

Flow of Energy in an Ecosystem



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المزيد من مادة
أحياء:

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التواصل الاجتماعي بحسب الصف التاسع العام



صفحة المناهج
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انسباير - Water and its solutions

1

أسئلة درس الكائنات الحية وعلاقاتها المتبادلة - عام بريدج

2



Principals of Ecology

Flow of energy in an ecosystem



التاريخ

16/9/2026



المعلمة

Rania Adel



الصف

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science



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استكشف

<https://almanahj.com/ae>



2023



Flow of Energy in an Ecosystem

How does energy flow through an ecosystem?

The Source of Energy: Autotrophs

An **autotroph** is an organism that collects energy from sunlight or inorganic substances to produce food. They are the foundation of all ecosystems.

Sunlight Energy



Organisms with chlorophyll absorb light energy during photosynthesis, converting inorganic CO₂ and H₂O into organic molecules.

Examples: Green plants and algae.

Chemical Energy



Where sunlight is unavailable, some bacteria use inorganic substances like hydrogen sulfide (H₂S) and carbon dioxide to make organic molecules for food.

Obtaining Energy: Heterotrophs

A **heterotroph** (or **consumer**) is an organism that gets its energy requirements by consuming other organisms.



Key Takeaway: Every heterotroph ultimately relies on autotrophs, making autotrophs the first critical step, to follow in the flow of energy.

Consumer Classification Matrix

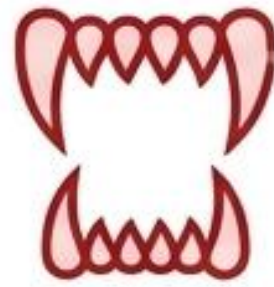
Herbivores



Eats only plants.

Examples: Cow, rabbit, grasshopper.

Carnivores



Preys on other heterotrophs.



Examples: Wolves, lions, lynxes

Omnivores



Eats both plants and animals.

Examples: Bears, humans, mockingbirds.



Quick Check:

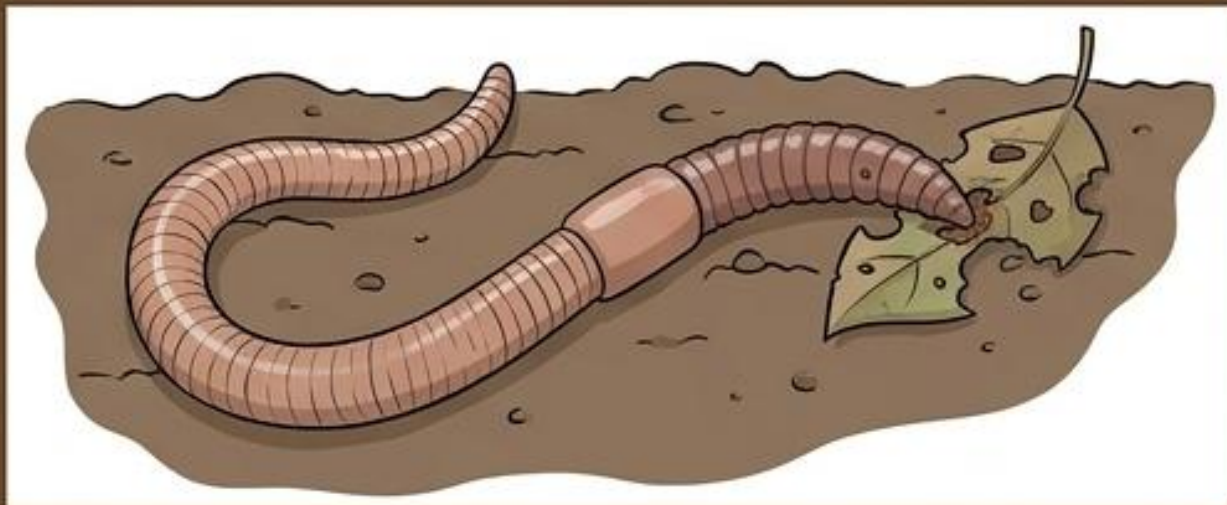
Are you a herbivore, carnivore, or omnivore?

