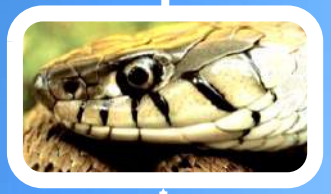




FOOD CHAINS, TROPHIC LEVELS & ECOLOGICAL PYRAMIDS





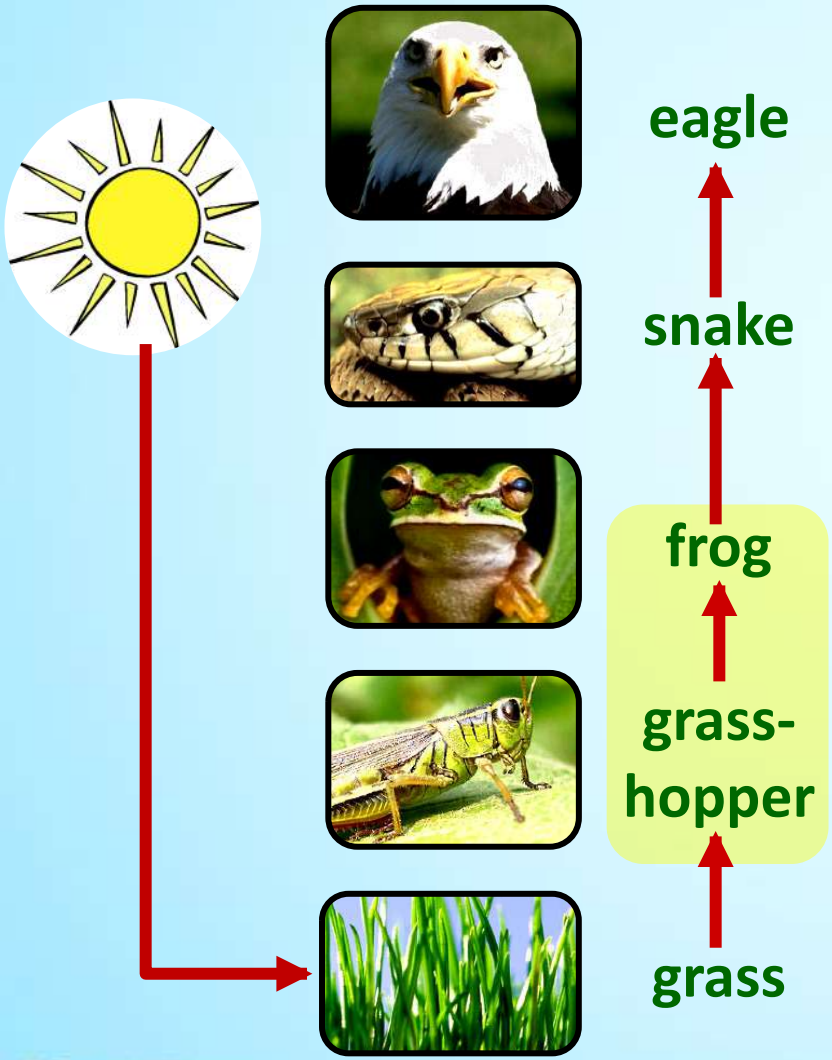
CONCEPTS EXPLORED IN THIS LESSON

1) Introduction to Food Chains
2) Food Chains
3) Humans and Food Chains
4) Food Webs
5) Trophic Levels
6) Ecological Pyramids

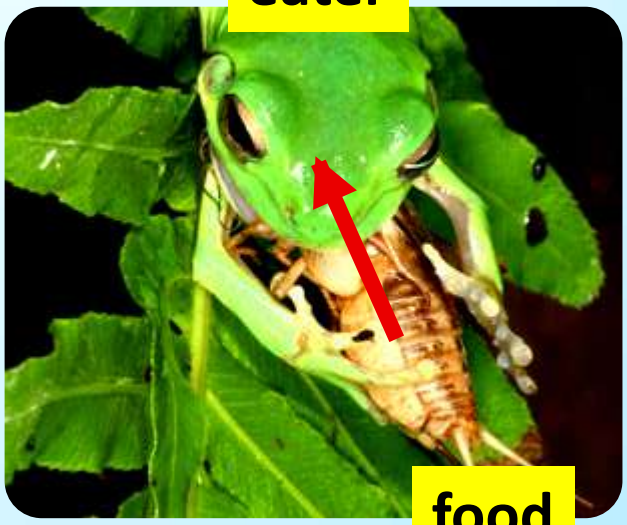
INTRODUCTION TO FOOD CHAINS

Food Chain: is a sequence of feeding relationships describing which organism eats another.

The Sun is the source of energy for food chains.



Keep in mind that the arrow tip always points towards the "eater".



