Introduction to ecosystems

An ecosystem is a community of organisms interacting with its physical environment. Topic 1.1 focuses on how resources shape relationships among organisms.

1. BUILD THE SYSTEM

Population
One species in an area

→

Community
All populations in an area

→

Ecosystem
Community + environment

Pond example: a frog population belongs to a community with algae, insects and microbes. Include water, light, temperature and dissolved nutrients to describe the ecosystem.

2. DISTINGUISH THE PARTS

Biotic components include plants, animals, fungi and bacteria. Abiotic factors include light, water availability, temperature and pH. These conditions influence which organisms can survive and how well they grow.

3. LOOK FOR INTERACTIONS

Ecology examines relationships, not just a species list. Less rainfall can reduce plant growth, leaving less food for herbivores. Effects on other populations depend on their diets, alternative resources and other conditions.

Foundation link: energy moves through an ecosystem and ultimately dissipates as heat; matter is recycled. Later Unit 1 topics develop energy flow and nutrient cycles.

Ecosystem components and energy/matter distinction: OpenStax, Biology 2e 46.1.

Scope: College Board AP Environmental Science CED (2025), Topic 1.1, p. 36.

Who benefits, and who is harmed?

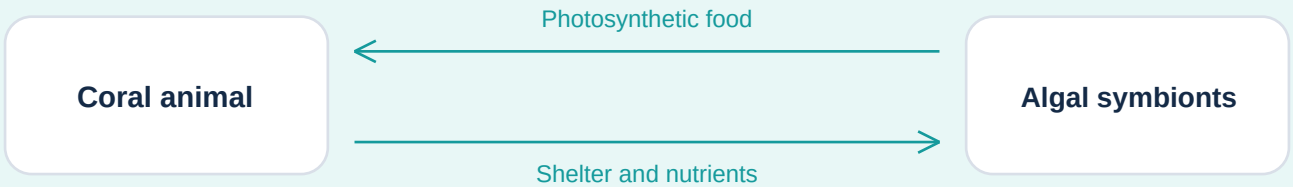
Use + for a benefit, - for harm, and 0 for no significant effect in the relationship described. These signs refer to survival or reproduction, not whether an organism is "good" or "bad".

1. COMPARE SPECIES INTERACTIONS

Relationship	Effects	What happens?
Predation	**+ / -**	A predator eats prey: a spider captures and consumes a fly.
Mutualism	**+ / +**	Both partners benefit: coral and its photosynthetic algal symbionts.
Commensalism	**+ / 0**	One benefits; the other is unaffected: a small bird nests in a tree without harming it.
Parasitism	**+ / -**	A parasite gains resources at a host's expense: a tapeworm absorbs nutrients in an animal's intestine.

Symbiosis = a close, long-term association between different species. It includes mutualism, commensalism and parasitism; it does not always benefit both partners.

2. MUTUALISM: FOLLOW THE EXCHANGE



The algae live in coral tissues. Coral provides a protected environment and materials the algae use; the algae supply products of photosynthesis.

Predation and parasitism share + / - signs, but differ in how the consumer obtains resources and in the duration of its association with the other organism.

Interaction examples: OpenStax, Biology 2e 45.6.
Symbiotic relationships: NOAA Ocean Exploration, What is symbiosis?
Coral-algal exchange: NOAA, Corals Tutorial.

Scope: College Board AP Environmental Science CED (2025), Topic 1.1, p. 36.

Limited resources shape coexistence

Competition occurs when organisms need the same resource and its supply is insufficient for all demands. Resource partitioning can reduce this overlap.

1. TWO SCALES OF COMPETITION

Intraspecific competition is within a species; interspecific competition is between species. Two seedlings of the same species can compete for light, while seedlings of different species can compete for the same soil water. Competition has a - / - effect relative to access without a competitor.

2. THREE WAYS TO PARTITION RESOURCES

SPACE	**Different places**	Two insect-eating bird species feed mainly in different parts of a tree.
TIME	**Different times**	Two species use the same feeding area mainly at different times of day.
RESOURCE USE	**Different ways**	Two seed-eating species concentrate on different seed sizes.

These are simplified examples, not a claim that organisms agree to share.

3. EXPLAIN WHY PARTITIONING HELPS

Reduced overlap means fewer individuals draw on exactly the same limited supply. This can lower competition and support coexistence. It does not create unlimited resources or guarantee that competition disappears. Resource-use differences can arise through behaviour and evolutionary change.

Keep the distinction clear: habitat is where an organism lives; its niche includes how it uses resources and interacts with its environment.

Competition and resource partitioning: College Board, ERT-1.A.3.
Niche and coexistence: OpenStax, Biology 2e 45.6.

Scope: College Board AP Environmental Science CED (2025), Topic 1.1, p. 36.