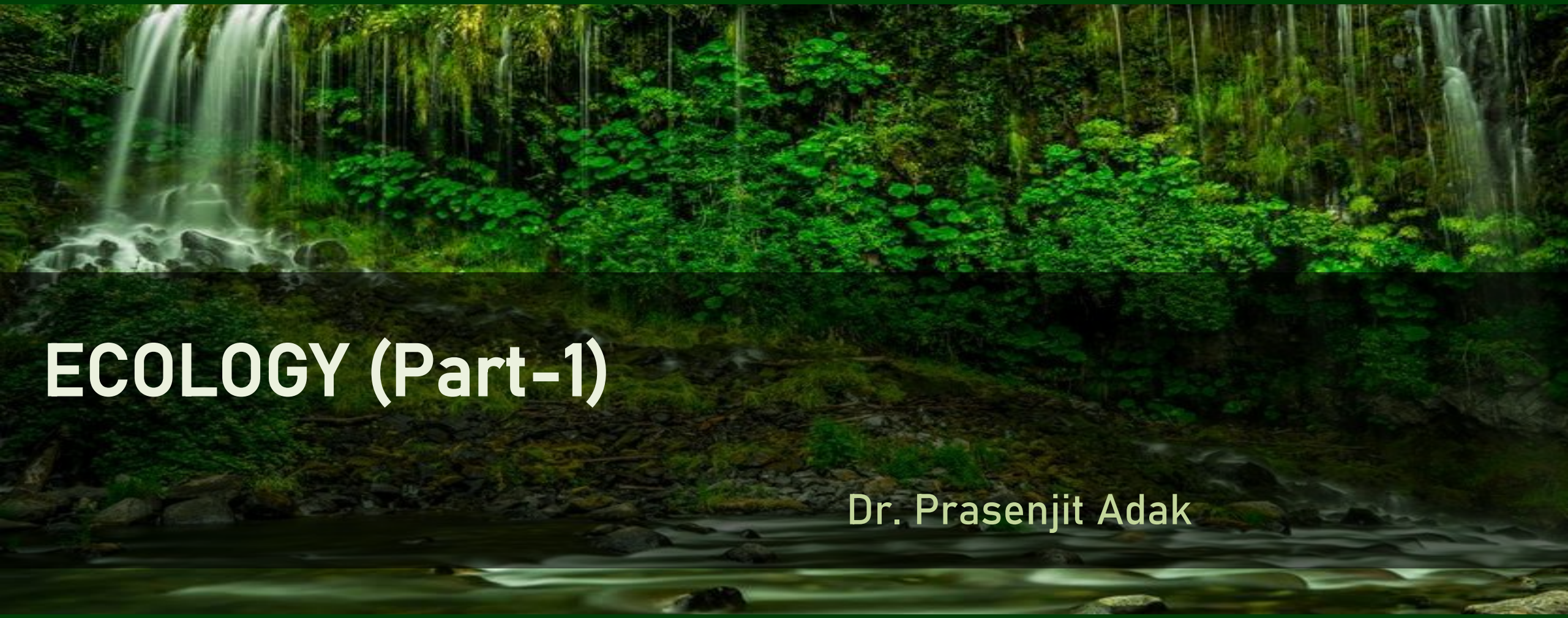


ECOLOGY (Part-1)

Dr. Prasenjit Adak

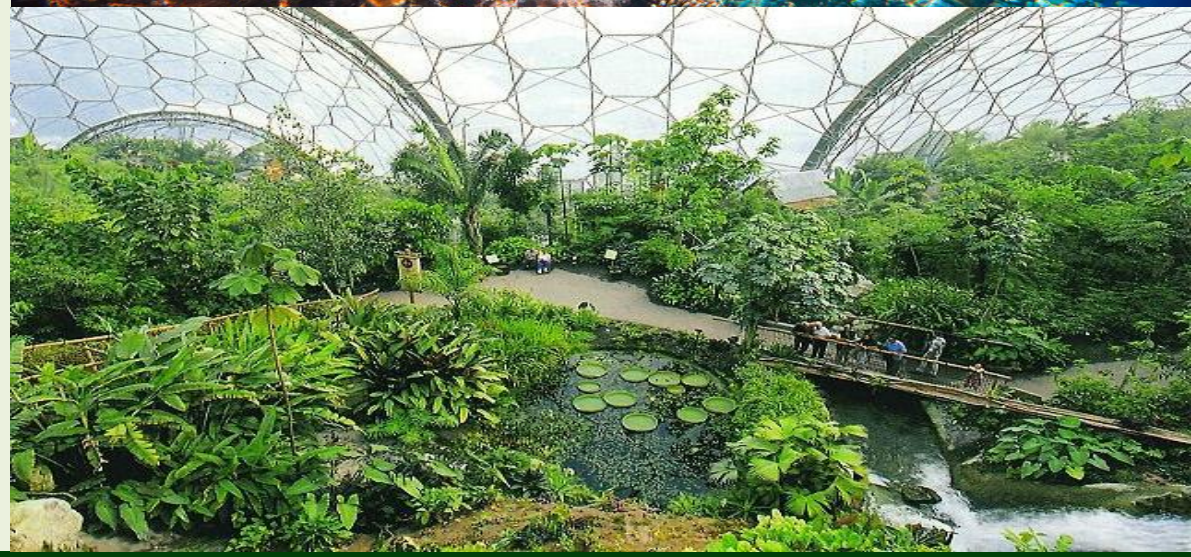
Introduction

- Greek word “Oikos” meaning “home” and “logos” meaning “study”
- Ecology: The study of organisms in their natural habitat interacting with their surroundings
- Ecosystem: A self-regulating group of biotic communities of species interacting with one another and with their non-living environment exchanging energy and matter

This PPT should be used as reference only. Reading books (mentioned in syllabus) is mandatory for the preparation of the examinations.

