*Sciences Year 2, Unit 2:* ***Energy Flow and Nutrient Cycles***

*Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

**How are systems interconnected?**

By the early 1900s, the sea otter population in the North Pacific was nearly extinct. Fur traders had killed thousands of sea otters in order to harvest and sell their furs. Historically, the sea otters acted as a natural predator of sea urchins, which feed on kelp. Without this predator in the northern Pacific kelp forests, the sea urchin population increased greatly. As the sea urchin populations grew, the kelp population dropped.

The damage caused to the kelp forests by over hunting otters led to laws that protected sea otters. Over time the otter population recovered, and the kelp forests began to return to their natural balance, until recently. During the 1990s, scientists noticed the that the kelp forests near Western Alaska were declining, yet again. Scientists began to ask the question, “Why?”

One scientist, Dr. Estes, and his team think they may have the answer... Without the sea otters to keep the urchins in check, the urchins multiplied and over-consumed the kelp. Why, you may ask, are the sea otters not keeping the urchins in check? Scientists have found evidence to suggest that sea otters are being preyed upon by a new predator. This new predator is the orca (killer whale). There are two pieces of evidence. First, scientists have spotted of several orca-otter attacks. Second is the lack of otter carcasses being washed up on beaches. These carcasses would suggest disease or starvation. Normally, orca whales choose to feed mainly on sea lions, seals, young whales, and squid. However, their natural food sources have decreased due to the fishing industry. Resourceful and hungry, the orcas are now seeking out sea otters for nourishment. Scientists have found that it would only take about four otter-eating orcas to affect the health of kelp forests.

With fewer sea otters grazing on urchins, the urchins are rapidly reproducing. More sea urchins lead to more kelp being eaten. And if more kelp is eaten, entire kelp forests are going extinct. The web of life is so interconnected. Changes in one species can have an impact on many other species in an ecosystem. Humans also have a great impact on nature. Sometimes our actions can lead to unintended consequences.

**YOUR TASKS:**

1. Draw a food web showing the feeding relationships between kelp, orca whales, sea lions, sea otters, sea urchins, the sun, and young whales. Use arrows to show the transfer of matter from one organism to another.
2. During the 1990s, scientists noticed the that the kelp forests near Western Alaska were declining, yet again. Scientists began to ask the question, “Why?”

Read each of the claims below. Choose the one you feel the article supports the most and cite specific

pieces of evidence from the text to support the claim you choose.

* **Claim 1** - The kelp is unable to obtain enough sunlight to survive in its natural habitat.
* **Claim 2** - Sea otters have begun to overgraze the kelp forests.
* **Claim 3** - Sea urchins are flourishing due to shift in the diet of orcas.
* **Claim 4** - Sea otters are eating all of the sea urchins.

**RUBRIC:**

***Criterion B: Communication in science***

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| **Achievement Level** | **Level**  **Descriptor** | **Task Specific**  **Clarification** |
| 0 | * The student does not reach a standard described by any of the descriptors given below. |  |
| 1-2 | * The student uses a **limited range** of scientific language **correctly**. * The student communicates scientific information with **limited effectiveness.** * When appropriate to the task, the student **makes little attempt** to document sources of information. |  |
| 3-4 | * The student uses **some** scientific language correctly. * The student communicates scientific information with **some effectiveness.** * When appropriate to the task, the student **partially documents** sources of information. |  |
| 5-6 | * The student uses **sufficient** scientific language correctly. * The student communicates scientific information **effectively.** * When appropriate to the task, the student **fully documents** sources of information **correctly**. |  |
| What I think I got: |  |  |
| What I actually got: |  |  |