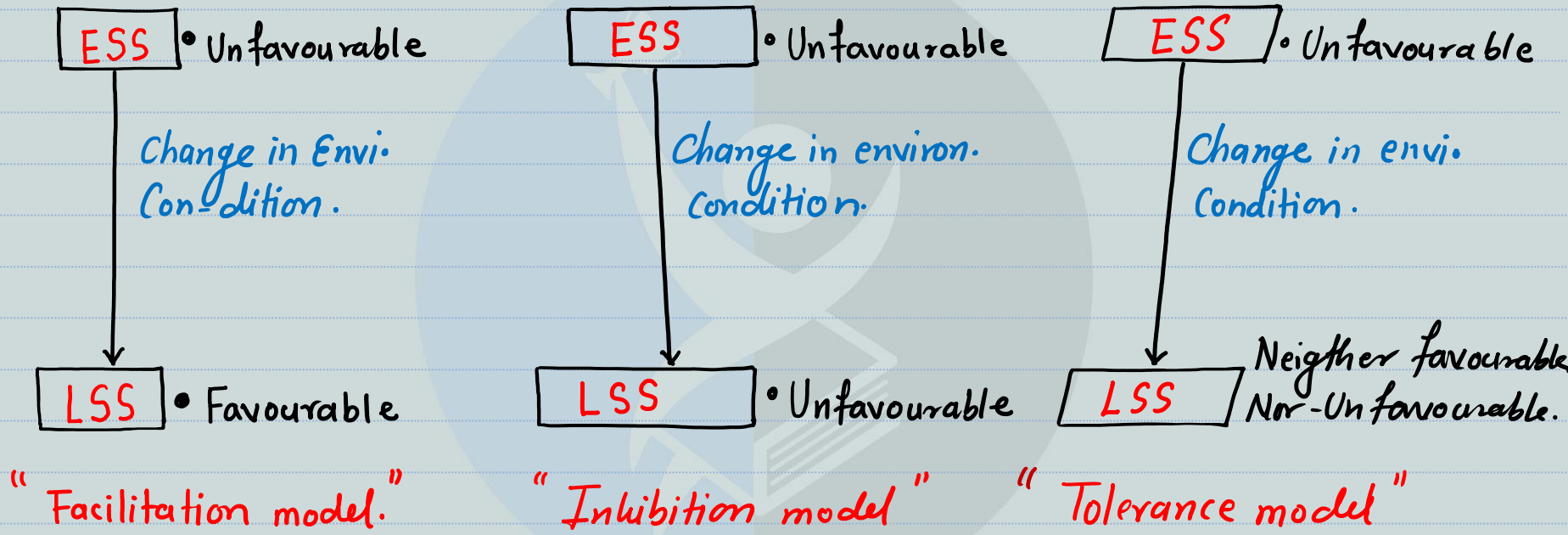
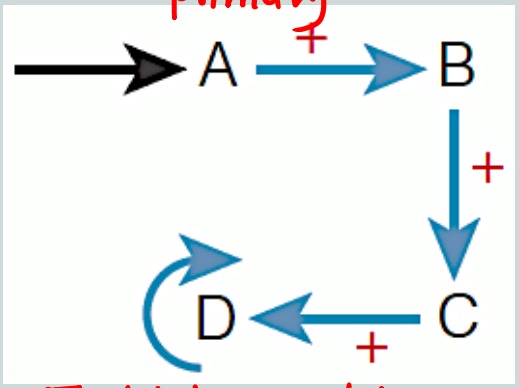
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Models of Ecological Succession :

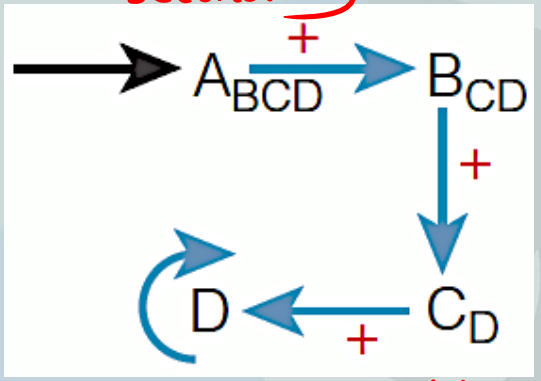


Primary



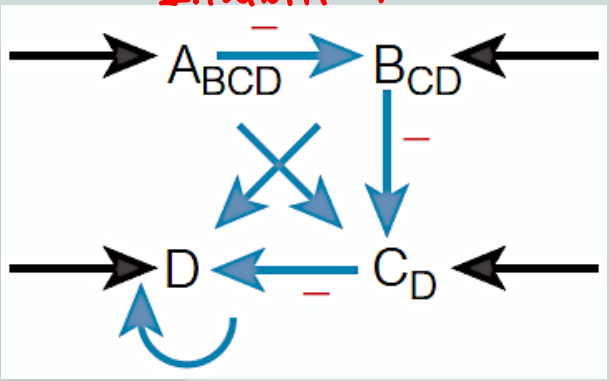
Facilitation model.

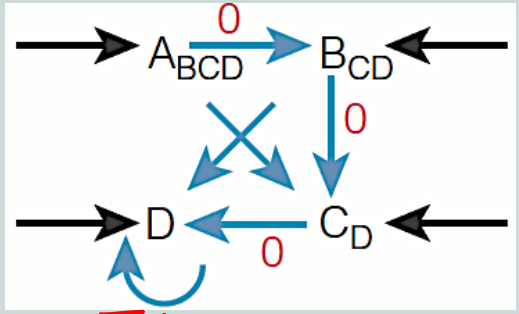
Secondary



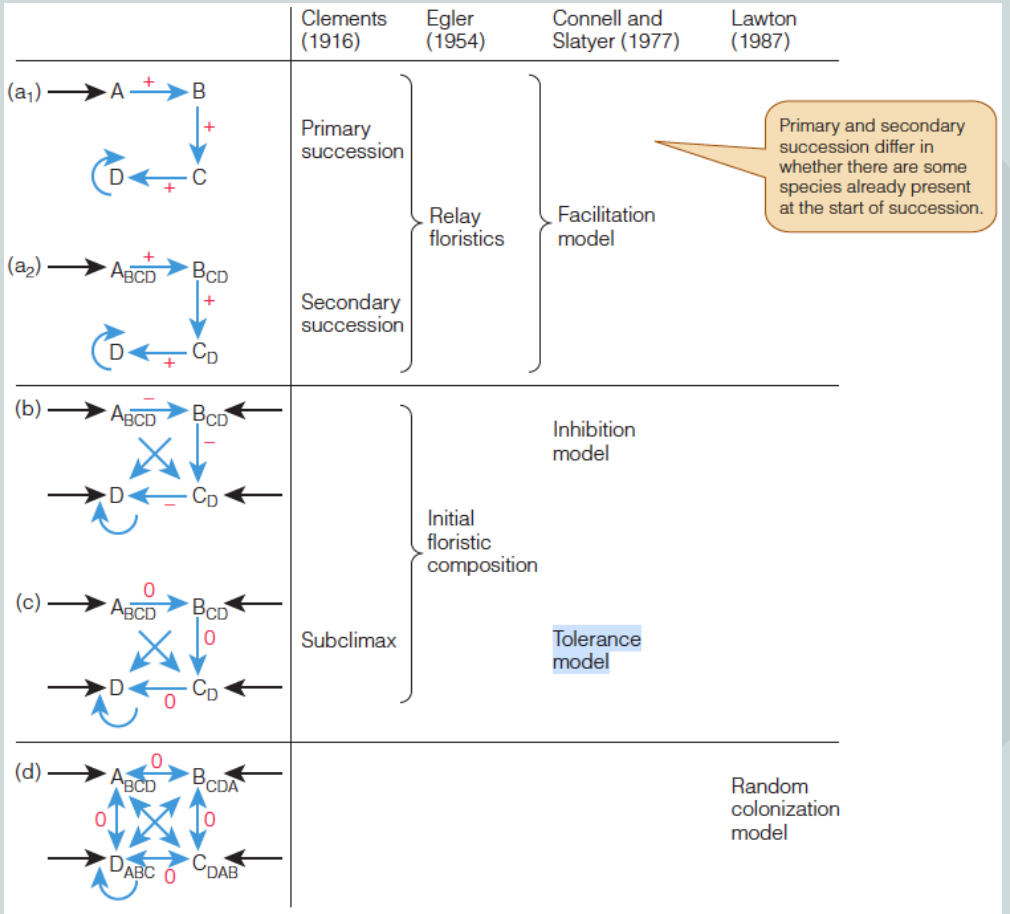
Facilitation model.

