interactions **PS2-A: Forces and Motion** • Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (3-PS2.1) • The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (3-PS2.2) **PS2-B: Types of Interactions** • Objects in contact exert forces on each other. (3-PS2.1) • Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between	**3-PS2.1**: Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. *[Assessment Boundary: Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down.]* **3-PS2.2**: Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. *[Assessment Boundary: Assessment does not include technical terms such as period and frequency.]* **3-PS2.3**: Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. *[Assessment Boundary: Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.]* **3-PS2.4**: Define a simple design problem that can be solved by applying scientific ideas about magnets.	• An example could include an unbalanced force on one side of a ball can make it start moving; and balanced forces pushing on a box from both sides will not produce any motion at all. • An example of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw. • An example of an electric force could include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; an example of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paperclips, and the force exerted by one magnet versus the force exerted by two magnets. An example of cause and effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force. • Ask questions to define problems. Plan and carry out investigations.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Physical Science Concepts (cont.)	**Students who demonstrate understanding will:**	
two magnets, on their orientation relative to each other. (3-PS2.3-4) **GLEs**: SA.1; SB.2-3; SE.1-2		
Earth & Space Concepts	**Students who demonstrate understanding will:**	
3-ESS2: Earth's Systems **ESS2.D: Weather and Climate** • Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (3-ESS2.1) • Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (3-ESS2.2) **GLEs**: SD.1-2; SF.2; CS.B.4	**3-ESS2.1**: Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. *[Assessment Boundary: Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.]* **3-ESS2.2**: Obtain and combine information to describe climates in different regions of the world.	• Examples of data could include average temperature, precipitation, and wind direction.
3-ESS3: Earth and Human Activity **ESS3.B: Natural Hazards** A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3.1) **GLEs**: SB.3; SD.2-3	**3-ESS3.1**: Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.	• Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, and lightning rods.

FOURTH GRADE

Performance Expectations:
In fourth grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

NGSS Summary:
The performance expectations in fourth grade help students formulate answers to questions such as: "What are waves and what are some things they can do? How can water, ice, wind, and vegetation change the land? What patterns of Earth's features can be determined with the use of maps? How do internal and external structures support the survival, growth, behavior, and reproduction of plants and animals? What is energy and how is it related to motion? How is energy transferred? How can energy be used to solve a problem?" Fourth grade performance expectations include PS3, PS4, LS1, ESS1, ESS2, ESS3, and ETS1 disciplinary core ideas from the *NRC Framework*.

Disciplinary Core Ideas from the *NRC Framework*:

Students are able to use a model of waves to describe patterns of waves in terms of amplitude and wavelength, and that waves can cause objects to move. Students are expected to develop understanding of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. They apply their knowledge of natural Earth processes to generate and compare multiple solutions to reduce the impacts of such processes on humans. In order to describe patterns of Earth's features, students analyze and interpret data from maps. Fourth graders are expected to develop an understanding that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. By developing a model, they describe that an object can be seen when light reflected from its surface enters the eye. Students are able to use evidence to construct an explanation of the relationship between the speed of an object and the energy of that object. Students are expected to develop an understanding that energy can be transferred from place to place by sound, light, heat, and electrical currents or from object to object through collisions. They apply their understanding of energy to design, test, and refine a device that converts energy from one form to another.

Crosscutting Concepts
The crosscutting concepts of patterns; cause and effect; energy and matter; systems and system models; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas.

These strands are not to be taught in a sequential order, but should be integrated throughout the year.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Life Science Concepts	**Students who demonstrate understanding will:**	
4-LS1: From Molecules to Organisms: Structures and Processes **LS1.A: Structure and Function** Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1.1) **LS1.D: Information Processing** Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1.2) **GLEs**: SA.1, 3; SC.1-3; CF.2; CS.A.3	**4-LS1.1**: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. *[Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.] [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]* **4-LS1.2**: Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. *[Clarification Statement: Emphasis is on systems of information transfer.] [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.]*	• Diagram or make a model of plant and/or animal cells. • Contrast inherited traits with those that are not inherited. • Explore how Alaskan plants have adapted to their unique environments.
Physical Science Concepts	**Students who demonstrate understanding will:**	
4-PS3: Energy **PS3.A: Definitions of Energy** • The faster a given object is moving; the more energy it possesses. (4-PS3.1) • Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3.2-3) **PS3.B: Conservation of Energy and Energy Transfer** • Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3.2-3)	**4-PS3.1**: Use evidence to construct an explanation relating the speed of an object to the energy of that object. *[Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.]* **4-PS3.2**: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. *[Assessment Boundary: Assessment does not include quantitative measurements of energy.]* **4-PS3.3**: Ask questions and predict outcomes about the changes in energy that occur when objects collide. *[Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.] [Assessment Boundary: Assessment does not include quantitative measurements of energy.]* **4-PS3.4**: Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.	• Demonstrate how light travels with model. • Use frozen, saturated peat moss and a variety of coverings (e.g., leaves, snow, soil) to simulate how ground cover affects light absorption and reflection. • Research Aurora Borealis. • Design an experiment that investigates the effectiveness of different insulating and conducting materials. • Demonstrate how sound travels with a model.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Physical Science Concepts (cont.)	**Students who demonstrate understanding will:**	
• Light also transfers energy from place to place. (4-PS3.2) • Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3.2, 4) **PS3.C: Relationship Between Energy and Forces** When objects collide, the contact forces transfer energy so as to change the objects' motions. (4-PS3.3) **PS3.D: Energy in Chemical Processes and Everyday Life** The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. (4-PS3.4) **ETS1.A: Defining Engineering Problems** Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (Secondary to 4-PS3.4) **4-PS4: Waves and their Applications in Technologies for Information Transfer**	*[Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.] [Assessment Boundary: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.]* **4-PS4.1**: Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. *[Clarification Statement: Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.] [Assessment Boundary: Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.]* **4-PS4.2**: Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. *[Assessment Boundary: Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.]* **4-PS4.3**: Generate and compare multiple solutions that use patterns to transfer information. *[Clarification Statement: Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse code to send text.]*	

