

Ecosystems

Part IV – Living World

Ecosystems

- **Definition:**

- a community of **living organisms interacting** with one another and with the **nonliving** components in their habitat.



4 Levels of Ecological Organization





Trophic Relationships

- Definition:
 - **feeding connections** among living organisms in an ecosystem
- 3 trophic levels:
 - **Producers**
 - **Consumers**
 - **Decomposers**

Producers (Autotrophs)

- Produce their own food through **photosynthesis**.
 - They need **sun** for the process to occur.
- They **introduce energy** into an ecosystem.

ex. Land: **trees, grass**

Water: **algae, phytoplankton**

Producers



Consumers (Heterotrophs)

- **Definition:**

- obtain their energy by **eating other living things**

- **Two types:**

- Primary or first order consumers
- Secondary or second order consumers

Primary Consumers

- **Feed on producers**
- Must be **herbivores**
 - Includes omnivores



Secondary (tertiary, etc) Consumers

- Carnivores that **feed on primary consumers** (herbivores/omnivores)
 - Note: Insectivores eat insects Considered carnivores
 - **Tertiary consumer** (third order consumer)
 - Feeds on secondary consumers
 - **Top order consumer**
 - Has no predator
- 

Secondary Consumers



Oh my!
Tertiary Consumers



Decomposers (Detritivores)

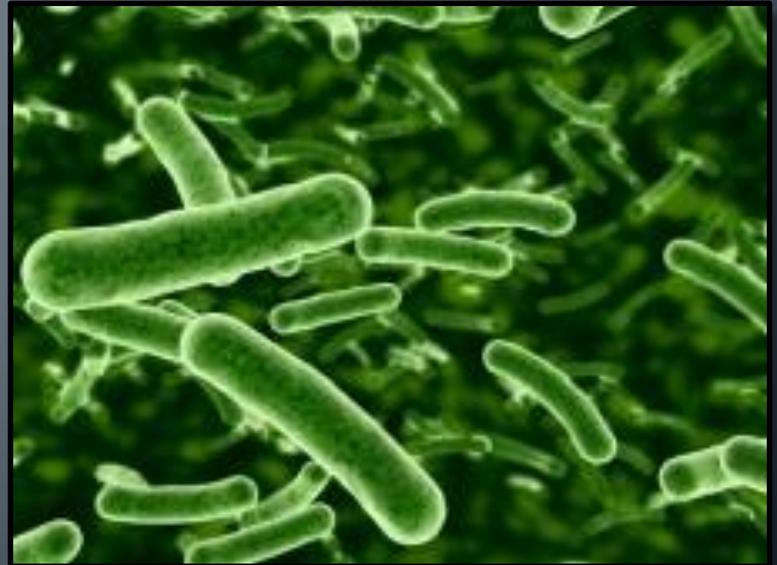


Means: detritus (waste) eaters

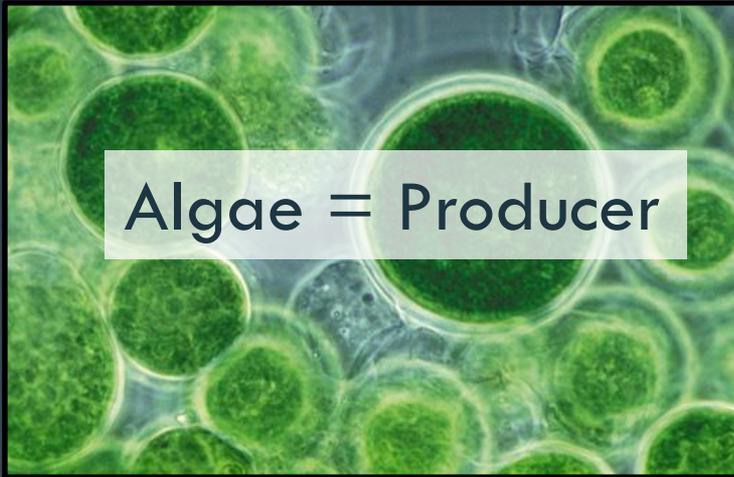
- feed on **detritus (dead organic matter)**
- **connected to all trophic** levels (everything dies)
- they are an essential component to completely **break down** an organism
- helps keep soil and environment healthy

Ex:

