

ECOSYSTEMS

Grades 7-8

STUDENT JOURNAL

This journal belongs to:



INSTRUCTIONS

This student journal accompanies *The Good and the Beautiful Ecosystems* science unit. It contains all the worksheets and journal pages that are needed to complete the unit. Each student will need his or her own copy of the science journal.

The lesson extensions are also found here. These extensions are optional for older students (grades 7–8) to complete on their own. Each extension is accompanied by lined paper so the student can keep his or her work in one place.

Have each student take his or her time to create high-quality work as the activities and worksheets are completed. Students may enjoy looking back on their past discoveries when they've finished.



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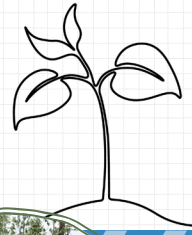




EXTENSION

Instructions:

1. Read the information below.
2. Answer the questions in one or two sentences.
 - a. How do you think an earthquake could affect animal life in or near the area where you live?
 - b. What are some possible positive effects of an earthquake?



Earthquakes and Ecosystems



Thousands of earthquakes happen throughout the world every year. That's about 50 earthquakes every day! We often hear of lives lost and property destroyed in human-inhabited areas, but how do earthquakes affect the living things in other areas? Let's take a look at how an abiotic factor, like an earthquake, can change the lives of wild animals.

Earthquakes and Animals



Since early times, people have believed that animals can sense earthquakes before they happen. While it is unlikely that an animal can predict an

earthquake, animals have been observed acting strangely prior to earthquakes because they are able to detect an earthquake's first seismic waves—the **P waves**, or pressure waves, that arrive in advance of the **S waves**, or secondary shaking waves. Another way that animals can detect an earthquake is through sound. Elephants can sense much lower sound waves than humans can, so they may hear or feel a quake before it reaches the surface.

How would an animal act if it were to notice something different, like a P wave? It might run, act confused, or seem more alert. While animals have been observed to act differently before an earthquake hits, this behavior was usually remembered *after* the earthquake, not used to predict the quake before it happened. Could animals be used to warn us of earthquakes in the future? Some scientists think it's possible by tracking the activity of tagged animals, including unusual mass migrations, and comparing it to seismic activity from space.

Whether or not animals sense an earthquake before it comes, they can still be affected by it when it arrives. There are several ways that a wild animal's life can be changed because of an earthquake.

Loss of Life

Just as with humans, there is potential for loss of life in the animal world when earthquakes hit. Depending on the severity of the loss, this could have a drastic impact on an ecosystem, as it could result in too many or not enough of a certain type of animal within the ecosystem. This is called **ecological imbalance**.

Geographical Changes



Earthquakes can cause significant geographical changes that can affect animal habitats and ecosystems. This lake in Montana, USA, known as both Quake Lake and Earthquake Lake, was formed when a 1959 earthquake caused a landslide that blocked the Madison River. Landslides can also wipe out entire forests. Just think of how that would affect an ecosystem! Forests provide many things for animals, including food and shelter.

Debris

Animals living in the ocean are also affected by landslides caused by earthquakes. As rocks and dirt rush into the ocean, they sometimes

