Di Stefano - Key

Ecology Notes Chapters 3-6 BIO.SOL.1acdehim2d4a6d8abde

Chapter 3 What's Ecology Page 64

Biosphere: all life on Earth and all parts of the Earth in which life exists

Ecology: the scientific study of interactions among organism and between organisms and their physical environment

How is life organized?

Level	Description	Example
species	A group of similar organisms that can breed and produce fertile offspring	Homo sapiens
population	A group of individuals that belong to the same species and live in the same area	squirrels in Caledon Park
community	Different populations that live together in a defined area	all in King George
Ecosystem	All of the organisms that live in a place, together with their physical environment	VA
Biome	A group of ecosystems that share similar climates and certain organisms	Desert
Biosphere	The entire planet, with all its organisms and physical environments	Earth

So, how to we break up the environment with living and non-living parts?

ABIOTIC FACTORS	BIOTIC FACTORS
Any non-living part of the environment	Any living part of the environment in which organisms might interact
4 examples temperature rocks water sunlight nutrients sand	4 examples fish tiger algae robin

Organisms need energy for growth, reproducing, and their metabolic processes

- NO energy thus NO life functions

AUTOTROPHS: these organisms use sunlight to make their own food

- Store energy in forms that make it available to other organisms that eat them
- AKA primary producers
- Deep down in the bottom of the ocean there is NO light so how do organisms go through photosynthesis?
  - They use the chemical in the hydrogen sulfide vents
  - These organisms are go through Chemosynthesis

HETEROTROPH: organisms that obtain food by consuming other living things

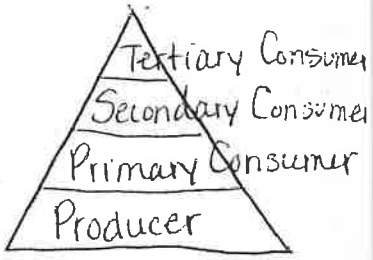
- AKA Consumer
- ***Different types of heterotrophs***
  - Herbivore: eats only plant material
    - Examples: cows, caterpillow deer
  - Carnivore: eats only meat
    - Examples: snakes, tiger
  - Omnivore: eats both meat and plants
    - Examples: Human, bears, pigs
  - Scavenger: consume the carcasses of other animals
    - Examples: Vulture
  - Decomposer: eat by chemically breaking down organic matter
    - Examples: Bacteria, Fungi
  - Detritivore: feed on plant and animal remains and other dead matter
    - Examples: earthworm, mites, crabs

- Energy flows through and ecosystem in a 1 way stream from primary producer to various consumers
- FOOD CHAIN: a series of steps in which organisms transfer energy by eating and being eaten
  - Always starts with a Autotroph
    - In aquatic ecosystems the autotrophs are called phytoplankton
  - The arrows points to who does the eating
    - Example: pretzel → Mrs. D (I do the eating of pretzels NOT pretzels eating me)

- The food chain order is as follows:

Autotroph → herbivore (Primary Consumer) → omnivore (Secondary Consumer) → carnivore (Tertiary consumer)

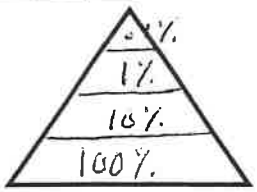
- FOOD WEB: a network of complex interactions formed by the feeding relationships among the various organisms in an ecosystem
- A bunch of interconnected food chains
- Shows all the eating relationships within an ecosystem
- Why are decomposers and detritivores extremely important?
  - plants would just die if not eaten
  - decomposers convert this dead material to detritus
  - This is then eaten by detritivores
  - Decomposers also cycle nutrients needed for autotrophs to grow
  - Without decomposers nutrients would remain locked within dead organisms
- What would happen to a food chain/web if 1 organism is killed off from an ecosystem? everything after would be effecte



- Trophic level: each step in a food chain/web
- Ecological Pyramid: shows the relative amount of energy or matter contained within each trophic level in a food chain/web
  - 3 types of pyramids

