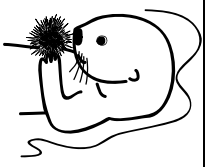
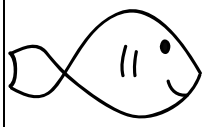
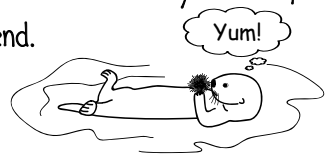
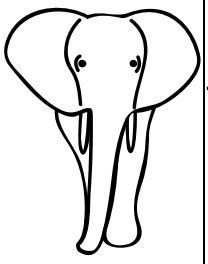
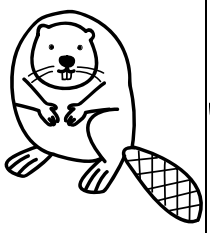
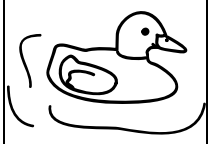
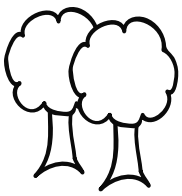
Think about it!

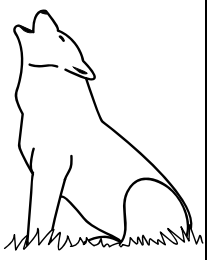
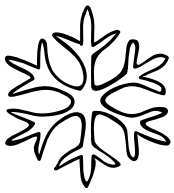
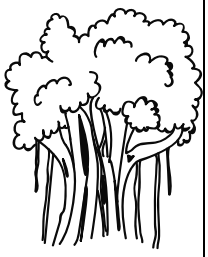
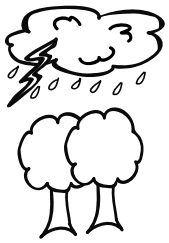
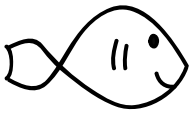
Which vital role(s) do you think each keystone species below provides for their ecosystem?

Here are some of the ways a keystone species can help keep ecosystems healthy:

- Eating plants or animals to control their numbers
- Providing food, water, or habitats (places to live) for other animals and plants
- Spreading plant seeds or pollen
- Moving nutrients from one ecosystem to another
- Maintaining plant and animal diversity

Ecosystem choices: forest – grassland – desert – marine – freshwater – rainforest – tundra

Organism	Ecosystem	How might it help the ecosystem?
Sea otter 	**Example:** Marine Symbol for it: 	Sea otters eat sea urchins, which eat the base of kelp (long sea plants). Without otters to control their population, urchins can destroy the "kelp forest" upon which so many other species depend. 
African elephant 	Grassland	African elephants help to maintain a special type of grassland called savannah. They do this by clearing enough trees so that the trees cannot grow together to form a complete canopy. This lets enough sunlight reach the grasses upon which so many organisms depend. Hundreds of species either eat the grasses, like antelope, or prey on those animals, like lions. The seeds of many African plants have also evolved to germinate (start to grow) only after they are passed through an elephants' digestive system.
Beaver 	Wetlands 	Beavers chew down trees and make dams that stop the water and help create wetlands. The ponds and wetlands increase biodiversity, or the number and types of species. Beavers provide many other benefits to the ecosystem, including helping to create food for fish, drought protection, and more open space between trees.
Grizzly bear	Forest 	Grizzly bears eat fish like salmon and disperse the waste throughout the forest, both as feces and partially eaten carcasses. This provides the trees and other organisms that live in the forest with necessary nutrients, like nitrogen. Salmon eat most of their food at sea, and without bears, much of those nutrients would stay in the rivers after the fish spawn and die. Then the dead salmon and nutrients would be washed back out to sea before the forest could benefit.

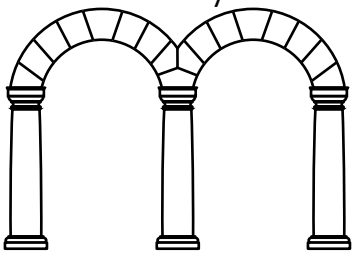
Organism	Ecosystem	How might it help the ecosystem?
Wolf 	Tundra 	Wolves hunt in packs to make kills. Many other animals benefit from the carcasses, including bears and eagles. Most importantly, wolves control the population of animals that might otherwise grow too numerous, like caribou. If this happens, the food supply can quickly be eaten and many organisms can starve to death, including the wolves' prey, like caribou. Like all keystone species, wolves help to keep the ecosystem in balance.
Kangaroo rat	Desert	Kangaroo rats are an important food source for many desert animals, including coyotes and foxes. They disperse the seeds of many plants and dig burrows which can provide shelter for many different species of animals. They also speed up the decomposition of plants, adding to the fertility of the soil and allowing new plants to grow.
Strangler fig 	Rainforest 	At certain times of the year, strangler figs are one of the only plants that supply fruit in the rain forest. Many animals depend on the figs, including different species of monkeys and birds. Other organisms can then prey on the fig eaters, including jaguars. All of the nutrients then cycle back to the ecosystem. These trees also provide shelter for many organisms.
Coral	Marine 	Coral are tiny organisms that work with algae (tiny plants) to form beautiful coral reefs. These reefs provide food and shelter for countless species of fish and other marine life. Scientists are trying to understand why many of the world's coral reefs are dying, which is leading to the loss of many fish and other marine organisms.

What is another organism that might be a keystone species?

Organism	Ecosystem	How might it help the ecosystem?
Answers will vary	*Answers will vary*	*Answers will vary for how the keystone species can help to keep the ecosystem healthy. Ideas are listed at the top of the previous page.*

Learn more and see if you're right!

1. Research the species at the library or on the Internet. Are your ideas about keystone species supported by the latest scientific research? If not, add the new details you learn to the charts and cross out any ideas that were incorrect.
2. Getting back to stone arches, which ancient civilizations used them for building? In what ways did they use them? Are there any still standing today, and if so, where?



The Ancient Greeks and Romans were two of the civilizations best known for building arches. Arches were used to create aqueducts to bring water to the cities and construct enormous buildings like the Coliseum in Rome. Many examples of these ancient stone arches can still be found in the areas that were once part of the Roman Empire, including around the Mediterranean Sea and in the Middle East. Other civilizations like the Maya in Central America were known for creating triangular-shaped arches. These can still be seen in countries like Mexico and Guatemala.

3. Why did those ancient civilizations end, and do you think the same thing could happen to our civilization? Why or why not? What can we do to be sure our civilization is as strong as an arch, and does not go the way of other civilizations throughout history?

Historians and archeologists debate the reasons why the civilizations ended, but damage to the environment is thought by many to be one cause. For example, the most important food source for the Maya was corn. Corn uses a lot of nutrients from the soil, and it is thought that the land could suddenly not produce enough food to feed the Mayan people. The rainforest also had to be cut down to plant the corn, which created other problems, including faster erosion (washing away) of the soil.