UNIT ENQUIRY – How can we restore Biodiversity?

Lesson 1 – Why is Ecosystem Biodiversity Important?

1. An **ecosystem** is a community of living organisms functioning together as an interconnected system alongside their physical environment.

2. **Biodiversity** refers to the variety and number of different species (animals, plants, fungi, and bacteria) living in a particular habitat or ecosystem, as well as how they interact.

3. The type of plants and animals that live in an ecosystem are determined by a delicate balance of factors such as climate, topography, soil and water availability

4. **Healthy ecosystems with high biodiversity** provide lots of **ecosystem services** to humans such as **goods** like food, wood, medicines or **services** like water purification or carbon storage.

5. Living organisms and non-living elements in ecosystems depend on each other for survival, such as for food, shelter, or nutrients. This relationship is called **interdependence**. When humans interfere in ecosystems they can collapse. The importance of interdependence was shown in Yellowstone where the removal of Wolves and later reintroduction had a big impact on the park. Including the meandering of the river and the deer population.

Lesson 2 – Which UK Ecosystems are threatened?

1. Globally there are 10 major biomes (global ecosystems) which provide habitats for different plants and animals. For example a desert or tropical rainforest. The UK is predominantly temperate forest

2. The UK ecosystems are mostly manmade with just 5% being native woodlands and next to no natural grassland. Major land-uses include farmland 52%, woodland (including plantations) 13% and urban areas 7%. Other ecosystems include bogs, moorlands, fen and heathlands.

3. In the last 100 years significant changes have occurred which have an indirect impact on biodiversity, most significantly global population has quadrupled, average life expectancy has increased from 30-73, and globalisation has meant international trade has increased 45 fold.

4. The direct impacts of these changes include deforestation with a 40% loss of woodland associated with WW2. Car emissions from an astonishing change in the number of vehicles from 30 million to 6 billion causing air pollution and climate change. At the same time the increase in trade has led to 180 invasive species being introduced to the UK. Amazingly the amount of land used for farming has stayed the same, but food output has increased 3-fold.

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Lesson 3 – What are the impacts of Agriculture Intensification on Grassland Biodiversity?

1. 97% of meadows have been lost in the last 100 years and 99% of grassland are 'improved' **monocultures.** Almost half of UK biodiversity has been lost and 40% of pollinators are threatened.

2. The human population in the UK has grown from 40 million to 78 million or almost doubled. At the same time the type of food we consume has changed. This means our demand for food has increased.

3. Over the last 100 years, the single change that impacted UK grassland biodiversity most was **post-WWII agricultural intensification**. Government incentives and modern farming methods drove the **ploughing of permanent meadows for arable crops**, in combination with the use of **chemical fertilizers to increase the size of the crop and pesticides to kill pests** increased farmers yields.

4. Farms also became larger and used more larger machines to remain competitive at the expense of hedgerows - the only space left for wildlife.

5. Approximately 60% of our food is grown in the UK and the rest is imported, and global events have increased food prices and reduced UK **food security**. Imports are also a source of displaced deforestation in other countries.

6. Other impacts of increased food production are non specific toxicity caused by the chemicals, and run-off leading to Eutrophication of rivers and lakes with high levels of nutrients means leading to algae blooms which starve other aquatic animals of oxygen leading to mortality

Lesson 4 - How can Grassland Biodiversity be Restored while improving food security?

1. Biodiversity and food production have traditionally been competing. There are a number of potential solutions which include importing more food, rewilding projects like Knepp, Mob Grazing, reducing chemical inputs (organic) and agroforestry/field margins.

2. Knepp estate has rewild its farm allowing weeds to take over with no pesticides and fertilisers being used. Animals live 'wild' on the farm such as Long-horn cattle and beavers have been reintroduced. Food productivity has reduced and it now only sells luxury products and deals in tourism but biodiversity has improved significantly.

3. Wakelyn's agroforestry grows trees alongside food. Healthier soil and more biodiversity along with carbon storage but more expensive to manage.

4. Riverford Organic fruit and vegetables is nature friendly with no chemicals and lots of hedgerows. Soils are healthy but yields are lower.

5. Yeo Valley uses mob grazing where cows graze land in a more traditional manner where grass is allowed to grow longer so it can support more biodiversity. Requires more land to rear the same number of cows.

Lesson 5 - Britain has lost much of its natural woodland. What should we do to restore biodiversity and expand woodland habitats?

1. UK woodland coverage has increased in the last 100 years from just 5% in to almost 13% today. However the new forests have often been nonnative species which do not support much biodiversity. After the last ice age before agriculture upto 75% of land was covered by forest.
2. The UK government has a target of 19% forest cover as part of a commitment to protect 30% of land for nature.
3. Ecosystem services presented by UK woodland include carbon sink, filtering the air, flood mitigation, timber, health benefits.
4. Only 20% of our timber demand is met by UK forests
5. Barriers to restoration of forest include invasive species like squirrels and the fungus which causes Ash Dieback, industrial pollution, extreme weather events like extreme heat and droughts, trophic cascades like herbivore damage.
6. The UK has a legally binding target to increase forest cover to 17%. This is an increase that is equivalent to putting trees on an area that is 40% of Wales.
7. Solutions to increasing woodland size involve agroforestry, targeting marginal land for planting, national forests programme including the Western Forest, urban canopy expansion and using the land in National Parks where forest cover is currently low.

Lesson 5 – Why can't we swim in our rivers and how can we fix them?

1. Just 15% of England's rivers are in good ecological health. Rivers with the worst biodiversity…
2. Biodiversity loss in UK rivers is caused by agricultural pollution, wastewater discharge, physical alterations, over extraction, urban diffuse and invasive species.
3. Biodiversity restoration is hampered by a lack of finance, regulatory failures, infrastructure?, fragmented land ownership and historical building and use of flood plains.
4. Rivers can be restored through re-naturalising rivers, using nature based solutions, reforming agriculture, improve sewage infrastructure and SUDS
5. The UK is not in an economically favourable position so there needs to be creative

ways to pay for the clean up which include Water companies (private) pay, polluter pays, ELM schemes on farms, developer contributions.