

Name: \_\_\_\_\_

Smigala<sup>15</sup>

## **Bio 21: Ecology Unit Assignment**

**Use the readings and diagrams provided in the packet to help answer the questions and define the vocabulary. Feel free to use chapters 18-20 in your textbook as well as any other internet resources you find to supplement your understanding. Make note of any concepts that you are having trouble with so that we can make sure to review them in class.**

Vocabulary: (make sure that you understand what each term means)

Community	Food chain
Ecosystem	Food web
Population	Energy pyramid
Habitat	Limiting factors (density dependent vs. density independent)
Abiotic factors	
Biotic factors	Carrying capacity

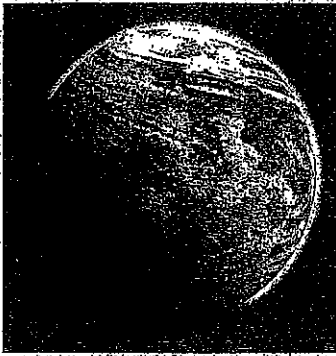
Major Concepts: (ID's page reviewed in packet)

- Comparing terms about ecosystems: community, population, habitat, ecosystem. (p.1-2)
- Identifying biotic and abiotic factors in an ecosystem. (p.1)
- Interpreting energy pyramids showing how energy is used, lost and passed on from one level on the pyramid to the next. (p.3)
- Identifying the carrying capacity of a population on a graph and explaining what it is. (p.4)
- Factors that affect the size of a population: comparing and contrasting density dependent and density independent limiting factors. (p. 4-5)
- Interpreting and creating food chains and food webs. (p. 5)

# Components of an Ecosystem

The concept of the ecosystem was developed to describe the way groups of organisms are predictably found together in their physical environment. A community comprises all the organisms

within an ecosystem. Both physical (abiotic) and biotic factors affect the organisms in a community, influencing their distribution and their survival, growth, and reproduction.

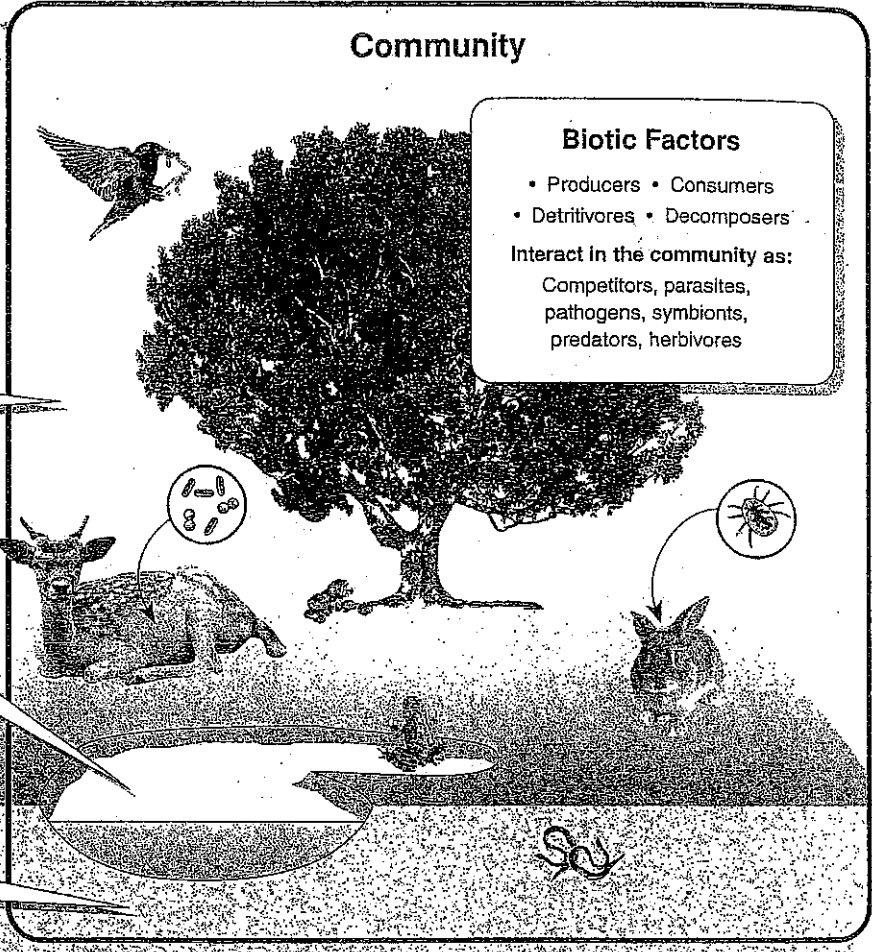
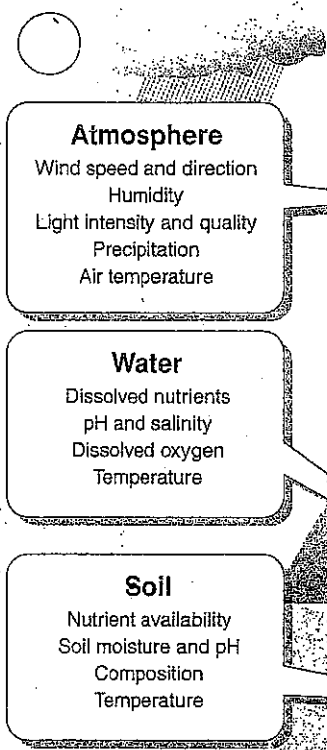