The Clean-Up Crew: Recycling Nutrients

Both break down dead organisms to make nutrients available to producers.
Without them, organic material would be locked away forever!

Detritivores

- Action: Eat fragments of dead matter.
- Mechanism: Internal digestion (like other animals).
- Examples: Worms, many aquatic insects on stream bottoms.



Decomposers

- Action: Release digestive enzymes onto dead matter.
- Mechanism: External digestion, then absorbing nutrients.
- Examples: Fungi, bacteria.



Mapping the Flow: Food Chains

A **food chain** is a simplified model showing how energy flows through an ecosystem in a single pathway.

Crucial: Arrows represent the direction of energy flow!

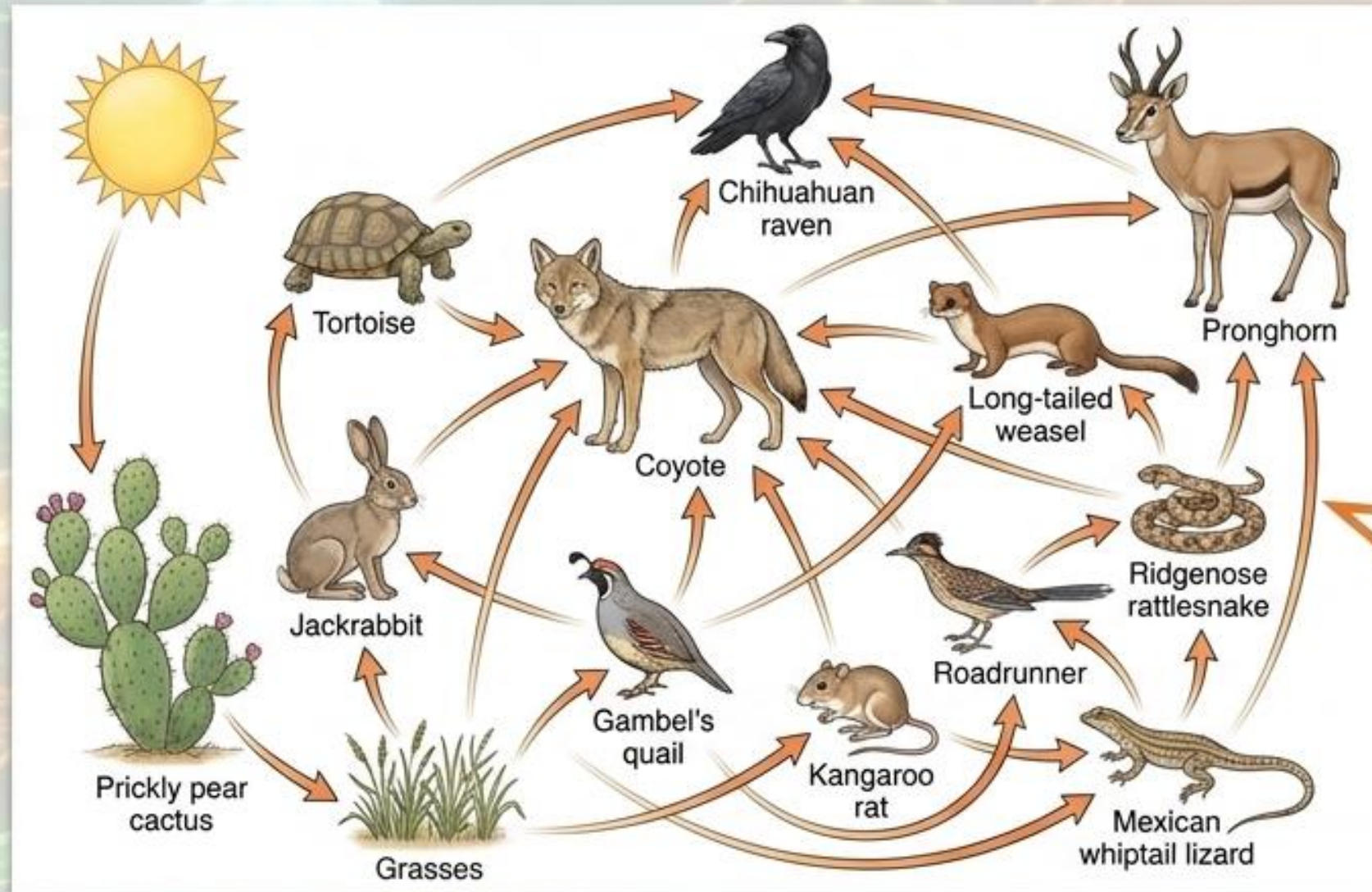


Structural

Trophic Level = Each step in a food chain or food web. Autotrophs make up the first level; heterotrophs make up the rest.

