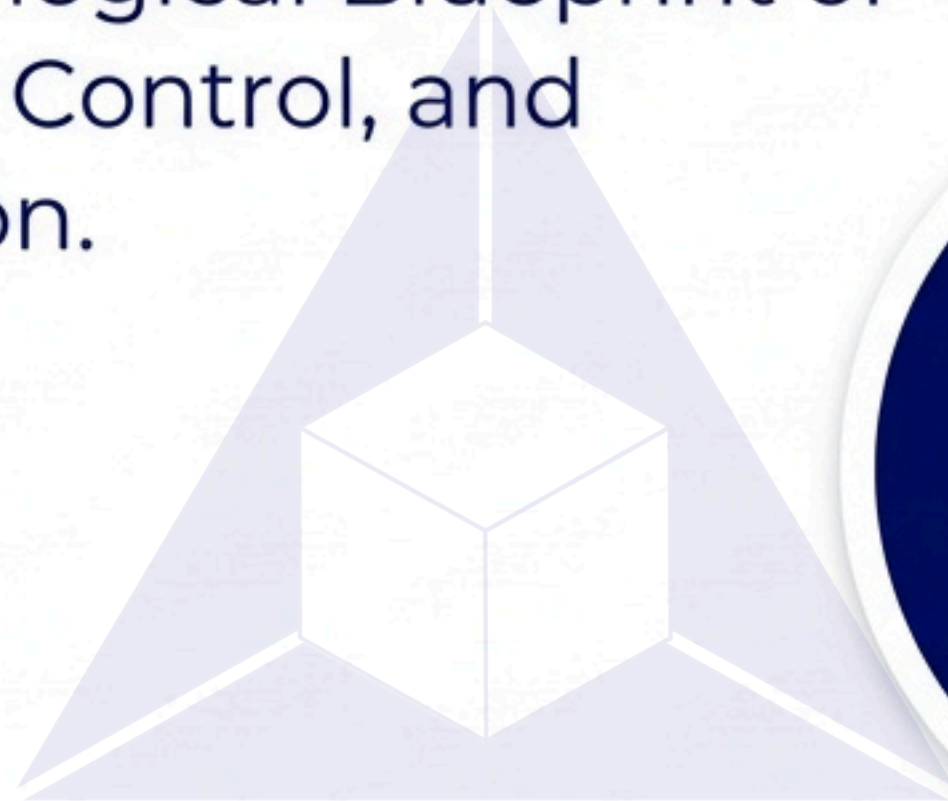


PREDATION

The Ecological Blueprint of
Energy, Control, and
Evolution.

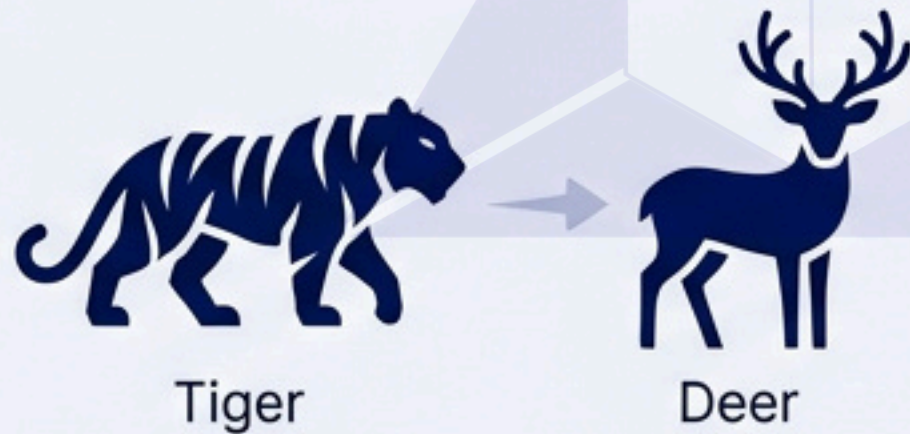


Redefining the Predator-Prey Interaction

Predation is mathematically defined as a $[+]/[-]$ interaction. One species benefits (Predator), while the other suffers (Prey).

