

## Human Activity affects Biological Diversity.

### Reduction of Biological Diversity

The stresses of urbanization and habitat intrusion by farming and industry have resulted in a decline in genetic, species and ecosystem diversity. Extinction, population decreases and degradation of ecosystems reduces biological diversity on the Earth.

### Extinction and Extirpation

Extinction is the disappearance of every individual of a species from the entire planet. It is a natural part of the Earth's history. Scientists estimate that 99% of species that have ever existed on the Earth are now extinct (many by mass extinction - sudden environmental change, like the Ice Age). Most extinction take place over long periods of time, but the rate of extinctions is rising, and this is reducing the biological diversity of our planet. Extirpation is a local extinction, or the disappearance of a species from a particular area.

### Natural Causes of Extinction and Extirpation

Natural selection is a slow process. Even if there is a lot of variation within a species, sometimes the changes in the environment are so drastic that and so quick, that none of the individuals within a species can survive. Most extinctions, in the past, were due to:

- catastrophic events (volcanic eruptions, earthquakes, floods, fire)
- lack of food (due to overpopulation)
- disease

Not all extinctions happened millions of years ago. Diseases and natural events occur all the time and when they do, a species, within a particular area, can be extirpated very quickly.

### Overspecialization

Sometimes organisms have adaptations that suit them only to a very narrow set of environmental conditions. This usually occurs in a relatively stable area, where the environment does not change for a very long period of time. This is called overspecialization and it is another cause of extinction. The giant panda is a species that is overspecialized, because it relies on bamboo, making it vulnerable to extinction, when the bamboo is scarce.

### Human Causes of Extinctions and Extirpations

Most extinctions and extirpations today are caused by human activity. Habitat destruction - as a result of -

- Urbanization
- Construction
- agricultural development
- Logging
- Damming of rivers
- Pollution
- Pesticides, Herbicides and Fertilizers

### Introduction of Non-Native Species

When introduced species use the same resources, as the native species, the competition will cause a decline in the numbers of native species, simply because there is less to go around. The introduced species will have no natural predators to limit its population and will, in time, take over from the native species.

Over-Hunting This was the major cause of the decline and eventual extirpation of the plains Bison, as well as the extinction of the passenger pigeon. Sometimes species are hunted to deliberately extirpate them. The black-tailed prairie dogs were considered a pest in the 1930's and were hunted to reduce their numbers.

### Effects of Extinctions and Extirpations

Extinctions and extirpations reduce biological diversity. When an organism disappears locally or globally, many other species are affected. The cycle of life is adversely affected.

## Artificial Selection

Artificial Selection is the process of selecting and breeding individuals with desirable traits to produce offspring with the desired traits. The selection process is simple. Only those individuals, with the desired trait, will be allowed to reproduce. This selection process also applies to plants, which can be bred to possess desirable traits. The main difference between 'natural' selection and 'artificial' selection is that, humans control the artificial selection process.

## Biotechnology

The process of intervention to produce more desirable organisms has been going on for some time. This process takes a long time to see results - usually many generations. Farmers, dog and horse breeders, along with scientists can now speed up the artificial selection process by using 'low-tech' or 'high-tech' technologies, such as;

- cloning (made from cells)
- artificial insemination (artificially joining the male and female gametes)
- in vitro fertilization (male and female gametes are selected and then allowed to fertilize in a controlled setting)
- genetic engineering (directly altering the DNA of an organism)

## Biotechnology and Society

*Beneficial* or *detrimental* to society? That is one of the pressing questions that many humans are struggling with, when it comes to biotechnology. There are many good things that can be produced, but what about the problems, including,

- risks in animals (reducing genetic variation within a specific population, less resistance to disease, birth defects and other abnormalities)
- risks in plants (resistance to herbicides)

Preserving global biological diversity is a challenge that is receiving much attention. The Biodiversity Strategy was created to preserve biodiversity in America. It will be done through the cooperation of many levels of government, along with many groups, agencies and individuals, who are dedicated to preserving our bio-diverse future.

- Protected Areas (National Parks, Provincial Parks, game preserves, natural areas)
- Restoration Programs for Ecosystems and Species (Governments and *Nature Conservancy* programs to purchase land for species habitat renewal, individual landowners giving habitat back - in the form of a naturally protected area, Ducks Unlimited programs)
- Resource Use Policies  
(Laws - *National Accord for the Protection of Species at Risk* - *Species at Risk Act* - *Wildlife Act*)
- Controlling the Introduction and Spread of Exotic Species (Information and teaching about the invasiveness of an exotic species is communicated to the public on a regular basis. Penalties and fines, as well as loss of desirable areas for recreational purposes, has improved the perception of the negative effect an exotic species can have on a local ecosystem.)
- Conservation of Genetic Resources (*Ex-situ* conservation refers to conservation of components of biodiversity outside of a natural habitat.
  - The collection and storage of genetic resources, such as seeds (IPGRI)
  - Zoos (captive breeding programs)
  - Sperm and Egg Banks
  - Human Genome Project

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