OPHS Biology	Name:
	Unit 9 (Ecology)
Topic 1: Ecology Basics	
 By the end of this topic, you should be able to Identify and describe the different levels of ecological organization List key features of the main biomes (aquatic and terrestrial) Describe the events in primary and secondary succession 	
By definition, ecology is the study of	
the interactions between organisms	
and the and	
components	s of the environment.
LEVELS OF ORGANIZATION (fill in the or	ganizer above with these terms)



KEY VOCABULARY

- Environmental Factors: these can be either biotic (______) or abiotic (______)

 - Abiotic Examples: _____
- Niche: the role that an organism plays in its environment (includes habitat, ways of obtaining nutrients...)
 - Fundamental Niche: ______
 - Provide an example:
 - Realized Niche: _____

• Provide an example:



Based on this graph, is species a or species b the stronger competitor?

- An organism's habitat is part of its niche, but more is included than just the habitat. A lizard lives in a desert, but it's niche also includes behaviors. What are some of these other components for a desert-dwelling lizard?
 - _____

Unit 9 (Ecology)

- Generalists: species with ______ niches (such as possums and raccoons)
- **Specialists:** species with ______ niches (such as a koala)



Name: _

BIOMES

Terrestrial (land-based):

Biome	Geographic Location	Average Yearly Precipitation	Average Temperature	Basics to Remember
	Near equator	>200 cm	27 degrees Celsius	Consistently high temperature, rainfall and humidity; Tall broad- leaved trees
	Every continent except Europe	<15 cm	23 degrees Celsius	Widely Varying temperatures, low rainfall
	South of arctic circle	40-100 cm	-7 degrees Celsius	Summers = short and moist ; winters = long, cold, and dry ; contains mostly coniferous trees
	South of the boreal forests	75-150 cm	10 degrees Celsius	Well-defined seasons (spring, summer, fall, winter) ; includes deciduous trees (lose leaves in fall)
	Africa, South America, and Australia	76-102 cm	27 degrees Celsius	Summers = hot and rainy, winters = cool and dry ; tall grasses and scattered trees
	All continents except Europe	51-89 cm	15 degrees Celsius	moderate rainfall and temperature, fires possible, think U.S. prairie!
	Arctic Circle	15-25 cm	-15 degrees Celsius	Constant layer of frost (permafrost), cold and dark much of the year, short grasses and shrubs
	400 (w) uoitetid 300 200 100 0 30 20 30 20 Ave	Vinitaker Blon Communities en Communities en 1977 Modified from <i>The Economy</i> 200 mperate Rein Forest Temperate Deciduous Forest Temperate Deciduous Forest Temperate Deciduous Forest Temperate Deciduous Forest Temperate Deciduous Forest Taga Tung Grassland and Desert Tung tung Communities of the temperature (°C)	re Diagram H Whittaker d Ecosystems SER Ricklefts 0	

Name: _____

Aquatic (water-based):

Biome	Marine	Freshwater	Basics to Remember
		Х	Body of standing water, Zones based on water depth
		Х	Moving water, flows from source to mouth
	Mixture of salt	and freshwater	Types: marshes, swamps, bogs; Reedy plants and mangrove trees; Moist and humid
	Mixture of salt	and freshwater	One of the most diverse ecosystems; Forms where fresh water from a stream or river merges with salt water from the ocean
	Х		Very diverse; Found in warm, shallow marine waters; Key organism = coral!
	Х		Zones based on water depth = photic, aphotic, benthic; Depth of organisms depends on sunlight requirements

Unit 9 (Ecology)

SUCCESSION

- Ecological Succession: a series of changes in an ecosystem in which new ______ of organisms ______ of existing ones
 - **Succession** that begins in an area where there is not an existing community is called
 - Examples: _____
 - **Succession** that begins in an area where an existing community has been partially destroyed is called ______
 - Examples: ______

Language Target for Unit 9, Topic 1: Compare and contrast primary and secondary succession by creating a Venn diagram with each of the phrases below.

