

# **Environmental Management**

## **Key Terms:**

**Natural Ecosystems and Human Activity**

<p style="text-align: center;"><b>Ecosystem</b></p>	<p>All living things (biotic components) together with all non-living things (abiotic components) in an area.</p> <p>It consists of <b>communities</b> of living things that live in single-species <b>populations</b>, in particular <b>habitats</b>, where they perform particular functions within their <b>niche</b>.</p>	<p style="text-align: center;"><b>Habitat</b></p>	<p>The place within an ecosystem where an organism lives, finds food and reproduces.</p>
<p style="text-align: center;"><b>Biotic</b></p>	<p>Living components of the environment that may affect other living things.</p> <p>Including:</p> <ul style="list-style-type: none"> <li>- competition</li> <li>- predation</li> <li>- pollination</li> </ul>	<p style="text-align: center;"><b>Niche</b></p>	<p>The role of a species within the ecosystem.</p>
<p style="text-align: center;"><b>Abiotic</b></p>	<p>Non-living components of the environment that may affect living things.</p> <p>Including:</p> <ul style="list-style-type: none"> <li>- temperature</li> <li>- humidity</li> <li>- water</li> <li>- oxygen</li> <li>- salinity (fresh, brackish, marine/saline water, salt marshes)</li> <li>- light</li> <li>- pH</li> </ul>	<p style="text-align: center;"><b>Brackish Water</b></p>	<p>Water that is salty but not as salty as seawater.</p>
<p style="text-align: center;"><b>Population</b></p>	<p>All the organisms of one species living in a defined area.</p> <p>E.g. all the frogs in a pond, lions in a national park etc.</p>	<p style="text-align: center;"><b>Food Chain</b></p>	<p>A diagram showing the relationship between a single producer and primary, secondary and tertiary consumers.</p> <p><b>Energy flows:</b> food to heat to atmosphere - <b>pyramid of energy</b>, each stage more of original energy is lost.</p> <p><b>Nutrients cycle:</b> stay in the body until no longer needed (death or defecation), then taken up by another living thing</p> <p>Mineral cycles - Carbon cycle, oxygen cycle, nitrogen cycle etc.</p>
<p style="text-align: center;"><b>Community</b></p>	<p>A group of populations of different species that live together in an area and interact with each other.</p> <p>E.g. all the different animals in the Arctic tundra, or all the different plants in the Arctic tundra - animal communities and plant communities.</p>	<p style="text-align: center;"><b>Photosynthesis</b></p>	<p>The process by which plants or plant-like organisms make glucose in the form of carbohydrate from carbon dioxide and water using energy and sunlight.</p> <p style="text-align: center;">light &amp; chlorophyll</p> <p style="text-align: center;">CO<sub>2</sub> + H<sub>2</sub>O <math>\xrightarrow{\hspace{1cm}}</math> glucose + O<sub>2</sub></p>

Producers

Organisms within an ecosystem that can carry out photosynthesis.

Tertiary Consumers

Organisms within an ecosystem that derive their food from secondary consumers.

Herbivore

Another name for primary consumer.

Decomposers

Organisms within an ecosystem that derive their food from the waste and bodies of dead organisms

Carnivore

another name for secondary and tertiary consumer.

Food Web

A diagram showing the relationship between all (or most) of the producers, primary, secondary and tertiary consumers in an ecosystem.

Any changes in one part of the web can cause changes in the other parts.

Primary Consumer

Organisms within an ecosystem that derive their food from producers.

Pyramid of Numbers 1

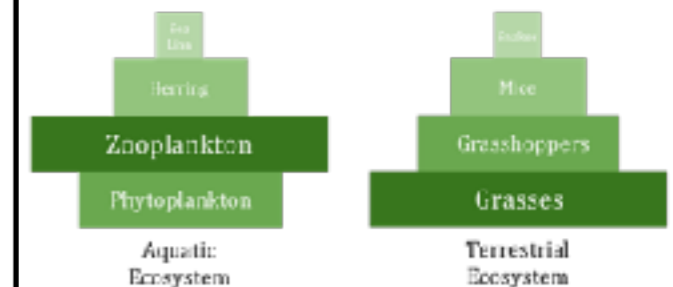
A diagram that represents the numbers of organisms at each feeding (trophic) level in an ecosystem by a horizontal bar whose length is proportional to the numbers at that level.

Secondary Consumers

Organisms within an ecosystem that derive their food from primary consumers.

Pyramid of Numbers 2

([https://commons.wikimedia.org/wiki/File:Numbers\\_Pyramid.svg](https://commons.wikimedia.org/wiki/File:Numbers_Pyramid.svg))



## Trophic Level

A feeding level within a food chain or web.

## Biodiversity

The variety of plants and animals in the world or in a particular ecosystem.

## Chlorophyll

The green pigment in plants that traps light energy.

## Quadrat

A frame of known area used to sample organisms that do not move, such as plants.

**Results:** can be estimates (ACFOR - abundant, common, frequent, occasional, rare) or gridded and counted for a quantitative measure.

