

What is an ecosystem?

- All the **living (biotic)** and **nonliving (abiotic)** parts of an environment as well as the interactions among them
- Ecosystems may be **aquatic (water)** or **terrestrial (land)**.
- Interactions may include:
 - **producers** (obtain energy by making their own food; plants -photosynthesis)
 - **consumers** (obtain energy by consuming their food)
 - **decomposers** (get energy by breaking down dead organisms and the wastes of living things); bacteria, fungi (mold, mushrooms,etc) , some worms, termites, some beetles, etc.

Abiotic & Biotic Factors

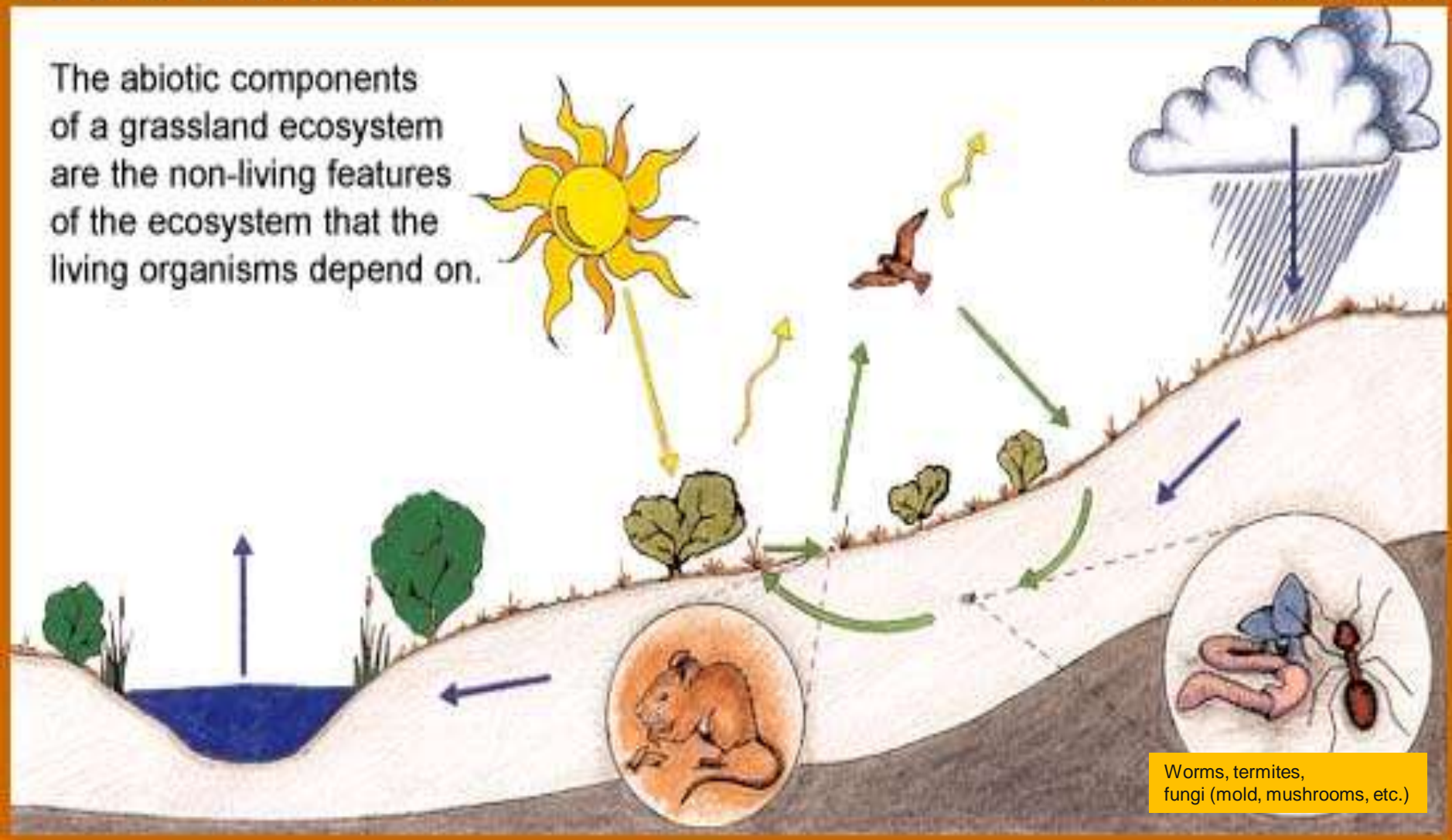
➤ Abiotic Factors (nonliving)

- water
- sunlight
- rocks
- oxygen/air, nitrogen
- temperature/climate
- space, salinity, pH
- shelter
- soil
- nutrients

➤ Biotic Factors (living)

- Food
 - grass
 - trees
 - animals, insects,
 - plants
- bacteria, fungi

The abiotic components of a grassland ecosystem are the non-living features of the ecosystem that the living organisms depend on.