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Physical Science Concepts (cont.)	**Students who demonstrate understanding will:**	
PS4.A: Wave Properties • Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. (4-PS4.1) • Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). (4-PS4.1) **PS4.B: Electromagnetic Radiation** An object can be seen when light reflected from its surface enters the eyes. (4-PS4.2) **PS4.C: Information Technologies and Instrumentation** Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. (4-PS4.3) **ETS1.C: Optimizing The Design Solution** Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (Secondary to 4-PS4.3) **GLEs**: SA.1; SB.1-3; SE.3		

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Earth & Space Concepts	**Students who demonstrate understanding will:**	
4-ESS1: Earth's Place in the Universe **ESS1.C: The History of Planet Earth** Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1.1) **ESS2.A: Earth Materials and Systems** 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. (4-ESS2.1) **ESS2.B: Plate Tectonics and Large-Scale System Interactions** The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (4-ESS2.2) **ESS2.E: Biogeology** Living things affect the physical characteristics of their regions. (4-ESS2.1)	**4-ESS1.1**: Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. *[Clarification Statement: Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.] [Assessment Boundary: Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.]* **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.] [Assessment Boundary: Assessment is limited to a single form of weathering or erosion.]* **4-ESS2.2:** Analyze and interpret data from maps to describe patterns of Earth's features. *[Clarification Statement: Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.]* **4-ESS3.1**: Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. *[Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels.]*	• Take field trip to Fort Knox Gold Mine. • Take a field trip to UAF Geophysical Institute. • Demonstrate the movement of the Earth's fault lines with a model or map. • Design a model that demonstrates the forces that cause earthquakes. • Use map or puzzle to demonstrate plate tectonics. • Analyze traditional stories of earthquakes and volcanoes.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Earth & Space Concepts (cont.)	**Students who demonstrate understanding will:**	
ESS3.A: Natural Resources Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3.1) **ESS3.B: Natural Hazards** A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3.2) **ETS1.B: Designing Solutions to Engineering Problems** Testing a solution involves investigating how well it performs under a range of likely conditions. (Secondary to 4-ESS3.2*)* **GLEs**: SA.1, 3; SD.1-4; SE.1, 3; SF.2; SG.1, 3	**4-ESS3.2**: Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. *[Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.] [Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.]*	

FIFTH GRADE

Performance Expectations:
In fifth grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, using mathematics and computational thinking, engaging in argument from evidence, and obtaining, evaluating, and communicating information; and to use these practices to demonstrate understanding of the core ideas.

NGSS Summary:
The performance expectations in fifth grade help students formulate answers to questions such as: "When matter changes, does its weight change? How much water can be found in different places on Earth? Can new substances be created by combining other substances? How does matter cycle through ecosystems? Where does the energy in food come from and what is it used for? How do lengths and directions of shadows or relative lengths of day and night change from day to day, and how does the appearance of some stars change in different seasons?" Fifth grade performance expectations include PS1, PS2, PS3, LS1, LS2, ESS1, ESS2, and ESS3 disciplinary core ideas from the *NRC Framework*.

Disciplinary Core Ideas from the *NRC Framework*:
Students are able to describe that matter is made of particles too small to be seen through the development of a model. Students develop an understanding of the idea that regardless of the type of change that matter undergoes, the total weight of matter is conserved. Students determine whether the mixing of two or more substances results in new substances. Through the development of a model using an example, students are able to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. They describe and graph data to provide evidence about the distribution of water on Earth. Students develop an understanding of the idea that plants get the materials they need for growth chiefly from air and water. Using models, students can describe the movement of matter among plants, animals, decomposers, and the environment and that energy in animals' food was once energy from the sun. Students are expected to develop an understanding of patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

Crosscutting Concepts:
The crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; energy and matter; and systems and systems models are called out as organizing concepts for these disciplinary core ideas.

