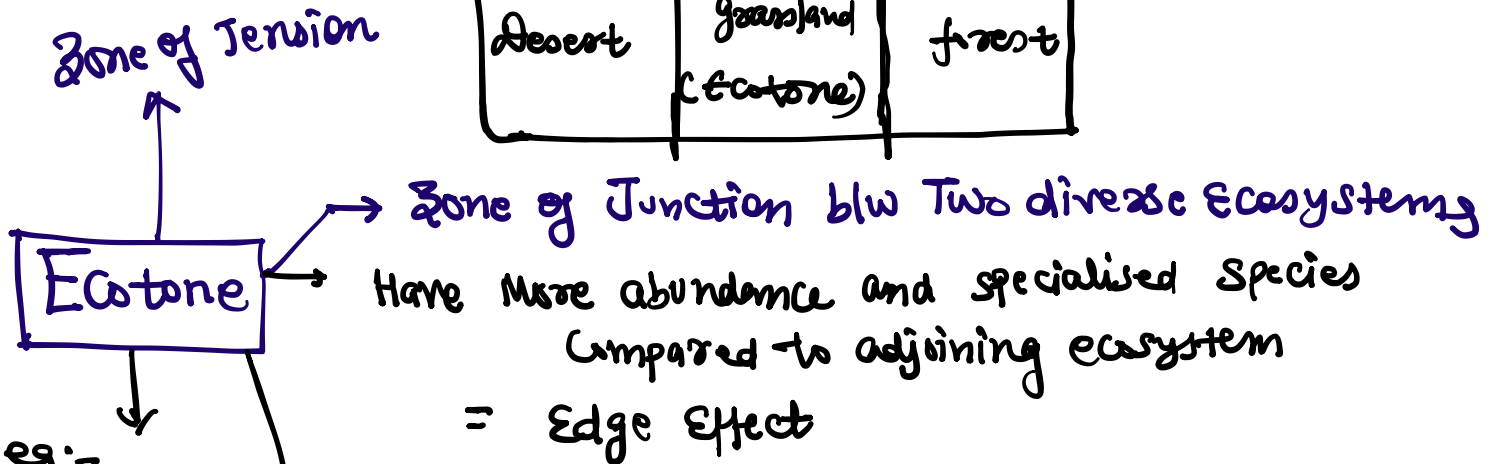
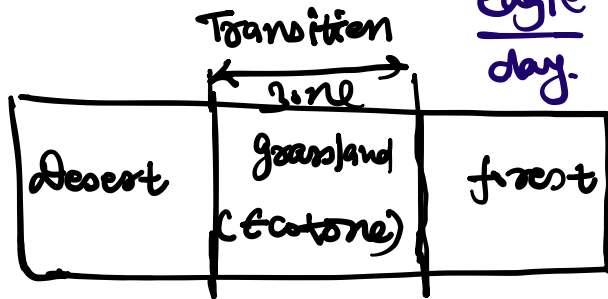


Certain set of conditions are provided to specie for the unique function to carry out during.



eg:- Galapagos Island finches;  
Eagle & owl  
 day. Night



eg:-  
 Wetland  
 Corals  
 Mangroves  
 Marshlands (Terai)  
 Delta/Estuary  
 grassland

Specialised / primarily or abundantly found species = Edge species

Species adapted to particular cond<sup>n</sup> = Ecotype

# Functional unit of Ecosystem

① Energy flow

Plants Convert 1% Sunlight

2 Processes → Photosynthesis  
→ Respiration

- Trophic Level : Position occupied by specie in food chain acc. to Nutritional Need

Primary Producers

Autotrophs

Chemotrophs

Thiobacillus

Phototrophs

\* Woody Plants,  
Herbaceous plants  
Cyanobacteria  
Phytoplanktons

Consumers — Heterotrophs

- Primary Consumers

- 2° Consumers

- 3° Consumers

Scavengers

Macro consumers

- Vulture, Eagle, Hawk  
Hyena.

Detritivores & Decomposers

Also termed as saprophytes  
external digestion

Decomposers

Organisms such as

Microscopic but some are visible  
eg: Mushroom

Bacteria

Fungi

Protozoa

Insects

(Beetles, Dungflies)