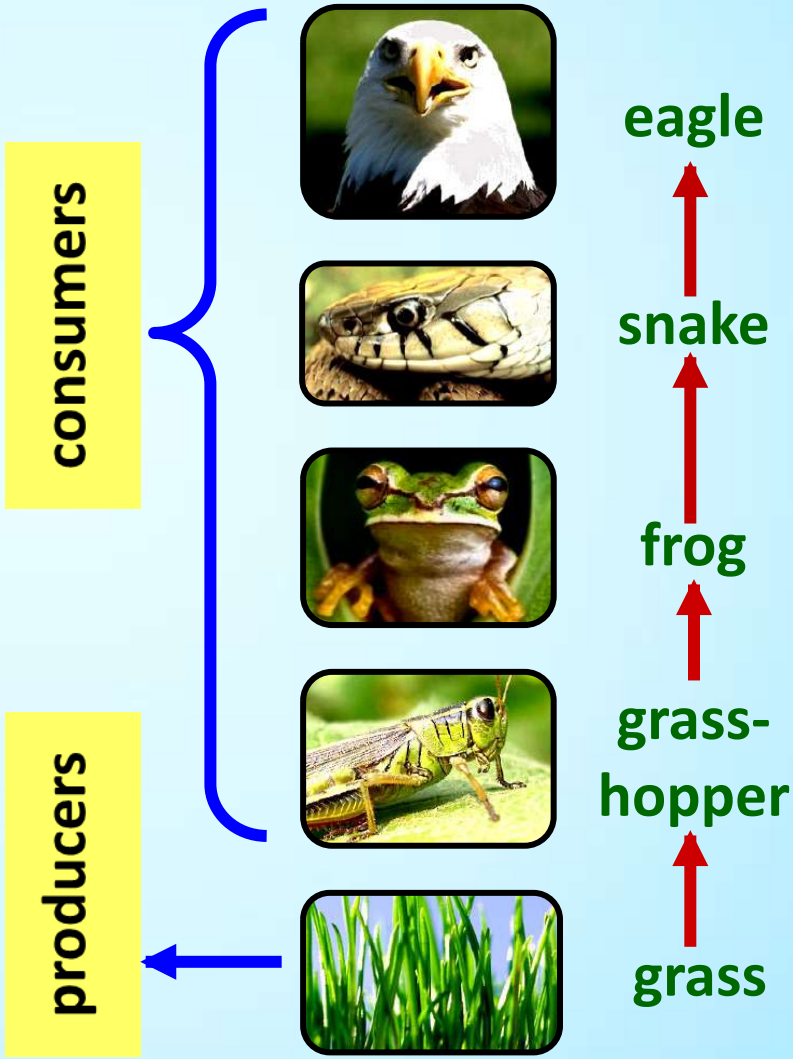
INTRODUCTION TO FOOD CHAINS

Label and write descriptions on your food chain diagram.

Since they **cannot** make their own food, they must eat or "**consume**" other organisms.

They form the **basis** of all **terrestrial** food chains.

They use the energy in **sunlight** to make their own food through a process called **photosynthesis**.



FOOD CHAINS

There are different levels of consumers…..

Top carnivore: any organism that is **not hunted** by any other. It's at the **top** of its food chain.

consumers

producers

eagle *quaternary consumer*

The **4th** consumer in a food chain.

It eats **tertiary consumers**.

snake *tertiary consumer*

The **3rd** consumer in a food chain.

It eats **secondary consumers**.

frog *secondary consumer*

The **2nd** consumer in a food chain.

It eats **primary consumers**.

grass-hopper *primary consumer*

The **1st** consumer in a food chain.

It eats **producers**.

grass

FOOD CHAINS

All organisms eventually die and decompose.

consumers

producers

eagle

snake

frog

grass-hopper

grass

detritus

decomposers

nutrients

The cycle restarts.

Detritus: is the **waste matter** of living organisms and the **remains** of dead organisms.

Decomposers: are organisms that **eat detritus** and break it down into **nutrients**.

Nutrients: are substances needed for an organism's **growth** and **repair**.

