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Unit 5: ECOSYSTEMS

NOTES: 6.08

FOCUS: Nutritional Relationships

ESSENTIAL QUESTION: Can you summarize the nutritional relationships that exist within an ecosystem and give an example of each?

Ecosystems are based on Relationships:

No Man Is An Island

No man is an island,
Entire of itself.
Each is a piece of the continent,
A part of the main.
If a clod be washed away by the sea,
Europe is the less.
As well as if a promontory were.
As well as if a manor of thine own
Or of thine friend's were.
Each man's death diminishes me,
For I am involved in mankind.
Therefore, send not to know
For whom the bell tolls,
It tolls for thee.

~ John Donne, 1572 - 1631

- Every ecosystem is based on relationships.
- Plants, animals, and other organisms that share resources must rely on each other for survival, especially food.
- All nutritional relationships are based on a mutual need for energy.



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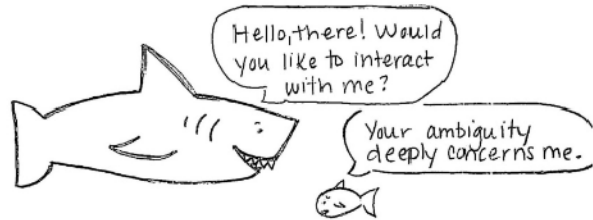
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Symbiosis

- Symbiosis is a close ecological relationship between two or more individuals in an ecosystem.
- Sometimes a symbiotic relationship benefits both species, sometimes one species benefits at the other's expense, and in other cases one species is unaffected.
- Ecologists use a different term for each type of symbiotic relationship:

- Competition
- Cooperation
- Coexistence
- Predator-Prey
- Parasitism
- Mutualism
- Commensalism



Competition:

- Competition is a contest between organisms for territory, a niche, or resources.
- Occurs naturally between living organisms that co-exist in the same ecosystem.
- Can occur between individuals of the same species.
 - Ex: Two maple sapling competing for sunlight in a dense forest. One will grow taller and survive and the other will, most likely, die.
- Can occur between organisms from different species.
 - Ex: Squirrels and chipmunks competing for acorns.

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Cooperation:

- Cooperation is the opposite of competition.

- Cooperation occurs when individuals, usually within the same species, will work together for the benefit of the entire group



- Ex: Red wolves living together to raise their offspring as a group.

Coexistence:

- Coexistence occurs in an ecosystem when two species live in the same area without coming into conflict with one another.

- Coexistence can occur for several reasons:

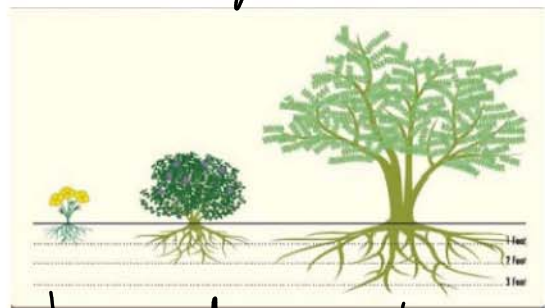
- unrelated species - fungi decompose dead organic material while an owl hunts mice in the exact same space.

- Abundant resources - sparrows and meadowlarks

both eat seeds and worms. If there are plenty of both, the birds will co-exist. If resources

become scarce, the birds will compete

- Complementary niches - A deep-root plant and a shallow-root plant growing side-by-side.



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Predator – Prey:

• A predator-prey relationship develops when one animal uses another animal as a food source.



- Ex: lions & zebras, bears & fish, foxes & rabbits

- Predators and prey co-evolve as part of each other's environment.
 - Predators must evolve whatever is necessary to continue catching their prey.

- speed, stealth, camouflage, keen senses, venom

- Prey must evolve whatever is necessary to continue evading their predators.

- speed, camouflage, poison, keen senses, defensive structures

Parasitism

- Parasitism is a relationship where one organism, the parasite, lives off of another organism, the host, causing harm and sometimes even death.

- The parasite benefits while the host is harmed.

- Ex 1: tapeworms

- Attach themselves to the intestines of their host, consuming the host's food while depriving the host of nutrients.

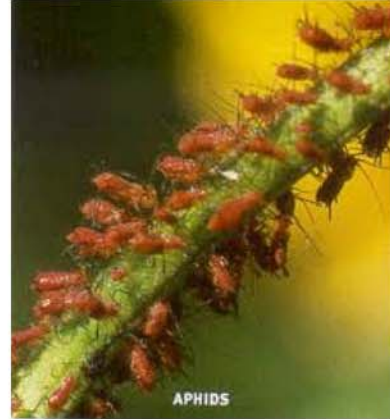


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- Ex 2: fleas
 - Live in the fur of their host, biting their skin and sucking their blood.
 - The host is harmed, but the flea benefits by having a food source and warm habitat.
- Ex 3: Aphids
 - Live on soft-tissue plants (potatoes, tomatoes, beets, wheat) by sucking the sap out of the plant
 - Aphid gets a sweet food source while the plant becomes sickly and underproductive.



Mutualism

- Mutualism is a form of Symbiosis where both species benefit from the relationship.
 - Ex 1: bees & flowers
 - The bee gets nectar to make into food.
 - The flower benefits from cross-pollination when the bee inadvertently picks up pollen grains and carries them to the next flower.
 - Ex 2: Bacteria & humans
 - Bacteria help humans digest food that they otherwise would not be able to process.
 - Humans benefit by being able to consume a more diverse diet.
 - Bacteria benefit by having a constant food supply and a habitat.



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- Ex 3: ladybugs & vegetable plants
 - Ladybugs eat aphids and aphids suck sap out of vegetable plants.
 - Ladybugs get a yummy aphid meal while the plants are protected from the parasite aphids



Commensalism

- Commensalism is a relationship in which one species benefits while the other is unaffected
 - Example 1: egrets & livestock
 - As livestock (cows, horses, goats) grazes in a field, their movements stir up various insects. The egrets follow the livestock and eat the insects as they are stirred up.
 - The egret has an easier time finding food and the livestock are unaffected.
 - Example 2: sharks & remoras
 - Remoras (AKA: sucker fish) attach themselves to the underside of a shark and feed off of bacteria, food scraps, and waste.
 - The remora gets an easy meal, but the shark is really unaffected.

