Chapter 3 The Biosphere

3-1 What is Ecology?

Key Concepts
1. What different levels of organization do ecologists study?
2. What methods are used to study ecology?

Ecology
study of interactions between organisms and their environment

Biosphere
where all life exists on land, water, and air
extends 8 km above and 11 km below the surface
closed system - nothing enters or leaves
except energy from the sun

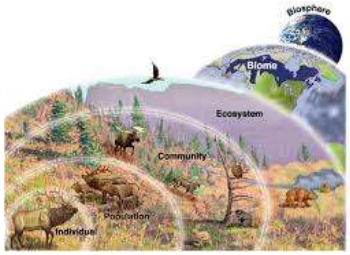
Abiotic Factors
all nonliving things
soil, rocks, water, wind, temperature, sun, air etc

Biotic Factors
all living things
animals, plants, etc

Why is it important to have abiotic factors in the biosphere?

Biosphere divided into levels of organization. (Review Chapter 1)
Molecules
Cells
Groups of Cells - tissues, organs and organ systems

Ecologist studies
Organism - individual
Species - organisms that can mate and produce fertile offspring
Population - group of organisms of one type that live in the same area
Community - populations that live together in a defined area
Ecosystem - community and its nonliving or physical surroundings
Biome - contains ecosystems that share the same climate and similar dominant communities
Biosphere - contains all the ecosystems



Can a group of rabbits and a group of mice make up the same population in an ecosystem? Explain.

No, because individuals in a population must be of the same species

Could a biome in Brazil near the equator be the same as a biome in northern Canada? Explain.

No, because those two biomes would have different climates and different communities.

How do scientists study the biosphere?
Of course they use the scientific method but...

They also use these ecological methods.

If studying the rainforest, scientists might use

Observing
observe species, communities, how many of each, develop questions

this usually leads to experimenting and modeling

Experimenting
experiments used to test hypotheses

Modeling
create a model that represents a phenomena that occurs in a period of time

these models lead to new predictions to be tested

Assignment
Section 3-1

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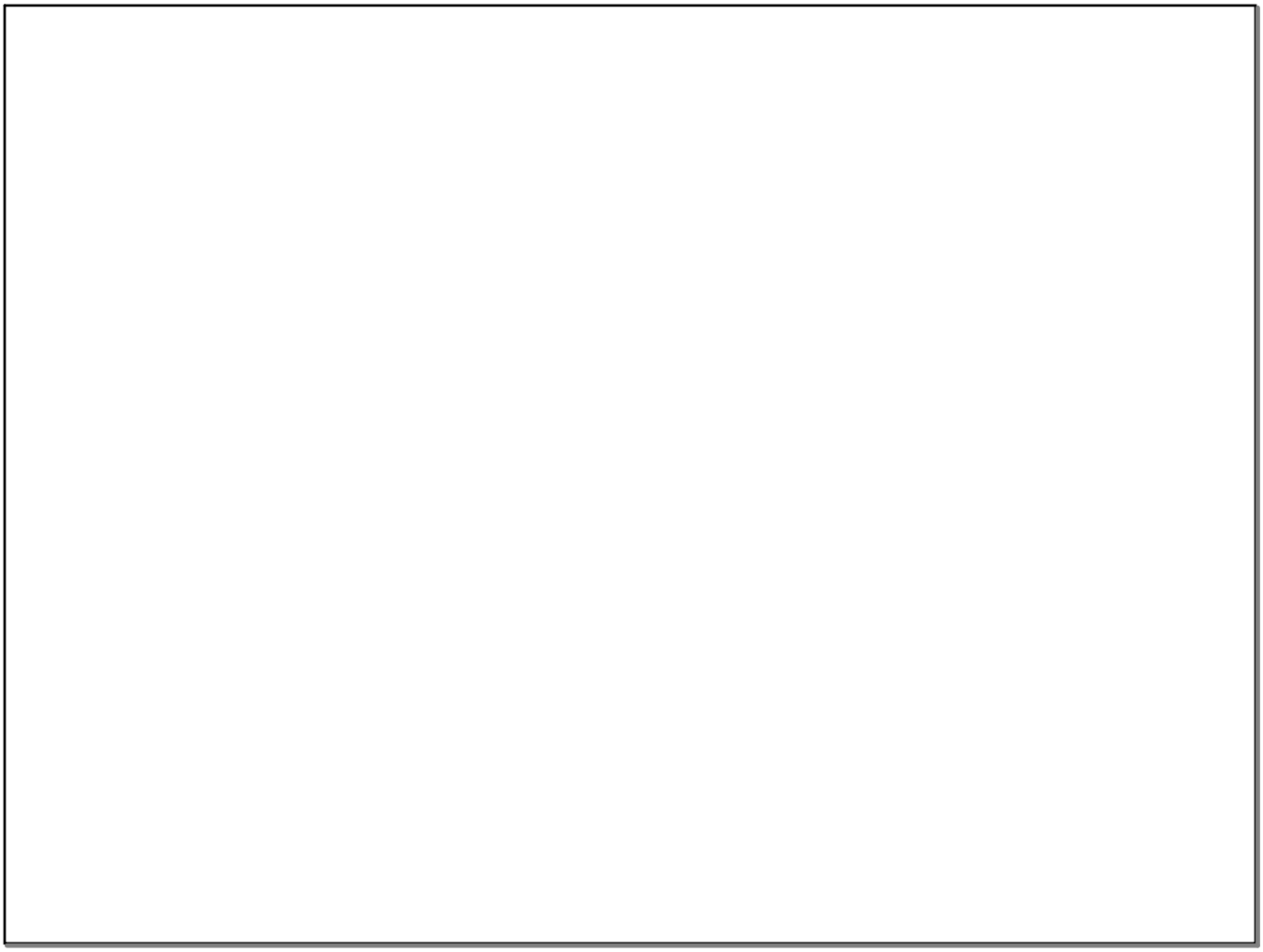

