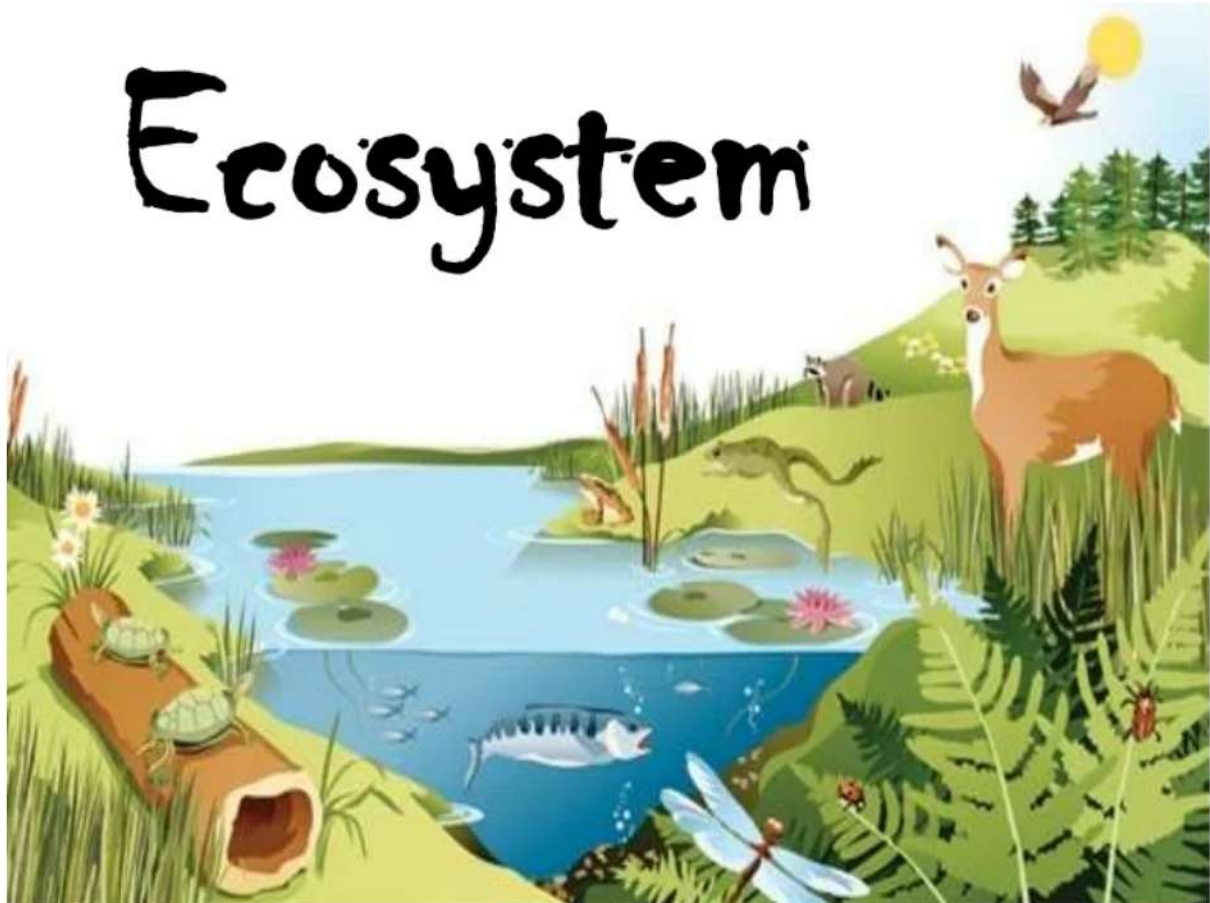


Ecosystems

What is an Ecosystem?