worms, bacteria, mushrooms and insects

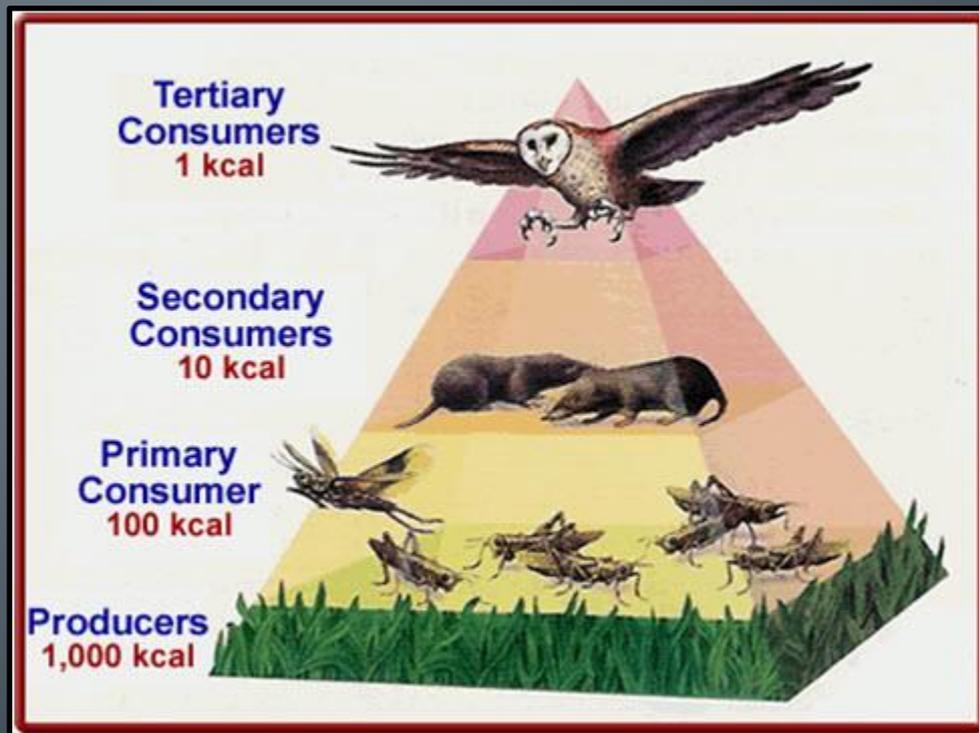


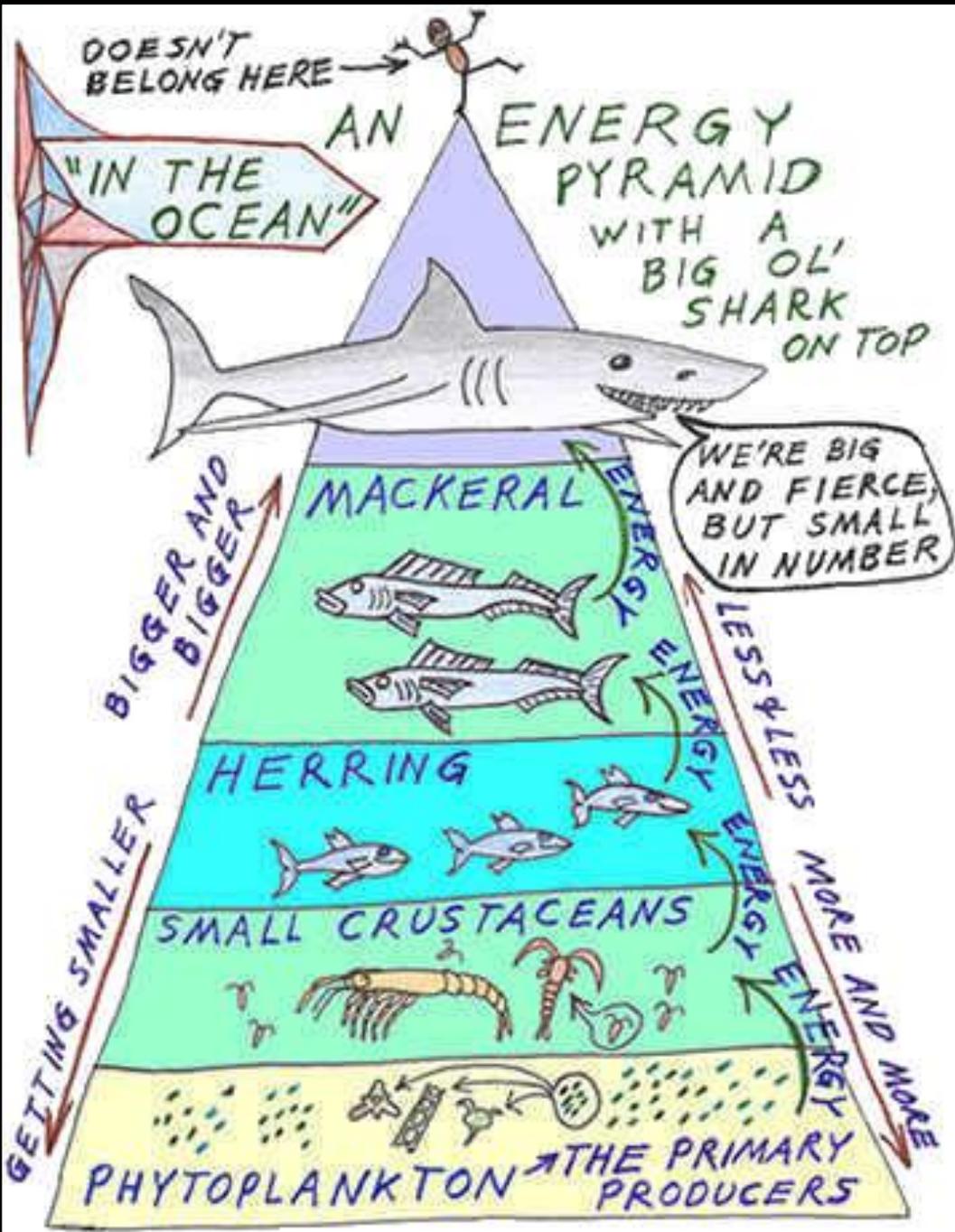
Review – Producer? Consumer? Decomposer?



Food Pyramid

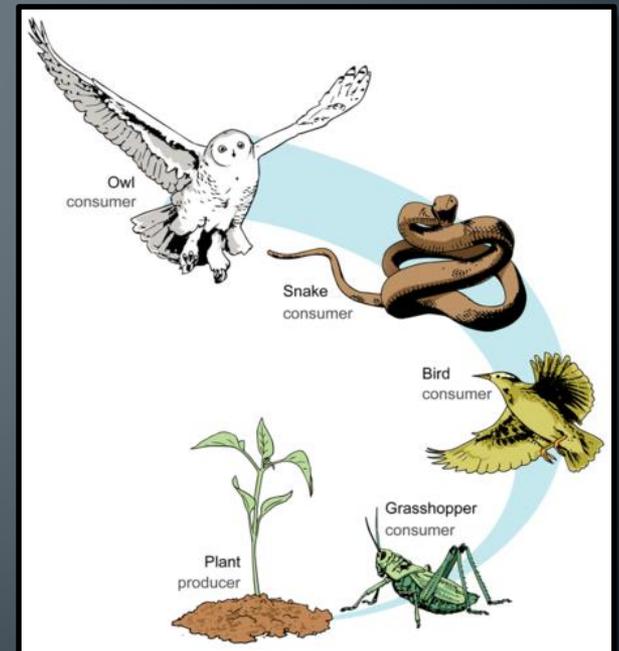
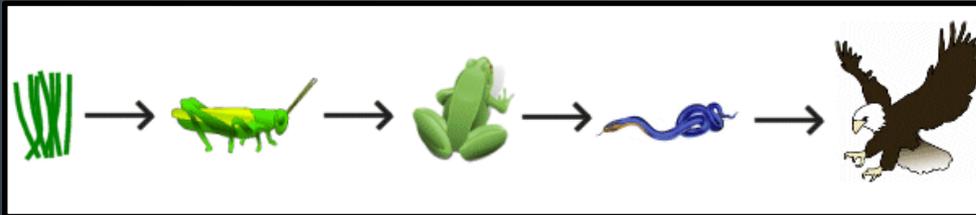
- Representing **predator-prey relationships**, in which various forms of life are shown on different levels, with **each level preying on the one below it.**