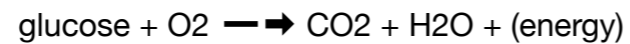
**Placing quadrat:** random, systematic

**Pros:** quick; inexpensive; portable

**Cons:** not always accurate, placing can be unintentionally biased

## Respiration

The process by which living things release energy from food to carry out the processes of life, such as movement.



## Sampling 1: Random

A sampling method in which the sampling device is placed using random number tables or the roll of dice.

## Pollen Grain

The structure in plants that contains the male sex cell, it is carried to the female organ by pollination.

## Transect

A sampling method in which sampling devices are laid out along a line already placed across an area.

**Pros:** quick; inexpensive; portable

**Cons:** often used in inappropriate situations

## Pyramid of Energy

([https://en.wikipedia.org/wiki/Ecological\\_pyramid](https://en.wikipedia.org/wiki/Ecological_pyramid))



## Sampling 2: Systematic

A sampling method in which the sampling device is placed along a line or some other pre-determined pattern, the most common pattern being the line of a transect.

<p>Pooter</p>	<p>A device for retrieving small animals from devices such as nets and pitfall traps.</p>	<p>Wetlands</p>	<p><b>Main kinds:</b> marsh, swamp, bog and fen  <b>Sub-types:</b> mangrove forest/swamps, carr, pocosin, floodplains, mire, vernal pool, sink, and many others. Freshwater, brackish or saline, classification based on the dominant plants &amp;/or the source of the water.  <b>Benefits:</b> protect shoreline; maintain water quality; flood control; refill aquifers; biological productivity; tourism; source of fish/wild fowl/fuel/fibres  <b>Loss of habitat:</b> drainage (farming, forestry, tourism, mosquito control); dredging (floor protection); discharge of pollutants and construction waste; peat removal, ground water removal.</p>
<p>Sampling 3: Systematic Vs Random</p>	<ul style="list-style-type: none"> <li>• How distribution changes over an environmental gradient (e.g. effect of road on vegetation) - <b>Systematic</b></li> <li>• Comparison of areas (e.g. insects in grazed area/non-grazing area)— <b>Random</b> (with grid) - straightforward counting or placing of pitfall</li> </ul>	<p>Deforestation</p>	<p><b>Causes:</b> farming (80%), logging for fuel, timber, paper (10%); clearing land for roads and settlements; mineral extraction  <b>Impact:</b> habitat loss; local droughts; soil erosion/desertification; climate change; loss of biodiversity and genetic depletion.  <b>Solutions:</b> Selective logging, eco/sustainable tourism, agroforestry (e.g. alley cropping), national parks/wildlife and ecological reserves/corridors; extractive reserves; world biosphere reserves, seed banks</p>
<p>Pitfall Traps</p>	<p>Traps laid in the ground for animals and insects to fall into.</p> <p><b>Pros:</b> inexpensive; portable  <b>Cons:</b> often kills the organisms captured; may over or under sample.</p>	<p>Ecotourism</p>	<p>Tourism in which the participants travel to see the natural world, ideally in a sustainable way.</p> <p>or</p> <p>Responsible travel to natural areas that conserves the environment and improves the welfare of the local people.</p>
<p>Extinction</p>	<p>The process by which a species or other named group ceases to exist on the Earth or in a named area.</p> <p>Habitat loss is the biggest cause.  Causes of habitat loss:</p> <ul style="list-style-type: none"> <li>- drainage of wetlands</li> <li>- deforestation</li> </ul>	<p>Carbon Sink</p>	<p>A forest, ocean or other natural environment viewed in terms of its ability to absorb CO<sub>2</sub> from the atmosphere.</p> <p>In young forests, the intake of CO<sub>2</sub> from the atmosphere in photosynthesis exceeds its output from respiration, so the net flow of carbon is from the atmosphere into plants.</p>
<p>Climax Community</p>	<p>The stable community characteristic of an area that persists as long as the climate does not change.</p>	<p>Biomes</p>	<p>A biome is a large area characterised by its vegetation, soil, climate, and wildlife.</p> <p>Five major types of biomes: <b>aquatic, grassland, forest, desert, and tundra</b>, though some of these biomes can be further divided into more specific categories, such as <b>freshwater, marine, savanna, tropical rainforest, temperate rainforest, and taiga</b>.</p>

## Carbon Store

A mature vegetated area where the intake of CO<sub>2</sub> from the atmosphere by photosynthesis **equals** its output from respiration, so the mature plants store carbon.

(carbon sink, CO<sub>2</sub> intake is **more than** output)

## Tundra

(<https://www.nationalgeographic.org/article/five-major-types-biomes/>)

**Climate:** cold, minimal precipitation, short summers

- poor quality soil nutrients
- not much biodiversity and vegetation is simple - partly due to a frozen layer under the soil surface, called permafrost.
- wildlife adapted to extreme conditions.

**Types:** arctic and alpine

Arctic: north of boreal forests

Alpine: mountains where the altitude is too high for trees to survive

**Threats:** climate change, mining

## Conservation

The protection, preservation, management and restoration of wildlife and habitats.

