
GRASSHOPPER
BIRD
PRODUCER
SECONDARY CONSUMER
ECOLOGY
GRASS
FOX
ENERGY
TERTIARY

INTRODUCTION

Imagine standing in the middle of a dense forest. Birds are singing, insects are buzzing, and the trees are swaying in the wind. Beneath your feet, the soil teems with life—worms, ants, and countless tiny creatures. Above, sunlight shines down, providing energy for the plants. What keeps everything in balance?

Everything in an ecosystem, from the tiniest microbe to the tallest tree, is connected. Ecosystems are made up of living things (like animals and plants) and non-living things (like water, air, and sunlight). Together, they work like a team, making sure that energy moves smoothly and nutrients are recycled. But what happens when one part of this system changes? What happens when humans or natural disasters mess with the balance?

In this unit, you'll explore how energy flows through ecosystems—from producers (like plants that turn sunlight into food) to consumers (like animals that eat plants or other animals) and decomposers (like fungi that break down dead matter). You'll learn about important cycles in nature, like the water, carbon, and nitrogen cycles, and how they help keep everything in balance.

But change is always happening. You'll discover how disruptions, such as pollution or habitat loss, can affect the flow of energy and nutrients. You'll also learn why biodiversity, or having many different types of plants and animals, is so important for keeping ecosystems strong and healthy.

By the end of this unit, you'll understand how everything in an ecosystem is connected, and how symbiotic relationships (like when bees pollinate flowers) help organisms survive and thrive. Whether it's how plants use photosynthesis to create energy or how animals adapt to new conditions, you'll see how every living thing plays a role in maintaining a healthy ecosystem.

Are you ready to become an ecosystem expert? Let's dive into the web of life and see how all the parts fit together!

VOCABULARY

Vocabulary Word	Definition
10% Energy Rule	
Abiotic Factor	
Adaptation	
Atmospheric Nitrogen	
Autotroph	
Bacteria	
Biotic Factor	
Carbon Cycle	

Vocabulary Word	Definition
Carnivore	
Commensalism	
Competition for Resources	
Decomposer	
Detritivore	
Ecological Pyramid	
Ecological Succession	
Ecosystem	

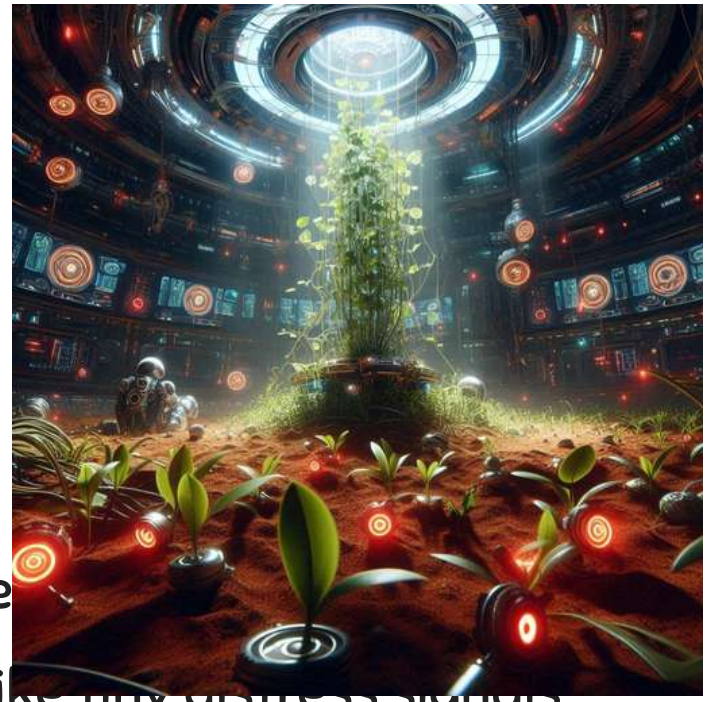
Vocabulary Word	Definition
Ecosystem Instability	
Ecosystem Stability	
Flow of Energy	
Food Chain	
Food Web	
Fungi	
Herbivore	
Heterotroph	

Vocabulary Word	Definition
Homeostasis	
Invasive Species	
Mutualism	
Natural Disaster	
Nitrogen Cycle	
Nitrogen Fixation	
Omnivore	
Organism	

Vocabulary Word	Definition
Parasitism	
Pioneer Species	
Population	
Population Diversity	
Predation	
Primary Consumer	
Primary Succession	
Producer	

Vocabulary Word	Definition
Respiration	
Secondary Consumer	
Secondary Succession	
Species	
Species Diversity	
Symbiotic Relationship	
Tertiary Consumer	
Trophic Level	

PHENOMENON



- Mission Log – Sol 138
- Location: Mars HAB – Ecosystem Bay, Sector 7

It started with the silence.

The buzz of Martian pollinators that usually fluttered around the hydroponic bay had stopped.

The nutrient sensors in the root modules flickered re
began to fall—one by one—curling in on themselves like tiny distress signals.

Sector 7, home to the colony's main closed-loop ecosystem, was failing.

This system was designed to be perfect: sunlight-fed algae tanks, carefully balanced nutrient cycles, artificial weather systems, and a thriving food web of plants, insects, and decomposers. It mirrored Earth's ecosystems—except smaller, controlled, and sealed inside a glass dome on a planet 140 million miles from home.

Now, something was breaking the balance.

You pull up the data: oxygen levels are dropping, carbon dioxide is climbing, and the water filtration loop is sluggish. The decomposers aren't breaking down waste properly. The herbivores are eating faster than the plants can regrow. One small imbalance has triggered a chain reaction—and nobody knows what started it.

As part of the Life Support Response Team, your job is to figure out:

- What's missing?
- What's overproducing?
- What's out of sync?

To do that, you'll need to dig deep into how energy flows and matter cycles through ecosystems.

You'll explore how producers, consumers, and decomposers interact, how the water, carbon, and nitrogen cycles support life, and how biodiversity helps systems bounce back from stress.

You'll also investigate:

- How human actions inside the HAB—like resource overuse or adding new species—may have caused disruptions
- How different types of symbiotic relationships are being affected
- Whether this collapse was caused by a natural ecological shift... or human interference

Sector 7 was meant to be stable. Resilient. Balanced.

But ecosystems are living puzzles—and one missing piece can take down the whole picture.

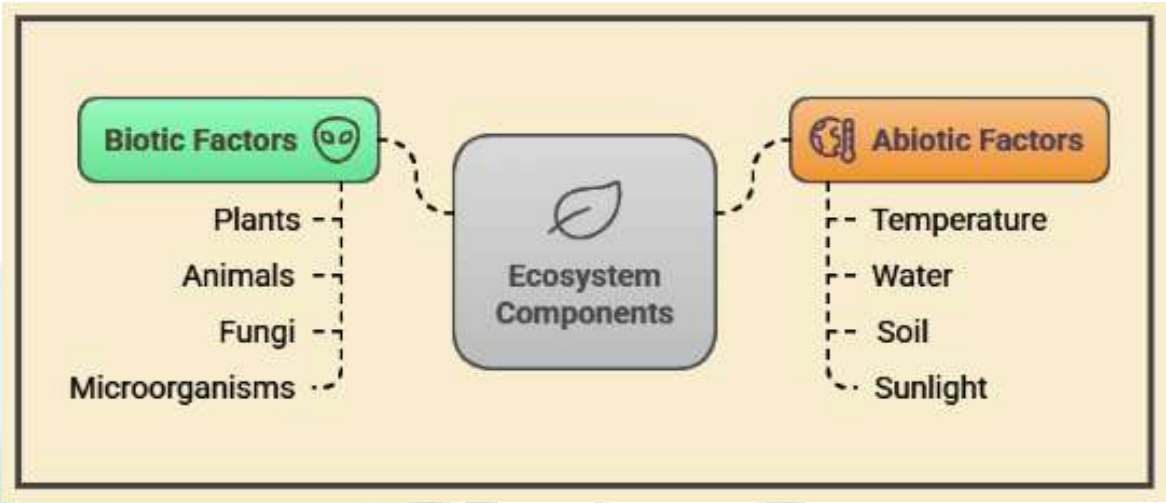
- Your mission: Restore the flow. Rebalance the system. Protect the future.

ECOSYSTEMS

Introduction to Ecosystems

- What is an Ecosystem?
  - An **ecosystem** is a place where **living** things, like plants and animals, interact with **nonliving** things, like water, soil, and air.
    - **Example**: A **forest** ecosystem includes trees, deer, birds, soil, rivers, and sunlight.
- Basics of Ecosystems
  - **Living** things (**biotic**): These include plants, animals, bacteria, and decomposers.
    - **Example**: Bees pollinate flowers, and earthworms break down soil.
  - **Non-living** things (**abiotic**): These include rocks, soil, water, air, and sunlight.
    - **Example**: Rivers provide water for fish and animals.

Ecosystems



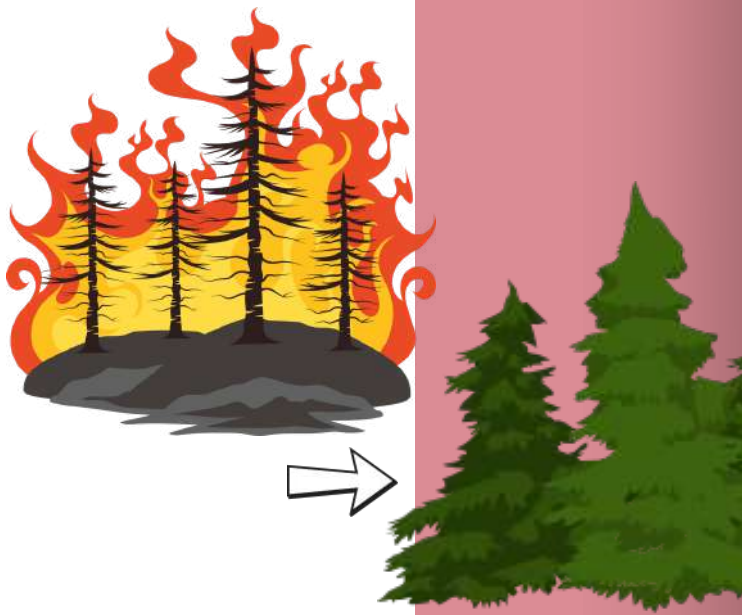
Stability

Ecosystems rely on energy flow, recycling nutrients, and recovering from disturbances.

- Stable Ecosystems
  - A **stable** ecosystem has:
    - **High biodiversity:** Many **different** species live together.

- **Balanced nutrient recycling: Nutrients** move evenly **in** and **out**.
  - **Example:** In a pond, decaying plants release nutrients for algae.

- **Resilience to disturbances:** The ability to **recover** after **storms** or **fires**.
  - **Example:** Grasslands regrow quickly after a wildfire.