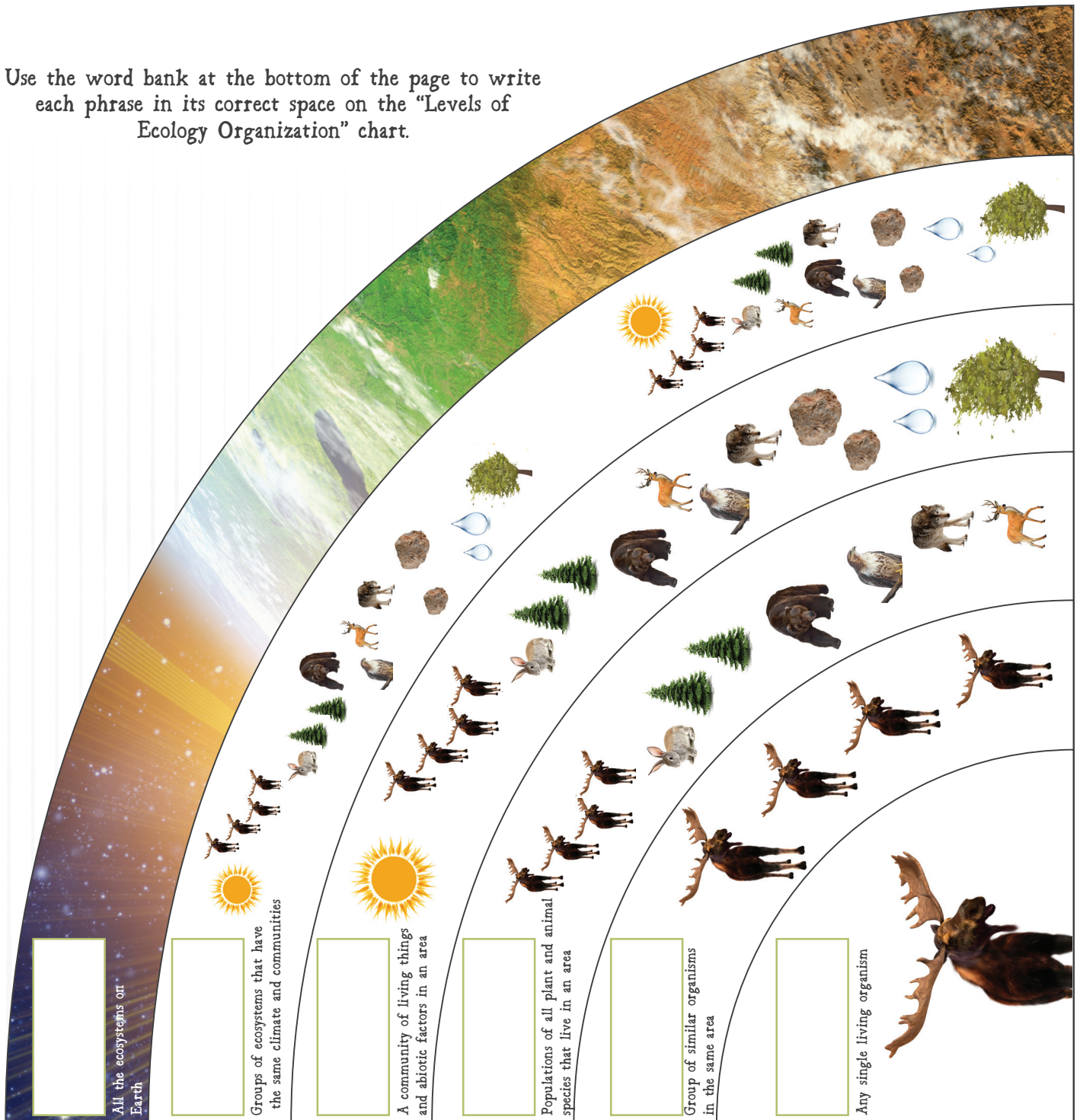


take human household items and rubble with them, which become ocean debris. Animals may get injured by or become trapped in this debris as it floats around or makes its way to the ocean floor.

While humans can't do anything to prevent earthquakes from happening, we can try to help wildlife survive the aftermath.

LEVELS OF ECOLOGY ORGANIZATION

Use the word bank at the bottom of the page to write each phrase in its correct space on the "Levels of Ecology Organization" chart.



Word Bank

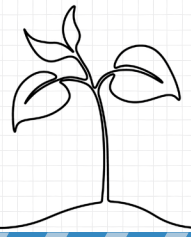
Ecosystem Biosphere Community Population Individual organism Biome



EXTENSION

Instructions:

1. Read the information below.
2. Draw a carbon cycle diagram in your science journal and label it with the four processes that contribute to the carbon cycle.



The Carbon Cycle

Our planet and its atmosphere are part of a closed environment where the matter that exists now is all that will ever exist. As the Law of Conservation of Mass states, *Matter is neither created nor destroyed*. For example, water is never destroyed or created; it simply changes forms in a cycle. Carbon also changes forms in a cycle and must be recycled as it is the foundation of all life on Earth—the “building block of life.” This is because carbon can form stable bonds with many elements, including itself, and be part of millions of different compounds.

Most carbon is found in rocks and sediments in the earth, including fossil fuels. The rest is found in living organisms, in the ocean, and in the atmosphere in the form of carbon

dioxide, or CO_2 . Key molecules that make up organisms, such as protein and DNA, contain carbon.

The carbon cycle is nature’s way of reusing carbon atoms. These carbon atoms travel from the atmosphere into the earth’s organisms and back into the atmosphere again and again. Four major processes contribute to the carbon cycle. As you read about them, refer to the image on the left.

