Conservation

Learning Objectives

the factors affecting biodiversity

To include human population growth, agriculture (monoculture) and climate change.

the ecological, economic and aesthetic reasons for maintaining biodiversity

Ecological, including protecting keystone species (interdependence of organisms) and maintaining genetic resource • economic, including reducing soil depletion (continuous monoculture) • aesthetic, including protecting landscapes

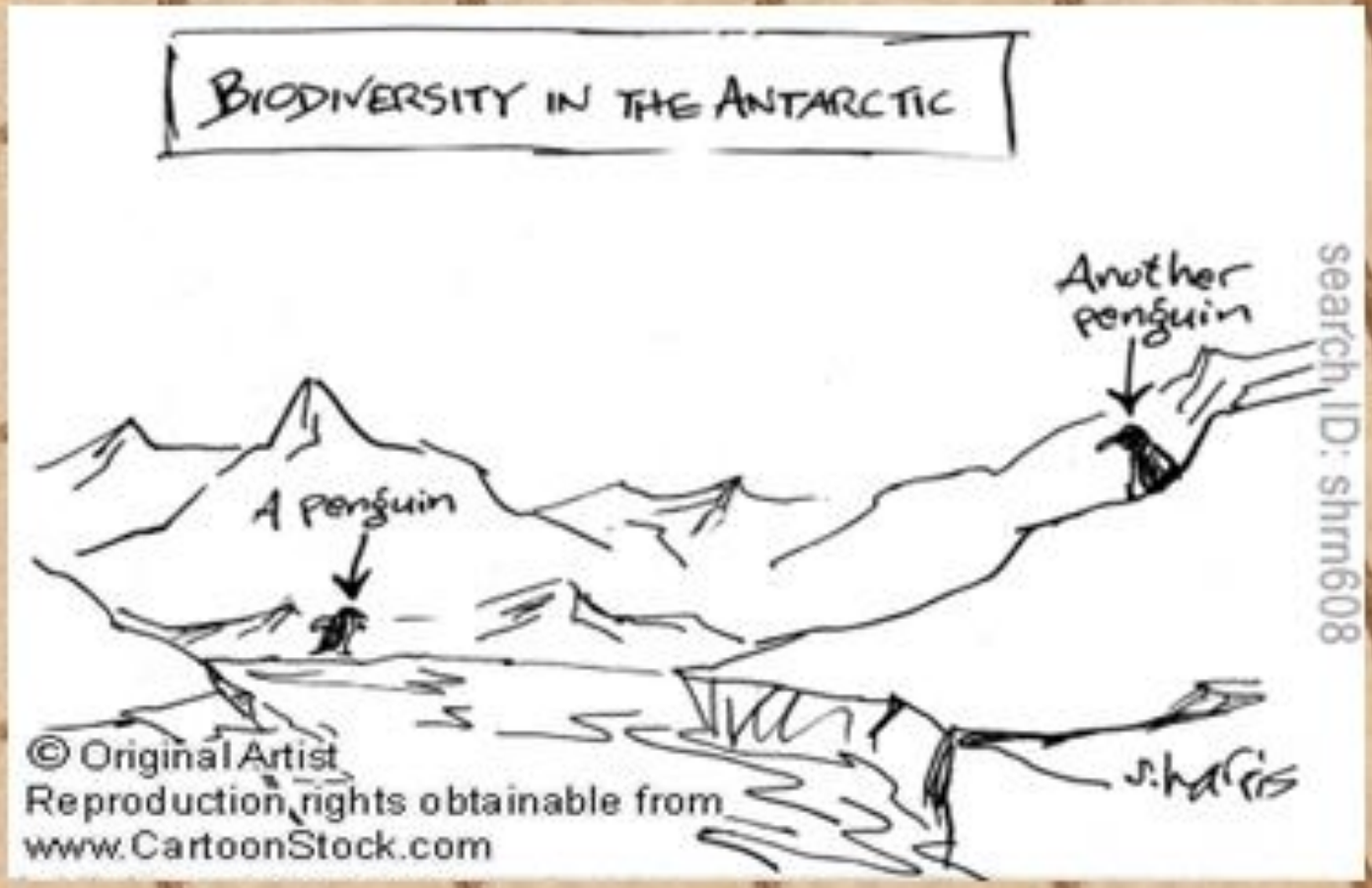
in situ and ex situ methods of maintaining biodiversity

In situ conservation including marine conservation zones and wildlife reserves • ex situ conservation including seed banks, botanic gardens and zoos.

international and local conservation agreements made to protect species and habitats.

Historic and/or current agreements, including the Convention on International Trade in Endangered Species (CITES), the Rio Convention on Biological Diversity (CBD) and the Countryside Stewardship Scheme (CSS).

BIODIVERSITY



Discuss how the biodiversity of the two neighbouring areas within a managed woodland will vary from one another.