Classification of ecosystem

- Natural ecosystem
  - Aquatic
    - Fresh water
      - *Running water*
      - *Standing water*
    - Marine
  - Terrestrial
    - Grassland
    - Forest
    - Desert
- Artificial / Engineered ecosystem



Structural unit

- Abiotic
  - Physical
    - Climatic (Sunlight, temperature, humidity, rainfall, wind)
    - Edaphic (soil type, soil moisture, soil reaction)
    - Geographic (Latitude, longitude, Altitude)
  - Chemical
    - Major nutrients
    - Trace elements
    - Pollutants
    - Organic substances

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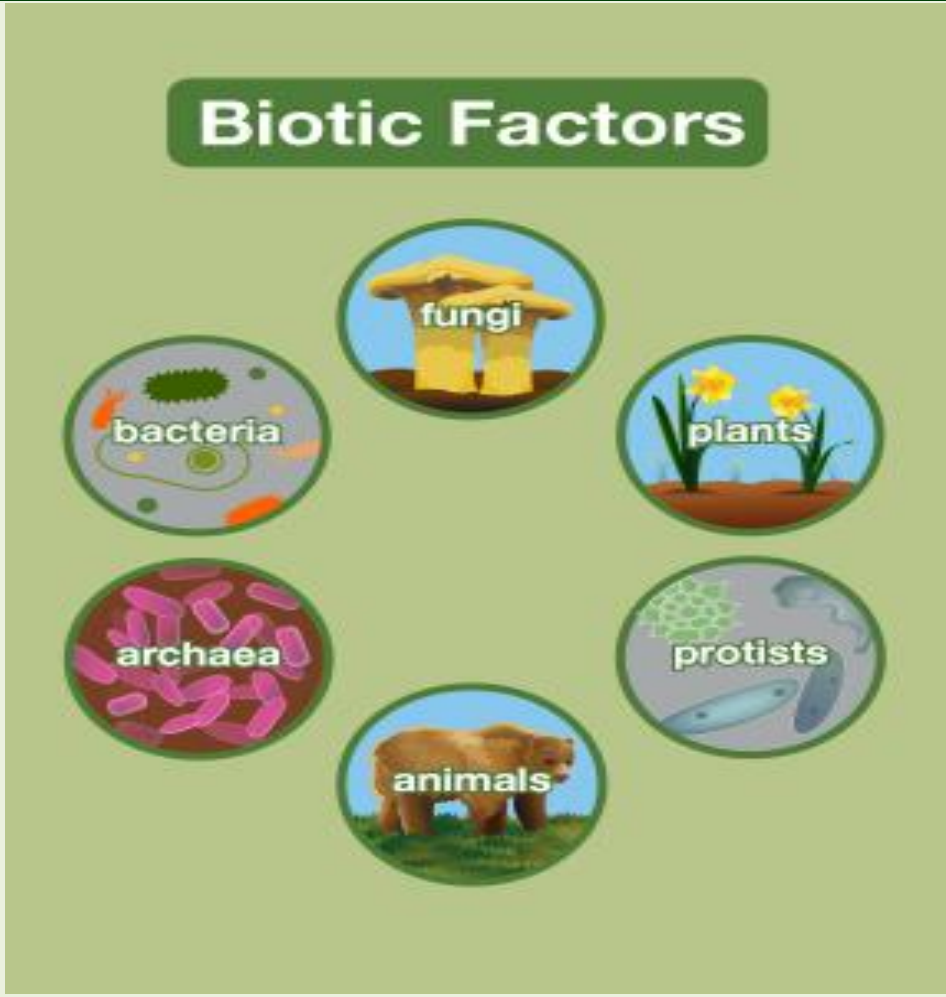
Structural unit

- Biotic
  - Producers
    - Photo-autotrophs
    - Chemo-autotrophs (*Nitrosomonas*, Iron bacteria, Methanogens)
  - Consumers
    - Herbivores
    - Carnivores
    - Omnivores
    - Detritivores
  - Decomposers