Food Chain

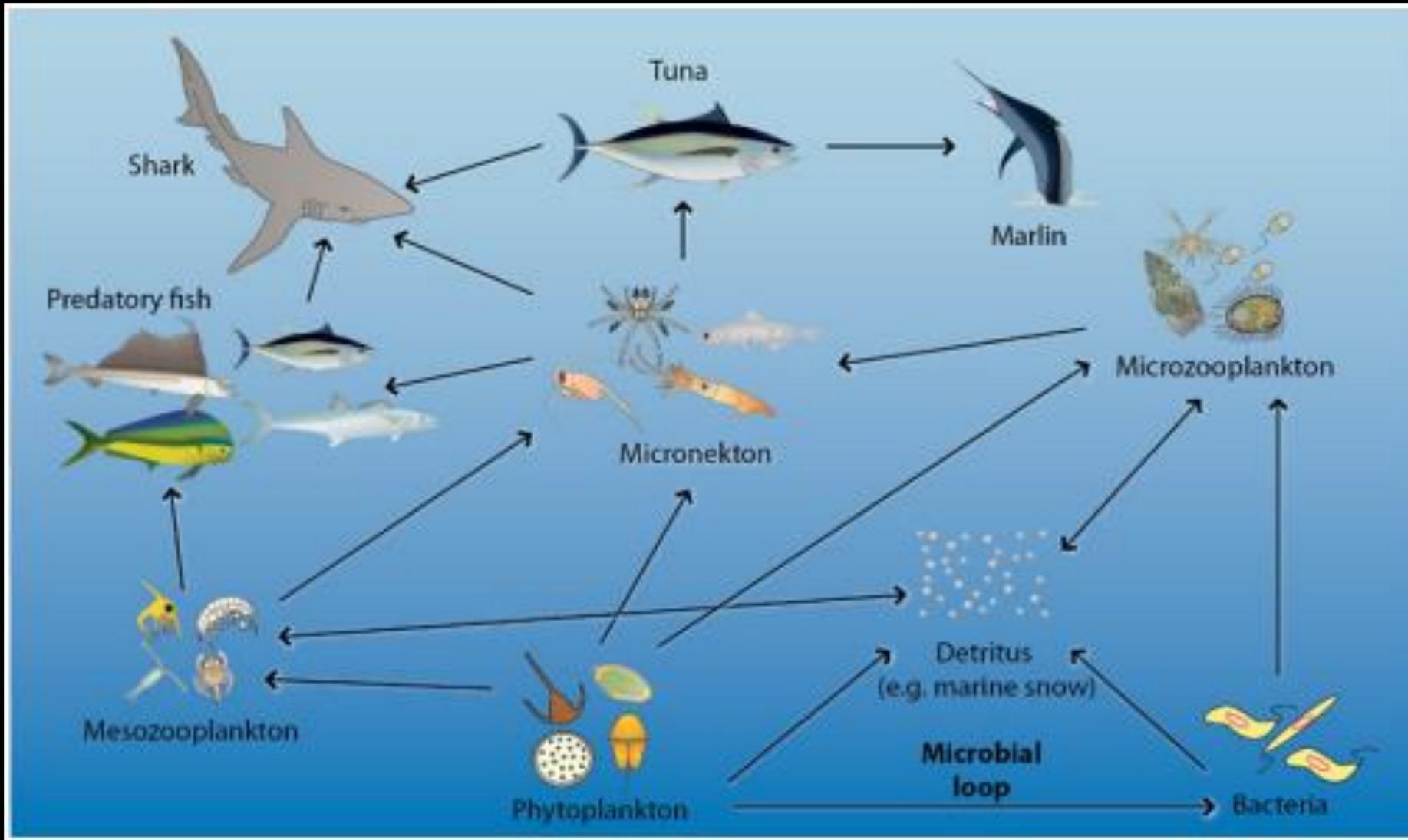
- A trophic relationship with a **straight feeding process**. **Decomposers** are part of each trophic level.

