

Principles of Ecology

BSc. Course 2024 – 2025

Lecture 7

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Limiting Factors

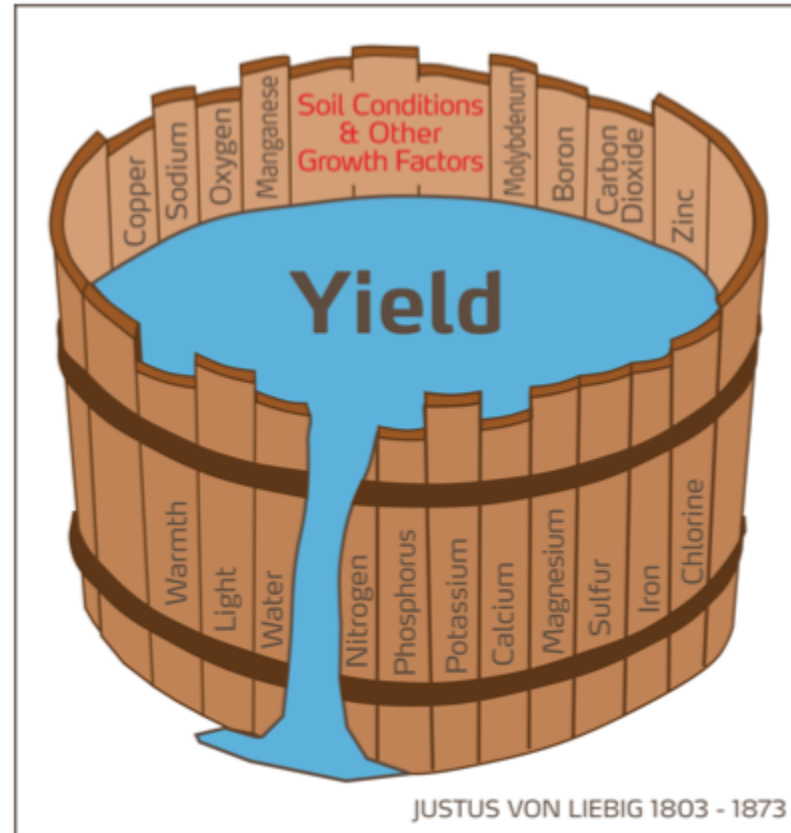
قانون ليبج للحد الأدنى

Liebig's Law Of The Minimum

(نمو اي نبات يعتمد على كمية العناصر الغذائية المتوفرة له بالحد الأدنى من الكمية)

**Justus von Liebig's
"Law of the Minimum"
published in 1873**

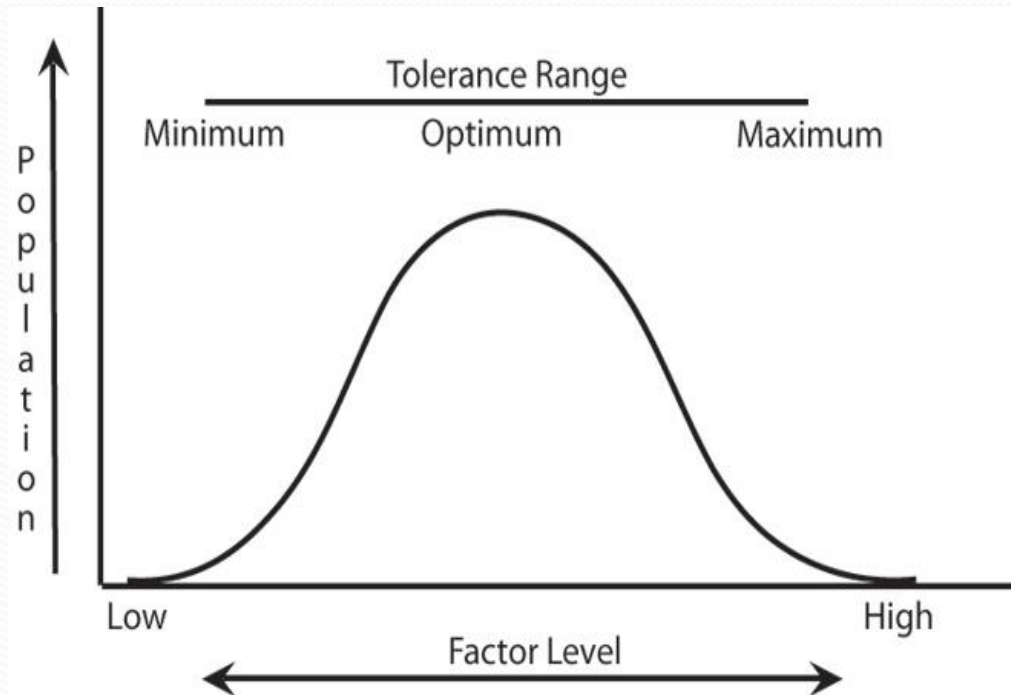
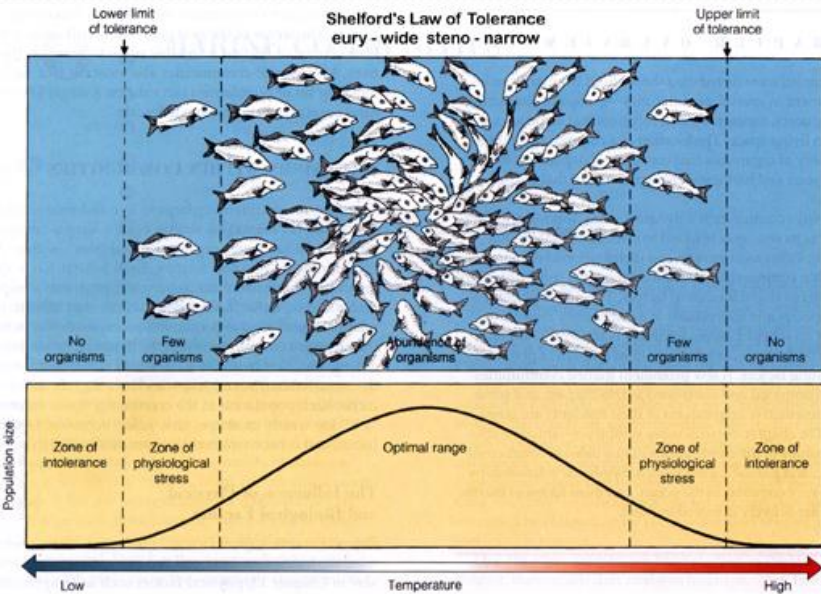
"If one growth factor/nutrient is deficient, plant growth is limited, even if all other vital factors/nutrients are adequate...plant growth is improved by increasing the supply of the deficient factor/nutrient"