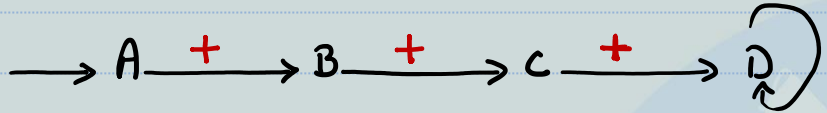
Inhibition.



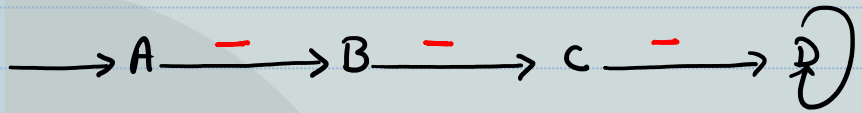


Tolerance.

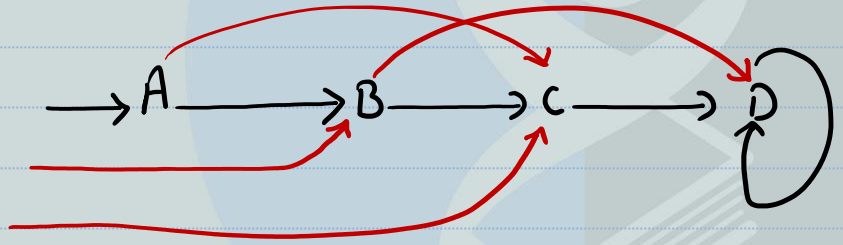

Clements (1916)
Egler (1954)
Connell and Slatyer (1977)
Lawton (1987)
(a1)
A
B
C
D
+
(a2)
ABCD
BCD
CD
Primary succession
Secondary succession
Relay floristics
Facilitation model
Primary and secondary succession differ in whether there are some species already present at the start of succession.
(b)
−
Inhibition model
Initial floristic composition
(c)
0
Subclimax
Tolerance model
(d)
BCDA
DABC
Random colonization model



Facilitation model.



Inhibition model.



"Tolerance model"

Which one of the following options lists mechanisms that drive ecological succession?

1. Only facilitation and tolerance
2. Disturbance and tolerance
3. Only tolerance and inhibition
4. Facilitation, tolerance and inhibition

Following are a set of statements about various models of succession:

A. In inhibition model, strong competitive interaction is present as no species is completely superior.

B. In tolerance model, later successional species are neither inhibited nor aided by species of previous

C. In inhibition model, competitive interaction is weak as no species is completely superior.

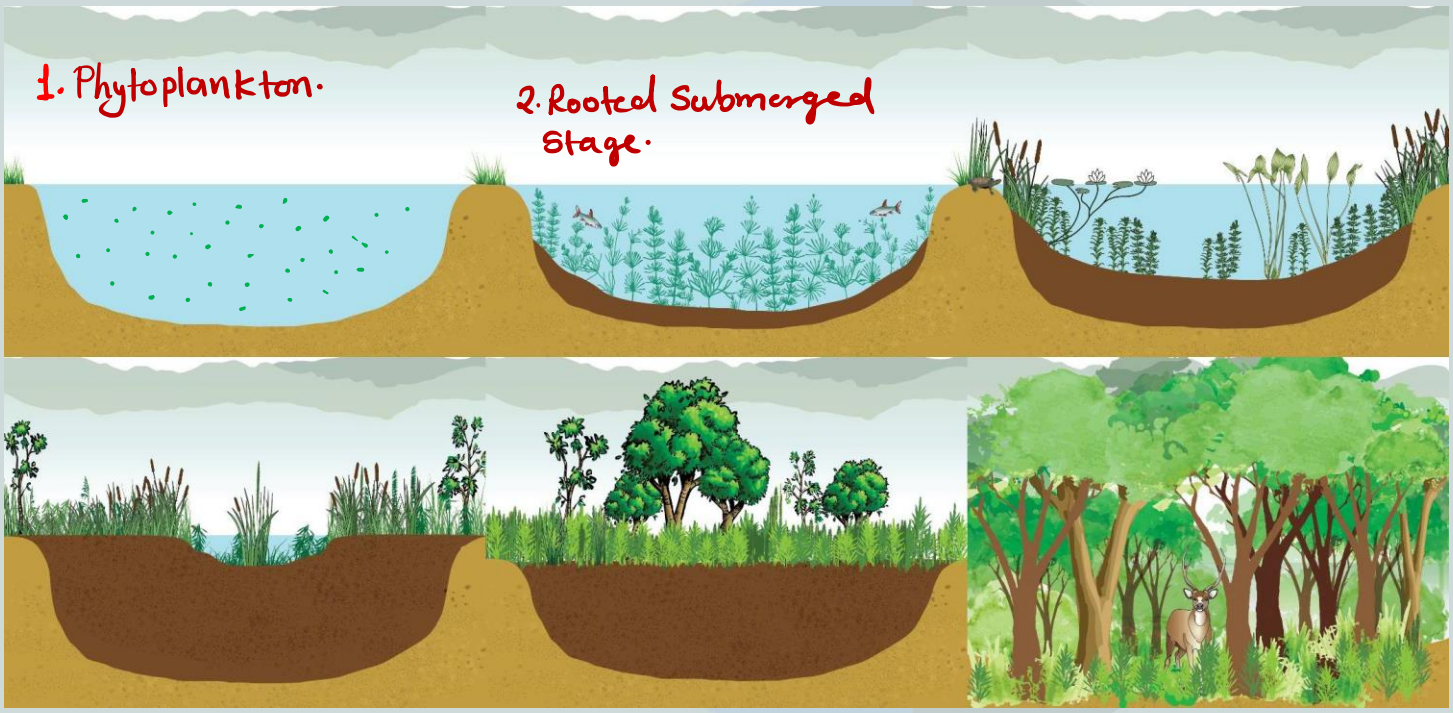
D. In facilitation model, later successional species are neither inhibited nor aided by species of previous

Which one of the following options represent correct statements?