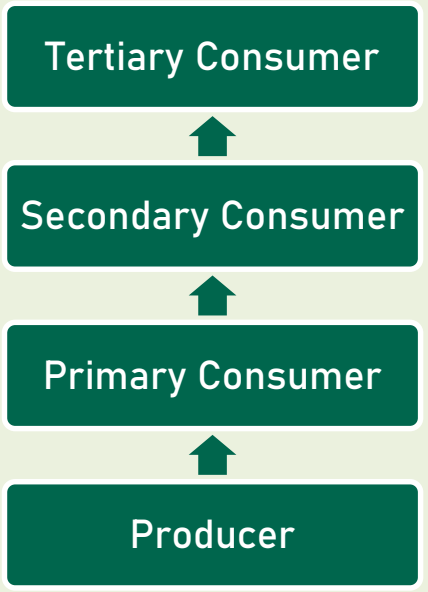


Limiting Factors

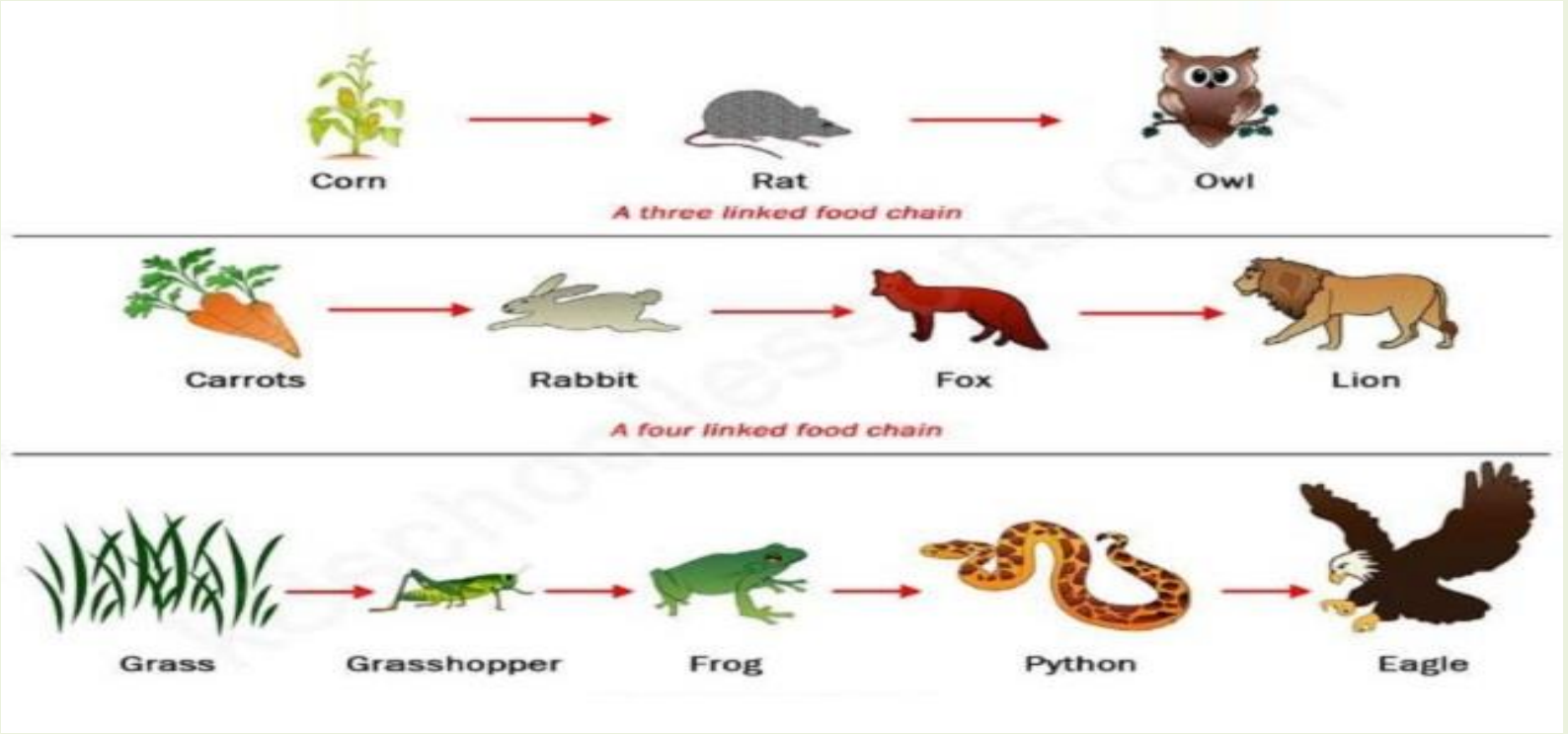
- Factors which restrict the further growth of population
  - Availability of food
  - Water
  - Shelter
  - Space

Food chain

- Food chain is a series of groups of organisms called trophic levels, in which, there is repeated eating and eaten by so as to transfer food energy.