Limiting Factors

Shelford's Law of Tolerance (Optimum Condition)

- Not only what is available in minimum is considered a limiting factor as in Liebig's law, but what is available in excess as in the factors of heat, water and light are also considered limiting factors.



Limiting Factors

قانون شلفورد للتحمل

Shelford's Law of Tolerance (**Optimum Condition**)

#	Environmental Factor	Eury	Steno
1	Temperature	Eurythermal	Stenothermal
2	Water	Euryhydric	Stenohydric
3	Salinity	Euryhaline	Stenohaline
4	Nutrition	Euryphagic	Stenophagic
5	Living Place	Euryecious	Stenoecious

Limiting Factors

Some important Limiting Factors

1- Temperature

- a) **Physiological Adaptations** (The wet -soft- parts of the plant die due to freezing, however the plant can resist freezing by lowering the freezing point through losing water and increasing the concentration of salts in its tissues and cells)
- b) **Structural Adaptations** (Shells, cocoons, fur, feathers, and variation in the length of ears, tails, and beaks, which are shorter in cold regions)
- c) **Behavioral Adaptations** (**Hibernation & Estivation**)

Limiting Factors

Some important Limiting Factors

2- Light

- a) **Photoperiod (Circadian Rhythm, Seasonal Rhythm, Lunar Cycle)**
- b) **Light intensity (UV < dissolved O₂), (Insects with dark color)**
- c) **Light wavelength (short waves lethal to bacteria), Zonation**

Limiting Factors

Some important Limiting Factors

3- Water

(Rainfall, Humidity, Evaporation, ...etc.)

