Nature provides more than products

Ecosystem services are benefits that people receive from ecosystems. APES groups them into four categories, including benefits that are not bought or sold.

1. PROVISIONING: MATERIAL GOODS

These are resources obtained from ecosystems: food, fresh water, timber, fiber and natural sources of medicines. Fish harvested for a meal are a provisioning service. The key is the physical product supplied.

2. REGULATING: ENVIRONMENTAL CONDITIONS

Ecosystem processes can moderate hazards and maintain conditions. Examples include flood reduction, water purification, carbon storage and pollination. Insect pollination helps some crops produce fruits and seeds; it is not the harvested crop itself.

3. CULTURAL: NONMATERIAL BENEFITS

People gain recreation, learning, aesthetic enjoyment, spiritual meaning and cultural identity from ecosystems. Birdwatching in a wetland is a cultural service, even if no admission fee is charged.

4. SUPPORTING: THE FOUNDATIONS

Processes such as nutrient cycling, soil formation and primary production underpin other services. Decomposition returns nutrients that plants can use; plant growth then supports food webs and the resources people obtain.

> Classify the particular benefit, not the entire ecosystem. One forest or wetland can provide services in all four categories.

Four categories and human disruption: College Board, ERT-2.B-C.
Service definitions and examples: USDA Climate Hubs; US Forest Service.
Supporting processes in forests: US Forest Service.

Scope: College Board AP Environmental Science CED, Topic 2.2, p. 53.

Connect a process to a human benefit

A useful explanation shows how the ecosystem works, which service results and why that service matters to people. A wetland illustrates these connections.

1. A FLOOD-REGULATION CHAIN

Wetland space and vegetation

Water can spread out and flow more slowly.

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Temporary water storage

The downstream flood peak can be reduced.

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Benefit to people

Lower flood exposure can mean less property damage.

2. WATER QUALITY IS ANOTHER REGULATING SERVICE

Slower water flow allows some suspended sediment to settle. Wetland plants and soils can retain some pollutants, helping improve downstream water quality. Cleaner source water can reduce treatment needs.

3. SAME ECOSYSTEM, OTHER BENEFITS

Fish used as food → provisioning

Wildlife watching and outdoor learning → cultural

Nutrient cycling that sustains plant growth → supporting

Limits matter: benefits vary with wetland size, condition and location. Wetlands do not stop every flood or remove every pollutant.

Water storage, pollutant retention and wetland pressures: US EPA.
Distinguishing service categories: USDA Climate Hubs.

Scope: College Board AP Environmental Science CED, Topic 2.2, p. 53.

Disruption can carry hidden costs

Anthropogenic means caused by humans. Changing an ecosystem can alter its processes, reduce its services and create both ecological and economic consequences.

1. WETLAND DRAINAGE: LOSS OF FLOOD REGULATION

Draining or filling a wetland removes space that could store water. More water may reach downstream areas rapidly, increasing flood risk. Ecological effects include habitat loss; economic effects can include higher repair costs or spending on flood defenses.

2. POLLINATOR HABITAT LOSS: LESS POLLINATION

Removing flowering plants and nesting sites can reduce wild pollinators. Less pollen transfer can limit reproduction in plants that depend on them. Ecologically, seed production may decline; economically, affected crops may yield less or require paid pollination services.

3. FOREST REMOVAL: CHANGING MULTIPLE SERVICES

Clearing forest can provide a short-term timber harvest while reducing carbon storage, habitat and opportunities for forest recreation. The trade-off is not just trees versus empty land: several benefits change together, and different people may gain or lose.

4. EVALUATE THE WHOLE CHAIN

Human activity → changed ecosystem process → changed service → consequences for organisms and people.

No market price does not mean no value. Consider long-term effects, who receives the benefits and whether damaged functions can realistically be restored. Avoid counting the same benefit twice.

Disruption and its ecological/economic consequences: College Board, ERT-2.C.
Pollination and other services: USDA Climate Hubs.
Valuing multiple ecosystem benefits: US Forest Service.

Scope: College Board AP Environmental Science CED, Topic 2.2, p. 53.