Name: _____

Date: _____

Class: _____

# IB Environmental Systems and Societies

# 3.3 Threats to Biodiversity

## Significant ideas:

While global biodiversity is difficult to quantify, it is decreasing rapidly due to human activity.

Classification of species conservation status can provide a useful tool in conservation of biodiversity.

## Species Number and species loss

1. State the number of species **known to science** (species that have been found and named).

Approximately 1.8 million species described and named

2. One estimate for the total species number alive on Earth today is about 7 million. Explain why this number is much larger than your answer to question 1.

- majority of species have yet to be discovered + described
- some groups, such as terrestrial birds + mammals, are better known
- estimates depend on mathematical models
- many habitats and groups of species are under-recorded as they are hard to reach or there is insufficient funding

3. Evaluate the current estimates of total species number on Earth today.

*Help: when you evaluate, you should give a balanced argument, weighing up the positives and negatives. One way to approach this particular questions is to give reasons for why current estimates of species number might be quite reliable, and reasons why the estimate may not be so reliable.*

- The estimate is reliable as it gives an indication of possible scale
- The number of species alive on Earth is not constant over geological time.
- The number is unreliable as some smaller species, insects, bacteria and other microbes, have been overlooked
- some species may have been counted more than once (mislabelled or not compared to already identified species)
- some species are difficult to access.

4. Discuss how current extinction rates compare with those through geological history.

The background (natural) level of extinction known from fossil records is between 10 to 100 species per year. Current extinction rate has been estimated to be between 100 - 100 000 times greater. The rate is estimated to be about 3 species per hour.

5. Use the headings below to describe the ways in which humans are causing species loss

***Habitat destruction and fragmentation***

Habitats have been destroyed or divided for agriculture, mining, plantation crops. Fragmented habitats become isolated + vulnerable.

***Introduction of invasive species***

Upset the balance of an ecosystem, outcompete native species

***Pollution***

Includes chemicals, litter, nets, plastic bags, oil spills which damages habitats and kills plants and animals, leading to loss in population numbers

***Agricultural practices***

Reduce biodiversity with monoculture, genetic engineering and the use of pesticides. Fewer species grown, more pest species destroyed

***Overharvesting (e.g. of fish)***

Human population growth and improved fishing techniques means more species are harvested from oceans. Increasing by-catch reduces diversity

***Hunting/poaching***

Growing rural poverty and improved methods of hunting means more and more people living at subsistence level over-exploit environment

## The Impact of Humans on Tropical Biomes

1.

a) What proportion of the Earth is covered by tropical rainforests?

6%

b) What proportion of all species on Earth live in tropical rainforests?

50% - over

2. With reference to biodiversity hotspots, describe the levels of species and habitat diversity in tropical rainforests.

Overall tropical rainforests have high species diversity and habitat diversity but hotspots, such as Malaysian peninsula, have even more than others.

3. Using the headings to guide you, describe the ecological **services** that tropical rainforests provide

***Oxygen production***

High levels of heat, water and light year round means photosynthesis is rapid and not limited by raw materials.

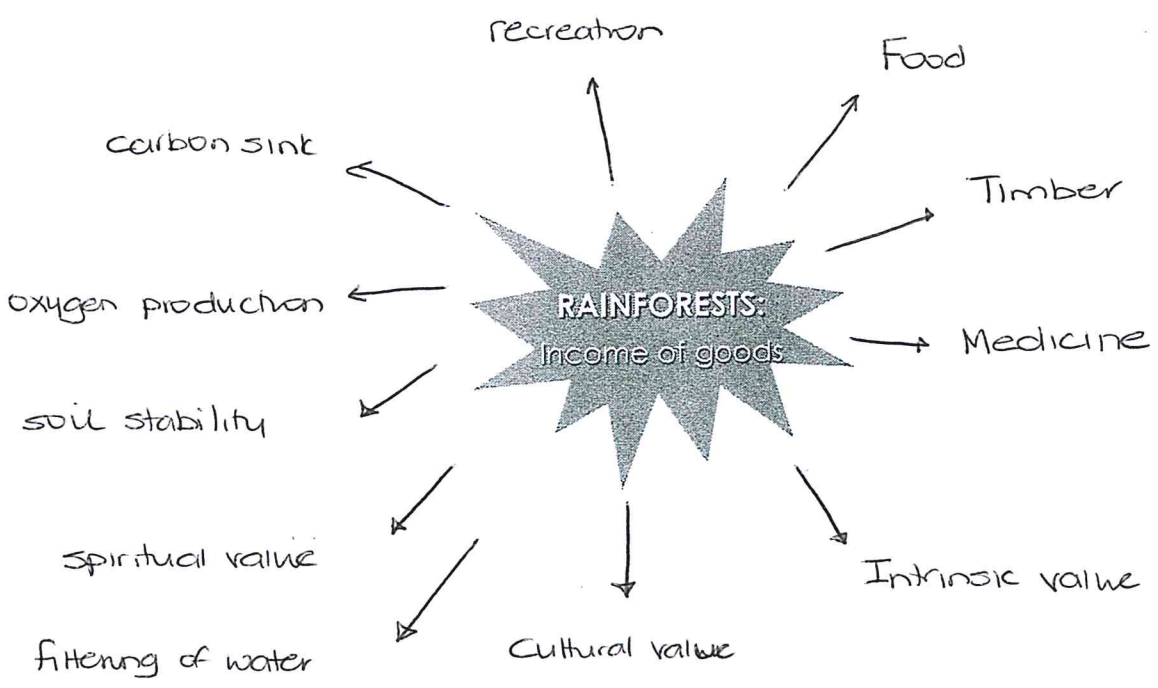
***Nutrient cycling and soil formation***

Fast rate of respiration and decomposition increase nutrient cycling rates but most nutrients are held in plants, not in the soil.