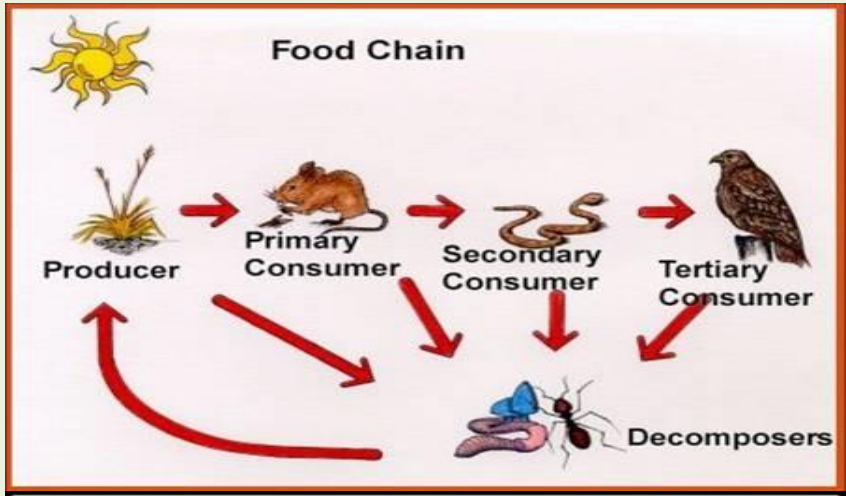


Trophic Levels



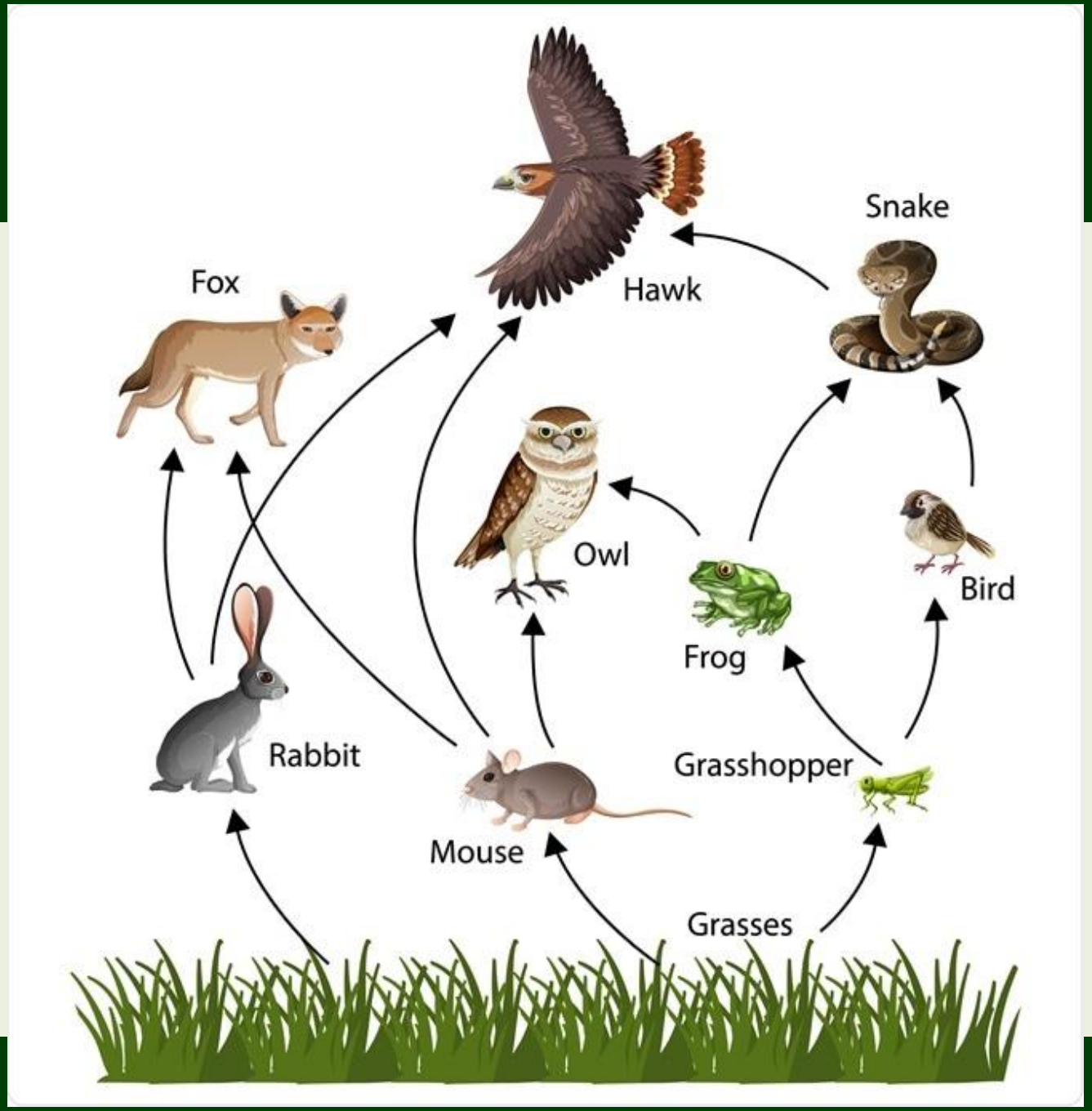
Types of Food Chain

- Grazing food chain
  - Grass → Rabbit → Fox
  - Algae → Water flea → Small fish → Big fish
- Detrius food chain
  - Dead organic matter → Fungi → Bacteria
- Significance of food chain
  - Energy flow
  - Nutrient cycles
  - Ecological balance (population size regulation)
  - Biomagnification
    - The process by which a compound (such as a pollutant or pesticide) increases its concentration in the tissues of organisms as it travels up the food chain



Food Web

- Food web: A network of food chain
- Food web is an important conceptual tool for illustrating the feeding relationships among species within a community, revealing species interactions and community structure, and understanding the dynamics of energy transfer in an ecosystem.



Ecological pyramids

- An ecological pyramid is a graphical representation of different living organisms at different trophic levels. It was given by Raymond Lindman and G. Evelyn Hutchinson.
- These pyramids are shaped like actual pyramids with base broads and narrow down at the apex.
- The first trophic level is producers and the next topic level is primary consumer and so on.
- Graphical representation of the ecological pyramid shows a relationship between living beings at different trophic levels.
- Ecological Pyramids are of three types:

a) Pyramid of numbers

b) Pyramid of biomass

c) Pyramid of energy

Ecological pyramids

- Pyramid of number

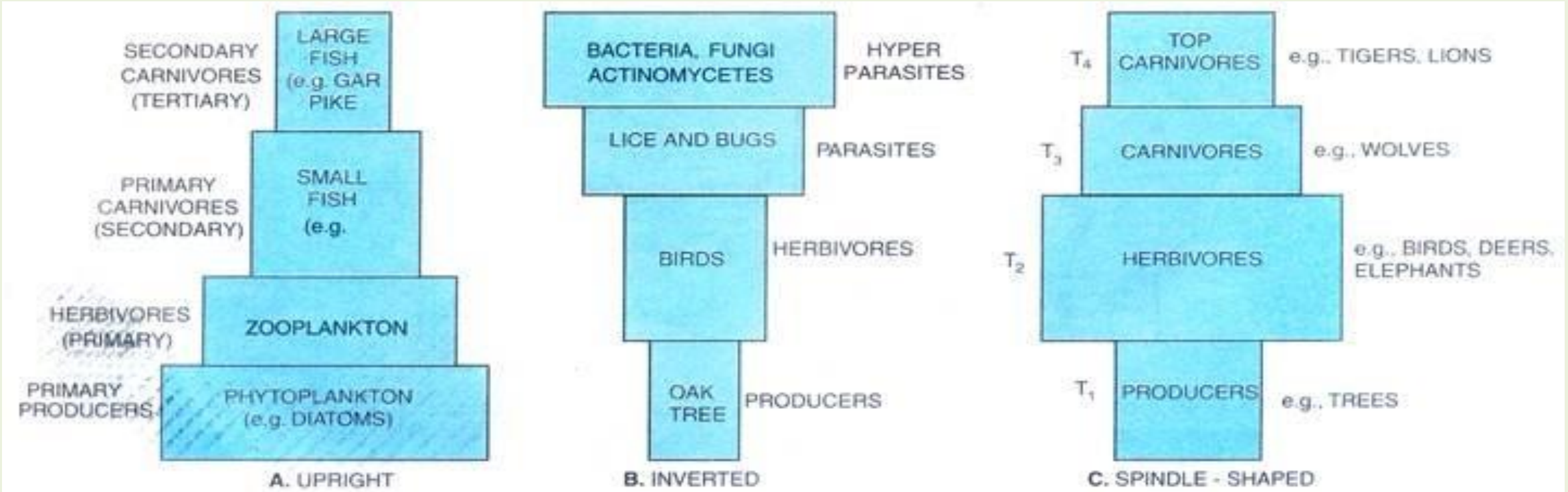
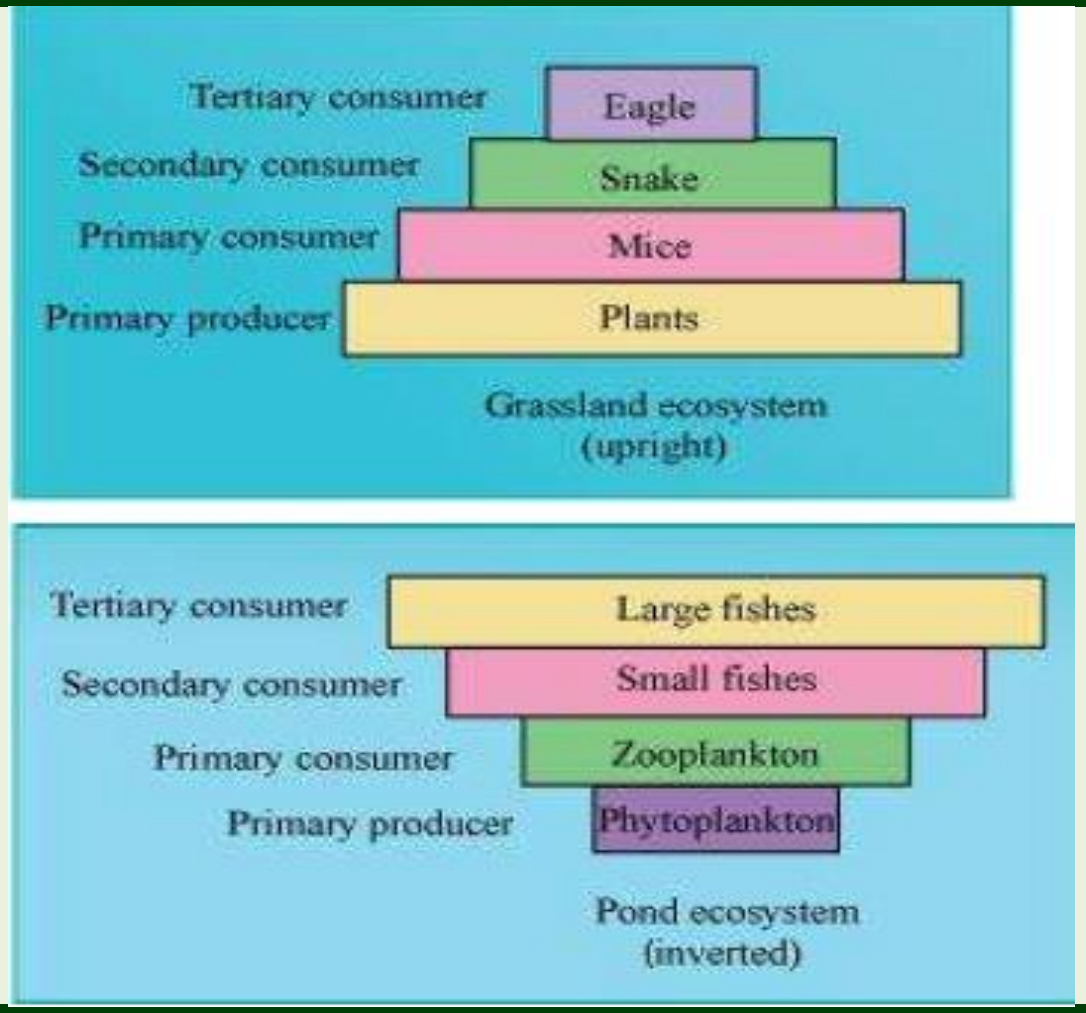