However, issues like pollution, habitat loss, and climate change can make ecosystems less stable

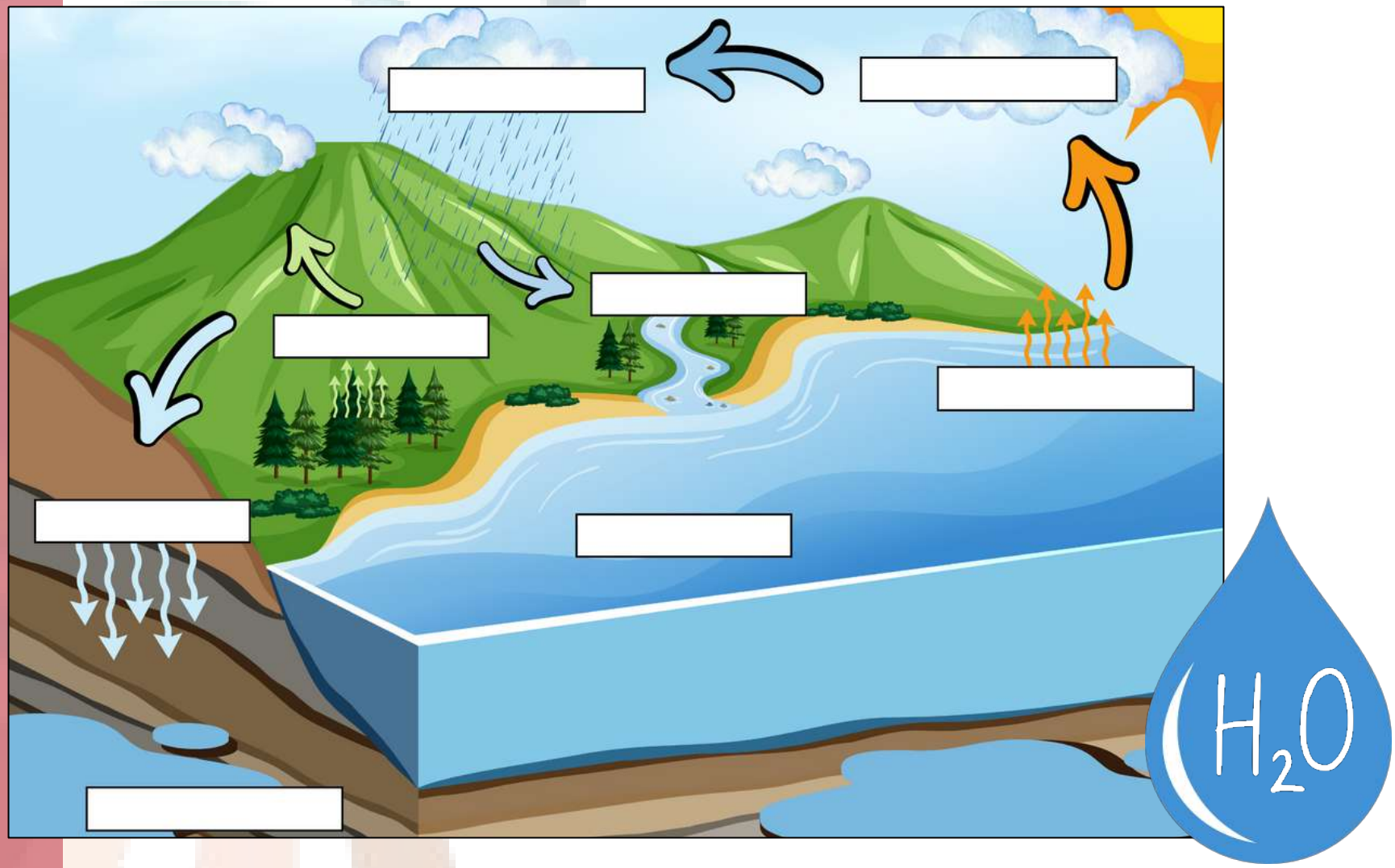
- What are biotic factors in an ecosystem? Can you think of examples of how they help keep an ecosystem stable?
- What are abiotic factors in an ecosystem? How do they affect the living things in an ecosystem?
- Why do you think both biotic and abiotic factors are important for keeping an ecosystem stable? Can you think of a time when changing one of these factors might affect the ecosystem?
- How might the balance between biotic and abiotic factors change in an ecosystem? What could happen if one of these factors is changed or removed?
- Which do you think is more important for an ecosystem: biotic factors or abiotic factors? Why do you think that?

NUTRIENT CYCLING

How Matter and Energy Move in Ecosystems

- **Water Cycle** – The water cycle shows how water moves through Earth:
  - **Evaporation**: Water turns into **vapor** and **rises**.
  - **Condensation**: Water vapor **cools** and forms **clouds**.

- **Precipitation**: Rain, snow, or hail **falls** from **clouds**.
  - **Example**: Rain provides water for rivers, plants, and animals.
- **Runoff**: Water **flows** into **rivers**, **lakes**, and **oceans**.

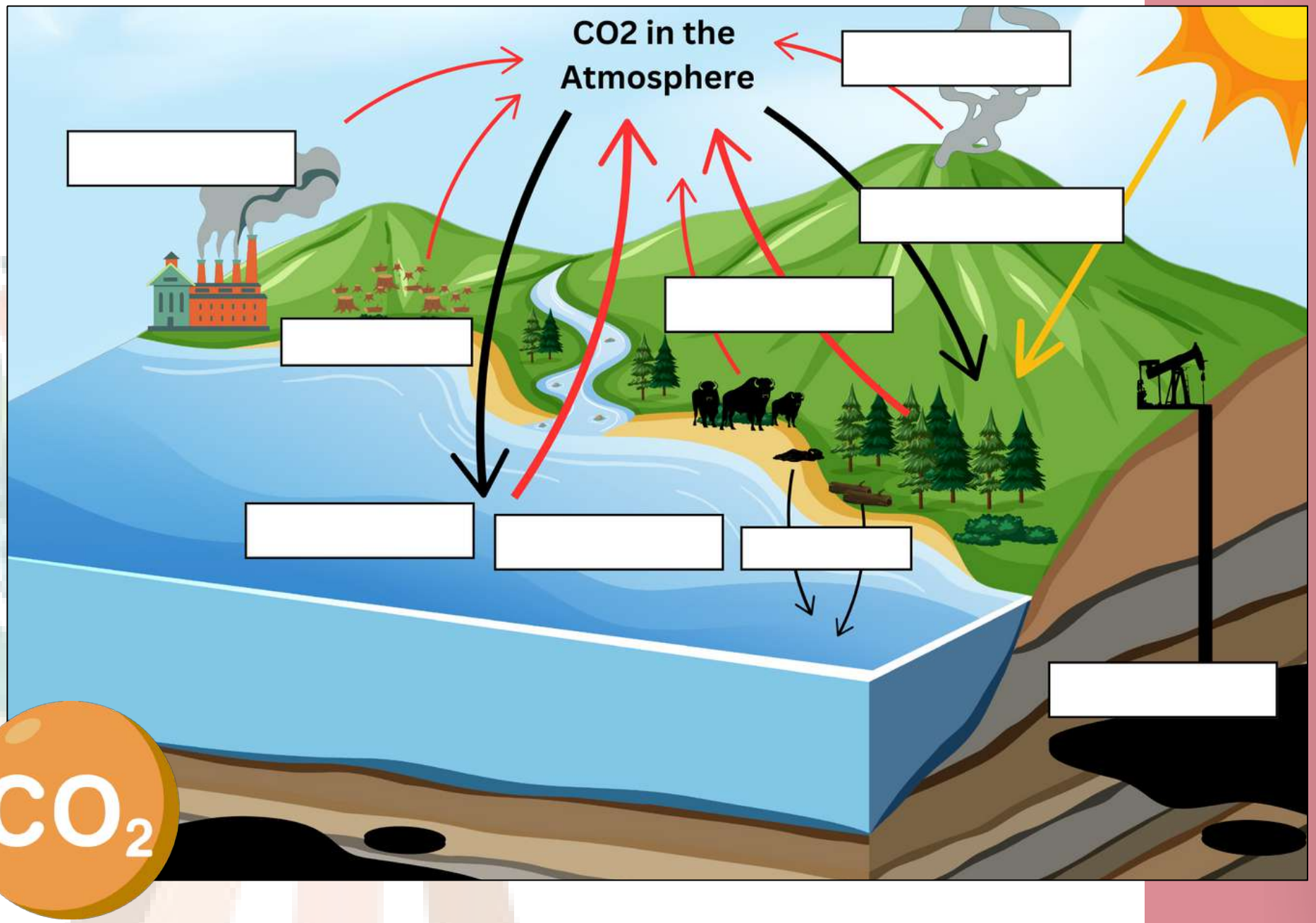


The water cycle provides life-giving water for plants and animals.

Carbon Cycle – The carbon cycle moves carbon around in ecosystems:

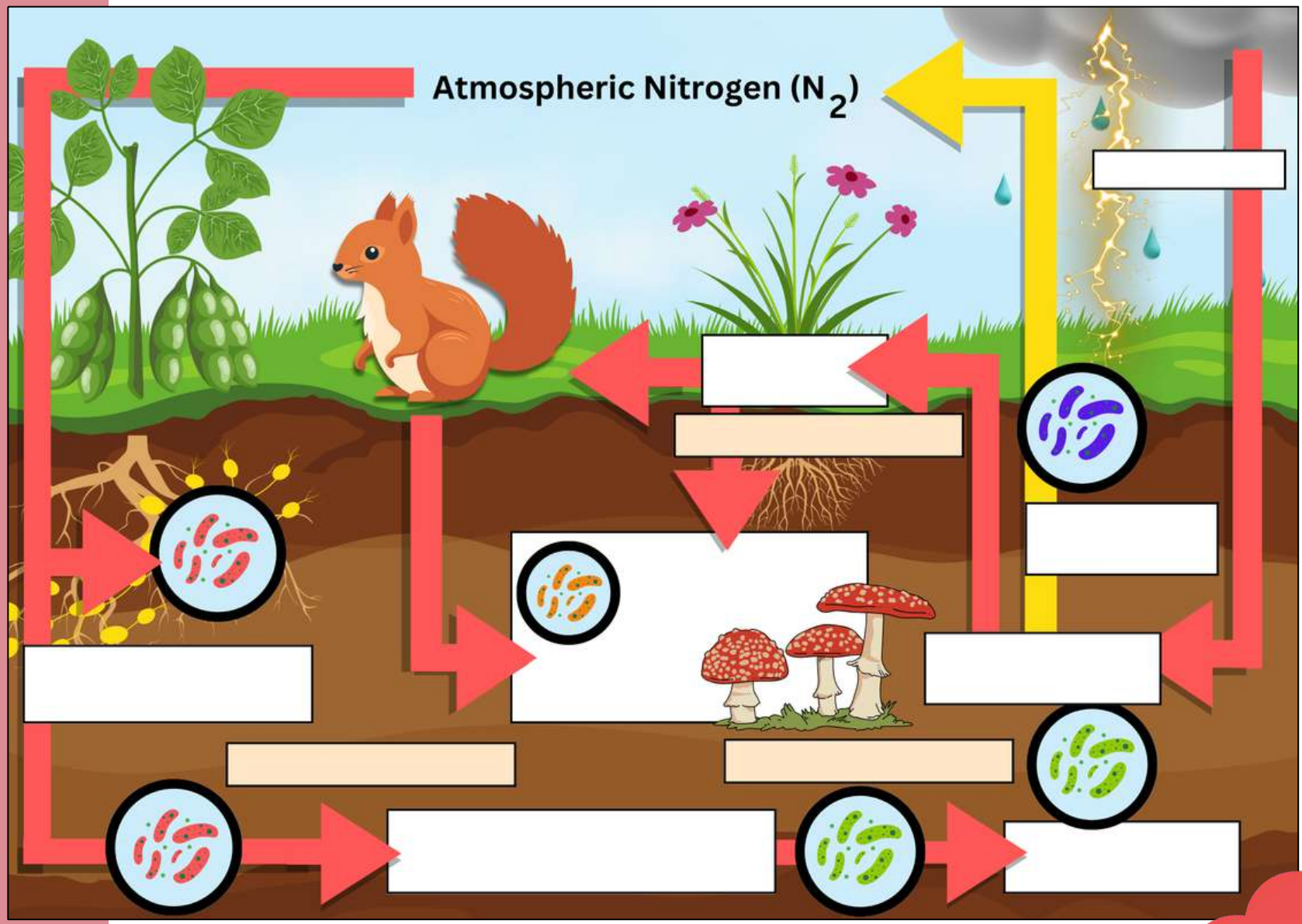
- **Photosynthesis:** Plants use **sunlight and carbon dioxide to make food.**
  - **Example: Forest trees absorb carbon dioxide and grow.**
- **Respiration:** Animals and plants use **food** for **energy** and **release** carbon dioxide.
  - **Example:** A lion breathing releases carbon dioxide.
- **Decomposition: Dead** plants and animals **return carbon** to the **soil**.
  - **Example:** A fallen tree decays and enriches the soil.
  - **Burning fuels: Fossil fuels** like coal or gas **release** carbon dioxide

- **Example:** Driving cars adds carbon to the atmosphere.



