NAME\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Grade 7 Unit Ecology-Mrs. Weimer

Part 1-Introduction

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - the study of interactions among organisms with each other and with environment

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - portion of planet where life exists

LEVELS OF ORGANIZATION

\_\_\_\_\_\_\_\_\_\_\_\_\_ - individuals that can breed with one another

Population - all the individuals of the same species (ducks) in an area

Community - all the populations that live together in an area

\_\_\_\_\_\_\_\_\_\_\_\_\_- the community plus the physical factors in an area (rain, light, soil..)

\_\_\_\_\_\_\_\_\_\_\_\_\_ - large area that has a particular climate, and particular species of plants and animals that live there

\_\_\_\_\_\_\_\_\_\_\_\_\_ - the part of the earth that supports life

Ecological methods - how do we study it?

Observing
Experimenting
Modeling

\*Sometimes, you must be cautious in how a model interprets data....

Part 2-Energy Flow

Energy Flow

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(producers) - capture energy from environment and convert it into "food"

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(consumers) - must eat things

* Herbivores
Carnivores
Omnivores
Detritivores / Decomposers

\*SUNLIGHT is the main source of energy\*

Photosynthesis - uses light energy to make "food"

Chemosynthesis - makes food from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (some bacteria synthesize food in this way)

FOOD CHAINS AND FOOD WEBS - illustrate the flow of energy in an ecosystem

\*Note the direction of the arrows, they indicate where the energy is going when one organism consumes another.

Identify:

Primary Consumers

Secondary Consumers

Tertiary Consumers

Find the Omnivore.

1. Describe the Nitrogen Cycle-
2. Describe the water cycle-
3. Describe the carbon cycle-

Part 3-Ecosystems on Land

* Ecosystems on Land
* Organization of the Environment
	+ The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the part of the Earth that supports life.
	+ Scattered throughout the biosphere is a wide range of habitats– dry deserts, lush rainforests, even dark caves.
		- Each of these areas, called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, has its own unique geography and climate.
* Abiotic Influences of an Ecosystem
	+ The two most significant abiotic factors that influence life in a biome are\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_.
		- As the\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or distance away from the equator, increases, average temperature tends to decrease.
		- As the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or elevation from sea level increases, average temperatures decrease.
			* In addition to changing altitude, the presence of mountains has a major influence on the distribution of precipitation.
			* As warm, moist air travels up a mountain range, the air cools (due to altitude) and the moisture condenses.
			* As a result, the\_\_\_\_\_\_\_\_\_\_\_\_\_\_ side of the mountain facing the incoming air currents receives disproportionately more precipitation than the opposite, \_\_\_\_\_\_\_\_\_\_ side.
			* This is called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ effect.
* Ocean and Lake Effects
	+ Biomes located near a large body of water often have greater precipitation levels and milder, more stable temperatures.
		- Water gains and loses heat much more slowly than air.
		- The nearby water evaporates and fuels incoming \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Climatographs
	+ A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is a combination precipitation and temperature graph for a given biome.
		- The average monthly precipitation for the area is displayed as a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		- The average monthly temperature is displayed as a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Deserts
	+ Lowest moisture levels of all ecosystems.
		- Precipitation is infrequent and unpredictable.
		- The lack of water is a major limiting factor for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
		- The lack of plants, in turn, is a limiting factor for any other consumer or decomposer.
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are usually located in the interior of continents, far from sources of moisture.
		- Wind patterns also prevent any moisture from collecting.
		- The Sahara Desert in Africa and the Great Australian Desert are examples.
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ deserts are formed primarily due to their position on the leeward side of a large mountain range.
		- The Gobi desertfalls on the leeward side of the Himalayan mountains.
		- The Atacama Desert in Chile is the driest place on Earth, outside of Antarctica.
		- Some weather stations have *never* recorded any rainfall!
	+ This is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_. The ocean water cools the air so much that it is unable to hold moisture well.
		- The Andes Mountains form a rain shadow effect on the opposite side.
* Midlatitude, or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ fall in higher latitudes, between 40 and 60 degrees.
	+ This means much more temperature variability, including different seasons.
	+ Temperate deserts receive somewhat more precipitation than subtropical deserts, supportingplants adapted to the climate.
	+ The Sonoran Desert in the southwestern United States is an example.
	+ Many temperate desert plants are succulents, meaning they have thickened, fleshy parts for storing water.
* Succulent plants also grow very slowly.
	+ The Saguaro cactusgrows 75 years before sproutingits first arm!
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ consistently experience temperatures below freezing.
	+ The little precipitation that falls takes the form of ice or snow.
	+ Most of the interior of Antarctica is considered a polar desert.