$[+]/[-]$

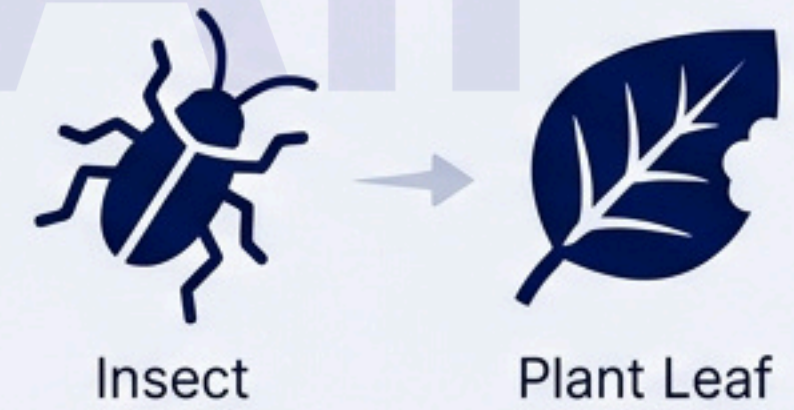
The Carnivore



The Granivore



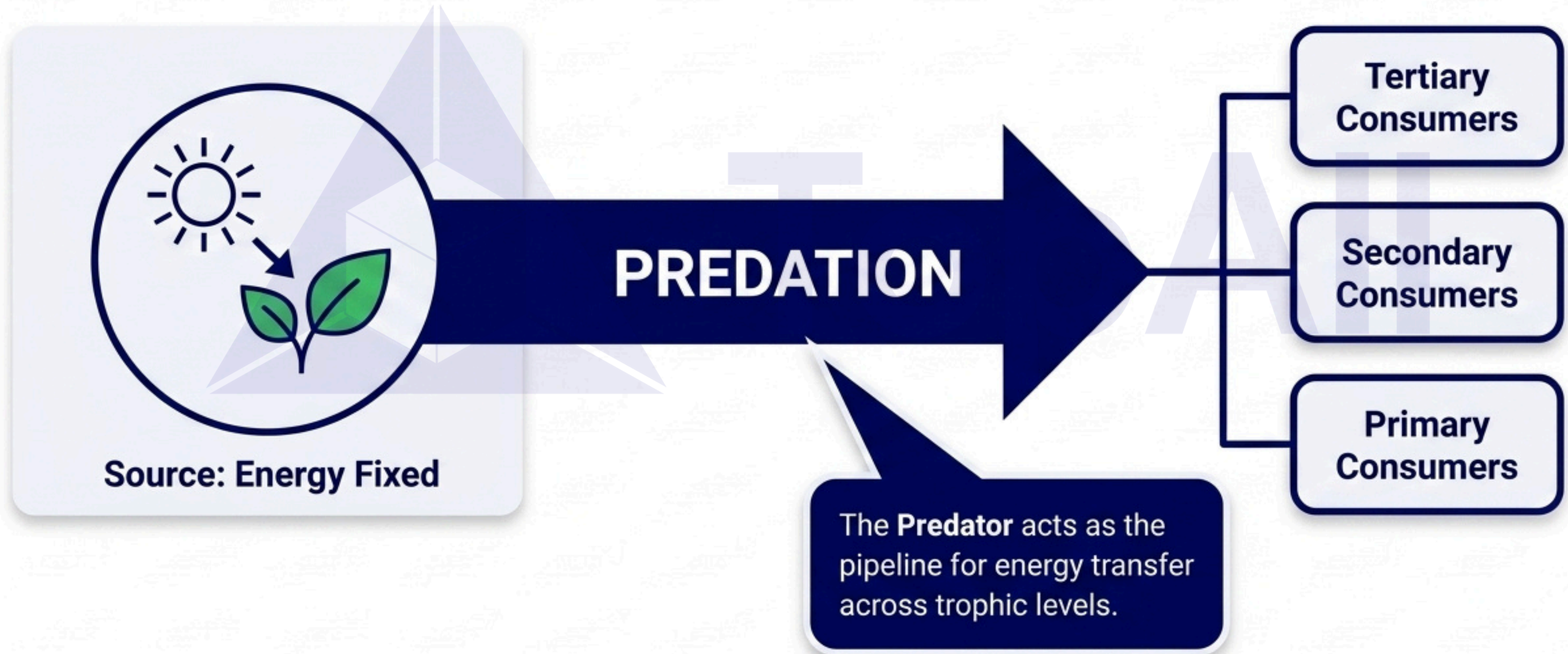
The Herbivore



Nearly 25% of all insects are phytophagous (feeding on plant sap and parts). Ecologically, herbivores are predators of plants.

Nature's Energy Conduit

What happens to the energy fixed by autotrophs if there