Nitrogen Cycle – Nitrogen moves between air, soil, and living things:

- **Nitrogen fixation**: Special **bacteria** make nitrogen in the air usable for plants.
  - **Example**: Clover plants have bacteria on their roots to fix nitrogen.
- **Nitrification**: Bacteria **change** nitrogen into **forms** plants can **use**.
  - **Example**: Soil bacteria convert nitrogen for crops like wheat.
- **Denitrification**: Bacteria **return** nitrogen **back** to the **air**.
  - **Example**: Wetlands are common places for denitrification.



These cycles keep ecosystems healthy by moving water, carbon, and nitrogen to where they are needed.

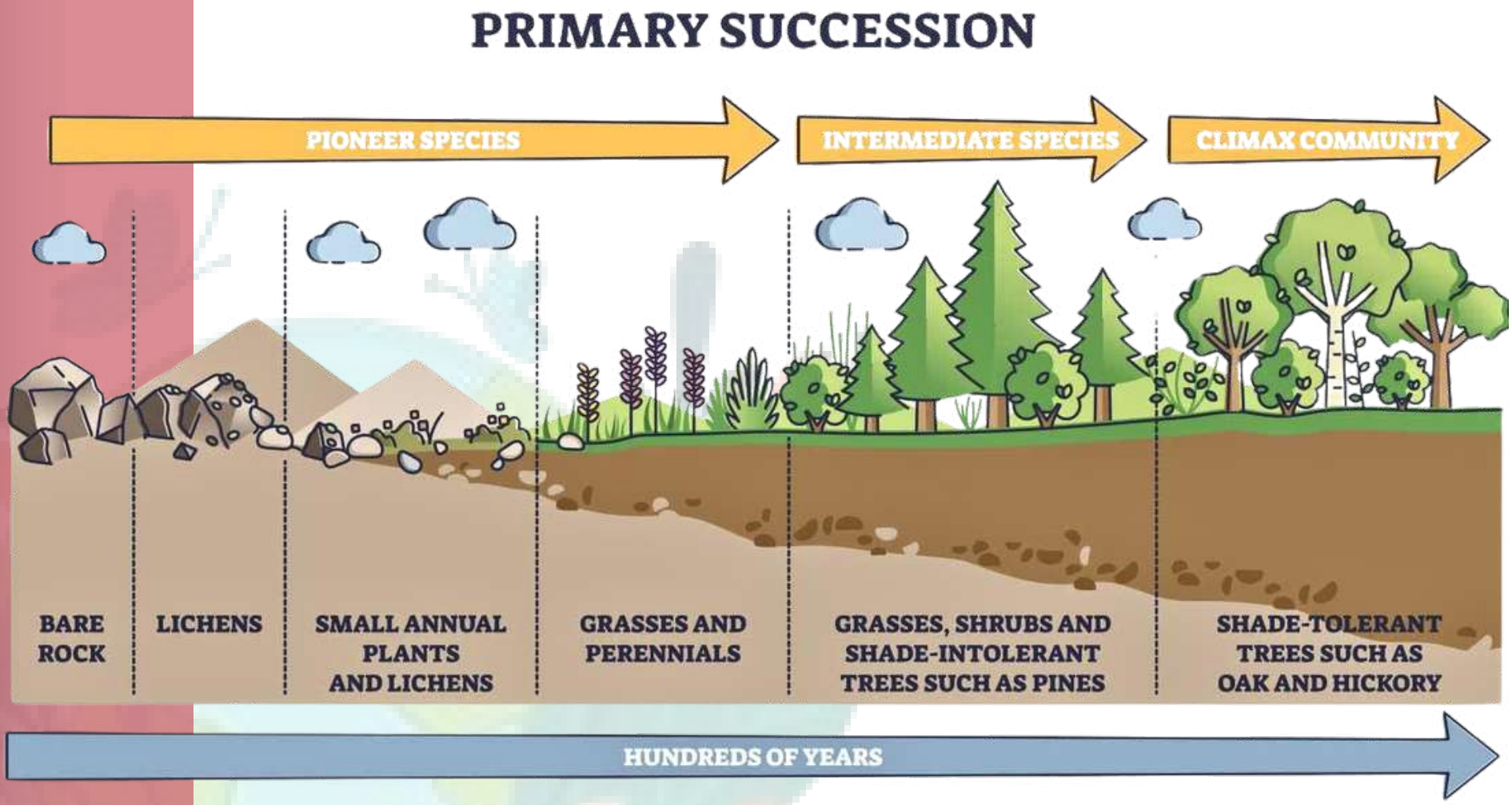
N_2

- What is the carbon cycle, and how does it help living things get the carbon they need?
- How does the water cycle provide necessary water and nutrients to plants and animals?
- Why is the nitrogen cycle important for plants and animals? How does it help them grow?
- Can you explain how the water cycle connects to the carbon cycle and helps move nutrients through the environment?
- What could happen if one of these cycles (carbon, water, or nitrogen) was disrupted? How might that affect ecosystems?

ECOLOGICAL CHANGE

How Ecosystems Change Over Time

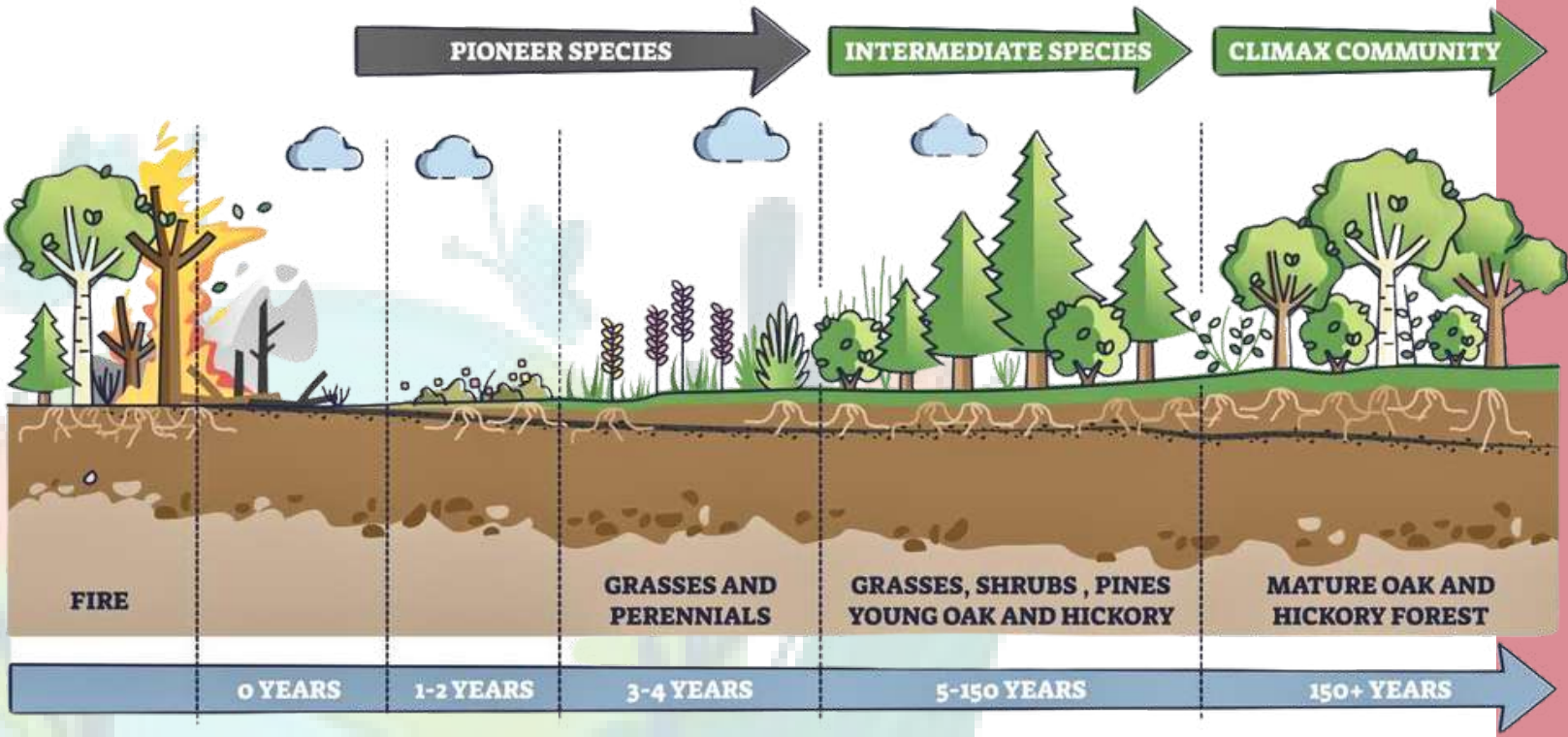
- What is Ecological Succession? **Ecological succession** is the **natural process** where ecosystems **change** and **grow** over **time**.



- **Secondary Succession:** Happens where **soil** is already **present** (like after a **fire**).
  - **Example:** Grass re-grows quickly in a burned field, followed by shrubs and trees → **climax community**

- **Types of Succession**
- **Primary Succession:** Starts with bare rock (like after a volcano erupts).
  - **Pioneer Species:** first species into an area - **Lichens** and **mosses** - **breaks** down **rocks** into **soil**.
  - **Seed dispersal:** birds, insects, and wind carry **seeds** of **grasses** and small **shrubs** into the area.
  - **Smaller trees** and then **bigger** trees grow
  - Eventually leading to a **climax community** - sum of all **biotic** factors - plants and animals - **huge** amounts of **diversity**

SECONDARY SUCCESSION

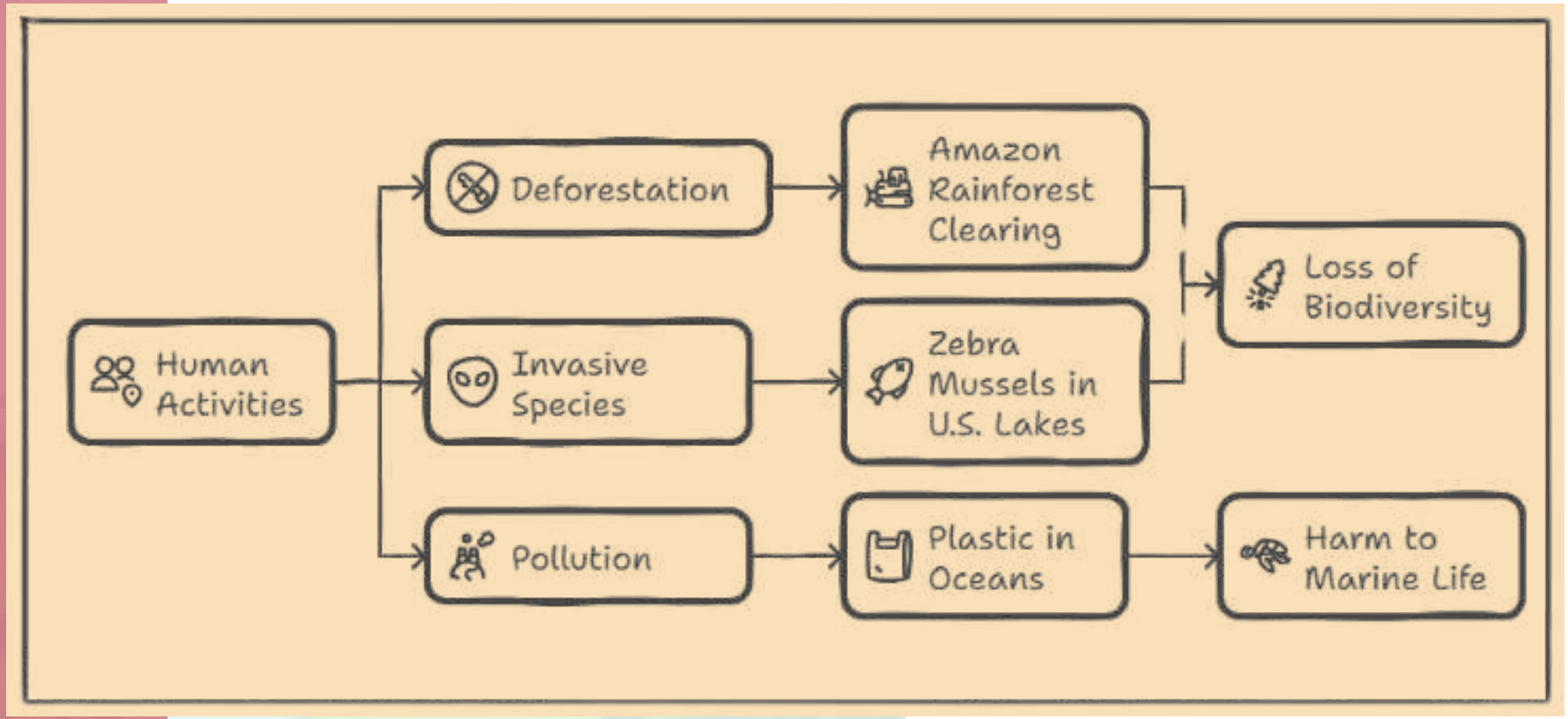


- What is primary succession, and how is it different from secondary succession?
- Can you explain what happens during primary succession when there is no soil? How do plants and animals start to grow in this new area?
- What is secondary succession, and how does it happen in areas where soil already exists?
- Why is it important for ecosystems to go through succession? How does this help restore balance in the environment?
- How might primary and secondary succession look different after a forest fire or a volcanic eruption?

HUMAN IMPACT

Human Impacts on Ecosystems

- **Human Activities That Harm Ecosystems**
  - **Deforestation:** Cutting down forests for farming or construction.
    - **Example:** The Amazon rainforest is cleared for cattle ranching.
  - **Invasive species:** Non-native species harm ecosystems.
    - **Example:** Zebra mussels crowd out native species in U.S. lakes.
  - **Pollution:** Harmful substances damage plants and animals.
    - **Example:** Plastic in oceans harms fish and sea turtles.



RECOVERY

How to Help Ecosystems Recover

- **Reforestation:** Plant trees to restore forests.
  - **Example:** Replanting trees in areas damaged by logging.

- **Wetland restoration:** Fix wetlands by removing harmful plants and adding native ones.
  - **Example:** Restoring the Everglades in Florida.

- **River and ocean clean-ups:** Remove pollution.
  - **Example:** Community events clean rivers and beaches.

How organisms adapt to changes

How Changes Affect Living Things

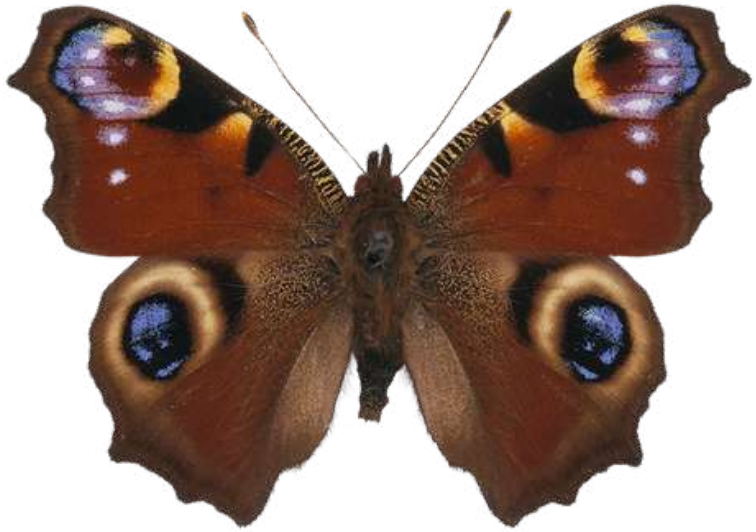
- **Natural selection:** Animals with better traits survive and reproduce.
- **Examples of Adaptations**
  - **Camouflage:** Animals blend into their surroundings.
    - **Example 1:** Arctic foxes have white fur to hide in snow.
    - **Example 2:** Leaf insects look like leaves, making them hard to spot.

Coral (poisonous)

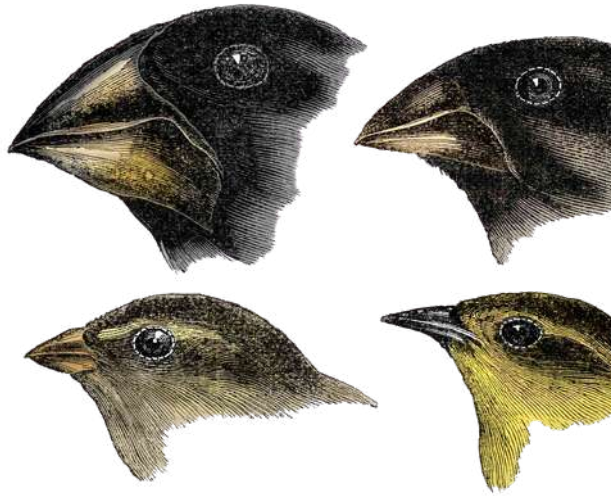
King (non-poisonous)

  - **Mimicry: Animals look or act like something else to survive.**
    - **Example 1:** Scarlet king snakes mimic venomous coral snakes to scare predators.

- **Example 2:** Moths with wing patterns that look like large eyes scare away birds.
- **Example 3:** Orchid mantises look like flowers to attract prey.



- **New traits: Animals develop traits to handle changes.**
  - **Example 1:** Darwin's finches have different beak shapes to eat different foods.
  - **Example 2:** Some fish, like the Atlantic killifish, survive in polluted waters.
  - **Example 3:** Bacteria evolve resistance to antibiotics.



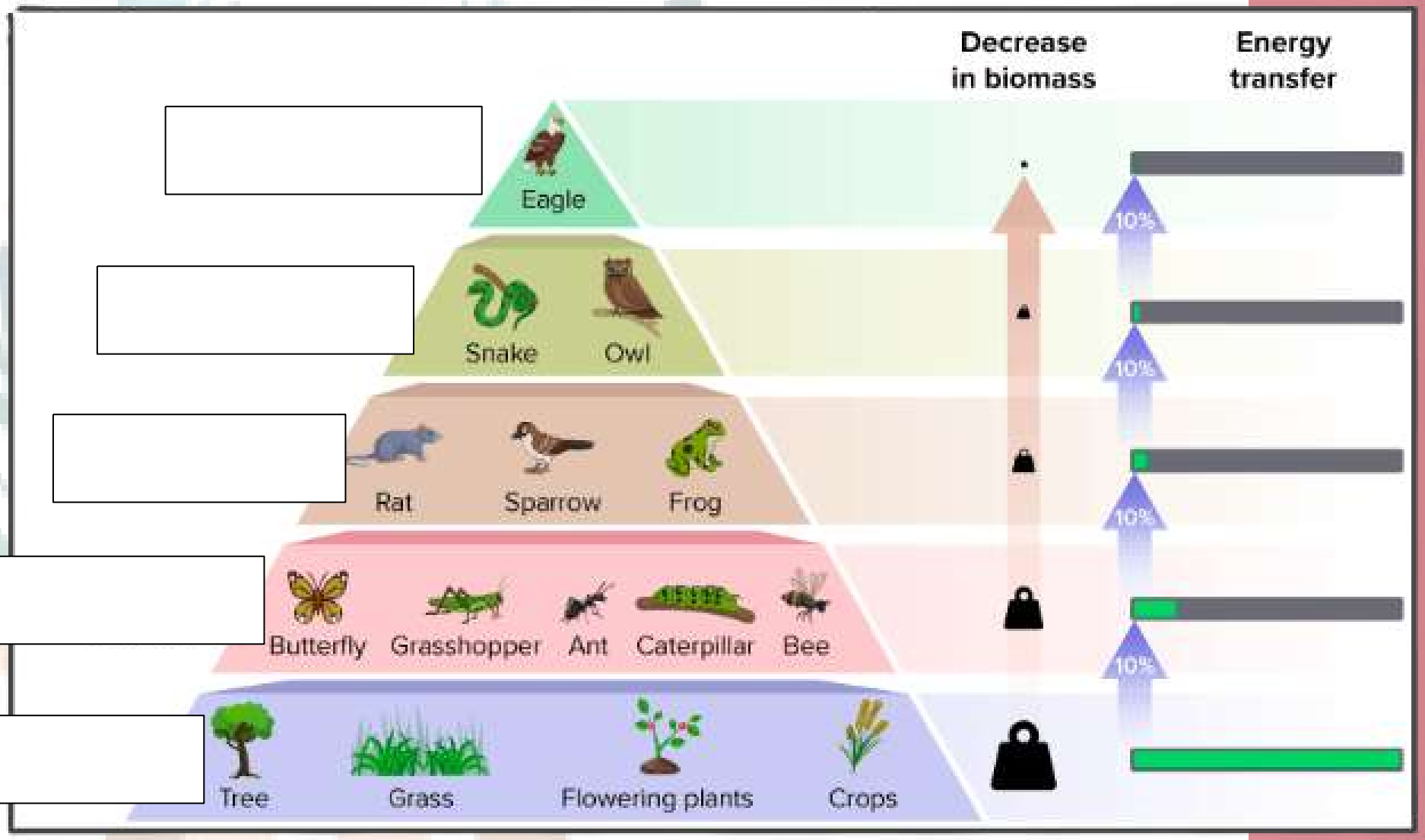
- What is animal adaptation, and how do animals change to survive in their environment? Can you think of an example?
- How do changes in an ecosystem affect the animals living there? What might happen if their environment changes quickly?
- Can animals adapt to changes in their ecosystem? How might an animal change over time to survive in a new environment?
- Why do you think some animals are better at adapting to changes in their ecosystem than others?
- How do animals and plants work together to adapt to changes in an ecosystem, like a change in temperature or food availability?

ENERGY FLOW

Introduction

- **What are trophic levels and why are they important?**
  - **Trophic levels** are the steps in a **food chain**, where **organisms** get **energy** from each **other**. They are important because they show how **energy** moves **through** an **ecosystem**.
- **Overview of energy flow in ecosystems:**
  - **Energy flows** through **ecosystems** from the **sun** to plants

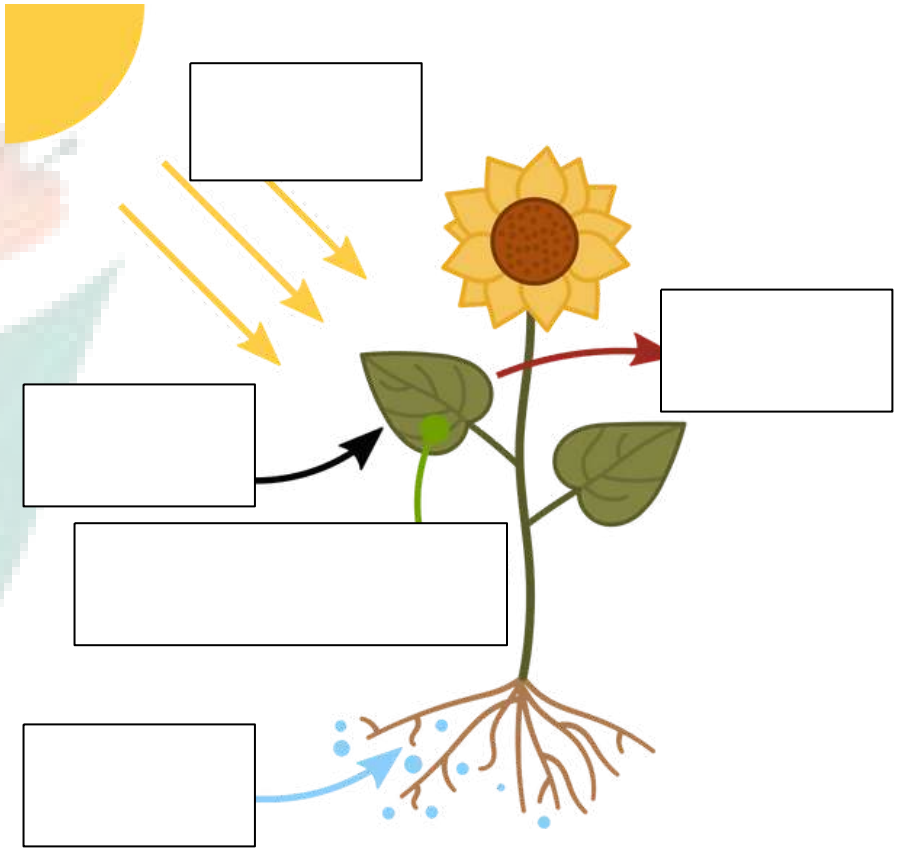
(**producers**), then to animals (**consumers**), and finally to **decomposers**. This flow is important because it helps organisms get the energy they need to live.



From the Bottom - Producers?

Producers and Primary Productivity

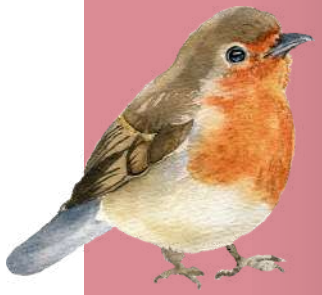
- **What are producers and their role in capturing energy?**
  - **Producers** are organisms like **plants** that use **sunlight** to make **food** through a process called **photosynthesis.**
  - **Photosynthesis** turns **sunlight** into **chemical energy,** which is **stored in glucose (a type of sugar).**
- **Producers** are at the **bottom** of the **food chain** and are the **first trophic level.**

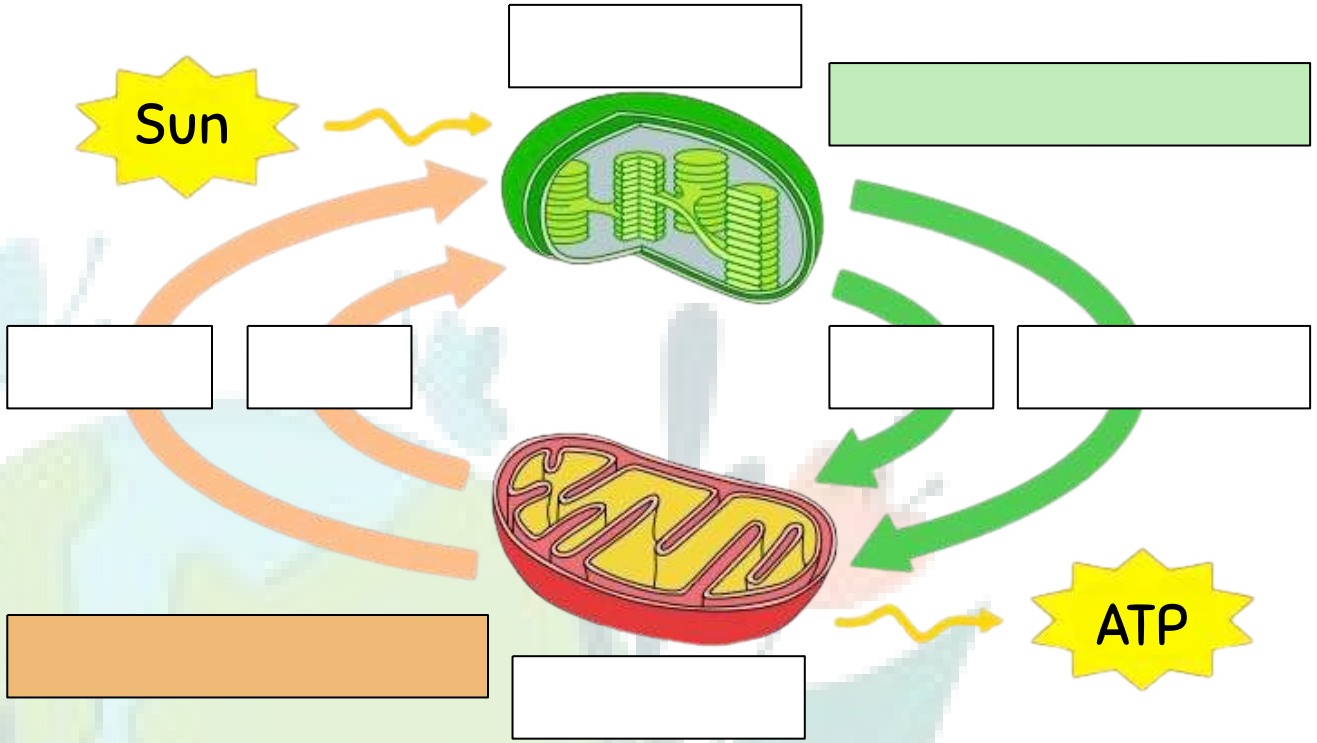


WHO IS NEXT?

Consumers and Food Chains/Webs

- **Cellular Respiration** and **Energy Flow** in Ecosystems
  - **Cellular respiration** is the process where organisms **break down glucose** to get **energy** in the form of **ATP** (the energy cells use).
  - It **happens** in the **mitochondria** of **plant** and **animal** cells.
- **How does cellular respiration fit into the energy flow?**
  - After **producers** create **food** through **photosynthesis**, organisms use **cellular respiration** to **release** energy from the **food** they **eat**.



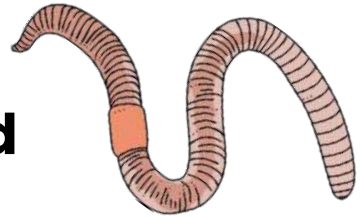


WHO EATS WHOM?

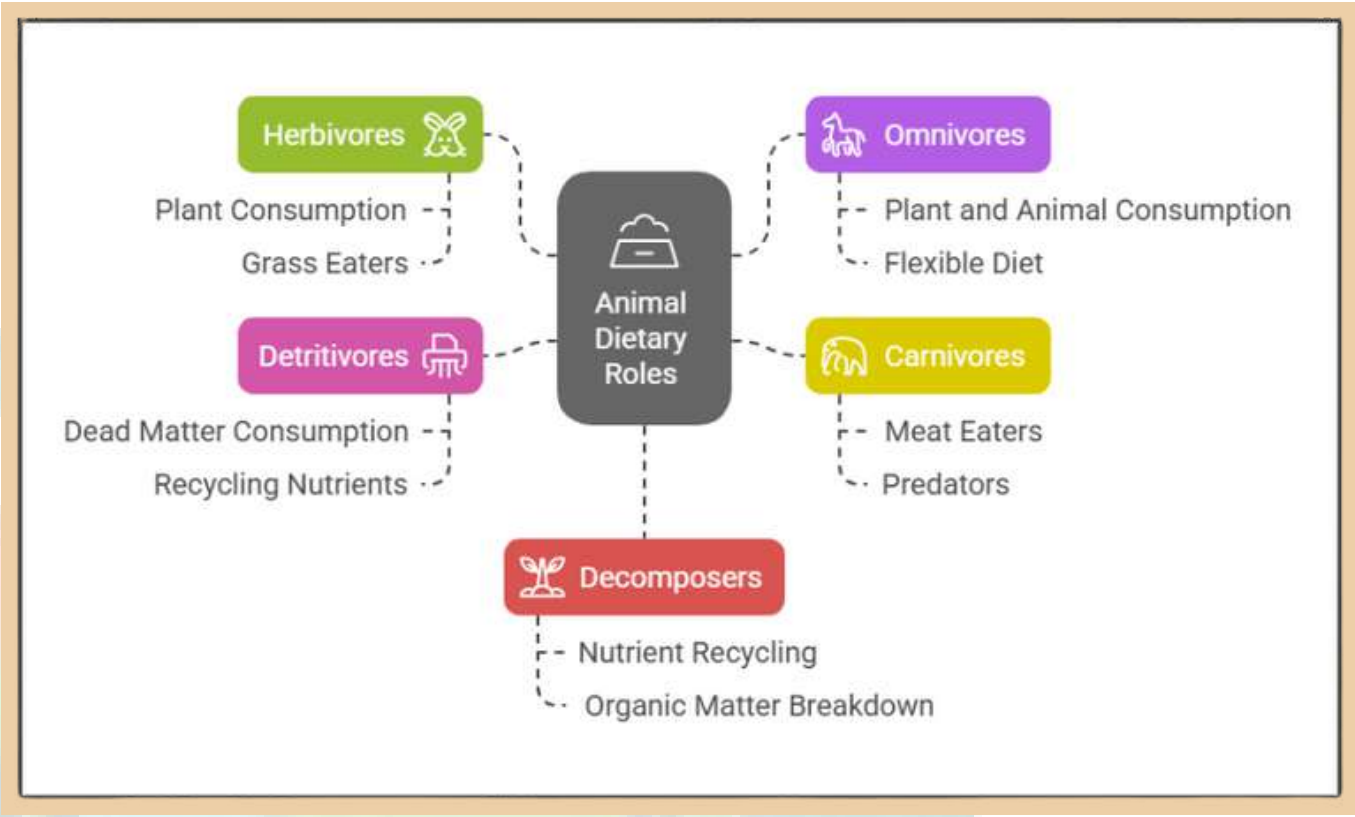
- This energy moves through the food chain as different organisms consume each other.
- **Different types of consumers:**
  - **Herbivores:** Eat only **plants**.

- **Omnivores:** Eat **both** plants and animals.
- **Carnivores:** Eat **only** other animals.

- **Detritivores:** Eat **dead** or **decaying** matter.



- **Decomposers:** Break down **dead** organisms and **recycle nutrients**



- **Food Chains and Trophic Levels:**
  - A **food chain** shows how **energy moves** from **one** organism to the **next**.
- **Trophic levels** are the **steps** in this chain.
  - For example, deer are herbivores (primary consumers), while bears are omnivores (secondary consumers).

- What is a food chain, and how does energy flow through it from one organism to another?
- Can you explain what a food web is and how it shows the connections between different animals and plants in an ecosystem?
- What role do producers play in a food chain or food web? Can you give an example of a producer?
- How do consumers, like herbivores and carnivores, depend on producers and each other for energy in a food web?
- What might happen if one part of a food chain or food web is affected, like if a key species is removed or disappears?

MAPPING ENERGY AND FEEDING

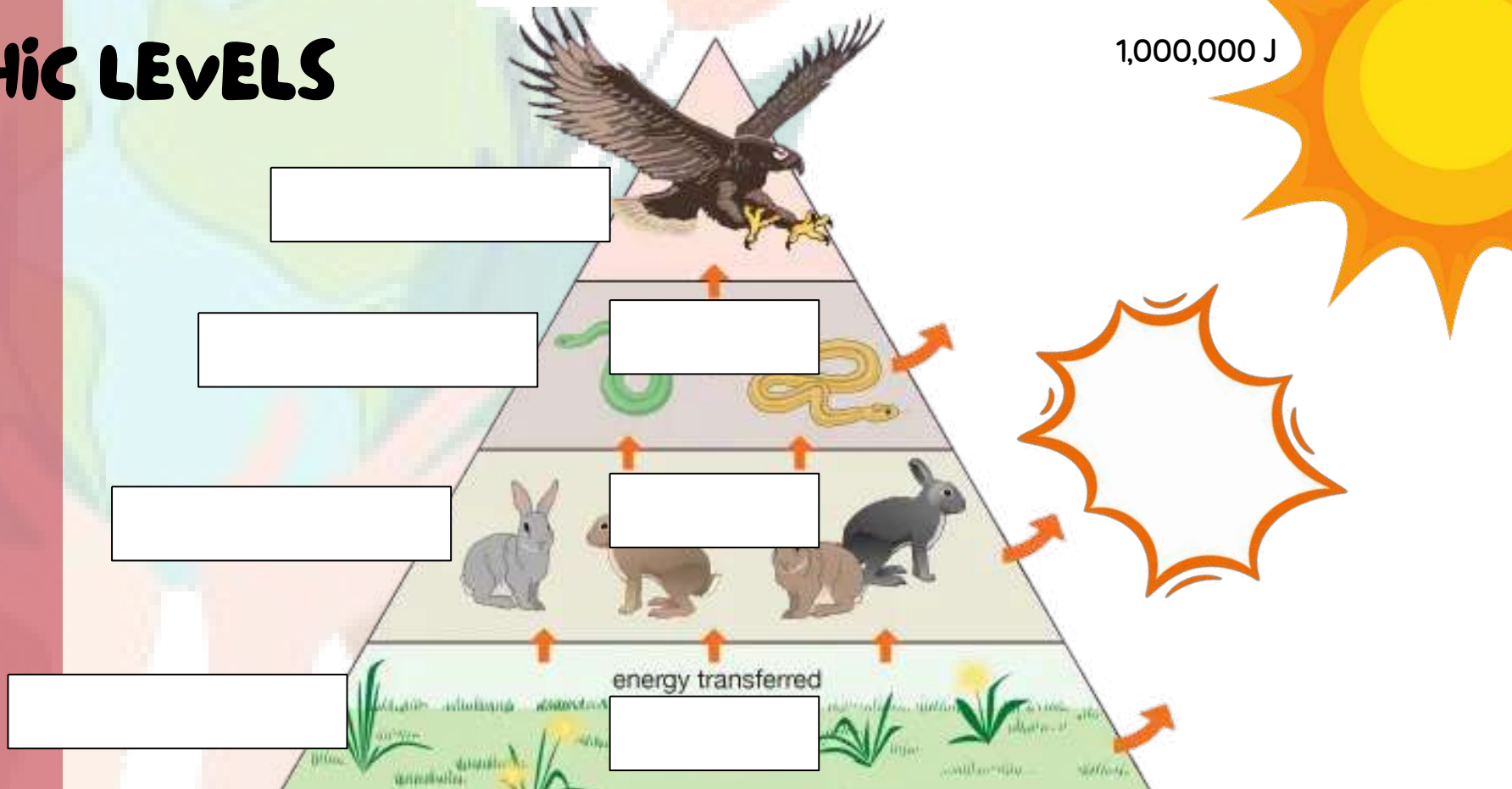
Food Webs and Energy Pyramids

- **Food Webs:** A food web is a complex **system** of many **interconnected** food **chains**. It shows how different food **chains link** together and how **energy** flows **between** them.
- **Energy Pyramids:** An energy **pyramid** shows how energy **decreases** as it moves **up** the food **chain**.
  - The **most** energy is at the **bottom** (**producers**) and the least

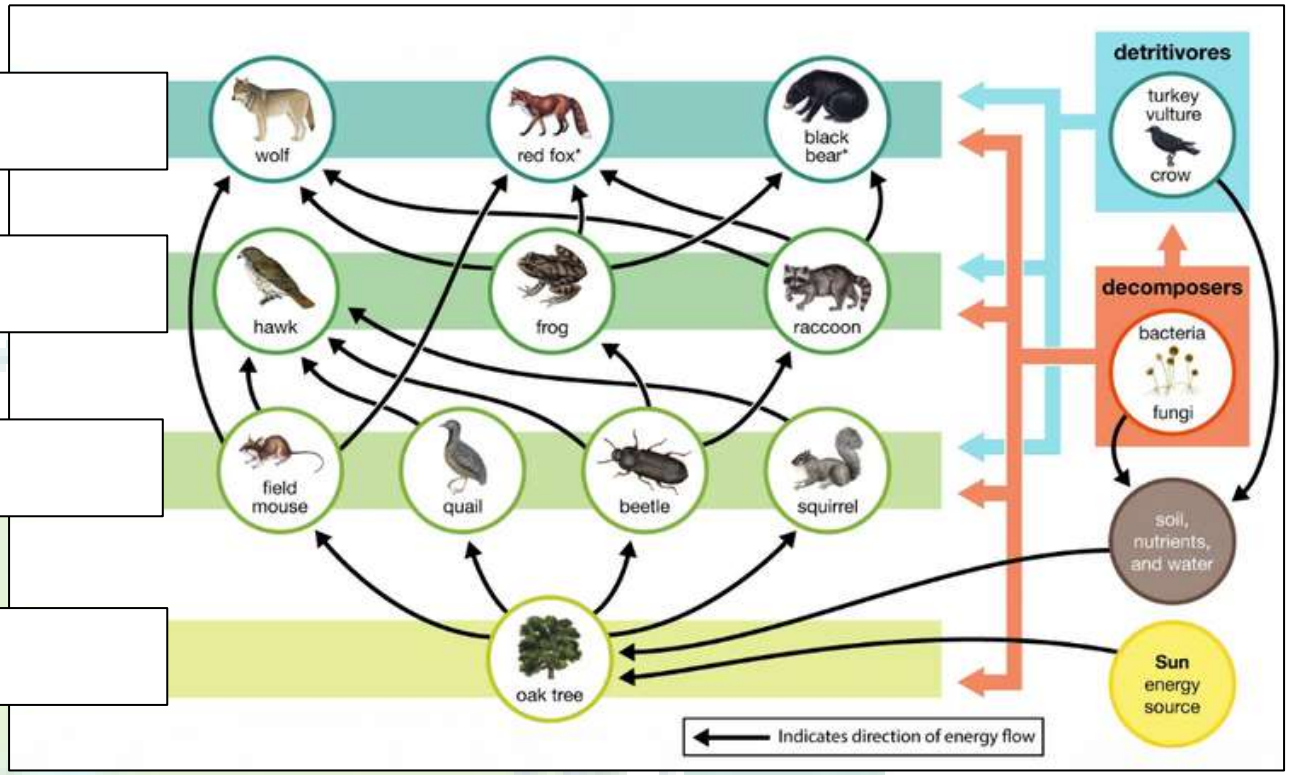
energy is at the **top** (**top predators**).

- **Energy** is **lost** at each **step** because **some** is used for **growth**, movement, or as **heat**.
  - **The 10% Rule:** Only about **10%** of the **energy** from **one** trophic level moves **to** the **next** level. The **rest** is lost as **heat** or **used** by the **organism**.

TROPHIC LEVELS



FOOD WEB

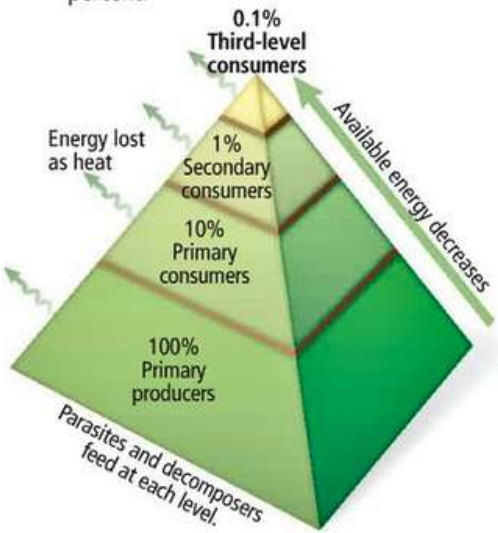


Other Ecological Pyramids

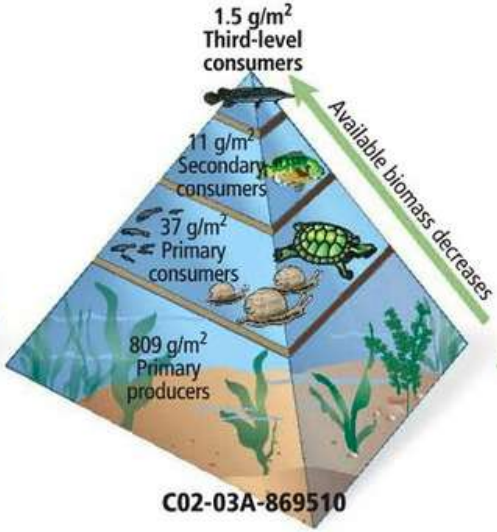
- **Pyramid of Numbers:** Shows the **number** of **organisms** at each trophic level, with the most at the bottom.
- **Pyramid of Biomass:** Shows the total **weight** of **organisms** at each trophic level, with the most at the bottom.
- **Pyramid of Energy:** Shows how much **energy** is at each **level** of the food chain, with the most at the bottom.

