Grade 4 | Unit 1 Animals and Plants in their Environment

RECOMMENDED TIME: SEPTEMBER – OCTOBER (8 WEEKS)

Unit Overview:

Plants, animals and their environment are interdependent. Plants and animals interact in a number of ways that affect their survival. The survival of plants and animals varies, in response to their particular environment. As the physical environment changes over time, plants and animals adaptation. *[Refer to Appendix A for the Humane Treatment of Animals and for Conservation Day]*

Essential Question:

What are the interactions of animals and plants within an ecosystem?

Key Ideas:

LE. Key Idea 3: Individual organisms and species change over time.

LE. Key Idea 4: The continuity of life is sustained through reproduction and development.

LE. Key Idea 5: Organisms maintain a dynamic equilibrium that sustains life.

LE. Key Idea 6: Plants and animals depend on each other and their environment.

LE. Key Idea 7: Identify ways in which humans have changed their environment and the effects of those changes.

NYS SCIENCE STANDARDS
http://www.p12.nysed.gov/ciai/mst/pub/elecoresci.pdf

Major Understandings:

Quoted from New York State Performance Indicators (LE: 3.2a, b, 4.2b, 5.2c, g, 6.1a, f, 6.2a, b, 7.1a-c)

- Green plants are producers because they provide the basic food supply for themselves and animals. **(6.1a)**
- All animals depend on plants. Some animals (predators) eat other animals (prey). **(6.1b)**
- Animals that eat plants for food may in turn become food for other animals. This sequence is called a food chain. **(6.1c)**
- Decomposers are living things that play a vital role in recycling nutrients. **(6.1d)**

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MST STANDARDS
http://www.p12.nysed.gov/ciai/mst/pub/elecoresci.pdf

Standard 2: Information Systems

Key Idea 1: Information technology is used to retrieve, process, and communicate information as a tool to enhance learning.

Key Idea 2: Knowledge of the impacts and limitations of information systems is essential to its effective and ethical use.

Standard 6: Interconnectedness: Common Themes

Key Idea 1: Through systems thinking, people can recognize the commonalities that exist among all systems and how parts of a system interrelate and combine to perform specific functions.

continued

NGSS CROSS-CUTTING CONCEPTS
http://www.nextgenscience.org/sites/ngss/files/Appendix%20G%20-%20Crosscutting%20Concepts%20FINAL%20edited%204.10.13.pdf

Patterns:

Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena and designed products.
- Patterns of change can be used to make predictions.
- Patterns can be used as evidence to support an explanation.

continued

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■ Plants manufacture food by utilizing air, water, and energy from the Sun. **(6.2a)** ■ The Sun's energy is transferred on Earth from plants to animals through the food chain. **(6.2b)** ■ Food supplies the energy and materials necessary for growth and repair. **(4.2b)** ■ An organism's pattern of behavior is related to the nature of that organism's environment, including the kinds and numbers of other organisms present, the availability of food and other resources, and the physical characteristics of the environment. **(6.1e)** ■ Individuals within a species may compete with each other for food, mates, space, water, and shelter in their environment. **(3.2a)** ■ All individuals have variations, and because of these variations, individuals of a species may have an advantage in surviving and reproducing. **(3.2b)** ■ The health, growth, and development of organisms are affected by environmental conditions such as the availability of food, air, water, space, shelter, heat, and sunlight. **(5.2g)** ■ Senses can provide essential information (regarding danger, food, mates, etc.) to animals about their environment. **(5.2c)** ■ When the environment changes, some plants and animals survive and reproduce, and others die or move to new locations. **(6.1f)** ■ Humans depend on their natural and constructed environments. **(7.1a)** *continued*	**Key Idea 2:** Models are simplified representations of objects, structures, or systems used in analysis, explanation, interpretation, or design. **Key Idea 3:** The grouping of magnitudes of size, time, frequency, and pressures or other units of measurement into a series of relative order provides a useful way to deal with the immense range and the changes in scale that affect the behavior and design of systems. **Key Idea 4:** Equilibrium is a state of stability due either to a lack of change (static equilibrium) or a balance between opposing forces (dynamic equilibrium). **Key Idea 5:** Identifying patterns of change is necessary for making predictions about future behavior and conditions. **Key Idea 6:** In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs. **Standard 7: Interdisciplinary Problem Solving** **Key Idea 1:** The knowledge and skills of mathematics, science, and technology are used together to make informed decisions and solve problems, especially those relating to issues of science/technology/society, consumer decision making, design, and inquiry into phenomena. **Key Idea 2:** Solving interdisciplinary problems involves a variety of skills and strategies, including effective work habits; gathering and processing information; generating and analyzing ideas; realizing ideas; making connections among the common themes of mathematics, science, and technology; and presenting results.	**Cause and Effect: Mechanism and Prediction:** Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which t hey are mediated, is a major activity of science and engineering. ■ Cause and effect relationships are routinely identified, tested, and used to explain change. ■ Events that occur together with regularity might or might not be a cause and effect relationship. **Scale, Proportion, and Quantity:** In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change. ■ Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods. ■ Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. **Systems and System Models:** A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems. ■ A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. ■ A system can be described in terms of its components and their interactions. *continued*

