

Outdoor and Environmental Studies
Teach Yourself Series
Topic 9: Biodiversity

SAMPLE

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SAMPLE

Biodiversity

Biodiversity, or biological diversity, is the variety of all species on earth. It is the different plants, animals and micro-organisms, their genes, and the terrestrial, marine and freshwater ecosystems of which they are a part. Biodiversity is both essential for our existence and intrinsically valuable in its own right.

This is because biodiversity provides the fundamental building blocks for the many goods and services a healthy environment provides. These include things that are fundamental to our health, like clean air, fresh water and food products, as well as the many other products such as timber and fibre. Having a large variety of plants, animals, micro-organisms, ecosystems, climatic regions and abiotic features is important because it allows the earth and its population to adapt to change more readily.

Other important services provided by our biodiversity include recreational, cultural and spiritual nourishment that maintain our personal and social wellbeing. Looking after our biodiversity is therefore an important task for all people.

Over the last 200 years Australia has suffered the largest documented decline in biodiversity of any continent. Despite efforts to manage threats and pressures to biodiversity in Australia, it is still in decline.

Types of Biodiversity

As it appears in Unit 4

Three types of biodiversity

There are three aspects to biodiversity: species diversity, genetic diversity and ecosystem diversity. All three interact and change over time and from place to place.

Species diversity

Species diversity refers to the variety of different types of living things on Earth, such as bacteria, fungi, insects, mammals, plants and more. Different species have different roles to play within ecosystems. To remain healthy, most ecosystems require thousands of different species making up their food webs.

A species can be defined as a group or population of similar organisms that reproduce by interbreeding within the group. Members of a species do not normally reproduce with members of any other species.

Human beings, for example, belong in a single species — *Homo sapiens*. Although there are different populations of humans, with different characteristics in different parts of the Earth, they can all successfully interbreed with each other and produce normal offspring. So, even though no two human beings are exactly alike, humans make up a single species because they reproduce among themselves.

Genetic diversity

Genetic diversity refers to the variations between individuals of a species — characteristics passed down from parents to their offspring.

If you think of a group of people in your street, or within your own family, no two will be exactly alike. All are humans, but all are different. These differences are due to genetic diversity, that is, the variety of genes within a species.

Each species consists of individuals with their own particular genetic composition. When the individuals interbreed, their offspring have new combinations of the genes, resulting in new mixtures of the characteristics of the species.

This diversity of characteristics is essential for the survival of healthy populations in natural communities. When the environment of a community changes, as they do all the time, some individuals will have characteristics that suit the new environment. They are more likely to survive and produce offspring that are also suited to the new environment. As a result, the whole population may change. This is how the process of **adaptation** occurs.

If a small population of a species becomes isolated from the larger group, the small population is forced to reproduce by breeding within itself — to inbreed. Inbreeding can result in a loss of genetic diversity, making it harder for the species to adapt to changing conditions.

Ecosystem diversity

Ecosystem diversity refers to the great variety of environments produced by the interplay of the living (animals and plants) and non-living world (earth forms, soil, rocks and water).

Ecosystems are the combination of communities of living things with the physical environment in which they live. There are many different kinds of ecosystems, from deserts to mountain slopes, the ocean floor to the Antarctic, with coral reefs and rainforests being amongst the richest of these systems.

Each ecosystem provides many different kinds of habitats or living places. The living things and the non-living environment (earth forms, soil, rocks and water) interact constantly and in complex ways that change over time, with no two ecosystems being the same.

Although ecosystems are ever-changing and complex, some universal principles apply. One of these is that matter constantly cycles and recycles. Another principle is that energy moves through the cycle, being used, absorbed and stored.

For example, forests act as filters for air, absorbing carbon dioxide and releasing oxygen. Seas are the great stabilisers of climates, with warm currents moderating temperatures on the land masses they pass. Mangroves and seagrass beds are the nurseries for marine creatures. While the sun is a constant source of Earth's energy, energy is also available from geothermal processes. So while each ecosystem generates its own relationships, the Earth's environments are interrelated — they all rely on the sun and the Earth's oxygen and water to survive.

You can begin to appreciate how the elements in each ecosystem are connected to each other and the diversity that exists amongst Earth's ecosystems. Maintaining this ecological diversity is important for the health of the planet.

