Earth Systems

by Sophia

WHAT'S COVERED

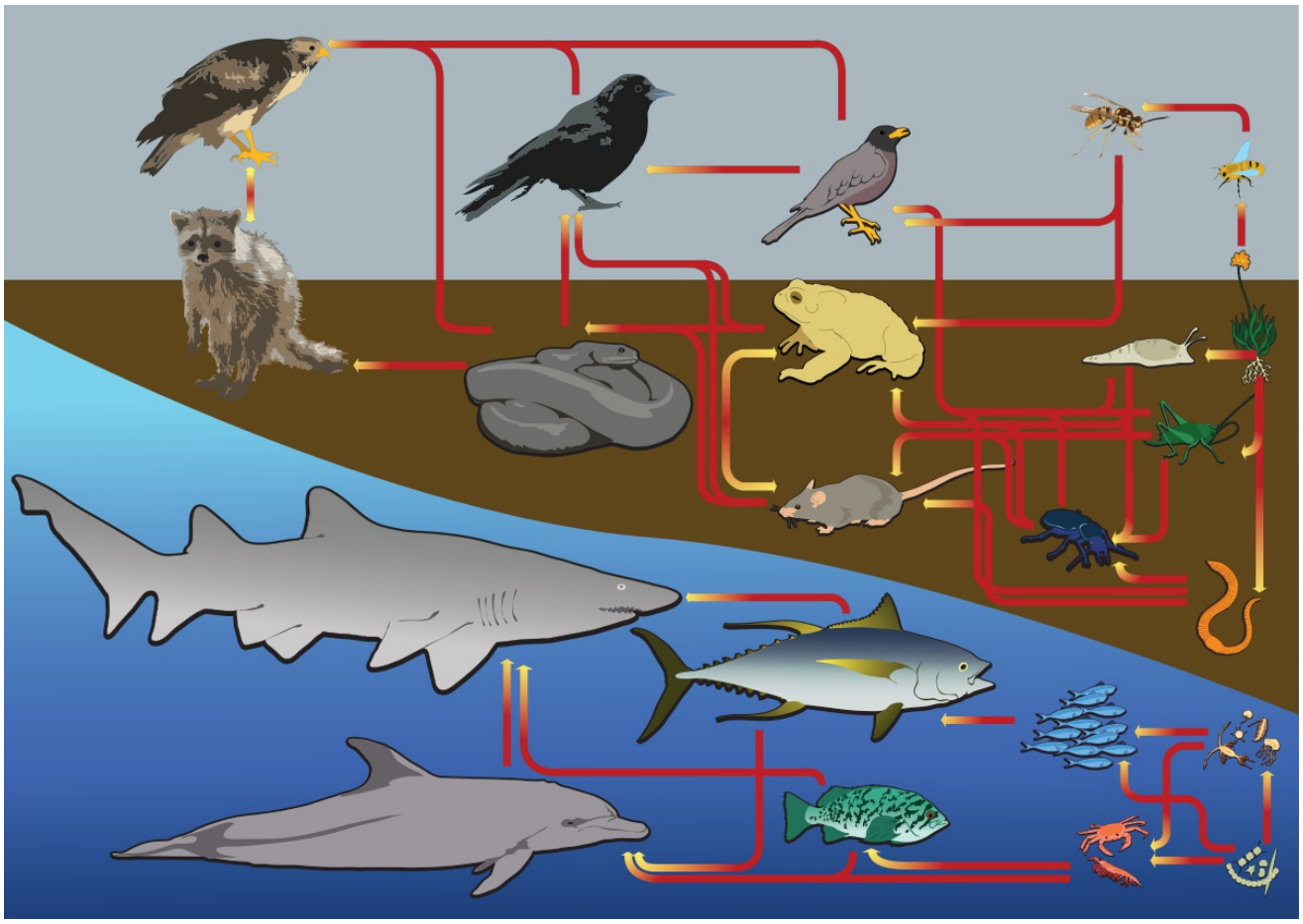
In this lesson, we will cover the topic of Earth systems. We will discuss several important interacting Earth systems and the importance of keeping those systems in balance. Specifically, this lesson will cover the following:

1. Overview of Earth Systems

Earth is the composition of many different systems working together to create our biosphere and planet. These systems have an impact on humans, and humans have an impact on them. Because of this, it is important for us to understand these systems as well as their relationship with each other.

The following are some important Earth systems.

- Atmospheric systems, which include the weather and climate
- Geologic cycles, which include the carbon, water, and nitrogen cycles
- Energy production and cycling, which includes photosynthesis, a vital process for all life
- Energy movement through ecosystems, which includes food webs and food chains (see diagram below)



If these systems are not healthy and balanced, ecosystems cannot thrive, which will inevitably result in negative impacts to the quality of life of human beings.

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2. Balance of Earth Systems

As mentioned before, life on Earth depends on a specific balance in synergy between Earth systems. If one system or piece is affected, over time, it will impact the whole and possibly create significant challenges to life. Life on Earth could be significantly altered if the following are impacted:

- Temperature: Current life on Earth, including humans, has adapted to a particular range of temperatures. If that range were to shift substantially, mass extinction could occur.
- Atmospheric composition: Our atmosphere has reached a concentration of 21% oxygen over millions of years. This composition is essential to human life, and if it increases or decreases, humans could go extinct. In addition, as carbon dioxide increases, global temperatures rise, which could impact life on Earth.

  DID YOU KNOW

  Without our entire atmosphere, most life on Earth would not be able to survive or be protected from falling asteroids, which currently burn up in our atmosphere.

- Ozone: Our ozone layer protects the planet from receiving too much UV radiation, which could cause severe genetic mutations, cancer, and death in all species. The ozone layer also regulates Earth's temperature. Without it, our planet will heat up.
- Water: Life on Earth would not exist at all without water, and if the 3% of fresh water on our planet

disappeared, many species would struggle to survive or go extinct.

IN CONTEXT

Consider what might happen if the balance in just one of these Earth systems tips. Suppose that the concentration of ozone in our atmosphere drops significantly, perhaps because of human air pollutants, such as aerosols, or simply because of natural causes. As the ozone layer thins, UV radiation reaching Earth's surface will increase. This could lead to genetic mutation, increased cancer levels, and even extinction of many species, including humans.

In addition, the increased radiation reaching Earth will tip the balance in Earth's temperature, causing it to heat up. Increased temperatures on Earth will make survival harder for species that have adapted to colder temperature ranges.

Then, as the average global temperature rises, other chain reactions will occur. Ice caps and glaciers will melt faster, reducing the availability of freshwater. Ocean temperatures will heat up and release more carbon dioxide into the atmosphere because oceans are carbon sinks, which will then lead to further rises in average global temperature. This process will continue setting off more and more chain reactions, which is why keeping the balance in our systems is so important.

SUMMARY

In this lesson, we discussed an **overview of Earth systems** and the importance of keeping them in **balance** for life on Earth. We also explored the chain reaction of consequences when the balance in one of these systems is disrupted.

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