Nurse Logs

| Sample type:	Performance Task including stimulus and 4 items
Subject:	Life Science
Learner:	5th Grade
Standards:	NGSS: 5-LS1-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. SEP: Developing and Using Models SEP: Connections to the Nature of Science: Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena DCI: LS2.A: Interdependent Relationships in Ecosystems DCI: LS2.B: Cycles of Matter and Energy Transfer in Ecosystems CCC: Systems and System Models Environmental Principle and Concept(s): Principle IV Concept a: "that the effects of human activities on natural systems are directly related to the quantities of resources consumed and to the quantity and characteristics of the resulting byproducts."
DOK:	2-3

	Question 1	Question 2	Question 3	Question 4
Performance Expectation	5-LS2-1	5-LS2-1	5-LS2-1	5-LS2-1
DOK	3	2	2	3
SEP: Developing and Using Models		x		
SEP: Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena				x
DCI: LS2.A: Interdependent Relationships in Ecosystems	x		x	x
DCI: LS2.B: Cycles of Matter and Energy Transfer in Ecosystems	x	x		
CCC: Systems and System Models	x	x	x	

Body of sample:

Stimulus:

Nurse Logs

A student is walking through the Quinault Rainforest. This rainforest is home to many different types of plants and fungi. Animals such as deer rely on small plants, shrubs, or moss for food. Many types of birds and insects make their homes in the giant Sequoia trees. The student notices some places where trees grow in a straight row. She takes a closer look. She makes some sketches in her notebook.
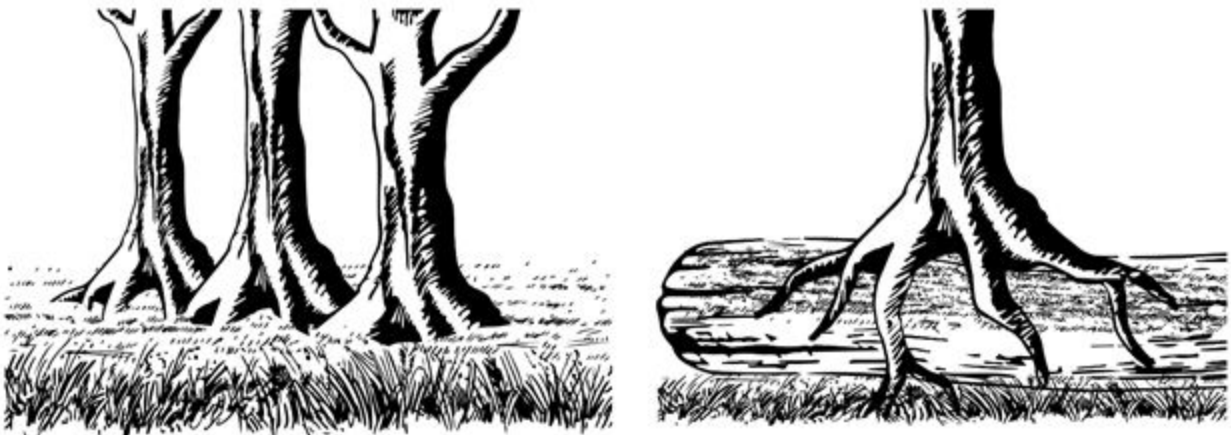
The student returns to science class, where she finds out that the fallen tree is known as a "nurse log." Fungi and moss grow on the dead tree and break it down. This creates a place where seeds and seedlings can get what they need to grow.

Item 1:

Evidence of Achievement: Students use their knowledge to describe the cycle of matter in a system and to describe how organisms are interdependent.

A tree in the Quinault rainforest falls on a trail where people walk. Two park rangers inspect the damage. One says they should remove the tree. The other suggests that they should remove only the part of the tree blocking the trail and leave the rest.

a. Describe how leaving the tree will affect the cycling of matter in the rainforest.

b. Describe how removing the tree can have a positive effect on some living things in the rainforest ecosystem.