Detritivores

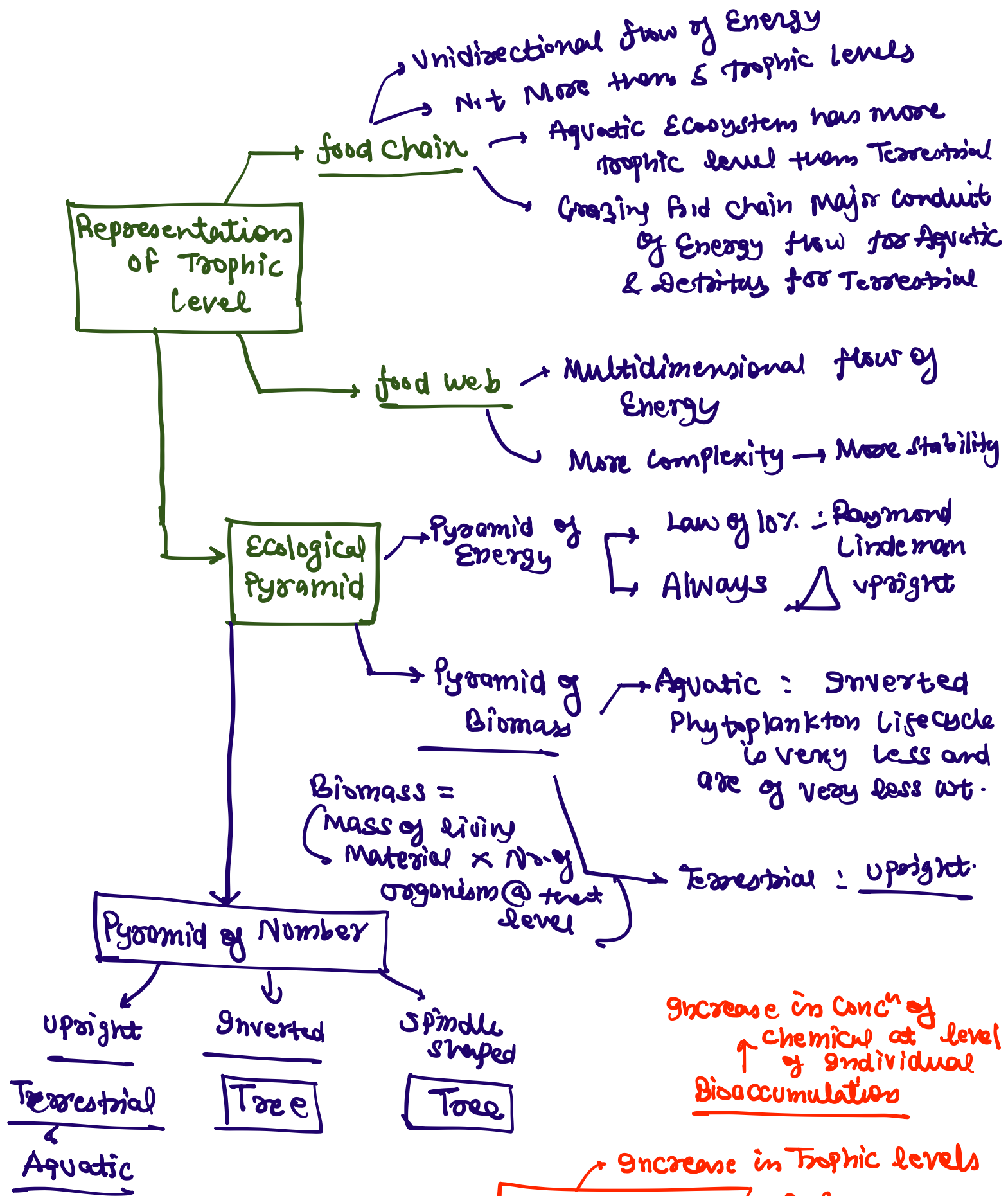
eg- Internal digestion

- Earthworms

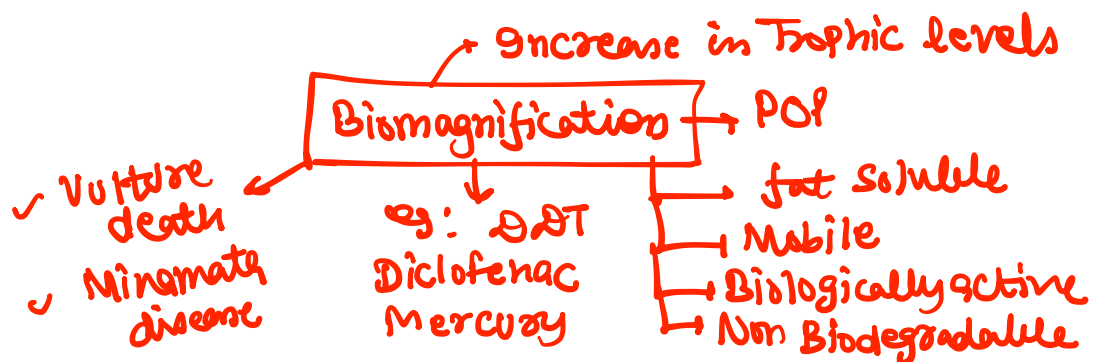
- Millipeds

- Termites

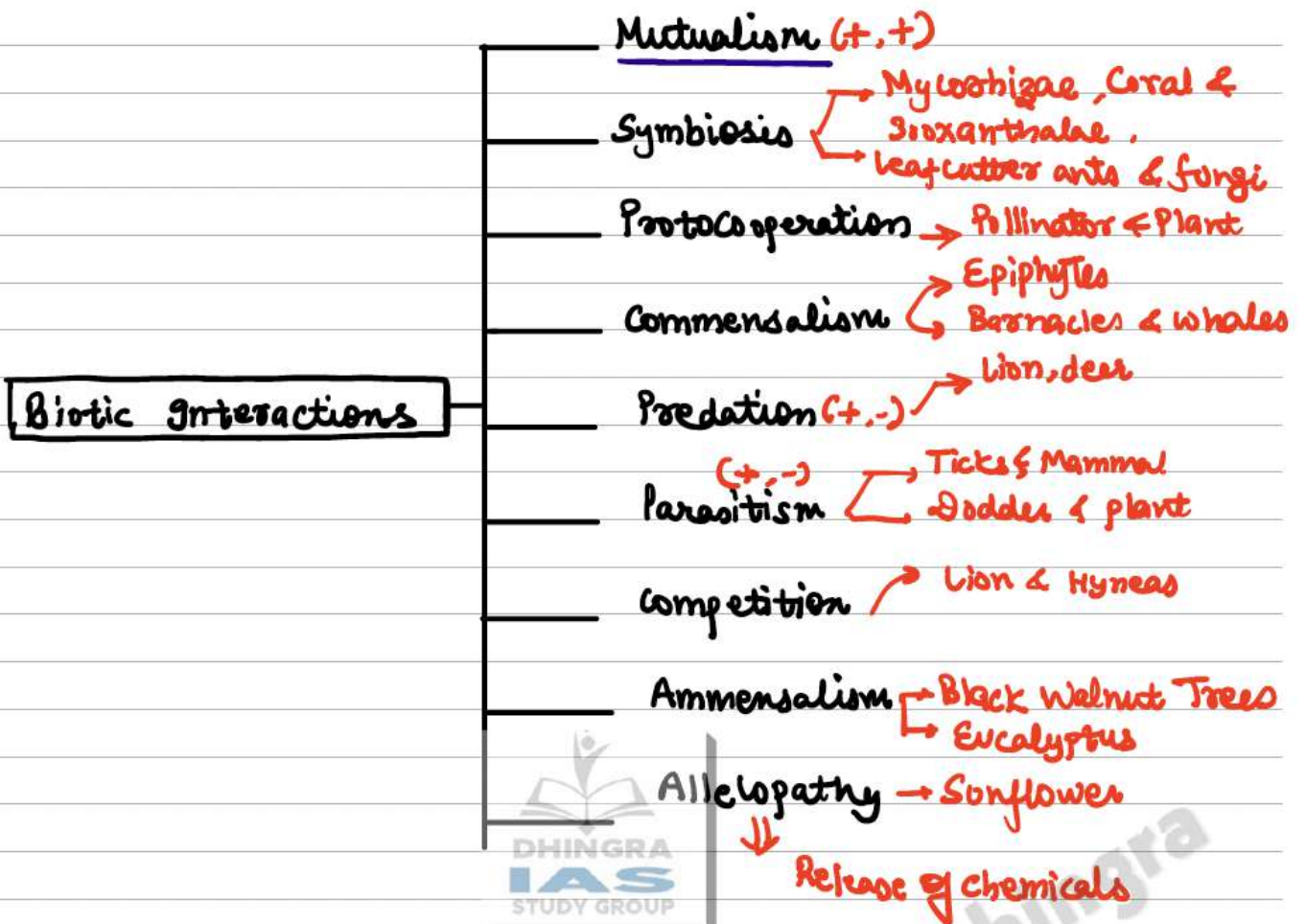
- Wood lice



increase in conc<sup>n</sup> of chemical at level of individual  
Bioaccumulation







## Ecological Succession

- ✓ Gradual & fairly Predictable Changes
- ✓ Changes finally lead to a community that is in eqbm with environment called 'Climax Community'

Pioneer Comm.

Seral comm.

Climax comm.

Primary

Secondary

occurs where  
no living org.  
existed eg.  
Bare rock, Volcanic  
eruption, pond  
↓  
slow

Soil  
existed  
earlier  
↓  
fast

Hydroarch → Mesic  
(Wet areas)

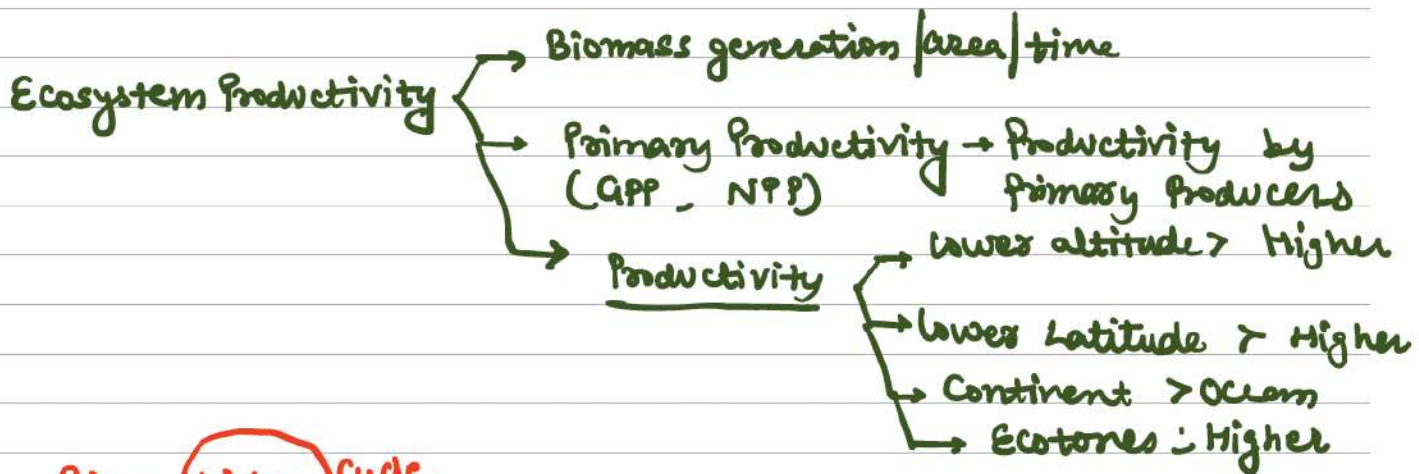
Xerarch  
(Dry areas)

Net Primary  
Productivity

Pioneer Climax

Pioneers → Phytoplankton  
Lichens

Nudation → Migration → Ecesis → Competition → Reaction → Stabilization



Bio - Life  
Geo - Earth  
Cycle.

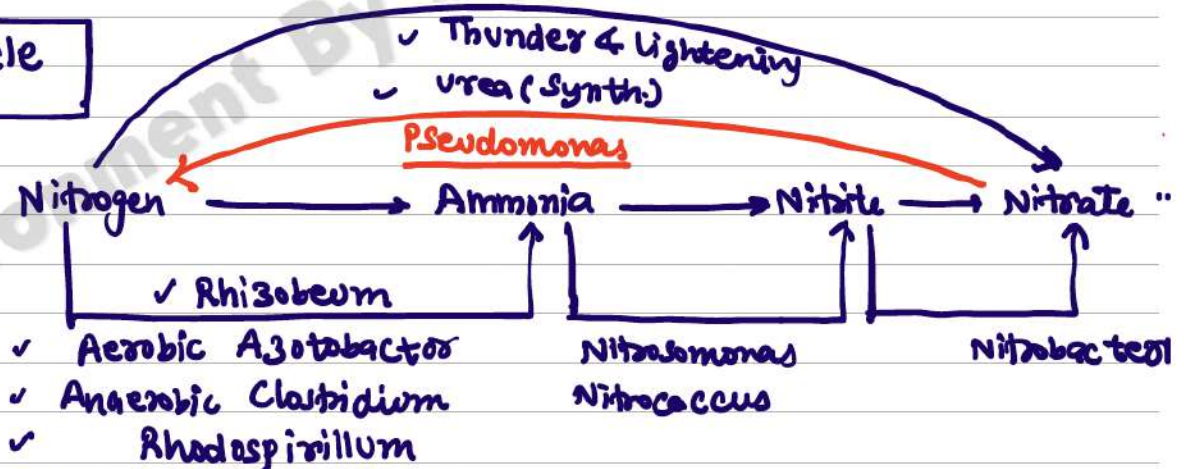
### Biochemical cycle



**Water Cycle :** Evaporation, Sublimation, Transpiration  
Condensation  
Precipitation, Infiltration, Runoff, Percolation