FOOD CHAINS

Food chains can occur in aquatic ecosystems.

consumers

producers

top carnivore

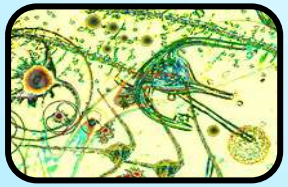
killer whale

shark

larger fish

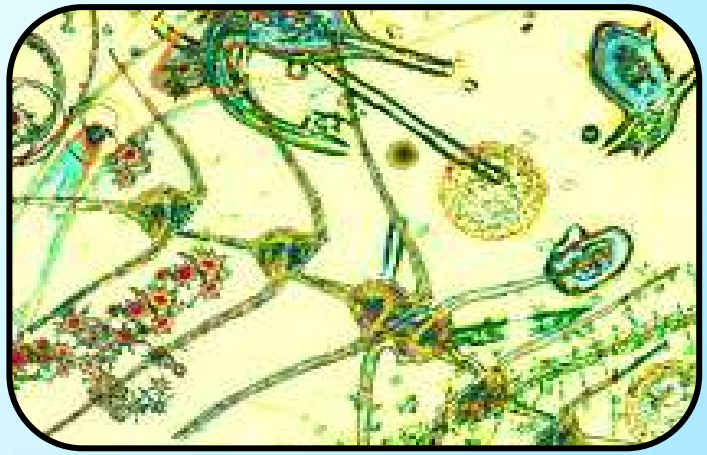
small fish

zooplankton



phytoplankton

Marine food chains start with microscopic aquatic organisms called phytoplankton that can perform photosynthesis to make their own food.



FOOD CHAINS

Food chains can occur in aquatic ecosystems.

Hydrothermal Vent

How could a food chain start without sunlight and photosynthesis?

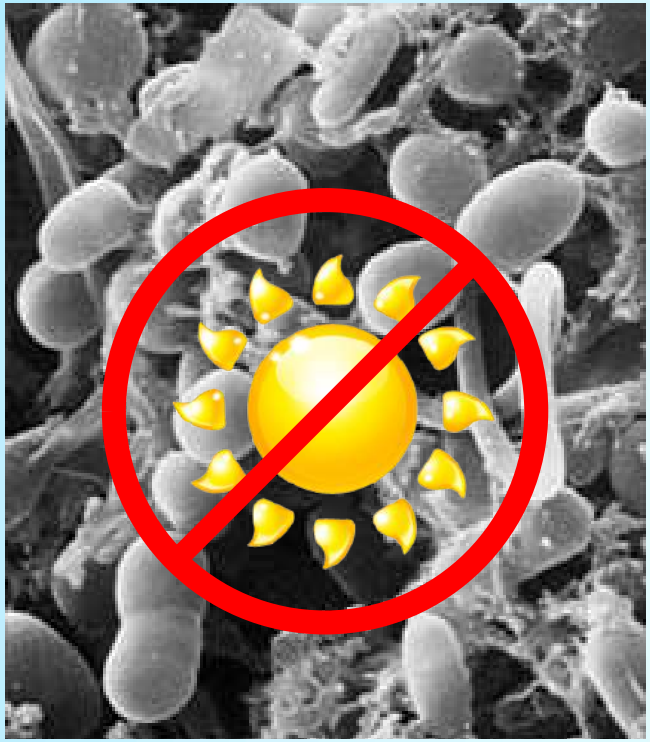
Though most aquatic food chains start off with photosynthetic phytoplankton that get their energy from the sun, there are exceptions.

In the 1970s, scientists discovered deep sea hydrothermal vents in the ocean which were too deep for sunlight to reach.

Here they found new types of bacteria that could generate energy using the sulfides found in the vents.

FOOD CHAINS

Food chains can occur in aquatic ecosystems.



Chemoautotrophic Bacteria in Hydrothermal Vents

How could a food chain start without sunlight and photosynthesis?

Though most aquatic food chains start off with photosynthetic phytoplankton that get their energy from the sun, there are exceptions.

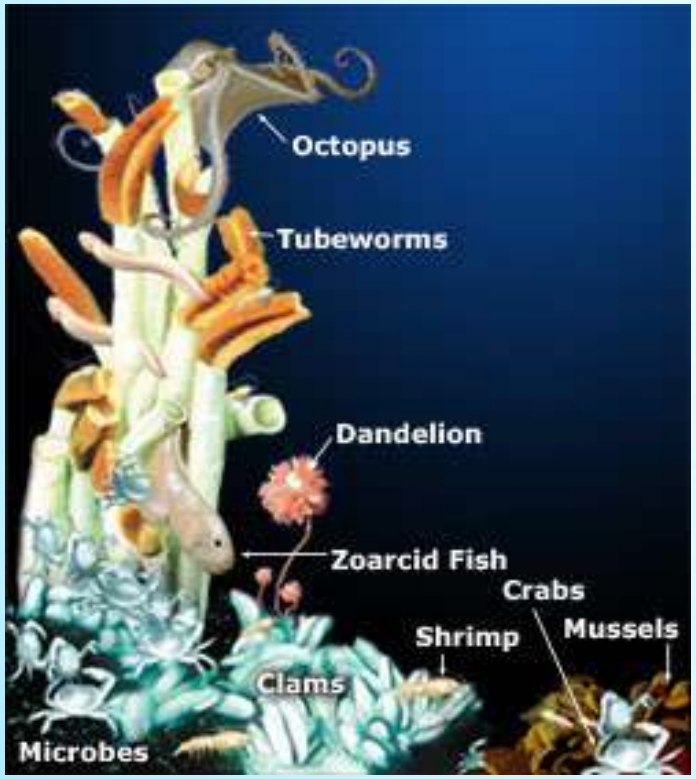
In the 1970s, scientists discovered deep sea hydrothermal vents in the ocean which were too deep for sunlight to reach.