are no animals to eat them? **Predators** act as **biological bridges**, transferring captured solar energy upward to higher trophic levels.





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Key Highlights

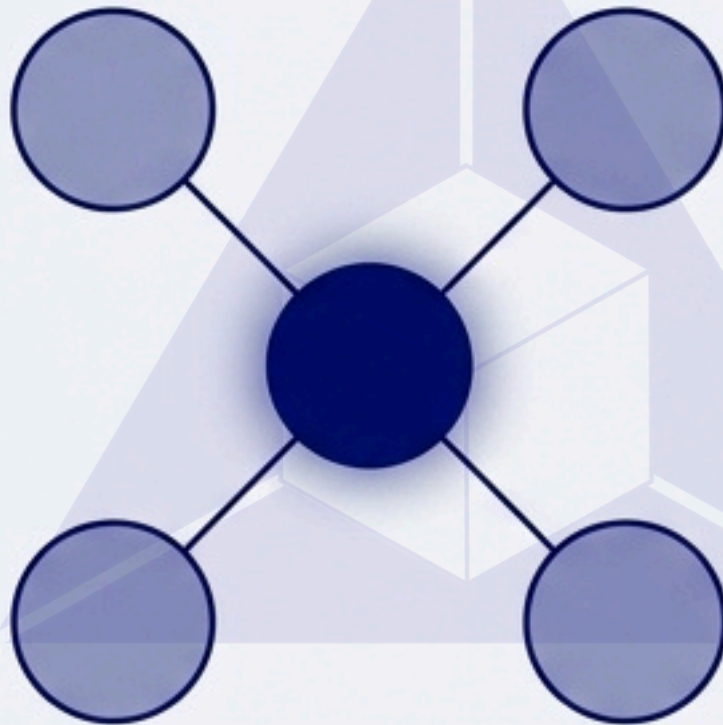
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Population Control & Ecosystem Stability