Pyramid of Energy

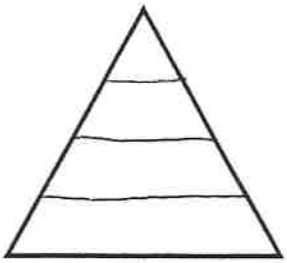
- Shows the relative amount of energy available at each trophic level
- Only a small portion of the energy that passes through any trophic level is stored in organisms of the next level
- Organisms use most energy needed on life processes
- Rest is released as heat
- 10% Rule
- 10% is transferred to the next level
- 90% is lost



Pyramid of Biomass

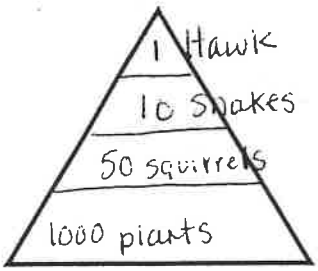
Biomass: the total amount of living tissue within a given trophic level

- This pyramid shows the relative amount of living organic matter available at each level



Pyramid of numbers

- Shows the relative number of individuals at each level
- Will decrease as you go up the pyramid
- Why?

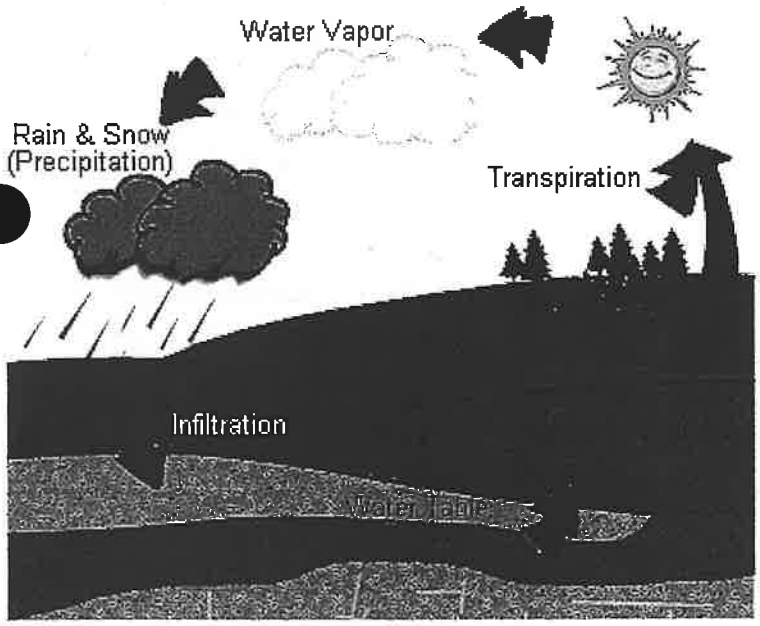


Cycles in Biosphere

● would happen if matter was bound in living matter and never recycled? life ceases

- Living organisms are composed of 4 main elements: Oxygen, Carbon, Hydrogen, Nitrogen
- Matter is recycled within and between ecosystems. Elements pass from one organism to another and among parts of the biosphere through closed loops.
- Energy is transferred into usable forms to support the functions of an ecosystem.
- A constant supply of usable energy is needed, but matter must be cycled through the biosphere.
- The cycling of nutrients in the biosphere involves both matter in living organisms and physical processes found in the environment such as weathering.
- This is called the **BIOGEOCHEMICAL CYCLES**

~Water Cycle~ page 81



Precipitation: rain, snow, hail, sleet

Evaporation: water rises as a gas

Condensation: water vapor cools & make clouds

Transpiration: water evaporates from plants

Run off: water flows off land

Percolation: water seeps into the ground

Why is Freshwater important? All life needs it

How much freshwater is there? 3%.

