HOLLISTON Public Schools

Unit 2: Energy

Subject Area: Science	**Course**: 7th Grade Science		
Unit Title: Ecosystems	**Grade(s)**: 7th	**Start**: September	**End**: December
Unit Summary: In this unit students will… Focus on how living things interact with the living and nonliving parts of an ecosystem. Students will spend many days outside, collecting data and learning from our local ecosystem. Students examine the limiting factors of the environment that can cause the size of a population to change over time. Students model how energy moves within an ecosystem. Students will participate in a project based learning unit where they will design a solution to protect their local ecosystem.			

Stage 1: Desired Results

Massachusetts Learning Standards

- 7.MS-LS1-4. Construct an explanation based on evidence for how characteristic animal behaviors and specialized plant structures increase the probability of successful reproduction of animals and plants.
- 7.MS-LS2-2. Describe how relationships among and between organisms in an ecosystem can be competitive, predatory, parasitic, and mutually beneficial and that these interactions are found across multiple ecosystems.
    - Clarification Statement: Emphasis is on describing consistent patterns of interactions in different ecosystems in terms of relationships among and between organisms.
- 7.MS-LS2-1. Analyze and interpret data to provide evidence for the effects of periods of abundant and scarce resources on the growth of organisms and the size of populations in an ecosystem.
- 7.MS-LS2-6(MA). Explain how changes to the biodiversity of an ecosystem—the variety of species found in the ecosystem—may limit the availability of resources humans use.
    - Clarification Statement: Examples of resources can include food, energy, medicine, and clean water.
- 7.MS-ESS2-4. Develop a model to explain how the energy of the Sun and Earth's gravity drive the cycling of water, including changes of state, as it moves through multiple pathways in Earth's hydrosphere.
    - Clarification Statement: Examples of models can be conceptual or physical. State Assessment Boundary: A quantitative understanding of the latent heats of vaporization and fusion is not expected in state assessment.
- 7.MS-LS2-3. Develop a model to describe that matter and energy are transferred among living and nonliving parts of an ecosystem and that both matter and energy are conserved through these processes.
    - Clarification Statements: Cycling of matter should include the role of photosynthesis, cellular respiration, and decomposition, as well as transfer among producers, consumers (primary, secondary, and tertiary), and decomposers. Models may include food webs and food chains. State Assessment Boundary: Cycling of specific atoms (such as carbon or oxygen), or the

biochemical steps of photosynthesis, cellular respiration, and decomposition are not expected in state assessment.

- 7.MS-LS2-4. Analyze data to provide evidence that disruptions (natural or human-made) to any physical or biological component of an ecosystem can lead to shifts in all its populations.
    - Clarification Statement: Focus should be on ecosystem characteristics varying over time, including disruptions such as hurricanes, floods, wildfires, oil spills, and construction.
- 7.MS-LS2-5. Evaluate competing design solutions for protecting an ecosystem. Discuss benefits and limitations of each design.*
    - Clarification Statements: Examples of design solutions could include water, land, and species protection and the prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.

Transfer (Authentic, relevant application of learning to new situations)

Students will be able to independently use their learning to…

- Develop critical thinking patterns in order to make personal and civic decisions that respect how living systems maintain balance and stability, minimizing impact on factors that disturb stability.

Meaning

Enduring Understandings

Students will understand that…

- Resources are distributed unevenly around the planet.
- The organisms in an ecosystem are interdependent/interconnected.
- Population growth is limited by access to resources.
- Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.
- Human activity impacts ecosystems they inhabit and indirectly affects all ecosystems globally.
- Animals have developed specific behaviors and adaptations that increase their odds of reproducing in their lifetimes.
- Plants reproduce using a variety of strategies including specialized structures and interdependence with animals.
- Biodiversity arises in species as a result of random changes in individuals that increase the likelihood they will mate and pass that change to new generations.
- As human consumption of natural resources increases, so do the negative impacts on Earth.
- Energy and matter are recycled through ecosystems

Essential Questions

Students will keep considering...

- How does energy cycle within an ecosystem?
- How do organisms interact with the environment and each other?
- How can one organism's addition or removal from an ecosystem impact the other organisms within the ecosystem?
- Why are variations within a population important for the species' continued survival?
- How have plants and animals influenced each other's adaptations over time?
- How does a disruption affect an ecosystem?
- What are the possible impacts of humans on ecosystems and what can be done to mitigate harmful effects?

• Humans can mitigate their impact on ecosystems	
Acquisition	
Knowledge ***Students will know…*** • earth's major biomes and ecosystems • trophic levels within an ecosystem • factors such as birth, death, and migration impact the population size of a species • competitive, predatory, parasitic, and mutually beneficial relationships • the difference between abiotic and biotic factors • nutrient cycling through photosynthesis, cellular respiration, and decomposition • food webs and food chains • the terms biodiversity and adaptation • examples of animal behaviors that affect the probability of animal reproduction, such as nest building, herding of animals, vocalizations, and colorful plumage • examples of animal behaviors that affect the probability of plant reproduction, such as transferring pollen or seeds; and, creating conditions for seed germination and growth • examples of plant structures that affect the probability of plant reproduction, such as bright flowers, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury	**Skills** **Students will be skilled at…** • 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 • Obtaining, Evaluating, and Communicating Information • collecting, graphing, and analyzing data on population changes in an ecosystem (7.MS-LS2-1) • analyzing and developing a model of a food web that shows the flow of energy and cycling of matter through an ecosystem and how it conserved (7.MS-LS2-3.) • synthesizing information and predicting the outcome to explain overall impact of a disruption (7.MS-LS2-4.) • determining factors that affect the probability of reproduction (7.MS-LS1-4) • analyzing and using the evidence from examples to develop an argument of how animal behaviors and specialized plant structures affect the probability of reproduction (7.MS-LS1-4) • making inferences based on data to construct an argument that human activities and technologies can be engineered to mitigate the negative impact of increases in human population and per capita consumption of natural resources on the environment (7.MS-ESS3-4.) • evaluating design solutions for protecting an ecosystem (7.MS-LS2-5.) • calculating the change in the growth and population size of a species (including humans) by analyzing and interpreting data with abundance and scarcity of resources (7.MS-LS2-1.