These strands are not to be taught in a sequential order, but should be integrated throughout the year.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Life Science Concepts	**Students who demonstrate understanding will:**	
5-LS1: From Molecules to Organisms: Structures and Processes **LS1.C: Organization for Matter and Energy Flow in Organisms** • Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (Secondary to 5-PS3.1) • Plants acquire their material for growth chiefly from air and water. (5-LS1.1) **5-LS2: Ecosystems: Interactions, Energy, and Dynamics** **LS2.A: Interdependent Relationships in Ecosystems** The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2.1)	**5-LS1.1**: Support an argument that plants get the materials they need for growth chiefly from air and water. *[Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.]* **5-LS2.1**: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. [*Clarification Statement: Emphasis is on the idea that matter that is not food {air, water, decomposed materials in soil} is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.] [Assessment Boundary: Assessment does not include molecular explanations.]*	• Create models of food webs/chains. • Take a field trip to the Chena River Riparian System on Chena Hot Springs Road. • Create a *The most important thing about*… pattern book focused on Alaskan plants (based on *The Important Book* by Margaret Wise Brown). • Make a food chain diagram.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Life Science Concepts (cont.)	**Students who demonstrate understanding will:**	
LS2.B: Cycles of Matter and Energy Transfer in Ecosystems Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases and water from the environment and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2.1) **GLEs**: SA.1, 3; SC.1-3; SE.3; SF.3; SG.3		
Physical Science Concepts	**Students demonstrate understanding will:**	
5-PS1: Matter and Its Interactions **PS1.A: Structure and Properties of Matter** • Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. (5-PS1.1) • The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1.2) • Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1.3)	**5-PS1.1**: Develop a model to describe that matter is made of particles too small to be seen. *[Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.]* **5-PS1.2**: Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. *[Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that form new substances.] [Assessment Boundary: Assessment does not include distinguishing mass and weight.]* **5-PS1.3**: Make observations and measurements to identify materials based on their properties. *[Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.] [Assessment Boundary: Assessment does not include density or distinguishing mass and weight.]*	• Adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water. • Reactions or changes could include phase changes and dissolving/mixing new substances. • Materials to identify could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response of magnetic forces, and solubility; density is not intended as an identifiable property.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Physical Science Concepts (cont.)	**Students demonstrate understanding will:**	
PS1.B: Chemical Reactions • When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1.4) • No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (5-PS1.2) **5-PS2: Motion and Stability: Forces and Interactions** **PS2.B: Types of Interactions** The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5- PS2.1) **5-PS3: Energy** **PS3.D: Energy in Chemical Processes and Everyday Life** The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (5-PS3.1) **GLEs**: SA.1-2; SB.1-4; SC.2; SD.1-2, 4; SE.1, 3; SF.1; SG.2-3; CS.A.3	**5-PS1.4**: Conduct an investigation to determine whether the mixing of two or more substances results in new substances. **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-PS3.1**: Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. *[Clarification Statement: Examples of models could include diagrams, and flow charts.]* **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 the Earth**.** *[Assessment Boundary: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (e.g., 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 and selected stars that are visible only in particular months.] [Assessment Boundary: Assessment does not include causes of seasons.]*	

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Earth & Space Concepts	**Students who demonstrate understanding will:**	
5-ESS1: Earth's Place in the Universe **ESS1.A: The Universe and its Stars** 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) **ESS1.B: Earth and the Solar System** 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) **5-ESS2: Earth's Systems** **ESS2.A: Earth Materials and Systems** 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)	**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 the 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 and selected stars that are visible only in particular months.] [Assessment Boundary: Assessment does not include causes of seasons.]* **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 and percentages of 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 the Earth's resources and environment.	• Demonstrate the movement of Earth's fault lines with a model or map. • Design a simple model that demonstrates the forces that cause earthquakes. • Use a map or puzzle to demonstrate plate tectonics. • Take a field trip to the UAF's Geophysical Institute. • Analyze traditional stories that describe earthquakes and volcanoes. • Invite UAF's *Tunnel-man* into the classroom.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Earth & Space Concepts (cont.)	**Students who demonstrate understanding will:**	
ESS2.C: The Roles of Water in Earth's Surface Processes 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) **5-ESS-3: Earth and Human Activity** **ESS3.C: Human Impacts on Earth Systems** 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) **GLEs**: SA.1-3; SB.1, 3-4; SD.1-4; SE.1-3, SF.1; SG.3; CS.A.3		
Engineering, Technology & Applications of Science	**Students who demonstrate understanding will:**	
3-5-ETS1: Engineering Design **ETS1.A: Defining and Delimiting Engineering Problems** Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (3-5-ETS1.1)	**3-5-ETS1.1**: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. **3-5-ETS1.2**: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. **3-5-ETS1.3**: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.	• Bridge building. • *Engineering is Elementary* kits in Library Media Services. • Look at house structures in the book *The Three Little Pigs*. • Activity: Marshmallow Tower. • Activity: Shapes of Strength. • Bring in practicing engineers from the community.

CORE IDEAS	PERFORMANCE EXPECTATIONS	SUGGESTED EXPLORATIONS
Engineering, Technology & Applications of Science (cont.)	**Students who demonstrate understanding will:**	
ETS1.B: Developing Possible Solutions • Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1.2) • At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1.2) • Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1.3) **ETS1.C: Optimizing the Design Solution** Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1.3)		