Sometimes **Cultural diversity** is considered to be a fourth type of biodiversity. This refers to a variety of language, religious beliefs, social structures and land management practices that exist within in different cultural groups. This type of diversity is important in allowing cultures to survive and allowing healthy natural environments to be maintained as cultural groups learn from each other to develop sustainable practices

Review Questions

1. Name and define the three types of biodiversity and describe why each is important to our society.

a. _____

b. _____

c. _____

2. Victoria is described as having a diverse range of ecosystems. Explain why you think this is the case.

3. Cultural Diversity is sometimes considered to be the fourth component of biodiversity. Which of the following responses best describes the importance of cultural diversity as it relates to biodiversity?

- A. Different cultural groups can teach other societies how to gain benefit from the local natural environment in a sustainable way.
- B. Mixing of cultural groups allows ideas to be shared thus making the community stronger and more resilient.
- C. Some cultural groups have a spiritual connection with the land they inhabit. Sharing this connection with other groups expands the appreciation all groups have of the area they live in.
- D. Cultural diversity can contribute to maintaining other types of biodiversity as we can learn about new medicines and food products.
- E. All of the above.

Solutions to Review Questions

1. Define each type of biodiversity. This should be a single sentence summary of the definition. A description of the importance to society of this type of biodiversity should be included
 - a. Species diversity is an index that incorporates the number of species in an area and also their relative abundance. Areas of high species diversity have a large number of species present as well as large numbers of individuals within each species. Possible responses about the importance of species diversity include:
 - Greater chance of surviving catastrophic events such as fires if there are more species and greater numbers in an area.
 - Species diversity gives access to greater variety for food and resources.
 - Is important to maintain balance in food webs and food chains.
 - b. Genetic diversity refers to the total number of genetic characteristics in the genetic makeup of a species. It also refers to the variation in genetic information within a species and between species. Reasons this is important include:
 - Allows adaptation to occur in response to changes over time
 - Allows new traits to be produced that could be useful to the species and other species, e.g. As a resource for humans.
 - c. Ecosystem diversity refers to the diversity of a place at the level of ecosystems. Ecosystem Diversity can also refer to the variety of ecosystems present in a biosphere. It is the variety of habitats, communities, and ecological processes in the biosphere. An example of this variety within Victoria is the Mt Buffalo National Park that includes Alpine, Woodland and Wet Sclerophyll Forest all in a small area. This variety in ecosystems is important because each ecosystem plays a role in maintaining the balance of cycles on our planet. They are all interrelated and maintaining this diversity is important for maintaining the health of the planet.
2. Reasons for Victoria having a diverse range of ecosystems include;
 - A variety of landforms – coast, low hills, alpine, plains, river valleys, desert.
 - A varied climate – hot and dry in the North West, cold and wet in the south and alpine areas
 - Large variation in soil types
 - These factors combine to produce a many different sets of conditions which have led to the establishment of many different types of ecosystems.

3. Answer: E

Explanation:

All of the responses are valid reasons why cultural diversity is important. The diversity of ideas and beliefs are also an important tool that can be used to maintain biodiversity.

4. Three features of an environment that has high levels of biodiversity could include:

- A wide variety of plants and animals
- Low levels of pollution or other interference from humans
- Soil quality and waterflows maintained at natural levels
- A number of interrelated ecosystems in the area
- Large populations of the species that inhabit the area

5. Responses include;

a. There are four reasons that it is important for us to maintain biodiversity

1. For the economic benefit of variety in food production both now and in the future as well as for the discovery of as yet unknown food and medical resources.
2. To maintain the balance of life on the planet. All the systems are interrelated and loss of biodiversity could affect the balance of life on the planet.
3. To maintain the aesthetic value of the planet and to allow people to engage in a variety of enriching experiences.
4. Because all species have the right to exist.

b. There are many possible responses to this but some include;

- The aesthetic value of biodiversity has allowed humans to participate in many fulfilling recreational experiences that have contributed to their personal development.
- The development of new medicines or health products such as paw paw ointment and aloe vera from natural products has meant less reliance on chemically produced medicines.

6. Responses for each of the six factors could include;

a. Destruction of habitat in Victoria has been significant over the last 200 years. This has resulted in more competition between species and individuals within a species for the remaining habitats. The fragmentation of habitat makes it more difficult for interbreeding to occur and the result is inbreeding and a weaker gene pool within a population. Both of these factors can lead to loss of biodiversity. An example of this is the Orange Bellied Parrot which has almost become extinct through habitat destruction caused by logging.

b. The spread of invasive species such as blackberries causes loss of biodiversity as the new species grows or breeds more rapidly than the native species and either preys or competes for food with native species, or as in the case of blackberries, spreads throughout the area and chokes out other species.