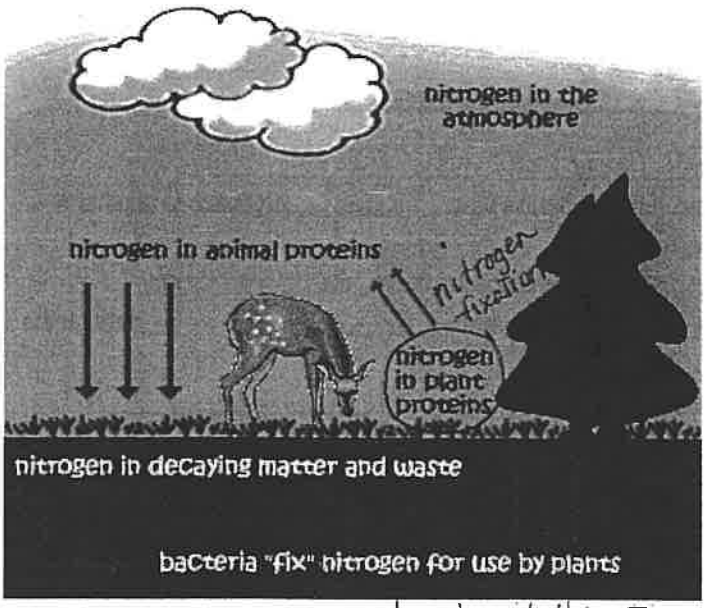
How much is available? 31%.

The rest is frozen and 69 %

Pg. 82 Carbon and Oxygen Cycle

- Carbon is found in all living things
- Photosynthesis converts CO_2 and H_2O into carbohydrates and releases O_2.
- Autotrophs breaths in CO_2.
- Autotrophs breaths out O_2.
- Heterotrophs breaths in O_2 and Heterotrophs breathe out CO_2.
- Carbon when buried makes fossil fuels. When fossil fuels burn they release carbon which adds CO_2 to the atmosphere.

Pg 84 Nitrogen Cycle

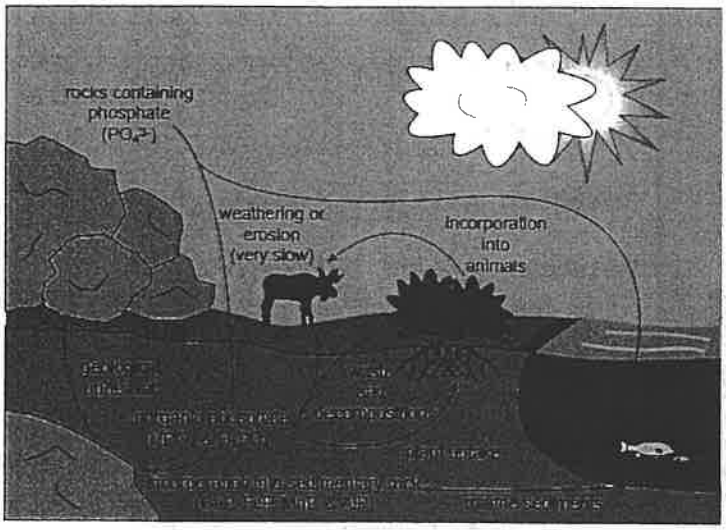


- Nitrogen is found in proteins. It is the most abundant in the atmosphere (78%)
- **Nitrogen fixation** (label on diagram)
- Define: process of capture and conversion of Nitrogen into a usable form for plants

Why is Nitrogen a factor that limits growth of producers?
must have need to make protein

- **Denitrification** (label on diagram)
- Define: Soil bacteria convert fixed nitrogen compounds back to nitrogen gas to return to the atmosphere

Pg 85 Phosphorus Cycle



- Phosphorus is essential for growth and development, and making of RNA/DNA.
- Rocks/sediments gradually wear down and Phosphorus is released
- Some Phosphorus stays on land and cycles between organisms and soil
- Some Phosphorus can wash into rivers/streams where it dissolves and settles back into rocks

CHAPTER 4 ECOSYSTEMS AND COMMUNITITES PG 94

Weather: the day to day conditions of Earth's atmosphere

Climate: year after year patterns of temperatures and precipitation

Greenhouse Effect: process by which certain gases CO_2, methane, water vapor trap sunlight energy in Earth's atmosphere as heat

