

Name: _____ Date: _____ Per: _____

Questions from reading: A Brief Introduction to Ecology

1. What is an ecosystem?
2. If “a” means without, and “bio” means life, what do you think the word “abiotic” means? What could “biotic” mean?
3. What is the relationship between ecology and an ecosystem?
4. If a population of many species is left alone, what will happen to it?
5. One factor that impacts an ecosystem is:
6. What three things are involved in how the size of a species population changes?
7. How can you figure out the change in population size?
8. Differentiate between “emigration” and “immigration”.
9. If the birthrate exceeds the deathrate, what will happen to the population size?
10. Define resources.
11. Differentiate between “renewable” and “nonrenewable” resources and give an example of each.

12. How does the amount of resources affect organisms in an ecosystem?

13. Define carrying capacity.

14. What does interactions between species determine?

15. Differentiate between competition and predator-prey.

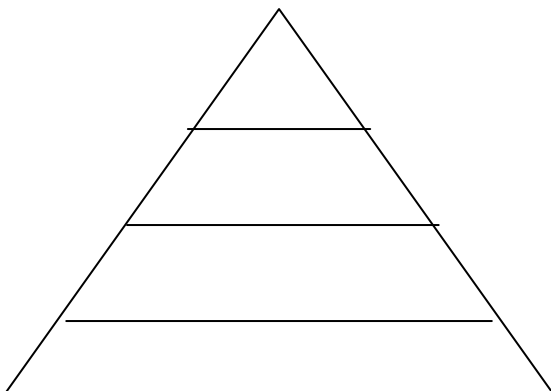
16. What is the ultimate source of energy for most organisms?

17. Give a general definition for a “consumer”.

18. Define trophic level.

19. Differentiate between a primary consumer and a primary producer.

20. Fill in the food pyramid using words from the last paragraph of the reading.



A Brief Introduction to Ecology

HOW AN ECOSYSTEM WORKS:

An ecosystem refers to all the living organisms and their non-living environment within a given area. Note that this definition includes two components; the living component which consists of the animals, plants and microbes, and the non-living component which refers to the air, water, rocks, soil and weather.

There is no limit to how large or small an ecosystem can be. An ecosystem can be as large as an ocean or as small as a puddle. Very large ecosystems are known as biomes. An important point to recognize about ecosystems is the interaction between a grouping of plants and animals and their non-living environment and how the two strive to achieve a balance.

Ecology relates to the study of ecosystems. Scientists who study the different components of ecosystems and how they are related to one another are called ecologists. Ecologists have determined that the populations of many species if left undisturbed by humans will remain relatively unchanged over time. Why then are so many species becoming extinct? Today, extinction rates are thousands of times greater than the natural rate.

To better understand the reasons for this, it is first important to learn about the different factors affecting the living and non-living components of ecosystems and how they are interrelated.

One factor which has a great impact on an ecosystem is the number of living organisms there are in a particular ecosystem. The number of individuals of each species present in the ecosystem is determined by that species' rate of population growth. There are three factors involved in how the size of a species population changes over time. They are:

- Birth
- Death
- Migration into (immigration) or out of (emigration) the population

A change in the population size of a given species can be determined by subtracting the number of individuals that leave a population (through death or emigration) from the number of individuals that join a population (through birth or immigration).

Change in Population Size = # Individuals that JOIN - # Individuals that LEAVE
(birth + immigrants) - (death + emigrants)

From this we can see the following:

- That a population will remain unchanged if as many individuals leave as join.
- That if more individuals join a population than leave population growth will result.
- That if more individuals leave a population than join a population decline will result.

The rate at which the population of a given species grows or declines is also affected by a number of factors related to the species' life history strategy. These include:

- The age at which the species is first able to reproduce
- The frequency with which reproduction occurs
- The number of offspring produced per reproductive effort
- The number of years a species is able to reproduce
- The average life expectancy of the species

Another factor which has a great impact on the balance of an ecosystem is the availability of resources. Resources are those things necessary for a species' survival and successful reproduction. Resources can be of two types: renewable and non-renewable.

Renewable resources are those which are able to be renewed or replaced. These include food (nutrients), water, and light.

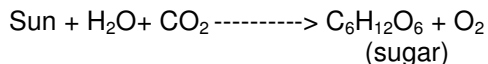
Non-renewable resources are those which are not able to be replaced. Only a finite amount of these resources exist. Space and territory (habitat) are examples of non-renewable resources.

The number of living organisms an ecosystem is able to support is directly related to the amount of renewable and non-renewable resources present in the ecosystem. Under natural conditions, most populations will stabilize at a level known as the carrying capacity of the ecosystem. The carrying capacity is the maximum number of organisms that an ecosystem can support on a continued basis. In most cases, an ecosystem's carrying capacity is determined by the availability of resources such as space, nutrients, water and light.

Interactions between species or between members of the same species often determine who will be successful in obtaining resources and who will survive. Such types of interactions include competition and predator-prey relationships. Competition occurs when two individuals (or species) both attempt to utilize a resource (such as food or space) that is limited relative to the demand for it. Predator-prey relationships occur when one organism (the predator) kills and eats another living organism (the prey). In predator-prey relationships, one organism is the resource! Once all members of a prey species are gone the predator will have to look for alternative sources of food for energy.

This brings us to the next factor that affects how an ecosystem functions-- this is how energy flows within an ecosystem. Regardless of their size, the energy flow within all ecosystems is pretty much the same. The sun is the ultimate source of energy in most ecosystems and for almost all living things. Energy from the sun flows through ecosystems allowing nutrients to be produced.

Nutrients in turn, cycle and recycle within the ecosystem in the following way: Plants are the primary producers in most ecosystems. They are able to use the light energy from the sun to produce carbohydrates through a process called photosynthesis. In addition to sugar, which is a carbohydrate, oxygen is given off as a by-product as shown in the reaction below:



Organisms that rely on the carbohydrates produced by plants for their means of energy are called consumers. There are usually several levels that energy flows through from producers to consumers. Each level is called a trophic level. As mentioned, all of the organisms (mostly plants and some bacteria) that obtain their energy directly from the sun and use it to produce carbohydrates are called primary producers. Primary producers make up the lowest trophic level. The second level consists of those organisms which feed entirely on plants. These organisms are known as herbivores or primary consumers. Carnivores are those organisms that feed on herbivores and other animals. They are referred to as secondary consumers and make up the third trophic level. Occasionally some carnivores eat other carnivores. When this happens, they form the fourth trophic level: tertiary consumers. Organisms from each of these four levels feed on one another with each level feeding directly on the level below it, making up a series called a food chain. The length and complexity of food chains vary greatly. In the wild, it is rather rare for one type of organism to feed on only one other kind of organism; usually, each will feed on two or more kinds, and in turn will be fed on by several other kinds of organisms. This type of complex feeding arrangement within an ecosystem is referred to as a food web.