Fig. 14.15. Pyramids of numbers : **A.** In pond ecosystem; **B.** In parasitic food chain; **C.** Tree ecosystem.

Ecological pyramids

- Pyramid of biomass



Ecological pyramids

- Pyramid of energy

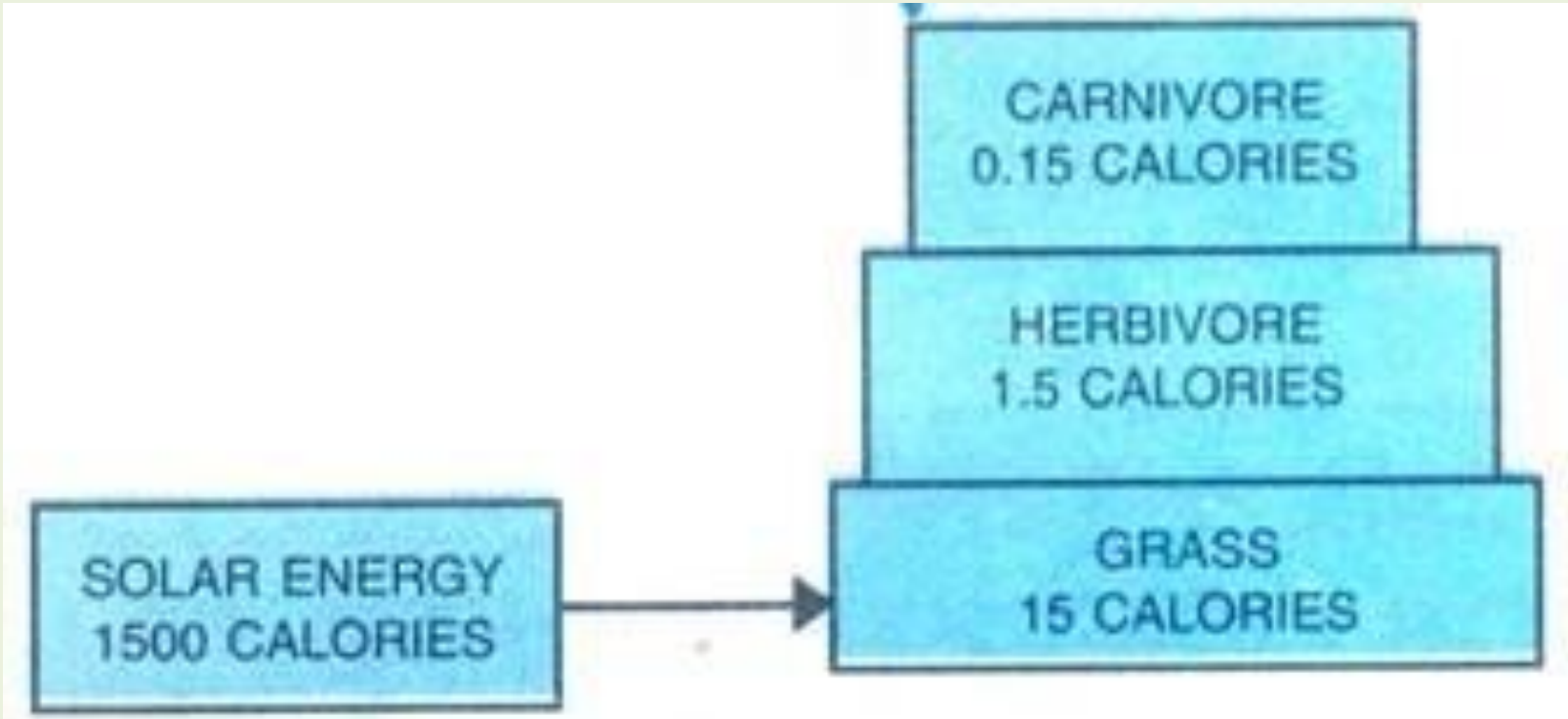


Fig. 14.18. Pyramid of energy.

