

Limits to Population Growth

An ecosystem's **carrying capacity** is the maximum size of a population existing in the ecosystem at any given time without damage to the ecosystem. There are a number of factors limiting the ability of the ecosystem to support a species. Anything preventing the growth of a population is a **limiting factor**. Limiting factors are:

Space:

Many species of animals establish territories for breeding. This includes most songbirds, as well as many mammals and fishes. Even species that do not establish territories often have fewer offspring when species are crowded.

When the population becomes crowded, individuals may **emigrate** or move to other areas. The lemming, a small Arctic rodent, emigrates every four or five years. During an ordinary winter, lemmings are protected from their enemies by the snow, and if plenty of food is available, they continue to breed during the winter. As they become crowded, they move up or down the mountainside in search of food. Contrary to popular belief, they do not march to water to commit suicide.

Clean water, supporting fish and other aquatic life in an area free from too much human activity, is a good habitat for the river otter. As we develop wild areas, we destroy good otter habitat. In Pennsylvania the otter has been protected since 1952, but laws to protect a species cannot save it if it has no space to live.

Food:

When food supplies decrease, the size of the population depending on that source of food becomes smaller. In the tundra ecosystem of northern Canada, the only food for the lynx (lingks) is the snowshoe hare. When the number of hare decreases, the number of lynx also decreases. In the Florida Everglades, the snail kite population fluctuates with availability of its only source of food—the apple snail. Organisms that depend upon one food source are most vulnerable to population crashes.

In the garden, "good bugs" eat "bad bugs." If pesticides are sprayed to kill the "bad bugs," the population of "good bugs" also decreases. While some bugs—both good and bad—survive the spray, others move into the area from nearby gardens. The population of "bad bugs" must recover before there is enough food to support a large population of "good bugs."

Climate and Weather:

Why is the coniferous forest biome in the northern reaches of the planet? Coniferous trees can tolerate extreme cold. Climate plays a major role in the distribution of plants and animals.

Fewer animals survive when the winter weather is unusually cold, and the snow is deep. For certain species, such as rabbits, a cold and wet spring may decrease the number of young that survive. For other species, such as mosquitoes, an unusually wet spring provides ideal conditions for breeding and can result in a population explosion.

Cover:

If the habitat does not provide a good place to hide, organisms may become easy food for predators. On modern farms, the quail and rabbit populations are often limited due to a lack of brushy fencerows that would provide good cover. Farmers can improve the habitat by not mowing or harvesting certain sections of land.

Most species do not travel far from home in search of food. One study showed that quail would not travel to a food supply that is more than two hundred yards (180 m) from their cover. When there was cover on only one side of a square forty-acre (16-ha) field, the quail fed in only one half of the field. When there was cover on both sides of the field, the quail used the entire field.

Disease:

Organisms spread disease more readily if they are crowded. As the **population density**—number of a species per unit area of living space—increases, the distance that a diseased organism must travel to reach its next victim is reduced. More organisms are infected with the disease. If the population density increases until the supply of food is limited, the weakened animals may die from diseases they would normally survive.

Human activity:

As wild areas become developed, the populations of those species that do not tolerate human activity will decline. Loons abandon their nests when disturbed by human activity. Bobcats and river otters leave the area in search of a more peaceful habitat. Successful breeding may depend upon the availability of a habitat without human disturbance.

Shade:

The tops of the mature trees in a forest make a roof or **canopy**. The shade created by a canopy of mature oak trees becomes a limiting factor. It prevents other trees of the same species from growing. Shade-tolerant species, such as maple and beech, are more successful, and eventually become the dominant trees in the forest.

Resource:

Pearson, J. "Environmental Science: How the World Works and Your Place in it". Edmonton: J.M. LeBel, 2016.