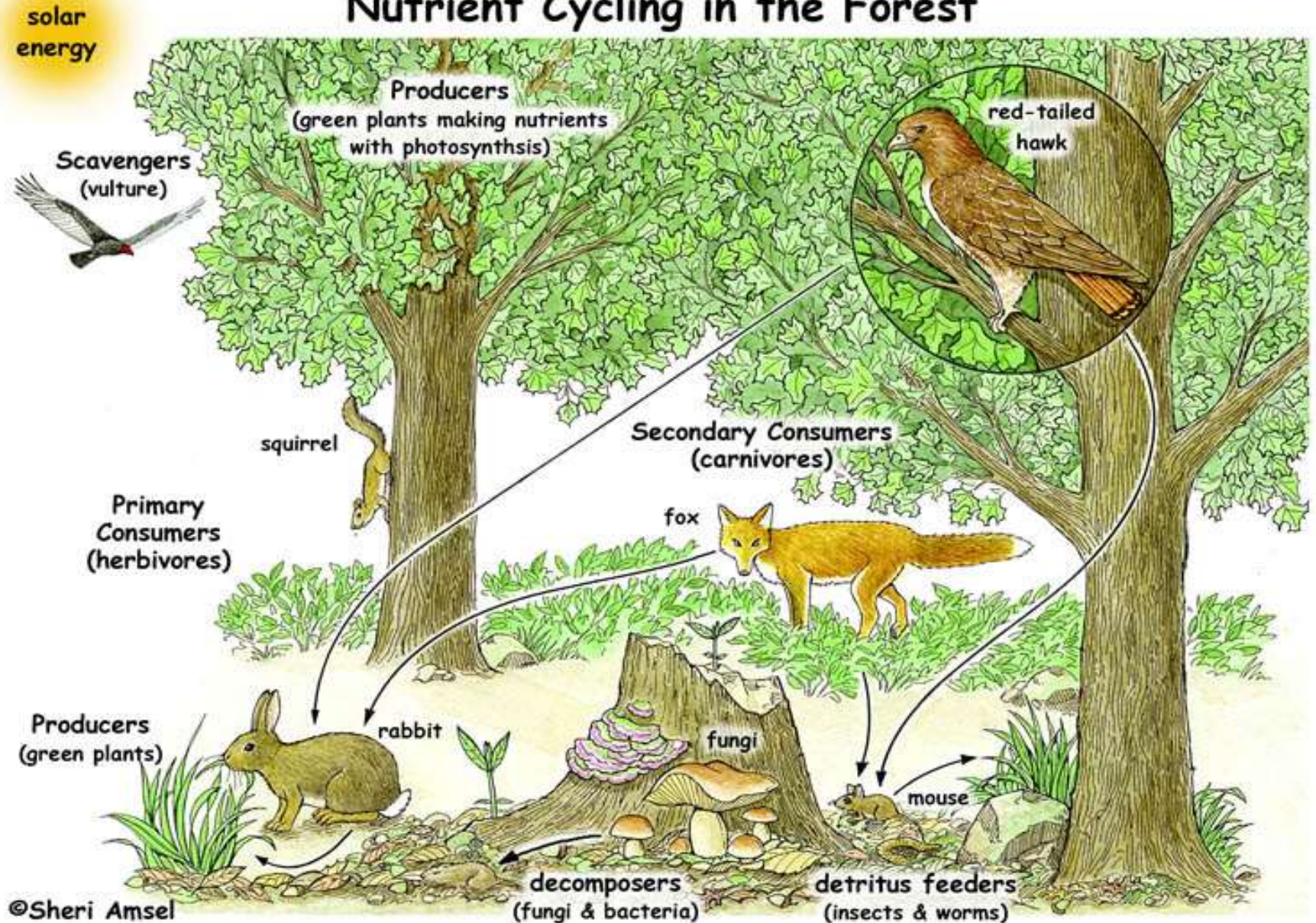


Worms, termites,
fungi (mold, mushrooms, etc.)

In the diagram,

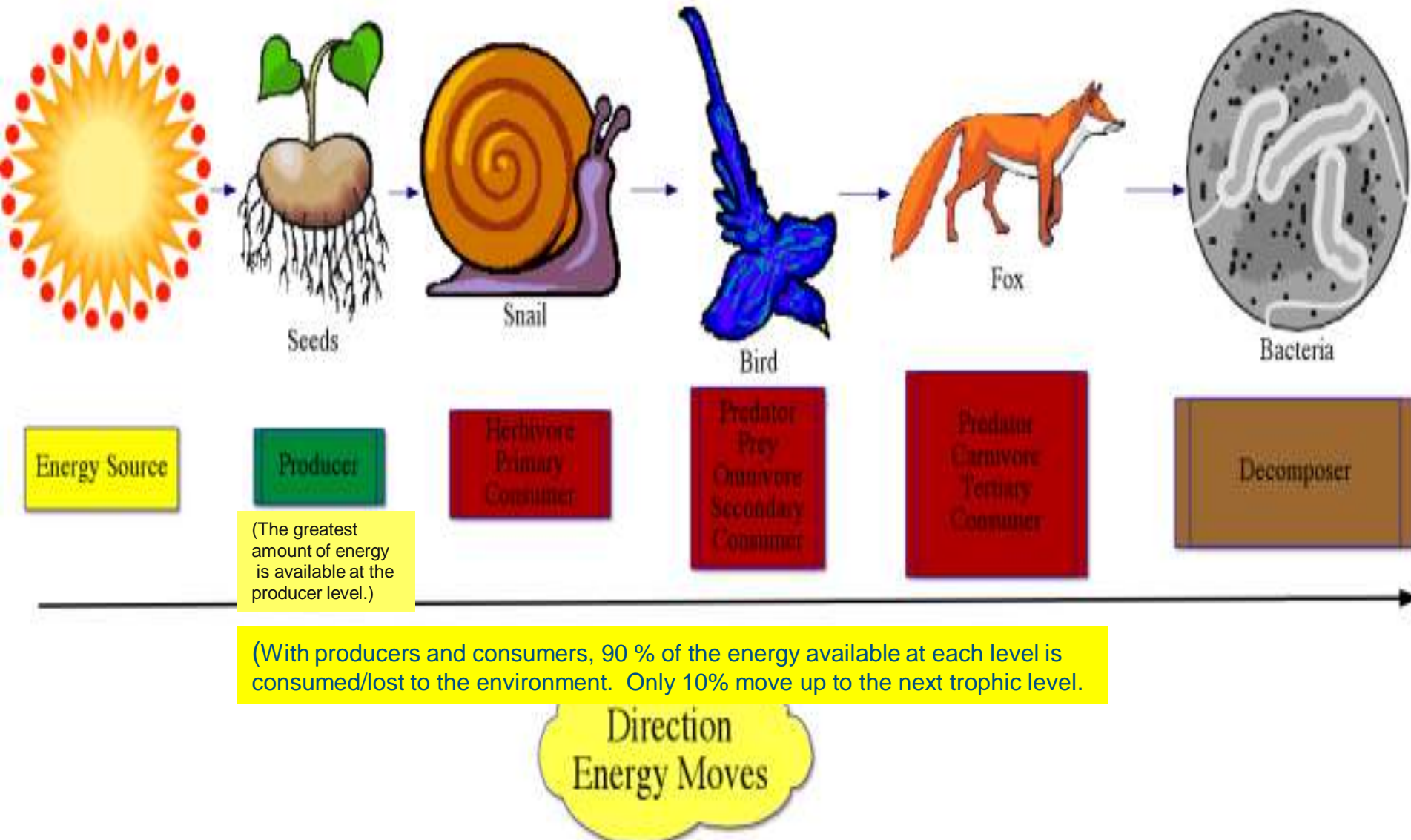
1. What are the decomposers? Producers? Consumers?
2. What organisms are competing for the same abiotic resources?
3. What is the source of energy that drives or sustains the ecosystem?