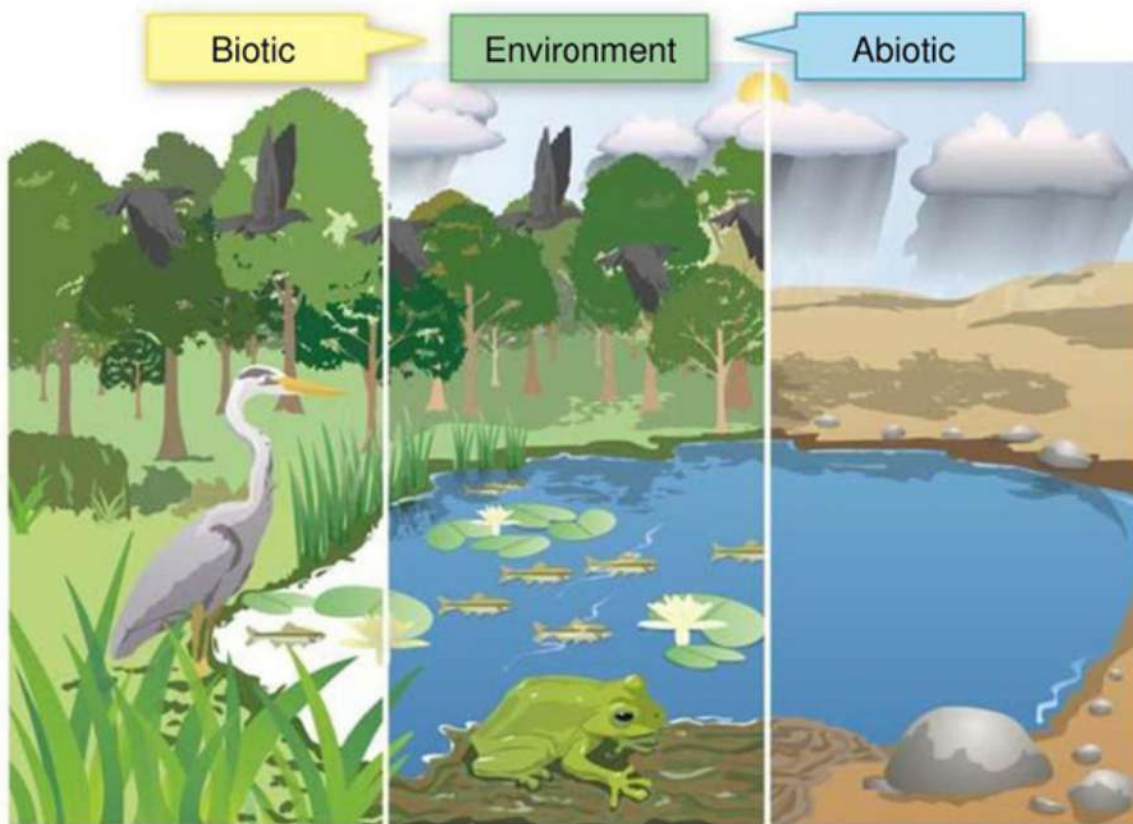


An ecosystem is a system of interacting living organisms and their physical environment. It includes both biotic (living) factors and abiotic (non-living) factors. These factors work together to create a balanced environment where life can thrive.

Biotic Factors:

- **Producers:** Also known as autotrophs, these are organisms like plants and algae that make their own food through photosynthesis. They convert sunlight into energy, forming the base of the food chain.
- **Consumers:** These are organisms that rely on other organisms for food. They are categorized into:
 - **Herbivores:** Eat plants (e.g., rabbits, deer).
 - **Carnivores:** Eat other animals (e.g., lions, eagles).
 - **Omnivores:** Eat both plants and animals (e.g., humans, bears).
- **Decomposers:** These organisms, such as bacteria and fungi, break down dead plants and animals, recycling nutrients back into the environment.

Biotic and Abiotic Factors



Abiotic Factors:

- Sunlight: Provides energy for photosynthesis and influences temperature.
- Water: Essential for all life forms; affects plant growth and animal habitats.
- Temperature: Affects the types of organisms that can survive in an ecosystem.
- Soil: Provides nutrients for plants and affects water retention.
- Air: Supplies oxygen for respiration and carbon dioxide for photosynthesis.