**Fresh water :** Glaciers & Ice caps > Ground water > Lakes > Rivers.

### Nitrogen cycle



→ Oceans :- Nostoc, Anabaena, Spirulina



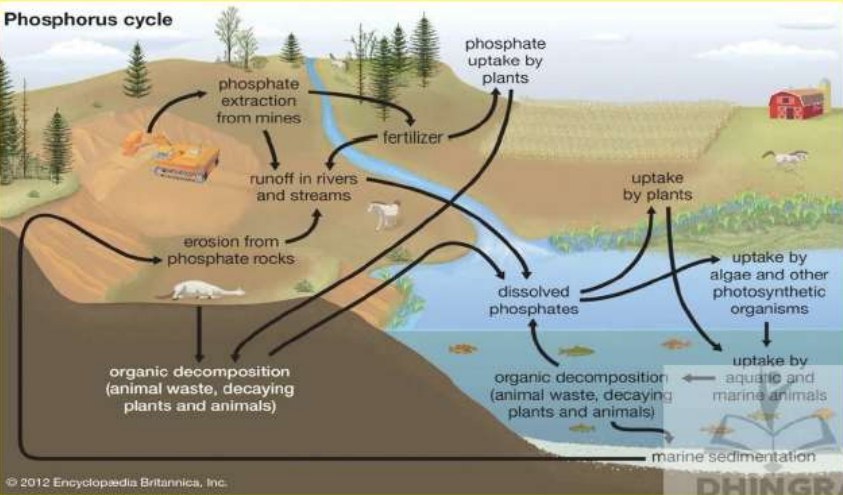
## Phosphorous cycle

Phosphate rock

Erosion

Enters Rivers & streams

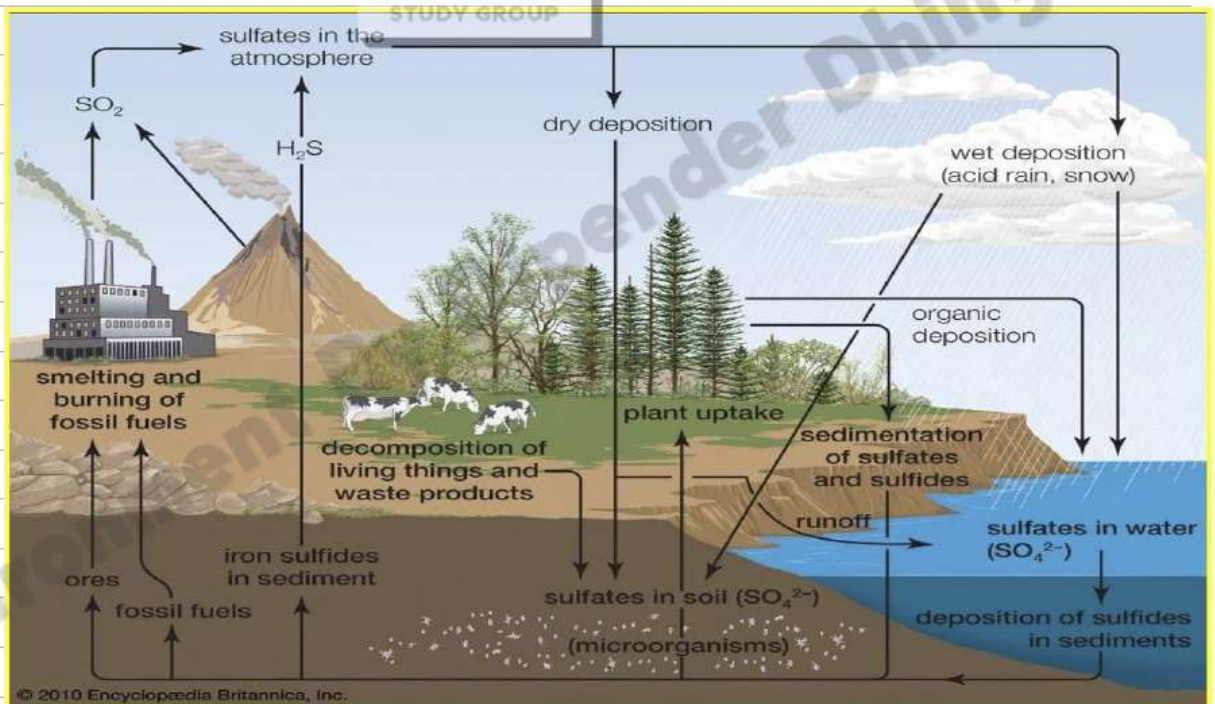
Continental shelves  
Oceans



## Sulphur cycle

(Reservoir → Soil & Sediment)  
Volcanoes.

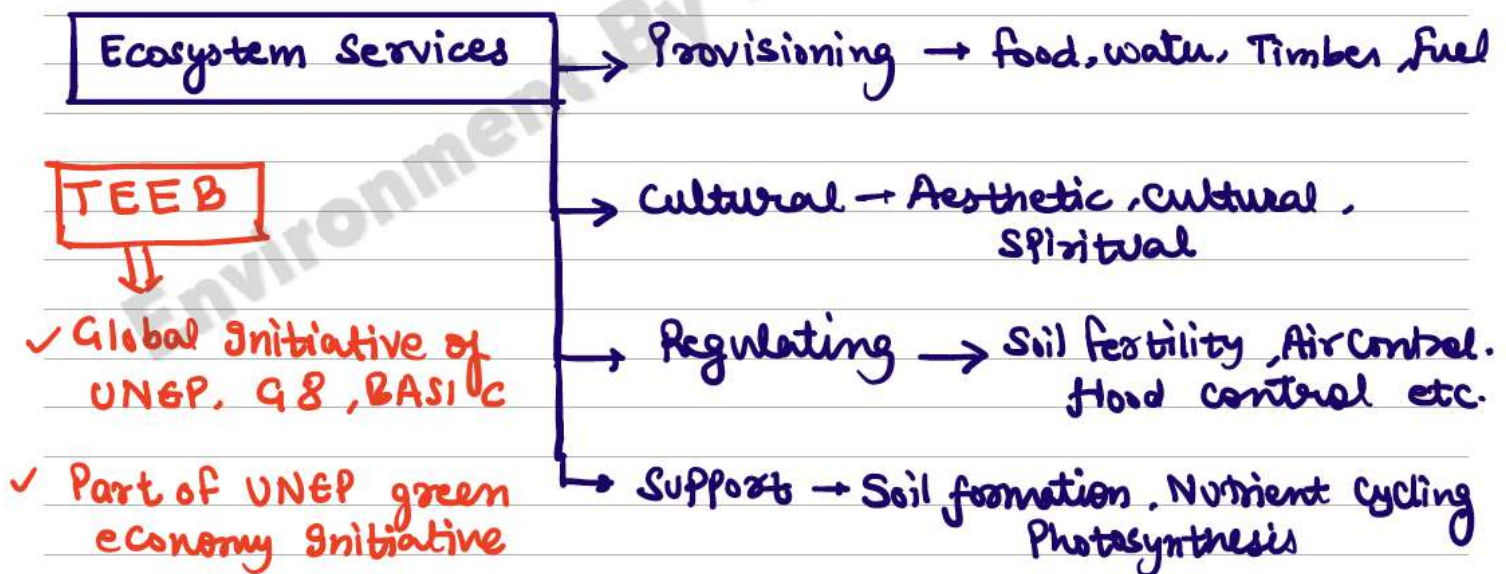
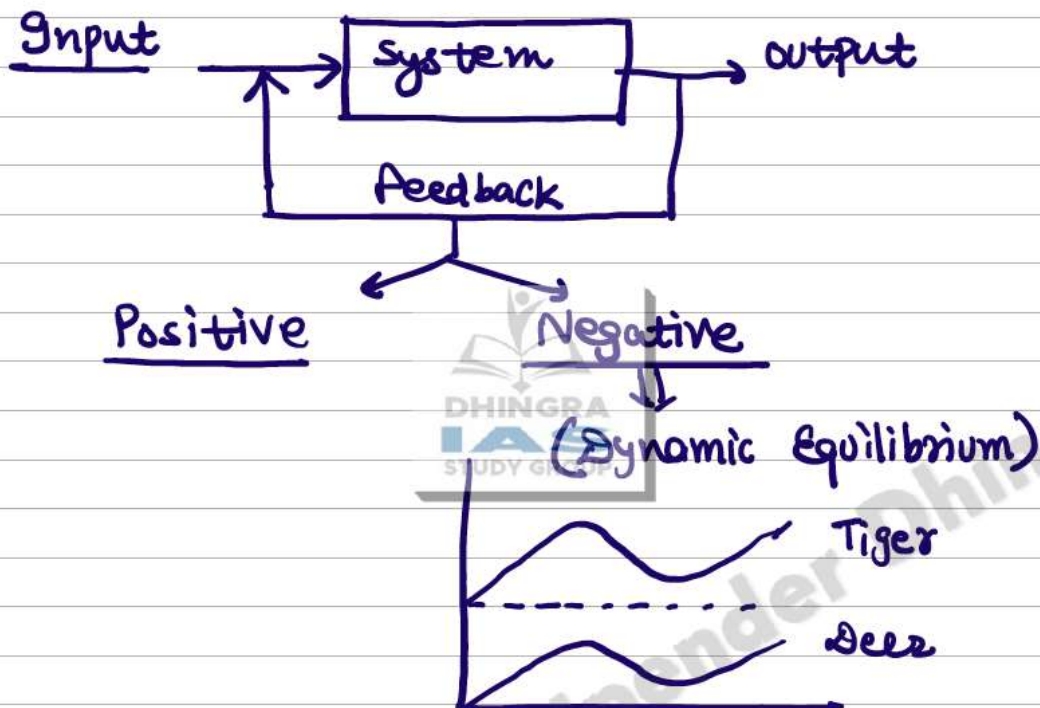
Rock → Weathering → Erosion  
Ocean ← decomposition  
Runoff



$$\text{Earth overshoot Day} = \frac{\text{Ecological footprint}}{\text{Earth's Biocapacity}} \times 365$$