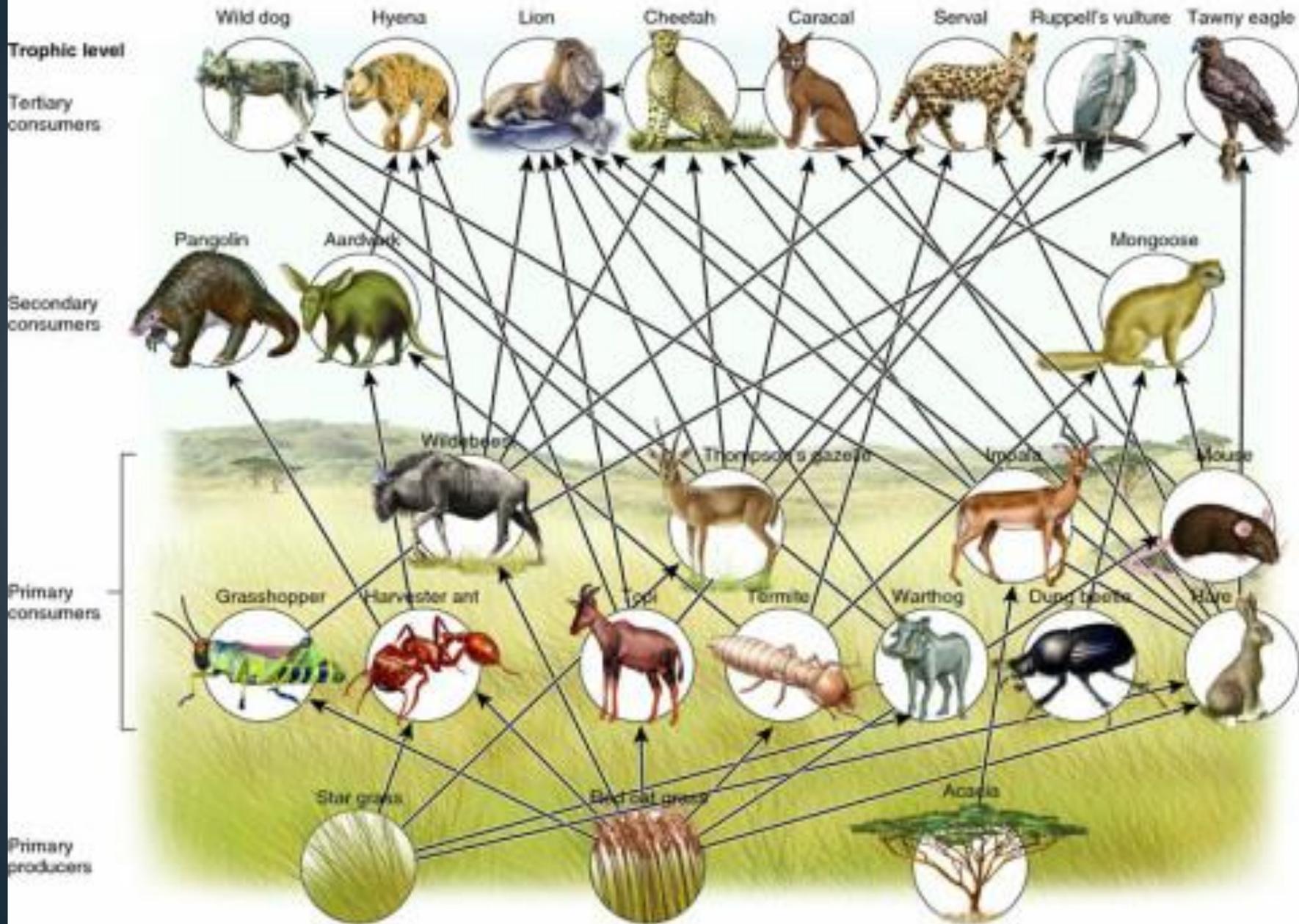


Food Web

- Trophic levels with **multiple feeding relationships**. Many food chains can be made from it.

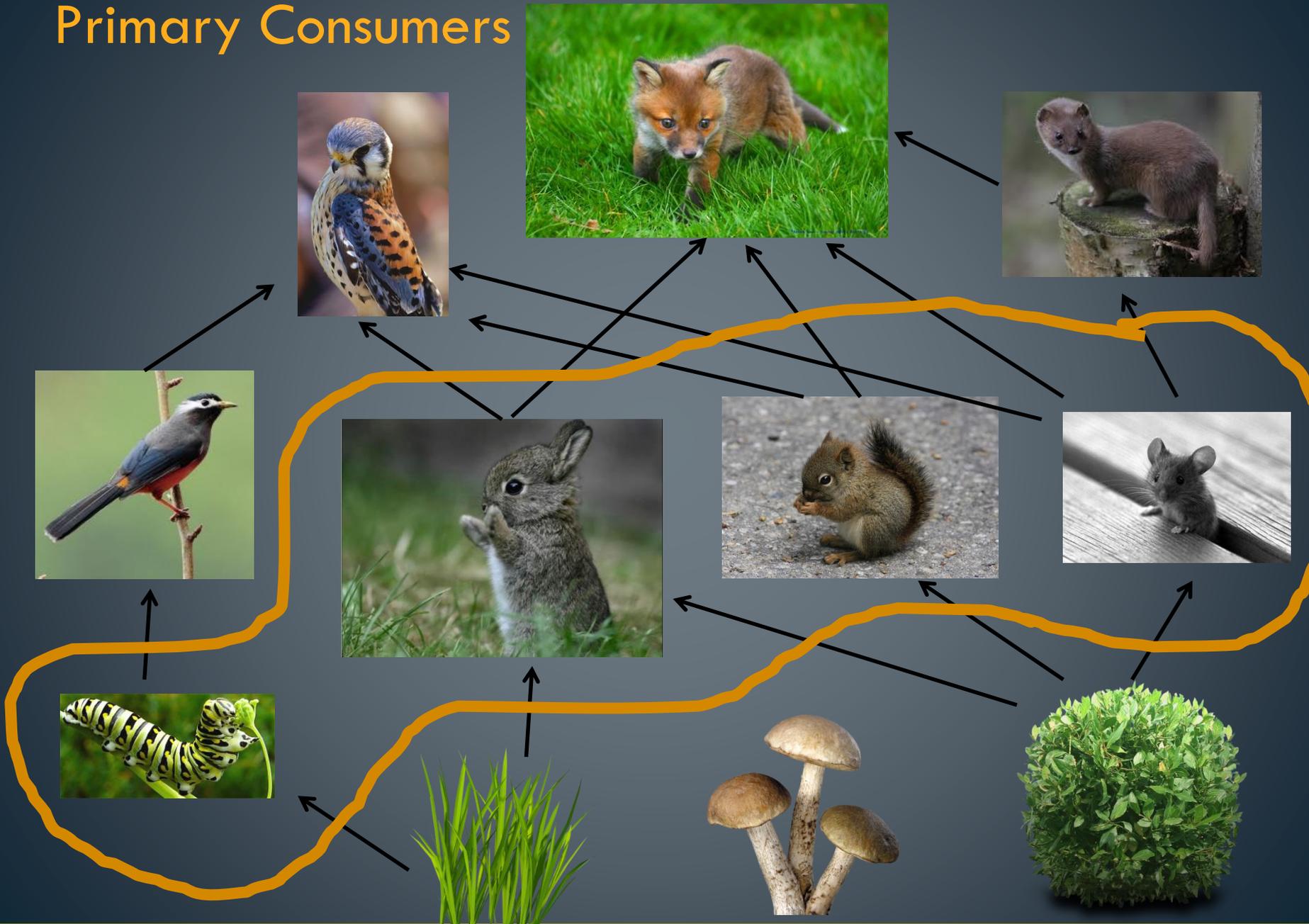
Notice the arrows go from the **prey to the predator**. They show energy transfer.