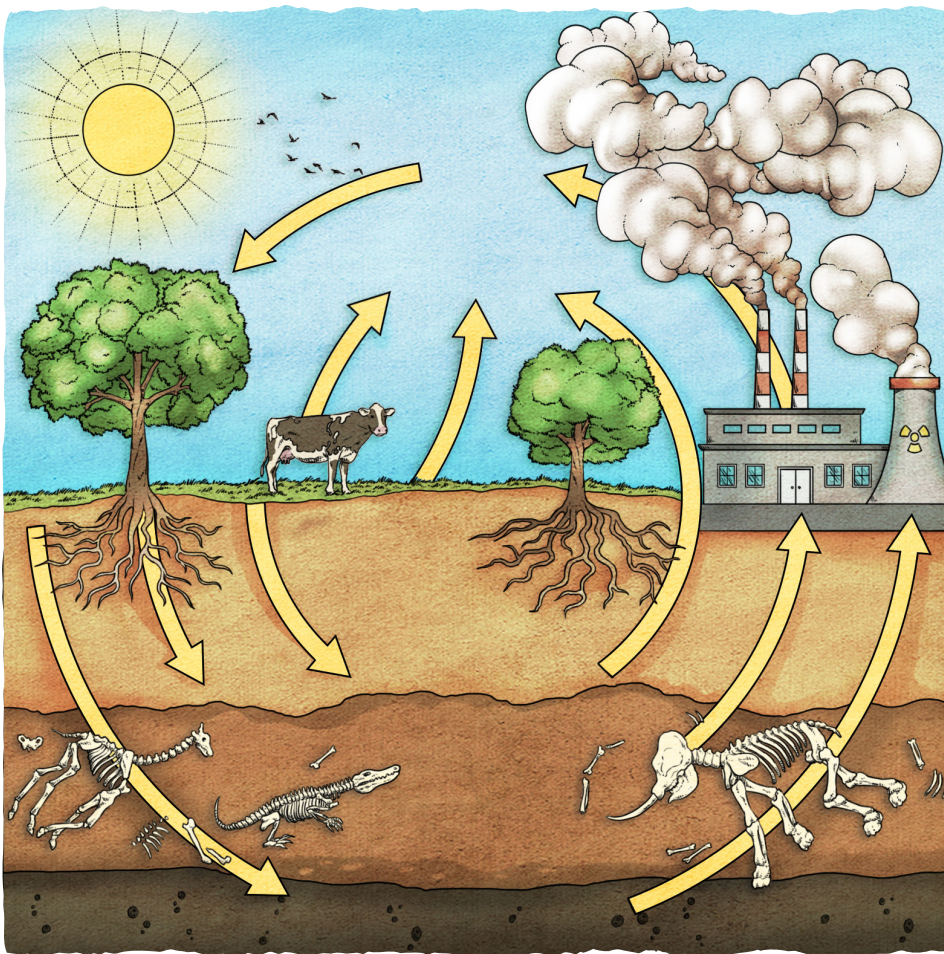
Photosynthesis—Plant matter uses energy from the sun to combine carbon dioxide from the air with water and nutrients, creating sugar and oxygen.

Respiration—Organisms use the oxygen released by plants to **respire**. They inhale oxygen and exhale carbon dioxide, which goes back into the atmosphere. Even plant roots

respire by taking up oxygen from the air in the soil and combining it with the sugars produced during photosynthesis to create energy for growth.

Decomposition—Dead material from plants and animals is broken down and releases carbon into the air, soil, and water.

Combustion—When organic material is burned, one of the byproducts is carbon dioxide. Others include water and energy. When we take carbon-filled fossil fuels from the ground and burn them, we are able to power cars and factory motors. This releases more carbon into the atmosphere in the form of carbon dioxide. Carbon dioxide is a pollutant in the atmosphere, but some of it cycles back to plants, which take the carbon dioxide from the air and convert it all over again through the process of photosynthesis!



ENERGY PYRAMID



0.1 kcal

Apex Predators

Trophic Level 5

90%
energy loss



Tertiary Consumers

Carnivores

Trophic Level 4

1 kcal

90%
energy loss



Secondary Consumers



Omnivores

Trophic Level 3

10 kcal

90%
energy loss



Primary Consumers

Herbivores

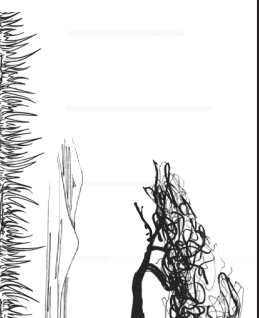
Trophic Level 2

_____ kcal

90%
energy loss



Producers



Trophic Level 1

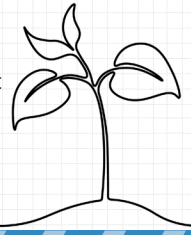
1,000
kcal



EXTENSION

Instructions:

1. Read about apex predators below and study their food chains.
2. Write or draw the food chain for each of the three predators shown at the bottom of the page.