1. A and D
2. B and C
3. A and B
4. C and D

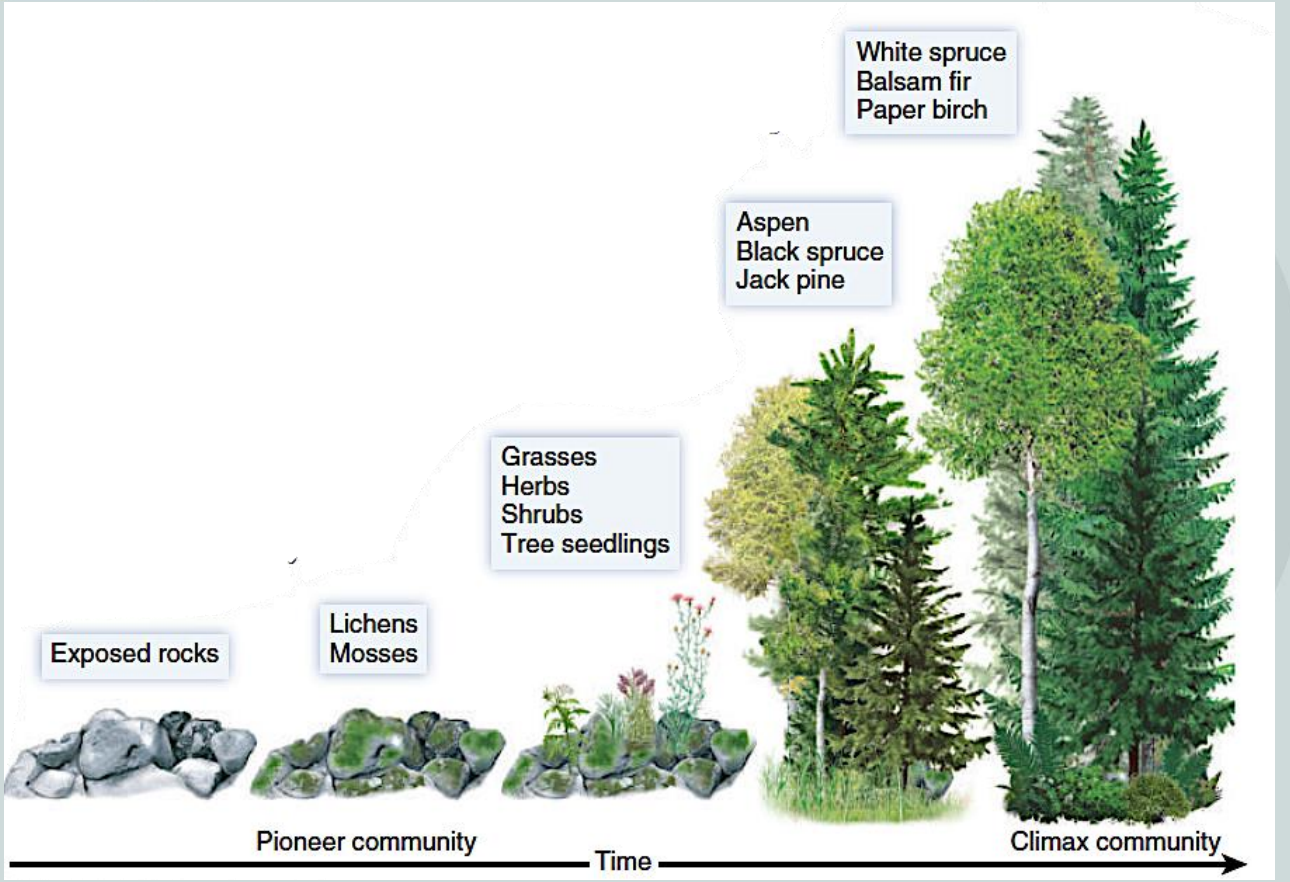
Hydrosere: Succession in newly formed water body.

1. Phytoplankton stage: "Pioneer stage"
2. Submerged stage:
3. Floating stage:
4. Reed swamp stage:
5. Sedge-meadow stage:
6. Woodland stage:
7. Climax stage:


1. Phytoplankton.
2. Rooted Submerged Stage.

Lithosere: Rock.

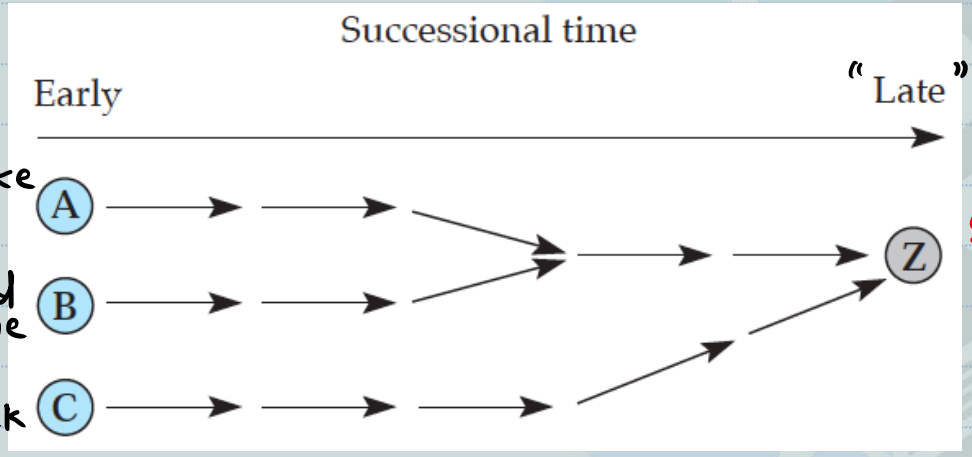
1. Crustose lichen.
2. Foliose lichen.
3. Mosses stage,
4. Herb's stage,
5. Shrub stage,
6. Forest stage,


White spruce
Balsam fir
Paper birch
Aspen
Black spruce
Jack pine
Grasses
Herbs
Shrubs
Tree seedlings
Lichens
Mosses
Exposed rocks
Pioneer community
Time
Climax community

Climax concept in succession

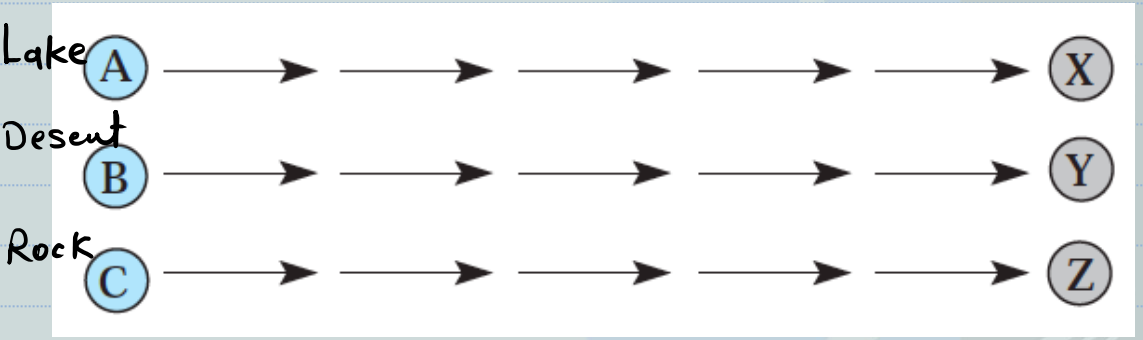
1. Mono-climax theory: F.E Clements

* Not much imp.



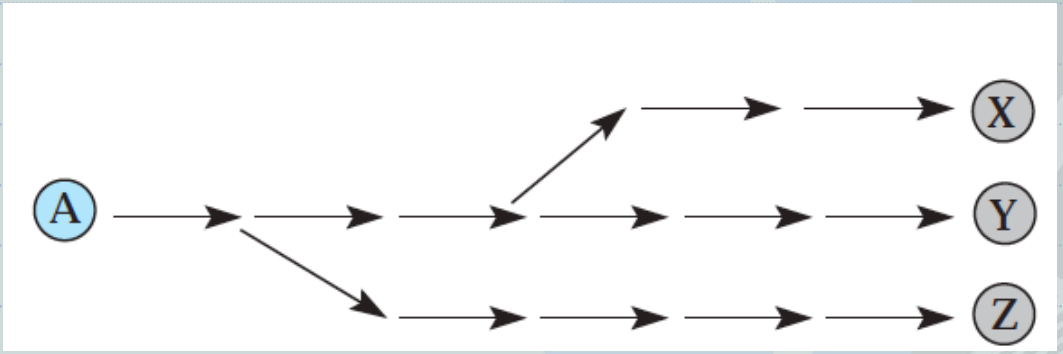
11. Poly-climax theory: Tansley

Environmental cond. are not same at everywhere.



III. Climax - Pattern theory: Whittaker

Environmental pattern = Climax pattern.