## The Biosphere and the Earth's Physical Environment

The **biosphere** containing all the Earth's living organisms amounts to a narrow belt around the Earth extending from the bottom of the oceans to the upper atmosphere. Broad scale life-zones or **biomes** are evident within the biosphere, characterized according to the

predominant vegetation. Within these biomes, **ecosystems** form natural units comprising the non-living, physical environment (the air, soil, and water) and the **community** (all the populations of different species living and interacting in a particular area).

### Physical Environment



1. (a) Distinguish clearly between a community and an ecosystem: \_\_\_\_\_
  
3. Distinguish between biotic and abiotic factors: \_\_\_\_\_
  
4. Use one or more of the following terms to describe each of the features of a rainforest listed below:  
**Terms:** *population, community, ecosystem, physical factor.*
  - (a) All the howler monkeys present: \_\_\_\_\_
  - (b) The entire forest: \_\_\_\_\_
  - (c) All the organisms present: \_\_\_\_\_
  - (d) The humidity: \_\_\_\_\_

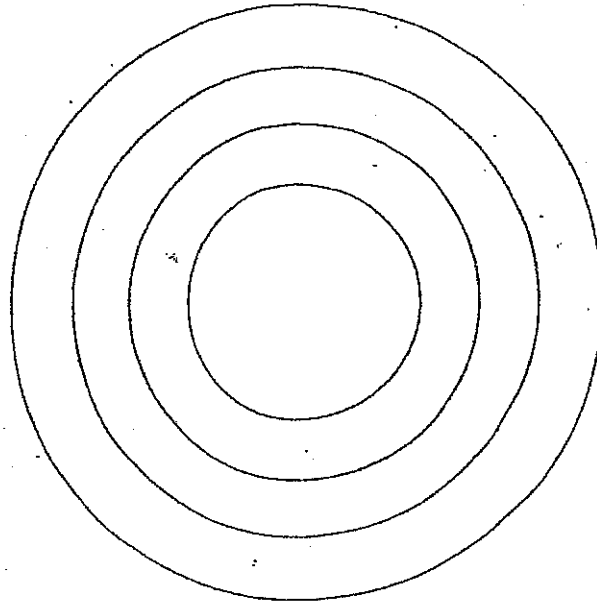
Place the terms below within the circles. The term that includes all of the others should be in the outermost circle. Place the others in order until the smallest group is in the center circle.

population

ecosystem

community

organism



# Habitats

The environment in which an organism lives (including all the physical and biotic factors) is termed its **habitat**. For each of the organisms below, briefly describe their habitat (an example is

provided). As well as describing the general environment (e.g. river, swamp), include detail about the biotic and abiotic factors in the habitat which enable the organism to thrive.



Jew's ear fungus: *Auricularia auricula*

1. General habitat of the Jew's ear fungus: Woodland, especially on elder.

(a) Biotic factors: Source of live and/or dead wood (usually elder)  
from which to obtain its nutrition.

(b) Abiotic factors: Autumnal: needs cooler temperatures, high  
moisture levels in the soil and high humidity.