Grasslands

* Grasslands receive more precipitation and cooler temperatures than deserts.
* With water being less of a limiting factor, more \_\_\_\_\_\_\_\_\_\_\_\_ is found here than in deserts.
* Tropical grasslands, also called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, are located near the equator, usually between desert and rainforest biomes.
	+ Savannas have consistent temperatures. The seasons are instead based on precipitation.
* Temperate grasslands, called \_\_\_\_\_\_\_\_\_\_\_\_\_ in North America, are farther away from the equator and experience seasonal temperature shifts.
	+ Prairie plants have adapted to the cold winter and frequent absence of precipitation by developing root systems that can be several feet deep.
	+ This enables prairie plants to recover quickly from drought or wildfire, while the slow growing trees
	cannot.
* Polar grasslands, also called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are below freezing most of the year.
	+ Limiting factor is temperature.
	+ Due to the short growing season, only the top layer of soil actually thaws and can support plant life.
	+ The rest is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ There is a growing season in the tundra, but it is only a few months long.
	+ Only lichens, herbs, and other small plants survive there.

Forests

* Forest biomes receive much more consistent precipitation than deserts and grasslands, allowing them to support hardwood trees.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ receive the greatest amount of rainfall of any other biome and are consistently warm.
	+ Few abiotic limiting factors for plant growth.
	+ Rainforests are so dense with life that they are divided into four layers:
		- Emergent layer
		- Canopy
		- Understory
		- Forest Floor
			* The emergent layer and canopy contains the majority of the fruit, leaves, and flowers of the trees.
			* Most of the animal life is also found in the canopy..
* The understory only receives about 5% of the sunlight that shines on the canopy.
	+ Contains shrubs, seedlings, and some animals.
* The forest floor is the darkest layer and is mostly home to decomposers like insect larvae and fungi.
	+ Despite the rapid decomposition rate, the nutrients are reabsorbed so quickly that the topsoil is very thin.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, located at higher latitudes, experience a winter that reaches below freezing.
	+ Like rainforests, these mostly contain broadleaf trees which are well-suited for absorbing sunlight.
	+ They are divided into the same layers – canopy, understory, and forest floor.
		- The growth is not constant, so the soil is actually much deeper and richer.
		- Winter poses a problem for these trees – the air is too dry for the trees to survive with their leaves intact.
		- Deciduous trees adapt by shedding leaves when water is scarce or ground is frozen.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ receive a comparable amount of precipitation to tropical ones, but are in higher latitudes.
	+ One example is the Northern Pacific coast of the United States and Canada, which has two geographic advantages:
		- Located on the windward side of the Olympic mountain range.
		- Receives constant moisture from the wind currents off the Pacific ocean.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, also called taiga, are found throughout the far northern latitudes.
	+ These forests are characterized by coniferous trees, which are much more well-adapted to the long, cold, dry winters.
		- Needle-shaped leaves have a waxy coating that retains moisture in the winter.
		- Cone shape allows accumulated snow to slide to the ground.
* Ecosystems in Transition
	+ Biomes are dynamic – they change as the Earth changes. This process is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	+ Ecosystem succession takes two forms, depending on the starting point.
		- Organisms that thrive during the early stages of succession are called \_\_\_\_\_\_\_\_\_\_\_\_\_\_. Those only found in later stages are called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ occurs when a new ecosystem develops where there was none before.
		- A combination of wind, water, and pioneer species such as lichens break down rock into soil.
		- Once the soil has enough organic matter, small plants and shrubs can be supported. Over time, trees spout and become dominant.
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ occurs following the disruption of an existing ecosystem.
		- Fire, flood, volcanic eruption, clear-cutting, etc.
		- This form of ecological succession does not take as long. Soil is already in place, and pioneer species appear within days or weeks.
* **Aquatic Ecosystems**
* Aquatic ecosystems, like those on land, have a series of abiotic factors that influence what organisms can survive where.
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or the dissolved salt in the water.
	+ Water temperature
	+ Amount of sunlight
	+ Availability of dissolved oxygen gas in the water.
	+ Nutrients such as nitrates and phosphates.
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or the cloudiness of the water.
* Biotic Factors
	+ Life in aquatic ecosystems falls within these types:
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, which are free-floating or weakly swimming.
			* **Phytoplankton** are plant-like and include algae.
			* **Zooplankton** are animal-like, including organisms like single-celled protozoa or jellyfish.
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are strong swimmers and consumers. Fish, whales, sea turtles, etc.
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_are bottom-dwellers.
			* Sea stars, lobsters, mussels, etc.
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ break down dead organisms and wastes into nutrients that can be re-used.
			* Bacteria.
* Freshwater Ecosystems
	+ Freshwater ecosystems have a very low salinity level.
		- Include lakes, ponds, rivers, streams, and inland wetlands.
	+ Some freshwater ecosystems are \_\_\_\_\_\_\_\_, meaning they contain standing water. Others are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, meaning the water is constantly moving.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ form in depressions made by glaciers, volcanic activity, or movement of the Earth’s plates.
	+ The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is near the shore and contains shallow, sunlit waters.
		- High biological diversity due to the presence of photosynthetic plants and algae.