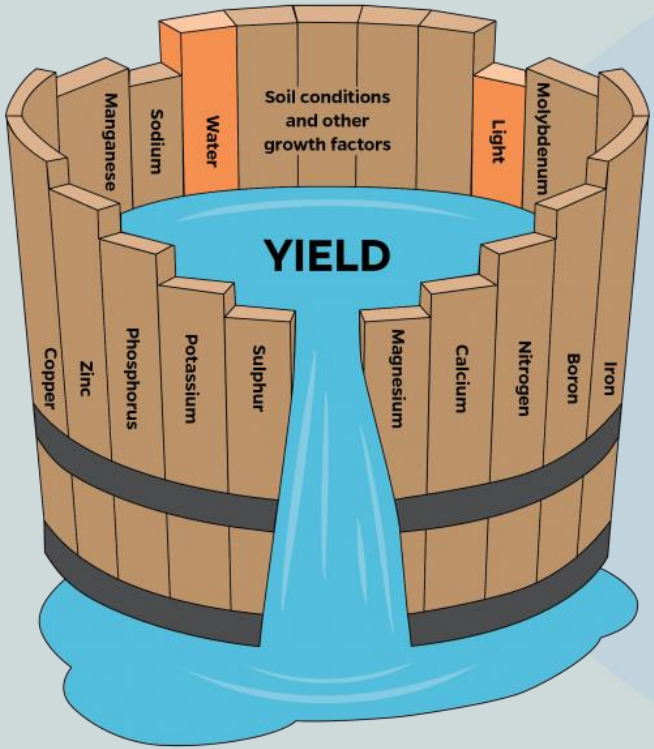
IV. Climax as vegetation: Egler

"Vegetation = climax."

Law of limiting factors

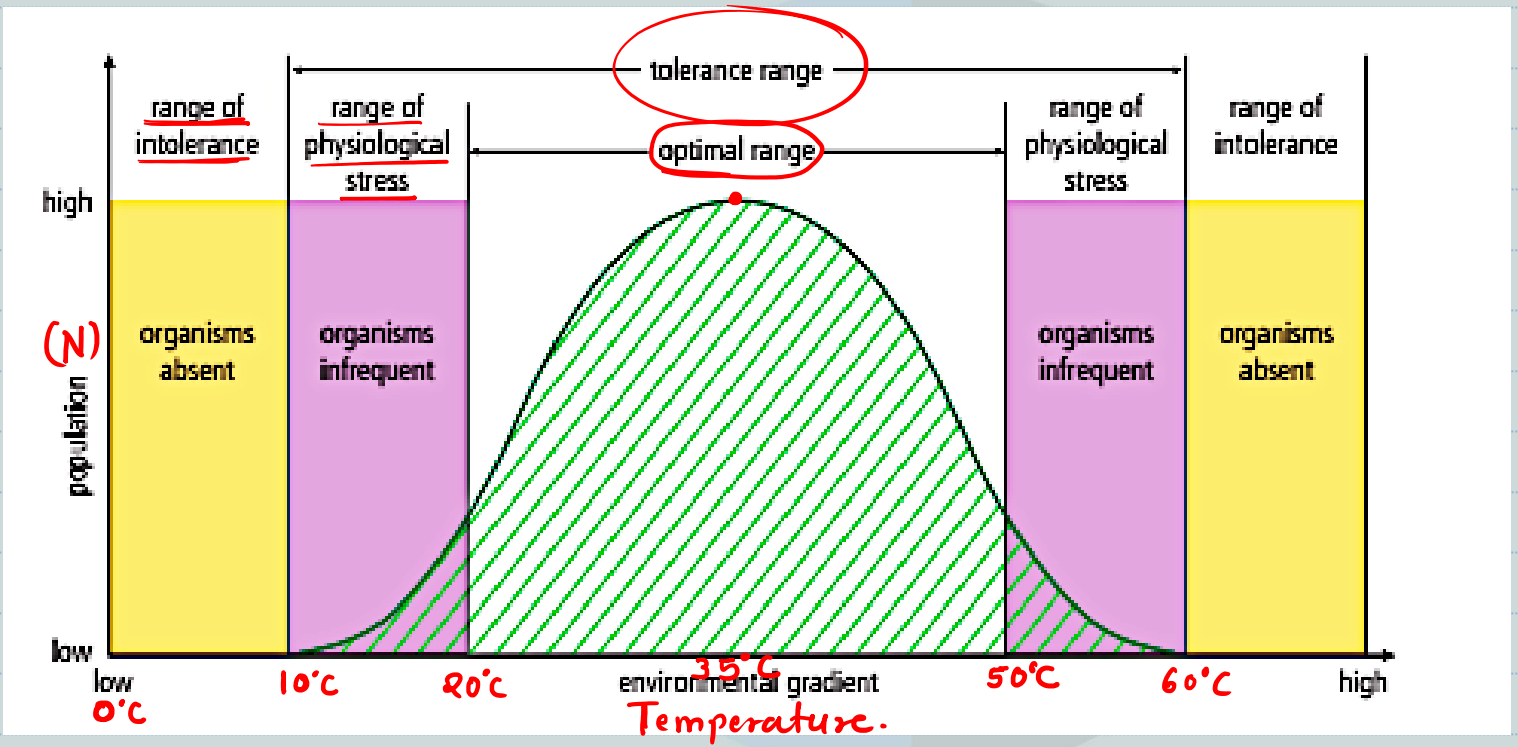
1. **Liebig's law of minimum**: Any nutrient which is present in least Amount should called - limiting factor.

e.g. Desert – H_2O
Poles – Light
Aquatic – "P"
Terrestrial – "N"
Marine ecosystem – "Nutrient"

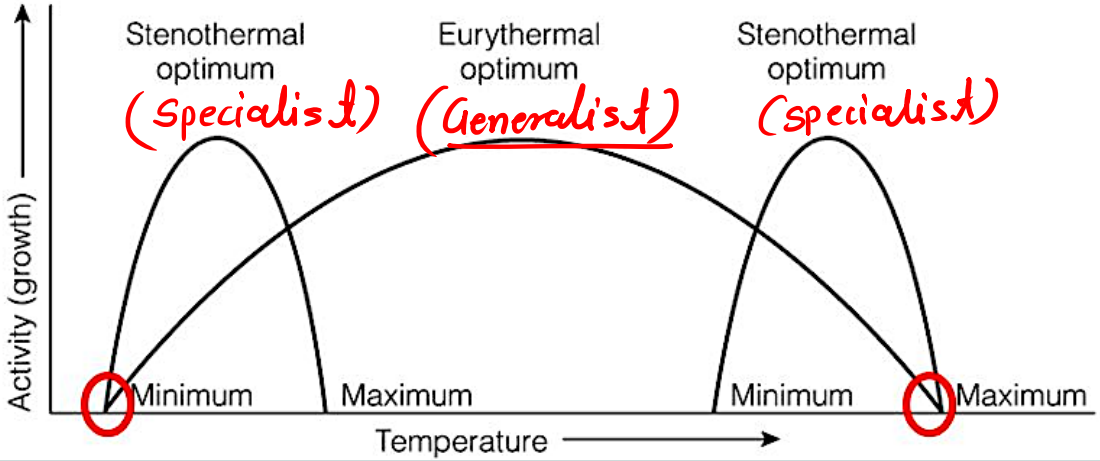

Manganese
Sodium
Water
Soil conditions and other growth factors
Light
Molybdenum
YIELD
Copper
Zinc
Phosphorus
Potassium
Sulphur
Magnesium
Calcium
Nitrogen
Boron
Iron

2. Shelford's law of tolerance: The geographical distribution of a species will be controlled by that environmental factor for which the organism has the narrowest range of tolerance.

