

Standard 6.4.3

Strand 6.4: STABILITY AND CHANGE IN ECOSYSTEMS	The study of ecosystems includes the interaction of organisms with each other and with the physical environment. Consistent interactions occur within and between species in various ecosystems as organisms obtain resources, change the environment, and are affected by the environment. This influences the flow of energy through an ecosystem, resulting in system variations. Additionally, ecosystems benefit humans through processes and resources, such as the production of food, water and air purification, and recreation opportunities. Scientists and engineers investigate interactions among organisms and evaluate design solutions to preserve biodiversity and ecosystem resources.	
Standard 6.4.3 MS-LS2-3	Develop a model to describe the cycling of <u>matter</u> and flow of <u>energy</u> among living and nonliving parts of an ecosystem. Emphasize food webs and the role of producers, consumers, and decomposers in various ecosystems. Examples could include Utah ecosystems such as mountains, Great Salt Lake, wetlands, and deserts.	
	Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. Develop and use a model to describe phenomena.	Energy and Matter - Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion). - The transfer of energy can be tracked as energy flows through a designed or natural system.
DCI	LS2.B: Cycle of Matter and Energy Transfer in Ecosystems 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.	
Student Friendly Objectives	I can develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.	
Anchor Phenomena	Matter cycles in and energy flows through an ecosystem.	
Possible Scenarios	Food webs of Great Salt Lake, mountains, wetlands, deserts Decomposition of dead organisms	
Vertical Learning Progression Alignment	Previous Science Content (Discussed in K-5 Standards)	Future Science Content (Discussed in 9-12 Standards)
	Matter cycles between the air and soil and among organisms as they live and die.	- Photosynthesis and cellular respiration provide most of the energy for life processes. - Only a fraction of matter consumed at the lower level of a food web is transferred up,

		resulting in fewer organisms at higher levels. • At each link in an ecosystem elements are combined in different ways and matter and energy are conserved. • Photosynthesis and cellular respiration are key components of the global carbon cycle.
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What students should be doing:

1. Components of the model
 - a. To make sense of a given phenomenon, students develop a model in which they identify the relevant components, including:
 - i. Organisms that can be classified as producers, consumers, and/or decomposers.
 - ii. Nonliving parts of an ecosystem (e.g., water, minerals, air) that can provide matter to living organisms or receive matter from living organisms.
 - iii. Energy
 - b. Students define the boundaries of the ecosystem under consideration in their model (e.g., pond, part of a forest, meadow; a whole forest, which contains a meadow, pond, and stream).
2. Relationships
 - a. In the model, students describe relationships between components within the ecosystem, including:
 - i. Energy transfer into and out of the system.
 - ii. Energy transfer and matter cycling (cycling of atoms):
 1. Among producers, consumers, and decomposers (e.g., decomposers break down consumers and producers via chemical reactions and use the energy released from rearranging those molecules for growth and development).
 2. Between organisms and the nonliving parts of the system (e.g., producers use matter from the nonliving parts of the ecosystem and energy from the sun to produce food from nonfood materials).
3. Connections
 - a. Students use the model to describe the cycling of matter and flow of energy among living and nonliving parts of the defined system, including:
 - i. When organisms consume other organisms, there is a transfer of energy and a cycling of atoms that were originally captured from the nonliving parts of the ecosystem by producers.
 - ii. The transfer of matter (atoms) and energy between living and nonliving parts of the ecosystem at every level within the system, which allows matter to cycle and energy to flow within and outside of the system.
 - b. Students use the model to track energy transfer and matter cycling in the system based on consistent and measureable patterns, including:
 - i. That the atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.
 - ii. That matter and energy are conserved through transfers within and outside of the ecosystem.