The Complex Reality: Food Webs

A **food web** is a model representing the many **interconnected food chains** and **pathways** in which **energy** flows through a group of organisms.

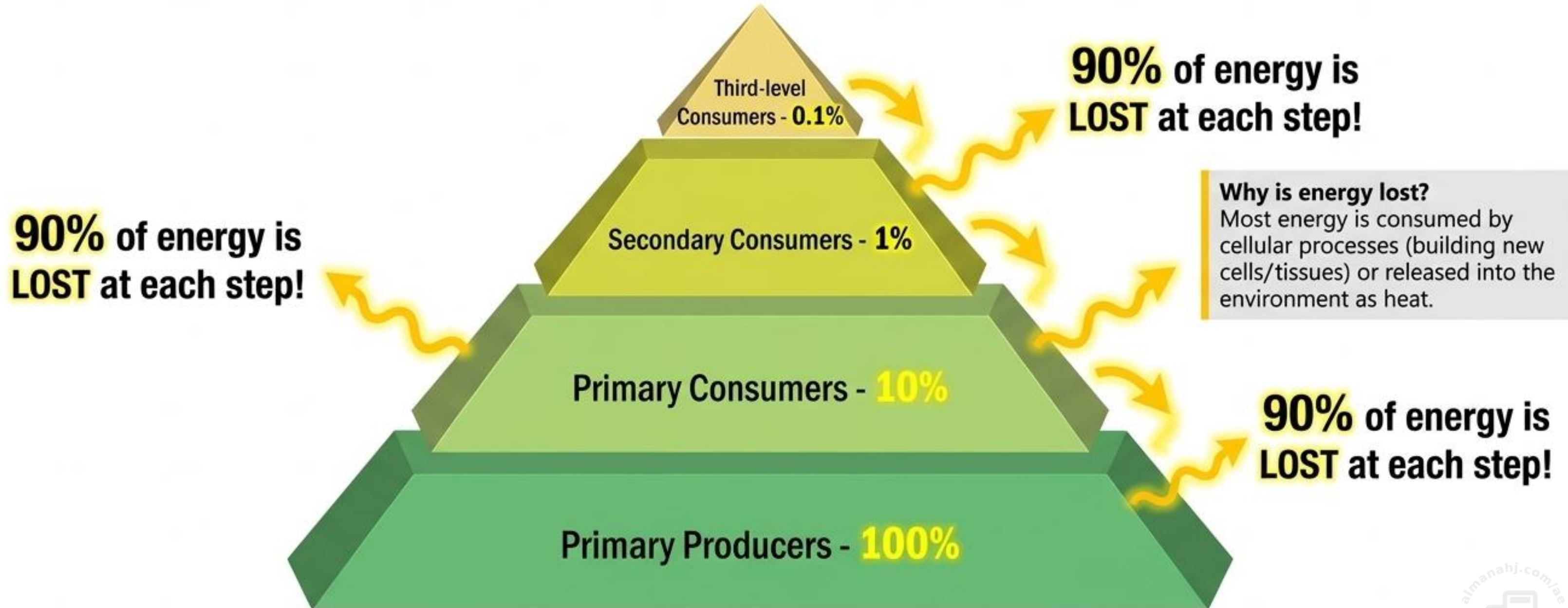


Feeding relationships are **complex** because most organisms feed on more than one species.

Key Takeaway: A food web is simply many food chains woven together.

Ecological Pyramids: Energy Loss

An ecological pyramid is a diagram showing the relative amounts of energy, biomass, or numbers of organisms at each trophic level.



Ecological Pyramids: Biomass & Numbers

Biomass is the total mass of living matter at each trophic level.



The **relative number** of individual organisms decreases at higher levels.

