Ecosystems

**Ecosystems**—communities of organisms living together in combination with their physical environment. Ecosystems can be small, such as the tide pools found near the rocky shores of many oceans, or exceptionally large, such as the Amazon Rainforest in South America.

**What are ecosystems like?**

Some ecosystems are marine, others freshwater, and others yet terrestrial—land based. Ocean ecosystems are most common on Earth, as oceans and the living organisms they contain cover 75% of the Earth's surface. Freshwater ecosystems are the rarest, covering only 1.8% of the Earth's surface.

Terrestrial ecosystems can be further grouped into broad categories called biomes, based on climate. Examples of terrestrial biomes include tropical rain forests, savannas, deserts, coniferous forests, deciduous forests, and tundra.

**Energy and matter in ecosystems**

The organisms found in an ecosystem tend to have adaptations, beneficial features arising by natural selection, which help them get energy and matter in the context of that ecosystem.

Both energy and matter are conserved, neither created nor destroyed, but take different routes through ecosystems:

Matter is recycled; the same atoms are reused over and over.

Energy flows through the ecosystem, usually entering as light and exiting as heat.

**Matter is recycled.**

Matter is recycled through Earth’s ecosystems—though it may move from one ecosystem to another as it does when nutrients are washed away into a river. The same atoms are used repeatedly, assembled into different chemical forms, and incorporated into the bodies of different organisms.

Thanks to this recycling, the atoms that make up your body right now have long, unique histories. They’ve most likely been part of plants, animals, other people, and even dinosaurs!

**Energy flow is unidirectional, or one-way.**

Energy, unlike matter, cannot be recycled in ecosystems. Instead, energy flow through an ecosystem is a one-way street from light to heat.

Energy usually enters ecosystems as sunlight and is captured in chemical form by photo synthesizers like plants and algae. The energy is then passed through the ecosystem, changing forms as organisms metabolize, produce waste, eat one another, and eventually, die and decompose.

Each time energy changes forms, some of it is converted to heat. Heat still counts as energy—and thus no energy has been destroyed.

This one-way flow of energy through ecosystems means that every ecosystem needs a constant supply of energy, usually from the sun, in order to function. Energy can be passed between organisms, but it cannot be recycled because some of it is lost as heat in each transfer.

**Stability and dynamics of ecosystems**

Ecosystems are dynamic systems, and a static ecosystem would be a dead ecosystem. As we discussed energy is constantly flowing through an ecosystem and chemical nutrients are continually being recycled. At higher levels of organization, organisms are dying and being born, populations are fluctuating in their numbers, and climate patterns are varying seasonally and in less predictable ways.