Unless otherwise specified, "descriptions" referenced in the evidence statements could include but are not limited to written, oral, pictorial, and kinesthetic descriptions.

5-LS2-1 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

5-LS2-1. **Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.**[Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.] [Assessment Boundary: Assessment does not include molecular explanations.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models
Modeling in 3–5 builds on K–2 models and progresses to building and revising simple models and using models to represent events and design solutions.

- Develop a model to describe phenomena.

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Connections to the Nature of Science

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

- Science explanations describe the mechanisms for natural events.

Disciplinary Core Ideas

LS2.A: Interdependent Relationships in Ecosystems

- 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.B: Cycles of Matter and Energy Transfer in Ecosystems

- 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.

Crosscutting Concepts

Systems and System Models

- A system can be described in terms of its components and their interactions.

Observable features of the student performance by the end of the grade:		
1	Components of the model	
	a	Students develop a model to describe* a phenomenon that includes the movement of matter within an ecosystem. In the model, students identify the relevant components, including:
		i. Matter.
		ii. Plants.
		iii. Animals.
		iv. Decomposers, such as fungi and bacteria.
		v. Environment.
2	Relationships	
	a	Students describe* the relationships among components that are relevant for describing* the phenomenon, including:
		i. The relationships in the system between organisms that consume other organisms, including:
		1. Animals that consume other animals.
		2. Animals that consume plants.

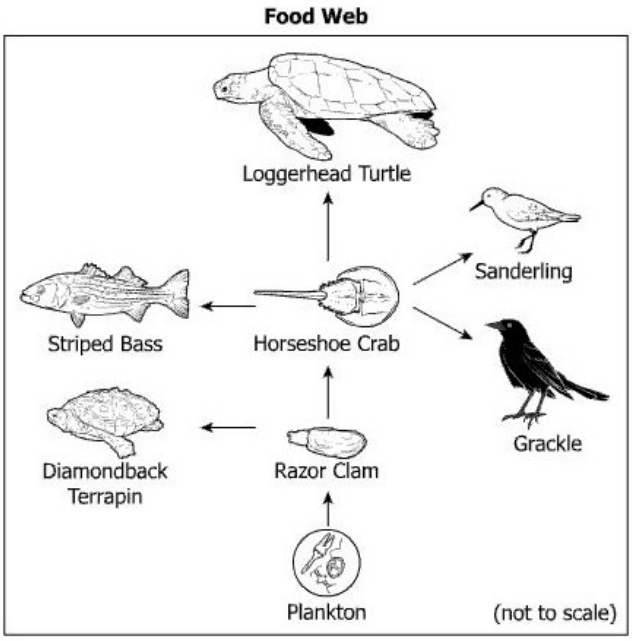
		3. Organisms that consume dead plants and animals.
		4. The movement of matter between organisms during consumption.
		ii. The relationship between organisms and the exchange of matter from and back into the environment (e.g., organisms obtain matter from their environments for life processes and release waste back into the environment, decomposers break down plant and animal remains to recycle some materials back into the soil).
3	Connections	
	a	Students use the model to describe*:
		i. The cycling of matter in the system between plants, animals, decomposers, and the environment.
		ii. How interactions in the system of plants, animals, decomposers, and the environment allow multiple species to meet their needs.
		iii. That newly introduced species can affect the balance of interactions in a system (e.g., a new animal that has no predators consumes much of another organism's food within the ecosystem).
		iv. That changing an aspect (e.g., organisms or environment) of the ecosystem will affect other aspects of the ecosystem.

TASK 1

Question: A giraffe eats leaves from a tree. What is it gaining in terms of energy by doing this? Where does the tree get the energy to grow and produce leaves and fruit? Where does the energy go after the giraffe eats it?

Source:
http://scholarworks.gvsu.edu/cgi/viewcontent.cgi?article=1271&context=honorsprojects

TASK 2



Which of these represents a correct flow of energy based on the food web shown?

A. Loggerhead Turtle →→ Horseshoe Crab →→ Razor Clam
B. Horseshoe Crab →→ Loggerhead Turtle →→ Sanderling
C. Diamondback Terrapin →→ Razor Clam →→ Plankton
D. Razor Clam →→ Horseshoe Crab →→ Sanderling

TASK 3

Four friends were talking about how matter and energy move through an ecosystem. This is what they said:

Morrie: “I think only energy cycles through an ecosystem.”

Felicia: “I think only matter cycles through an ecosystem.”

Stefano: “I think both matter and energy cycle through an ecosystem.”

Lincoln: “I think neither matter nor energy cycles through an ecosystem.”

Which friend do you most agree with? Explain your thinking.

Source: NSTA 2011, Uncovering Student Ideas in Life Science

TASK 4

What is the role of decomposers in a food chain?
A. They consume other organisms.
B. They break down dead organic matter.
C. They use the Sun's energy to make food.
D. They convert inorganic matter into organic matter.

Correct Response: B

Source: Louisiana Department of Education – 5th grade sample science items

TASK 5

Rocky Mountain National Park's ecosystem includes the following plants, animals, and decomposers that make up a small set of the living things at the park:

- Limber pines, a type of tree
- Black bears
- Snowshoe hares
- Needlegrass, a type of plant
- Ravens, a type of bird
- Mountain lions
- Fungi and bacteria

1. Including parts of the environment (for example, the sun) draw a model that shows how each of the living things at the park are connected. Label each thing in your model as a plant, animal, decomposer, or the environment.

2. Imagine a deer mouse dies in Rocky Mountain National Park. Add the mouse to your model – now, adding arrows to your model, show how the matter from the mouse travels through the ecosystem.

3. Write a paragraph description for how the movement of matter happens in your model.

4. How did matter change as it moved throughout your model?

FORMATIVE ASSESSMENT PLANNING GUIDE
SCIENCE, GRADE 5

PERFORMANCE EXPECTATION:

5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

[Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.] [Assessment Boundary: Assessment does not include molecular explanations.]

LEARNING GOAL	SUCCESS CRITERIA	Evidence-Gathering Opportunities
Develop a model to describe the movement of matter in the system we are exploring	-Students develop a model that identifies the following relevant components: matter, plants, animals, decomposers, and the environment. -Students explicitly talk about their model as a system and systems can be described in terms of its components and their interactions.	-Groups identify the phenomena under study and they create a model identifying the necessary components -Their model is revised (develop) throughout the process and their final product has a reflection that explains their revisions/progress -In a beginning of class reflection, students are able to relate their model to a system with interacting components and relate it to other possible systems so they understand the idea of systems
Find relationships between the movement of matter among plants, animals, decomposers, and the environment	-Students identify the four relationships between organisms that consume other organisms - Students identify the relationship between organisms and the exchange of matter from and back into the environment	-Identify essential relationships between the movement of matter in an ecosystem during food webs activities -Addition of these essential relationships to the model they are developing

Use their model to describe how an ecosystem can be healthy and what happens when new species can change the balance of the ecosystem	- Show how multiple species of different types are each able to meet their needs in a relatively stable web of life - Show how newly introduced species can affect the balance of interactions in a system - Demonstrate how a changing aspect of the ecosystem will affect other aspects of the ecosystem - Students explicitly talk about their model as a system and systems can be described in terms of its components and their interactions.	- Present how their models represent a healthy ecosystem (movement of matter) due to species being able to meet their needs and how the balance of the ecosystem can be damaged (product could vary) - Relate this idea back to other systems and have a class discussion about what other systems behave in this manner to reiterate the cross cutting concept