	+ The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is also sunlit, but is farther away from the shore.
		- Most of the photosynthesis in the lake occurs here, producing the majority of the food and
		oxygen.
	+ The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the area near the bottom of the lake. As in the ocean, this layer is inhabited mostly by decomposers feeding from detritus from above.
* Ecologists will classify lakes based on their nutrient levels and biological productivity.
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ lakes are very low in nutrients.
		- Populations of plankton and algae are very low.
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ lakes have much greater concentrations of nutrients.
		- This removes a growth limiting factor for algae and plankton.
* Rivers and Streams
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ narrow channels of water, often begin in mountainous areas, where water (from melting snow or glaciers) moves rapidly across rocks and down waterfalls.
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are formed when streams combine with \_\_\_\_\_\_\_\_\_\_ water from the surrounding land.
		- Water in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is generally cold, rich in oxygen, and low in nutrients.
		- As the water moves through the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the streams widen, become deeper, and are warmed by the sun.
			* Oxygen levels decrease, but nutrient levels rise.
		- Low-lying areas, called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, experience wide, slow-moving rivers that will occasionally flood and deposit material from upstream.
			* The water continues to warm, oxygen levels decrease. The nutrients continue to increase.
			* The river eventually ends at a larger body of water. This is called the river \_\_\_\_\_\_\_\_\_\_.
			* Freshwater mixes with saltwater, forming \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ water.
* Located away from coastal areas, **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** are non-permanent bodies of fresh water.
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ do not have trees, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_do.
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_are wetlands characterized by plants that produce an acidic secretion, slowing down the action of decomposers.
* Aquatic Zones
	+ The oceans and freshwater ecosystems are divided into different zones based on the availability of two biggest limiting factors:
		- Sunlight
		- Nutrients
		- The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ extends from the high-tide mark on land to the edge of the continental shelf.
			* Despite only making up 10% of the ocean’s ecosystems, the coastal zone accounts for 90% of its biodiversity.
			* Life is plentiful due to an abundance of sunlight and nutrients, the two biggest limiting factors for life in the water.
			* Within the coastal zone are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; partially enclosed bodies of water where seawater mixes with freshwater.
			* There are also many varieties of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; areas of land that are fully saturated with water at least part of the year.
				+ Salt marshes
				+ Sea grass beds
				+ Mangrove forests
		- A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is a coastal wetland regularly flooded by tides, and dominated by herbs, grasses, and shrubs.
			* No trees.
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are wetlands with plants that have long, narrow leaves that grow to resemble grasslands.
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are wetlands with trees that have evolved to survive in the high-salt, low-oxygen water.
* Benefits of Wetlands
	+ Wetlands are highly productive ecosystems that support a great deal of biodiversity.
	+ They can slow and hold influxes of water, helping to prevent flooding.
	+ Water that passes through wetlands tends to come out cleaner, with less sediment and pollution.
* Intertidal Zone
	+ The gravitational pull of the moon and sun causes tides to rise and fall about every 6 hours on coasts.
	+ This creates an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that is submerged during high tide and exposed during low tide.
	+ The physical nature of the shores in intertidal zones can vary greatly.
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are found on coasts with heavy wave activity.
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_are found in areas with gentler wave action or that are sheltered.
		- The color of sand indicates the source material that eroded to form it:
			* Black: Volcanic
			* Brown: Granite
			* White: Coral
* Coral Reefs
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are small animals that live in the warm coastal waters of the tropics and subtropics.
		- Mutualistic relationship with photosynthetic algae.
	+ As the polyps grow, they produce a calcium-based external skeleton. When the polyps die, the skeletons are left behind and are built upon by other polyps.
	+ Over time, the network of crevices and ledges creates a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; an ideal habitat for a wide variety of fish and other marine animals.
	+ The most diverse and productive ecosystem in the ocean.
* Open Ocean
	+ Moving away from the coast, the availability of nutrients decreases rapidly.
		- Nutrients become a limiting factor for life.
	+ The open ocean is sometimes referred to as a “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_” due to the relative lack of
	life here.
	+ Animals found here must be able to travel great distances to find food.
	+ The characteristics of the water in the open ocean change as you move downwards.
		- The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ contains sufficient sunlight for photosynthesis.
		- The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (bathyal zone) contains little to no sunlight.
		- The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (abyssal zone) is the ocean floor; no sunlight reaches here.
			* Food webs in the benthic zone are much different because their source of energy is not sunlight, but dead matter that sinks from above layers.
				+ Also known as “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_”.
			* Many species living in the aphotic and benthic zones are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, meaning they can produce and emit light.