Here they found new types of bacteria that could generate energy using the sulfides found in the vents. They didn't need the sun for energy.

FOOD CHAINS

Food chains can occur in aquatic ecosystems.

Bacteria in these vents form the basis of vent food chains in the same way as **phytoplankton** and **plants** do in other ecosystems.

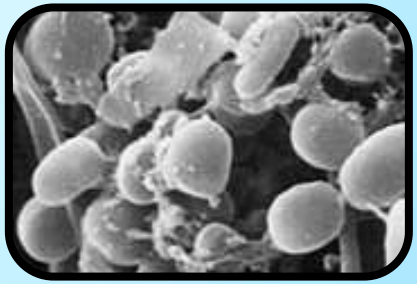


Hydrothermal Vent Organisms

octopus
secondary consumer

crab
primary consumer

chemo-autotrophic bacteria
producer

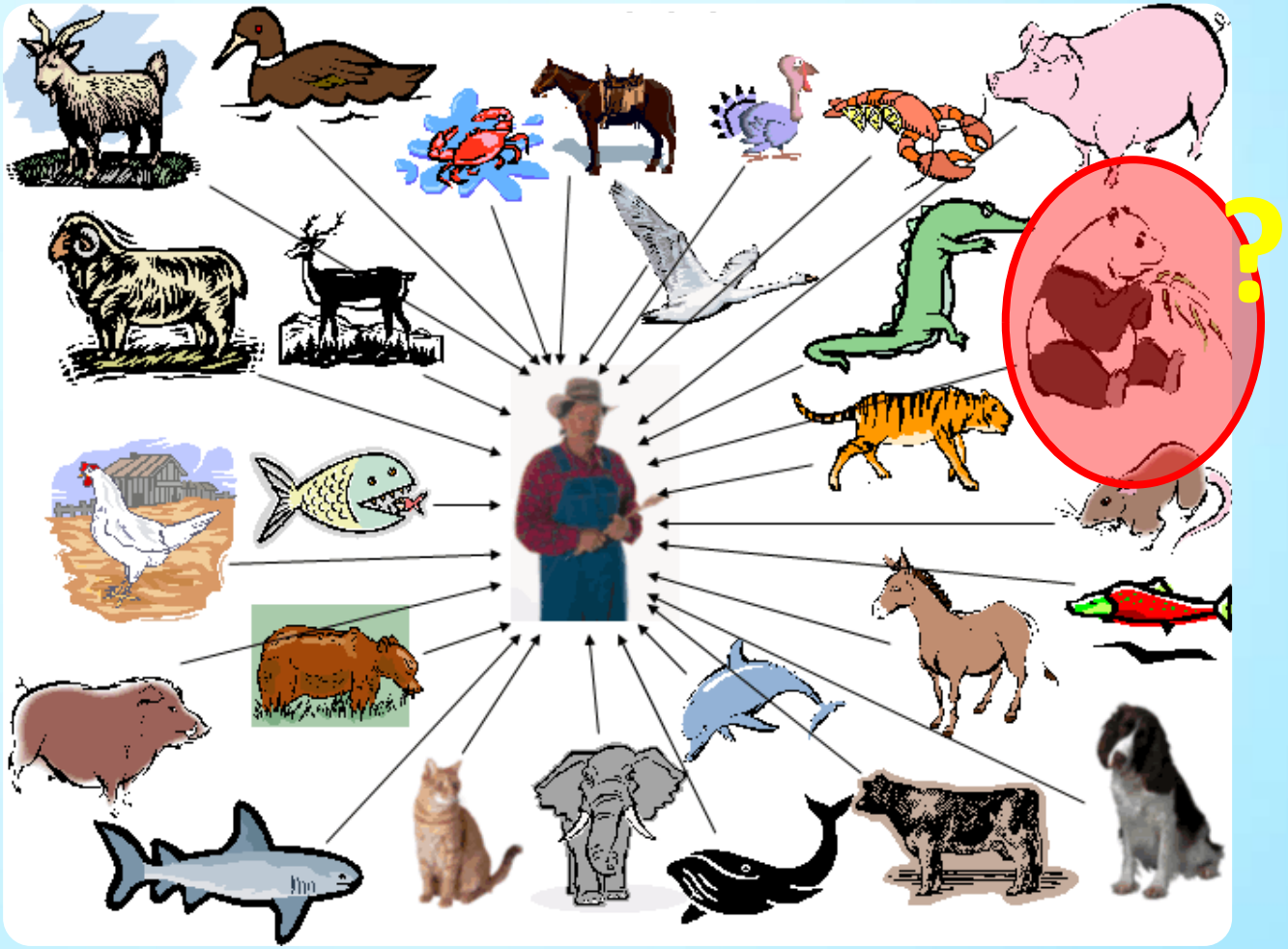


HUMANS AND FOOD CHAINS

Since humans are not hunted for food by any other animal, and since humans eat almost anything, (well maybe not this) this makes us top carnivores.