Energy flow

- Universal energy flow model

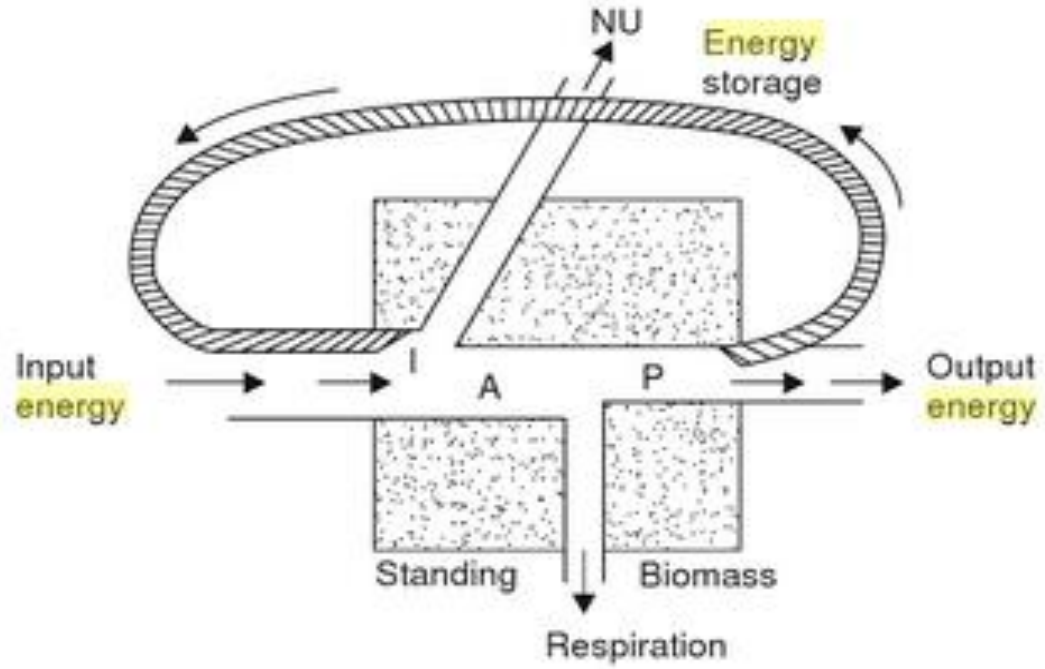


Fig. 3.8. Universal energy flow model applicable to all living components (I = Energy input; A : assimilated energy ; P = Production ; NU = Energy not used.