Nutrient Cycling in the Forest



Arrows are pointing in the direction of what is being consumed.

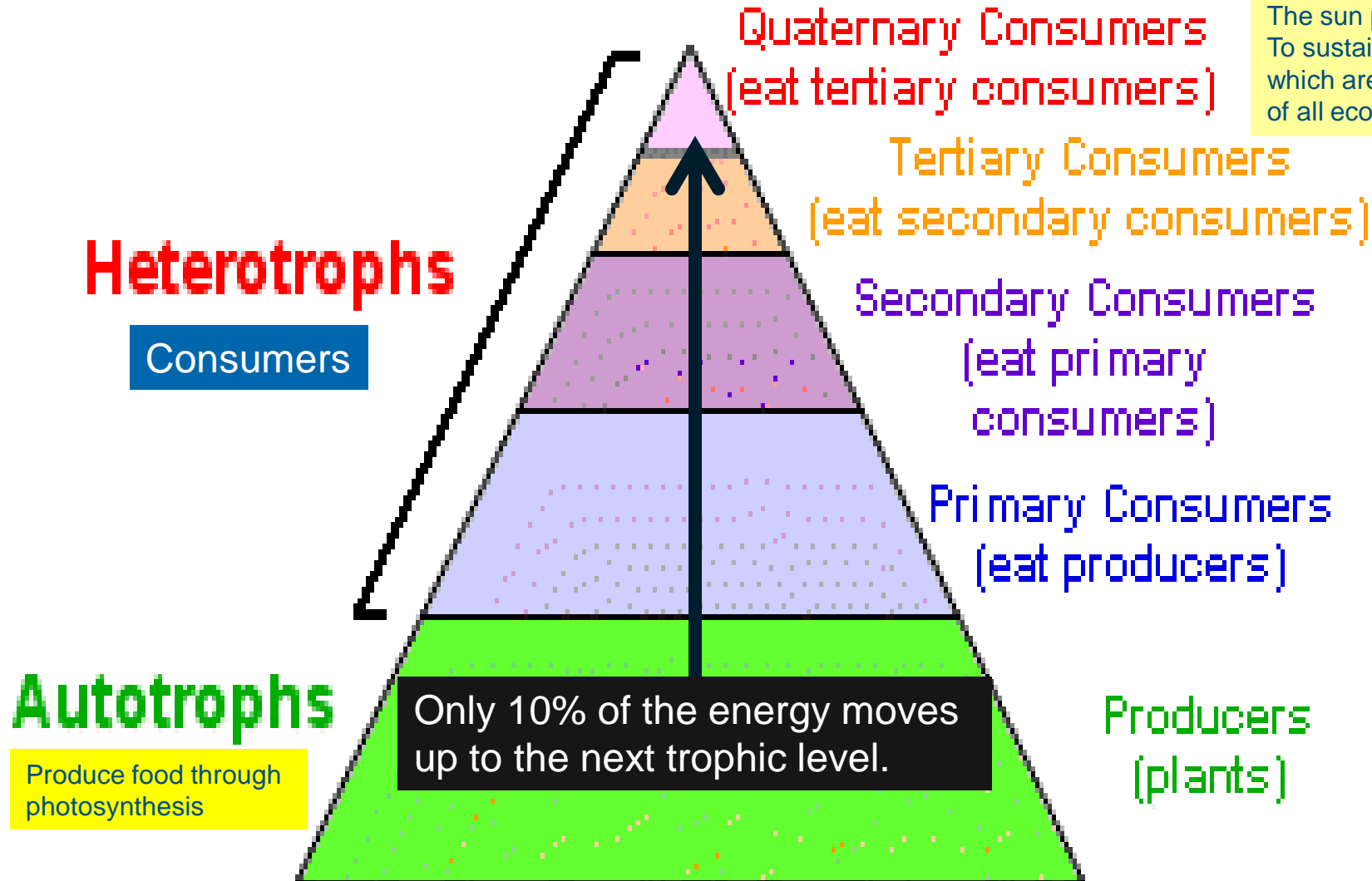
Food Chain Vocabulary