## Ecological Homeostasis :- James. E. Lovelock

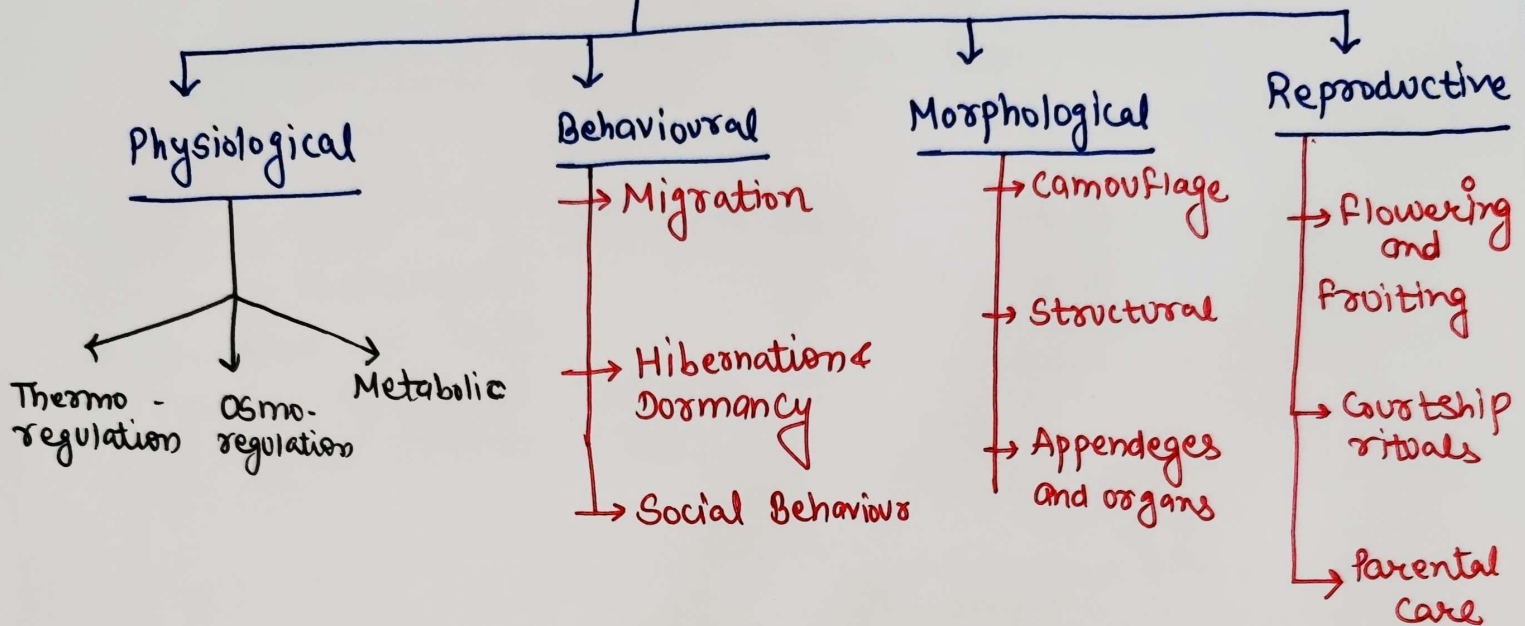
Living organisms interact with inorganic surroundings on earth to form a synergistic & self regulating complex system that helps to maintain & perpetuate the conditions for life.





# Environment and Ecology : Dipender Dhingra

## Adaptation in Species



Thermoregulation: Species have evolved mechanisms to regulate Body Temp. (Sweating in Mammals & Basking in reptiles)

eg:- Polar Bears → dense fur to insulate them from cold conditions

### Metabolic Adaptations

→ To survive in extreme environments with limited resources by adjusting their Metabolic rates. (Hibernation and Aestivation)

### Physiological Adaptations

#### Osmoregulation

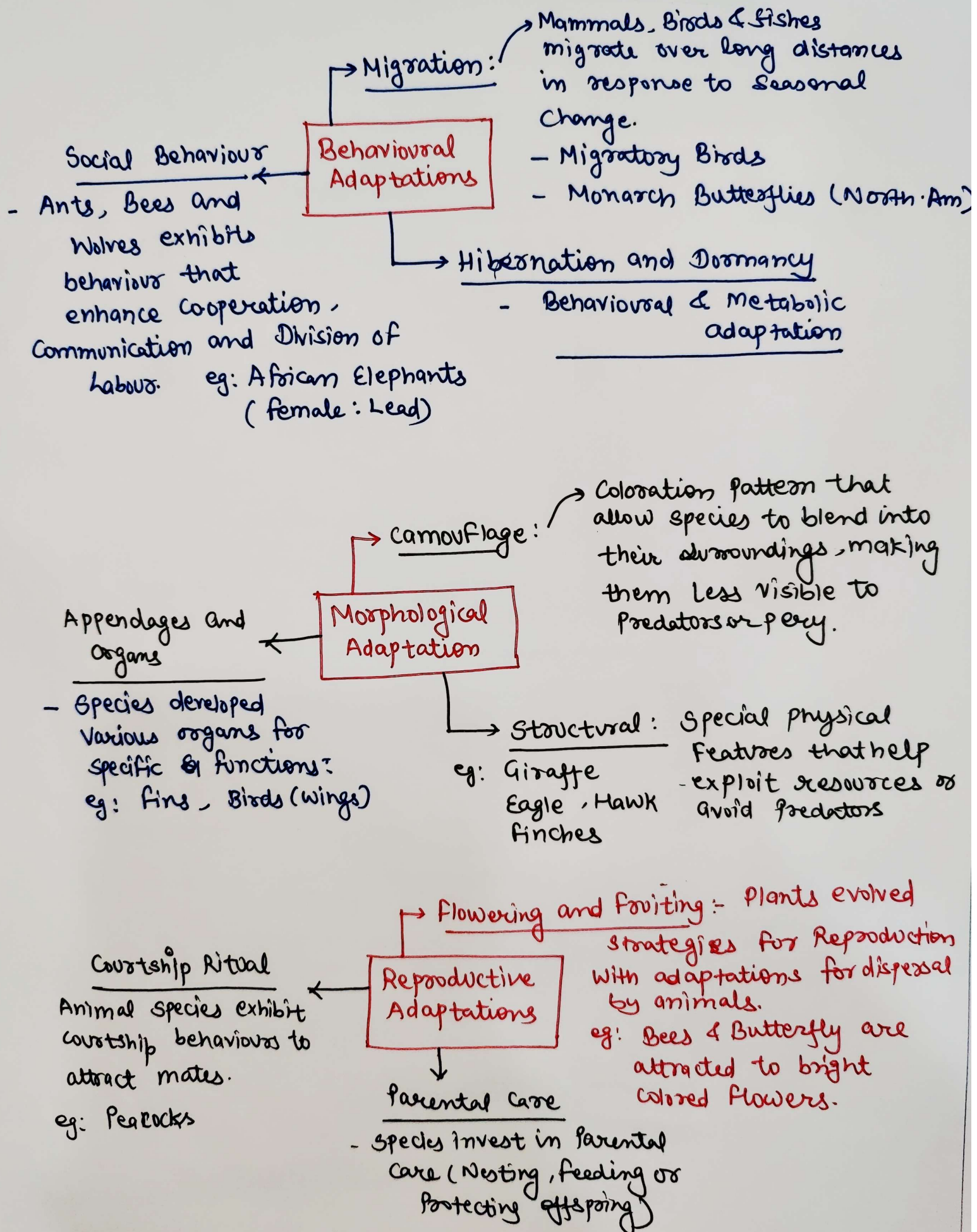
- To Maintain Water and Salt Balance.

eg: Sharks : Salt Secreting cells

Mangroves ; Salt excretion Mechanisms / glands.

<u>Hibernation</u>	<u>Aestivation</u>
<p>(Prolonged dormancy)</p> <p>eg: Bears, Bats</p> <p>Warm &amp; Cold Blooded Animals</p> <p>Birds.</p> <p>- State of inactivity during winter months</p> <p>- Significant decrease in Metabolic rate and conserve energy</p>	<p>eg: Insects, Frogs and Snails.</p> <p>'Cold blooded Animals'</p> <p>- State of dormancy in response to hot and dry conditions.</p> <p>- Reducing Metabolic activity.</p> <p>- Seek cool &amp; Moist areas.</p>