Where are humans on any food chain?

Count how many of these animals you've eaten in your life.



HUMANS AND FOOD CHAINS

Have you ever eaten one of these?

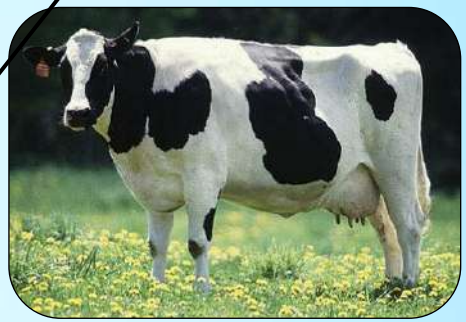
What is it made of?

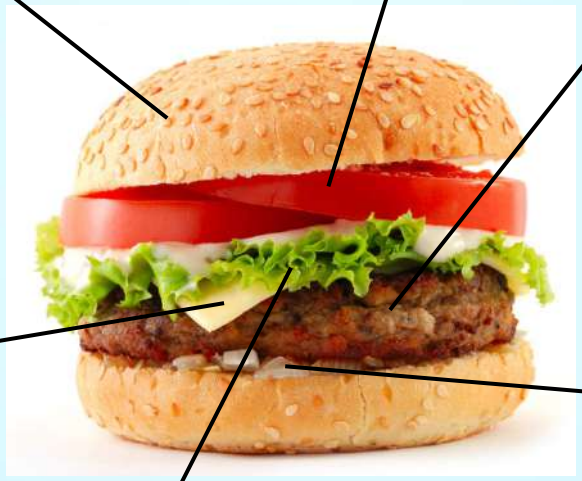
What food chains did you participate in when you ate this?

wheat

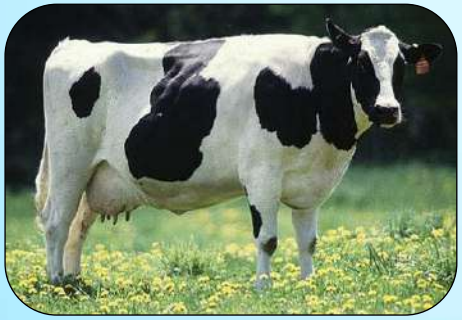
tomato

beef





cheese



onion

lettuce

HUMANS AND FOOD CHAINS


human

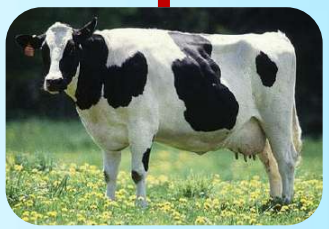

human


human


human


human

Humans are mainly primary consumers because we eat a lot of plants. When we eat animals, they are usually herbivores , so this makes us also secondary consumers.