CR Rubric	
Score **Description**	**Sample response**
2 The student demonstrates understanding of the Performance Expectation, including the ability to: ● describe the movement of matter in the system; **AND** ● describe the interdependent relationships of the tree and other organisms in the ecosystem.	Possible answers include: a. If the tree is left in place, other living things will be able to use the tree to get matter they need to live. Decomposers break down the tree. They get nutrients from the tree and release them back into the soil. Seeds that fall on the decaying tree get water and nutrients to sprout and grow on the remains of the tree. b. Removing the tree will clear space on the forest floor. More plants will be able to grow in the space that was once taken up by the tree.
1 The student demonstrates partial understanding of the Performance Expectation. Student is able to: ● complete **one** of the tasks listed in the two-point score description; **OR** ● do **both** of the tasks listed in the two-point score description, but they contain errors.	Possible answers include: a. The student describes only one step in the cycling of matter: the decomposing of the matter OR the seeds getting nutrients from the tree to sprout. b. The student describes an effect, but it was not positive: the birds and insects must find new homes.
0 The student demonstrates little or no understanding of the Performance Expectation.	Possible answers include: a. The student response is incomplete or incorrect: trees need sunlight to grow. This is not an example of matter. b. The student response is incomplete or incorrect: people will be able to walk in the rainforest. This is not necessarily a positive effect.

**Three-Dimensional Coach:** Matter is anything that has mass and takes up space.

Energy is the ability to do work.

All living things depend on matter and energy. Think about how matter and energy interact in an ecosystem.

Item 2:

Evidence of Achievement: Students use their knowledge to complete a model to describe the movement of matter in an ecosystem.

Which of these materials complete the model that shows what matter is needed by seedlings growing on a nurse log? Choose all that apply.
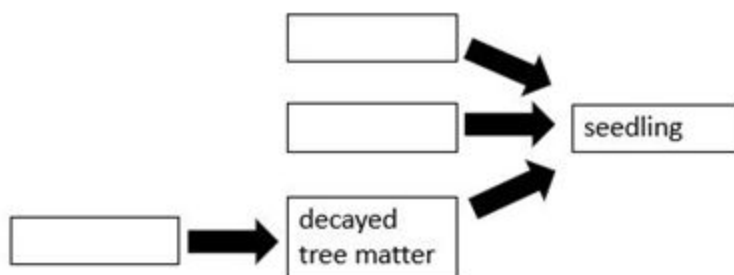
A. air
B. deer
C. fungi
D. sunlight
E. water

Distractor Rationales

A. **Correct Answer.** Trees need oxygen from the air to grow.
B. The seedlings do not need deer in order to grow.
C. **Correct Answer**. Fungi are needed to cause the tree to decay into matter that seedlings need to grow.
D. Sunlight is not matter.
E. **Correct Answer**. Water is needed by seeds to sprout on the nurse log. Water is also matter needed by plants to make food so seedlings can grow.

Three-Dimensional Coach In a model showing how matter flows in a system, notice that the arrows show the direction in which the matter is transferring. It points at the part of the environment that is using the matter.

Item 3:

Evidence of Achievement: Students use their knowledge to describe the interdependence of organisms in the environment on the different types of matter available for resources.

The student wants to make a model to compare living things that depend on the tree before and after it fell in in the rainforest.

Place an X in the box to show if the living thing depends on the living tree or on the decaying tree to get the materials it needs to live.

Living thing	Depends on tree before it falls	Depends on tree after it falls
Bird		
Fungi		
Deer		

CR Rubric		
Score	**Description**	**Sample response**
2	The student demonstrates understanding of the Performance Expectation, including the ability to: ● develop and use a model; **AND** ● describe interdependent relationships in ecosystems.	<table><tr><td>Living thing</td><td>Depends on tree before it falls</td><td>Depends on tree after it falls</td></tr><tr><td>Bird</td><td>x</td><td></td></tr><tr><td>Fungi</td><td></td><td>x</td></tr><tr><td>Deer</td><td></td><td>x</td></tr></table>
1	The student demonstrates partial understanding of the Performance Expectation. The student is able to: ● complete **one** of the tasks listed in the two-point score description; **OR** ● complete **both** of the tasks listed in the two-point score description, but they contain errors.	The student has a partially correct answer.
0	The student demonstrates little or no understanding of the Performance Expectation.	No X's are placed correctly.

