

# Grade 5 - Unit 3 - Ecosystem Sustainability

## Unit Focus

Students will explore ecosystem sustainability through the lens of food production technology as they investigate the factors that create a balanced ecosystem. In doing so, students will understand how light is the first energy source for life on Earth by developing and using models of food webs. Students will use their understanding of light wavelengths and energy from Unit 1 and seasonal patterns of sunlight from Unit 2 to investigate the role of light in ecosystems and how people are working to create innovative methods to produce food for our growing population that protects our environment from overuse and pollution.

## Stage 1: Desired Results - Key Understandings

### Established Goals

#### Next Generation Science

##### Elementary Standards: 5

- 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-ETS1-1*
- Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. *5-LS2-1*
- Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. *5-ESS3-1*
- Support an argument that plants get the materials they need for growth chiefly from air and water. *5-LS1-1*
- 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. *5-PS3-1*

##### Middle School Life Science: 6 - 8

- Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. *MS-LS2-3*

#### Next Generation Science Standards (DCI)

##### Science: 5

- 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. *LS1.5.C1*
- 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. *ESS3.5.C1*
- 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. *LS2.5.B1*

### Transfer

- T1** Communicate effectively based on purpose, task, and audience to promote collective understanding and/or recommend actions.
- T2** Create models to explore complex systems, show mastery of key science concepts, and/or develop solutions through creation of a product open to testing and redesign.

### Meaning

#### Understandings

- U1** Ecosystems are an interconnected system that has a delicate balance.
- U2** Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. (*LS2.6.B1*)
- U3** Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. (*LS2.6.B1*)
- U4** The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (*LS2.6.B1*)

#### Essential Questions

- Q1** What role does sunlight play in a balanced ecosystem?
- Q2** How does matter and energy transfer through the different levels of a food web in an ecosystem?
- Q3** How can we use the formula for photosynthesis to demonstrate how matter is conserved?
- Q4** How can we use technology to sustain life?
- Q5** How will the growth in human population impact the environment?

## Stage 1: Desired Results - Key Understandings

<ul style="list-style-type: none"> <li>Plants acquire their material for growth chiefly from air and water. LS1.5.C2</li> <li>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. ETS1.5.A1</li> </ul>	<p>U5 Scientists and engineers are continually developing new technologies to help people overcome problems.</p>	
<b>Acquisition of Knowledge and Skill</b>		
<b>Knowledge</b>		<b>Skills</b>
<ul style="list-style-type: none"> <li>The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. PS1.5.A2</li> <li>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). PS3.5.D1</li> <li>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. LS2.5.A1</li> </ul> <p><i>Science: 6</i></p> <ul style="list-style-type: none"> <li>Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. LS2.6.B1</li> <li>Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. ESS3.6.C2</li> </ul> <p><b>Student Growth and Development 21st Century Capacities Matrix</b></p> <p><i>Critical Thinking</i></p> <ul style="list-style-type: none"> <li>Synthesizing: Students will be able to thoughtfully combine information/data/evidence, concepts, texts, and disciplines to draw conclusions, create solutions, and/or verify generalizations for a given purpose. MM.1.3</li> </ul> <p><i>Collaboration/Communication</i></p> <ul style="list-style-type: none"> <li>Collective Intelligence: Students will be able to work respectfully and responsibly with others, exchanging and evaluating ideas to achieve a common objective. MM.3.1</li> </ul>	<p><b>U5</b> Scientists and engineers are continually developing new technologies to help people overcome problems.</p> <p><b>K1</b> Ecosystems are composed of abiotic and biotic components that interact. Ecosystems differ in the abiotic components that drive the biotic organisms that can be supported.</p> <p><b>K2</b> Plants are a source of energy (food) and nutrients for animals that consume them. Energy passed to consumers that eat plants came indirectly from the sun as a result of photosynthesis. Some animals consume plants, and other animals consume animals that eat plants in predator-prey relationships.</p> <p><b>K3</b> Decomposers (mainly bacteria and fungi) consume dead plants and animals and break down the organic materials, thus- returning nutrients to the environment for reuse by other organisms.</p> <p><b>K4</b> Populations can be reduced or increased by environmental changes caused by nature (for example, droughts, forest fires or disease) and by humans (climate change, land development or over-hunting).</p> <p><b>K5</b> Vocabulary: matter, ecosystems, organism, population, biotic factor, abiotic factor, biodiversity, food chain, photosynthesis, producer, consumer, herbivore, carnivore, omnivore, food web, predator, prey, habitat, decomposer, adaptation, hydroponics, independent variable, dependent variable, control set-up, constant.</p>	<p><b>S1</b> Planning and conducting an experiment to solve a challenge.</p> <p><b>S2</b> Creating a model that demonstrates understanding of the flow of energy in an ecosystem</p> <p><b>S3</b> Designing a technological solution to grow food.</p>