A.	No previously existing life	B.	Comes after a natural disaster	C.	Climax community
D.	Starts as a result of a forest fire or flood	E.	Starts as a result of a volcano or glacier	F.	Previously existing life
G.	Pioneer species	H.	Starts with existing soil	I.	Starts on bare soil
J.	Lichens break down rock and turn it into soil	K.	Happens relatively slowly	L.	Happens relatively fast

Unit 9 (Ecology)

Topic 2: Population Ecology

By the end of this topic, you should be able to...

- Compare and contrast exponential and logistic growth
- Compare and contrast density dependent and density independent limiting factors •
- Analyze and interpret age structure pyramids (human population growth)

Vocabulary Related to Population Ecology

- **Population =** a group of organisms of the same ______ that live in a particular ______
- **Population Growth** (increasing the _____ of a population) **usually** cannot continue forever. When a
- population can no longer grow, it has reached its ______. Things that affect population growth can be either ______ (living) or ______ (non-living) and can depend on how big the population already is!
- **Limiting Factors =** Components of the environment that ______ the growth of a population. ٠

1. **Density Dependent =** limits the size of a population when the population reaches a certain _____ (number of organisms per area)

Examples:

2. **Density Independent =** limits the size of a population no matter what the ______ is Examples:

Study the table below. Gypsy moth caterpillars can destroy trees by eating too many leaves and making them susceptible to disease or drought. Which student has correctly identified the density-dependent and density-independent limiting factors associated with an invasion of gypsy moth caterpillars?

Forest Ecosystem Factors

Student	Population of Gypsy Moth Caterpillars	Disease	Drought
1	density-independent	density-dependent	density-dependent
2	density-dependent	density-independent	density-independent
3	density-independent	density-independent	density-dependent
4	density-dependent	density-dependent	density-independent

- There are two types of population growth based on whether there are limiting factors present.
 - 1. Exponential Growth= population increases ______in size (can only happen for ______periods
 - of time when there are no ______ factors) We call the line pictured in _____ a ____ curve. Example of Exponential Growth in Nature:
 - 2. **Logistic Growth=** population grows ______ for some time and then stops growing once it reaches its _____, the
 - total number of individuals the environment can support We call the line pictured in ______a ____ curve.

Make sure to label the *carrying capacity* (K) on your graph! Example of Logistic Growth in Nature:



Name: Unit 9 (Ecology) **Human Population Growth** Useful Measurements: ____ (AKA mortality rate), _____, and X France Age India Females >85 Males 80-85 Females Males 75-80 70-75 >70 65-70 60-65 55-60 50-55 45-50 40-45 35-40 30-35 25-30 20-25

15-20 10-15 5-10 0-5 5 4 3 2 1 0 1 2 3 4 5 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 Percent Percent

The image above shows two age structure pyramids. The left pyramid shows the age structure in France, and the right pyramid shows the age structure in India. What is different about these two pyramids?

Which country/population seems to be growing more?

• List several reasons why a **developed country** like France might have a different age structure than a **developing country** like India



Language Target for Unit 9, Topic 2: Embedded in class practice 🕲

Unit 9 (Ecology)

Topic 3: Community Ecology

By the end of this topic, you should be able to...

• Compare and contrast the different types of symbiotic relationships within communities

Symbiotic Relationships

<u>Symbiosis</u>: close ______ between members of different ______

Types of Symbiotic Relationships:

Туре	Definition	Symbols	Example
Predation	One organism kills another organism for food (the 2 nd organism dies)		
Parasitism	one organism is helped and the other organism is harmed (the 2 nd organism does not die)		
Competition	Both organisms are hurt by the interaction when they try to use the same resource		
Mutualism	both organisms benefit from each other		
Commensalism	one organism helped and the other organism is neutral (not helped or harmed)		

Brood parasites are organisms that rely on others to raise their young. The strategy appears among birds, insects and some fish.



Language Target for Unit 9, Topic 3: Embedded in class practice 🕹

Name: _____

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Unit 9 (Ecology)

Topic 4: Nutrient Cycles and Food Webs

By the end of this topic, you should be able to...