Energy flow

- Single channel energy flow model

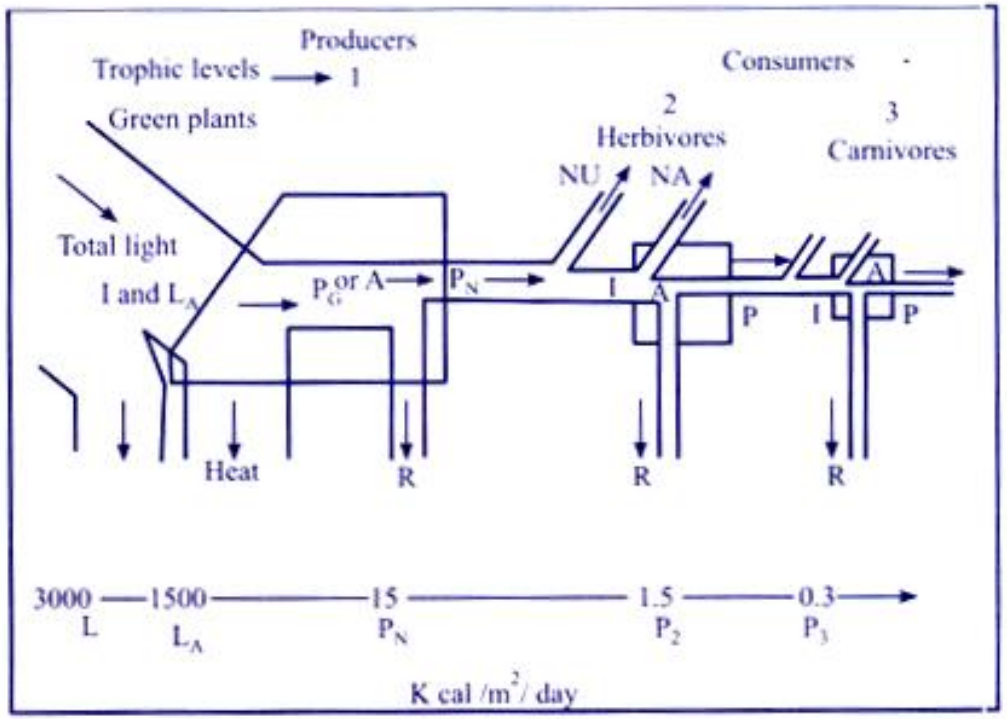


Fig. 1.4 A simplified energy flow diagram depicting three trophic levels

Energy flow

- Double channel or Y-shaped energy flow model

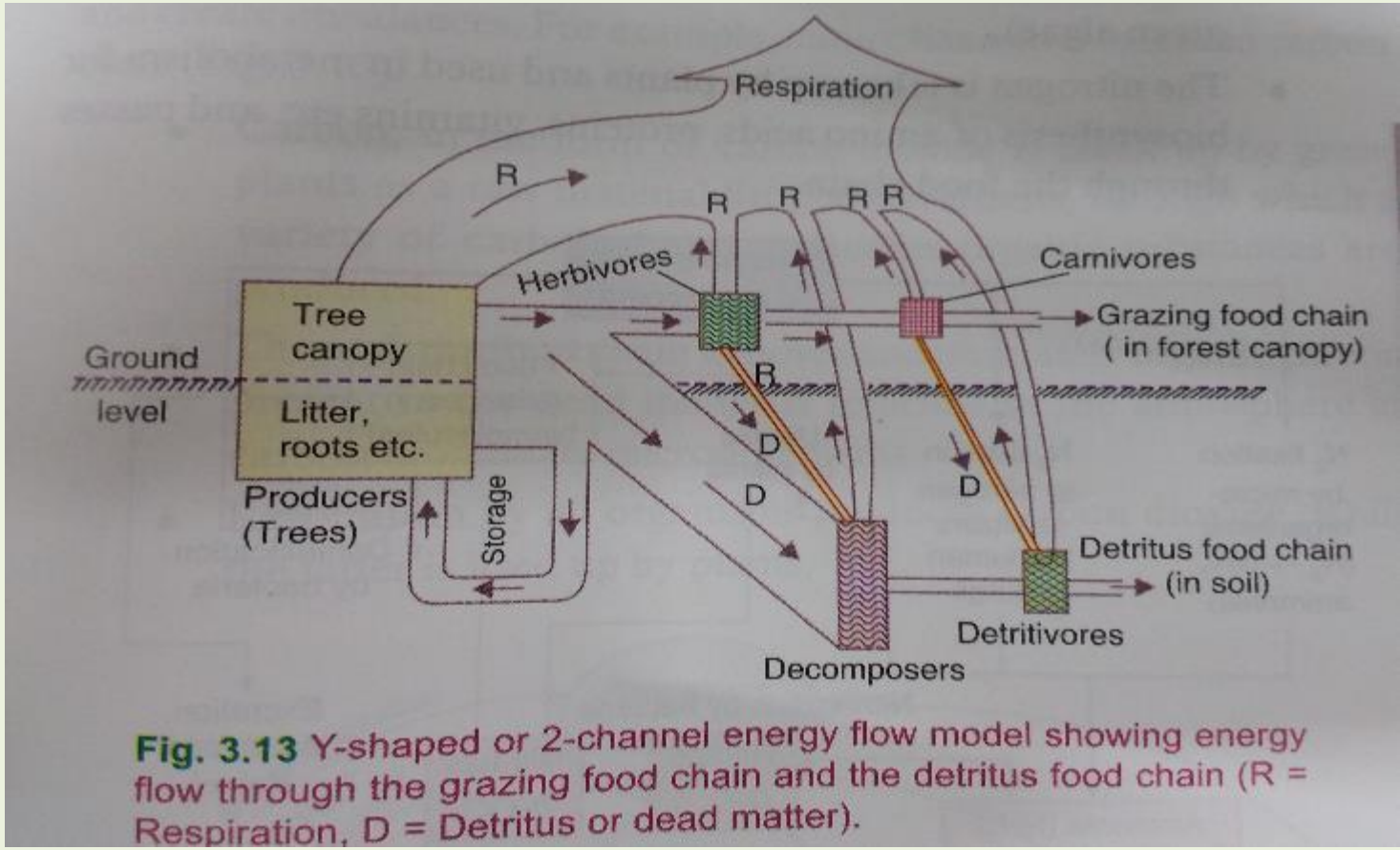
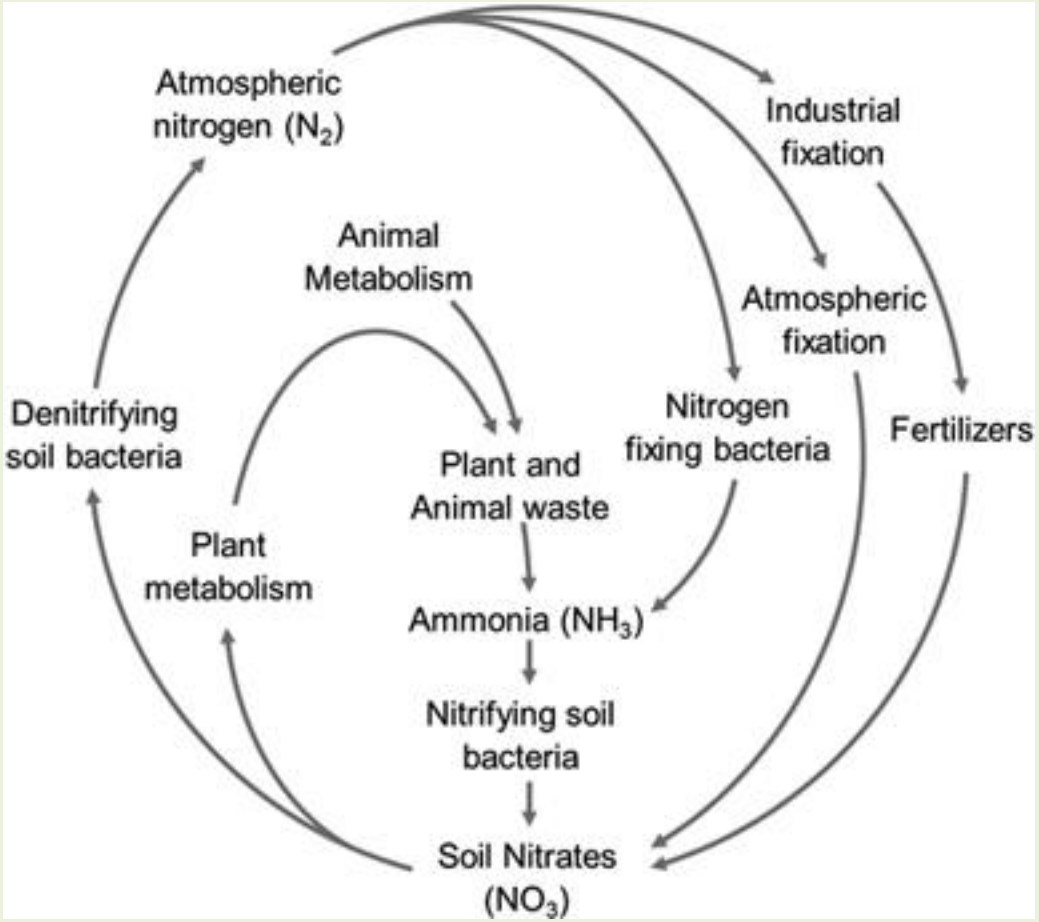


Fig. 3.13 Y-shaped or 2-channel energy flow model showing energy flow through the grazing food chain and the detritus food chain (R = Respiration, D = Detritus or dead matter).