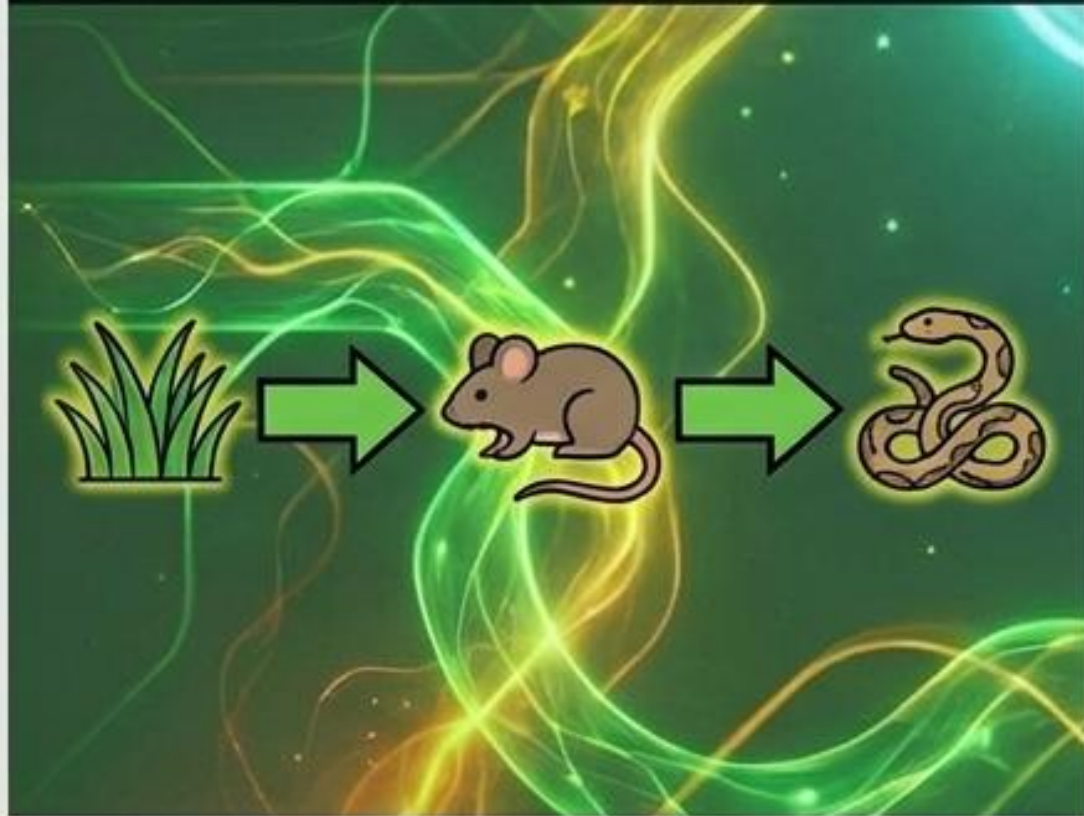


Both biomass and numbers decrease as you move up because there is simply **less energy available to support larger populations** of organisms at the top!