Habitat: where an organism lives

Niche: what an organism does and how it interacts in the environment (the job or role in an ecosystem)

Tolerance: the ability to survive and reproduce under a range of environmental conditions

Keystone species: single species that is not usually abundant in a community yet exerts strong control on the structure of a community

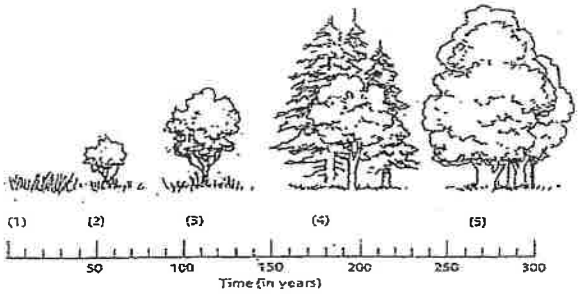
Species Interactions

Species Interaction	Description	Species A	Species B	Your Example
Competition	Interaction in which 2 species fight over the same resource	—	—	2 animals fighting at over a water hole
Predation	Interaction in which one organism captures and feeds on another organism *Predator vs prey*	+	— dies	lion eats zebra cat eats mouse
Herbivory	Interaction in which one animal (herbivore) feeds on producers	+	—	deer on plant cow on grass
Mutualism	Interaction in which both species benefit from the relationship	+	+	alligator & bird clownfish + sea anemone
Commensalism	Interaction in which 1 organism benefits and the other is neither harmed nor helped	+	0	tree + bird
Parasitism	Interaction in which 1 organism lives on or inside (parasite) another organism (host) and harms it *Parasite vs host*	+	— (lives)	leech on human tick on dog

SUCCESSION Page 106

Ecosystems change over time especially after disturbances as some species die out and new species move in

Ecological Succession : a series of more or less predictable changes that occur in a community over time



Primary Succession	Secondary Succession
-Succession that occurs in an area in which NO trace of previous community is present -establishment of an area with exposed rock with NO topsoil	-succession that occurs in an area that was only partially destroyed by disturbances -change after a community of organisms has been removed - soil still intact

Pioneer Species = the first organisms to appear during succession

Climax Community = a stable and mature community

BIOMES Page 110

Biome : a group of ecosystems that share similar climates and typical organisms

Biomes classified by their plants, temperature, rainfall, and animals.

List of Biomes in the World

Biome Name	Climate	Location	Plant type	Animal Type	Movie
Tundra	Very little Very very cold winters short summers	Near the Arctic Circle	Short/low growing Lichen, moss PERMAFROST	Caribou, polar bear, artic hare Migrate	
Boreal Forest / Coniferous Forest / Taiga	Long winters short summers	Canada Northern NA, Asia and Europe	Coniferous trees	Moose, beaver, lynx, wolverine -migrate, thick fur	
Temperate Forest	4 seasons	NA, Asia, Europe, Australia	Deciduous trees	Squirrel, deer, rabbit, fox, skunk,	
Woodlands/ Scrubland	38-100 cm 10-40 C	Near Mediterranean sea, West side of N/S America and Australia	Evergreen shrubs	Foxes, birds, bobcats, jackrabbits, lizards, snakes, butterflies	
Savanna	2 seasons Wet vs dry	Africa, Australia, SA	Grasses, scattered trees	Lion, cheetah, elephant, giraffe, zebra	
Desert	Very little rain Extreme temps	Every continent except Europe	Cacti	Lizards, rats, snakes, tortoises, toads	
Tropical Rainforest	Lots of rain	Central SA, South Asia, NE Australia, West Africa	4 layers of trees	Chimp, tiger, bats, toucan, sloth,	

Aquatic Ecosystems

Freshwater Ecosystems	**Marine Ecosystems**
Ponds streams rivers lakes Wetland - freshwater - catfish, bass, minnow raccoon, duck	Oceans Saltwater makes up 97% of all water on Earth

