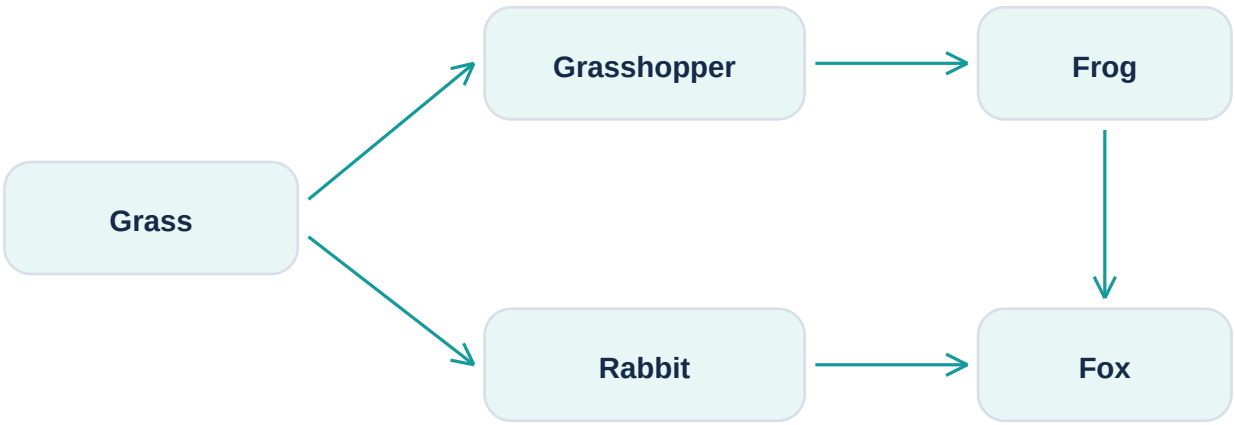
# One chain, several connected paths

A food chain follows a single feeding pathway. A food web joins two or more chains through shared organisms, showing how energy and matter move between them.

## 1. READ THE ARROWS: FOOD TO EATER




Simplified teaching web: only the links drawn are assumed. An arrow from rabbit to fox means that the fox eats the rabbit, not that the rabbit eats the fox.

## 2. TRACE TWO CHAINS THROUGH THE SAME WEB

A. Grass → rabbit → fox

B. Grass → grasshopper → frog → fox

The fox is a secondary consumer in A and a tertiary consumer in B. Its trophic position depends on the pathway; it is not determined by where its box is drawn.

## 3. DISTINGUISH A LINK FROM A MEASUREMENT

A feeding arrow identifies a relationship, not the amount transferred. Unless a legend says otherwise, line length or thickness does not show energy, population size or how often feeding occurs. A web is a selective model, not a complete species inventory.

Chains, webs and trophic roles: College Board, ENG-1.D.1.
Arrow direction and connected feeding paths: OpenStax, Biology 2e 46.1.

Scope: College Board AP Environmental Science CED (2025), Topic 1.11, p. 46.

# Include the living and detrital routes

Producers make organic compounds from inorganic materials. Consumers obtain organic matter by feeding. Dead material and waste connect every feeding level to detrital pathways.

## 1. CLASSIFY THE MEMBERS OF THE MODEL

| | | |
|---|---|---|
| **Producer** | Grass | An autotroph; first trophic level. |
| **Primary consumers** | Rabbit, grasshopper | Herbivores eating the producer. |
| **Higher consumers** | Frog, fox | Feed on other consumers in this web. |
| **Detritivores** | Example: earthworms | Ingest dead organic material. |
| **Decomposers** | Many fungi and bacteria | Digest organic matter externally and absorb products. |

## 2. RETURN NUTRIENTS, NOT ENERGY

Breakdown of remains and waste releases nutrients that producers can take up from soil or water. Decomposers also respire and release heat. Nutrient cycling does not send usable energy back around the same loop.

## 3. DO NOT PUT DECOMPOSERS ONLY AT THE TOP

A fallen leaf and a dead predator can both enter detrital pathways. These pathways branch from many levels, rather than forming one final step after the highest predator. They were left out of the page 1 drawing for clarity, not because they are absent.

Omnivores eat both producers and consumers. Feeding at several levels can connect otherwise separate chains.

Constituent members and nutrient return: College Board, ENG-1.D.1.
Grazing and detrital webs: OpenStax, Biology 2e 46.1.

Scope: College Board AP Environmental Science CED (2025), Topic 1.11, p. 46.

# Trace effects and close the loop

Adding or removing a species can change its neighbours directly and reach other populations indirectly. A feedback loop must return to influence the original change.

## 1. A DISTURBANCE CAN SPREAD

In the page 1 model, fewer frogs could reduce predation on grasshoppers: a direct effect. More grasshoppers could then increase grazing and reduce grass: an indirect effect. Foxes still have rabbits as another food source. These are possible responses, not guaranteed outcomes; diet switching, other limits and time delays matter.

## 2. NEGATIVE FEEDBACK: COUNTERACT A CHANGE

More prey → more food for predators → more predators
→ stronger predation → pressure for prey numbers to fall.

This response opposes the initial prey increase. Delayed responses can produce oscillations rather than a perfectly constant population. Negative means counteracting, not harmful.

## 3. POSITIVE FEEDBACK: REINFORCE A CHANGE

Fewer flowering plants → less food for dependent pollinators
→ fewer pollinators → less plant reproduction
→ a further decline in flowering plants.

This simplified mutualist loop reinforces a decline. It is most plausible when partners depend strongly on each other; alternative resources can weaken it. Positive means reinforcing, not beneficial or unlimited growth.

Causal arrows on this page mean "can lead to"; page 1 arrows mean food transfer.

Food-web changes and feedback: College Board, ENG-1.D.2.
Predator-prey responses: OpenStax, Biology 2e 45.6.
Mutualist decline mechanism: Nature Communications 8, 2031 (2017).

Scope: College Board AP Environmental Science CED (2025), Topic 1.11, p. 46.