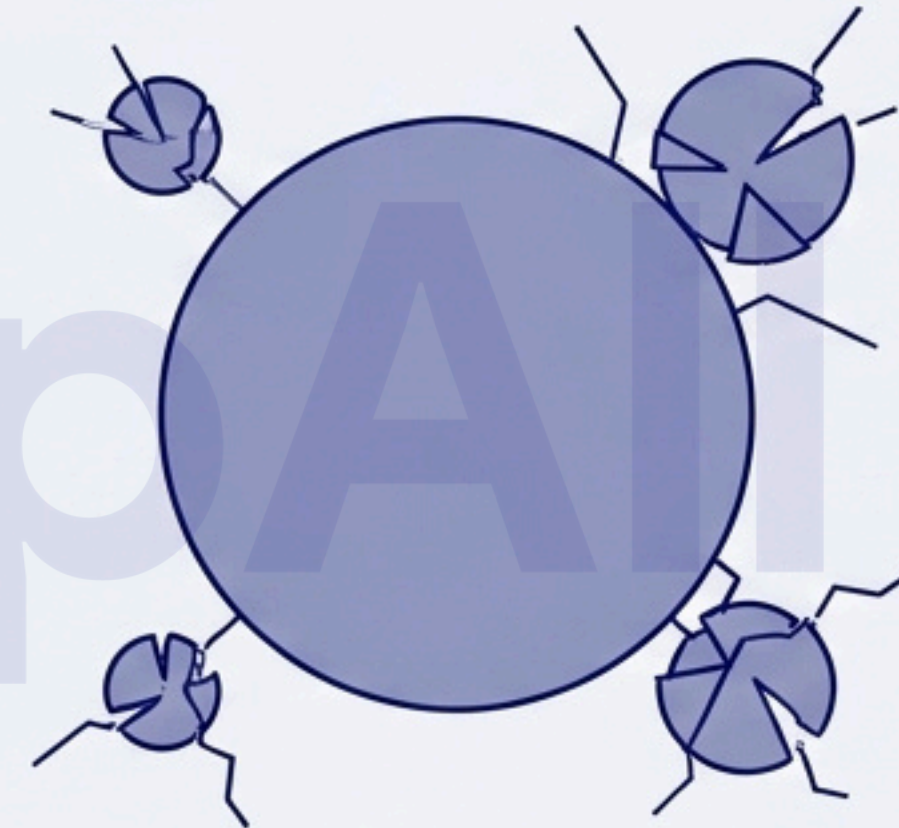
Predators keep prey populations in check. Without them, prey achieve extreme densities, leading to overexploitation and ecosystem collapse. Nature's predators are "prudent".

With Predators



Maintains Species Diversity

Without Predators



Competitive Exclusion



CASE STUDY: When the Pisaster starfish was removed from an enclosed intertidal area on the American Pacific Coast, >10 species of invertebrates became extinct within a year due to runaway interspecific competition.

Applied Ecology: Biological Control

Exotic species often become highly invasive because the new land lacks their natural predators. We exploit predator-prey dynamics for agricultural pest control.



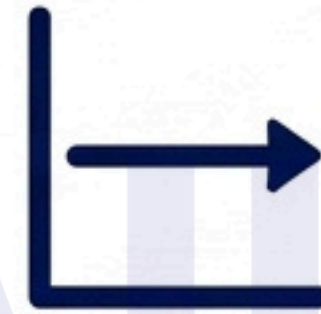
The Invasion (Australia, 1920s)

The Prickly pear cactus was introduced and caused havoc, rapidly spreading across millions of hectares of rangeland.



The Biological Control

A cactus-feeding predator (a moth) from its natural habitat was introduced.



The Result

The invasive cactus population was successfully brought under control.

The Evolutionary Arms Race: Prey Defences

Because they are under constant pressure, prey species evolve diverse mechanisms to lessen the impact of predation. Plants, unable to run, rely heavily on morphological and chemical warfare.

Cryptic / Behavioral



Camouflage: Many species of insects and frogs are cryptically-coloured to avoid detection by predators.

Morphological



Physical Barriers: Acacia and Cactus rely on thorns as their most common morphological defense against herbivores.

Chemical



Animals: The Monarch butterfly is highly distasteful to birds (acquires chemical from a poisonous weed during caterpillar stage).

Plants: Calotropis weed produces highly poisonous cardiac glycosides (fatal to cattle/goats). Extracts like nicotine, caffeine, and quinine evolved as grazer defenses.

NEET Key Takeaways: Predation

High-yield terminology and concepts for competitive exams.

✓ **Interaction Type:** [+] / [-] (Predator benefits, Prey harmed).

✓ **Phytophagous:** Term for plant-eating insects (~25% of all insects).

✓ **Energy Conduit:** Predators transfer solar energy fixed by plants to higher trophic levels.

✓ **Biological Control:** Prickly pear cactus (Australia, 1920s) controlled by specific moth.

✓ **Pisaster Starfish:** Keystone predator removal caused extinction of >10 invertebrate species via interspecific competition.

✓ **Cardiac Glycosides:** The highly poisonous chemical defense produced by the weed Calotropis.

✓ **Monarch Butterfly:** Distasteful chemical defense acquired in the caterpillar stage from a poisonous weed.



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