Herring gull: *Larus argentatus*

2. General habitat of the herring gull:

(a) Biotic factors: \_\_\_\_\_  
 \_\_\_\_\_

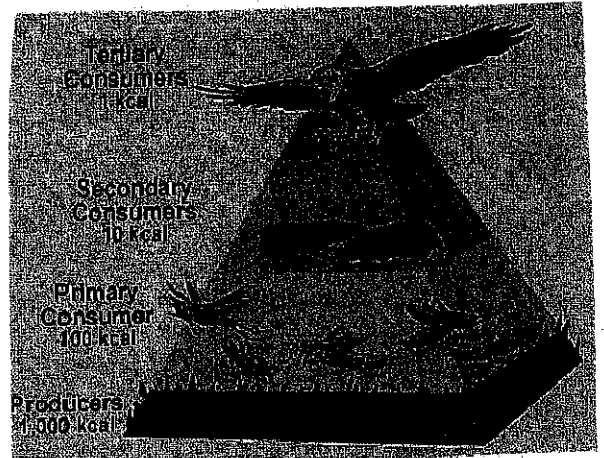
(b) Abiotic factors: \_\_\_\_\_  
 \_\_\_\_\_

## Ecology: Energy Flow

### Pyramid of Energy

An important use of food is for energy. At each step of a food web energy is transferred to the next higher level. Energy from the sun is transferred from producer to primary consumer and from primary consumer to secondary consumer. Sunlight is the original source of energy for all organisms in the food pyramid.

The energy transfer is not efficient because much of the food energy taken in by a consumer is used during the process of metabolism. Energy is "lost" at each food level therefore less energy is available to the higher levels of the food chain than to the lower levels. At each consumer level only about 10 percent of ingested nutrients are used to make new body tissues that represent food for the next feeding level. The rest of the energy is lost as heat and unavailable chemical energy. This concept is often represented by a pyramid. In a food web the greatest amount of energy is at the producer level. This is why the producer level is how at the bottom of the pyramid. The amount of usable energy decreases with each higher feeding level forming a **pyramid of energy**.



1. Why is the energy transfer in a food web inefficient?

---

---

2. A pyramid of energy shows usable energy \_\_\_\_\_ with each higher feeding level.
3. At each consumer level only about \_\_\_\_\_ percent of ingested nutrients are used to make new body tissues. The rest of the energy is lost as \_\_\_\_\_ and unavailable \_\_\_\_\_.

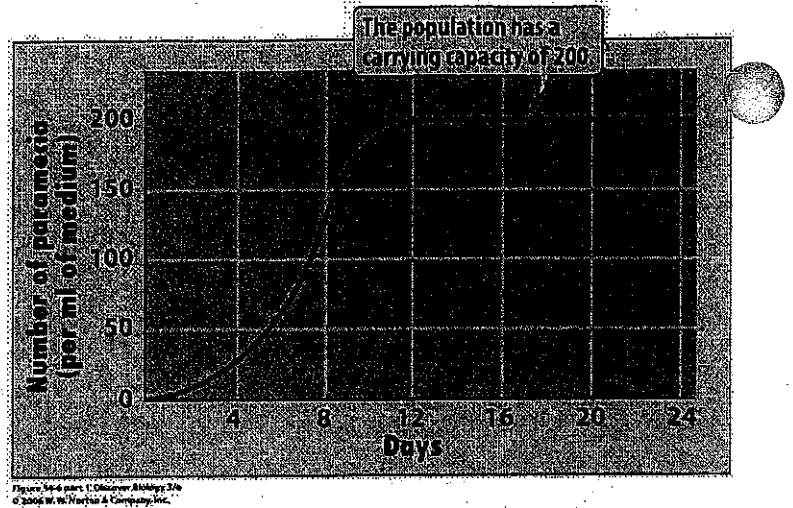
Base your answers to questions 4 – 6 on the diagram at the right that represents as food pyramid of organisms living in a pond.