# Environment & Ecology: Dipender Dhingra

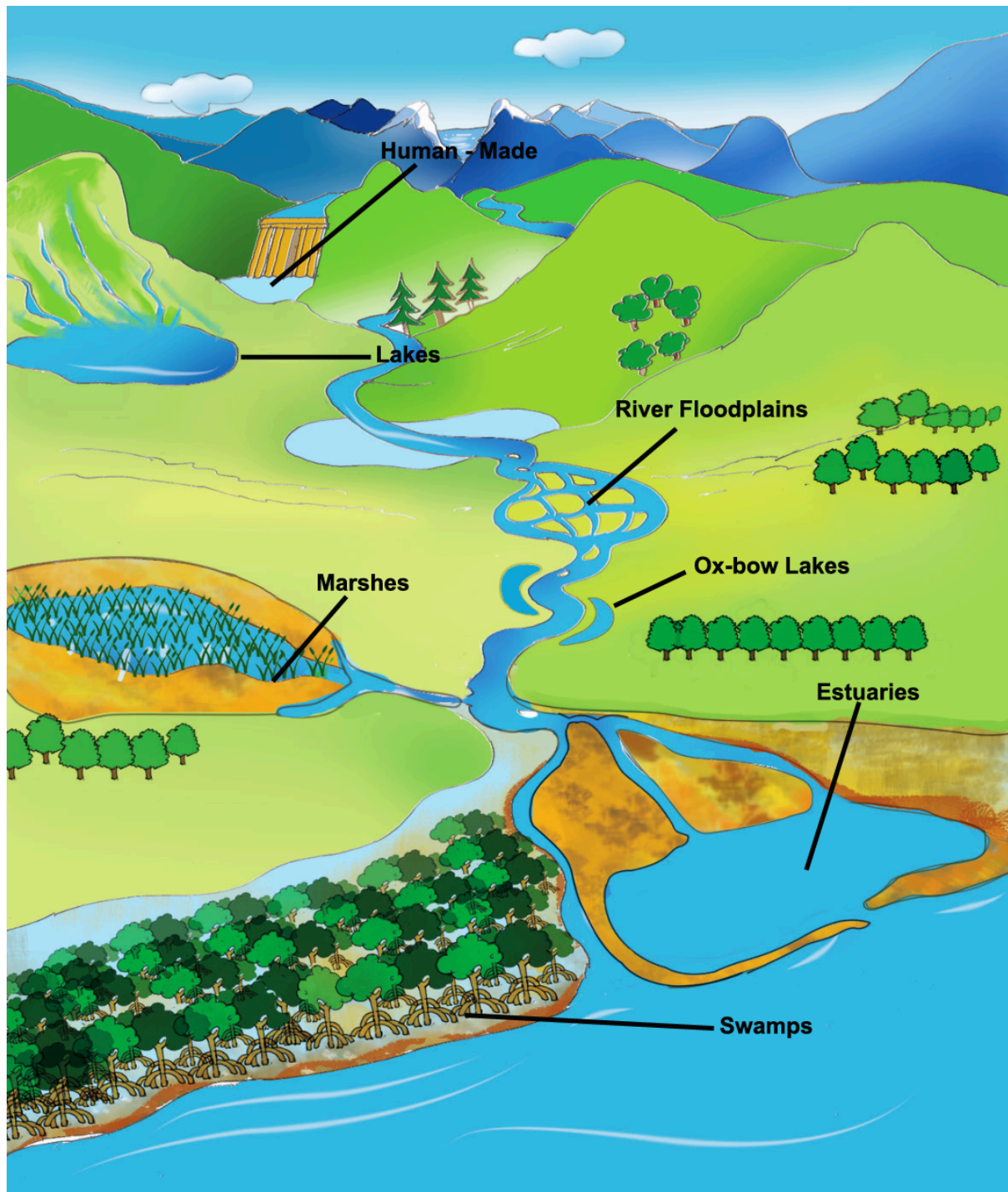




## **WETLANDS**

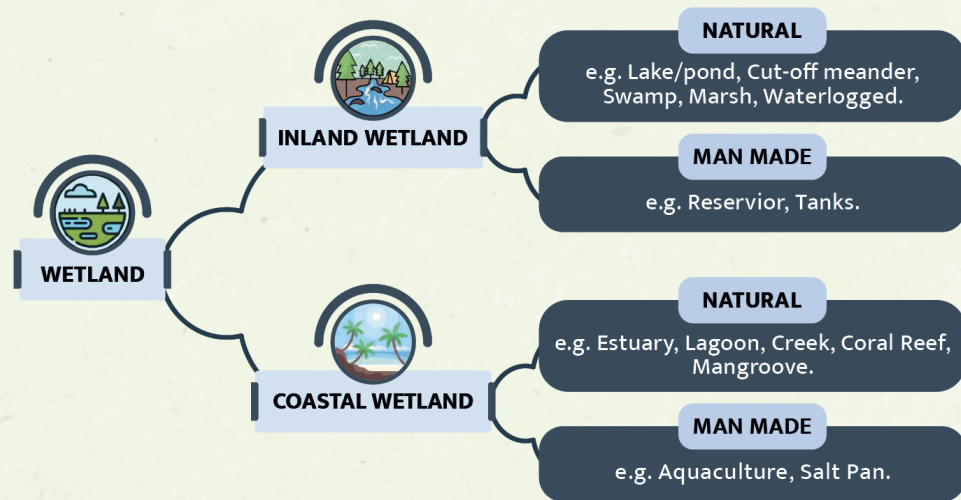
Wetlands are transition zones (eco tone) between terrestrial and aquatic ecosystems Static or flowing, fresh, brackish or saline Includes areas of marine water the depth of which at low tide does not exceed 6 m

e.g. Mangroves, lake littorals , floodplains and other marshy or swampy areas. Occupy 18.4% of the country's area (excluding rivers) of which 70% are under paddy cultivation.





## CLASSIFICATION OF WETLANDS



## TYPES OF WETLANDS



### MARINE

Coastal wetlands including coastal lagoons, rocky shores, and coral reefs.



### ESTUARINE

Including deltas, tidal marshes, and mangrove swamps.



### LACUSTRINE

Wetlands associated with lakes.



### RIVERINE

Wetlands along rivers and streams.



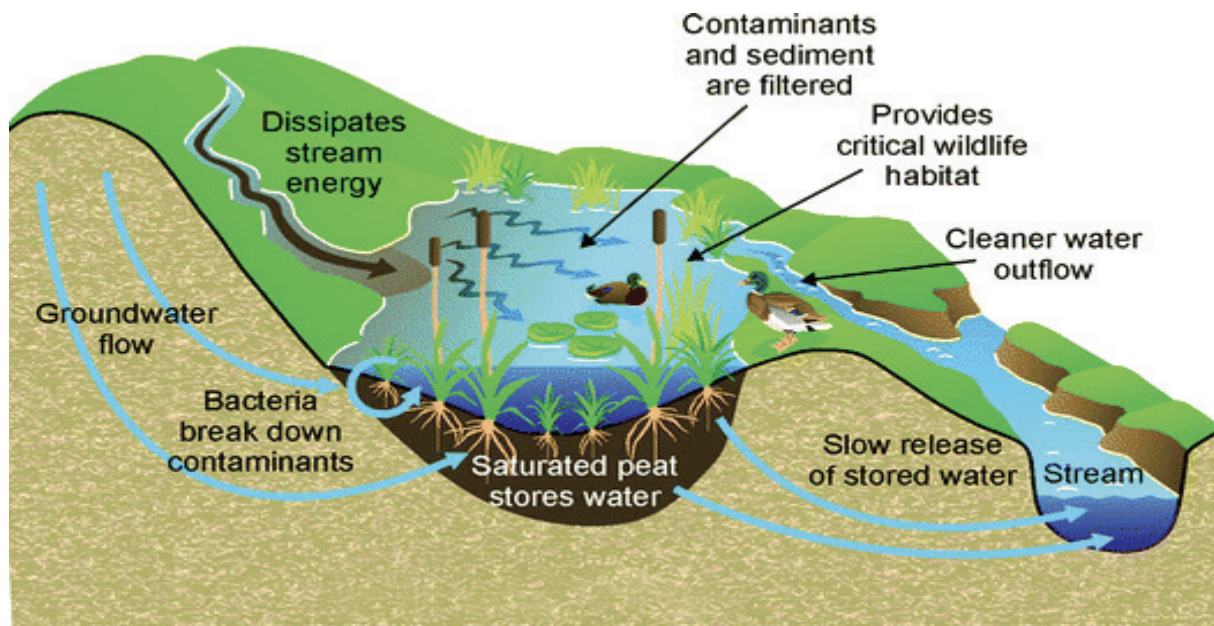
### PALUSTRINE

Meaning “marshy” - marshes, swamps and bogs.



### HUMAN-MADE WETLANDS

such as fish and shrimp ponds, farm ponds, irrigated agricultural land, salt pans, reservoirs, gravel pits, sewage farms and canals. Also termed as urban wetland



## PEATLANDS

Peatland are a heterogeneous mixture of plant material that had accumulated in a water-saturated area and are only partially decomposed due to the absence of oxygen.

Types of peat are – swamp forests, fens, bogs or mires.

Formed in areas with permanent water saturation i.e. either terrestrialisation or palaudification.

They are mostly found in permafrost regions towards the poles and at high altitudes, in

coastal areas, beneath tropical rainforest and in boreal forests.

Countries with the largest peatland areas are – Russia, Canada, Indonesia, USA, Finland etc.

Brazzaville Declaration was signed to promote better management and conservation of Cuvette Centrale Region in Congo Basin.

GPI (Global Peatlands Initiatives) is an initiative by leading experts and institutions to save

peatlands as the world's largest terrestrial organic carbon stock and to prevent it from being emitted.

## DIFFERENCE BETWEEN LAKE AND WETLAND

CHARACTERISTIC	LAKE	WETLAND (SHALLOW LAKE)
• <b>Origin</b>	• Largest is due to tectonic forces: Fluvial, Geomorphic, in the water table, etc.	• Mostly Fluvial, Residual lakes
• <b>Water turnover</b>	• Permanent	• Permanent or Temporary
• <b>Water level changes</b>	• Relatively Small	• Relatively Large
• <b>Thermal stratification</b>	• Yes	• No
• <b>Vertical mixing</b>	• Thermally regulated	• Wind regulated
• <b>Dominant Producer</b>	• Phytoplankton	• Macrophytes
• <b>Food chain</b>	• Grazing Pathway	• Detritus pathway
• <b>Productivity</b>	• Low	• High
• <b>Trophic status</b>	• Oligotrophic	• Mostly Eutrophic
• <b>Functions-Flood control</b>	• Less Significant	• Significant
• <b>Waster treatment</b>	• No	• Yes

## IMPORTANCE OF WETLANDS



### FOR CLIMATE AND BIODIVERSITY

- 30% of land-based carbon is stores in peatlands.
- Role in flood mitigation by controlling the rate of runoff.
- Act as a riparian buffer against erosion and pollutants.
- Habitat to aquatic flora and fauna, numerous species of native and migratory birds.



### FOR CLEAN WATER

- Swaps and rewards remove pollutants.
- Water purification, filtration of sediments and nutrients from surface water.
- Nutrients recycling, groundwater recharging and stabilisation of local climate.



### FOR JOBS

- One billion people depend on wetlands for their livelihoods.



### FOR ECONOMIES

- Important resource for sustainable tourism.
- Genetic reservoir for various species of plants (especially rice).

## Reasons For Depletion

Excessive pollutants dumped into wetlands beyond the recycling capacity.

Habitat destruction and deforestation.