Three-Dimensional Coach Living things in an environment depend on one another. They have many relationships. Describe the ways in which a change in the population of one living thing in an environment can affect populations of other living things.


Item 4:

Evidence of Achievement: Students use their knowledge to describe the interdependence of organisms in the environment by selecting the graph that explains the relationship between a nurse log and the number of seedlings that it can support.

The student continues to walk through Quinault rainforest. She finds a newly fallen tree and predicts it will become a nurse log. She learns that there is a pattern in the number of Sequoia trees that grow from seed to tree on a nurse log. Which graph shows how the number of Sequoia trees on this nurse log will most likely change over time?
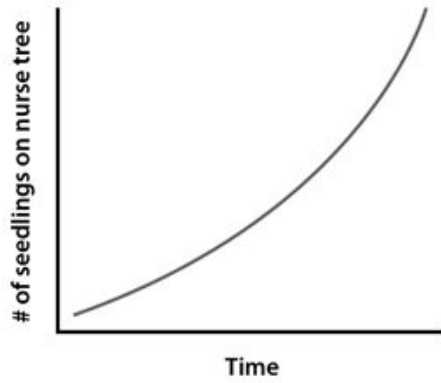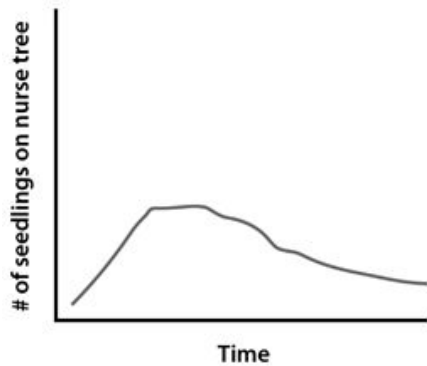
A.
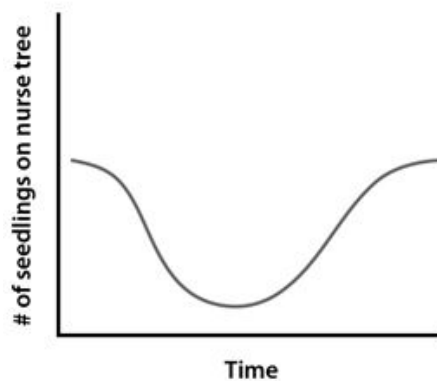
B.
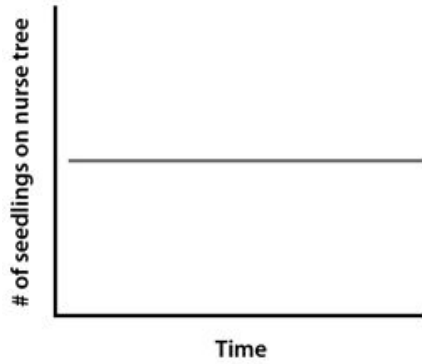
C.

D.

Distractor Rationales

    A. This graph does not show how the number of seedlings would change because the number of seedlings will decrease over time, not increase.

    B. This graph shows no change. As the seedlings grow larger, they will need more room to grow, and so the number of seedlings on the log will decrease.

    C. This graph shows a continual increase in the number of seedlings over time. As the seedlings grow, the amount of matter available for growth in the nurse log will decrease, leading to fewer seedlings being able to grow.

    D. **Correct Answer.** This graph shows an initial increase in the number of seedlings, but then a decrease over time. As the seedlings grow larger, just a few will have enough matter needed to grow on the nurse log. The number of seedlings will decrease as they grow larger.

Three-Dimensional Coach A graph can be used to model relationships among organisms in a system. When reading a graph, carefully look at the labels on each axis. Observe the patterns you see in the data shown in the graph.

Sources: https://www.sciencedirect.com/science/article/pii/S1002007107000202