

Grade 7 - Unit 2 - Ecology and Human Impact

Unit Focus

This unit will focus on ecosystem dynamics as students investigate how changes to an ecosystem can have far-reaching effects. The unit will begin with an environmental phenomenon that students will work to decipher through their content investigations. Students will develop a model of an ecosystem, investigate the interdependence of the biotic and abiotic factors, and recognize how just one change can alter the balance of an environment. Students will further investigate ecosystem dynamics by performing an experiment on the effect of certain chemicals on aquatic environments. In doing so, students will be able to quantify how different concentrations of widely used pollutants can damage our local aquatic ecosystems and use this data to support their explanation for the environmental phenomenon that launched this unit. Students will engage in a debate or Socratic seminar as they navigate the intricacies of competing interests and plans for use of local resources. The culminating experience will ask students to develop and promote a pollution mitigation plan to help decrease water pollution in Madison, using scientifically-based justifications for their claims.

Stage 1: Desired Results - Key Understandings

Established Goals	Transfer	
<p>Next Generation Science <i>Middle School Earth and Space Sciences: 6 - 8</i></p> <ul style="list-style-type: none"> Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. <i>MS-ESS3-3</i> Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. <i>MS-ESS2-1</i> <p><i>Middle School Life Science: 6 - 8</i></p> <ul style="list-style-type: none"> Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. <i>MS-LS1-6</i> Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. <i>MS-LS2-4</i> Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. <i>MS-LS2-3</i> <p>Next Generation Science Standards (DCI) <i>Science: 7</i></p> <ul style="list-style-type: none"> Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. <i>LS2.6.C1</i> 	<p>T1 Communicate effectively based on purpose, task, and audience to promote collective understanding and/or recommend actions.</p> <p>T2 Use the scientific process to generate evidence that addresses the original questions.</p>	
	Meaning	
	Understandings	Essential Questions
<p>U1 Ecosystems are dynamic and interconnected systems.</p> <p>U2 Matter and energy move through ecosystem through food webs and the biogeochemical cycles.</p> <p>U3 Ecosystem characteristics vary over time. Disruptions to any part of an ecosystem can lead to shifts in all of its populations.</p> <p>U4 Human activities significantly alter natural habitats, causing changes to Earth's environment that can impact living things.</p> <p>U5 Humans are actively designing solutions to minimize the impact of human activities on the environment.</p>	<p>Q1 How do matter and energy move through systems?</p> <p>Q2 How can disruptions in one system cause changes in another?</p> <p>Q3 How can we mitigate the negative impact our activities have on our local resources?</p>	

Stage 1: Desired Results - Key Understandings

<ul style="list-style-type: none"> • 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 • Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. ESS3.6.C1 • Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. LS2.6.A1 • Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. LS1.6.C1 • Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. ESS2.6.C1 <p>Student Growth and Development 21st Century Capacities Matrix</p> <p><i>Critical Thinking</i></p> <ul style="list-style-type: none"> • 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 <p><i>Global Thinking</i></p> <ul style="list-style-type: none"> • Citizenship: Students will be able to identify and contribute to critical issues in society in an ethical and responsible manner. MM.5.3 	Acquisition of Knowledge and Skill	
	Knowledge	Skills
	<p>K1 Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with non-living factors (MS-LS1)</p> <p>K2 The law of conservation of matter states: Matter can neither be created nor destroyed, only rearranged, thus, matter is continually recycled on earth through the carbon, nitrogen, water and phosphorus cycle.</p> <p>K3 Plants and animals require nitrogen, phosphorus, water and carbon dioxide to function.</p> <p>K4 Water moving through a watershed picks up, suspends or dissolves various substances produced by nature and by human activities. The quality and usability of water depends on what materials have been picked up, carried and concentrated in the water.</p> <p>K5 Water quality is important to support a variety of aquatic life and for human consumption.</p> <p>K6 Plants, algae, and other producers use the energy from light to make sugar from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen.</p> <p>K7 Eutrophication is the accumulation of nitrogen and phosphorus (largely from wastewater and fertilizers) that causes hypoxic conditions, resulting in dead zones due to the increase in algae on the surface of the water and, ultimately, the decomposition of large amounts of organisms.</p> <p>K8 Vocabulary: Food web, biotic, abiotic, cellular respiration, photosynthesis, decomposition, run-off, ground water, pollutant, watershed, septic system, wastewater, sewer, turbidity, universal solvent, permeability, slope, topographic, eutrophication</p>	<p>S1 Conduct an experiment to investigate a phenomenon.</p> <p>S2 Construct a scientific explanation, based on valid and reliable evidence obtained from sources (including students own experiments), that explains a natural phenomenon.</p> <p>S3 Explain, citing scientific evidence, how human activity may impact water resources in Connecticut, such as ponds, rivers, and the Long Island Sound ecosystems and propose a solution.</p>