cow


wheat


lettuce


onion


tomato

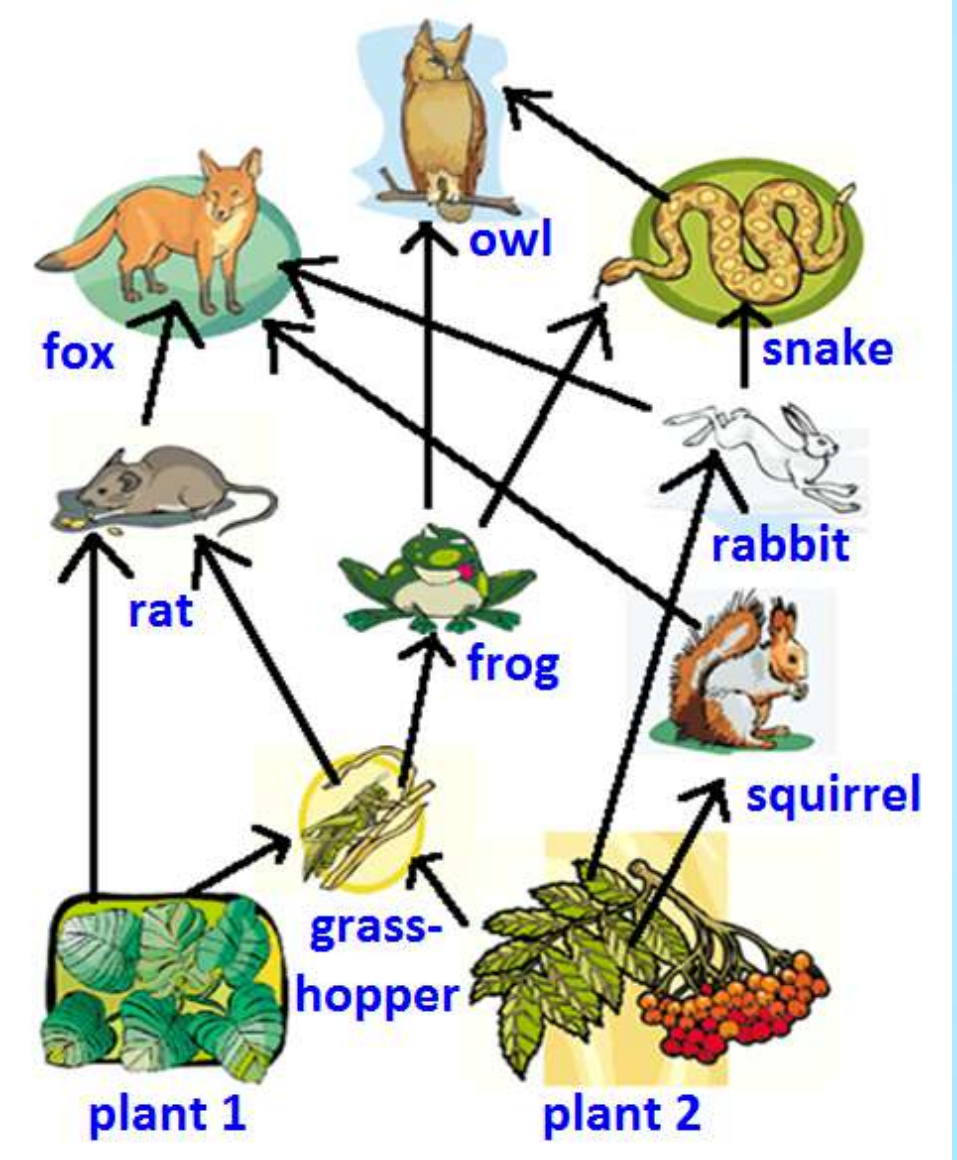

grass

FOOD WEBS

No ecosystem is only made up of only one food chain.

Members of one food chain usually also belong to another.

When you put all the interconnecting food chains in an ecosystem together, you form a food web.



TROPHIC LEVELS

Trophic Level: It is the **position** an organism occupies in a food chain. Each **link** in the chain represents one trophic level.





eagle

snake

frog

grass-hopper

grass

On land, the first trophic level begins with **plants**.

In the water, the first trophic level begins with **phytoplankton**.

shark

larger fish

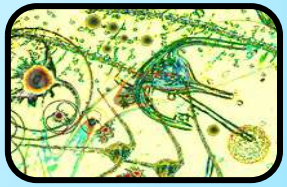
small fish

zooplankton

phytoplankton



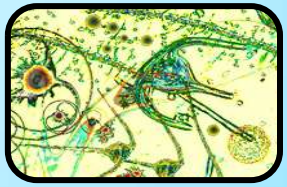




TROPHIC LEVELS

Trophic Level: It is the **position** an organism occupies in a food chain. Each **link** in the chain represents one trophic level.

eagle	5th trophic level	shark
snake	4th trophic level	larger fish
frog	3rd trophic level	small fish
grass-hopper	2nd trophic level	zooplankton
grass	1st trophic level	phytoplankton



TROPHIC LEVELS

eagle 0.1 kcal

- 0.9 kcal

snake 1 kcal

- 9 kcal

frog 10 kcal

- 90 kcal

grass-hopper 100 kcal

- 900 kcal

grass 1000 kcal

As organisms eat one another, energy is transferred up the food chain.

However, as energy is moved from one trophic level to the next, only 10 % of the energy makes it to the next level.

This 10 % is used to build biomass as well as to fuel bodily functions.

This means that 90 % of the energy is lost, mostly in the form of detritus and as heat from metabolic processes.

