

Teachers' Support Biodiversity

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Introduction

Climate change can impact on biodiversity, and reduced biodiversity and abundance can impact on climate change. OCC explores aspects of biodiversity in the context of climate change.

Student Activities

For a range of additional biodiversity lesson activities with curriculum links, explanations, answers and extension, click on:

[Biodiversity Activities](#)

[Biodiversity Student Pages](#)

For an example of a lesson plan integrating three learning areas and values click on: [Integrated Lesson Plan](#) This lesson plan is for *Mission Under My Feet*.

Definition and Distribution of Biodiversity

Definition

Biodiversity is the variety of life: the different plants, animals and micro-organisms, their genes and the ecosystems of which they are a part. Australia is one of the most diverse countries on the planet. It is home to more than one million species of plants and animals, many of which are found nowhere else in the world.

Biodiversity found on Earth today consists of many millions of distinct biological [species](#), the product of four billion years of [evolution](#).

Biodiversity is often used as a measure of the health of [biological systems](#)

A definition that is often used by ecologists is the "totality of genes, species, and ecosystems of a region". An advantage of this definition is that it seems to describe most circumstances and present a unified view of the traditional three levels at which biodiversity has been identified:

(Wikipedia)

- [genetic diversity](#) - diversity of [genes](#) within a species. There is a genetic variability among the populations and the individuals of the same species.

- [species diversity](#) - diversity among [species](#) in an ecosystem. "Biodiversity hotspots" are excellent examples of species diversity.

- [ecosystem diversity](#) - diversity at a higher level of organization, the [ecosystem](#). Diversity of habitat in a given unit area. To do with the variety of ecosystems on Earth.

The 1992 [United Nations Earth Summit](#) in [Rio de Janeiro](#) defined "biodiversity" as "the variability among living organisms from all sources including, 'inter alia', [terrestrial](#) [land ecoregions, as distinct from freshwater ecoregions and marine ecoregions], [marine](#) (saltwater environments), and other [aquatic ecosystems](#), and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems".[brackets added]. This is, in fact, the closest thing to a single legally accepted definition of biodiversity, since it is the definition adopted by the United Nations [Convention on Biological Diversity](#).

Distribution

Biodiversity is not distributed evenly on Earth. It is consistently richer in the [tropics](#) and in other localized regions such as the [California Floristic Province](#). As we approach polar regions, we generally find fewer species. Flora and fauna diversity depends on [climate](#), altitude, [soils](#) and the presence of other species. Large numbers of the Earth's species are formally classified as [rare](#) or [endangered](#) or [threatened species](#); moreover, most scientists estimate that there are millions more species actually endangered which have not yet been formally recognized. About 40 percent of the 40,177 species assessed using the [IUCN Red List](#) criteria, are now listed as [threatened species](#) with extinction - a total of 16,119 species.http://en.wikipedia.org/wiki/Biodiversity_-_cite_note-4#cite_note-4 A [biodiversity hotspot](#) is a region with a high level of [endemic species](#). These biodiversity hotspots were first identified by Dr. [Norman Myers](#) in two articles in the scientific journal *The Environmentalist*. [Dense human habitation](#) tends to occur near hotspots. Most hotspots are located in the [tropics](#) and most of them are forests.

[Brazil's Atlantic Forest](#) is considered a hotspot of biodiversity and contains roughly 20,000 plant species, 1350 vertebrates, and millions of insects, about half of which occur nowhere else in the world. The island of [Madagascar](#) including the unique [Madagascar dry deciduous forests](#) and lowland rainforests possess a very high ratio of species [endemism](#) and biodiversity, since the island separated from mainland [Africa](#) 65 million years ago, most of the species and ecosystems have evolved independently producing unique species different from those in other parts of Africa.

Many regions of high biodiversity (as well as high [endemism](#)) arise from very specialized [habitats](#) which require unusual adaptation mechanisms. For example the peat [bogs](#) of Northern [Europe](#) and the alvar regions such as the [Stora Alvaret](#) on [Oland](#), [Sweden](#) host a large diversity of plants and animals, many of which are not found elsewhere.(Wikipedia)

WA is one of the most biologically diverse regions in the world. The south-west of WA is one of the world's 34 internationally recognised terrestrial hotspots for biodiversity and the only one recognised in Australia.