Apex Predators

Deep in the woods, a black shadow leaps from the branch of a tree to the ground below. Stalking its prey, the predator moves about at will with no fear. This black jaguar is an apex predator, and it resides at the top of a food chain with no natural predators to threaten its life. Apex predators have a strong ecological impact because they greatly affect the populations of their prey species, which can help an ecosystem remain balanced and naturally regulated. Human hunting has caused some apex predator species to reach near extinction, but conservation efforts have helped regain balance and control prey populations in many areas.



Plant Matter



Insects



Frog



Snake



Eagle

With their sharp beaks and talons as well as their large size, eagles are apex predators of the sky. They safely soar high above the ground while searching for prey.



Algae



Krill



Mackerel



Seal



Polar Bear

Polar bears dominate the Arctic region by hunting from the ice. Their powerful paws and jaws can kill a seal with one blow.



Grass & Herbs



Water Buffalo



Komodo Dragon

These giant lizards live on isolated Indonesian islands. Feeding mostly on meat, their venomous saliva can still kill an animal even if it manages to escape after being bitten.

What does the food chain look like for these apex predators?



Wolf



Lion



Orca

COMPETITIVE INTERACTIONS

Look at each image below and determine if it shows an INTRASPECIFIC or an INTERSPECIFIC competitive interaction. Write the answer on the line below each image.



ART STUDY



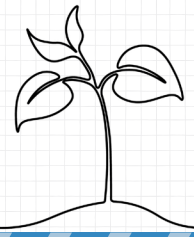
"A Cottage with Sunflowers at Peaslake" by Helen Allingham (1848–1926), date unknown



EXTENSION

Instructions:

1. Read the information below.
2. Write a paragraph answering two of the questions below:
 - a. How does one of the quotes by Wangari Maathai inspire you?
 - b. How do the trees found in Africa help the people there? How do trees impact your life?
 - c. What are the accomplishments of Wangari Maathai?



"You can make a lot of speeches, but the real thing is when you dig a hole, plant a tree, give it water, and make it survive. That's what makes the difference."

"There are opportunities even in the most difficult moments."



Wangari Maathai

"It is extremely important for adults and especially those who are in charge of cities to make sure that we do not lose touch with the land and with the environment."

"No matter who or where we are, or what our capabilities, we are called to do the best we can."

Wangari Maathai was a well-known environmentalist and biologist who made a difference in the world around her. Wangari was born in Nyeri, Kenya, Africa, in 1940 and attended the Mathari Catholic Mission boarding school in 1951. There she joined the "Legion of Mary" and learned to live by the motto "Serve God by serving fellow human beings." Wangari lived up to this motto during her lifetime as she dedicated countless hours to serving the community around her. After boarding school, Wangari attended Loreto High School, where she was rated first in her class. In 1960 Wangari earned a scholarship and traveled to the United States to attend college, where she studied biology and fostered her love for the natural world around her.

After earning her master's degree in biology, Wangari went home to Africa. She found her place and mission in the world as she interacted with the community around her. She became known as the Mother of Trees and used her education and wisdom to improve daily life for thousands of families in her homeland of Kenya.

Daily life in Africa was difficult. The streams were drying up, and supplies were becoming scarce. Women had to walk farther and farther to procure

water for their families, fencing for their animals, firewood for cooking, and food for their hungry children. Many women sought out Wangari's wisdom and pleaded for help. Do you know what Wangari's response was to all these women? Plant a tree! Wangari founded the Green Belt Movement in Africa that transformed the landscape of Kenya and improved the lives of many Africans. Millions and millions of trees were planted as a result of Wangari's leadership and vision. Wangari became the first African woman to earn the Nobel Peace Prize. When she passed away at the age of 71, she left a legacy, a movement, and an improved environment that will remain for generations to come.

Trees of Africa

Muluhakuha

This tree provides wood to build homes.

Mukuyu

This tree can filter and clean water and is considered sacred to people in Africa.

Moringa

Moringa seed oil contains antiseptic and anti-inflammatory properties that can help heal a variety of wounds and insect bites.

**Mubiru muiuru**

The delicious fruit of this tree is enjoyed, and the seeds are saved and shared to grow more.

Mukawa

The prickly thorns on this tree create a natural fence to keep out unwanted predators.