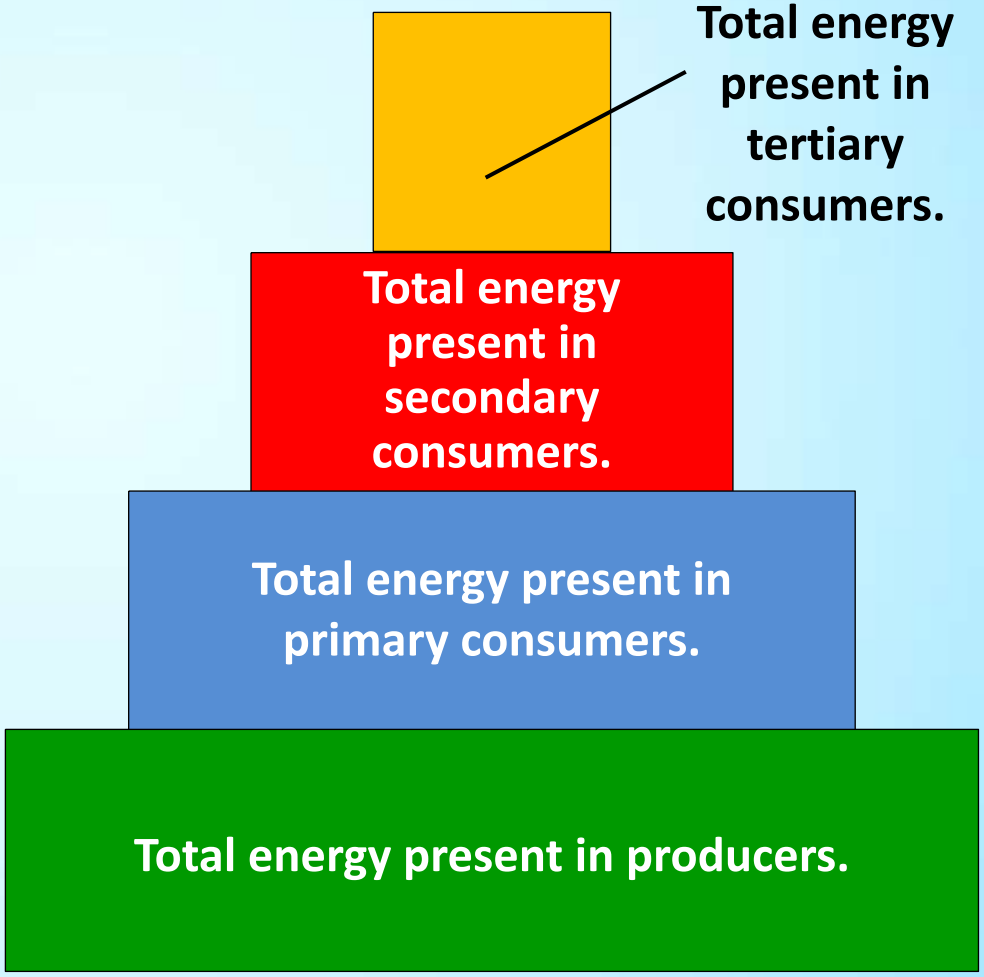
ECOLOGICAL PYRAMIDS

Ecological Pyramids: These are diagrams that represent each trophic level according to its **energy**, **biomass** or **population**.

1) Pyramid of Energy:

This pyramid indicates the amount of **energy** that is present in each trophic level.

The amount of energy **always decreases** as you move up trophic levels.