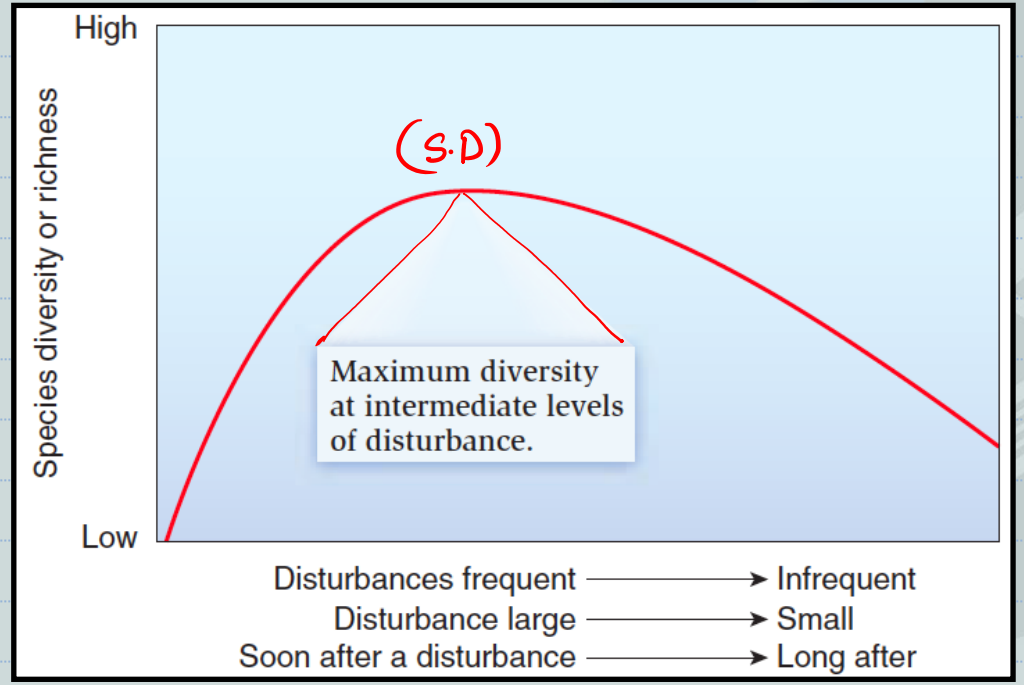
- Any factor is present in least : limiting factor
- Any factor is present in High concentration : limiting factor.


tolerance range
range of intolerance
range of physiological stress
optimal range
range of physiological stress
range of intolerance
high
(N)
population
low
organisms absent
organisms infrequent
organisms infrequent
organisms absent
low
0°C
10°C
20°C
environmental gradient
35°C
Temperature.
50°C
60°C
high

- ***Steno*** → narrow; ***Eury*** → wide
  - Stenothermal – eurythermal → temperature range
  - Stenohydric – euryhydric → water range
  - Stenohaline – euryhaline → salinity range
  - Stenophagic – euryphagic → food range
  - Stenoecious – euryecious → habitat range



Intermediate disturbance hypothesis: The concept that species diversity is greatest in those habitats experiencing a moderate amount of disturbance, allowing the coexistence of early and late successional species.



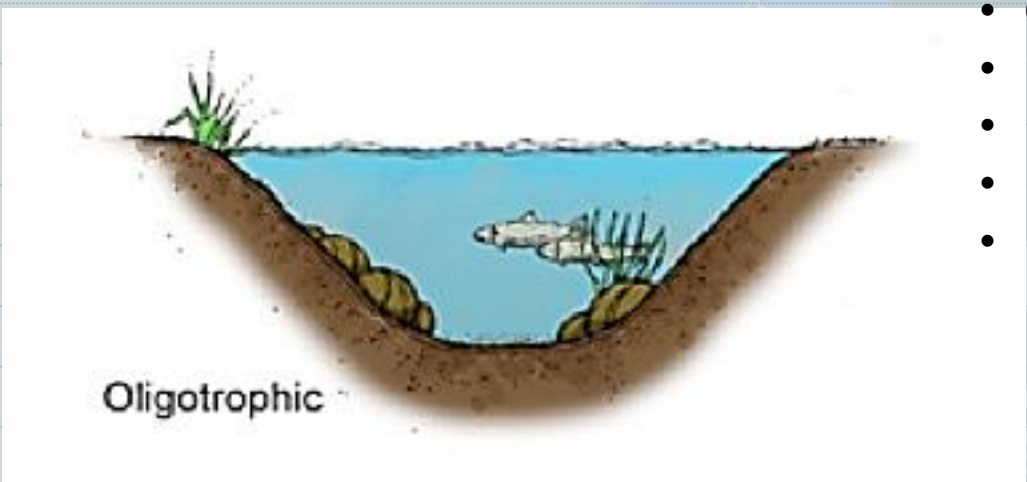
Eutrophication

Definition

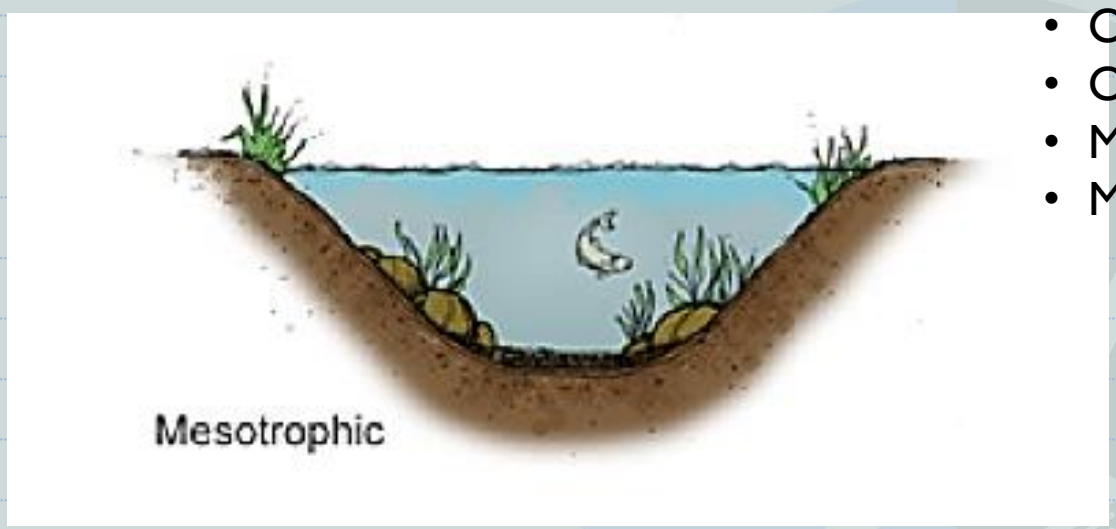
- ✓ If the nutrient level increase in the water bodies is called eutrophication.

✓ On the basis of nutrient content and primary production.

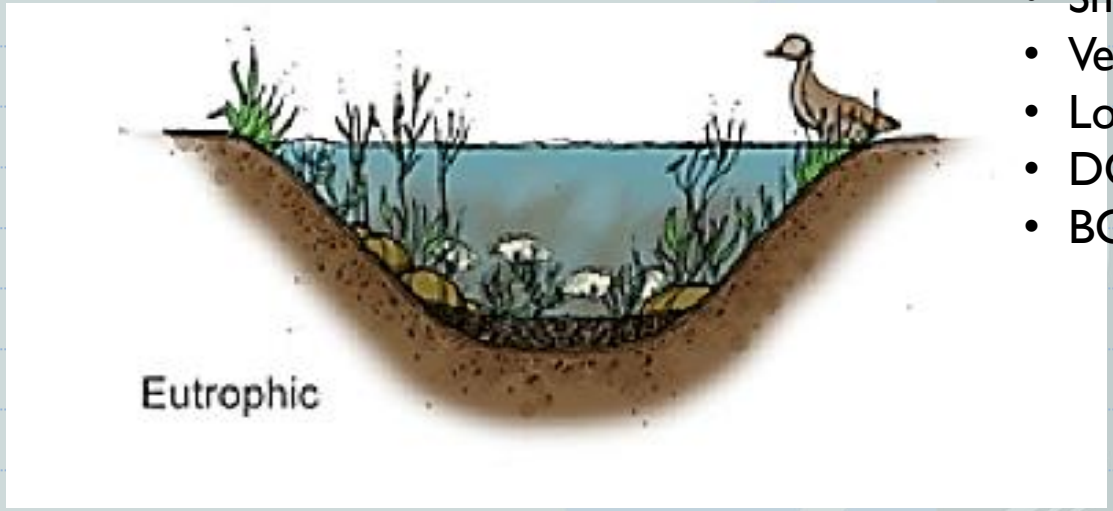
- Oligotrophic lake : Minimum
- Mesotrophic lake : Moderate
- Eutrophic lake : High.