Conversion of wetlands for agriculture and encroachments.

Overfishing and fish farming (Aquaculture).

Overgrazing in marshy soils.



## Conservation and Management of Wetlands

### **NATIONAL PLAN FOR CONSERVATION OF AQUATIC ECOSYSTEMS (NPCA):**

- For both wetlands and lakes, centrally sponsored scheme, under MoEFCC.
- Wetlands Authority within a state is the nodal authority for all wetland-specific enforcement of the rules.

### **WETLANDS (CONSERVATION AND MANAGEMENT) RULES, 2017:**

- Central government has empowered the states and union territories to identify and manage their wetlands.
- Shall apply to Wetlands categorised as 'wetlands of international importance' under the Ramsar Convention.
- Wetlands as notified by the Central Government, State Government and Union Territory Administration.
- Constitute State Wetlands Authority in each State and union territories that will be headed by the State's environment minister and include a range of government officials. They will determine, the 'wide use principle,' that shall govern the management of wetlands.
- Setting Up National Wetlands Committee. It will replace Central Wetlands Regulatory Authority (CWRA), to monitor implementation of these rules and advise the Central Government on appropriate policies and action programmes for conservation and wise use of wetlands.

- **Amrit Dharohar Scheme:** Launched during the Union Budget 2023-24, aims to enhance wetland utilization over three years, focusing on biodiversity, carbon stock, eco-tourism, and local community income.
- **Coastal Protection:** Governed by Coastal Regulation Zone Notification (2018) and Island Protection Zone Notification 2011, ensures preservation of coastal ecosystems for biodiversity and climate change mitigation.
- **MoEFCC's Wetlands Rejuvenation Programme:** Started in 2020 by MoEFCC, employs various strategies including baseline information development, health cards, stakeholder platforms, and management planning for over 500 wetlands.
- **Integration with Namami Gange:** Announced on World Wetlands Day 2021, to integrate wetland conservation with Namami Gange program, focusing on river rejuvenation and developing health cards and management plans for wetlands in Ganga districts.



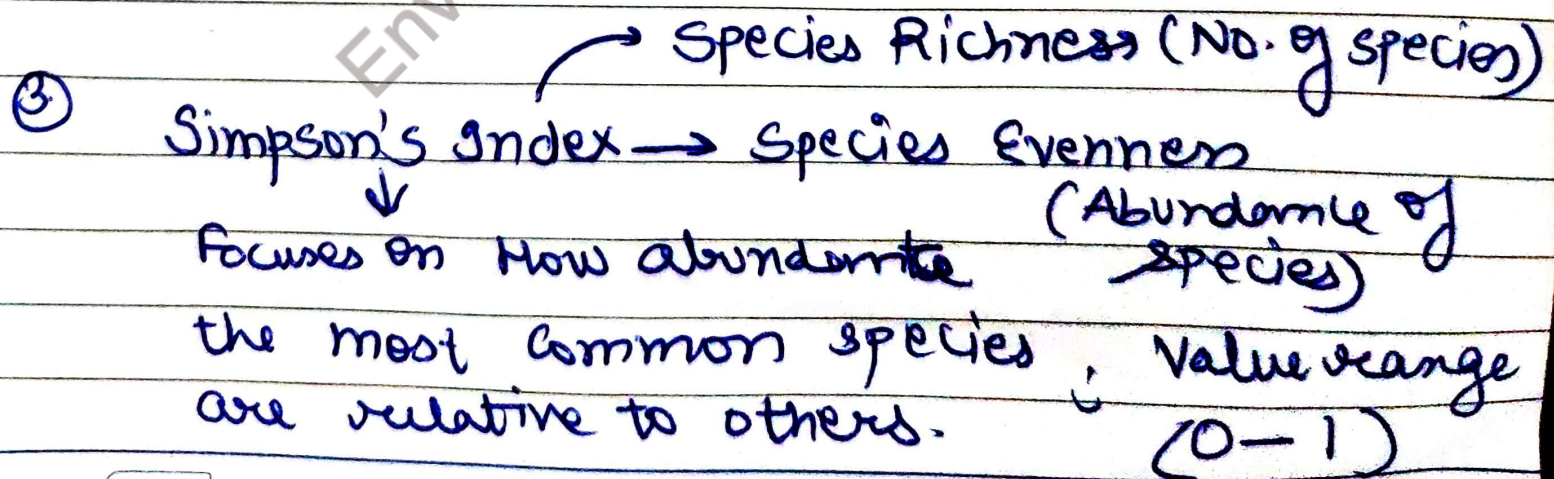
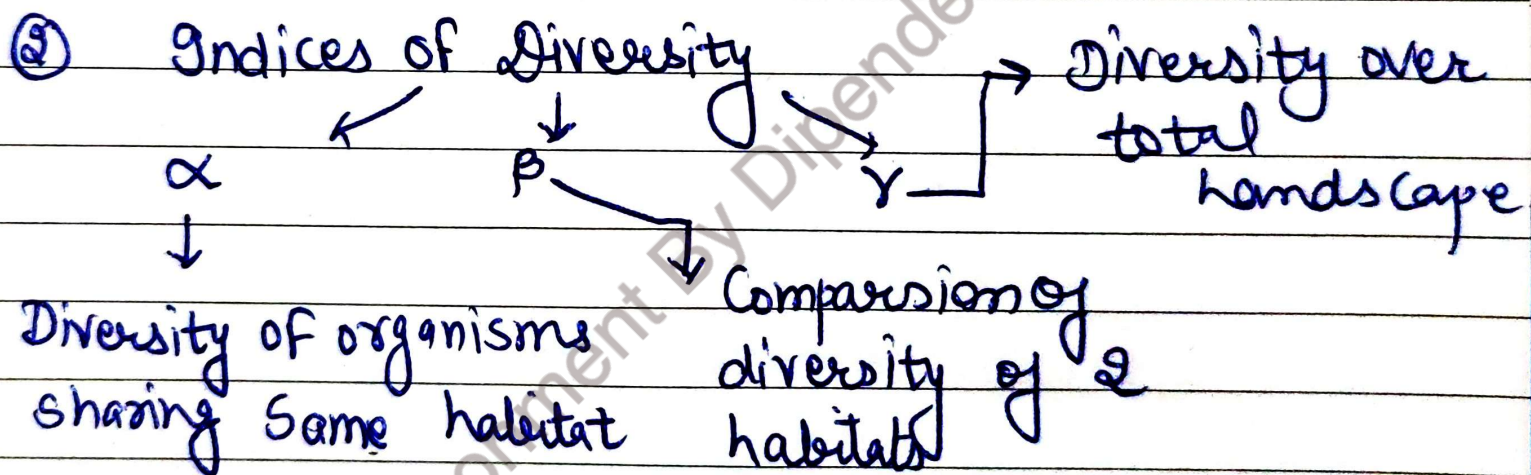
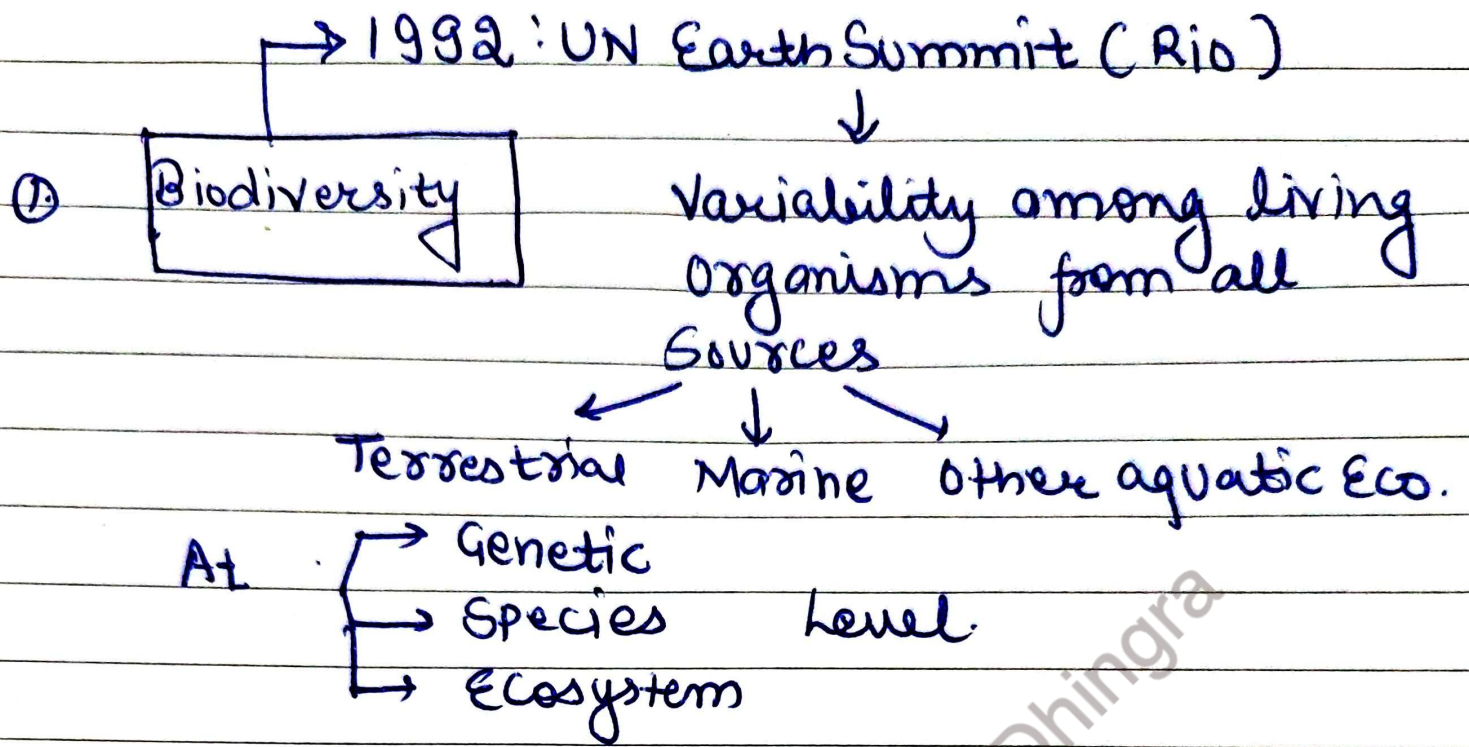


(Peatlands)



(Bogs)







Shannon-Wiener Index

Focuses more on Richness & Evenness with emphasis on rare & common species.

