

Copy of Earth Systems

by Sophia Tutorial



WHAT'S COVERED

This tutorial will cover the topic of Earth systems. We will discuss several important interacting Earth systems and the importance of keeping those systems in balance.

Our discussion breaks down as follows:

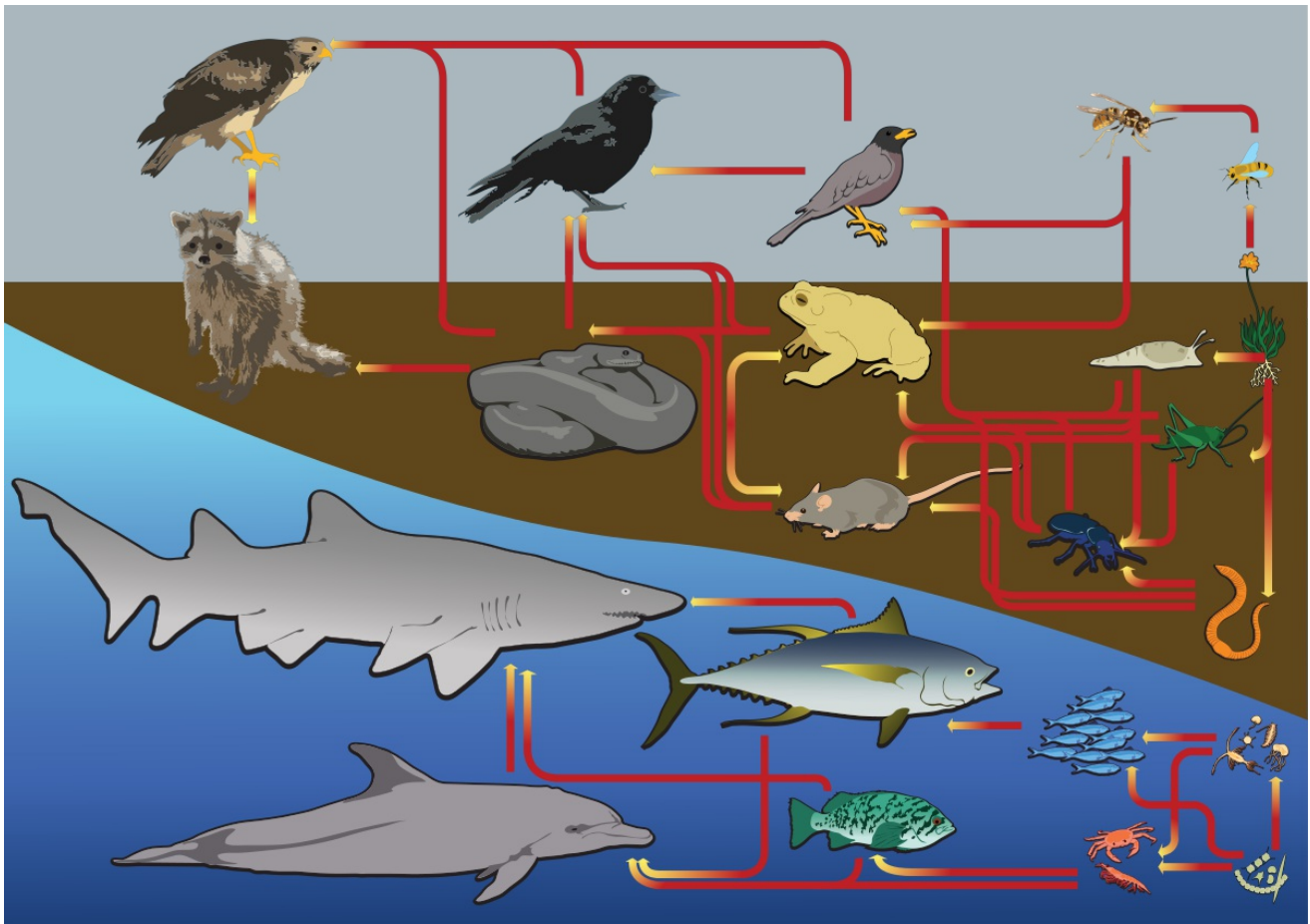
1. Overview of Earth Systems
2. Balance of Earth Systems

1. Overview of Earth Systems

Our 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.

Some important Earth systems are as follows:

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



Without these systems, healthy and balanced, ecosystems cannot thrive, which inevitably results in negative impacts to human quality of life.

2. Balance of Earth Systems

As mentioned, life on Earth depends upon a specific balance in synergy between these Earth systems. If one system or piece is affected, it will inevitably impact the whole over time, possibly creating significant challenges to life.

Life on Earth is dependent on a specific balance between four major systems:

- **Temperature.** Current life on Earth — including humans — has adapted to a particular range of temperatures. If that range were to substantially shift, 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 were to increase or decrease, 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, that could cause

severe genetic mutations, cancer, and death in all species. Our ozone layer also regulates Earth's temperature. Without it, our planet would 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 would go extinct.

IN CONTEXT

Consider what might happen if the balance in just one of these Earth systems were tipped. Suppose that the concentration of ozone in our atmosphere was lowered significantly, perhaps by human air pollutants, such as aerosols, or simply by natural causes. As the ozone layer thinned, UV radiation reaching the earth's surface would increase. This would lead to genetic mutation, increased cancer levels, and even deaths to many species, including humans.

In addition, the increased radiation reaching the earth would tip the balance in Earth's temperature, causing it to heat up. Increased temperatures on Earth would make it harder for other species, who have adapted to colder temperature ranges, to survive.

Then, as the average global temperature rose, other chain reactions would occur. Ice caps and glaciers would melt faster, reducing the availability of freshwater. Ocean temperatures would heat up and release more CO₂ into the atmosphere because oceans are carbon sinks, which would then lead to further rises in average global temperature. This process would continue setting off more and more chain reactions, which is why keeping the balance in our systems is so important.



SUMMARY

Today we learned about Earth systems and the importance of keeping them in balance for life on Earth. We also explored the chain reaction of consequences if the balance in one of these systems is disrupted.

Source: Adapted from Sophia instructor Jensen Morgan, FOOD WEB CC[HTTP://BIT.LY/1MFN5ZI](http://bit.ly/1MFN5ZI)