Chapter 5 Populations Page 130

Population: group of individuals of the same species that live in the same place at the same time

Population Density: refers to the number of individuals per unit area

Population Dispersion: how individuals in a population are spaced out across the range of the population

3 types: random, uniform, clumped

Population Growth

- Equation: (Births + Immigrants) - (Deaths + Emigrants)

Practice

How can you have a zero population growth? B = D

How can you have a positive population growth? B > D

How can you have a negative population growth? B < D

Demography : the study of human populations

Exponential Growth : population gets larger very fast

- J curve
- Works with ideal conditions with unlimited resources
- Example:

Carrying Capacity : the maximum number of individuals an ecosystem can support

List 4 technological advances that have helped human growth:

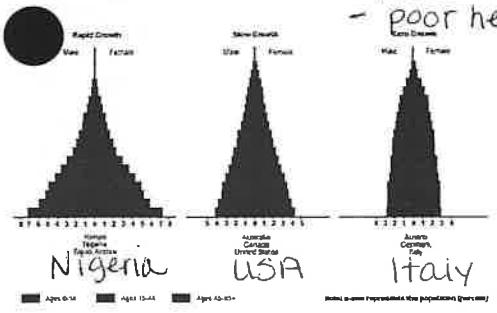
1 _____ 2 _____

3 _____ 4 _____

What is the difference between a <u>developing</u> and <u>developed</u> country?

Still ↓
- growing
- more farm based
- poor health

↳ level off
- lots of jobs
- technology (adv)
- good health



Explain the difference between these age structure graphs. The first is from Nigeria, second is USA, and the third is Italy.

Nigeria - still growing population - many young

USA - more young but almost stable

Italy - stable at all levels

Limits to Growth

Limiting Factor : a factor that controls the growth of a population

Examples: parasite, predator, disease, natural disaster

	Density Independent Limiting Factors	Density Dependent Limiting Factors
Define	-Limiting factor that affects all populations regardless of population density	- Limiting factors that depends on population density
Abiotic/ biotic	Effects more abiotic factors	Effects more biotic factors
Examples	Weather, hurricanes, drought, floods, natural disasters, wildfires	Competition, predation, disease, parasitism, overcrowding

Human Changing the Biosphere

What/How do we affect land?

Overgrazing: allowing animals to graze on the land to the point of destruction

Deforestation: cutting of trees without replanting (destruction of forests)

Pollution: humans putting harmful materials into the land, air, or water

Biomagnification: the increasing concentration of a harmful substance in organisms at higher trophic levels in a food chain/web

Biodiversity and Conservation

Biodiversity: total of the variety of organisms in the biosphere

Threats to biodiversity

What is the difference between **background extinction** and **mass extinction?**

gradual process of species becoming extinct — large percent of species go extinct at 1 time

What is the name of the species whose activities cause the greatest extinction? Homo Sapien

Biodiversity Threats

	Description	How is it affecting biodiversity	Example
Natural resources	Use of our natural resources found on Earth (minerals, fossil fuels, plants, air, water)	using more than can be replenished	oil, coal
Overexploitation	Excessive use of species with economic value	animals hunted/killed to near extinction	bison seaturtles
Habitat fragmentation	Separation of habitats into smaller pieces	animals must relocate to smaller and smaller areas	deer
Pollution	Chemically altered air, water, and soil that can be harmful	animals are killed, mutated or relocate	DDT - Bald Eagle Acid Rain
Introduced invasive species	Non-native species brought into an area	destroy the habitat by becoming over populated	fire ants rabbits snakehead

Conserving Biodiversity

1) Protect individual species
2) Preserve habitats
3) Preserve ecosystems
4) Conserve natural resources
5) Protect biodiversity (hotspots)

Ecological Footprint: total amount of functioning ecosystem needed both to provide the resources for a human population

America is 4x larger than the global average

Ecology in Action

1) recognize a problem in the environment
2) research to find the cause
3) change our behavior

Thus this will allow a more positive impact on the global environment