FOOD WEB

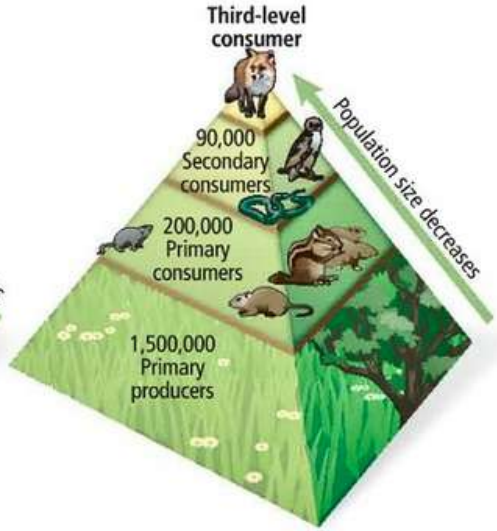
Pyramid of Energy
In a pyramid of energy, each level represents the amount of energy that is available to that trophic level. With each step up, there is an energy loss of 90 percent.



Pyramid of Biomass
In a pyramid of biomass, each level represents the amount of biomass consumed by the level above it.



Pyramid of Numbers
In a pyramid of numbers, each level represents the number of individual organisms consumed by the level above it.

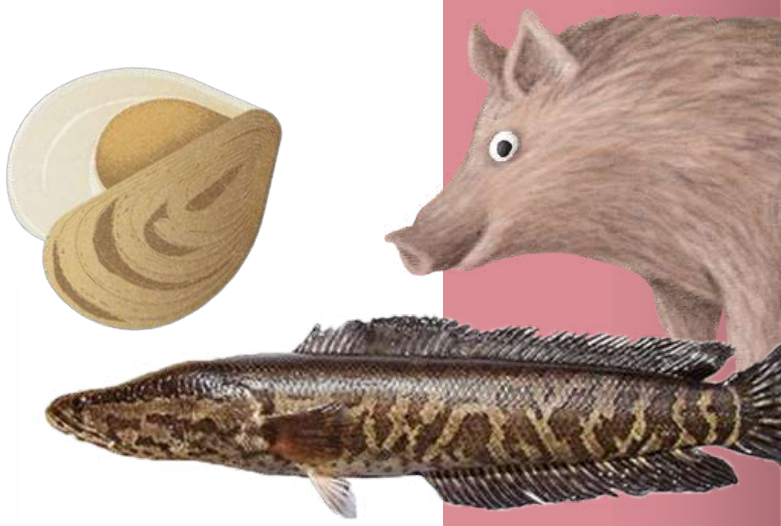


- What are food webs, and how do they show the feeding relationships between organisms in an ecosystem?
- What are trophic levels, and why is it important to understand where different organisms fit in these levels within a food web?
- Can you explain what a trophic cascade is and how changes at one trophic level can affect the entire food web?
- How do producers, consumers, and decomposers all fit into the food web, and what role do they play in nutrient cycling?
- What might happen to a food web if one species at a certain trophic level is removed or greatly reduced in number?

HUMAN IMPACTS

- Human activities like **deforestation**, **pollution**, and **climate change** can harm **ecosystems** and affect how **energy** flows through them.
- How human activities disrupt **energy flow**:
  - **Humans** can **change** how much **food plants** make, how **species interact**, and how ecosystems work, which can **disrupt** the energy flow.
- Impacts on primary productivity:
  - **Deforestation** can reduce the amount of food plants make.
  - **Climate change** can affect temperature and rainfall, which can reduce how much food plants make.

- **Impacts on food webs:**
  - **Overfishing** can remove important animals from the food web, and **invasive species** can mess up the balance between different species.
  - **Example:** Commercial Fishing, exotic constrictor snakes in the Everglades, feral pig populations, feral cats, snakehead fish, zebra mussels, etc



- **Pollution and energy flow:**
  - Pollution can reduce **nutrients** and change the environment, making it harder for energy to flow properly in ecosystems.

Mitigating Human Impacts

How Do wE Fix THiS?

- **Conservation and restoration:**
  - **Protecting** natural **habitats** and **fixing** damaged **ecosystems** can help **reduce** human **harm** to ecosystems.
- **Sustainable resource management:**
  - **Managing** resources **wisely** ensures ecosystems can keep **functioning** for the **long** term.
- **Climate change action:**
  - Reducing **adjusting** how we use **energy** - **alternative** forms of energy

- How do human activities like deforestation contribute to changes in ecosystems?
- What are some examples of pollution mentioned in the video?
- How does climate change, caused by human actions, alter ecosystems?
- What is overfishing, and how does it impact ocean ecosystems?
- What are some ways humans can help reduce their negative impact on ecosystems?

SYMBIOSIS

What is Symbiosis?

- **Symbiosis** is when **two** or **more** different **species** live **together** for a long time. The relationship can be **good**, **harmful**, or **not affect** them at all.
- **Types of Symbiotic Relationships**
  - **Mutualism (+ / +):** Mutualism is when **both** species **benefit** from the relationship.
    - **Example:** Bees help flowers by spreading pollen, which helps the flowers reproduce. In return, bees get nectar to eat.
  - **Commensalism (+ / 0): is** when **one** species **benefits**, and the other **isn't affected**.
    - **Example: Birds may nest in trees, but the trees aren't helped or harmed.**

Parasitism (+ / -): is when **one** species **benefits** while the other is **harmed**.

- **Example:** Tapeworms live inside animals and steal nutrients from them, which can harm the animal.

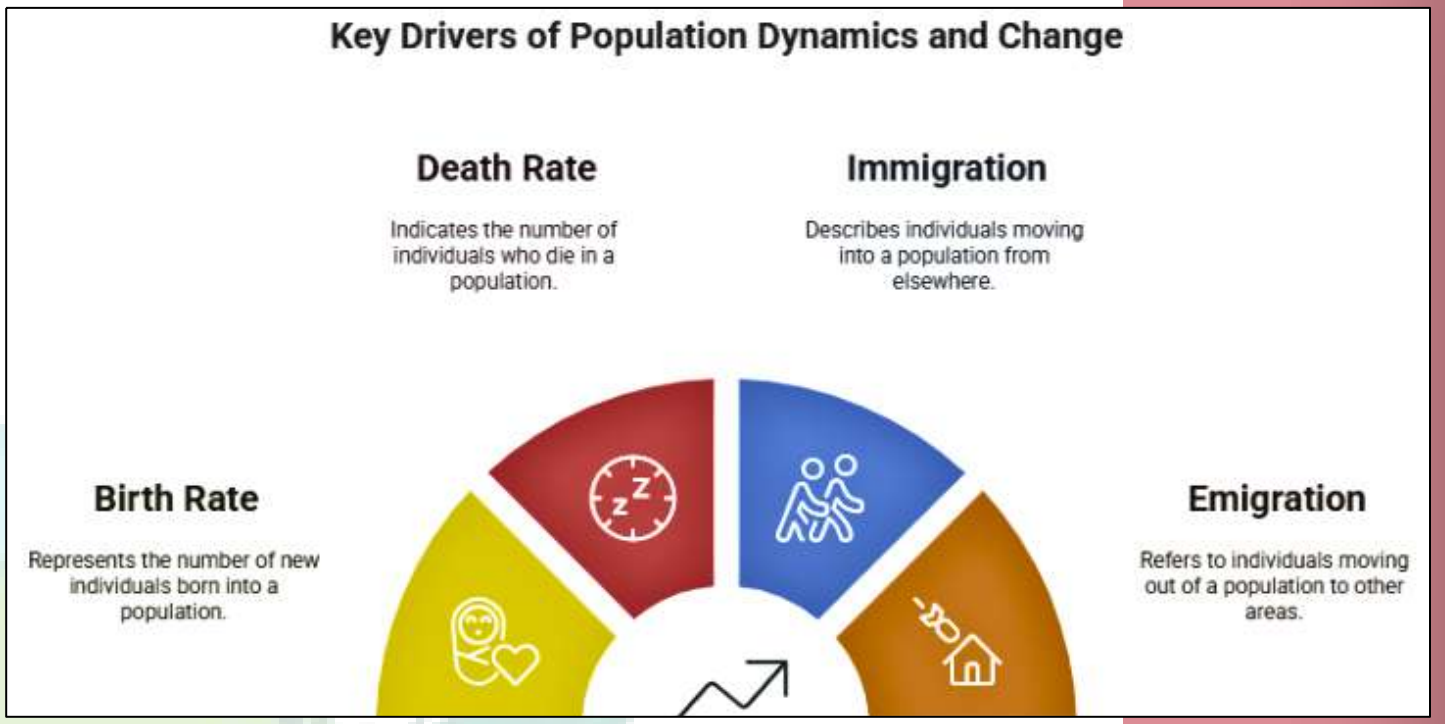
Relationship	Organism 1 + / – / 0	Organism 2 + / – / 0	Example
Mutualism			
Commensalism			
Parasitism			
Predation			
Competition			

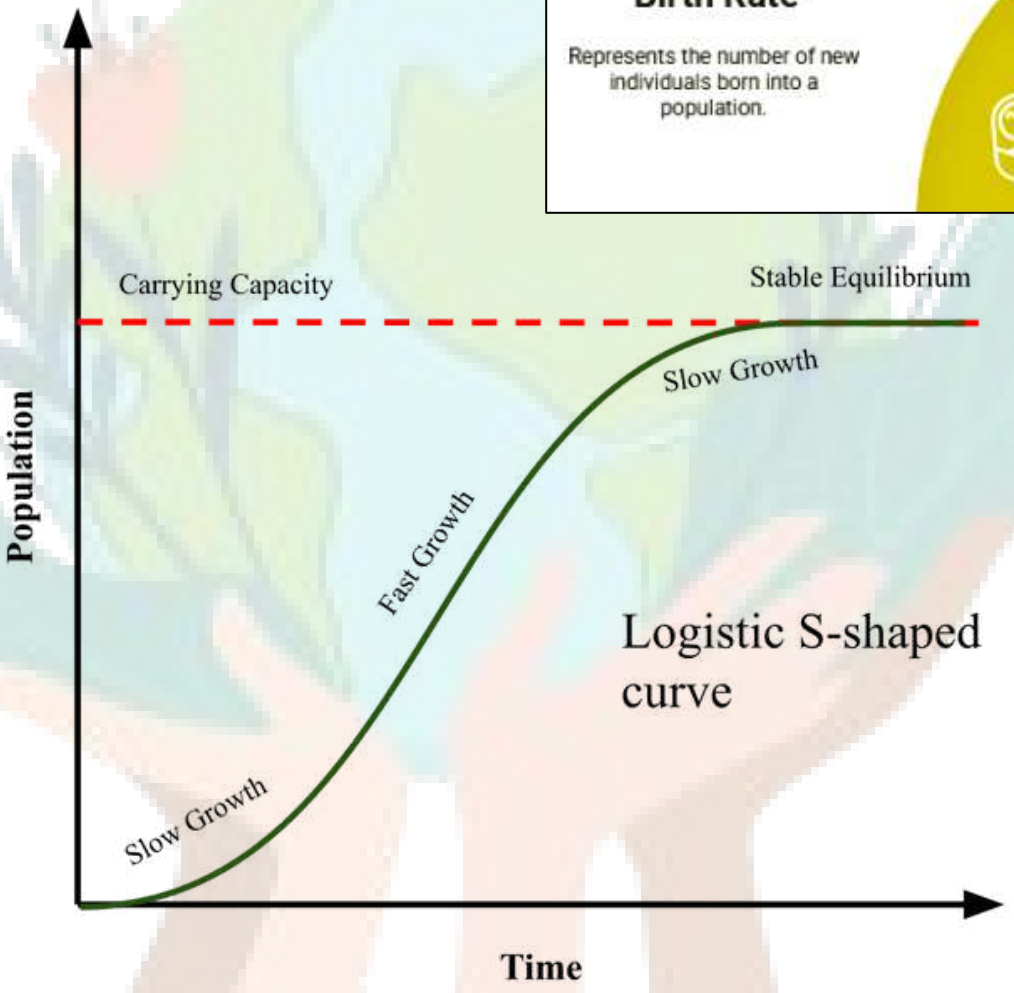
Populations

What is Population Ecology?