Interactions in Ecosystems:

Interactions in Ecosystems

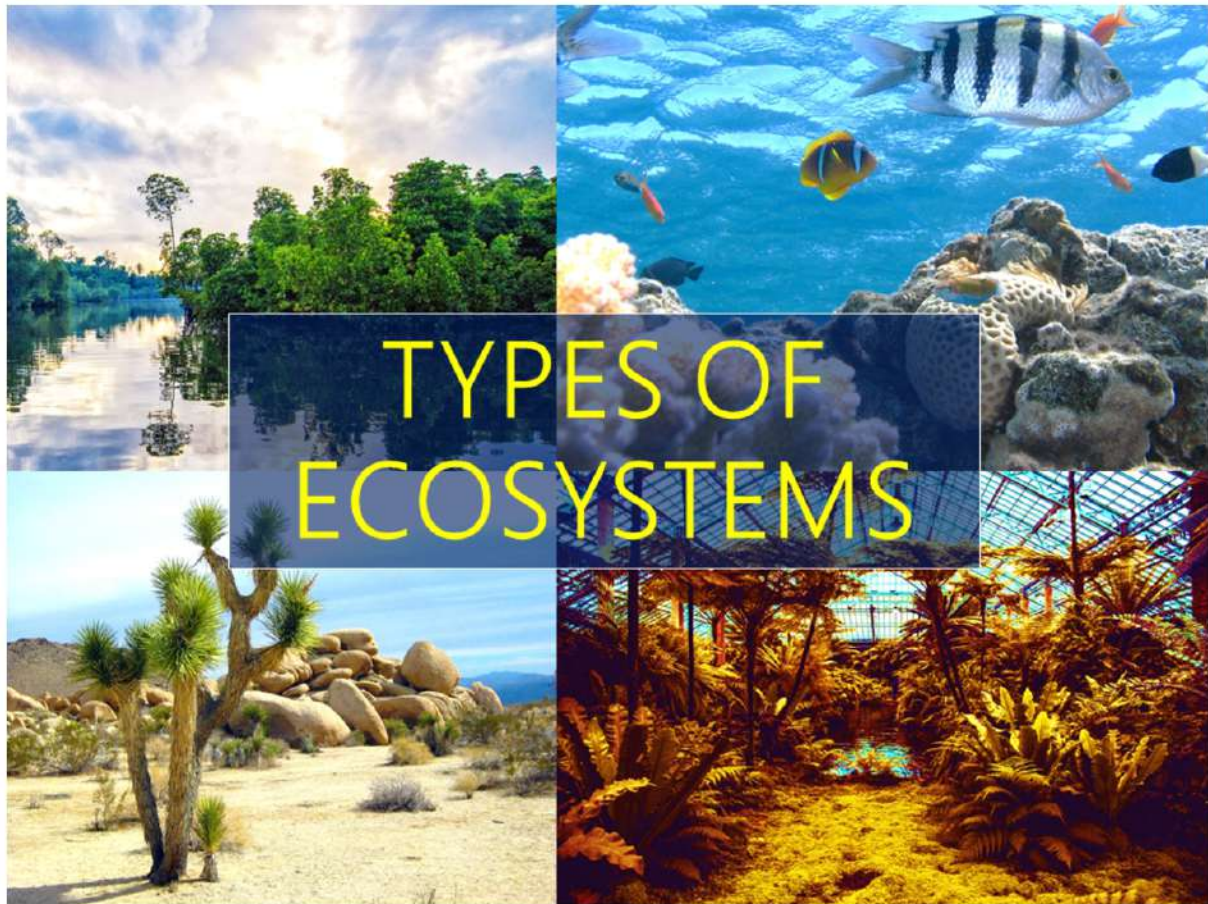


- Predation: One organism (predator) hunts another (prey) for food.
- Competition: Organisms compete for resources like food, water, and shelter.
- Symbiosis: Different species live together in close relationships. This includes mutualism (both benefit), commensalism (one benefits, the other is unaffected), and parasitism (one benefits at the expense of the other).

Types of Ecosystems

1. Forest Ecosystems: Forests are characterized by a dense canopy of trees and high biodiversity. They can be classified into several types:

- Tropical Rainforests: Located near the equator, these forests have warm temperatures and high humidity. They have the highest biodiversity of any ecosystem. Examples include the Amazon Rainforest and the Congo Basin.
- Temperate Forests: Found in regions with moderate climates, these forests have four distinct seasons. They are home to deciduous trees (which shed leaves in autumn) and various wildlife. Examples include the forests of North America and Europe.
- Boreal Forests (Taiga): Located in northern regions, these forests have cold temperatures and coniferous trees (e.g., pine, spruce). They cover large areas of Canada, Russia, and Scandinavia.