The State boasts:

- a 2.5 million square-kilometre mainland;
- more than 13,500 kilometres of coastline and more than 10,000 offshore islands;
- 26 of Australia's 80 bioregions, from sub-alpine areas to tropical rainforest and desert;
- 141 of Australia's 207 mammal species, 25 of which are unique to WA;

- 439 reptile species, 187 of which are unique to WA;
- more than 1600 fish species;
- hundreds of thousands of invertebrate species;
- more than 12,000 species of vascular plants; and
- an unknown number of fungi, lichens and other non-vascular plants

(source: <http://www.naturebase.net/content/section/4/97/>)

The forest, woodlands, shrublands, and heath of Southwest Australia are characterized by high endemism among plants and reptiles. Its unique vertebrate species include the numbat, honey possum, and the red-capped parrot. The western swamp turtle, which hibernates for nearly eight months of the year in response to dry conditions and hot temperatures, may be the most threatened freshwater turtle species in the world, although a successful conservation program has allowed its numbers to increase. The primary cause of habitat loss in Southwest Australia has been agricultural expansion, which is accentuated by extensive fertilizer use. A major threat for the native fauna has been the introduction of invasive alien species like foxes and cats

Terrestrial and Marine Biodiversity

Click on **Terrestrial Biodiversity** to find out more about the following topics:

- Land Management
- Managing WA Forests
- Tackling Salinity
- Tuart Trees
- Wandoo Trees
- Fauna, Flora, Bugs and Butterflies
- Feral Animals

Click on **Marine Biodiversity** to find out more about the following topics:

- Marine Parks and Reserves
- Coral Reefs

Biodiversity and the Impact of Climate Change

Climate Change can impact on biodiversity, and reduced biodiversity and abundance can impact on Climate Change.

Changes in climatic factors such as temperature and rainfall may directly affect the distribution, lifecycles, habitat and extinction rates of individual species. In turn these changes may modify certain ecosystems and communities. In altered ecosystems, invasive species are likely to thrive, whilst rare species may become extinct.

Climate change may also indirectly affect species and ecosystems by altering important factors such as:

- fire frequency and behaviour
- salinity
- the spread of diseases such as dieback
- water flows in rivers and wetlands

- the level of groundwater
- the number of extreme climatic events (floods, hail, tropical cyclones, drought)
- ocean acidity

These factors may greatly reduce the ability of our biodiversity to adapt to climate change naturally.

Visible Signs of Climate Change

Visible signs of the impact of climate change on our landscape may include disappearing wetlands, coral death due to coral bleaching and greater coast erosion. Visible impacts of climate change on our biodiversity may include changes in the flowering times of native plants, changes to the arrival and departure times of some bird species, a movement away from the usual locations by native animals, a decline in trees (such as wandoo and tuart) due to water stress, a decline in fish species and a greater spread of weeds and pests.

To manage climate change scientists need to know the extent to which climate determines where a species is found; and whether climate change will favour rare or vulnerable plants and animals, or contribute to the stresses and forces that endanger them.

Climate Change Activity

Seasons Investigation

(Ecoeducation)

Link the presence of habitat with particular species and create a score.

The presence of particular species will indicate the presence of their habitat.

The following chart can be used for environments including school grounds. It identifies some species that indicate high species diversity for this kind of environment. General groups of animals are used so that the chart can be used around Australia.

Curriculum Links:

Society & Environment (ICP, N & S Systems)
 Science (Earth and Beyond, Life and Living)
 Mathematics (Chance and Data)

Outcomes:

- Locate and evaluate relevant information;
- Record information accurately and in a suitable format;
- Collect and analyse data on the biodiversity of the local area;
- Understand that changes to an environment have different causes and effects;
- Understand that natural systems change over time at varying rates and respond to change in different ways;
- Understand that human impact on natural systems result in change;
- Develop methods to plan, collect, organise and record data;
- Understand that collecting and recording data requires accuracy;
- Understand that data can be classified, sequenced and tabulated;
- Understand that most data is collected from a sample and that it is often difficult to collect data from an entire population.

This would be a good post excursion activity:



EcoEducation has a large range of excursion programs that are carried out in the environment by trained leaders for school classes. These include programs about biodiversity, threatened species, national parks, responsible and healthy ways to use natural areas, using our senses and aboriginal culture and survival in the environment.

Bush Rangers is another program that is now a part of EcoEducation. Teachers may like to set up a Bush Ranger Unit at their school for years 8-12. This program is now extended to Senior School and is a Curriculum Council endorsed subject.

The activities provided by EcoEducation include part of a new program on biodiversity and the impacts of climate change called "Climate change – Measuring baseline biodiversity", and some activities on biodiversity adapted from the Bush Rangers manuals.

Teachers can find out more about DEC's EcoEducation programs at: www.naturebase.net/community/ecoeducation or contact us on ecoeducation@dec.wa.gov.au for booking programs (excursions or incursions) or to be placed on our mailing list for our electronic newsletters. For information about Bush Rangers, please ring 93340137. Our main centres are the Perth Hills National Park Centre, Wellington Discovery Forest Centre and Margaret River Eco Discovery Centre.