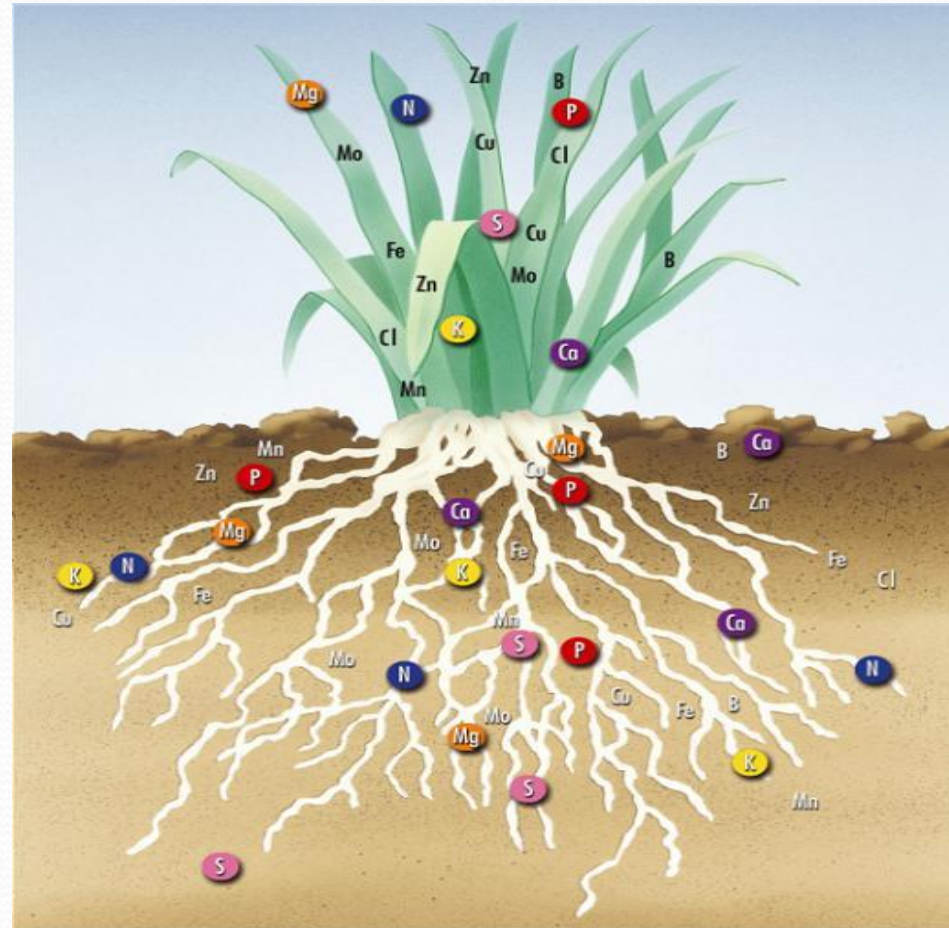
#	Biomes	Amounts of rainfall (cm/year)
1	Desert	0 – 25
2	Grassland	25 – 75
3	Dryland	75 – 125
4	Rainforests	> 125

Limiting Factors

Some important Limiting Factors

4- Nutrients (Biogenic Salts), Macro & Micronutrients)

Fe , Mn , Cu , Zn ,
B , Si , Mo , Cl ,
V , Co.



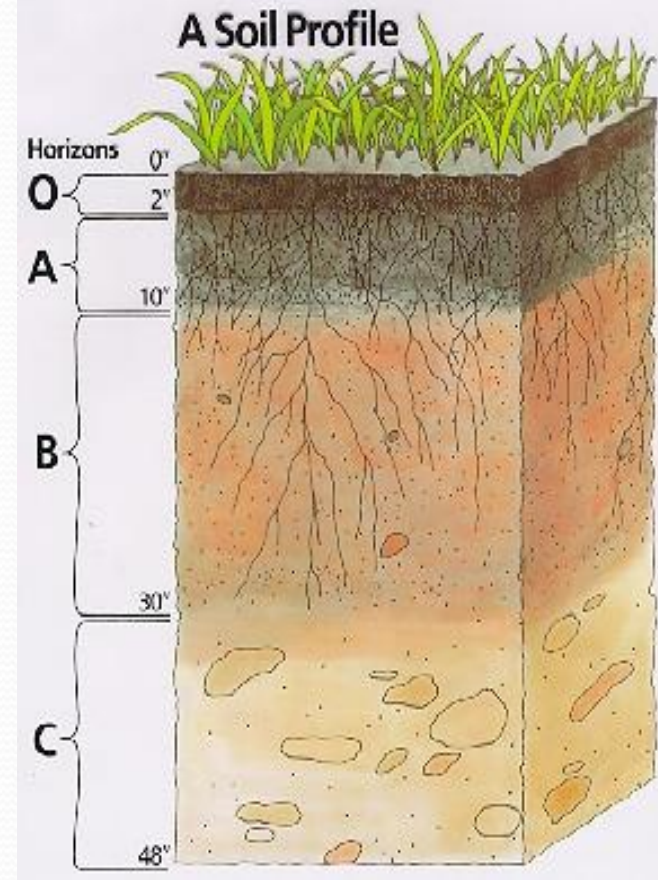
Some important Limiting Factors

5- Soil (Pedosphere)

Horizon A: It is the upper layer consisting of plant and animal remains decomposed by decomposing organisms through the **decomposition** process.

Horizon B: It is an intermediate layer consisting of mineral particles, in which all organic compounds have been completely decomposed and become inorganic by (the process of **mineralization**).

Horizon C: It is the parent (underlying) layer that is not affected by **biological** processes.



Some important Limiting Factors

5- Soil (Soil Formation)