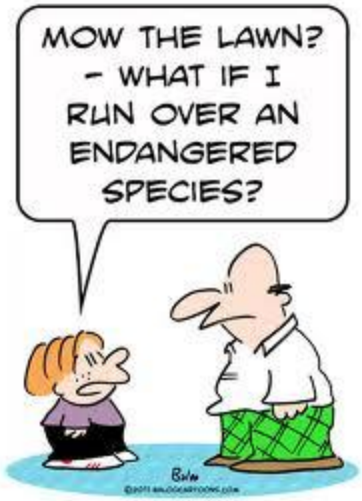
Area A

Natural woodland, some coppicing and felling but it has reached its climax community of mixed indigenous species(eg oak, birch, beech yew etc)

Area B

Conifer plantation containing rows of commercially grown species suitable for paper pulp (sp of pine)

Conservation



The main questions

- Why are species becoming endangered?
- Why should we conserve species?
- How we can protect endangered species and maintain diversity?

Why are species becoming endangered?

Extinctions have always occurred for a variety of reasons. As the environment changes species will need to adapt or they will become less fit and may disappear. The sabre tooth tiger has evolved and become extinct several times independently of humans. The fossil record is rich in species that are long gone.

However the rate of extinction has increased dramatically in recent history.

At least 784 recorded extinctions since 1500

Other undiscovered species are likely to be disappearing without ever being recorded

Population Growth

- Pollution (linked with climate change)
- Habitat destruction e.g. rainforests needed for land and resources

Agriculture

- Farming. Introduction of monoculture, land clearance
- Hunting e.g. Over-fishing, English wolf(1486) hunted to stop it killing livestock

Climate change

This is likely to be linked with human activity.

Causes loss of habitat

Changing environmental conditions eg water.

Spread of diseases to other regions.

Convention on Biological Diversity

Rio Earth Summit (1992)

Signed by over 150 world leaders with the aim of promoting sustainable development.

- Their aims concentrate on cooperation between governments eg. IVF breeding programmes . Sharing of seed banks
- Countries must try to develop **ex situ** and **in situ** conservation strategies
- **Environmental Impact Assessments** must be carried out prior to major developments

Why Preserve Biodiversity?

"The giant panda deserves to become extinct"

What do you think about this statement?

Reasons for Conservation

- **Economic**
  Reducing soil depletion by monoculture
- **Ecological**
  Maintaining a genetic resource eg for medicinal uses
- **Aesthetic**
  Protecting landscapes/species that are admired

Conservation can be In situ or Ex Situ

What do these terms mean?

In Situ Strategies

This aims to reduce the causes of extinction so that biodiversity is maintained.

Laws to minimise activities that lead to problems. These can be difficult to enforce.

- Designate protected areas.
  - National Parks e.g. Lake District
  - National Nature Reserves
  - Local Nature Reserves
  - SSSI

These can be protected, managed, studied, repaired, but can be unpopular with the people who live there.

Suggest some advantages of in situ conservation as a means of preserving biodiversity.

In Situ Conservation

The Benefits

A Healthy Natural Environment. (Balanced Ecosystem, Biologically diverse / Biodiversity)

Sustainable use of the Natural Environment. (Link to the Rio Earth Summit) Reducing the causes of extinction.

Leads to a more secure environmental future which can be enjoyed.

Conservation in the natural environment which provides all species resource requirements, and should take into account of the needs of the indigenous people.

Species are natural & well adapted to habitat & should feed and breed successfully. No special provisions need to be made.

Legislation is not always needed to establish Conservation Areas for the prevention of unacceptable species or habitat loss.

Human Activity in Conservation Reserves –Conflicts;

Historically reserve creation without consideration of the local people has caused conflict for the following reasons

- Protected Reserve animals 'escaping' to raid crops (e.g. Primates often raid farms for maize, mangoes & sugar cane).
- Continued hunting / poaching of protected animals for food, sport, research.
- Illegal harvesting of timber & other plant products.
- Tourists feeding protected animals, leaving litter, etc.

EX SITU CONSERVATION

- CONSERVING AN ENDANGERED SPECIES BY ACTIVITIES UNDERTAKEN OUTSIDE ITS NORMAL ENVIRONMENT i.e.IN CAPTIVE SURROUNDINGS.

EXAMPLES

- RARE BREEDS CENTRES.
- ZOOLOGICAL GARDENS.
- WILDLIFE PARKS
- SPERM BANKS
- CELLS IN TISSUE CULTURE.
- FROZEN EMBRYOS.
- CROPS IN CULTIVATION.
- BOTANIC GARDENS.
- SEED BANKS.

ANIMAL CONSERVATION / BREEDING PROGRAMMES;

Advantages

Prevents imminent extinction of endangered species

Can increase the population size quickly

Potential to repopulate areas by reintroduction programmes

Filter out genetic defects and poor genes.

