Start thinking like a Geographer!
because you are one!

Abiotic and biotic
Systems
Characteristics
Nature of ecosystems

1. The characteristics of Ecosystems
   - Know the components of an ecosystem – inputs – stores and outputs
   - Know the different scales of ecosystems
   - Know how energy moves around the ecosystem – energy flows and nutrient cycling in ecosystems

Skills
   - GIS – add layer to google earth – What GIS is p.123
   - How is it used in geog. How is it useful to fieldwork

7. MARK - Study Figure 3 which shows a food web for an ecosystem in California. Describe and comment on the food web shown.

The structure of ecosystems

Energy flows and nutrient cycling

Trophic levels, food chains and webs

Link these into TEF’S and TDW’S
### Ecosystems: Change and Challenge

#### Nature of ecosystems
- Structure of ecosystems, energy flows, trophic levels, food chains and food webs.

<table>
<thead>
<tr>
<th>Ecosystems in the British Isles over time</th>
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<tbody>
<tr>
<td>Succession and climatic climax: illustrated by one of lithosere, psammosere, hydrosere or halosere.</td>
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<tr>
<td>The characteristics of the climatic climax: temperate deciduous woodland biome.</td>
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<td>The effects of human activity on succession - illustrated by one plagioclimax such as a heather moorland.</td>
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<table>
<thead>
<tr>
<th>The biome of one tropical region</th>
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<tr>
<td>(savannah grassland or tropical monsoon forest or tropical equatorial rainforest)</td>
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<tr>
<td>The main characteristics of the biome.</td>
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<tr>
<td>Ecological responses to the climate and soil moisture budget – adaptations by vegetation and animals.</td>
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<td>Human activity and its impact on the biome.</td>
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<td>Development issues in the biome to include aspects of biodiversity and the potential for sustainability.</td>
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<th>Ecosystem issues on a local scale: impact of human activity</th>
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<td>Changes in ecosystems resulting from urbanisation.</td>
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<tr>
<td>Urban niches. Colonisation of wasteland: the development of distinctive ecologies along routeways (e.g. roads and railways).</td>
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<tr>
<td>The planned and unplanned introduction of new species and the impact of this on ecosystems.</td>
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<tr>
<td>Changes in the rural/urban fringe.</td>
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<td>Ecological conservation areas. One case study should be undertaken.</td>
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<td>The relationships between human activity, biodiversity and sustainability.</td>
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<td>The management of fragile environments (conservation versus exploitation): two contrasting case studies of recent (within the last 30 years) management schemes in fragile environments should be undertaken.</td>
</tr>
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</table>
Figure 3.6
Vegetation zones of the world

- Tropical evergreen forest
- Tropical monsoon forest
- Mediterranean forest
- Temperate deciduous forest
- Coniferous forest
- Temperate grassland
- Desert and scrub
- Tundra
- Alpine and ice desert
Figure 3.5
Climate zones of the world
What does this diagram help to explain with biomes?
What do you know so far?

**ECOSYSTEMS – CHANGE & CHALLENGE**

1. What are ecosystems?
2. What is biodiversity?
3. Make a simplified copy of Figure 1. A functional diagram of an ecosystem that identifies the key components of an ecosystem.
4. What is the difference between the living and the dead components of an ecosystem?
5. What is meant by ecosystem services?
6. Make a simple list of goods and vital services provided by ecosystems from Figure 2.

### Economic Benefits vs. Non-economic Benefits

<table>
<thead>
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<th>Economic Benefits</th>
<th>Non-economic Benefits</th>
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<table>
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<th>Other Benefits</th>
<th>Education and Legacy Value</th>
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7. What are ecosystem goods?
8. List the benefits of ecosystems from Figure 2.

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<th>GOODS</th>
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<th>OUTCOME</th>
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9. What are ecosystem services? (p. 2) – Access to resources, biodiversity, etc.
10. See Figure 3 to help understand the system.
11. Describe what the diagram shows.

- Community
- Biophysical
- Business
- Ecosystem / Function in use
- Ecology
- Regulation
- Services
What do you know so far?

ECOSYSTEMS – CHANGE & CHALLENGE

1. What is an ecosystem?

2. What is a biome?

3. Make a simplified copy of figure 1.1: a functional diagram of an ecosystem that identifies the key components of an ecosystem.

4. What is the difference between the biotic and the abiotic components of an ecosystem?

5. What is meant by ecosystem services?

6. Make a simple list of goods and vital services provided by ecosystems from Figure 2 (p. 2)

| Basic goods for survival | Vital services for survival |

Ecosystem A dynamic, stable system characterised by the interaction of plants and animals with each other and with the non-living components of the environment. An ecosystem can be considered at any scale from a small area, such as a pond or hedge, up to an area as large as the Earth itself.