Concept Synthesis: Three Ways to Model Ecosystems

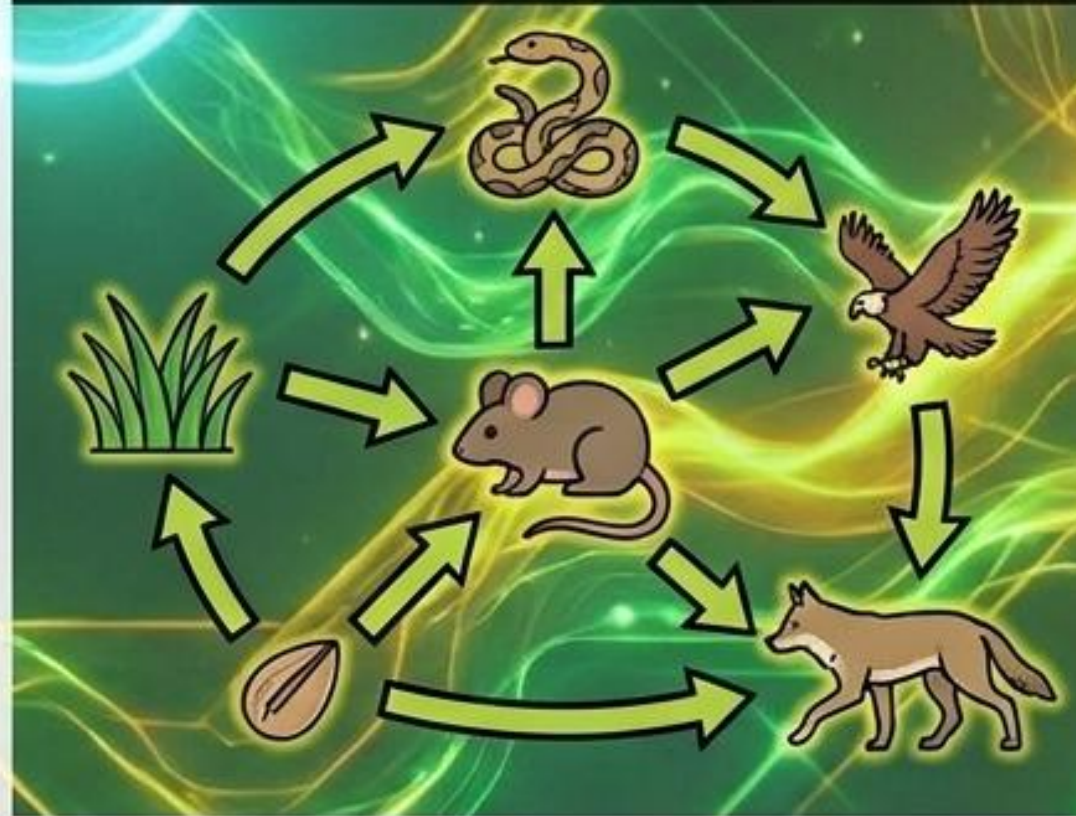
How do we track a mouse in a grassland ecosystem?

The Food Chain (Linear Path)



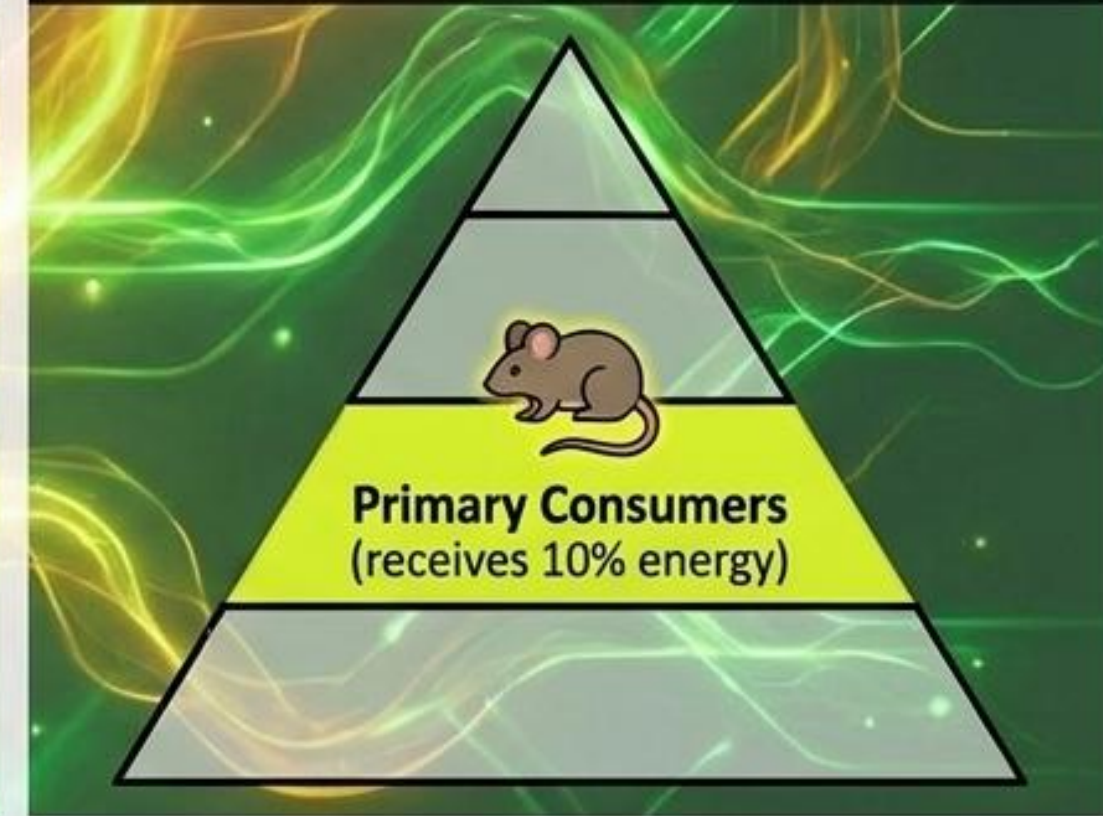
Shows the direct, single path of energy.