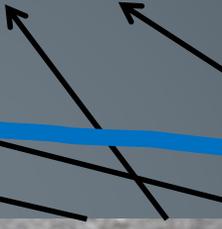
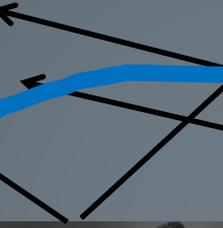
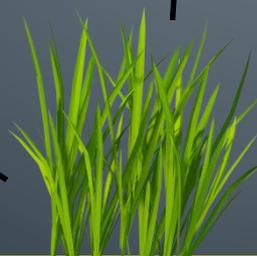


**Identify Primary,
Secondary and Tertiary
Consumers**

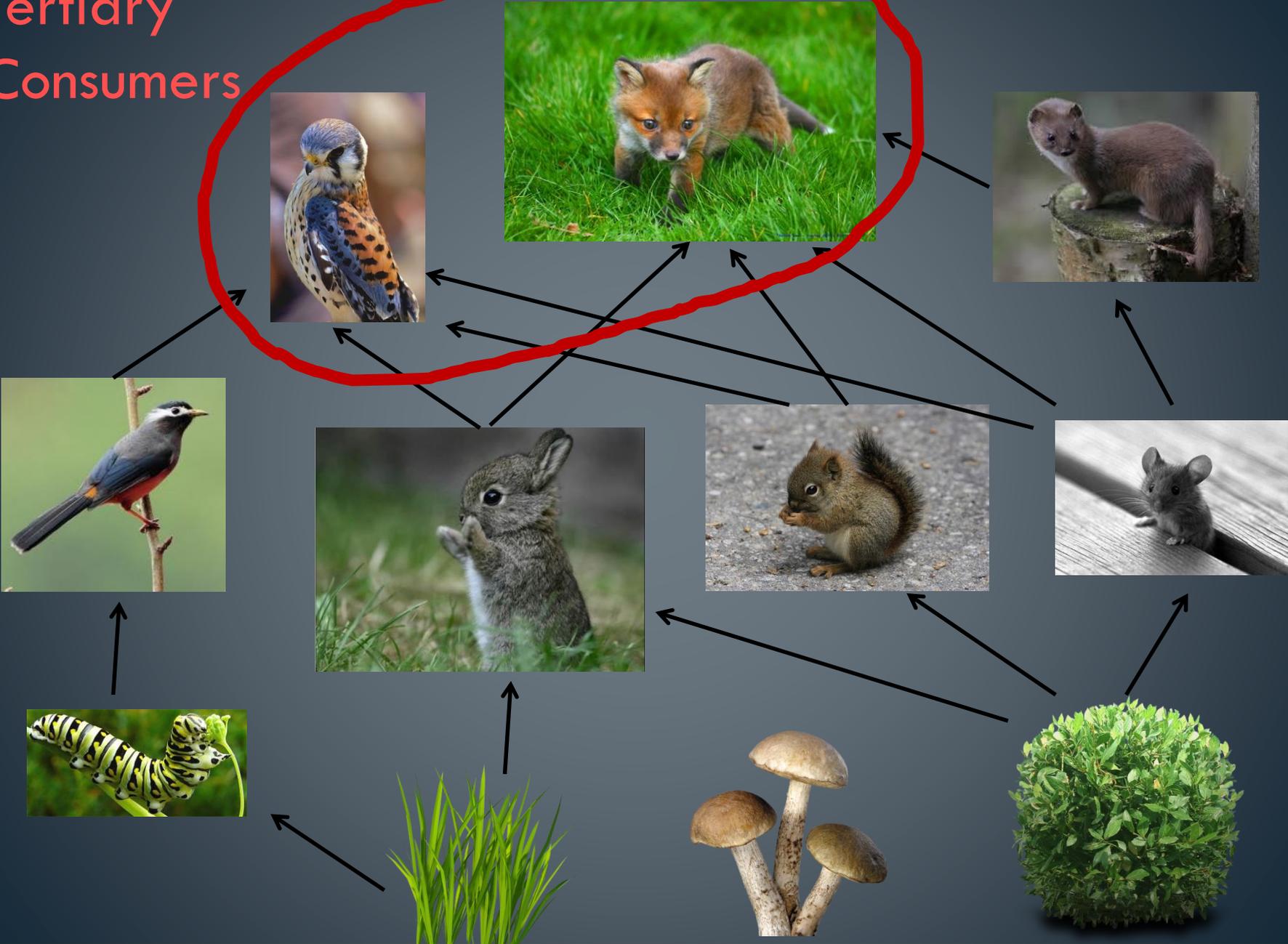
Primary Consumers



Secondary Consumers



Tertiary Consumers



Practice

- 1) Identify a:

producer - Bush, grass

primary consumer - Caterpillar, rabbit,
squirrel, mouse

secondary consumer - Thrush, fox, hawk,
weasel

tertiary consumer - Hawk, fox

Practice

- 2) What would happen to the # hawks if grass disappeared?

Decrease because caterpillars would die out, causing thrushes to die out

- 3) What would happen to # rabbits if grass disappeared?

Decrease because they have less food

Practice (cont'd)

- 4) What would happen if the hawks disappeared?

Increase in thrush and rabbits, decrease in grass and caterpillars

- 5) What would happen if the mouse disappeared?

Decrease in weasel, fox, hawk because lack food; increase in shrubs (no more predator) or increase in squirrels and rabbits (no more competition)

Practice (cont'd)

- 6) What often occurs when a predator or prey is taken out of a food web?

Causes changes in the food web;
affects biological cycles

- 7) Would you expect to find more weasels or foxes?

Weasels

Practice (cont'd)

- 8) How would you add the mushrooms into the web?

Decomposers

- 9) Make a food chain to the second order consumer.