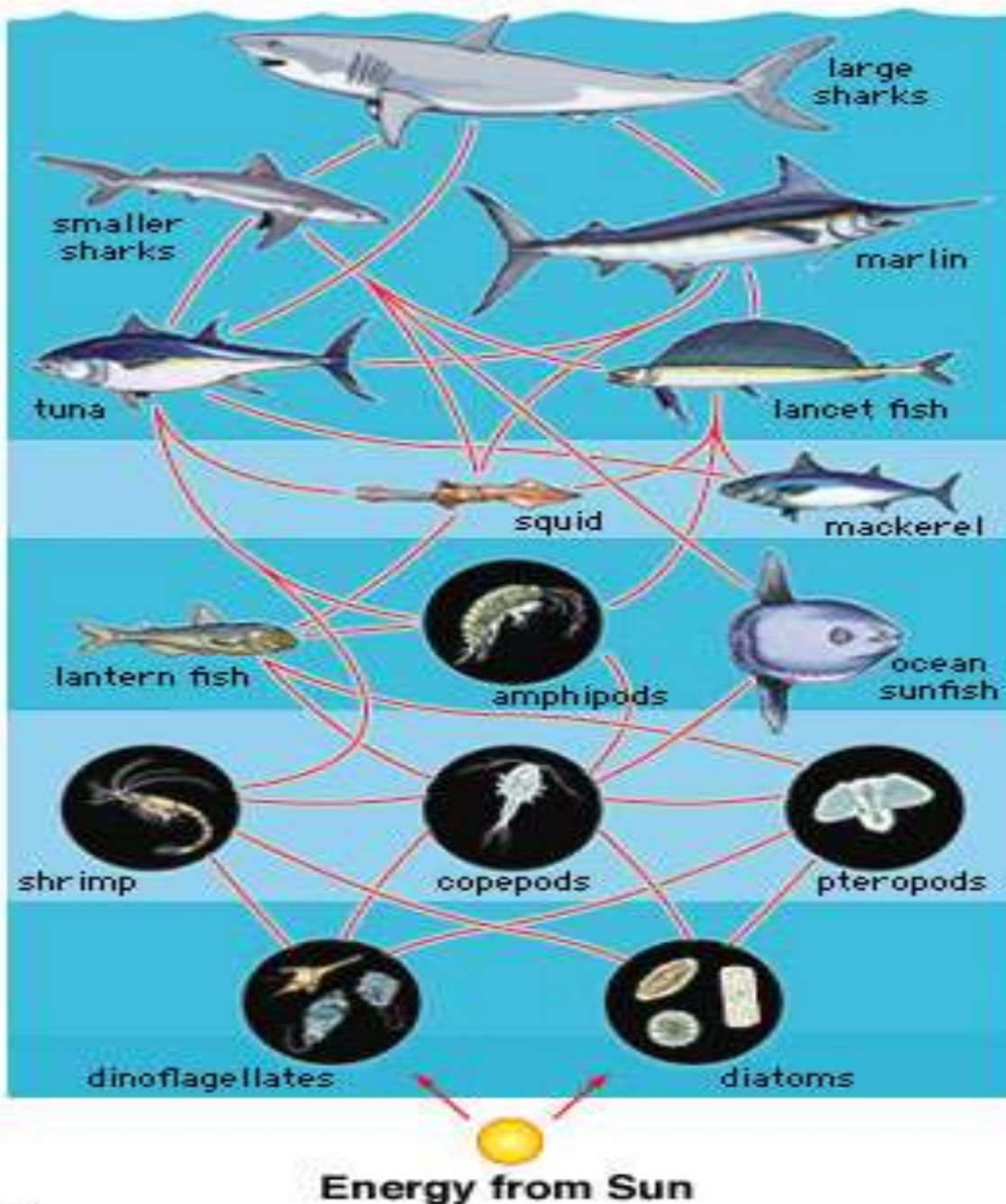
The Food Web



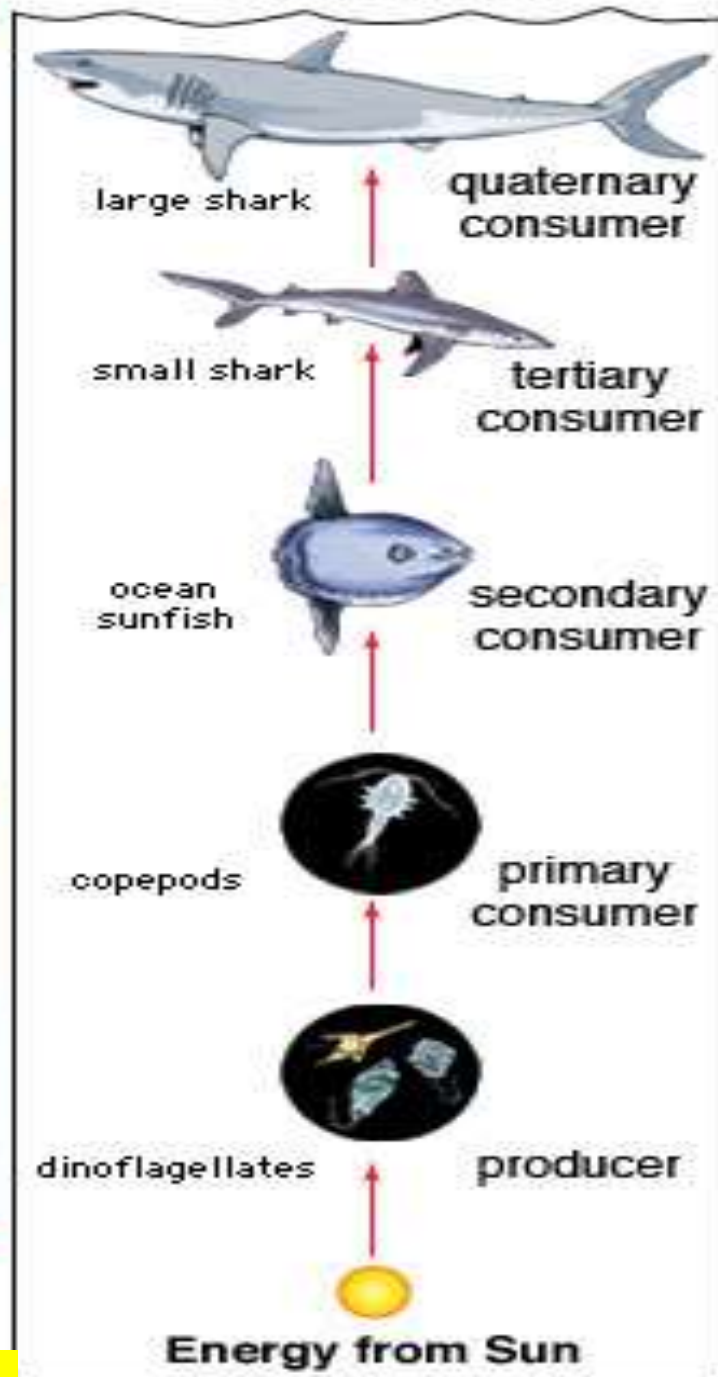
The sun provides energy
To sustain producers
which are the foundation
of all ecosystems.



