**1. Life Depends on the Sun**

* Energy from the sun enters an ecosystem when plants use sunlight to make sugar molecules.
* This happens through a process called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.
* **Photosynthesis** is the process by which plants, algae, and some bacteria use \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** to produce \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* + \_\_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_ 🡪 \_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_

**2. From Producers to Consumers**

* Because plants make their own food, they are called *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*.
* A **producer** is an organism that can make organic molecules from inorganic molecules.
* Producers are also called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, or self-feeders.
* Organisms that get their energy by eating other organisms are called *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.*
* A **consumer** is an organism that eats other organisms or organic matter instead of producing its own nutrients or obtaining nutrients from inorganic sources.
* Consumers are also called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, or other-feeders.
* An exception to the rule:
	+ Deep-ocean communities of worms, clams, crabs, mussels, and barnacles, exist in total darkness on the ocean floor, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	+ The producers in this environment are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that use \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_present in the water.
	+ Other underwater organisms eat the bacteria or the organisms that eat the bacteria.

**3. What Eats What?**

* Organisms can be classified by what they eat.
* Types of Consumers:
	+ **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
	+ **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
	+ **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
	+ **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**4. Burning the Fuel**

* An organism obtains energy from the food it eats.
* This food must be broken down within its body.
* The process of breaking down food to yield energy is called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***.*
* **Cellular Respiration** is the process by which cells produce energy from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; atmospheric \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to form \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Cellular respiration occurs inside the cells of most organisms.
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Part of the energy obtained through cellular respiration is used to carry out daily activities.
* Excess energy is stored as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**5. Energy Transfer**

* Each time an organism eats another organism, an energy transfer occurs.
* This transfer of energy can be traced by studying food \_\_\_\_\_\_\_\_\_\_\_\_\_, food \_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* A **food chain** is a sequence in which energy is transferred from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ as each organism eats another organism.
* Ecosystems, however, almost always contain more than one food chain.
* A **food web** shows \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that are possible in an ecosystem.
* Each step in the transfer of energy through a food chain or food web is known as a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* A **trophic level** is one of the steps in a food chain or food pyramid; examples include \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Each time energy is transferred, some of the energy is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Therefore, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to organisms at \_\_\_\_\_\_\_\_\_\_\_ trophic levels.
* Each layer of the pyramid represents one trophic level.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ form the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the energy pyramid, and therefore contain the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* The pyramid becomes smaller toward the \_\_\_\_\_\_, where \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Decreasing amounts of energy at each trophic level affects the organization of an ecosystem.
* Energy loss affects the number of organisms at each level.
* Energy loss limits the number of trophic levels in an ecosystem.
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**6. Carbon Cycle**

* The carbon cycle is the movement of carbon from the nonliving environment into living things and back
* Carbon is the essential component of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, which make up all organisms.
* Carbon exists in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Producers convert carbon dioxide in the atmosphere into carbohydrates during photosynthesis.
* Consumers obtain carbon from the carbohydrates in the producers they eat.
* During cellular respiration, some of the carbon is released back into the atmosphere as carbon dioxide.
* Some carbon is stored in limestone, forming one of the largest “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_” on Earth.
* Carbon stored in the bodies of organisms as fat, oils, or other molecules, may be released into the soil or air when the organisms dies.
* These molecules may form deposits of coal, oil, or natural gas, which are known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Fossil fuels store carbon left over from bodies of organisms that died millions of years ago.
* Humans burn fossil fuels, releasing carbon into the atmosphere.
* The carbon returns to the atmosphere as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Increased levels of carbon dioxide may contribute to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Global warming is an increase in the temperature of the Earth.

**7. The Nitrogen Cycle**

* The **nitrogen cycle** is the process in which nitrogen circulates among the air, soil, water, plants, and animals in an ecosystem.
* All organisms need nitrogen to build \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, which are used to build new cells.
* Nitrogen makes up \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the gases in the atmosphere.
* Nitrogen must be altered, or fixed, before organisms can use it.
* Only a few species of bacteria can fix atmospheric nitrogen into chemical compounds that can be used by other organisms.
* These bacteria are known as “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_” bacteria.
	+ **Nitrogen-fixing bacteria** are bacteria that convert \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	+ These bacteria live within the roots of plants called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, which include beans, peas, and clover.
	+ The bacteria use sugar provided by the legumes to produce nitrogen containing compounds such as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	+ Excess nitrogen fixed by the bacteria is released into the soil.
* Nitrogen stored within the bodies of living things is returned to the nitrogen cycle once those organisms die.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ break down decaying plants and animals, as well as plant and animal wastes.
* After decomposers return nitrogen to the soil, bacteria transform a small amount of the nitrogen into nitrogen gas, which then returns to the atmosphere to complete the nitrogen cycle

**8. The Phosphorus Cycle**

* Phosphorus is an element that is part of many molecules that make up the cells of living organisms.
* Plants get the phosphorus they need from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, while animals get their phosphorus by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_or other animals that have eaten plants.
* The **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is the cyclic movement of phosphorus in different chemical forms from the environment to organisms and then back to the environment.
* Phosphorus may enter soil and water when \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Small amounts of phosphorus dissolve as phosphate, which moves into the soil.
* Plants absorb phosphates in the soil through their roots.
* Some phosphorus washes off the land and ends up in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Because many phosphate salts are not soluble in water, they sink to the bottom and accumulate as sediment.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, which people use to stimulate and maximize plant growth, contain both nitrogen and phosphorus.
* Excessive amounts of fertilizer can enter terrestrial and aquatic ecosystems through runoff.
* Excess nitrogen and phosphorus can cause \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Excess algae can deplete an aquatic ecosystem of important nutrients such as oxygen, on which fish and other aquatic organisms depend.

**9. Acid Precipitation**

* When fuel is burned, large amounts of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is release into the atmosphere.
* In the air, nitric oxide can combine with oxygen and water vapor to form nitric acid.
* Dissolved in rain or snow, the nitric acid falls as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**10. Ecological Succession**

* Ecosystems are constantly changing.
* **Ecological succession** is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and replacement of the types of species in a community.
* Each new community that arises often \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	+ **Primary succession** is a type of succession that occurs on a surface where \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		- **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**. It begins in an area that previously did not support life.
		- Primary succession can occur on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	+ **Secondary succession** occurs on a surface \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. It is the process by which one community replaces another community that has been partially or totally destroyed.
		- Secondary succession can occur in ecosystems that have been disturbed or disrupted by humans, animals, or by natural process such as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* A **pioneer species** is a species that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ an uninhabited area and that starts an ecological cycle in which many other species become established.
	+ Over time, a pioneer species will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for other species.
* A **climax community** is the final, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in equilibrium with the environment.
	+ Even though a climax community may change in small ways, this type of community may remain the same through time if it is not \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	+ Natural fires caused by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are a necessary part of secondary succession in some communities.
	+ Minor forest fires remove accumulations of brush and deadwood that would otherwise contribute to major fires that burn out of control.
	+ Some animal species also depend on occasional fires because they \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ after a fire has cleared the land.
* Old-field succession is a type of secondary succession that occurs when \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	+ When a farmer stops cultivating a field, grasses and weeds quickly grow and cover the abandoned land.
	+ Over time, taller plants, such as perennial grasses, shrubs, and trees take over the area.
* Primary succession can occur
	+ on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ created by volcanic eruptions
	+ In areas exposed when a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ any other surface that has not previously supported life
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. This is because it begins where there is no \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* The first pioneer species to colonize bare rock will probably be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, which can live without \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* The growth of lichens breaks down the rock, which with the action of water, begins to form soil.



