

Examrace

Ecosystem – Composition, Structure, Function & Productivity YouTube Lecture Handouts for Competitive Exams 2021

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Ecosystem

- **Self-regulated** & self-sustaining
- Structural and Functional unit of nature includes living beings and environment
- Interact and exchange material
- Open System – input of energy and matter
- Result in productivity

Types of Ecosystem

Homeostasis/Biological Equilibrium

Functional balance which is not static and fluctuates within limits

Controls

- Carrying Capacity
- Recycling Waste
- Self-Regulation
- Feedback System

Components of Ecosystem

 **Biotic** – food contains energy for body building, growth and functions

- Producers (Autotrophs)
- Consumers (Heterotrophs)
- Decomposers (Reducers)

Abiotic – non-living factors

- Temperature
- Light
- Wind

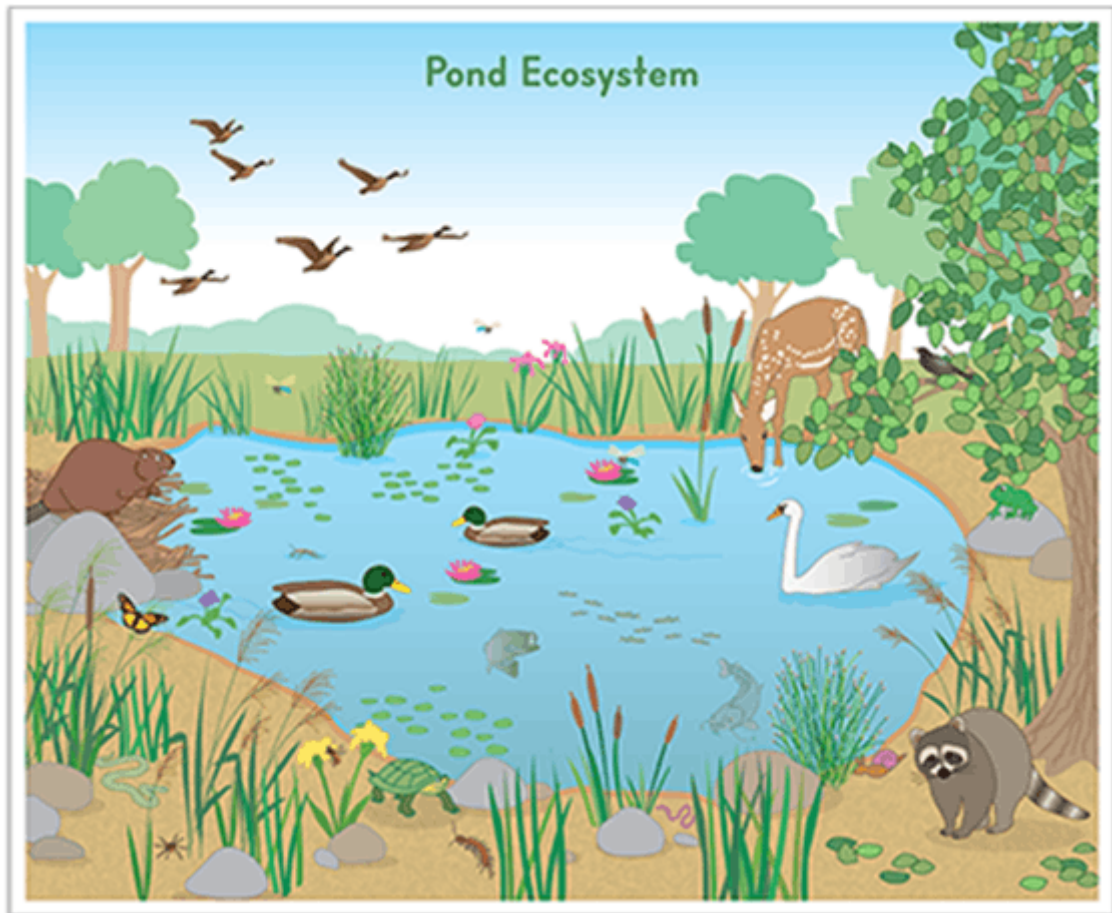
- Humidity – epiphytes that grow
- Precipitation
- Water – xerophytes & hydrophytes
- Background – Chameleon (change color) ; praying mantis & frog are green
- Gases
- Soil – water retention, aeration & minerals
- pH – acidic (Euglena & flagellates) or basic (calcareous shells)
- Relief – north & south faces of hill
- Mineral Elements

Structure

- Species Composition – identify and enumerate plants and animals
- Stratification – vertical layers
- Trophic Levels
- 🦋 Standing Crop – living biomass in unit area (dry weight is preferred as is independent of moisture differences)
- 🦋 Standing State – inorganic nutrients in ecosystem (non-living)

🦋 Ecosystem Functions

- Productivity
- Decomposition
- Energy Flow
- Nutrient Cycling



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Productivity

Rate of synthesis of energy containing biomass by any trophic level per unit area in unit time

Measured as $\frac{\text{gm}}{\text{m}^2} / \text{year}$ (weight)

Measured as $\frac{\text{Kcal}}{\text{m}^2} / \text{Year}$ (energy)

🦋 Primary Productivity – energy accumulation in green plants per unit area over time

$$\text{NPP} = \text{GPP} - \text{Rate of Respiration}$$

Secondary Productivity – Rate of re-synthesis of material by consumers

Respiration loss is 20 % for autotrophs, 30 % for herbivores and 60 % for carnivores

Maximum productivity – tropical rainforest

Minimum productivity – desert or Arctic regions

Order of productivity:

Tropical Rainforest > Tropical Deciduous > Temperate Deciduous > Temperate Coniferous > Savannah > Temperate Grassland > Scrub

Factors Affecting Productivity

- Solar radiation - maximum in tropics and so photosynthesis and NPP highest in tropics
- Temperature – temperate forest have lesser productivity due to cold climate
- Moisture
- Nutrients
- Photosynthetic Efficiency

Decomposition

Detritus

- Above Ground – litter (plant driven) , dried plants
- Below Ground – dead roots, underground dead animals

🦋 Process

- Fragmentation of Detritus (earthworm as farmer's friends)
- Catabolism
- Leaching – soluble substances are subject to leaching

🦋 Products formed

- Humus by **humification** – humus is dark colored organically rich in lignin and cellulose
- Inorganic nutrients by *mineralization* – both non mineral (CO_2 , H_2O) & mineral (Ca^{2+} , Mg^{2+} , K^+ , NH_4^+) from organic matter

Factors Affecting Decomposition

- Temperature
- Moisture – excess moisture impedes decomposition due to anaerobiosis
- pH – alkaline soils are rich in detritivores and acidic nature decreases detritivores
- Composition – chitin and lignin are slow to decompose

- Aerobiosis – aerobic conditions are required

✍ Mayank

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