***Sequestration of carbon dioxide***

Rapid photosynthesis and all year round growth means the trees and other vegetation lock up carbon

4. Complete the scatter diagram to list the income of **goods** that rainforests can provide




5. Outline the changes in percentage cover of rainforests over the Earth over the past 60 years. Use facts and statistics to support your answer if possible.

Rainforests covered up to 14% of the Earth's land surface in 1950 today it is estimated to be 8% of Earth's land surface or 2.5% of its total surface area (www.mongabay.com)

6. Give reasons for the changes outlined in question five.

Increased ranching and commercial logging
Increasing population pressure and loss of forest to clearance means the forest does not fully regrow before it is cleared again leading to a gradual degradation of nutrients and biodiversity

7.

a) In tropical biomes (as with many) there is a conflict between exploitation, sustainable development and conservation. Outline this conflict.

MEDCs have the luxury of being able to preserve their remaining natural ecosystems as they do not rely on these areas to provide income. Most tropical biomes are found in LEDC where the land provides income for the local economy. Modern logging techniques and more importance placed on eco-tourism can provide income without destroying natural capital.

b) Most tropical biomes cover Less Economically Developed Countries. Why might the conflict mentioned in part a) be more of a problem than it would in an MEDC?

LEDC do not always have access to latest technology. In LEDC more of the population is reliant on subsistence agriculture and population is increasing more rapidly. Lack of infrastructure, political support and education may limit the option of turning to ecotourism.

8. Using the table, evaluate the impact of human activity on biodiversity in tropical biomes. Use bullet points

*Help: Consider the ways in which exploitation of tropical biomes is useful to us (consider the income of goods we get when we exploit rainforests, or clear the land for something else) and also discuss the negative impacts.*

| Advantages | Disadvantages |
|---|---|
| • direct services (wood, medicine, food) | • indirect services lost ($O_2$ production, $CO_2$ sequestering, water filtration, soil stability, temperature stability) |
| • recreational value | • cultural value |
| • provides grazing land | • biodiversity loss |
| • scientific research | • loss of unidentified species |

## Threatened species and the IUCN Red List

1. In the table below, outline the factors that influence how prone a species is to extinction.

| Factor | Details |
|---|---|
| Geographical range | The narrower the geographical range the more vulnerable. If the habitat is destroyed the species will be too. |
| Genetic diversity | Small populations have lower genetic diversity which makes them more vulnerable to change. |
| Population density | The greater the population density the greater the chance of individuals breeding successfully |
| Number of populations | The reduced numbers of individuals means a reduced chance of the population surviving |
| Body size | Larger animals tend to have larger ranges, low population densities and need a lot of food. They compete with humans for food, may be seen as a danger or hunted for sport |
| Reproductive potential | Reproducing slowly and infrequently means population takes a long time to recover. This increases vulnerability |

| | |
|---|---|
| Migration | Organisms that migrate have the stress of migration routes and they need suitable habitats at both ends. If one is destroyed no food, barriers can prevent migration |
| Dispersers | species that can not move to new locations (disperse) are more vulnerable |
| Ability to move/disperse | Organisms that can move to new locations (disperse) such as plants + birds are less vulnerable. |
| Specialized niche requirements | If a species has a specialized diet or habitat requirement if this is put under threat so are they |
| Usefulness to humans | If they are hunted for food and sport their numbers can be quickly reduced especially if they live in large groups. |
| Island organisms | Vulnerable as their populations tend to be small and genetic diversity tends to be low. Islands are vulnerable to invasive species |

2. What does the acronym "I.U.C.N." stand for? World Conservation Union

International Union for the Conservation of Nature + Natural Resources

3. What is the IUCN **red list**?

Red list of threatened species

Red list determines the conservation status of a species based on population size, degree of specialization, distribution, reproductive potential and behaviour, geographic range + degree of fragmentation, quality of habitat, trophic level and the probability of extinction

4. List the IUCN red list categories in the table below.

| | Category | Shorthand |
|---|---|---|
| | Extinct | EX |
| Increasing extinction risk ↑ | Extinct in the wild | EW |
| | Critically endangered | CR |
| | Endangered | EN |
| | Vulnerable | VU |
| | near threatened | NT |
| | Least concern | LC |
| | Data deficient | DD |
| | Not evaluated | NE |

5. How do the IUCN describe their mission?

To influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

6. The IUCN is an international agency involving a large number of nations, and involves many government and non-government organisations.

Why is this level of cooperation necessary when creating and updating the red list?

The genetic diversity represented by these species is an irreplaceable resource which needs to be conserved through increased awareness. The species represent key building blocks of ecosystems + information on conservation status is needed for informed decision making from local to global levels.