Nutrient cycles

- Nitrogen



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Nutrient cycles

- Carbon

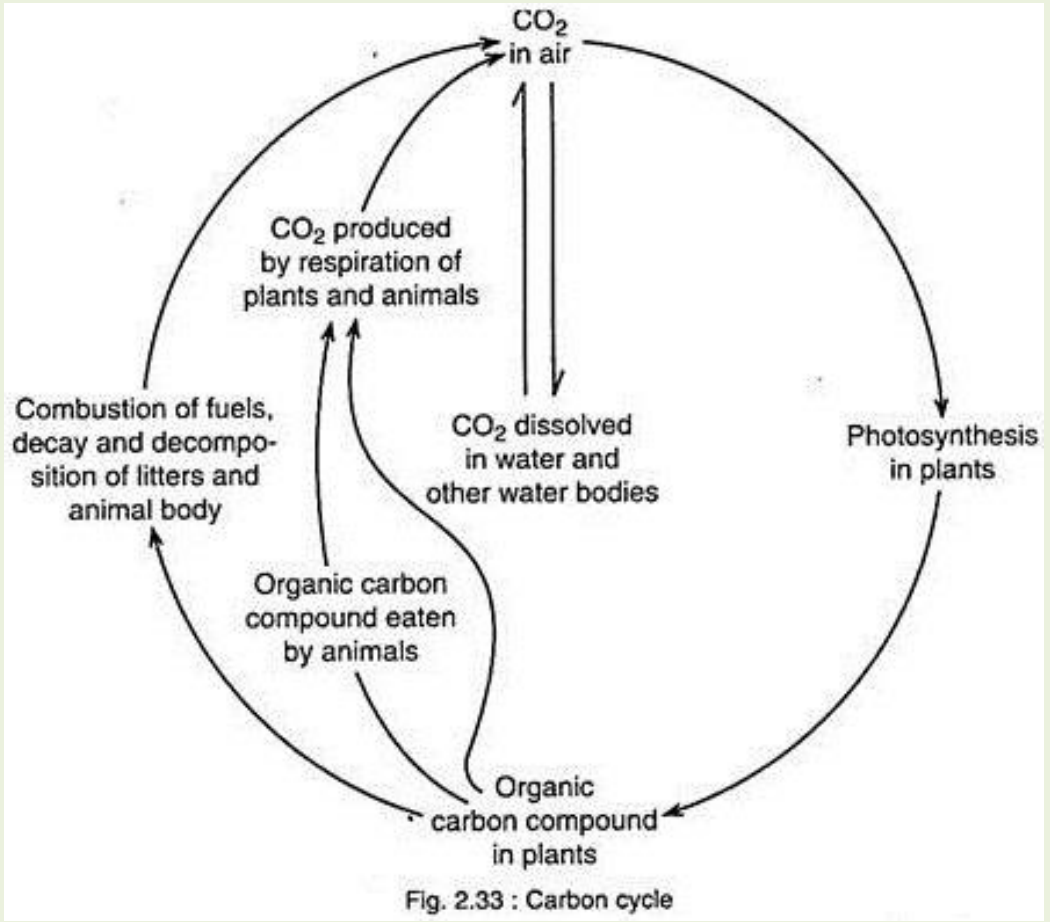
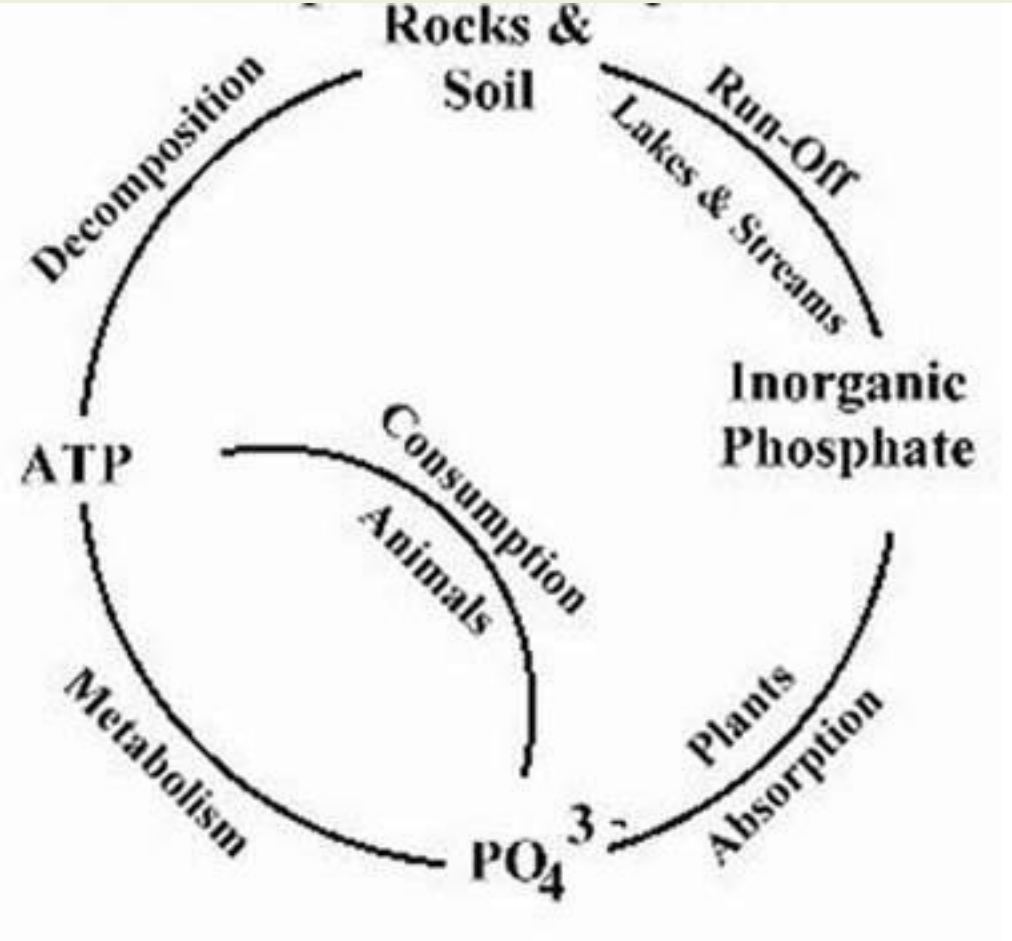


Fig. 2.33 : Carbon cycle

Nutrient cycles

- Phosphorus



Production of biomass

- Primary production
  - Biomass production using photosynthesis
- Secondary production
  - Biomass production by consuming producers

To be continued…

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