- Low nutrient
- Deep and clear
- Oxygen rich
- Less primary production
- Less biodiversity
- DO high
- BOD low



- Moderate nutrient
- Organic matter
- Oxygen level low at bottom
- Moderate primary production
- Maximum biodiversity

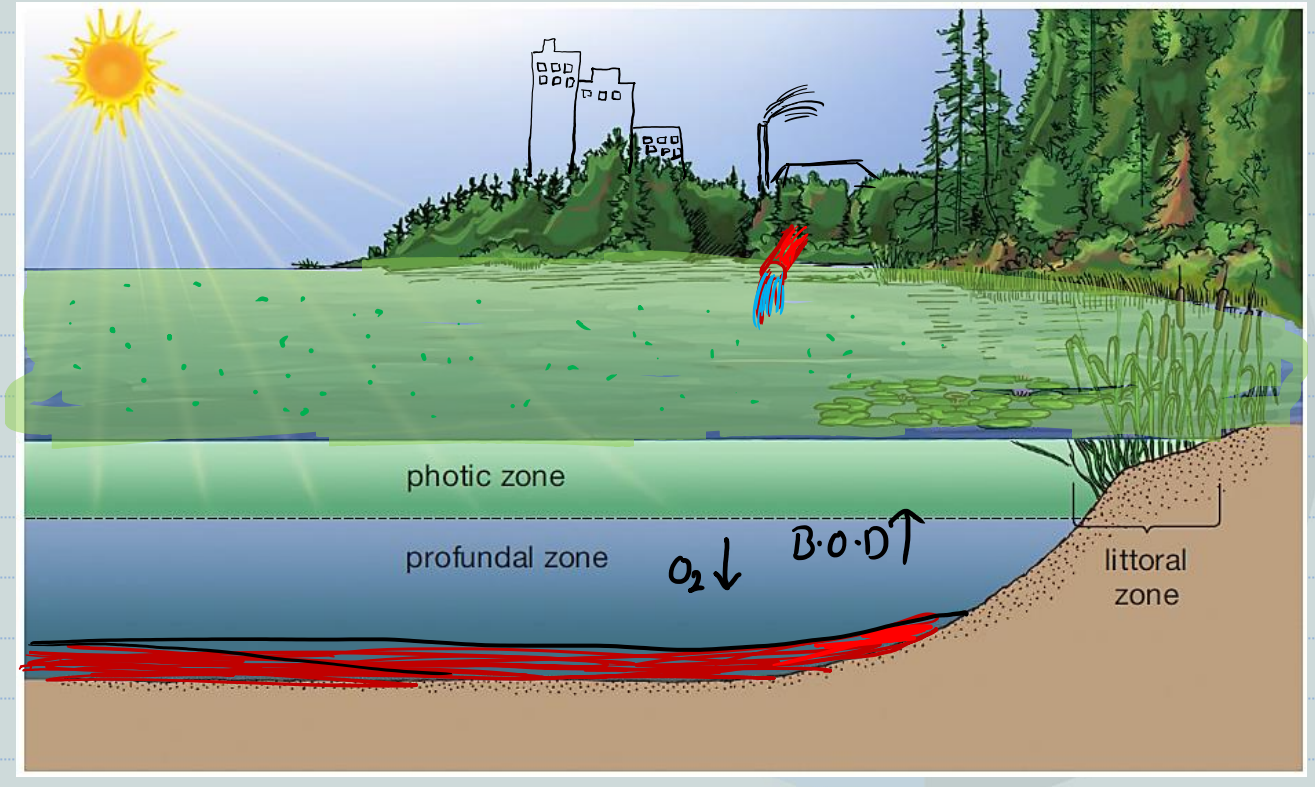


- High nutrient (Organic matter)
- Shallow and muddy water
- Very high primary production
- Low biodiversity
- DO low
- BOD high

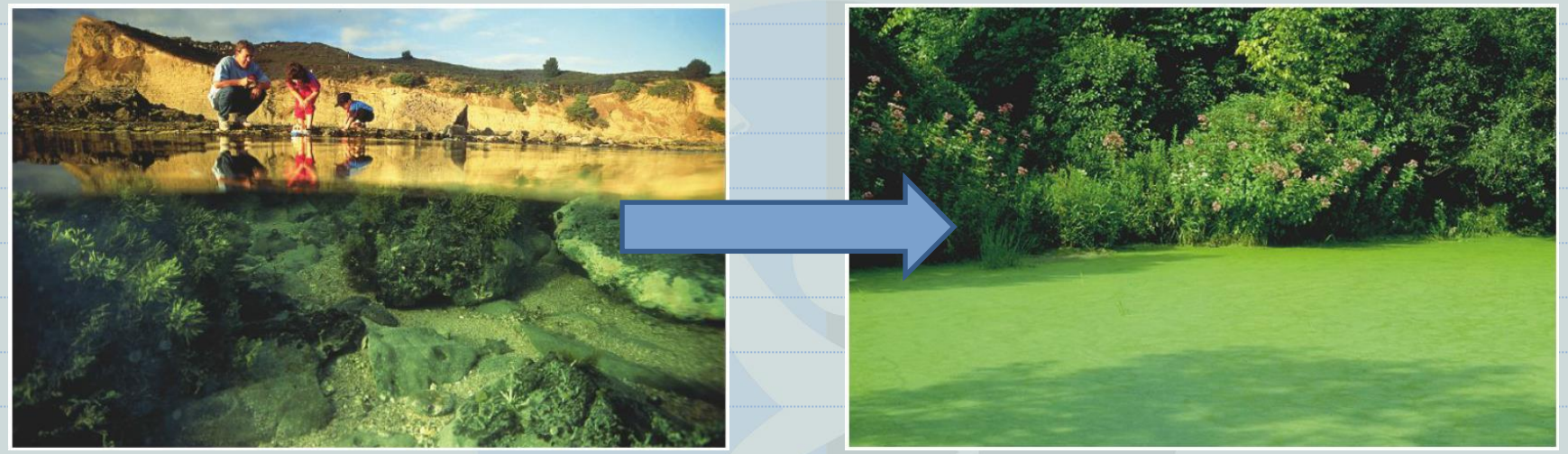
✓ **Eutrophication is natural aging of water body.**

Due to human activities increase input of nutrient in the water body from urban area and agricultural area can accelerate the rate of eutrophication.