Values are positive and increase with diversity  
Provides Comprehensive assessment of Biodiversity

★★

India's State of Forest report incorporate this

variation of Biodiversity

Latitudinal :->

✓ Tropical regions: Warm Temp. and Significant rainfall

Rainforest: 6% land and (50-75% all species)

Variation with Altitude:

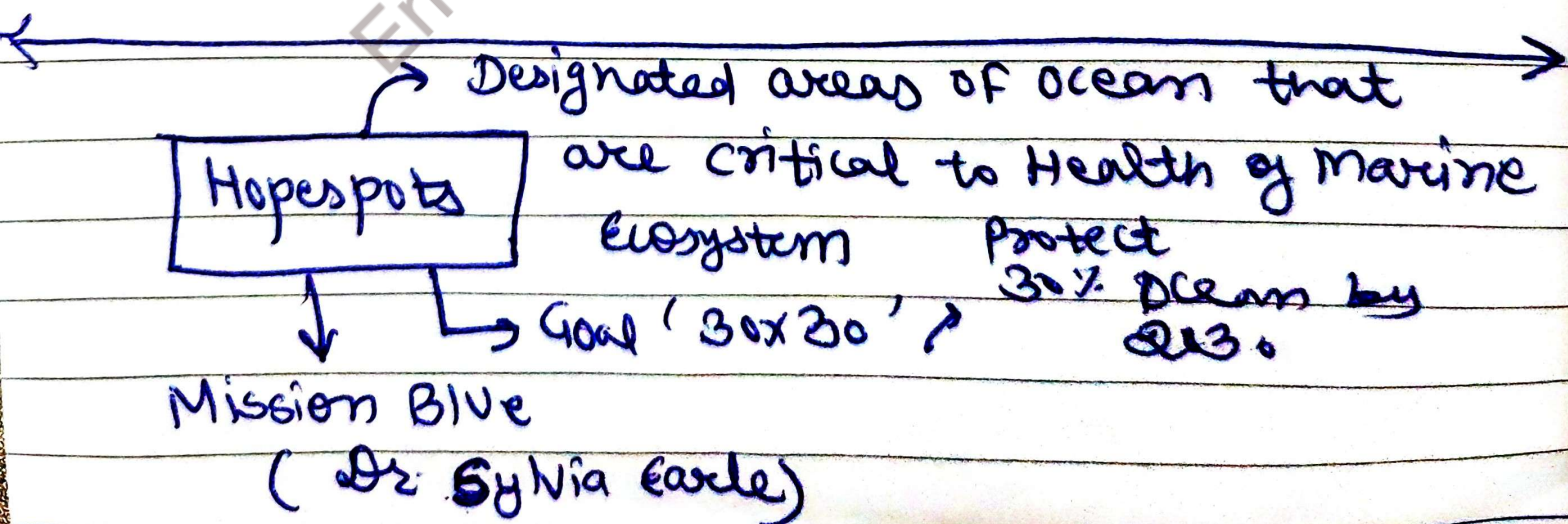
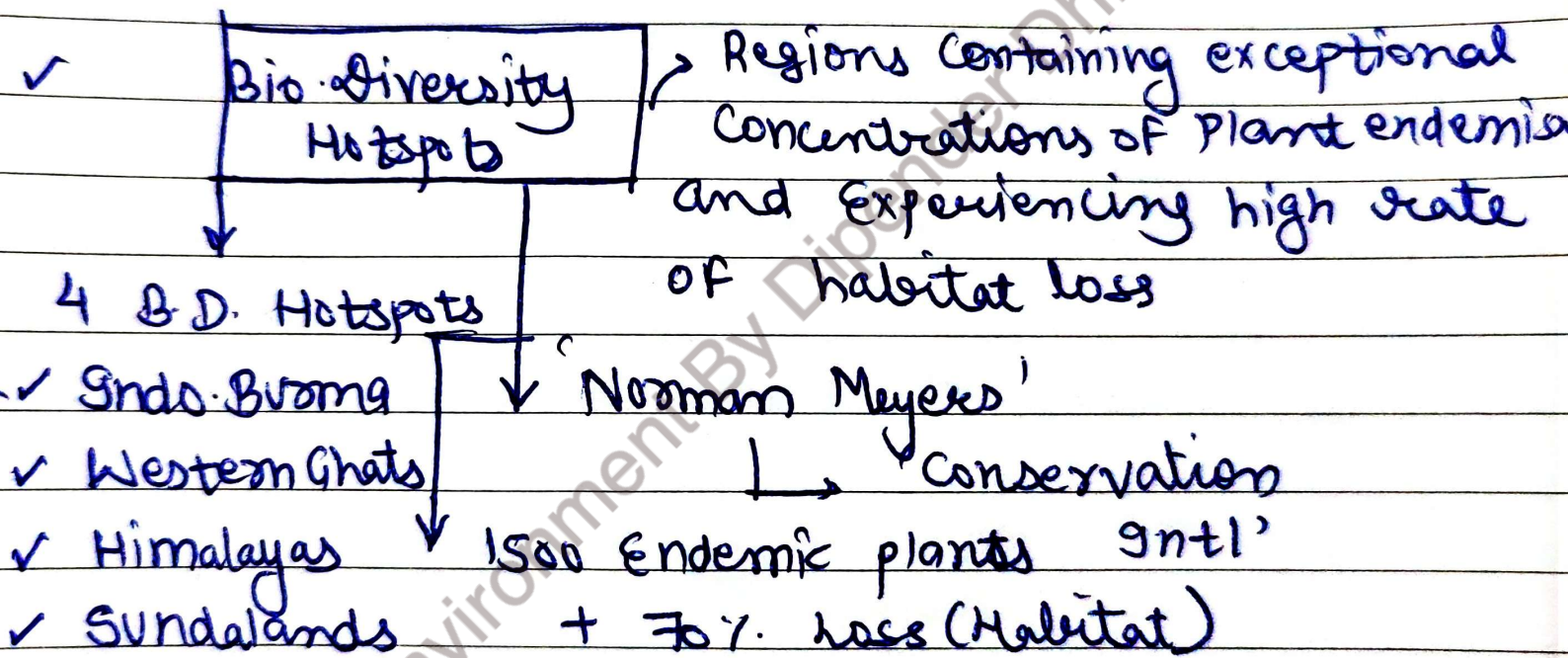
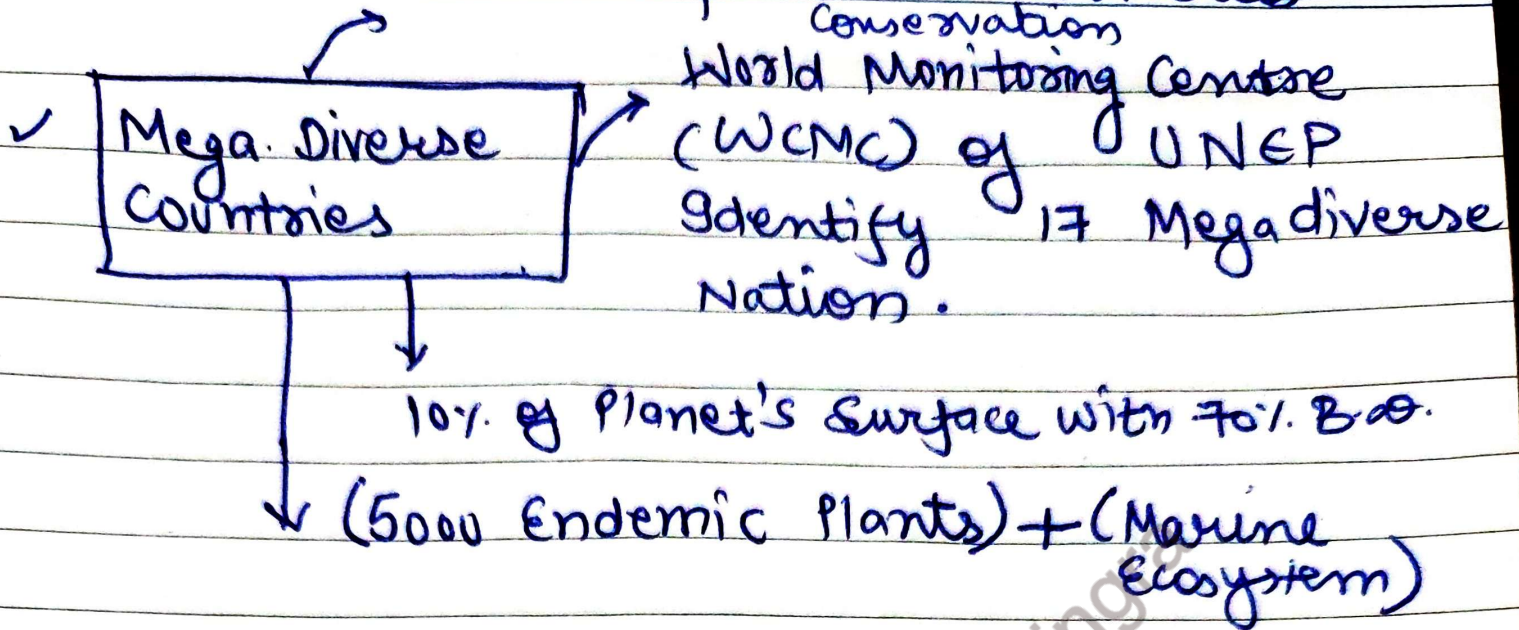
✓ In General, B.D. increases with altitude up to a certain threshold and then decreases

✓ Mountain at lower altitudes can support lesser Biodiversity, due to compression of a wide range of ecosystem into relatively short distance.