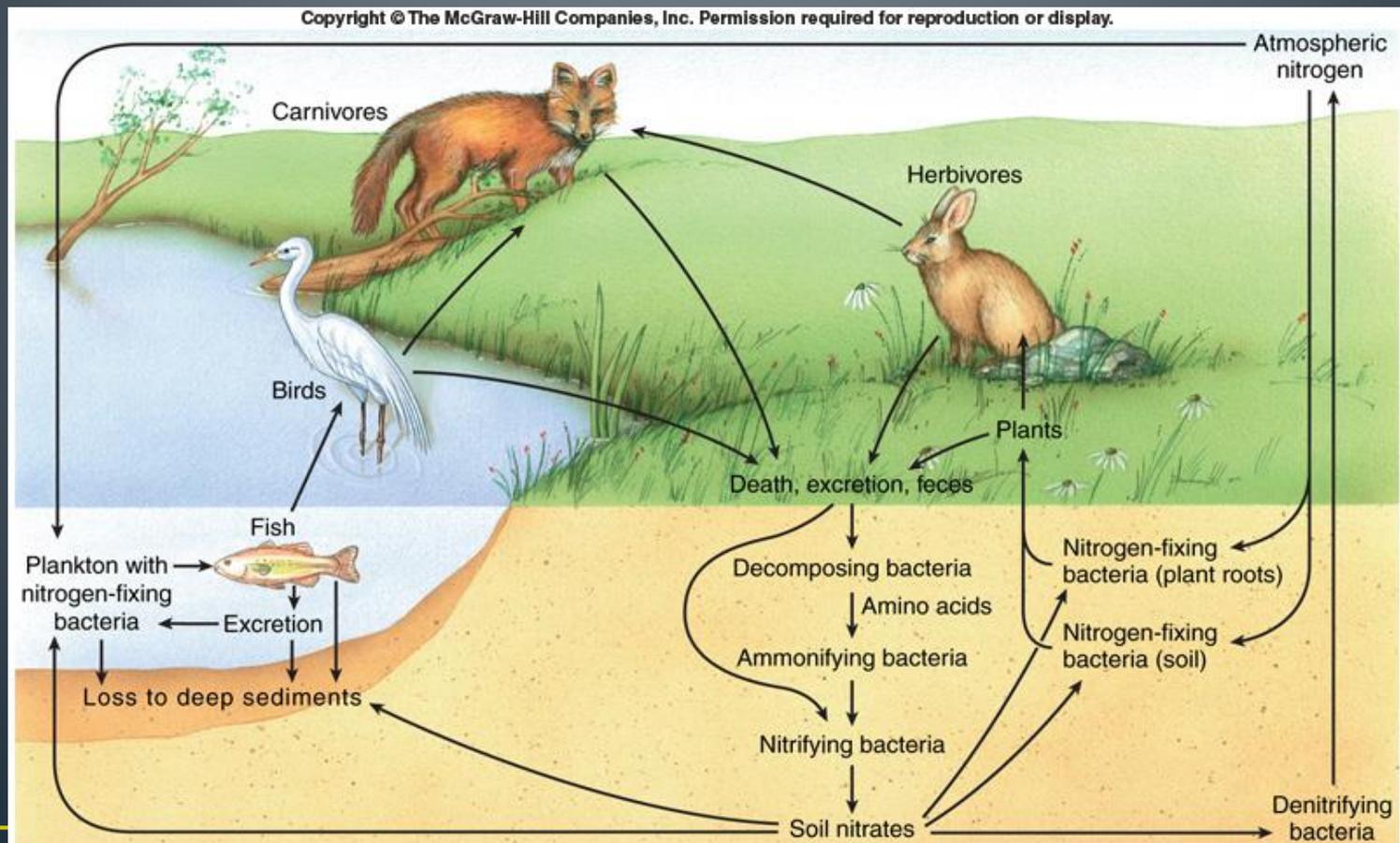
Grass -> caterpillar -> thrush

- 10) Make a food chain to the third order consumer.

Grass -> caterpillar -> thrush -> hawk

Chemical Recycling

- Decomposers make **inorganic matter** available by **breaking down organic matter**



Material and Energy Flow

- Energy **flows** in an ecosystem
- Only **10%** of the energy gained from food can actually be used **for growth and reproduction**
 - The other 90% of the energy gained will **be lost** through meeting the animal's daily needs (ex: **cellular respiration**) and **waste**

Material and Energy Flow

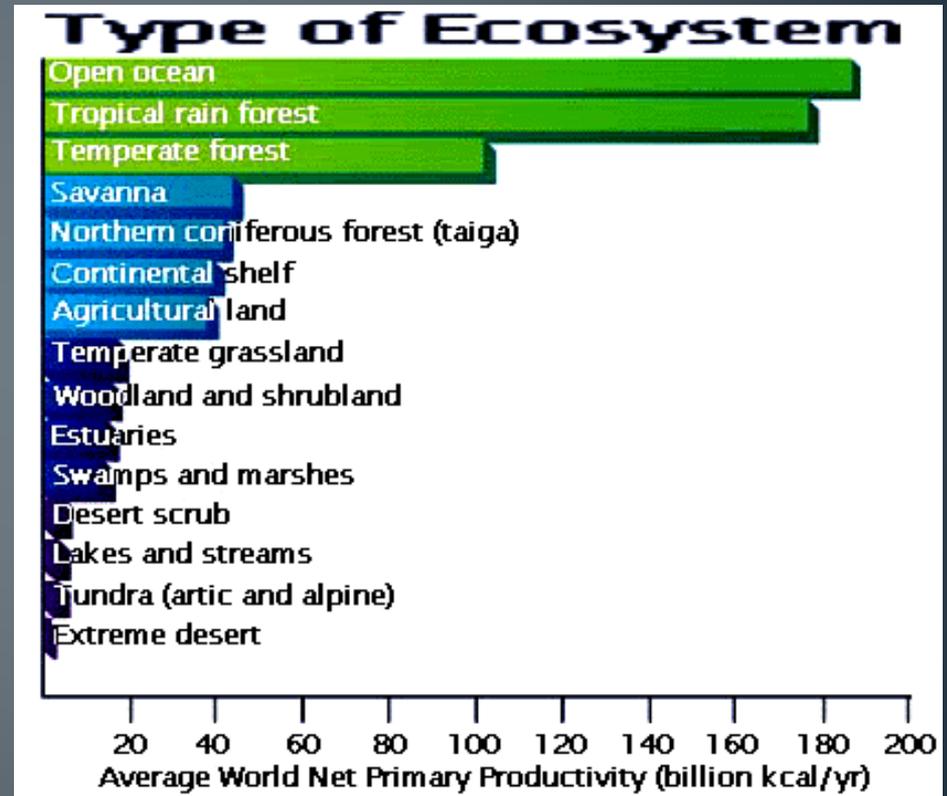
- Energy is **NOT** recycled in a food web
 - This means **new energy** from the sun is required

