Biodiversity

Low Biodiversity

Few species

Narrow geographic distribution

Population has low genetic diversity

What is Biodiversity?

Biological diversity is the diversity, or variety, of plants and animals and other living things in a particular area or region.

Biodiversity also means the number, or abundance of different species living within a particular region. Scientists sometimes refer to the biodiversity of an ecosystem, a natural area made up of a community of plants, animals, and other living things in a particular physical and chemical environment.

High Biodiversity

Many species

Broad geographic distribution

Population has high genetic diversity

Genetic Diversity

refers to the differences in genetic make-up between distinct species, as well as the genetic variations within a single species.

Species Diversity

This is the most common way of measuring biodiversity as species are easy to identify, and refers to the variety of living species within a geographic area.

Ecosystem Diversity

encompasses the broad differences between ecosystem types, and the diversity of habitats and ecosystem processes within each ecosystem type.

Why is Biodiversity important?

Everything that lives in an ecosystem is part of the web of life, including humans. Each species of vegetation and each creature has a place on the earth and plays a vital role in the circle of life. Plant, animal, and insect species interact and depend upon one another for what each offers, such as food, shelter, oxygen, and soil enrichment. Maintaining a wide diversity of species in each ecosystem is necessary to preserve the web of life that sustains all living things

Threats to Biodiversity

Overhunting
Habitat loss/degradation/fragmentation
Pollution
Climate Change
Competition with invasive species

In practice, maintaining biodiversity suggests sustaining the diversity of species in each ecosystem as we plan human activities that affect the use of the land & natural resources.

Biodiversity Hotspots

"The world's most remarkable places are also the most threatened. These are the Hotspots: the richest and most threatened reservoirs of plant and animal life on Earth."
- Conservation International

There are 34 biodiversity hotspots in the world. BUT their combined area now covers only **2.3%** of the Earth's land surface (originally this figure was 15.7%!).

Each hotspot faces extreme threats and has already lost at least 70 percent of its original natural vegetation. As a general rule, at least 150,000 plant species in a hotspot area must be **endemic** (only found in that particular area).

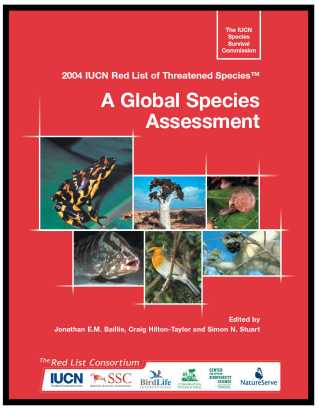
These hotspots also host a high number of endemic animals - some of which only exist in one place, which makes conservation of these habitats vital.

Want to find out more? Check out http://www.biodiversityhotspots.org

How do conservationists decide if a species is endangered?

IUCN (the International Union for Conservation of Nature) produces the Red List of Threatened Species. Many scientists work together in surveying species all over the world. The factors they focus on include:

- Population size - is the population in decline?
- Geographic range - how many places in the world is the species found? Is the species' habitat at risk? (e.g. from is it decreasing in size due to deforestation or has it been broken up due to fragmentation).
- Number of mature individuals in a population - these must be present in order for the population to carry on reproducing.
- Stability of population - if a population size or geographic range fluctuates greatly it is not very stable.



IUCN Red List

http://www.iucnredlist.org/

- Critically Endangered (CR)
- Endangered (EN)
- Vulnerable (VU)
- Near Threatened (NT)
- Least Concern (LC)
- Data Deficient (DD)

Species that fall into these categories are under threat from extinction and this makes them eligible for conservation attention.

Some examples of endangered species

Loris tardigradus
Red Slender Loris
Status: EN

Choeropsis liberiensis
Pygmy Hippopotamus
Status: EN

Camelus ferus
Bactrian Camel
Status: CR

Andrias davidianus
Chinese Giant Salamander
Status: CR

Nasikabatrachus sahyadrensis
Purple Frog

What is the EDGE programme?

Launched in January 2007, ZSL's EDGE of Existence programme is the only global conservation initiative to focus specifically on threatened species that represent a disproportionate amount of unique evolutionary history.

So-called Evolutionarily Distinct and Globally Endangered (EDGE) species are identified using a simple index that measures:

a) the contribution made by different species to phylogenetic diversity
b) The degree to which these species are threatened with extinction

Species that score highly for both measures are priorities for immediate conservation attention.

How are EDGE species classified?