Cultural eutrophication

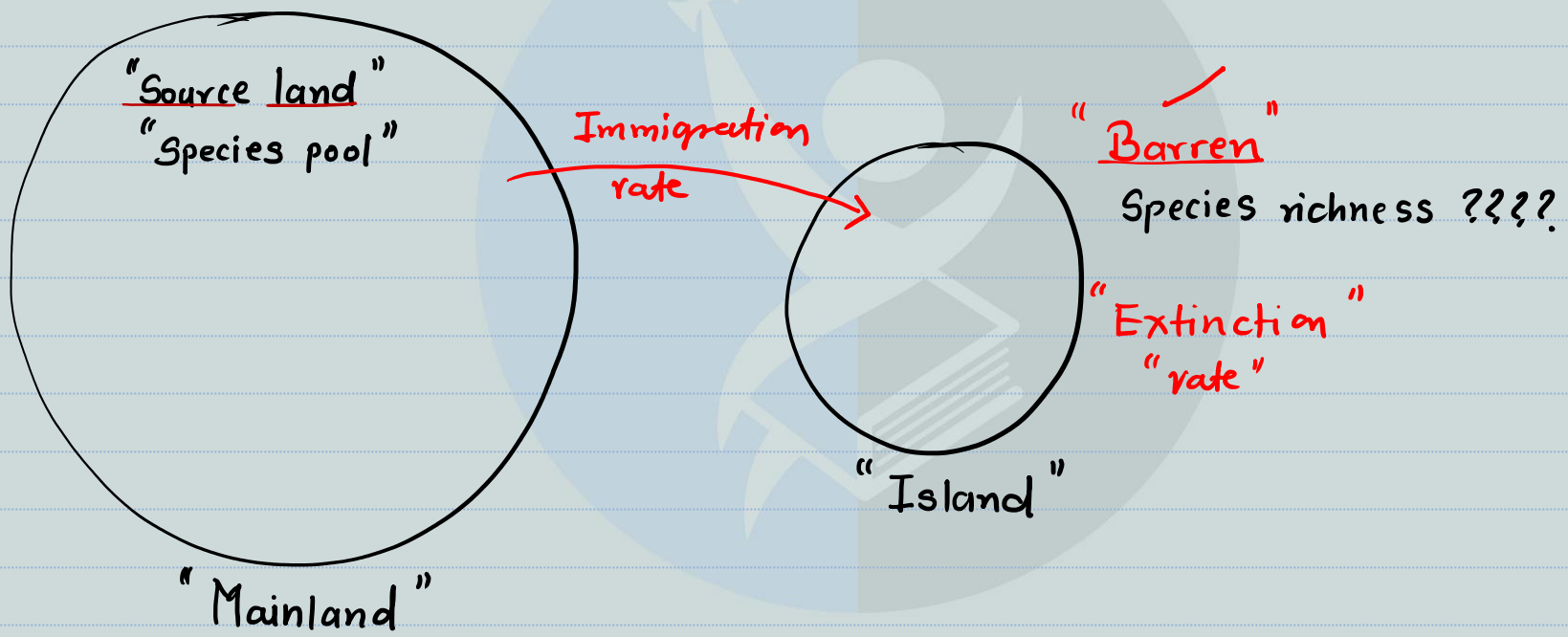


1. Detergent ↑
→ P, N ↑
↓
Phytoplantons (BGA)
(Algal bloom)



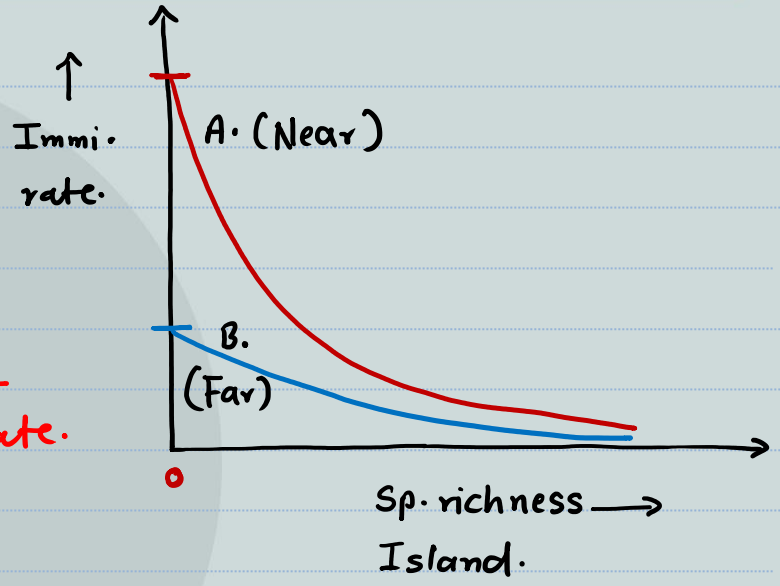
Theory of island biogeography "Mc Aurthor and Wilson"

" states that the number of species on an island tends toward an equilibrium number that is determined by the balance between immigration and extinction "



Immigration rate :

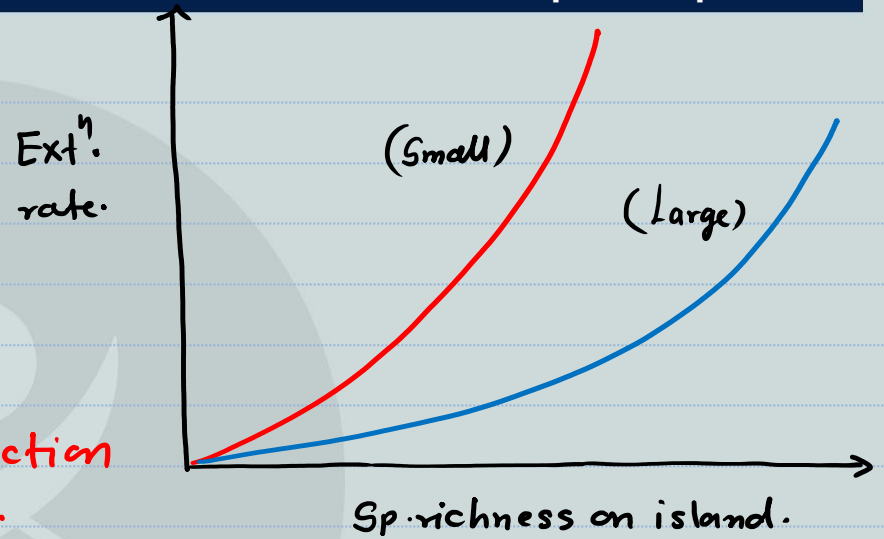
- Distance $= \frac{1}{\text{Immigration rate.}}$
- Species richness on island $= \frac{1}{\text{Immigration rate.}}$



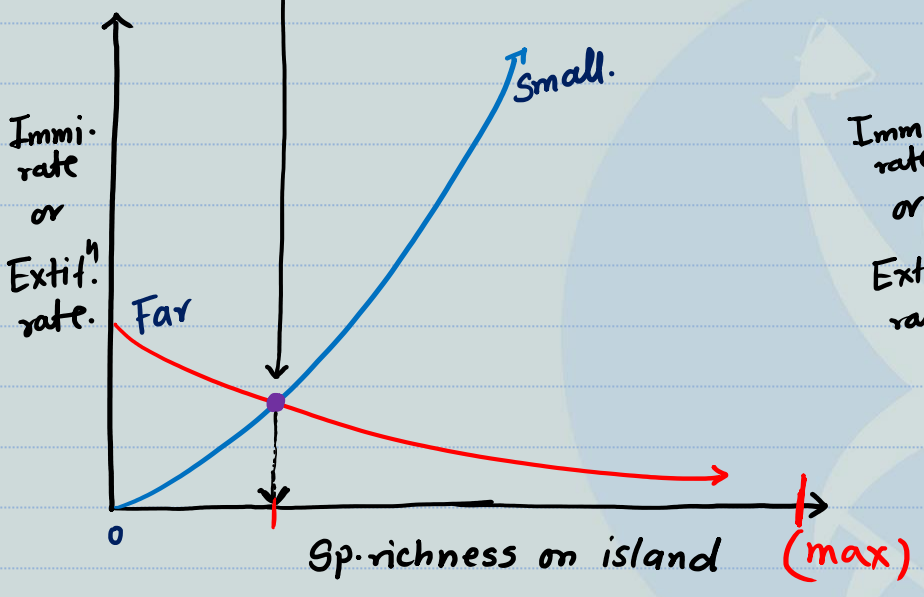
Extinction rate:

1. Size
   Large: Extinction rate ↑
   small: Extinction rate ↑↑

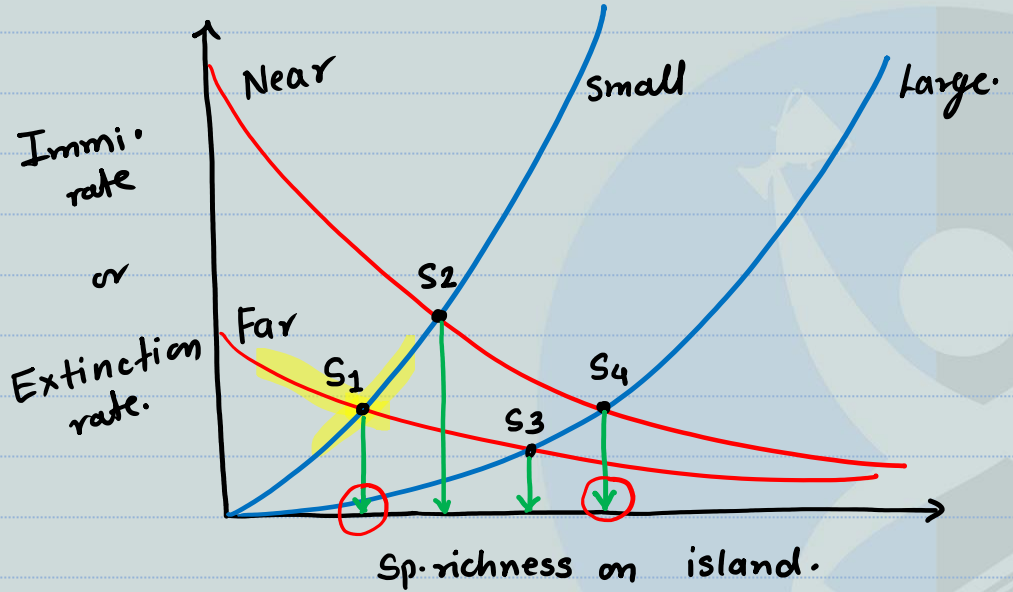
2. Species richness on island ∝ Extinction rate.



Dynamic equilibrium :($\hat{S}$)







S_1 : Far, Small : Sp. richness ↓

S_2 : Near, Small

S_3 : Far, Large

S_4 : Near, Large : Sp. richness ↑

Which one of the following is **NOT** correct?

(1) Island ecosystems are less prone to biological invasion because of their distance from mainland

(2) Invasive species have greater phenotypic plasticity compared to native species

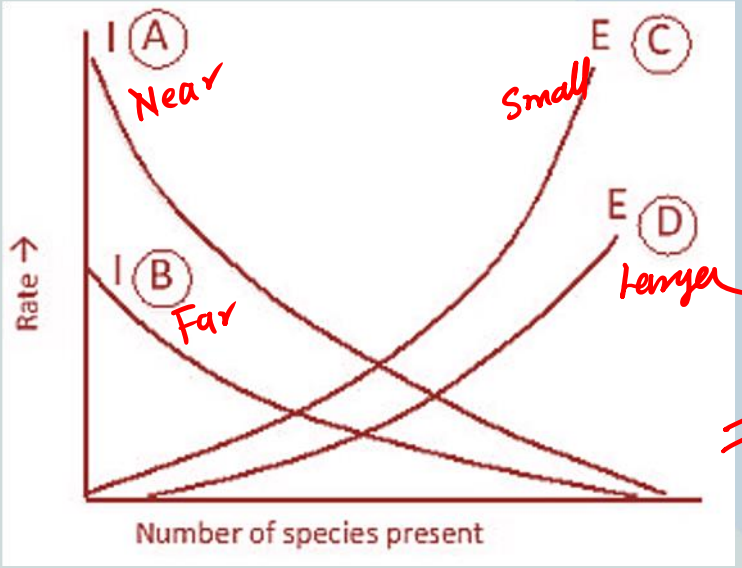
(3) Invasive species have high dispersal ability

(4) At a large scale, diversity rich ecosystems are generally more prone to invasion

The theory of island biogeography has synthesized into theory the following concepts, except:

1. Competition
2. Immigration
3. Equilibrium
4. Speciation

A researcher working on island biogeography mapped how isolation-controlled immigration (I), and area-controlled extinction (E), will act on number of species present on the islands. He forgot to label the size of the islands (small or large) and the location of the islands (near or far) on the graph.



Using information from Mac Arthur and Wilson's equilibrium theory, select the option that correctly identifies A, B, C and D in the figure above.

(1) A-large, B-small, C-near, D-far

(2) A-small, B-large, C-far, D-near

(3) A-near, B-far, C-small, D-large

(4) A-far, B-near, C-large, D-small

The species-area hypothesis

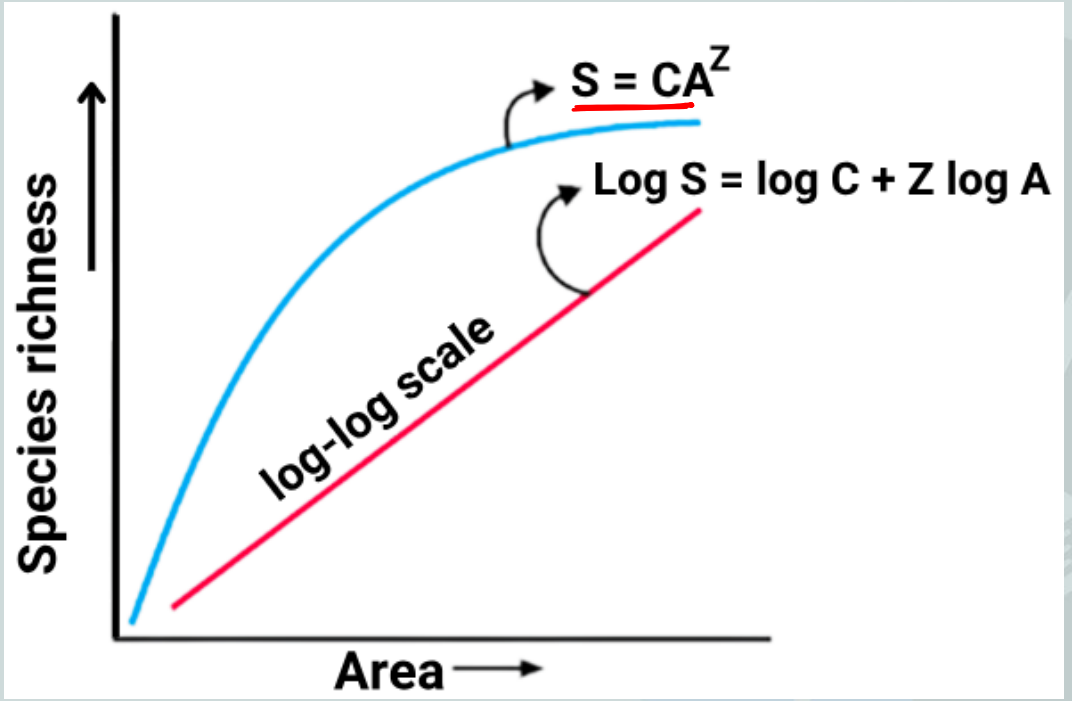
$$S = cA^z$$

or in logarithmic form,

Species richness — A constant — Area — Slope

$$\log S = \log c + z \log A$$

S = Sp. richness
c = constant
A = Area
z = slope of the line


S = CA^Z
Log S = log C + Z log A
log-log scale
Species richness
Area

HAPPY LEARNING

THANKS

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