

Keystone species

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The jaguar has a varied diet in Central and South America. It acts as a keystone predator by helping to balance the animals in the jungle ecosystem by consuming 87 different species of prey. Photo from the public domain.

A keystone species is a life form that affects an entire ecosystem. An ecosystem is a community of plants and animals.

No other creature can do the job a keystone species does. Without them, the ecosystem would have to completely change. It could even disappear completely.

Any creature may be a keystone species. Most keystone species are animals that have a huge influence on food webs. A food web is the system of how plants and animals depend on each other for food.

Carnivores, Herbivores And Mutualists

Predators

A keystone species is often a predator, or hunter. Just a few of them can have a huge effect on the animal populations they hunt.

In the Greater Yellowstone Ecosystem (GYE), gray wolves are a keystone species. The GYE stretches across the boundaries of the U.S. states of Montana, Wyoming and Idaho. It includes Yellowstone National Park. The GYE includes mountains, forests, meadows, bubbly geysers and freshwater habitats, or homes for animals.



The elk, bison, rabbit and bird species are eaten by predators in the GYE. How they eat and where they nest depends much on what wolves do.

The U.S. government set aside land for Yellowstone National Park in the late 1800s. At that time, hundreds of wolves roamed the GYE. The government feared that the wolf would hunt too many elk and bison, as well as livestock, like cows. So the government removed wolves from the GYE. The last remaining wolves in Yellowstone were killed in 1924.

The removal of this key predator started a top-down change in the GYE.

Without a top predator, elk populations in Yellowstone exploded. Elk herds competed for food resources. Plants such as grasses and reeds did not have time or space to grow back. This hurt populations of other species, such as fish, beaver and songbirds. These animals rely on plants and their roots, flowers, wood and seeds for survival.

It wasn't just animals that were affected. Stream banks wore away. This happened because plants were no longer there to hold the soil in place. Lake and river temperatures increased as trees and shrubs no longer gave them shade.

In the 1990s, the U.S. government began bringing wolves back to the Greater Yellowstone Ecosystem. The results have been impressive. Elk populations have shrunk, willow tree heights have increased and beaver and songbird populations have recovered.

Herbivores

Herbivores — plant eaters — can also be keystone species.

In African dry grasslands, such as the Serengeti in Tanzania, elephants are a keystone species. Elephants eat shrubs and small trees there. Elephants knock them over and uproot them. This keeps it a grassland, or savanna, rather than a forest.



With elephants to control the tree population, grasses thrive. This feeds grazing animals such as antelopes, wildebeests and zebras. Smaller animals such as mice can burrow in the warm, dry soil. Predators such as lions and hyenas depend on the savanna for finding prey.

Keystone Mutualists

Keystone mutualists are two or more species that work like a team. A change in one species would impact the other, and change the entire ecosystem. These are often pollinators, such as bees.

In the woody grasslands of Patagonia, a region in South America, a species of hummingbird and native plants work together. Local trees, shrubs and flowering plants need a hummingbird called the green-backed firecrown to move pollen. Pollen is a yellow powder that helps plants make seeds. Green-backed firecrowns deliver pollen to one-fifth of local plant species. In turn, these plants provide sugary nectar that hummingbirds need.

Pockets of the Patagonian habitat would collapse without green-backed firecrowns. No other creature can pollinate these plants.

Other Organisms Crucial To Ecosystems

Umbrella Species

Umbrella species are like keystone species. The main difference is that umbrella species often travel long distances. They have huge effects on all the different places they live.

Most umbrella species move from place to place.

The Siberian tiger is an umbrella species. It travels in a range of more than 620 miles in eastern Russia. Populations of deer, boar and moose are under the snowy "umbrella" of the Siberian tiger range.

Foundation Species

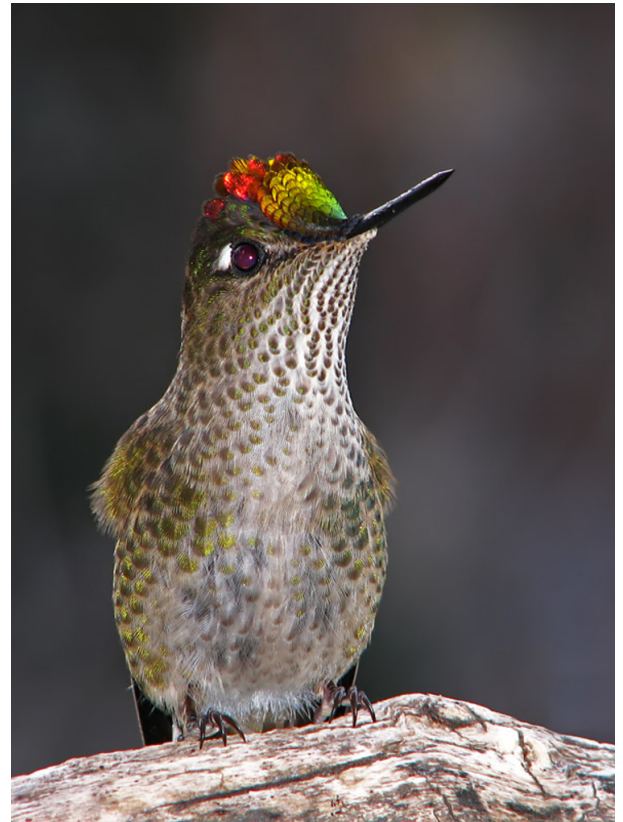
Foundation species help create or maintain a habitat.