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Review 2-2

Level of Organization	Definition	Example
Individual/Species		
Population		
Community		
Ecosystem		
Biome		

3-2 Energy Flow

Key Concepts
1. Where does the energy for life processes come from?
2. How does energy flow through living systems?
3. How efficient is the transfer of energy among organisms in an ecosystem?

Sunlight - Important?????
Yes, it is the main source for life on Earth.
Of all the sunlight that reaches the ground only 1% is used by biotic factors

Without the sun, we would not be here.

Autotrophs/Producers
make their own food through a process of photosynthesis
may use sun or chemicals

Examples:
plants, some algae, and some bacteria

Carbon dioxide + water $\xrightarrow{\text{light energy}}$ Carbohydrates + Oxygen

$$6CO_2 + 6H_2O \xrightarrow{\text{light energy}} C_6H_{12}O_6 + 6O_2$$

they use light energy to create sugars

chemosynthesis
creating food (carbohydrates) without light but energy in chemical bonds

bacteria uses this process to create food

Type of Autotroph	Where they're found
Plants	
Algae	
Chemosynthetic bacteria	
Photosynthetic bacteria	

Heterotrophs/Consumers
can not get energy from their physical environment, they need to eat other organisms to get their energy

Definition
rely on other organisms for their energy and food supply

Types of Heterotrophs
Herbivore
only eats plants

Carnivore
only eats animals

Omnivore
eats both plants and animals

Detritivores
eat plant and animal remains
worms, mites, crabs

Decomposers
breaks down organic matter
bacteria, fungi

Scavenger
eat large quantities of dead matter

How do these relationships work together?

Energy only moves in one direction. What does that mean?

starts with the sun to autotrophs to heterotrophs

Food Chain Video

Food Chain
the transfer of energy of organisms and eating and being eaten

Figure 3-7 page 69: example

algae (producer) are eaten by zooplankton are eaten by small fish are eaten by squid are eaten by shark

organisms eat to gain energy

Food Web
network of feeding relationships in an ecosystem

Figure 3-8 page 71: example

Trophic Levels trophic = Greek *trophe* = food or nourishment
1st level = Primary Producer - Autotrophs
2nd level = Primary Consumer - Heterotrophs
3rd level = Secondary Consumer - Heterotrophs
levels keep going to end of food chains/web

Two types of Food Webs
Grazing Food Web
begins with photosynthesis

Detrital Food Web
begins with decomposers and detritivores

break down organic wastes and the remains of dead organisms which releases mineral salts, carbon, nitrogen, phosphorous, and potassium which now can be reused by producers

Pyramids
demonstrates how much energy is available at each trophic level

Energy Pyramids
10% of energy used at each level is passed onto the next level

no limit on levels

page 72

Biomass Pyramid
grams of organic matter per unit area

the pyramid shows the amount of potential food available for each level

Pyramid of Numbers
demonstrates the number of individual organisms at each trophic level

Assignment
3-2 Worksheet

Food Web/Chain Worksheet - tomorrow

Sep 24-11:18 AM

Create an information poster about each Nutrient Cycle.

Cycles
- **Water**
- **Carbon**
- **Phosphorus**
- **Nitrogen**

Include
- **What is it?**
- **Purpose?**
- **Diagram of Cycle**
- **Facts**

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3-3 Cycles of Matter

Key Concepts
1. How does matter move among the living and nonliving parts of an ecosystem?
2. How are nutrients important in living systems?

Biogeochemical Cycles
the passing of elements, chemical compounds, and matter from one organism to another

pass the same molecules through the biosphere over and over

Water Cycle page 75 Figure 3-11

Path water takes to change from a liquid to a gas and back to a liquid.

What are two ways that water can enter the atmosphere?

evaporation and transpiration - definitions in book
make sure you understand them

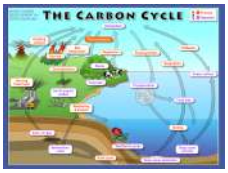
What process moves water through the cycle from the air to the ground?

precipitation

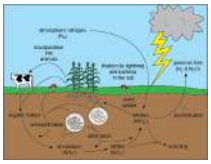
What are two routes by which water might make its way to the ocean?

Through runoff and through seepage into ground water and eventually flow into the ocean.

Carbon Cycle page 77 Figure 3-13



Nitrogen Cycle page 78 Figure 3-14

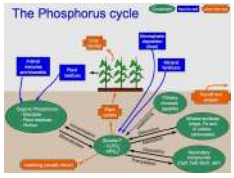


Nitrogen Fixation
turns nitrogen gas into ammonia

now producers can use them and consumers eat the produces

Denitrification
releases nitrogen back into the atmosphere by the conversion of nitrates into nitrogen gas

Phosphorus Cycle page 79 Figure 3-15



Nutrients
chemical substances that are needed for life

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