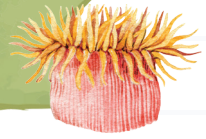
Muheregendi

This tree provides food for goats, which in turn provide milk for humans.

Mukinduri

The wood of this tree provides firewood for cooking and warmth.

MARINE BIOMES FACTS



There is one fact about each marine biome in each row below. Beginning with the ocean biome, find the fact in the first row that goes with it and draw a line from "Ocean" to that fact. *Hint: The facts are scrambled.*

Move to the next row, drawing a line from the fact in the previous row to the matching fact in that row, continuing down each row until you reach the last row. Repeat with the next two biome names. The letters on the ocean biome fact boxes will reveal the answer to the riddle:

What is the strongest creature in the ocean?

Ocean

Can also be called bays, inlets, or lagoons, each of which has one or more streams flowing into it. (A)

Because of its depth and lack of oxygen, much of it is still unexplored. It is like visiting the moon! (U)

An example is mangrove swamps, which have a mix of salt and fresh water and are found closer to the ocean. (R)

American alligators live here in the brackish waters. Crocodiles can be found in fresh or salt water. (T)

Filter animals, such as oysters and clams, thrive here. They help clean out impurities in the water. (C)

Many species of fish are born in estuaries before making their way out to the sea. (O)

Coral Reef

The salt content throughout its large area decreases the freezing temperature, so it rarely freezes. (M)

These form when a freshwater river meets the ocean, forming a mix of salt water and fresh water called brackish water. (T)

The Mariana Trench is the deepest part, reaching depths of over 10,973 m (36,000 ft). (S)

Many animals live in the coral structure, including sea turtles, sharks, fish, rays, and sea anemones. (N)

It's estimated that 50–80% of living organisms on Earth call it home. (E)

The coral gets its many brilliant colors from algae growing inside called *zooxanthellae*. (R)

Estuary

It is made of coral polyps, which are tiny animals. (S)

Most coral grows very slowly and can take hundreds of years to form. (E)

Some coral reefs have been around for thousands of years. (A)

Plant and animal life varies according to the depth of the water and the amount of light available. (S)

The coral structure is naturally white. (T)

The blue whale, the largest living animal, can only live here in the largest marine biome. (L)



ECOLOGICAL SUCCESSION

With your parent or teacher, read and discuss the verses below from the Bible. Then complete the page by identifying and drawing three pictures of the sequence of succession for the fruit tree as mentioned in these verses.

And God called the dry land Earth; and the gathering together of the waters called he Seas: and God saw that it was good.

And God said, Let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after his kind, whose seed is in itself, upon the earth: and it was so.

And the earth brought forth grass, and herb yielding seed after his kind, and the tree yielding fruit, whose seed was in itself, after his kind: and God saw that it was good.

—Genesis 1:10-12



First the earth
brought forth ...

and then ...

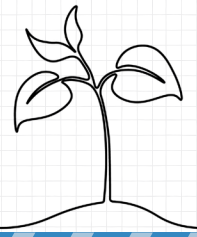
and then ...



EXTENSION

Instructions:

1. Read the information below.
2. Draw a cycle of a pond succession that includes three pioneer species, two plant species that may be found in, on, or around ponds, and five animal species that may rely on the pond. Label each species type.



Pond Succession

Have you ever seen a caterpillar change into a beautiful butterfly? Just like a butterfly goes through changes in a life cycle, a pond undergoes changes in a cycle called **pond succession**.

Ponds can develop from a simple depression in the earth. This lowered area can be created by humans or natural events and eventually fills with water, which can come from the earth (groundwater), the sky (rain or snow), or humans. As soon as the pond has water, it is ready to support life.

First, smaller organisms, such as algae, begin living in the pond. These are called **pioneer species**. Then animals such as insects, fish, and amphibians move in. Ponds are also an important source of water for other animals, such as birds and deer.



As the organisms and animals that live in the pond grow, die, and decay, the pond begins to fill with **sediment**. As this organic material settles to the bottom of the pond, it plays a major role in the life of the pond. If the pond is man-made and maintained, it will likely experience occasional cleaning. In natural ponds the sediment eventually builds up so much that there isn't much water left, creating a swamp or bog. Once the water is completely gone, another type of ecosystem can form, such as a grassland or a forest.

Animals aren't the only living things that rely on ponds. Many types of plants, such as cattails, water lilies, and water lettuce, grow in, on, and around ponds. Plants also add to the sediment, bringing a pond to the end of its life cycle.

Pond Wildlife

White-Tailed Deer



Mosquito



Great Cormorant



Water Lettuce