- **Population ecology** is the study of how **groups** of organisms **interact** with each **other** and their **environment**.
- **Key Concepts in Population Ecology**
  - **Population Growth:**
    - Population growth is how the **number** of **individuals** in a **population changes** over time.
  - **Factors Affecting Population Growth:**
    - **Birth Rate:** The number of offspring born in a population.
    - **Death Rate:** The number of individuals that die in a population.
    - **Immigration/Emigration: Immigration** is when individuals move **into** a population, and **emigration** is when they move **out**.

- **Carrying Capacity:**
  - Carrying capacity is the **maximum** number of **individuals** that an **environment** can **support**.
  - **Factors Affecting Carrying Capacity:**
    - **Resources:** The availability of food, water, and shelter.
    - **Competition:** Species compete for resources.
    - **Space:** Limited space can reduce the number of individuals an environment can support.


Key Drivers of Population Dynamics and Change
Death Rate
Indicates the number of individuals who die in a population.
Immigration
Describes individuals moving into a population from elsewhere.
Birth Rate
Represents the number of new individuals born into a population.
Emigration
Refers to individuals moving out of a population to other areas.


Carrying Capacity
Stable Equilibrium
Slow Growth
Fast Growth
Logistic S-shaped curve
Slow Growth
Population
Time

CHANGES in POPULATION

Population Dynamics

- **What are Population Dynamics?**
  - Population dynamics is how the **number** and **structure** of a **population** change over time.

- **Factors Affecting Population Dynamics:**
  - **Environmental Changes:** Things like climate change or natural disasters can change population size.
  - **Density Dependent Factors**: These are factors that affect the population more as the population gets larger, like competition.
  - **Predation:** when one organism (**Predator**) eats another (**Prey**)

- **Density Independent Factors:** These are factors that affect the population no matter how large it is, like climate change.
  - **Disease:** Disease can reduce a population by causing death or illness.

Factor	Definition	Examples
Density Dependent		
Density Independent		

Ecosystem Stability

- **Ecosystem Stability:**
  - Ecosystem stability is when an **ecosystem** can stay the **same** over **time**, even with changes.
- **Ecosystem Instability:**
  - Ecosystem instability is when things in an ecosystem are **out** of **balance**.
  - This can happen from **natural disasters**, **human activities**, or **climate change**, and it can hurt the health of the ecosystem and its species.

- What are some examples of limiting factors that control population size in ecosystems?
- How do density-dependent factors affect a population as its size increases?
- What are density-independent factors, and how do they impact populations regardless of size?
- Can you think of a situation where a density-dependent factor might cause a population to decrease?
- Why is it important for ecologists to understand the difference between density-dependent and density-independent factors when studying populations?

Summary

- What are the biotic and abiotic parts of an ecosystem, and how do they work together?
  - "Biotic parts of an ecosystem include living things such as _____."
  - "Abiotic parts, like _____, affect how living things grow and survive by _____."
- How does energy move through an ecosystem from producers to consumers?
  - "Energy starts with producers, like _____, that use sunlight to make food through photosynthesis."
  - "Consumers get energy by _____, and this energy moves through food chains and food webs."
- Why are the carbon, nitrogen, and water cycles important to life on Earth (or Mars)?
  - "These cycles help move important materials like _____ between living things and the environment."
  - "For example, the _____ cycle helps provide water that plants and animals need to survive."
- How can disruptions like pollution or deforestation affect ecosystems?
  - "Disruptions like _____ can hurt producers and consumers by _____."
  - "When an ecosystem is unbalanced, it can cause problems like _____."
- Why is biodiversity important for ecosystem stability and recovery?
  - "Biodiversity means having many different kinds of _____ in an ecosystem."
  - "Ecosystems with high biodiversity are stronger because _____."
- What are symbiotic relationships, and how do they help organisms survive?
  - "Symbiotic relationships are close connections between species, such as _____."
  - "For example, in mutualism, both species benefit by _____."

RESOURCES

MooMooMath and Science. (2023, August 31). Biotic and abiotic factors [Video]. YouTube. https://www.youtube.com/watch?v=qJr1p55rT5M

Cambridge In 5 Minutes. (2018, September 7). IGCSE BIOLOGY REVISION [Syllabus 20] – Nutrient Cycles [Video]. YouTube. https://www.youtube.com/watch?v=Mxj-MYS9jms

Amoeba Sisters. (2024, December 20). Ecology Review: Food chains & webs, Relationships, Nitrogen & Carbon cycles, Effects on Biodiversity [Video]. YouTube. https://www.youtube.com/watch?v=srpl5YRw-_U

Amoeba Sisters. (2017, November 27). Ecological relationships [Video]. YouTube. https://www.youtube.com/watch?v=rNjPI84sApQ

Ecology

study of life

is the study of the interactions among living things & their environments.

Organization

individual living thing

group of the same

can interbreed & produce offspring

group of different species

land

Lakes, rivers, streams, ponds

oceans

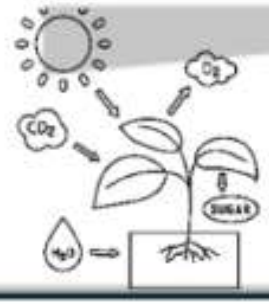
includes all of the organisms as well as the climate, soil, water, rocks and other nonliving things in a given area.

	Organism 1	Organism 2
Mutualism		
Commensalism		
Parasitism		

Water, Food

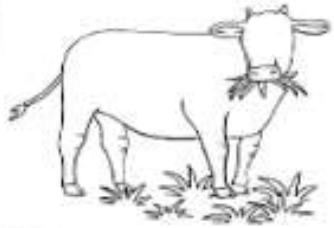
Territory, Mates

Energy in Ecosystems



[ ] – Sun – main source of energy

All living creatures need **food** for **energy**. Some organisms **make** their **own** food while **others** have to **eat** in order to get **energy**.



[ ] make their **own** food using non-living resources.

"self-feeder" [ ]

[ ] Process of converting **sunlight** to **food**

6_____ + 6_____ → _____ + 6_____

[ ] [ ]

[ ] [ ]

[ ] are organisms that get their **energy** by eating **other living** or once-living resources.

[ ] "Different feeder."

[ ] Process of converting **food** to **energy**

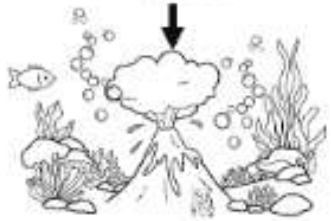
[ ] eat only **plants**

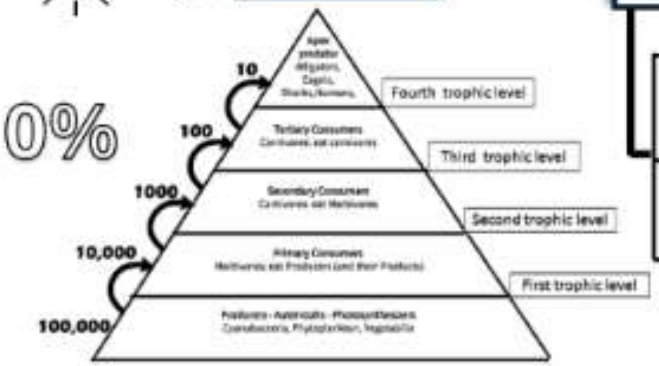
[ ] eat only **animals**

[ ] Both **animals** and **plants**

[ ] Break down **dead** things

[ ] Some **producers** live in places that never get sunlight - these organisms use **chemicals** to build important molecules.



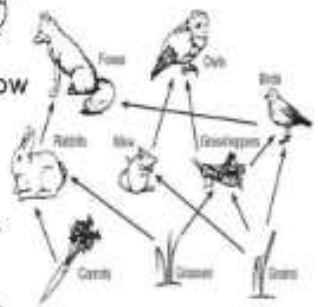


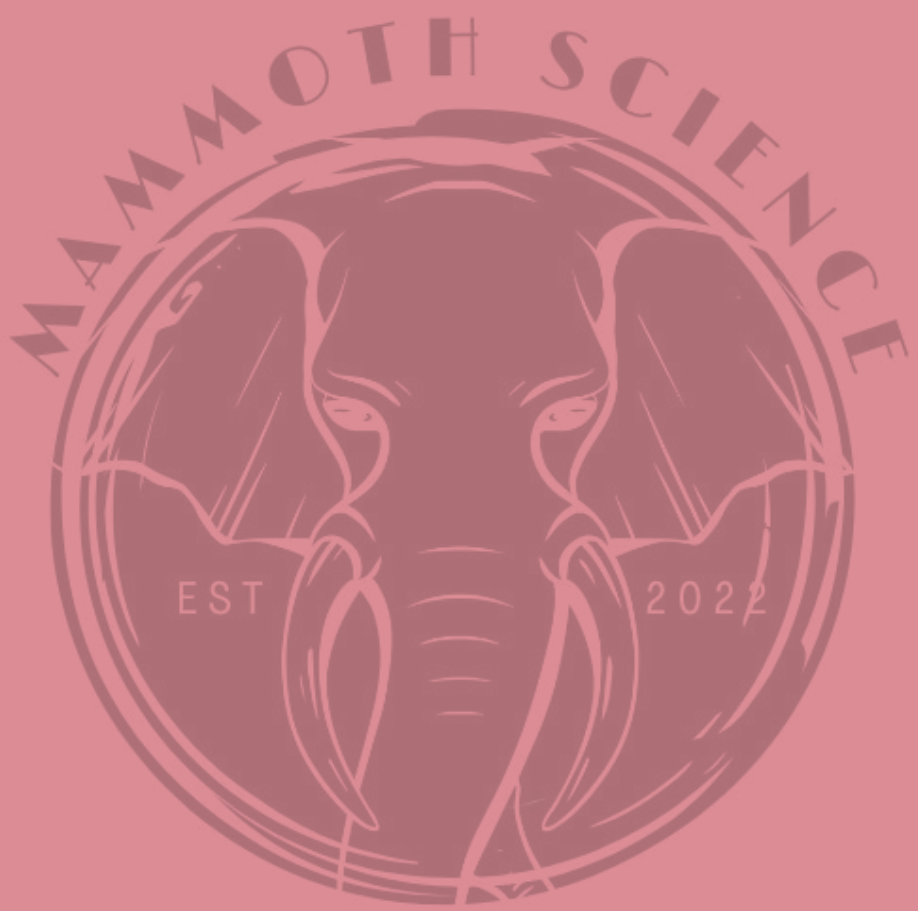
[ ]

[ ] - a complex **network energy** flow
- may have **multiple** feeding relationships

[ ] compares the **energy** used by **producers** and other organisms

[ ] represent a **feeding** step in the **transfer** of **energy** in an ecosystem




MAMMOTH SCIENCE
EST
2022