- Describe energy (E) transfers (food chains, food webs) that occur within an ecosystem
- Describe the cycling of key elements and compounds (nitrogen, carbon, water, phosphorus, sulfur...) between organisms and the environment

Basics and Roles of Organisms in E Transfer

- The ultimate source of all energy on earth is the ______
- Role of Organisms in Energy Transfer:
 - _____: capture energy from the sun and use it to make simple energy-rich molecules (ex: glucose). Another name for a producer is an _____
 - Ex: plants, blue-green bacteria
 - _____: cannot make their own food, must obtain nutrients by eating other organisms. Another name for a consumer is a _____
 - Ex: Animal, amoeba
 - _____: organisms that break down dead organic matter as a food source; help recycle nutrients throughout the ecosystem

Ex: Fungi

•

- There are different "trophic levels" that represent the different levels of energy transfer.
 - organism that eats a producer = _____
 - organism that eats a primary consumer = _____

Food Chain vs. Food Web

- _____ show linear relationships among organisms whereas ______
- show many different pathways of energy transfer and species' relationships
- Which is a better method for showing the energy-transfer relationships in an ecosystem and why?

	Algae $ ightarrow$ Zooplankton $ ightarrow$ Mack	erel ightarrow Squid ightarrow Shark	
	Organism	Trophic Level	
A	Algae		
Zooplankton			
Mackerel			
Squid			
S	Shark		
			Î



Efficiency of Energy Transfer

- The total mass of organic matter (living stuff) at each trophic level is called the _____
- Only ______ of the energy/biomass from one level can be transferred to the next level.
- Why is this? not all energy-containing material can be eaten or digested
 - Ex: bird beaks, cellulose in plants, teeth

Biomass	Pyramid	

Energy	Pyramid	

Name: ___

Name: _____

Unit 9 (Ecology) <u>Nutrient Cycles</u> (POGIL is the primary note source, here)

The Carbon Cycle

Term	Definition
Photosynthesis	The process by which plants convert carbon dioxide and water into sugars and release oxygen
	back into the air
Respiration	Organisms recycle carbon dioxide and release it back into the air
Decomposition	Decomposers (ex: fungi) break down dead material and release the carbon stored in these
	organisms back into the soil
Fossil Fuels	Organic matter that is buried underground which is converted into peat, coal, oil or gas
	deposits
Combustion	The burning of fossil fuels, adds CO2 (carbon dioxide) to the atmosphere





The Nitrogen Cycle

Term	Definition
N ₂	Nitrogen gas that is found in the atmosphere; not useable nitrogen for plants and animals
NH ₃	Ammonia; Found in the waste products of living organisms
NO ₃	Nitrate; Humans add this to the nitrogen cycle through plant fertilizers
NO ₂	Nitrite; Found in the waste products of living organisms
Bacterial Nitrogen	Nitrogen fixing bacteria capture and convert nitrogen gas into ammonia
Fixation	
Legumes	Plants that contain nitrogen-fixing bacteria in their roots
Atmospheric	Lightning bolts convert nitrogen gas into nitrates
Nitrogen Fixation	
Denitrification	Soil bacteria convert nitrates into nitrogen gas
Decomposers	Convert the nitrogen in dead organisms into ammonia

OPHS Biology

Unit 9 (Ecology)

The Water Cycle

Term	Definition
Condensation	Water vapor in the atmosphere changes into liquid water
Precipitation	Condensed water returns to earth in the form of rain, sleet, snow, or hail
Evaporation	Liquid water from lakes, ponds, etc. changes into atmospheric water vapor
Transpiration	Water evaporates from the leaves of a plant
Percolation	Seepage of precipitation into the soil to form groundwater
Groundwater	Water that falls on land and soaks into the ground
Runoff	Leftover precipitation that cannot percolate into the soil and instead drains into a body of
	water





The Phosphorus Cycle

Term	Definition
Soil phosphate	PO ₄ , the form of phosphorus that is present in the soil
Producers	Plants that absorb phosphates from the soil
Consumers	Animals that eat producers and obtain phosphates
Decomposition	When decomposers (ex: fungi) break down dead/decaying organisms and return phosphorus
	to soil in the form of phosphates
Weathering	When rocks are eroded, which releases phosphate into the soil
Sedimentation	Formation of rocks that contain phosphorus

The Food Web



 \leftarrow You can use this image to help when thinking of relationships between organisms

Language Target for Unit 9, Topic 4: Embedded in class practice 🕲

Name: