Grade 9 Science

Sustainable Ecosystems

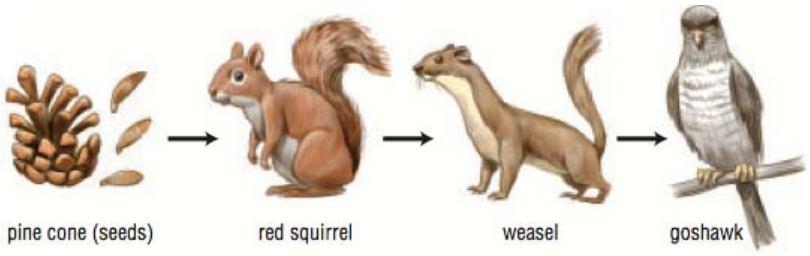
Class 7

Types of Consumers

- **Herbivores:** Animals that eat plants or other producers
- **Carnivore:** Animals that eat other animals
- **Omnivore:** Animals that eat both plants and animals
- **Scavenger:** Animal that feeds on the remains of another organism

Food Chains

- **Food chain:** A sequence of organisms each feeding on the next, showing how energy is transferred from one organism to another

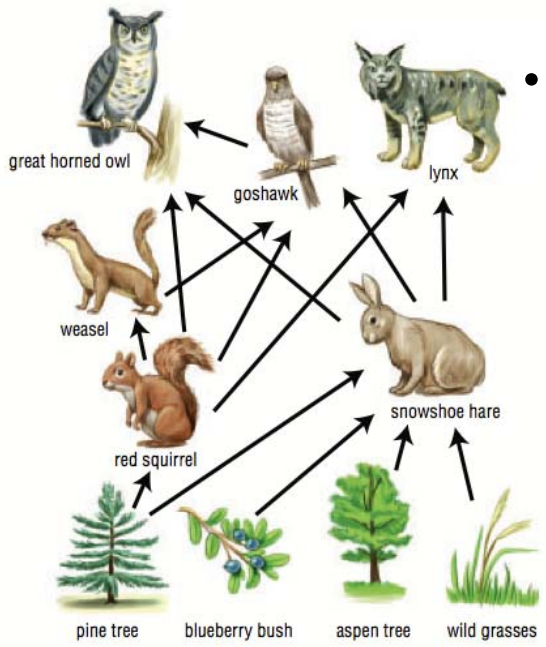


- Arrow shows the direction of food and energy flow. Arrows are read as "is eaten by"

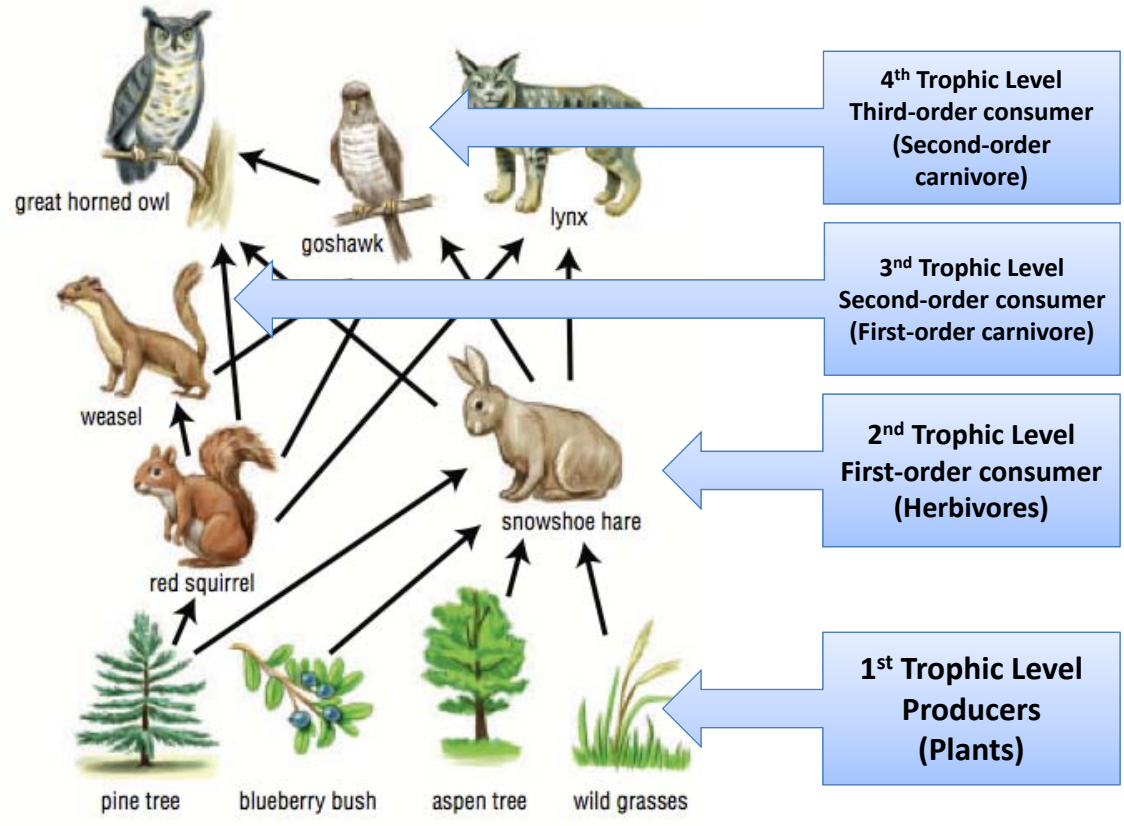
Trophic Levels

- **Trophic Level:** the level of an organism in an ecosystem depending on its feeding position along a food chain

Food Webs

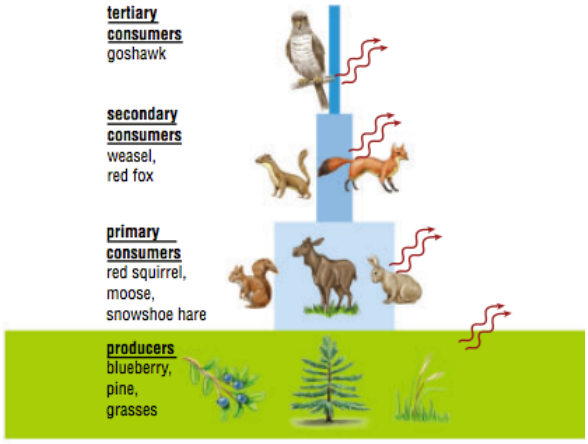


- **Food Webs**: A representation of the feeding relationship within a community
  - Large number of interactions reduce the vulnerability of any one species to the loss or decline of another species
  - Complex food webs are more stable than simple food webs



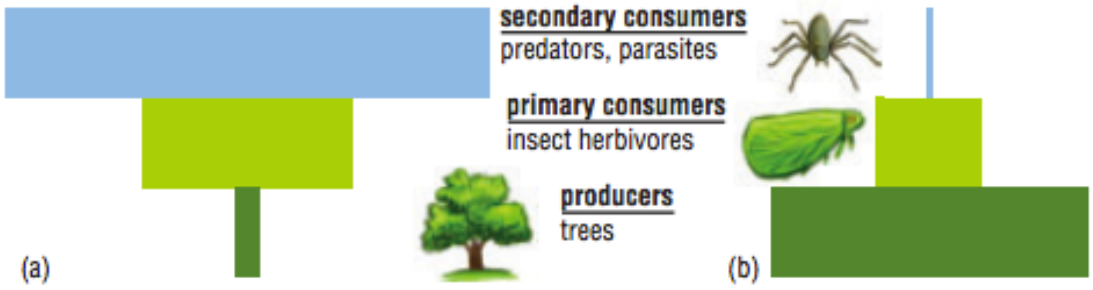
Ecological Pyramids

- A representation of energy, numbers or biomass relationships in ecosystems



Energy Pyramid

- Only a small amount of energy is transferred to the next trophic level
- Energy is used in reproduction and growth
- Energy is lost as thermal energy (red arrows)