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■ Over time humans have changed their environment by cultivating crops and raising animals, creating shelter, using energy, manufacturing goods, developing means of transportation, changing populations, and carrying out other activities. **(7.1b)** ■ Humans, as individuals or communities, change environments in ways that can be either helpful or harmful for themselves and other organisms. **(7.1c)**		**Energy and Matter: Flows, Cycles, and Conservation:** Tracking energy and matter flows into, out of, and within systems helps one understand their system's behavior. ■ Matter is made of particles. ■ Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems. ■ Energy can be transferred in various ways and between objects. **Structure and Function:** ■ The way an object is shaped or structured determines many of its properties and functions. ■ Different materials have different substructures, which can sometimes be observed. ■ Substructures have shapes and parts that serve functions. **Stability and Change:** For both designed and natural systems, condition that affect stability and factors that control rates of change are critical elements to consider and understand. ■ Change is measured in terms of differences over time and may occur at different rates. ■ Some systems appear stable, but over long periods of time will eventually change.

COMMON CORE STATE STANDARDS

http://www.corestandards.org/ELA-Literacy/
http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf

ELA/Literacy

RI.4.3: Explain events, procedures, ideas, or concepts in a historical, scientific of technical text, including what happened and why, based on specific information in the text.

RI.4.4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a Grade 4 topic or subject area.

RI.4.5: Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts or information in a text or part of a text.

RI.4.7: Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

W.4.2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

W.4.4: Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.

W.4.6: With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of one page in a single sitting.

SL.4.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 4 topics and texts, building on others' ideas and expressing their own clearly.

SL.4.3: Identify the reasons and evidence a speaker provides to support particular points.

Mathematics

MP.2: Reason abstractly and quantitatively.

MP.4: Model with mathematics.

MP.5: Use appropriate tools strategically.

4.MD.4: Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.

ENVIRONMENTAL GUIDELINES FOR LEARNING

http://resources.spaces3.com/89c197bf-e630-42b0-ad9a-91f0bc55c72d.pdf

Strand 1: Questioning, Analysis, and Interpretation Skills

- Guideline E—Organizing information —Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.
- Guideline F—Working with models and simulations—Learners understand that relationships, patterns, and processes can be represented by models.
- Guideline G—Drawing conclusions and developing explanations—Learners can develop simple explanations that address their questions about the environment.

Strand 2: Knowledge of Environmental Processes and Systems

Strand 2.2: The Living Environment

- Guideline A—Organisms, populations, and communities—Learners understand basic similarities and differences among a wide variety of living organisms. They understand the concept of habitat.
- Guideline C—Systems and connections —Learners understand basic ways in which organisms are related to their environments and other organisms.

Strand 2.4: Environment and Society

- Guideline A—Human/environment interactions—Learners understand that people depend on, change, and are affected by the environment.
- Guideline B—Places—Learners understand that places differ in their physical and human characteristics.
- Guideline E—Environmental issues—Learners are familiar with some local environmental issues and understand that people in other places experience environmental issues as well.

Strand 3: Skills for Understanding and Addressing Environmental Issues

Strand 3.1: Skills for Analyzing and Investigating Environmental Issues

- Guideline A—Identifying and investigating issues—Learners are able to identify and investigate issues in their local environments and communities.

Grade 4 | Unit 2 Electricity and Magnetism

RECOMMENDED TIME: NOVEMBER – JANUARY (11 WEEKS)

Unit Overview:

Students will understand characteristics and properties of electricity and magnetism. They will also understand the relationship between electricity and magnetism. The focus will be on simple circuits, conductivity and magnetic force.

Essential Question:

How does the use of electricity and magnetism affect our world?

Key Ideas:

PE. Key Idea 3: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

PE. Key Idea 4: Energy exists in many forms, and when these forms change energy is conserved.

PE. Key Idea 5 (PE): Energy and matter interact through forces that result in changes in motion.

NYS SCIENCE STANDARDS
http://www.p12.nysed.gov/ciai/mst/pub/elecoresci.pdf

Major Understandings:

Quoted from New York State Performance Indicators (PE: 3.1c, e, f, 4.1a-e, g, 5.1e, 5.2a, b)

- Energy exists in various forms: heat, electric, sound, chemical, mechanical, light. **(4.1a)**
- Energy can be transferred from one place to another. **(4.1b)**
- Some materials transfer energy better than others (heat and electricity). **(4.1c)**
- Energy and matter interact: water is evaporated by the Sun's heat; a bulb is lighted by means of electrical current; a musical instrument is played to produce sound; dark colors may absorb light, light colors may reflect light. **(4.1d)**

continued

MST STANDARDS
http://www.p12.nysed.gov/ciai/mst/pub/elecoresci.pdf

Standard 6: Interconnectedness: Common Themes

Key Idea 1: Through systems thinking, people can recognize the commonalities that exist among all systems and how parts of a system interrelate and combine to perform specific functions.

Key Idea 2: Models are simplified representations of objects, structures, or systems used in analysis, explanation, interpretation, or design.

Key Idea 6: In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.

Standard 7: Interdisciplinary Problem Solving

Key Idea 1: The knowledge and skills of mathematics, science, and technology are used together to make informed decisions and solve problems, especially those relating to issues of science/technology/society, consumer decision making, design, and inquiry into phenomena.

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NGSS CROSS-CUTTING CONCEPTS
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Cause and Effect: Mechanism and Prediction:

Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which t hey are mediated, is a major activity of science and engineering.

- Cause and effect relationships are routinely identified, tested, and used to explain change.
- Events that occur together with regularity might or might not be a cause and effect relationship.

Systems and System Models:

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot.

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■ Electricity travels in a closed circuit. **(4.1e)** ■ Objects have properties that can be observed, described, and/or measured: length, width, volume, size, shape, mass or weight, temperature, texture, flexibility, reflectiveness of light. **(3.1c)** ■ The material(s) an object is made up of determine some specific properties of the object (sink/float, conductivity, magnetism). Properties can be observed or measured with tools such as hand lenses, metric rulers, thermometers, balances, magnets, circuit testers, and graduated cylinders. **(3.1e)** ■ Objects and/or materials can be sorted or classified according to their properties. **(3.1f)** ■ Magnetism is a force that may attract or repel certain materials. **(5.1e)** ■ The forces of gravity and magnetism can affect objects through gases, liquids, and solids. **(5.2a)** ■ The force of magnetism on objects decreases as distance increases. **(5.2b)** ■ Interactions with forms of energy can be either helpful or harmful. **(4.1g)**	**Key Idea 2:** Solving interdisciplinary problems involves a variety of skills and strategies, including effective work habits; gathering and processing information; generating and analyzing ideas; realizing ideas; making connections among the common themes of mathematics, science, and technology; and presenting results.	■ A system can be described in terms of its components and their interactions. **Energy and Matter: Flows, Cycles, and Conservation:** Tracking energy and matter flows into, out of, and within systems helps one understand their system's behavior. ■ Matter is made of particles. ■ Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems. ■ Energy can be transferred in various ways and between objects. **Structure and Function:** The way an object is shaped or structured determines many of its properties and functions. ■ Different materials have different substructures, which can sometimes be observed. ■ Substructures have shapes and parts that serve functions. **Stability and Change:** For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand. ■ Change is measured in terms of differences over time and may occur at different rates. ■ Some systems appear stable, but over long periods of time will eventually change.

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ELA/Literacy

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Mathematics

MP.2: Reason abstractly and quantitatively.

MP.5: Use appropriate tools strategically.

ENVIRONMENTAL GUIDELINES FOR LEARNING
http://resources.spaces3.com/89c197bf-e630-42b0-ad9a-91f0bc55c72d.pdf

Strand 1: Questioning, Analysis, and Interpretation Skills

- Guideline A-Questioning—Learners are able to develop questions that help them learn about the environment and do simple investigations.
- Guideline B—Designing investigations—Learners are able to design simple investigations.
- Guideline C—Collecting information—Learners are able to locate and collect information about the environment and environmental topics.
- Guideline F—Working with models and simulations—Learners understand that relationships, patterns, and processes can be represented by models.
- Guideline G—Drawing conclusions and developing explanations—Learners can develop simple explanations that address their questions about the environment.

Strand 2: Knowing of Environmental Processes and Systems

Strand 2.3: Humans and Their Societies

- Guideline A—Individuals and groups—Learners understand that people act as individuals and as group members and that groups can influence individual actions.
- Guideline D—Global connections—Learners understand how people are connected at many levels -including the global level-by actions and common responsibilities that concern the environment.
- Guideline E—Change and conflict—Learners recognize that change is a normal part of individual and societal life. They understand that conflict is rooted in different points of view.

Strand 3: Skills for Understanding and Addressing Environmental Issues

Strand 3.1: Skills for Analyzing and Investigating Environmental Issues

- Guideline A—Identifying and investigating issues—Learners are able to identify and investigate issues in their local environments and communities.
- Guideline B—Sorting out the consequences of issues—As learners come to understand that environmental and social phenomena are linked, they are able to explore the consequences of issues.
- Guideline C—Identifying and evaluating alternative solutions and courses of action—Learners understand there are many approaches to resolving issues.

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- Guideline D—Working with flexibility, creativity, and openness—Learners understand the importance of sharing ideas and hearing other points of view.

Strand 3.2: Decision-Making and Citizenship Skills

- Guideline A—Forming and evaluating personal views—Learners are able to examine and express their own views on environmental issues.
- Guideline B—Evaluating the need for citizen action—Learners are able to think critically about whether they believe action is needed in particular situations and whether they believe they should be involved.
- Guideline C—Planning and taking action—By participating in issues of their choosing—mostly close to home—they learn the basics of individual and collective action.
- Guideline D—Evaluating the results of actions—Learners understand that civic actions have consequences.

Strand 4: Personal and Civic Responsibility

- Guideline A—Understanding societal values and principles—Learners can identify fundamental principles of U.S. society and explain their importance in the context of environmental issues.
- Guideline B—Recognizing citizens' rights and responsibilities—Learners understand the basic rights and responsibilities of citizenship.
- Guideline C—Recognizing efficacy—Learners possess a realistic self-confidence in their effectiveness as citizens.
- Guideline D—Accepting personal responsibility—Learners understand that they have responsibility for the effects of their actions.

Grade 4 | Unit 3 Properties of Water

RECOMMENDED TIME: FEBRUARY – MARCH (7 WEEKS)

Unit Overview:

Students observe and describe properties of materials, using appropriate tools. Students describe chemical and physical changes, including changes in states of matter with an emphasis on water.

Essential Question:

How do the properties of water affect living things and the natural environment?

Key Ideas:

PE. Key Idea 2: Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land.

PE. Key Idea 3: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

PE. Key Idea 4: Energy exists in many forms, and when these forms change energy is conserved.

LE. Key Idea 6: Plants and animals depend on each other and their physical environment.

NYS SCIENCE STANDARDS
http://www.p12.nysed.gov/ciai/mst/pub/elecoresci.pdf

MAJOR UNDERSTANDINGS:

Quoted from New York State Performance Indicators (PE: 2.1c, 3.1a-f, 3.2a-c, 4.1d, LE:6.2c)

- Matter takes up space and has mass. Two objects cannot occupy the same place at the same time. **(3.1a)**
- Matter has properties (color, hardness, odor, sound, taste, etc.) that can be observed through the senses. **(3.1b)**
- Objects have properties that can be observed, described, and/or measured: length, width, volume, size, shape, mass or weight, temperature, texture, flexibility, reflectiveness of light. **(3.1c)**
- Measurements can be made with standard metric units and nonstandard units. (Note: Exceptions to the metric system usage are found in meteorology.) **(3.1d)**

continued

MST STANDARDS
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Standard 6: Interconnectedness: Common Themes

Key Idea 1: Through systems thinking, people can recognize the commonalities that exist among all systems and how parts of a system interrelate and combine to perform specific functions.

Key Idea 2: Models are simplified representations of objects, structures, or systems used in analysis, explanation, interpretation, or design.

Key Idea 3: The grouping of magnitudes of size, time, frequency, and pressures or other units of measurement into a series of relative order provides a useful way to deal with the immense range and the changes in scale that affect the behavior and design of systems.

Key Idea 4: Equilibrium is a state of stability due either to a lack of change (static equilibrium) or a balance between opposing forces (dynamic equilibrium).

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Patterns:

Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena and designed products.
- Patterns of change can be used to make predictions.
- Patterns can be used as evidence to support an explanation.

Cause and Effect: Mechanism and Prediction:

Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

continued

NYS SCIENCE STANDARDS

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- The material(s) an object is made up of determine some specific properties of the object (sink/float, conductivity, magnetism). Properties can be observed or measured with tools such as hand lenses, metric rulers, thermometers, balances, magnets, circuit testers, and graduated cylinders. **(3.1e)**
- Water is recycled by natural processes on Earth. **(2.1c)**
  - evaporation: changing of water (liquid) into water vapor (gas)
  - condensation: changing of water vapor (gas) into water (liquid)
  - precipitation: rain, sleet, snow, hail
  - runoff: water flowing on Earth's surface
  - groundwater: water that moves downward into the ground
- Matter exists in three states: solid, liquid, gas. **(3.2a)**
  - Solids have a definite shape and volume.
  - Liquids do not have a definite shape but have a definite volume.
  - Gases do not hold their shape or volume.
- Temperature can affect the state of matter of a substance. **(3.2b)**
- Changes in the properties or materials of objects can be observed and described. **(3.2c)**
- Heat energy from the Sun powers the water cycle (See Physical Science Key Idea 2.) **(LE: 6.2c)**
- Objects and/or materials can be sorted or classified according to their properties. **(3.1f)**
- Energy and matter interact: water is evaporated by the Sun's heat; a bulb is lighted by means of electrical current; a musical instrument is played to produce sound; dark colors may absorb light, light colors may reflect light. **(4.1d)**

MST STANDARDS

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Key Idea 5: Identifying patterns of change is necessary for making predictions about future behavior and conditions.

Key Idea 6: In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.

Standard 7: Interdisciplinary Problem Solving

Key Idea 1: The knowledge and skills of mathematics, science, and technology are used together to make informed decisions and solve problems, especially those relating to issues of science/technology/society, consumer decision making, design, and inquiry into phenomena.

Key Idea 2: Solving interdisciplinary problems involves a variety of skills and strategies, including effective work habits; gathering and processing information; generating and analyzing ideas; realizing ideas; making connections among the common themes of mathematics, science, and technology; and presenting results.

Structure and Function:

The way an object is shaped or structured determines many of its properties and functions.

- Different materials have different substructures, which can sometimes be observed.
- Substructures have shapes and parts that serve functions.

Stability and Change:

For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

- Change is measured in terms of differences over time and may occur at different rates.
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Scale, Proportion, and Quantity:

In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

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- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.

Systems and System Models:

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

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Energy and Matter: Flows, Cycles, and Conservation:

Tracking energy and matter flows into, out of, and within systems helps one understand their system's behavior.

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- Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems.
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W.4.2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

W.4.4: Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.

W.4.6: With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of one page in a single sitting.

SL.4.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 4 topics and texts, building on others' ideas and expressing their own clearly.

SL.4.3: Identify the reasons and evidence a speaker provides to support particular points.

Mathematics

MP.2 : Reason abstractly and quantitatively.

MP.5 : Use appropriate tools strategically.

ENVIRONMENTAL GUIDELINES FOR LEARNING

http://resources.spaces3.com/89c197bf-e630-42b0-ad9a-91f0bc55c72d.pdf

Strand 1: Questioning, Analysis, and Interpretation Skills

- Guideline A—Questioning—Learners are able to develop questions that help them learn about the environment and do simple investigations.
- Guideline B—Designing investigations—Learners are able to design simple investigations.
- Guideline C—Collecting information—Learners are able to locate and collect information about the environment and environmental topics.
- Guideline D—Evaluating accuracy and reliability—Learners understand the need to use reliable information to answer their questions. They are familiar with some basic factors to consider in judging the merits of information.
- Guideline F—Working with models and simulations—Learners understand that relationships, patterns, and processes can be represented by models.
- Guideline G—Drawing conclusions and developing explanations—Learners can develop simple explanations that address their questions about the environment.

Strand 2: Knowing of Environmental Processes and Systems

Strand 2.1: The Earth as a Physical System

- Guideline A—Processes that shape the Earth—Learners are able to identify changes and differences in the physical environment.
- Guideline B—Changes in matter—Learners are able to identify basic characteristics of and changes in matter.
- Guideline C—Energy—While they may have little understanding of formal concepts associated with energy, learners are familiar with the basic behavior of some different forms of energy.