4. At which level of the food pyramid is the *smallest* percentage of total energy stored?  
A. A  
B. B  
C. C  
D. D
5. Which organisms in the food pyramid function as primary consumers?  
A. Bass  
B. Minnows  
C. Copepods  
D. Algae
6. What is the original source of energy for all organisms in this food pyramid?  
A. Water  
B. Sunlight  
C. The substratum  
D. Carbon dioxide

# Population Growth

*Why don't populations keep expanding?*

All living things need food, water, shelter and space to survive. And as long as organisms have all of these things available to them their population will continue to grow. However, populations cannot grow forever. Some form of environmental resistance will stop the population's growth. The form of environmental resistance is called a **limiting factor** since it *limits* the population. And the **carrying capacity** is the the highest level of a population that can be supported by that environment. Population growth is kept in check by two factors:



## 1. Limiting Factors

In populations a limiting factor is a factor that causes population growth to decrease. For example, the amount of oxygen on our planet would limit the population growth of mammals.

## 2. Density-Dependent Factors

A limiting factor that depends on population size is called a density-dependent limiting factor. Density-dependent factors operate only when the population density reaches a certain level. These factors operate most strongly when a population is large and dense.

Density-dependent limiting factors include:

- **Competition** - When populations become crowded, organisms compete for food, water, space, sunlight and other essentials. Competition among members of the same species is a density-dependent limiting factor.

1. When the deer population in Fairfield gets high, and snow and ice cover the landscape, what do the deer compete for the most?  
\_\_\_\_\_

- **Predation** - Populations in nature are often controlled by predation. The regulation of a population by predation takes place within a predator-prey relationship, one of the best-known mechanisms of population control.

2. Why could the deer population get so high in Fairfield? \_\_\_\_\_

- **Parasitism** - Parasites can limit the growth of a population because a parasite lives in or on another organism (the host) and consequently harms it.

- **Disease** - disease can spread quickly through a large population.

**Look at the graph of the paramecium, above, and answer the questions below:**

1. Describe how two density dependent factors (your choice) could bring the population growth below the carrying capacity of the petri dish:  
\_\_\_\_\_  
\_\_\_\_\_

2. What density dependent factors in the past have limited human growth? How?  
\_\_\_\_\_  
\_\_\_\_\_

## Density Independent Factors

Despite the population size, large or small, these factors can limit population growth. Examples of density-independent limiting factors include:

- unusual weather
- natural disasters
- seasonal cycles
- certain human activities—such as damming rivers and clear-cutting forests

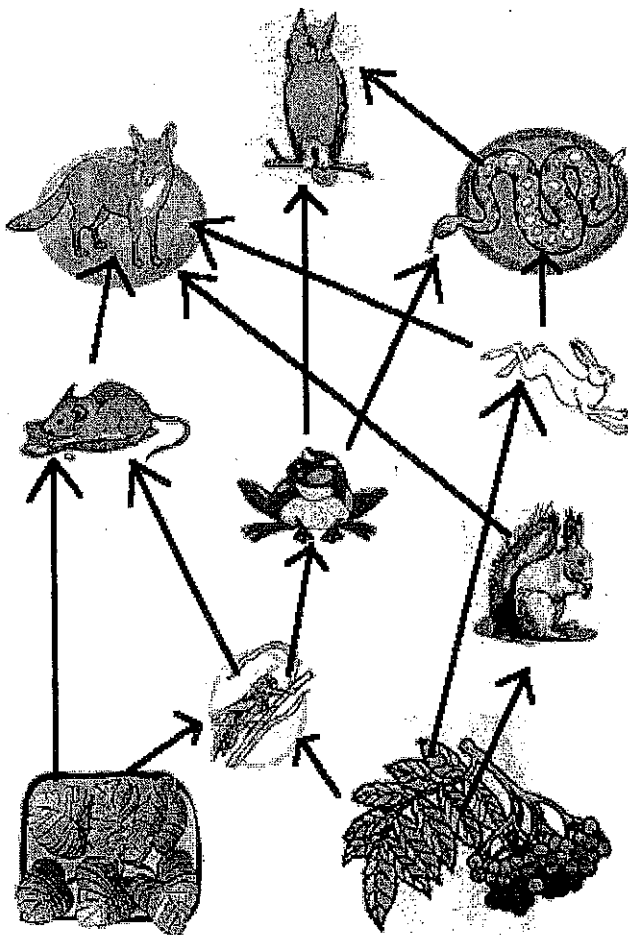
3. Why would large tornado impact small and large populations in the same way?

## Food Webs

Define:

Food Chain-

Food Web-



**Identify the:**

1. Producers

2. Primary Consumers

3. Secondary Consumers

4. What organisms are missing from this food web?

5. Where do the producers get their energy from in this food web?