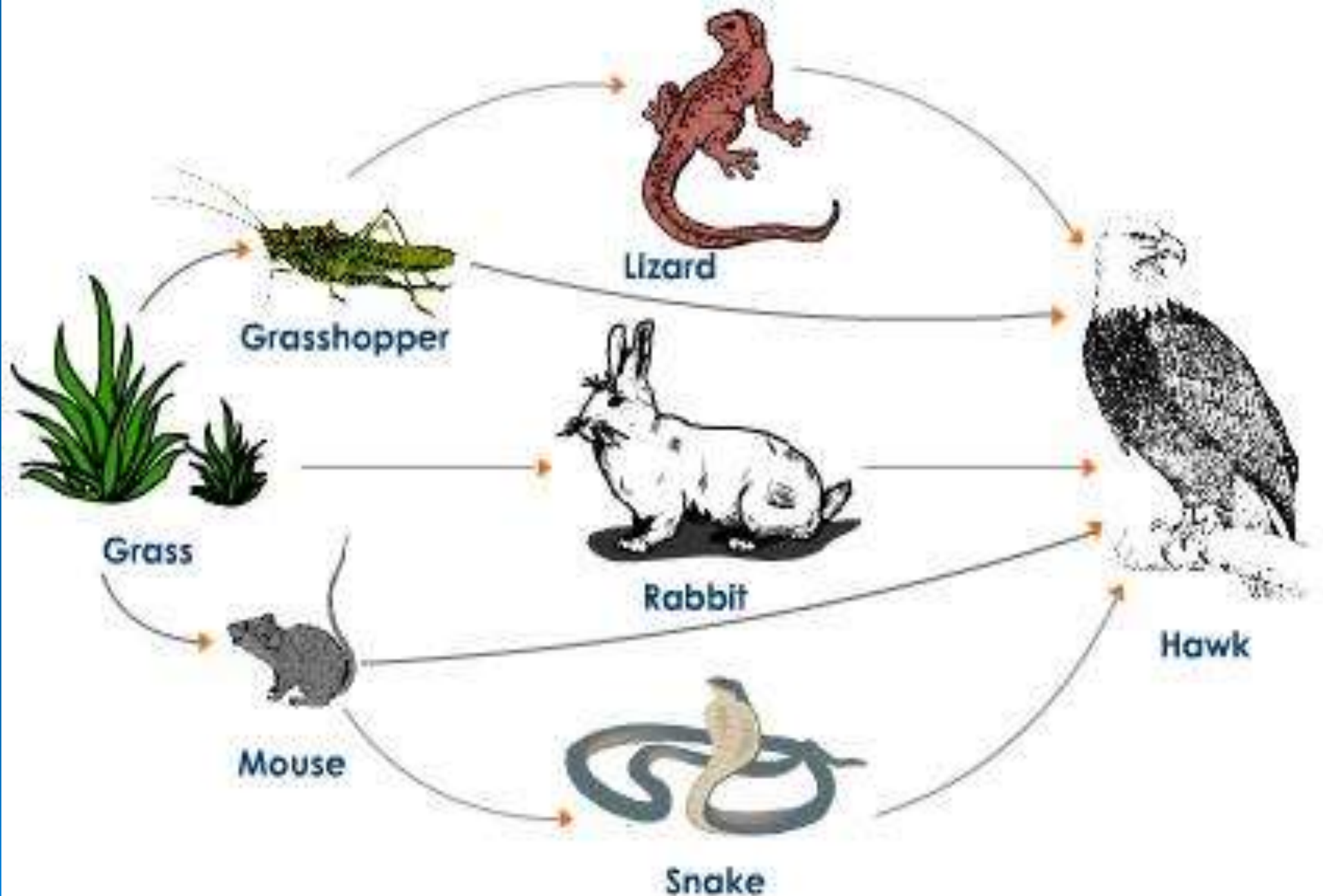
Food Web



Food Chain



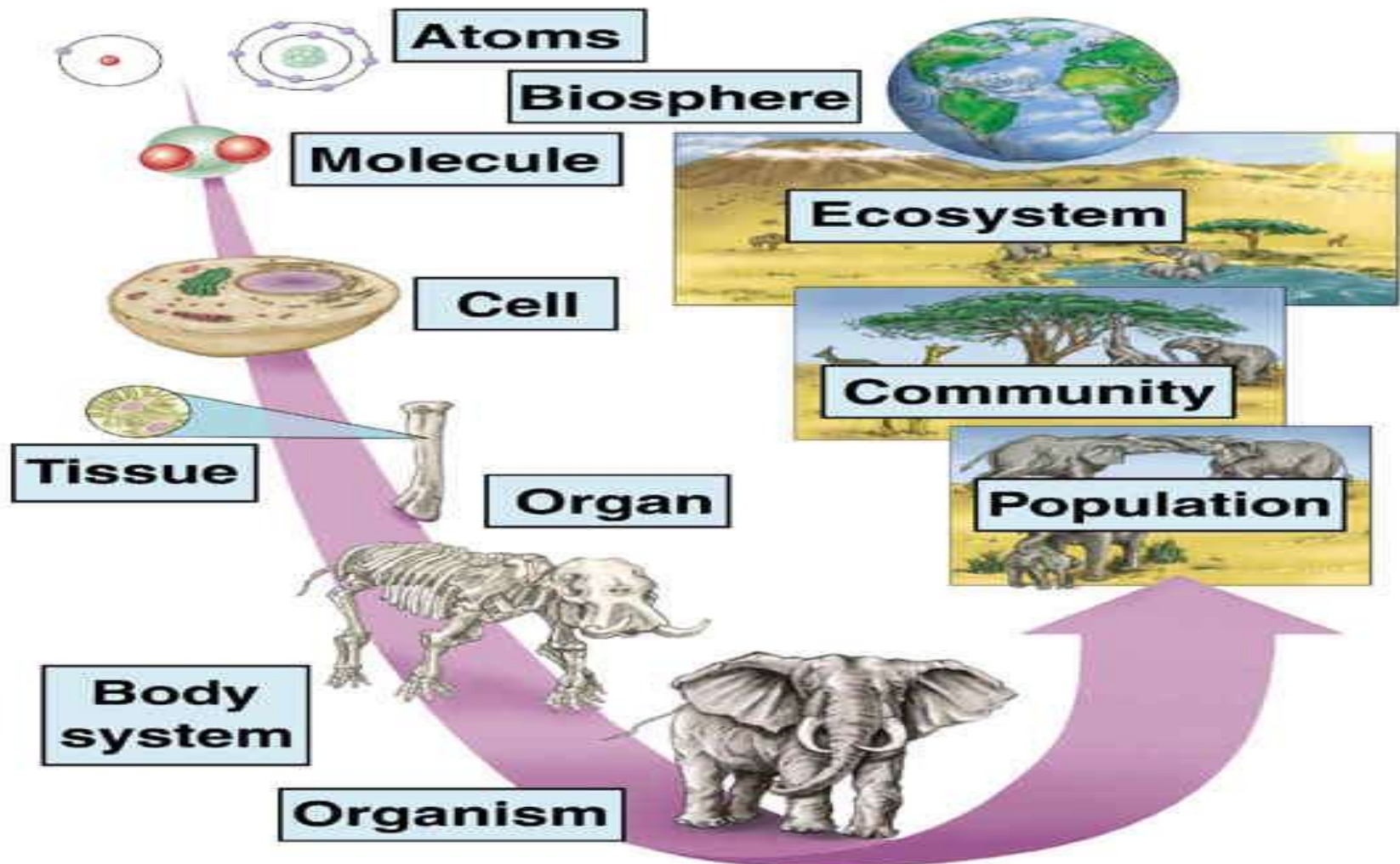
If removed from the food web, which organism (s) would have the greatest impact on the overall food web? Explain.











1. What are the producers? primary consumers? secondary consumers? tertiary consumer?
2. What organisms are competing for the same abiotic and biotic resources?
3. If removed from the food web, which organism would have the greatest impact on the overall food web?

From Atoms to Biosphere

Raven/Berg, Environment, 3/e
Figure 4.1



Ecosystem Organization

Biosphere	The part of Earth that contains all ecosystems	 <p>Biosphere</p>
Ecosystem	Community and its nonliving surroundings	 <p>Hawk, snake, bison, prairie dog, grass, stream, rocks, air</p>