The Food Web (Complex Connections)



Shows reality and multiple choices.

The Energy Pyramid (Quantity & Flow)



Shows available energy and population limits.

Review & Assessment (Part 1: Recall)



1. **Multiple Choice:** Which of the following is an example of an autotroph?
a) A bear b) A fungus c) An algae d) A grasshopper
2. **True/False:** Autotrophs that live in places without sunlight can use hydrogen sulfide to make organic molecules.
3. **Matching (Concept to Definition):**
 1. Herbivore | A. Eats both plants and animals
 2. Carnivore | B. Eats only plants
 3. Omnivore | C. Preys on other heterotrophs
4. **Fill in the Blank:** A _____ is a model that shows how energy flows through an ecosystem in a single pathway.
5. **Multiple Choice:** What do the arrows in a food chain represent?
a) Which animal is larger b) The direction of energy flow c) The water cycle
d) Where the animals live

Review & Assessment (Part 2: Application)

6. **Classification:** A mockingbird eats both seeds and small insects. Classify the mockingbird as an autotroph or heterotroph, AND as a herbivore, carnivore, or omnivore.
7. **Short Answer:** Identify the primary difference in how detritivores (like worms) and decomposers (like fungi) break down dead organisms.
8. **Cause & Effect:** What would happen to the organic material and nutrients in an ecosystem if all decomposers and detritivores were removed?
9. **True/False:** Heterotrophs make up the first trophic level in all ecosystems.
10. **Application:** In a food chain consisting of a Flower -> Grasshopper -> Mouse -> Snake, from which organism does the mouse directly obtain its energy?

Review & Assessment (Part 3: Critical Thinking)

11. Math Connection: If the autotrophs at the base of an energy pyramid contain 10,000 units of energy, how much energy will be available to the primary consumers on the next trophic level?



12. Short Answer: According to the 10% rule, what happens to the remaining 90% of energy that is NOT transferred to the next trophic level?

13. Vocabulary: What scientific term is used to describe the total mass of living matter at each trophic level?

14. Critical Thinking: Why does an ecological pyramid of numbers typically get narrower at the top? (Explain in terms of energy).

15. Synthesis: Why is a food web a more accurate representation of an ecosystem than a simple food chain?

ANSWER KEY (Questions 1-8)

- ✓ 1. c) An algae
- ✓ 2. True
- ✓ 3. 1-B, 2-C, 3-A
- ✓ 4. food chain
- ✓ 5. b) The direction of energy flow
- ✓ 6. Heterotroph AND Omnivore

- ✓ 7. Detritivores eat fragments of dead matter, while decomposers release digestive enzymes to break them down.
- ✓ 8. The organic material and nutrients would not be broken down and made available to producers to reuse.

ANSWER KEY (Questions 9-15)

- ✓ **9.** False (Autotrophs make up the first level).
- ✓ **10.** The Grasshopper.
- ✓ **11.** 1,000 units (10% of 10,000).
- ✓ **12.** It is consumed by cellular processes (building cells/tissues) or released into the environment as heat.
- ✓ **13.** Biomass.
- ✓ **14.** The population sizes decrease because there is less energy available at higher trophic levels to support large numbers of organisms.
- ✓ **15.** Because most organisms feed on more than one species, making feeding relationships a complex network of interconnected pathways rather than a single line.



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