## Grasslands

(<https://www.nationalgeographic.org/article/five-major-types-biomes/>)

**Open regions that are dominated by grass.**

**Climate:** warm and dry

**Types:**

- tropical grasslands (aka savannahs): close to equator, few scattered trees,
- temperate grasslands: away from the equator; no trees or shrubs; less precipitation than savannahs. **Subtypes:** Prairies (taller grasses) and steppes (shorter grasses)

**Threats:** climate change (drought, fires), hunting

**Protection:** ecotourism, reserves, laws, enforcement, monitoring

## Conserving Biodiversity 1

- Sustainable harvesting (wild animals, fish, plants, forests and medicinal plants)
  - assess abundance of populations
  - monitor harvests
  - selective logging
  - agroforestry
- National parks (including marine), wildlife and ecological reserves and corridors
  - laws - ban/limit e.g. hunting, logging etc.
  - regular inspection and enforcement
  - tourism: nature trails, car parks, roads, entry fees, information/education

## Forest

(<https://www.nationalgeographic.org/article/five-major-types-biomes/>)

**Dominated by trees and contain much of the world's terrestrial biodiversity.**

**Types:** temperate, tropical, and boreal forests (also known as the taiga).

**Climate:**

Tropical - warm, humid, close to equator

Temperate - higher latitudes, have 4 seasons.

Boreal - highest latitudes, coldest and driest, precipitation primarily snow.

**Threats:** deforestation, climate change, mining, land development

## Conserving Biodiversity 2

- Extractive Reserves
  - protected land, managed by locals, who take produces from area, e.g. rubber
- World biosphere reserves
  - core area: protected (monitoring, research)
  - buffer zone: managed (research, education, tourism, and facilities)
  - transition zone: cooperation (locals & conservation orgs. manage area)
  - UNESCO recognised: attracts funding, support of experts

## Desert

(<https://www.nationalgeographic.org/article/five-major-types-biomes/>)

Deserts are dry areas where rainfall is less than 50 centimetres (20 inches) per year.

**Types:** hot and dry, semiarid, coastal, and cold.

**Climate:** cold or hot, but most in subtropical areas.

- Extreme conditions = minimal biodiversity
- Any vegetation and wildlife there must have special adaptations for surviving in a dry environment.

- Wildlife primarily reptiles and small mammals.

**Threats:** mining (pollution), climate change

## Conserving Biodiversity 2

- Sustainable tourism and ecotourism
  - A last resort to prevent extinction
- Seed banks
  - dormant = easy to store (space and care)
  - doesn't damage wild populations
- zoos and captive breeding
  - provide education
  - research
  - captive-breeding programmes (mix partners, IVF and inter-zoo swapping, parent databases)

## Aquatic Biomes

(<https://www.nationalgeographic.org/article/five-major-types-biomes/>)

**Types:** freshwater and marine biomes.

**Freshwater:**

- bodies of H<sub>2</sub>O surrounded by land, e.g. ponds,
- have a salt content of less than one percent.

**Marine (and brackish):**

- include the ocean, coral reefs, and estuaries

**Threats:** pollution, climate change (acidification of oceans, rising temp (migration of fish, changes to currents, melt=changes to salinity) coral scorching etc.) (for fresh water see wetlands)

**Protection:** laws, monitoring, enforcing, education, hunting bans/quotas, research

## Climate & Weather

Weather refers to short-term atmospheric conditions while climate is the weather of a specific region averaged over a long period of time.

**Aspects:** solar radiation, temperature, humidity, precipitation (type/frequency,/amount), atmospheric pressure, and wind (speed and direction).

**The climate is affected by** its latitude/longitude, terrain, altitude, and nearby water bodies and their currents. **And weather is affected by climate.**

Types of climate: equatorial, tropical

## Sampling 4: Methods

Sampling sedentary organisms:

- quadrats
- transects

Sampling mobile organisms:

- pitfall traps & pooters

## International Union for Conservation of Nature (IUCN)

Brings together the world's most influential organisations and top experts in a combined effort to conserve nature and accelerate the transition to sustainable development.

Benefits of their red list of threatened species:

- Raises public awareness
- Scientific research
- Raising funds
- Help develop policies and laws

## Bioaccumulation

**The process by which compounds accumulate or build up in an organism at a rate faster than they can be broken down.E.g. mercury in fish.**

Fossil fuels release mercury into atmosphere when burnt. Depositing in soil and water via rainfall or as dust. Also in old insecticides and some paints.

Plankton absorb the mercury. They are eaten by primary consumers in low concentrations. Toxins cannot be excreted so they keep building over the life of the primary consumer.

## Difference between Bioaccumulation & Biomagnification

**Bioaccumulation** takes place in a single organism over the span of its life, resulting in a higher concentration in older individuals.

**Biomagnification** takes place as chemicals transfer from lower trophic levels to higher trophic levels within a food web, resulting in a higher concentration in apex predators.

(<https://www.nationalgeographic.org/activity/biomagnification-and-bioaccumulation/>)