Community	Populations that live together in a defined area	 <p>Hawk, snake, bison, prairie dog, grass</p>
Population	Group of organisms of one type that live in the same area	 <p>Bison herd</p>
Organism	Individual living thing	 <p>Bison</p>
Groups of Cells	Tissues, organs, and organ systems	 <p>Nervous tissue Brain Nervous system</p>
Cells	Smallest functional unit of life	 <p>Nerve cell</p>
Molecules	Groups of atoms; smallest unit of most chemical compounds	 <p>Water DNA</p>

Organism (single one of species)

Mushrooms



Polar Bears



Snakes



Coyotes



Prairie Dogs



Elephants



4 Populations (same species)

➤ Elk Population



➤ Cacti Population



➤ Elephant Population



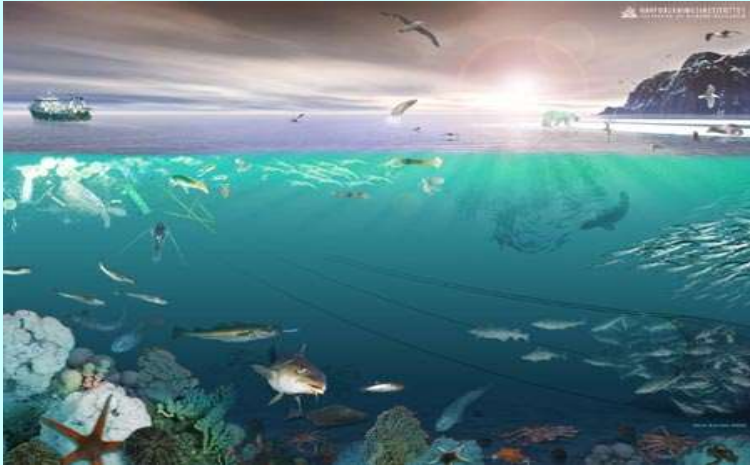
➤ Gorilla Population



Communities (many populations)

What communities are present in each of these ecosystems?