Corals are a foundation species of many islands in the South Pacific Ocean. These tiny animals grow as a colony of sometimes millions of individual corals. The rocky outer layers of these corals create huge walls around islands: coral reefs.

Coral reefs are full of colorful creatures. Tortoises, crabs, sponges, sharks and fish are all often part of healthy coral reef ecosystems.

Ecosystem Engineers

Like foundation species, ecosystem engineers contribute to the physical world around where they live. Ecosystem engineers modify, create and maintain habitats.



Some engineers change their environment by changing themselves. Corals and trees are such engineers. As they grow, they are a living part of the environment, providing food and shelter to other organisms. The hard outer shells left behind as corals die continue to define the ecosystem.

Other engineers change the environment around them. Beavers are an example. They help maintain woodland areas by cutting down older trees, allowing young ones to grow. They turn these trees into dams. Beavers change forests and streams. They turn them into wetland habitats.

Invasive species are often ecosystem engineers. They don't have predators or other factors holding them back. So, these species move to new environments and invade, or take over. This holds back the growth of native plants and animals, which are used to the old environment.



Kudzu is an invasive plant that changed the southeastern United States. Kudzu beats out native species for space and food, pushing them away. It is a vine that climbs and wraps around other plants. When certain native plants disappear, so do the insects and birds that depend on those plants.

Indicator Species

An indicator species is a life form that is affected easily by environmental changes. They can give us early-warning messages that a habitat is hurting, such as from water pollution, air pollution or climate change.

In Chesapeake Bay, in the northeastern U.S., oysters are an indicator species. Oysters filter water as they strain it for food particles. These shellfish filter important minerals, soils and pollutants that enter the bay. Oyster beds — large collections of oysters — help keep ocean shores healthy. The health of oysters in the Chesapeake is used to help understand the health of the entire ecosystem.

Flagship Species

A flagship species acts as a symbol for an environmental habitat or problem. A symbol is something that stands for something else, like a mascot.

Flagship species are often large animals that are loved for how they look. They often appear in movies, TV or books.



Flagship species can sometimes be symbols of general ideas about protecting nature. Polar bears are seen as a flagship species for climate change. The earth is getting warmer, and large ice sheets are melting. This affects how polar bears live and hunt.

The giant panda is perhaps the most familiar flagship species. Pandas are the global symbol of endangered species — creatures whose populations are being threatened.

Quiz

1 Which of the following keystone species is an herbivore and helps maintain grass populations?

- (A) wolves
- (B) beavers
- (C) elephants
- (D) hummingbirds

2 Read the paragraph from the section "Keystone Mutualists."

Pockets of the Patagonian habitat would collapse without green-backed firecrowns. No other creature can pollinate these plants.

What is the BEST definition of "collapse" as it is used above?

- (A) break apart
- (B) be ruined
- (C) fold up
- (D) give in

3 How is an umbrella species different from an indicator species?

1. An indicator species moves between many areas while an umbrella species stays in one large area.
2. An indicator species lives in one area while often an umbrella species moves between many areas.
3. An indicator species often maintains a habitat while an umbrella species is affected by many changes happening to the habitat.
4. An indicator species is often affected by changes to its habitat while an umbrella species affects many different habitats.

- (A) 1 and 3
- (B) 2 and 3
- (C) 1 and 4
- (D) 2 and 4

4 Read the paragraph from the section "Ecosystem Engineers."

Invasive species are often ecosystem engineers. They don't have predators or other factors holding them back. So, these species move to new environments and invade, or take over. This holds back the growth of native plants and animals, which are used to the old environment.

Which phrase from the paragraph BEST helps the reader understand the meaning of "invasive species"?

- (A) ecosystem engineers
- (B) new environments
- (C) take over
- (D) holds back

- 5 Why is the green-backed firecrown considered a keystone species in Patagonia?
- (A) It is a keystone predator that works with plants; the hummingbird eats the plants nectar.
 - (B) It is a keystone herbivore that works with plants; the hummingbird eats the plants nectar.
 - (C) It is a keystone mutualist that works with plants; the hummingbird receives nectar as food while pollinating the plants.
 - (D) It is a keystone ecosystem engineer that works with plants, the hummingbird receives nectar as food while pollinating the plants.

- 6 Read the section "Predators."
- Which answer choice BEST describes the structure of this section?

- (A) pro and con
- (B) cause and effect
- (C) compare and contrast
- (D) problem and solution

- 7 In what order would these damaging events occur in the Savanna if elephants were taken away?

1. Other herbivore populations, like zebras, would die without enough food.
2. Bushes and shrubs would out-compete with grass.
3. The grasslands would become a forest.

- (A) 1, 2, 3
- (B) 1, 3, 2
- (C) 3, 2, 1
- (D) 2, 3, 1

- 8 This article is organized by categories of species.

Why did the author choose to organize the information in this way?

- (A) to emphasize the differences between species in grasslands and forests
- (B) to compare the roles played by invasive plants in different environments
- (C) to summarize the important differences between carnivores and herbivores
- (D) to outline the different roles that important species can have in an environment