TYPES OF ECOSYSTEMS

2. Grassland Ecosystems: Grasslands are dominated by grasses with few trees. They include:

- Prairies: Found in North America, they have tall grasses and are home to large herbivores like bison.
- Savannas: Tropical grasslands with scattered trees, found in Africa, Australia, and South America. They support species like elephants and giraffes.
- Steppes: Dry grasslands found in Asia and Eastern Europe. They have cold winters and hot summers.

3. Desert Ecosystems: Deserts receive very little rainfall and have extreme temperatures. They can be:

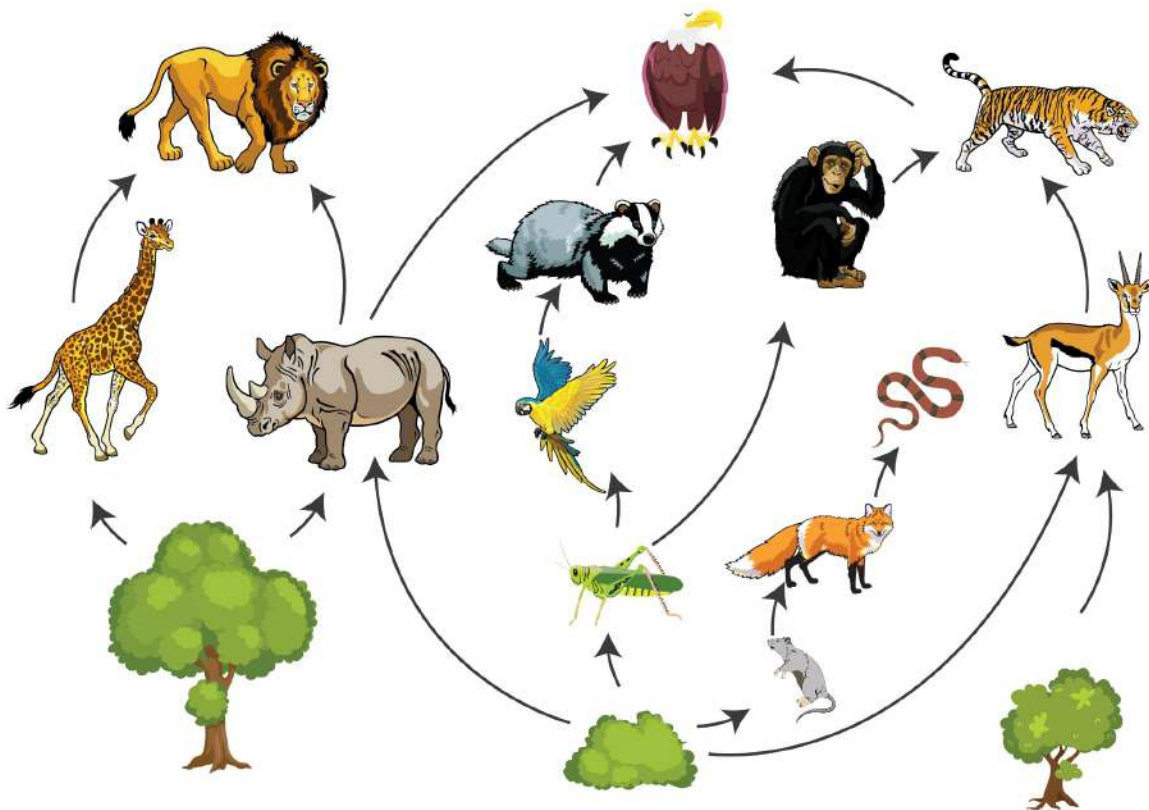
- Hot Deserts: Such as the Sahara in Africa, with scorching temperatures and sparse vegetation.
- Cold Deserts: Such as the Gobi Desert in Asia, with cold winters and limited vegetation.