Marine (aquatic) Ecosystem



Freshwater & Terrestrial Ecosystems



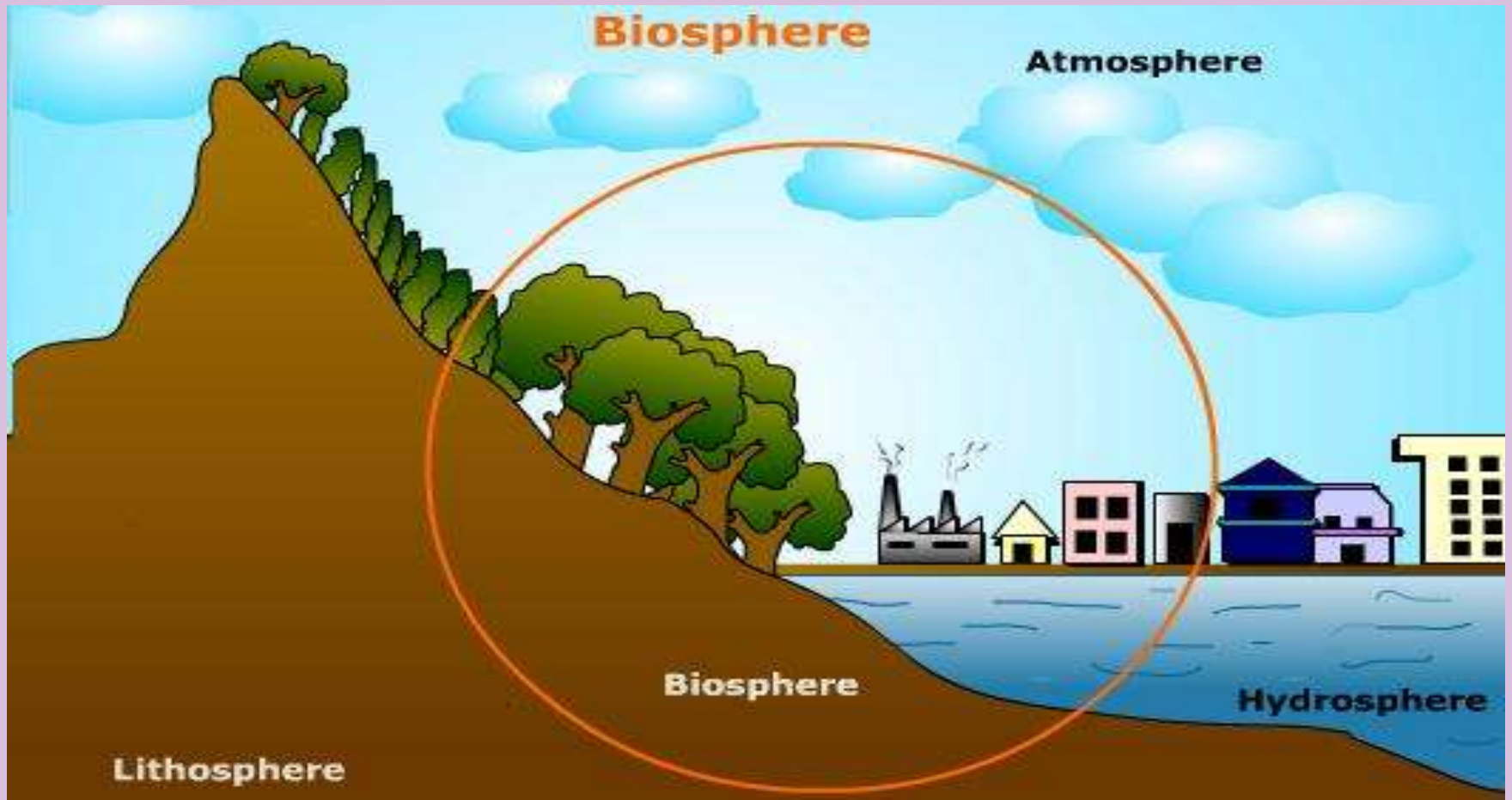
Terrestrial Ecosystem



Aquatic (estuary) Ecosystems



Ecosystems make up the biosphere.



Earth is the only planet on which life exists. It consists of three components **Lithosphere (Land)**, **Hydrosphere (Water)** and **Atmosphere (Air)**. The life supporting zone of the earth where atmosphere, hydrosphere and lithosphere meet, interact and make life possible, is known as **biosphere**.

How would the removal of algae from this arctic food web affect both the biotic and abiotic factors?

Abiotic Factors Affected

dissolved oxygen
decreases

nutrients may go up or
down

more CO₂ in water

water may be more turbid
temp. may change

Biotic Factors Affected

- animal plankton pop.
decreases
- silverside pop. decrease
- beluga whale pop. decrease
- cod pop. Decreases
- bacteria increase & use up
dissolved oxygen

****Every population is directly or
indirectly affected**

Biodiversity

A variety of species exist in all ecosystems.

What are examples of biodiversity in our area?

- plant biodiversity
- insect biodiversity
- animal biodiversity
- fungi biodiversity
- bacteria biodiversity

Limiting Factor

- - environmental **factors** that limit population sizes in a particular **ecosystem**

Population Density

- the number of people/organisms living per unit of an area (e.g. per square mile); the number of people relative to the space occupied by them
- _ how full an area is: the concentration of people or things within an area in relation to its size

Population Density: measures the number of individual organisms living in a defined space

High Population Density



China's Qingdao Huiquan Beach

Density – Dependent Factors

Competition

- food
- habitat/space
- water
- sunlight
- mating (Concerns relate to genetic mutations, and the number of individuals competing for a mate.)

Spread of Disease: Overcrowding increases the possibility of diseases being spread in a population.

Predation: Overcrowding interferes with the natural predator/prey relationship in an ecosystem.

Parasitism: Overcrowding increases the possibility of parasites being spread.

Density-independent Factors

- Limiting factors that occur regardless of how large the population is and reduce the size of all populations in the area; mostly abiotic
 - weather changes
 - temperature changes
 - human activities (pollution, urban sprawl, etc.)
 - natural disasters (volcanoes, fires, etc.)