Number Pyramid

- Number – the number of all individuals in a trophic level

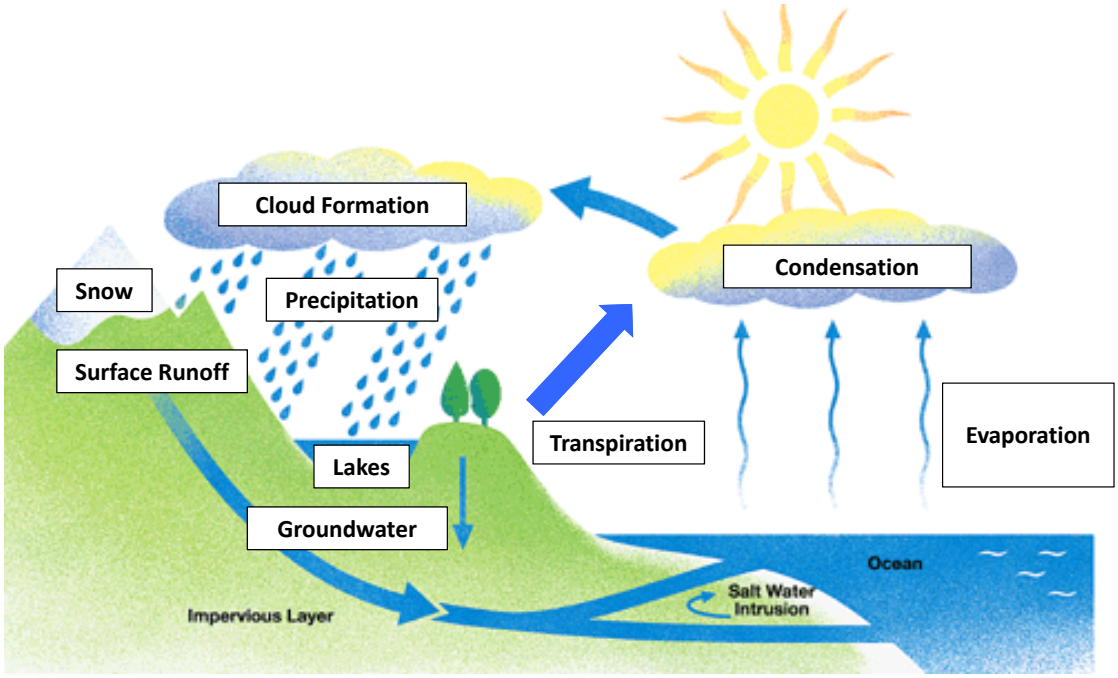
Biomass Pyramid

- Biomass – the mass of living organisms in a given area

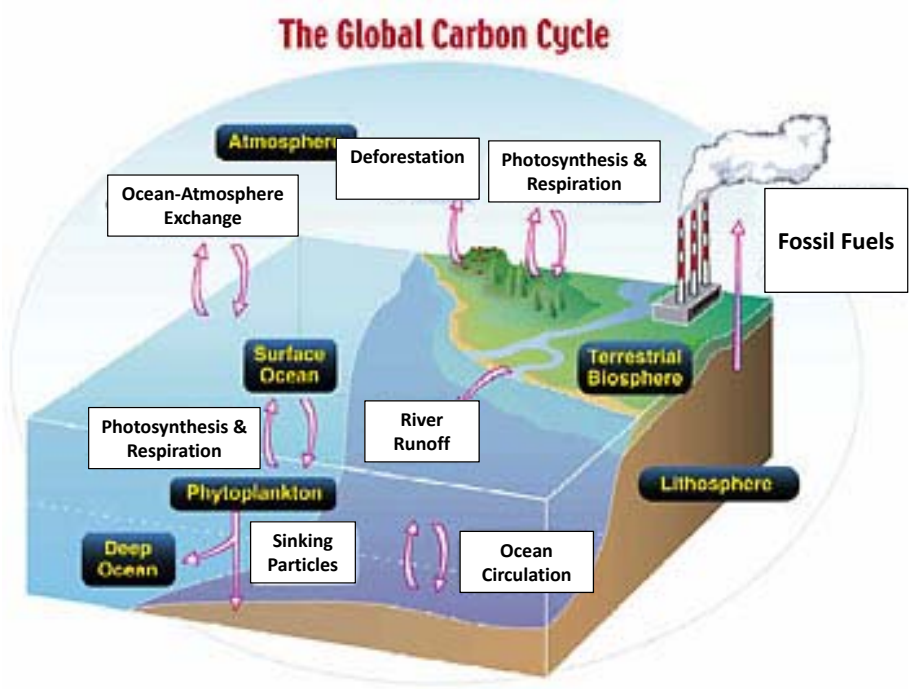
Biogeochemical Cycles

- **Biogeochemical Cycle:** The movement of matter through the biotic and abiotic environment
- 3 types of cycles:
  1. The Water Cycle
  2. The Carbon Cycle
  3. The Nitrogen Cycle