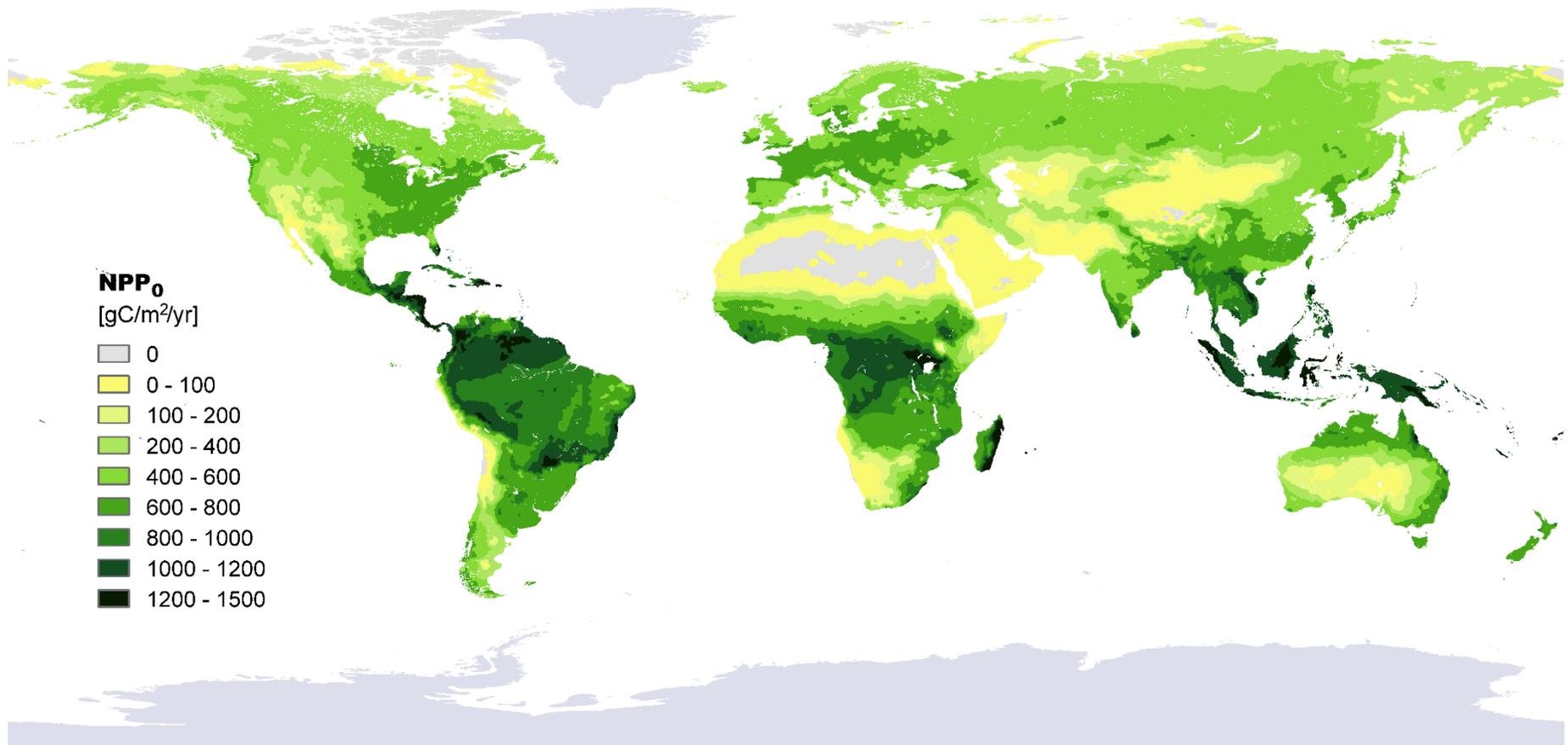
Primary Productivity

- Definition:
 - amount of **NEW biomass** created (by producers).
 - Depends on **light, water, nutrients and temperature.**

Biomass

- Definition:
 - the total mass of **organic matter** in an ecosystem (mass of all **living things**)





Disturbances

- an event that **damages an ecosystem**
- Two types:
 - 1- **natural disturbances**
 - 2- **human disturbances**

Natural Disturbances

- **Natural disturbances are:**
 - Events triggered by the **environment/nature**
 - Ex- storms, droughts, wildfires