4. Aquatic Ecosystems: These include both freshwater and marine environments:

- Freshwater Ecosystems: Include lakes, rivers, and wetlands. They support various species adapted to low salt concentrations, such as fish, amphibians, and water plants.

- Marine Ecosystems: Include oceans, coral reefs, and estuaries. Oceans cover most of Earth's surface and support a diverse range of life, including fish, marine mammals, and coral reefs. Estuaries, where freshwater meets saltwater, are highly productive and support many species.

Food Chains and Food Webs



Food Chain: A food chain illustrates how energy and nutrients move through an ecosystem. It starts with a producer and follows a path through various consumers. For example:

- Grass (Producer) → Grasshopper (Primary Consumer) → Frog (Secondary Consumer) → Snake (Tertiary Consumer)

Food Web: A food web is a more complex representation of how food chains interconnect in an ecosystem. It shows multiple food chains and how they overlap. For example, in a forest ecosystem, a plant might be eaten by a deer, while insects might eat the plant. Both the deer and insects might then be preyed upon by a fox.

Trophic Levels:

1. Primary Producers: Plants and algae that produce energy through photosynthesis.
2. Primary Consumers: Herbivores that eat plants.

3. Secondary Consumers: Carnivores that eat herbivores.
4. Tertiary Consumers: Top predators that eat other carnivores.

Energy Flow: Energy flows from producers to consumers and is lost as heat at each trophic level. Only about 10% of the energy is passed from one level to the next, meaning that higher trophic levels have less energy available.

Nutrient Cycling: Nutrients are recycled through ecosystems, ensuring that essential elements are reused. Key nutrient cycles include:

- **Carbon Cycle:** Carbon moves between the atmosphere, organisms, and the Earth. Plants absorb carbon dioxide for photosynthesis, and animals release it through respiration.
- **Nitrogen Cycle:** Nitrogen is fixed by bacteria, used by plants, and then passed through the food chain. Decomposers return nitrogen to the soil.
- **Phosphorus Cycle:** Phosphorus is found in rocks and soil. It is absorbed by plants, moves through the food chain, and returns to the soil through decomposition.

Human Impact on Ecosystems



1. **Deforestation:** The removal of forests for agriculture or urban development disrupts ecosystems, leading to loss of biodiversity and habitat destruction. It can also contribute to climate change by increasing carbon dioxide levels.

2. **Pollution:** Pollution from chemicals, waste, and industrial activities contaminates air, water, and soil. This can harm or kill plants and animals, disrupt food chains, and lead to health problems in humans.

3. **Climate Change:** Human activities, such as burning fossil fuels, increase greenhouse gases in the atmosphere, leading to global warming. This affects ecosystems by altering temperature and precipitation patterns, which can disrupt species and habitats.

4. **Overexploitation:** Overfishing, hunting, and harvesting of natural resources can deplete populations of species and disrupt ecosystems. It can lead to imbalances and affect the survival of other species.

5. **Habitat Destruction:** Urbanization and industrial activities destroy natural habitats, leading to loss of species and reduced biodiversity. This can result in the extinction of species and the disruption of ecosystem functions.

Conservation Efforts: To mitigate human impact, conservation efforts include:

- **Protected Areas:** Establishing national parks and reserves to protect habitats and species.
- **Sustainable Practices:** Using resources in ways that do not deplete them and allow for regeneration.
- **Pollution Reduction:** Implementing policies and practices to reduce pollution and waste.
- **Restoration Projects:** Rehabilitating damaged ecosystems to restore their natural functions.

Conclusion

In summary, ecosystems are vital systems composed of living organisms and their physical surroundings, intricately connected through complex interactions. They provide essential services such as clean air, water, and fertile soil, supporting the diversity of life on Earth. Human activities, including deforestation, pollution, and climate change, pose significant threats to these delicate systems, leading to the loss of biodiversity and disruption of ecological balance. It is crucial to recognize the importance of ecosystems and actively engage in conservation efforts to mitigate these impacts. By promoting sustainable practices and protecting natural habitats, we can ensure the health and resilience of ecosystems for future generations. Understanding and valuing these natural systems is key to preserving the Earth's environmental heritage and maintaining the well-being of all living organisms.