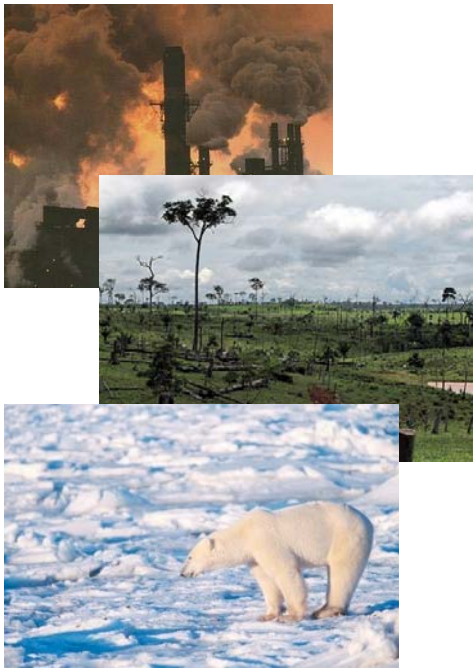
The Water Cycle



The Carbon Cycle

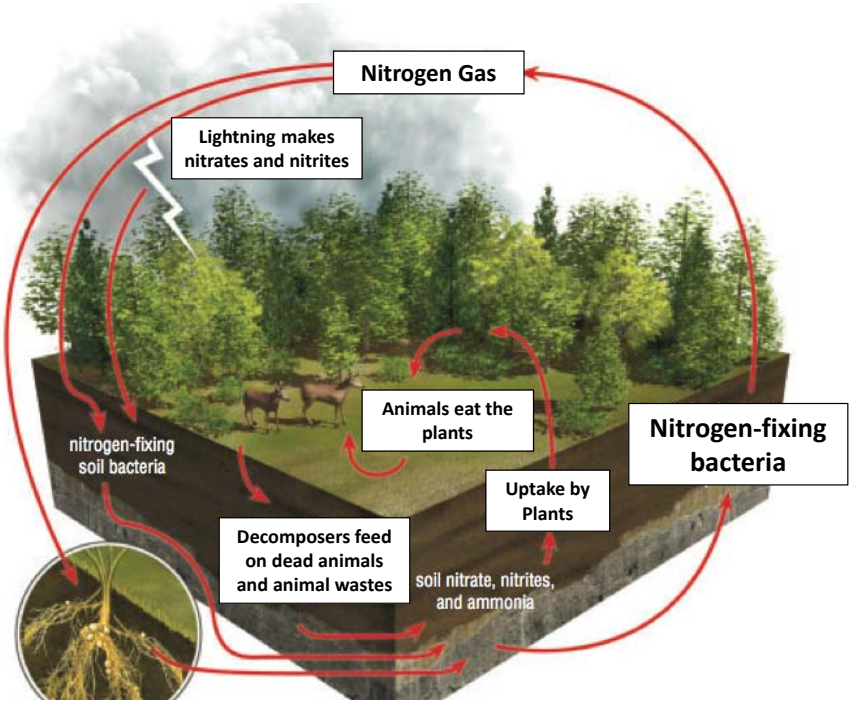


The Carbon Cycle



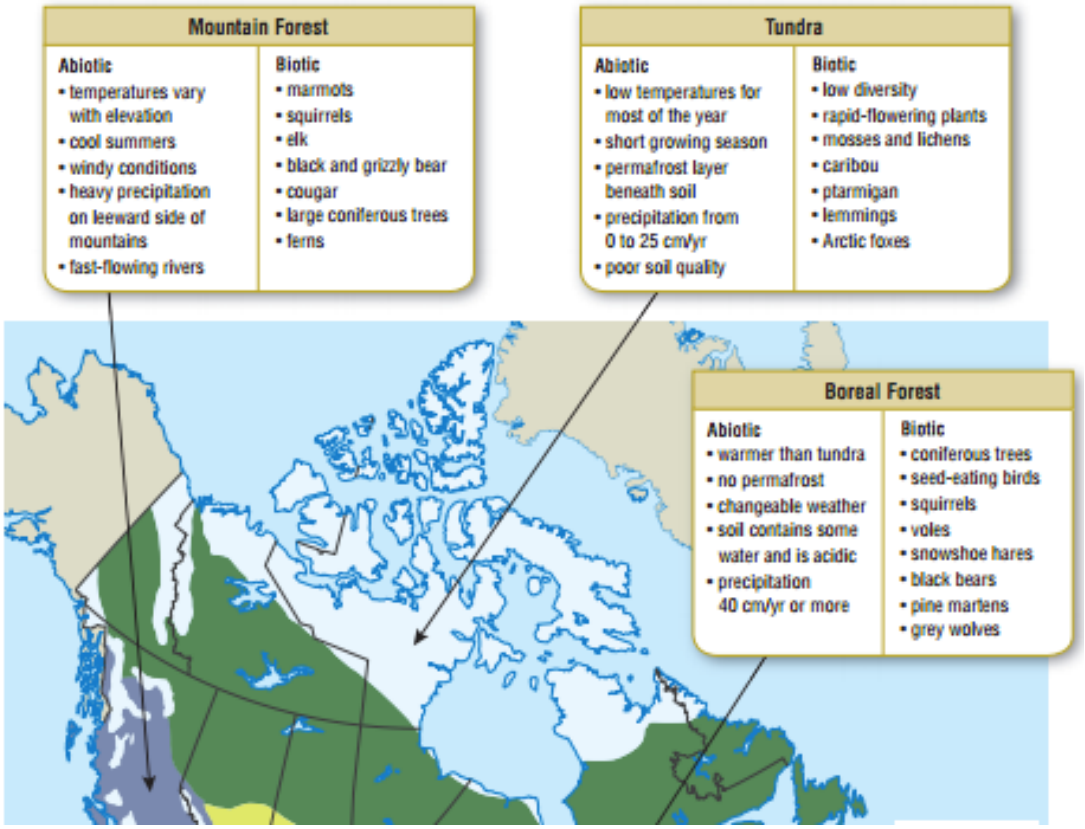
- Most of Earth's carbon is stored in carbon-rich deposits (fossil fuels, plant tissue, oceans)
- Human activities (burning of fossil fuels, deforestation) are dramatically affecting the carbon cycle
  - Causes climate change (melting glaciers, rising sea levels)