Human Disturbances

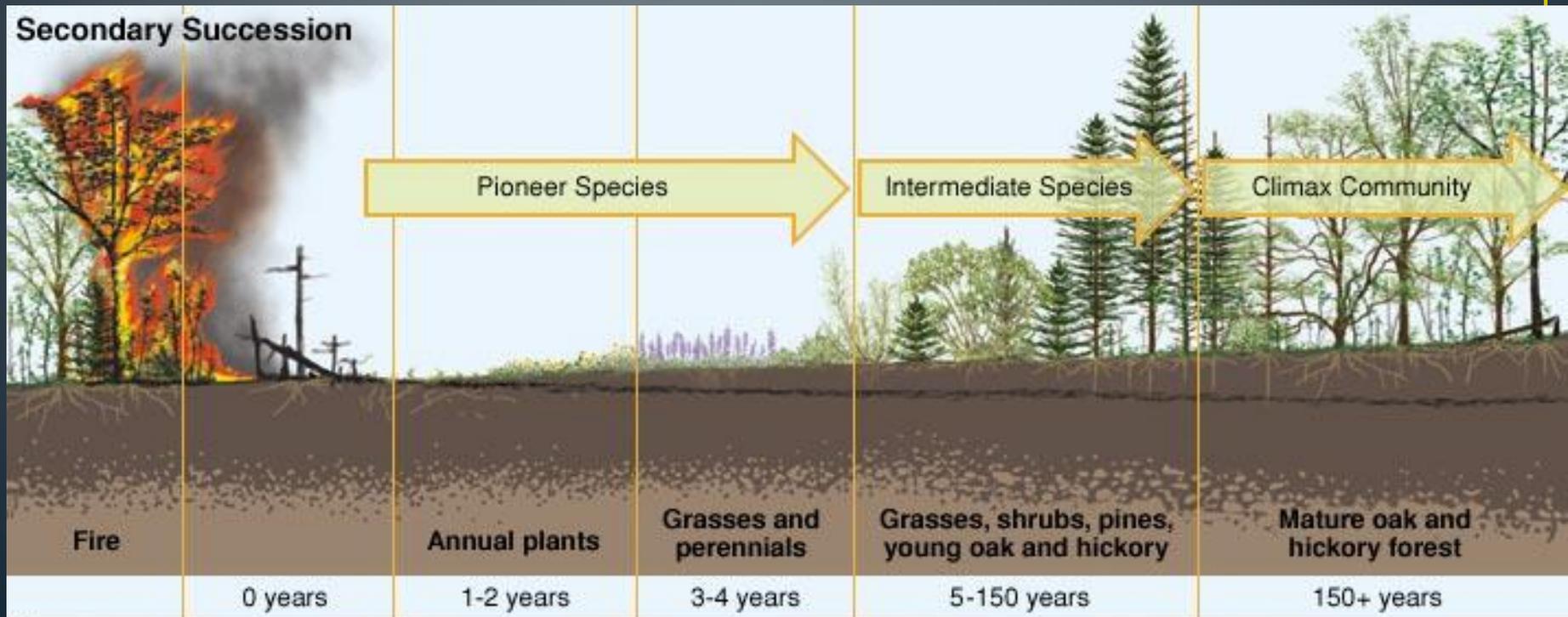
- **Human disturbances are:**
 - Disturbances triggered by **humans and their activities**
 - ex. logging, oil spills, mining





Ecological Succession

- All the **steps** necessary for an ecosystem to be stable again **after a disturbance** has occurred.



Past Exam Questions

- 1. The table below gives a list of disturbances. Some are natural, and others are the result of human activity.

Disturbances
1. Volcanic eruption
2. Acid rain
3. Snowstorm
4. Tree cutting
5. Forest fire

Which of these disturbances result from natural causes only?

A) 1, 2 and 3

B) 1 and 3

C) 1, 3, 4 and 5

D) 2 and 5

2. Four characteristics of certain living things are listed below:

1 – They are autotrophs.

2 – They are heterotrophs.

3 – They transform organic matter into inorganic matter.

4 – They transform inorganic matter into organic matter.

Which of the above characteristics can be associated with producers?

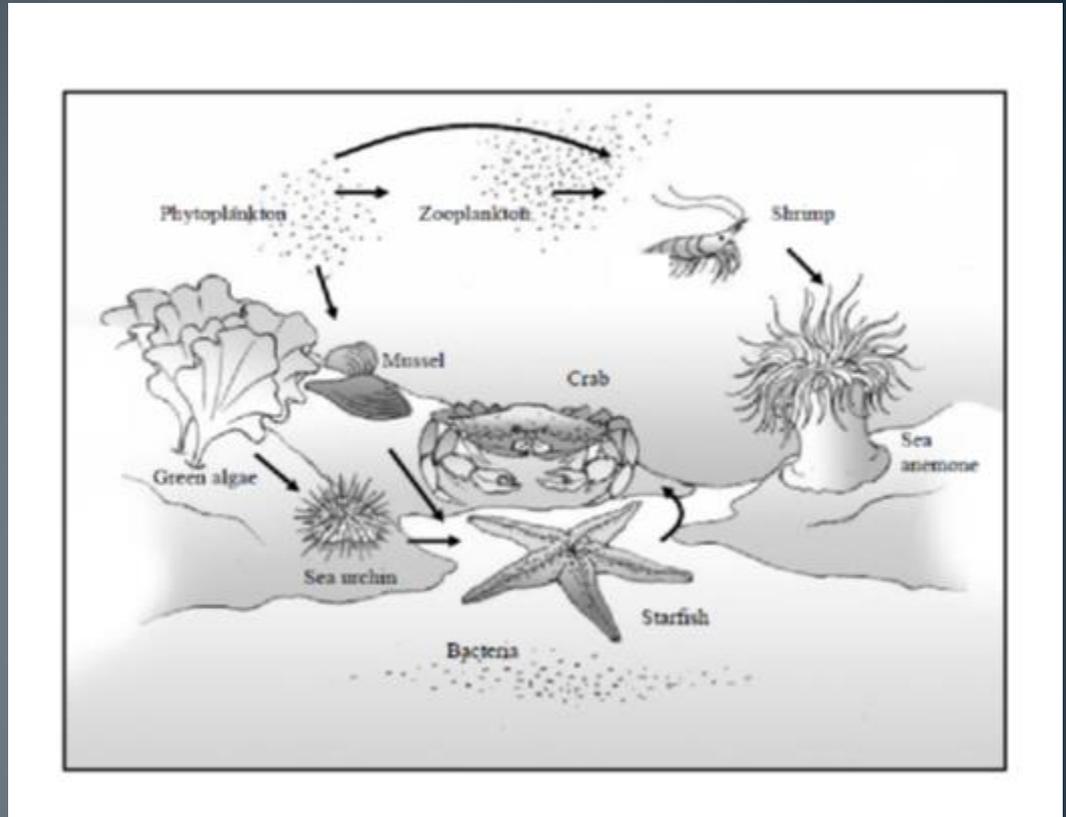
A) 1 and 3

B) 1 and 4

C) 2 and 3

D) 2 and 4

- 3. Biologists have noticed a rapid decline in the sea anemone population of the estuary near Grand Island. At first, they thought this was caused by abiotic factors, but they discovered that the direct cause of this rapid decline is a new type of fungus affecting sea anemones only.



In the short term, what impact is this disturbance likely to have on the zooplankton population?

Zooplankton population will decrease because there are no longer as many sea anemones to eat the shrimp that prey on them