Biome Ecosystem at a continental scale covering a large area, with vegetation characteristics that are predominantly influenced by the climate. A biome can also be judged by the speed at which the vegetation grows.
What do you know so far?

Equilibrium is important......

Ecosystems have a value.....
Figure 2 Basic goods and vital services provided by ecosystems

SURVIVAL
- Removes CO₂ (carbon sinks)
- Regulation exerts an impact
- Rested watersheds and helps grow and reefs
- Flutes and carries away
- To produce soil
- Biodiversity
- Habitats
- Thetic enjoyment and
- Future
- Nities across all sectors

- Heat sink
Nature of ecosystems

The structure of ecosystems

The components of an ecosystem are categorised as either biotic or abiotic. **Biotic** means the living environment, so components include:
- vegetation (living and decomposing)
- mammals, insects, birds and microorganisms

The mass of material in the bodies of animals and plants is called the **biomass**. It is mainly plant tissue.

**Ecosystem** A dynamic, stable
**Biome** Ecosystem at a continental
**Biomass** The total mass of plant
**Trophic level** A feeding level within
**Food web** When organisms within
**Environment** All the conditions in
**Food chain** A hierarchy of organisms in a community. Each member feeds upon another in the chain and is eaten in turn.
**Abiotic** means the non-living, chemical and physical components of the ecosystem and includes:
- climate — in particular the seasonal pattern of temperature and precipitation
- soil characteristics
- underlying parent rock
- relief of the land
- drainage characteristics

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[Image of soil texture]
What are the abiotic and biotic features of the boreal forest?

**Biotic features:**
- Few species
- Mainly black spruce forest and bogs
- Black bears, red squirrels, and moose
- Many biting flies
- Reduced ecosystem productivity due to short growing season
- Moderate rainfall
- Much of the precipitation is snow
- Snow insulates and protects ground species

What are the abiotic and biotic features of a beaver pond?

**Abiotic features:**
- Community of plants, fish, frogs, turtles, insects and beavers
- Surrounding forest is a food supply for the beavers
- Flooding kills trees, which are then used by species as food or
Abiotic conditions within an ecosystem

- Humidity: 67%, Light: 70%
- Humidity: 75%, Light: 50%
- Humidity: 80%, Light: 12%
- Humidity: 85%, Light: 6%
- Humidity: 90%, Light: 1%
- Humidity: 98%, Light: 0%

Soil Community
Very rich in decomposer species
Task
Divide up the different components of a pond ecosystem into the two groups ABIOTIC and BIOTIC

remains, and physical features associated with their activites.

Pond Ecosystem Concept Map Instructions
1. Print the 'Pond Ecosystem Concept Map' pdf file.
2. Cut out the information slips.
3. Onto an A2 piece of paper draw the cross section of a pond. The water level needs to be about one third of the way down the landscape sheet. The cross section should show the bottom of the pond and one pond bank.
4. Stick the information slips in appropriate places on your pond cross section.
5. Highlight all the biotic components in one colour and all the abiotic components in another.
6. Link the information slips together as is suggested by the 'links' information on each slip.
7. Write an explanation for each link - onto each link as you make them.
8. Complete the 'Abiotic and Biotic Components of Ecosystems' Worksheet.

Biotic - Of, pertaining to, or produced by life or living organisms.
Abiotic - Non-living.
Simple Overview

Outputs
- Carbon Dioxide
- Heat
- Human activities (harvesting, mining)
- Movement of animals and plants (e.g. migration)
- Leaching
- Surface runoff
- Water vapour
- etc ...

Stores / Processes
- Plants
- Soil
- Animals
- Micro-organisms
- Photosynthesis
- Reproduction
- Growth
- Decomposition
- etc ...

Org
- Organic
- Organic material through human activity
- Inorganic material
- Lightning
- Weathering of rock
- Sunlight
- Carbon Dioxide

Feedback Loop
As with any system there are inputs, outputs, stores and flows. Ecosystems are open systems because energy and living matter can both enter and leave the system.

- **Inputs** — the most important input is energy from the sun, which drives photosynthesis and so enables plants to grow. Other inputs include animals that arrive from elsewhere, and water, transported into the ecosystem by precipitation or rivers.

- **Outputs** — nutrients are transferred out of the system in a number of ways. Animals can physically move; water can move out of the ecosystem in rivers and by evapotranspiration, throughflow and groundwater flow.

- **Flows** — within an ecosystem nutrients can be transferred from one store to another, for example from the soil to the vegetation through capillary uptake by plant roots.

- **Stores** — the three main stores of nutrients are in the vegetation, plant litter and soils.
What are the common characteristics that we look at when understanding and comparing ecosystems? Brainstorm
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Thank you!