

## POPULATIONS

The study of populations looks at groups within a particular species. A **population** is a group of organisms of the same species **that live in a particular area**.

Natural changes in animal populations are not unusual, but the rapid decline in a species is a cause for concern. What caused the decline is important to know because it affects other species within the ecosystem as well.

A change in a population can mean an increase or a decrease in the number of individuals in that population. It can also mean the change in the number of males and females, or a change in the numbers of old and young individuals. A population within an ecosystem changes as a result of something happening in that ecosystem.

## SEASONAL CHANGE

Extreme temperature changes cause populations to swell in the summer and disappear in the winter. The disappearance of a population may mean only that surviving individuals are dormant, or hibernating in the winter months. Breeding cycles can also cause seasonal changes in populations.

### SHORT-TERM CHANGE

Short-term changes take place over a relatively short period of time and don't last very long. They happen irregularly and may be part of a natural event, or caused by human activities.

### LONG-TERM CHANGE

Also result from natural events or human activities. A landslide can change the course of a river or stream. Addition of a new species to an area may result in overpopulation of that species because there are no natural enemies. These changes can cause ripple effects because of the interactions that occur within every ecosystem.

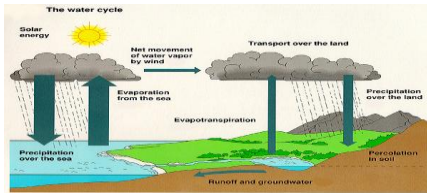
## WATER QUALITY

Water quality can change when natural events or human activities affect what is being added or taken from the water. Some species can tolerate certain changes because those changes are within their **range of tolerance**. Other species may have a very different range of tolerance to certain conditions and will not be able to survive.

Acid rain can kill a lake. The lake's death results from altering the conditions, which specific species can tolerate. Those species which depend (in the food chain) on the species that die will also perish. When light is blocked by **algal bloom** growing on the surface of the water, water plants, which produce oxygen for other organisms in the water, die (because they don't get enough light). When there is not enough oxygen in the water, other organisms also perish, and soon, the lake cannot support any life at all (it dies).

## WATER CYCLE

Water is recycled around the world through the **water cycle**. This doesn't mean that any one area will always have the same amount of water. In fact, it means just the opposite. No one area can expect the same amount of water year after year. This is because of other natural cycles and human intervention (use) that can cause changes to occur.



## WATER USE

There are **direct** (*domestic or personal use*) and **indirect** (*industrial and agricultural*) ways that humans use water.

Many indirect uses can have negative effects on Earth's water supply. Negative effects may include:

- Pollution of surface and groundwater
- Depletion of groundwater supply

**Power stations** – can discharge warm water into lakes or rivers (thermal pollution) killing organisms that cannot tolerate the increased temperature.

**Factories** – may add toxic chemicals (which can cause tumors, birth defects, sterility and even death) or, add to the thermal pollution problem.

## IMPACT ASSESSMENT

There are benefits and costs to using water.

Water Use	Benefit (+)	Cost (-)
<b>Agriculture</b> (irrigation)	Food Economy Jobs	Soil salinity Decreases vegetation Depletes groundwater supplies
<b>Industry</b> (coolant, solvent, washing, diluting pollutants)	Jobs Consumer Products Services	Pollution contributor Depletes groundwater supplies
<b>Domestic</b>	Convenience Jobs	Cost

## IMPACTS ON WATER

**Runoff** – from **farmland** contains fertilizers that can cause excessive plant growth. It may also contain toxic chemicals (pesticides and herbicides) that can kill living organisms.

**Habitat destruction** takes away the places where animals and plants can live and interact in an aquatic ecosystem.

**Sewage** – contains large amounts of nitrogen, which causes micro-organism populations to increase. These micro-organisms use up the oxygen in the water and may organisms can die as a result.

**Oil Spills** – from ships transporting oil from place to place can cause harm to plants and animals in, on or near the water.

## Monitoring and Assessing Water Quality



One way to help guard against problems with water quality is to monitor the water supply.

To **monitor** means to observe, check, or keep track of something for a specific purpose. Town and city water supplies have to be monitored on a regular basis to ensure that the quality of the water remains high.

Water technicians (**freshwater biologists**) regularly measure the level of chemicals in the water and the numbers and kinds of different species of organisms. They also make observations on how it looks and smells. In this way they can identify potential problems in the water supply and adjust the treatment of the water to eliminate them. Research scientists use monitoring techniques (evidence of toxins in the water and living organisms) to help them develop technologies to help protect the environment.

## PROBLEM SOLVING NEEDS MORE THAN SCIENCE AND TECHNOLOGY

Problem solving requires a strong **commitment** from people. They need to decide what needs to be done and then commit themselves and others to get it done. In many cases the solutions will require money and a way to raise it so the solution can be implemented without delay.

Water systems everywhere need to be monitored and cleaned up if they are causing a problem. The solutions to many of the problems may already be available, or new technologies should be developed to address the concern. Most importantly people must work together to solve the problems, because our water supply is our life source and without it, we will all perish.