Urban Sprawl



How may this affect:

- **water quality
(surface and ground)**
- **habitats**
- **soil quality**
- **air quality**
- **noise pollution**

Limiting Factors in an Ecosystem

➤ **Density-dependent Factors**

- operate more strongly on large populations and disease
- triggered by increases in population density (crowding)

* Competition for food, water, shelter & space

* Predation

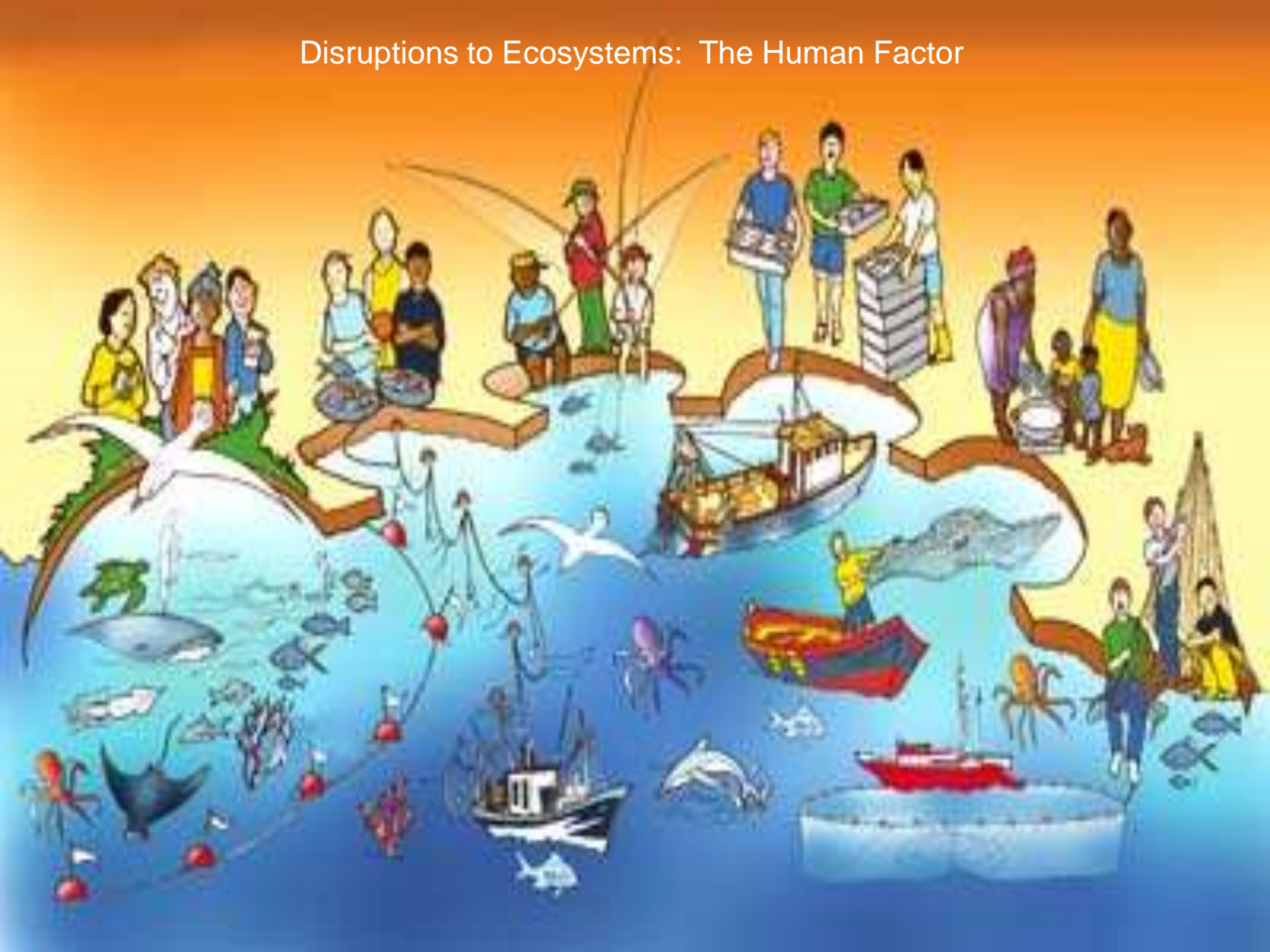
* Parasitism

* Disease

A change in an abiotic or biotic factor may:

- decrease the size of a population if it cannot acclimate/adapt to or migrate from the change.
- increase the size of a population if that change enhances its ability to survive, flourish or reproduce.

Disruptions to Ecosystems: The Human Factor



Disturbances to Physical (abiotic) or Biological (biotic) Components of Ecosystems

- Disruptions lead to shifts in all populations. This changes the biodiversity of an ecosystem.
- What disruptions may occur leading to a change in the **physical (nonliving/abiotic) components in an ecosystem?**

<http://www.youtube.com/watch?v=ddlrGkeOzsl> Lake Peigneur disaster 9:54

1. What affect did this disaster have on the aquatic ecosystems? Terrestrial?
 2. What affect did this disaster have on the terrestrial ecosystems?
- ** Include both biotic and abiotic factors when answering these two questions.
3. How would this disaster lead to possible “population shifts”? Be specific.

Disruptions to Physical (nonliving/abiotic) Components

- * Volcanic eruptions
- * Hurricanes
- * Fires
- * Drought
- * Habitat depletion (human and natural)
 - i.e. urban sprawl
- * Pollution
- * Clear cutting
- * Floods
- * Nuclear Bomb

How could these events change nutrients, water, light, salinity, shelter, soil, temperature, climate, etc. in an ecosystem?

Disruptions to Biological (living/biotic) Components

- * Volcanic eruptions
- * Hurricanes
- * Fires
- * Drought
- ** Overharvesting
- * Habitat depletion (human and natural)
- * Pollution (land & water)
- * Urban Sprawl
- * Clear Cutting
- * Introduction of exotic
(non native) species

**How could these events change the biological
(living/biotic) components in an ecosystem?**

Preventing Overharvesting

- Hunting seasons
 - Laws against poaching
 - Limit on Numbers
 - License required
 - Specific places
 - Wildlife Reserves/National Parks
 - Tagging/Monitoring Programs (remote sensing)
 - Breeding Programs
 - Identification of Endangered Species
- Laws (ownership)
 - Size limitations
 - Organizations
 - Size/types of nets
 - Limits on gender

Impact of Clear Cutting

What are the impacts on biotic and abiotic factors?