The Nitrogen Cycle



Major Terrestrial Ecosystems

- Climate determines the location and makeup of a terrestrial ecosystem
- **Biome** – a region defined by climate with a specific set of biotic and abiotic features
  - Tundra
  - Mountain Forest
  - Boreal Forest
  - Grassland
  - Temperate Deciduous Forest



Grassland

Abiotic	Biotic
• longer growing season than boreal forest • higher temperatures than tundra or boreal forest • rich, fertile soil • precipitation from 25 to 75 cm/yr	• fescue grasses • grasshoppers • bison • voles and mice • snakes • hawks • coyotes

Temperate Deciduous Forest

Abiotic	Biotic
• longer growing season than boreal forest • higher temperatures than tundra or boreal forest • fertile soil • precipitation up to 100 cm/yr	• deciduous trees and other flowering plants • tree and ground squirrels • many insects • shrews and mice • deer • black bears • hummingbirds • weasels

Major Aquatic Ecosystems

- **Freshwater Ecosystems** – rivers, streams and lakes
  - Classified by nutrient level:
    - Oligotrophic – low in nutrients; clear and deep
    - Eutrophic – high in nutrients; murky and shallow
  - Watershed – area of land in which all water drains into a single river or lake

- **Marine Ecosystems –** consist of salt water; ocean
  - Open ocean is nutrient poor
  - Deep ocean has no light
  - Water near shores are abundant with life
- **Estuary** – where salt water and fresh water mix; high in nutrients and support shellfish
- **Intertidal Zone**– part-time terrestrial and part-time aquatic
  - Organisms face changing conditions; develop tough tissue and protective coatings

Ecosystem Benefits

- Enjoyment of nature – ecotourism, cottage life
- Ecosystem products – hunt animals, harvest plants, forestry

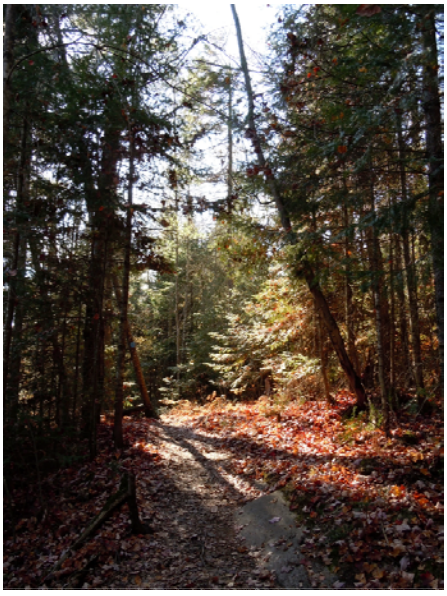
Table 1 Important Products from Terrestrial Ecosystems

Product	Original source	Use
maple syrup	maple trees	food, sweetener, flavouring
henna, indigo	plant extracts	dyes
latex (rubber) and chicle	assorted tropical trees	hoses, tires, chewing gum, golf balls
acetylsalicylic acid (ASA) (aspirin)	willow tree (original source of salicylic acid)	treats pain, blood thinner
waxes: carnauba, jojoba	carnauba palm leaves, jojoba seeds	commercial wax products, cosmetics, foods, lubricants
vincristine and vinblastine	rosy periwinkle (tropical flowering plant)	treatment of childhood leukemia
digitalis	foxglove (flowering plant)	treatment of heart disorders

- Protection – protect from erosion, filters, absorbs water

Sustainable Ecosystems

- An ecosystem that is maintained through natural processes
  - Maintain a relatively constant state of characteristics overtime
- Human activity can make a sustainable ecosystem unsustainable



Artificial Ecosystems

- Created and maintained by human actions
- Plants and animals are introduced
- Not usually sustainable and require management