Strand 2.2: The Living Environment

- Guideline C—Systems and connections—Learners understand basic ways in which organisms are related to their environments and to other organisms.
- Guideline D—Flow of matter and energy—Learners know that living things need some source of energy to live and grow.

Strand 2.4: Environment and Society

- Guideline D—Technology—Learners understand that technology is an integral part of human existence and culture.

Grade 4 | Unit 4 Interactions of Air, Water, and Land

RECOMMENDED TIME: APRIL – JUNE (11 WEEKS)

Unit Overview:

The water cycle, weather, erosion, deposition, and extreme natural events involve interactions among air, water, and land.

Essential Question:
How do natural events affect our world?

Key Ideas:

PE. Key Idea 2: Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land.

NYS SCIENCE STANDARDS
http://www.p12.nysed.gov/ciai/mst/pub/elecoresci.pdf

MAJOR UNDERSTANDINGS:

Quoted from New York State Performance Indicators (PE: 2.1c-e)

- Erosion and deposition result from the interaction among air, water, and land. **(2.1d)**
  - Interaction between air and water breaks down Earth materials.
  - Pieces of Earth material may be moved by air, water, wind, and gravity.
  - Pieces of Earth material will settle or deposit on land or in the water in different places.
  - Soil is composed of broken-down pieces of living and nonliving Earth material.
- Water is recycled by natural processes on Earth. **(2.1c)**
  - Evaporation: changing of water (liquid) into water vapor (gas)
  - Condensation: changing of water vapor (gas) into water (liquid).

continued

MST STANDARDS
http://www.p12.nysed.gov/ciai/mst/pub/elecoresci.pdf

Standard 6: Interconnectedness: Common Themes

Key Idea 1: Through systems thinking, people can recognize the commonalities that exist among all systems and how parts of a system interrelate and combine to perform specific functions.

Key Idea 2: Models are simplified representations of objects, structures, or systems used in analysis, explanation, interpretation, or design.

Key Idea 3: The grouping of magnitudes of size, time, frequency, and pressures or other units of measurement into a series of relative order provides a useful way to deal with the immense range and the changes in scale that affect the behavior and design of systems.

Key Idea 4: Equilibrium is a state of stability due either to a lack of change (static equilibrium) or a balance between opposing forces (dynamic equilibrium).

Key Idea 5: Identifying patterns of change is necessary for making predictions about future behavior and conditions.

continued

NGSS CROSS-CUTTING CONCEPTS
http://www.nextgenscience.org/sites/ngss/files/Appendix%20G%20-%20Crosscutting%20Concepts%20FINAL%20edited%204.10.13.pdf

Patterns:

Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena and designed products.
- Patterns of change can be used to make predictions.
- Patterns can be used as evidence to support an explanation.

Cause and Effect: Mechanism and Prediction:

Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which t hey are mediated, is a major activity of science and engineering.

- Cause and effect relationships are routinely identified, tested, and used to explain change.
- Events that occur together with regularity might or might not be a cause and effect relationship.

continued

NYS SCIENCE STANDARDS
http://www.p12.nysed.gov/ciai/mst/pub/elecoresci.pdf

- precipitation: rain, sleet, snow, hail
- runoff: water flowing on Earth's surface
- groundwater: water that moves downward into the ground

- Extreme natural events (floods, fires, earthquakes, volcanic eruptions, hurricanes, tornadoes, and other severe storms) may have positive or negative impacts on living things. **(2.1e)**

MST STANDARDS
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Key Idea 6: In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.

Standard 7: Interdisciplinary Problem Solving

Key Idea 1: The knowledge and skills of mathematics, science, and technology are used together to make informed decisions and solve problems, especially those relating to issues of science/technology/society, consumer decision making, design, and inquiry into phenomena.

Key Idea 2: Solving interdisciplinary problems involves a variety of skills and strategies, including effective work habits; gathering and processing information; generating and analyzing ideas; realizing ideas; making connections among the common themes of mathematics, science, and technology; and presenting results.

Stability and Change:

For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

- Change is measured in terms of differences over time and may occur at different rates.
- Some systems appear stable, but over long periods of time will eventually change.