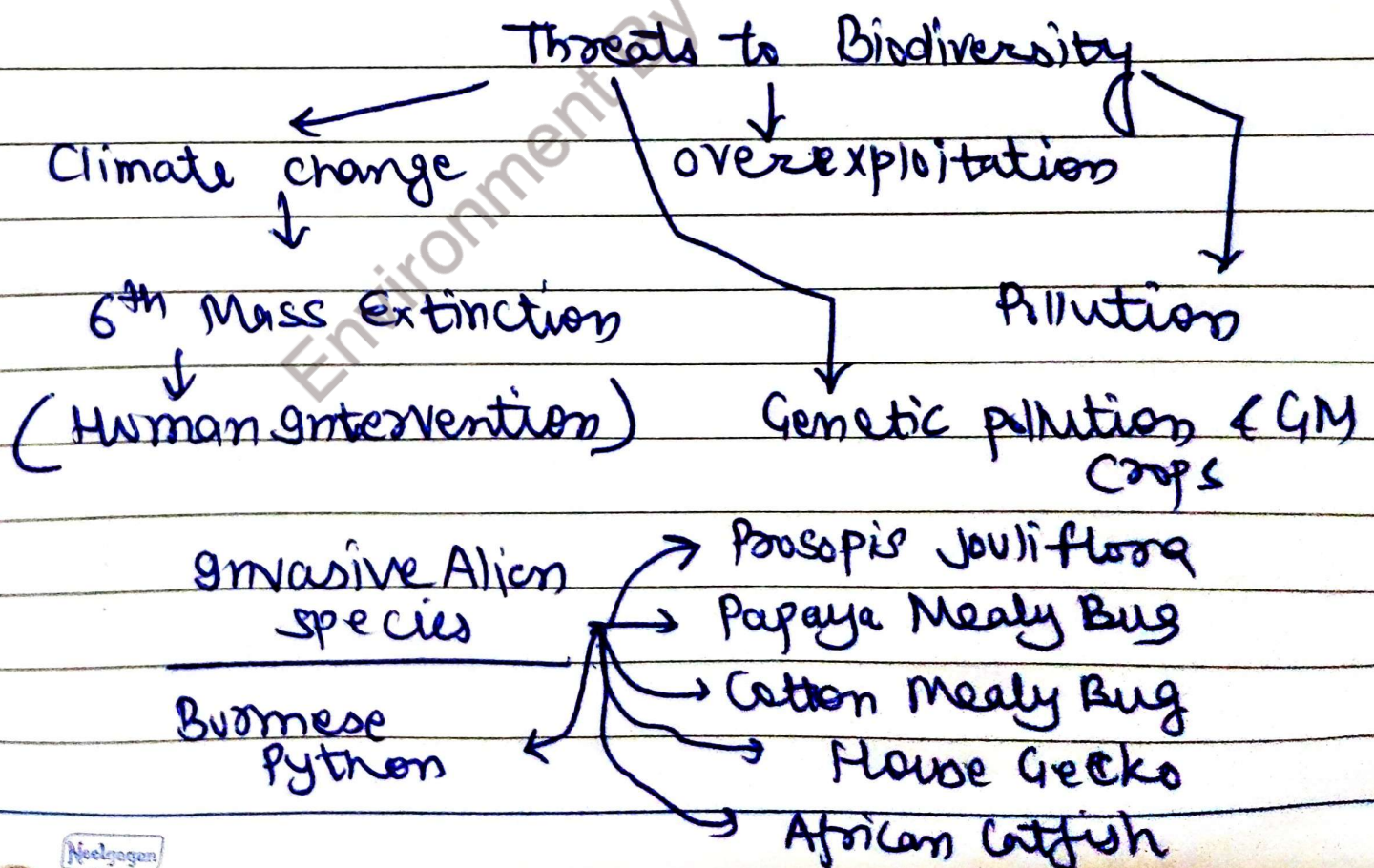
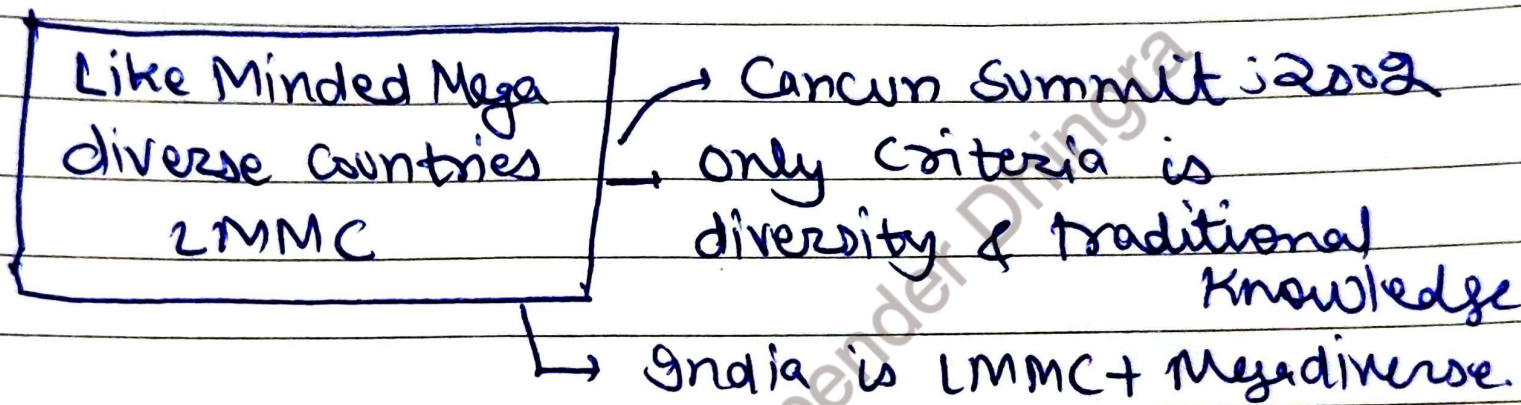


# World's top B.D. rich countries

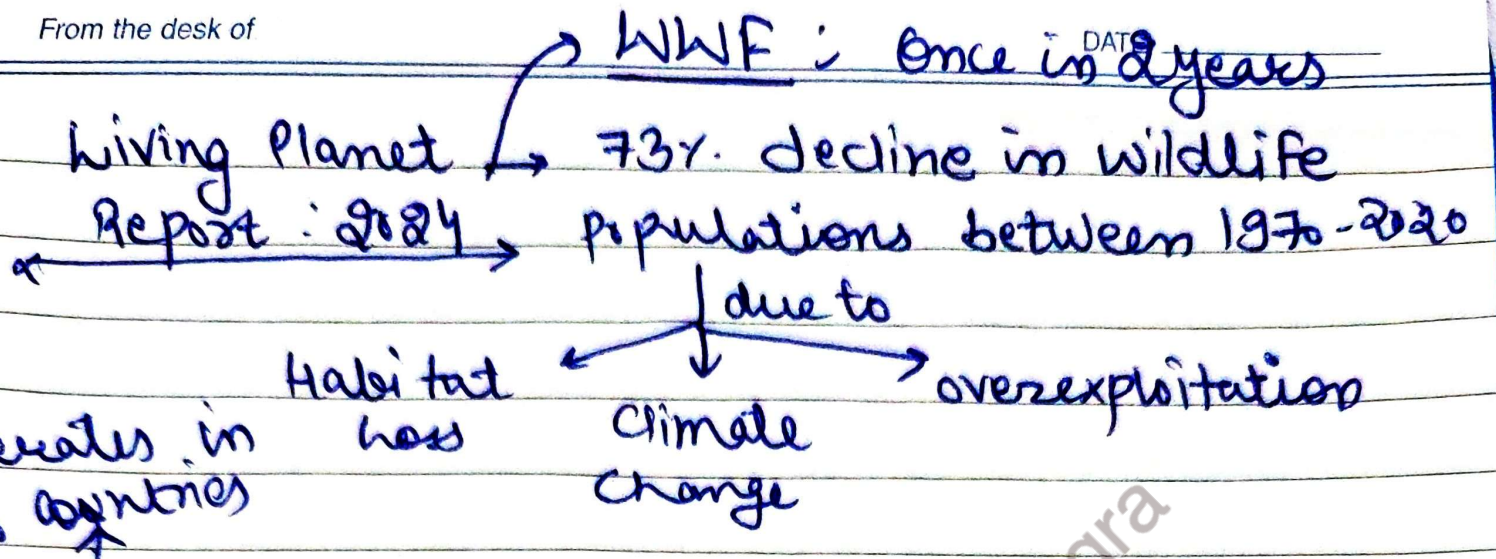
DATE











WWF : World Wide Fund for Nature

Funded in 1961, focuses on environmental changes

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graph TD; WWF[WWF : World Wide Fund for Nature] --> Funded[Funded in 1961, focuses on environmental changes];
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Flagship initiative

- a) Earth Hour
- b) Living Planet Report