Every species in a particular taxonomic group (e.g. mammals or amphibians) is scored according to the amount of unique evolutionary history is represents (Evolutionary Distinctiveness, or ED), and its conservation status (Global Endangerment, or GE). These scores are used to identify EDGE species.

A few other ways of classifying species for conservation:

Flagship Species
(e.g. tiger)

- Usually relatively large, and considered to be 'charismatic' in western cultures.
- Attract public attention and support for conservation measures.
- Selected to act as an ambassador, icon or symbol for a defined habitat, issue or environmental cause.
- Conservation of a flagship species' habitat will also conserve other species that live in the same area.
- Eliminating threats (e.g. hunting) to a flagship species may also help other species that are vulnerable to the same problems

Keystone Species
(e.g. sea otter)

- Play an essential role in the structure, functioning or productivity of a habitat or ecosystem at a defined level (habitat, soil, seed dispersal etc).
- If these species are removed from a habitat or ecosystem it may lead to significant ecosystem change or dysfunction which could have knock on effects on a broader scale.
- By focusing on keystone species, conservation actions for that species may help to preserve the structure and function of a wide range of habitats which are linked with that species during its lifecycle.

Indicator Species
(e.g. coral reef)

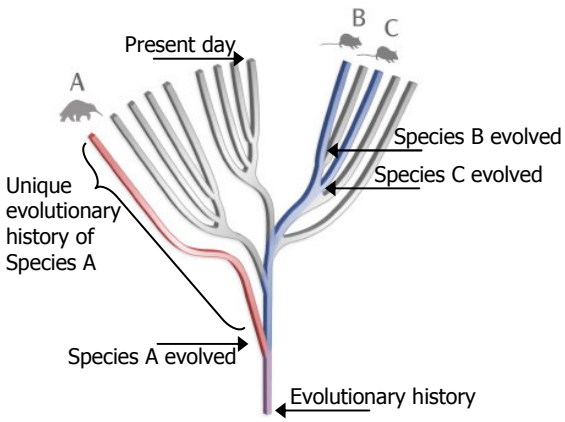
- Can be a single species or group of species chosen as an indicator of the state of an ecosystem or of a certain process within that ecosystem.
- The presence or absence, abundance or chemical composition of an indicator species demonstrates some distinctive aspect of the character or quality of an environment.
- Indicator species can highlight disease outbreak, pollution, species competition or climate change.
- Can be the most sensitive species in a region - early warning sign for monitoring biologists.

Why EDGE species are different

EDGE species are 'one of a kind' - if they disappear, there will be nothing like them left on the planet.

For example, some flagship species may be under great threat from extinction, but they may also be closely related to other species that still exist. Indicator species may be vital in highlighting environment change, but these species may not be endangered or evolutionarily distinct.

Explaining EDGE



ED

When we look at the tree of life it is easy to see which species are more evolutionarily distinct. In the diagram on the left, species A diverged from the tree and all other species much earlier than species B and C.

Because they diverged more recently than A, species B and C are more closely related. If B or C were to become extinct, the other species would still represent some of its genes.

If species A were to become extinct it has no close relatives because it diverged a long time ago. Therefore it is the most evolutionarily distinct.

ED calculations are based on the length of the branch of the tree that each species uniquely represents - in millions of years. ED scores range from 0.1 (for example, quite a few rodent species) representing very low evolutionary distinctiveness, to over 190 (the Mexican burrowing toad), representing a high amount of evolutionary distinctiveness.

GE

The IUCN Red List is used to determine which species are most globally endangered. CR (critically endangered) species that are still found in the wild are the most at risk from extinction. These species receive a score of 4, followed by EN (endangered) at 3, VU (vulnerable) at 2 and NT (near threatened) at 1. LC (least concern) species that are found in the wild are the least at risk from extinction, and are give a GE score of 0.

EDGE

If species A was marked as CR on the Red List, it would be given a GE score of 4. Because it represents a lot of evolutionary history that would be lost if it were to go extinct, it would have a high ED score.

HIGH ED + HIGH GE
=
IMPORTANT EDGE SPECIES - NEEDS IMMEDIATE CONSERVATION ATTENTION!!!

HIGH ED + MEDIUM GE *or* MEDIUM ED + HIGH GE
=
EDGE SPECIES - NEEDS CONSERVATION ATTENTION

LOW ED + LOW GE
=
NOT EDGE SPECIES - NOT REQUIRING IMMEDIATE CONSERVATION ATTENTION