NGSS CROSS-CUTTING CONCEPTS
http://www.nextgenscience.org/sites/ngss/files/Appendix%20G%20-%20Crosscutting%20Concepts%20FINAL%20edited%204.10.13.pdf

Scale, Proportion, and Quantity:

In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

- Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods.
- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.

Systems and System Models:

A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot.
- A system can be described in terms of its components and their interactions.

Energy and Matter: Flows, Cycles, and Conservation:

Tracking energy and matter flows into, out of, and within systems helps one understand their system's behavior.

- Matter is made of particles.
- Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems.
- Energy can be transferred in various ways and between objects.

COMMON CORE STATE STANDARDS

http://www.corestandards.org/ELA-Literacy/
http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf

ELA/Literacy

RI.4.3: Explain events, procedures, ideas, or concepts in a historical, scientific of technical text, including what happened and why, based on specific information in the text.

RI.4.4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a Grade 4 topic or subject area.

RI4.5: Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts or information in a text or part of a text.

RI.4.7: Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

W.4.2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

W.4.4: Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.

W.4.6: With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of one page in a single sitting.

W.4.7: Conduct short research projects that build knowledge through investigation of different aspects of a topic.

SL.4.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 4 topics and texts, building on others' ideas and expressing their own clearly.

SL.4.3: Identify the reasons and evidence a speaker provides to support particular points.

Mathematics

MP.2: Reason abstractly and quantitatively.

MP.4: Model with mathematics.

MP.5: Use appropriate tools strategically.

continued

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- Guideline C—Collecting information—Learners are able to locate and collect information about the environment and environmental topics.
- Guideline D—Evaluating accuracy and reliability—Learners understand the need to use reliable information to answer their questions. They are familiar with some basic factors to consider in judging the merits of information.
- Guideline E—Organizing information—Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.
- Guideline F—Working with models and simulations—Learners understand that relationships, patterns, and processes can be represented by models.
- Guideline G—Drawing conclusions and developing explanations—Learners can develop simple explanations that address their questions about the environment.

Strand 2: Knowledge of Environmental Processes and Systems

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Strand 2.3: Humans and Their Societies

- Guideline A—Individuals and groups—Learners understand that people act as individuals and as group members and that groups can influence individual actions.
- Guideline C—Political and economic systems—Learners understand that government and economic systems exist because people living together in groups need ways to do things such as provide for needs and wants, maintain order, and manage conflict.

continued

COMMON CORE STATE STANDARDS

http://www.corestandards.org/ELA-Literacy/
http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf

4.MD.A.1: Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.

4.MD.A.2: Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

4.OA.A.1: Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.

Strand 3.2: Decision-Making and Citizenship Skills

- Guideline A—Forming and evaluating personal views—Learners are able to examine and express their own views on environmental issues.
- Guideline B—Evaluating the need for citizen action—Learners are able to think critically about whether they believe action is needed in particular situations and whether they believe they should be involved.
- Guideline C—Planning and taking action—By participating in issues of their choosing—mostly close to home—they learn the basics of individual and collective action.
- Guideline D—Evaluating the results of actions—Learners understand that civic actions have consequences.

ENVIRONMENTAL GUIDELINES FOR LEARNING

http://resources.spaces3.com/89c197bf-e630-42b0-ad9a-91f0bc55c72d.pdf

- Guideline D—Global connections—Learners understand how people are connected at many levels—including the global level—by actions and common responsibilities that concern the environment.

Strand 2.4: Environment and Society

- Guideline A—Human/environment interactions—Learners understand that people depend on, change, and are affected by the environment.
- Guideline B—Places—Learners understand that places differ in their physical and human characteristics.
- Guideline C—Resources—Learners understand the basic concepts of resource and resource distribution.
- Guideline D—Technology—Learners understand that technology is an integral part of human existence and culture.
- Guideline E—Environmental issues—Learners are familiar with some local environmental issues and understand that people in other places experience environmental issues as well.

Strand 3: Skills for Understanding and Addressing Environmental Issues

Strand 3.1: Skills for Analyzing and Investigating Environmental Issues

- Guideline A—Identifying and investigating issues—Learners are able to identify and investigate issues in their local environments and communities.
- Guideline B—Sorting out the consequences of issues—As learners come to understand that environmental and social phenomena are linked, they are able to explore the consequences of issues.
- Guideline C—Identifying and evaluating alternative solutions and courses of action—Learners understand there are many approaches to resolving issues.
- Guideline D—Working with flexibility, creativity, and openness—Learners understand the importance of sharing ideas and hearing other points of view.