Opportunity for research

Possible to store gametes for the future and use for IVF

Disadvantages

Failure to breed

Lack of space limits number of individuals involved so this reduces genetic diversity leading to less variation

Reintroduction programmes don't always succeed because they fail to adapt or may not be accepted into a wild community

Repopulation

It is possible to rebuild biodiversity through reintroductions.

Examples of successfully recreated wildlife habitats;

- **UK reed beds -Bittern & Otter increases.**
- **Conifer clearance- wildlife habitat recovery.**
- **Grazing land reversion to traditional meadow grassland.**
- **Phinda Reserve, South Africa, livestock clearance & natural fauna reintroduction; (1990-1992; 1,000+ wildebeest, zebra, giraffe, other ungulates) (1992; 13 lions, 17 cheetah).**
- **Yellowstone National Park- Wolves reintroduced (Deer eaten, willow shoots grow, beaver make dams, lakes form, improved irrigation, forests grew).**

SPERM BANKS

Modern techniques make the freezing of genetic material in sperm or eggs possible.

From The Times November 7, 2006:

Sperm bank to save rare breeds from extinction

A plan to save 100 of Britain's 130 native breeds of farm animal from extinction was announced yesterday. Sperm and egg banks are to be created to save cattle, sheep, horses, goats, poultry and pigs from the growing specialisation of farming in which high-yield breeds dominate the food chain. A database will be established that will list every breed, the number of animals and where they are kept. The move is not only about the historic importance of keeping traditional breeds with their genetic diversity, but also because of the enormous contribution these animals make to the national economy.

Frozen Noah's Ark Singapore Zoological Gardens

- Some experts estimate that one animal species is wiped off the face of the Earth every hour. With the ravages of pollution, shrinking habitats and the ever-expanding human population, the situation is likely to get worse.
- **Zoos are turning to cryogenics in their efforts to stockpile genetic material and preserve a Noah's Ark for future generations.**
- Noah's Ark provides a bank of animal sperm and tissue samples of its captive wildlife.
- **Ultimate aim of cloning exotic animals.**
- Provide a safety net against extinction (i.e. using more common species as surrogate mothers to endangered ones). (E.g. with the common long-tailed macaque, which would be implanted with the embryo of other highly-endangered macaque species).
- Combat infertility in animals.
- Recreate animals which died prematurely.

Techniques that have been used to impregnate Singapore zoo animals.

- Frozen sperm can be used in assisted reproduction techniques, such as artificial insemination, in-vitro fertilisation and intro-cytoplasmic sperm injection (ICSI).which is when a single sperm is fused with an egg, and the embryo is implanted in the animal.

PLANT CONSERVATION / BREEDING PROGRAMMES

ADVANTAGES

- As part of their life cycle, most plants naturally have a dormant stage - the seed.
- Seeds are produced in large numbers and can be collected from the wild without disturbing the ecosystem or damaging the wild population.
- Seeds can be stored and germinated in protected surroundings.
- Plants can often be bred asexually.
- Botanical gardens can increase individual numbers quickly, providing ample supply for research.
- Captive-bred plants can be replanted in the wild.

PLANT CONSERVATION / BREEDING PROGRAMMES

DISADVANTAGES

- Any collection of wild seeds will cause some disturbance.
- Collected samples may not hold a representative selection of genetic diversity.
- Seeds collected from the same species from another area will be genetically different and may not succeed in a different area.
- Seeds stored for a length of time may not be viable.
- Plants bred asexually will be genetically identical - reducing genetic diversity further.
- Conclusions from research on a small sample may not be valid for a whole species.

Seed Banks

The Kew Millennium Seed Bank Project aims to store a representative sample of seeds from every known species of plant, including the rarest, most useful and most threatened species.

Seed banks contain seeds that can remain viable for many years. They are being stored but also being used to provide benefits to humanity:

- food and building materials for rural communities
- disease-resistant crops for agriculture
- habitat reclamation and repopulation

‘NORWAY’S ARK’-SEED VAULT

- SET UP BY THE GLOBAL CROP DIVERSITY TRUST MARCH 2008.
- FUNDED FROM NORWAY.
- **NATIONS ACROSS THE GLOBE ARE CONTRIBUTING SEEDS OF LOCAL CROPS.**
- LOCATED IN LONGYEARBYEN, SPITSBERGEN, NORWAY.
- COLD STORAGE VAULT CARVED INTO ROCK BENEATH THE ARCTIC PERMAFROST.
- STORE UP TO 3 MILLION SEEDS.

‘NORWAY’S ARK’-SEEDS STORED

- ALFALFA
- BARLEY
- BEAN
- BEET
- BLUEGRASS
- BRASSICA
- CARROT
- CHICKPEA
- CLOVER
- LENTIL
- MILK VETCH
- OAT
- ORCHARD GRASS
- PEA
- RICE
- RYEGRASS
- SAINFOIN
- SWEET CORN
- SUNFLOWER
- WHEAT