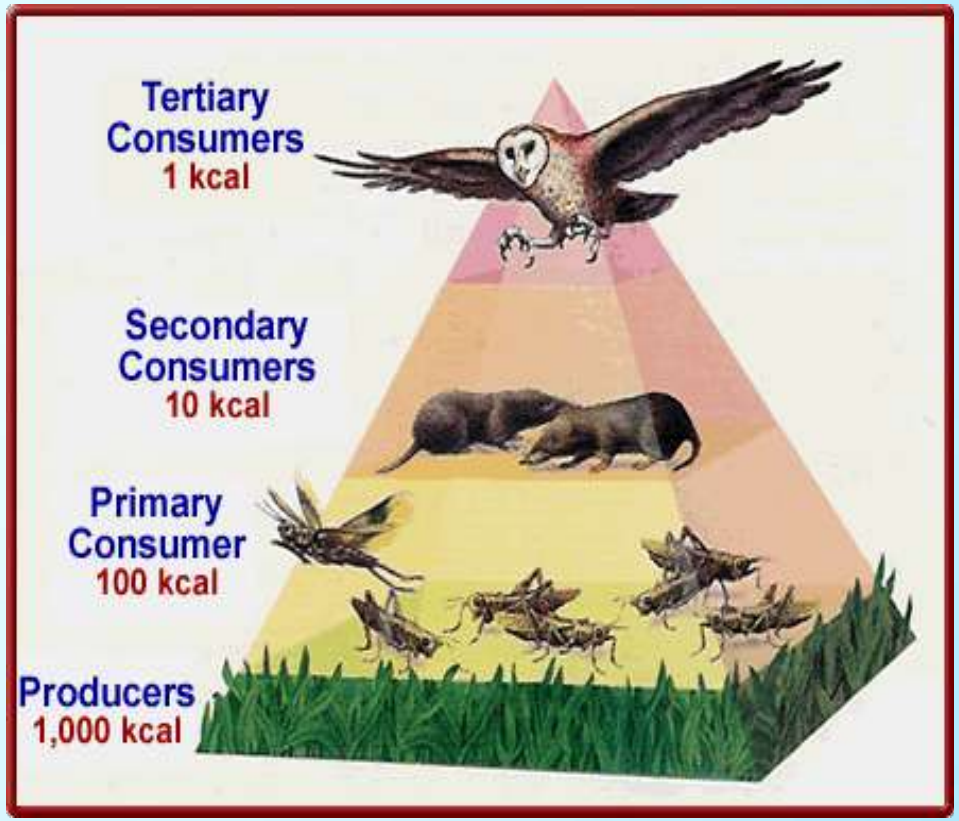
ECOLOGICAL PYRAMIDS

Ecological Pyramids: These are diagrams that represent each trophic level according to its **energy** , **biomass** or **population**.

1) Pyramid of Energy:

This pyramid indicates the amount of **energy** that is present in each trophic level.

The amount of energy **always decreases** as you move up trophic levels.



ECOLOGICAL PYRAMIDS

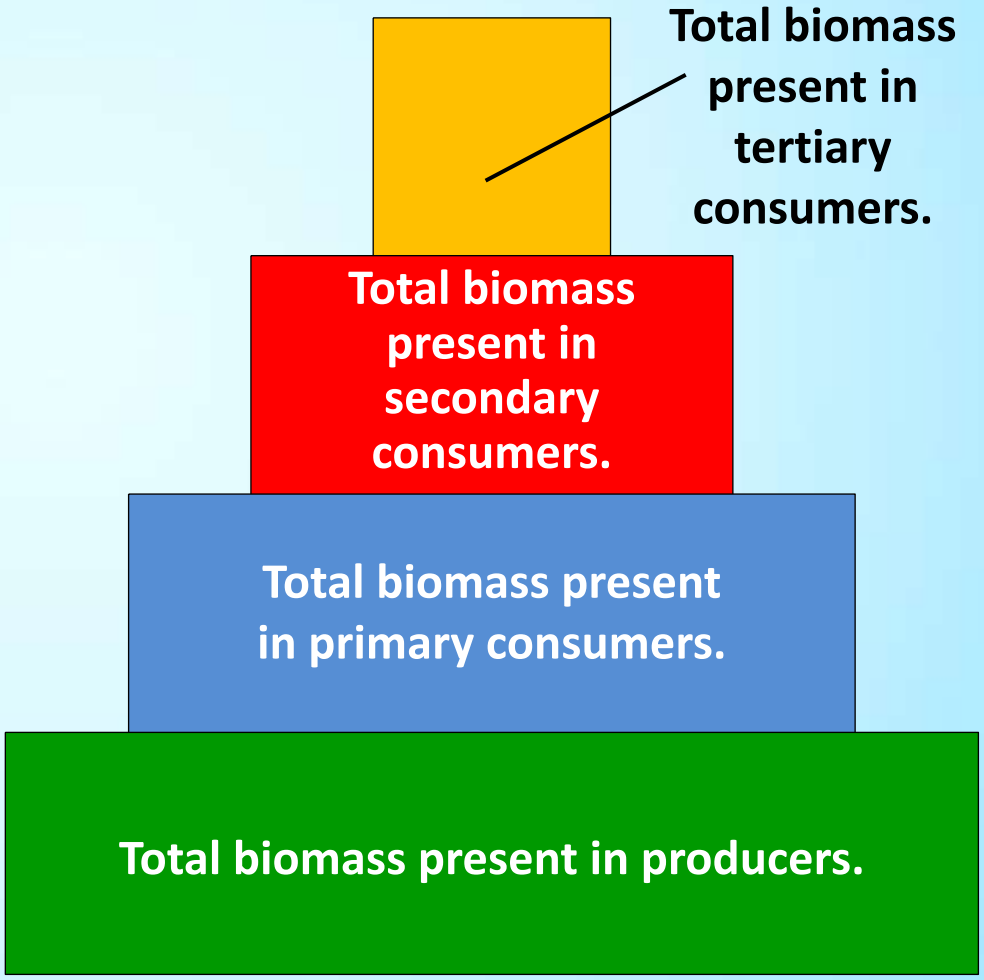
Ecological Pyramids: These are diagrams that represent each trophic level according to its **energy** , **biomass** or **population**.

2) Pyramid of Biomass:

This pyramid indicates the amount of **biomass** that is present in each trophic level, in a given area.

Biomass is the amount of **dry matter** (without water) within organisms.

On land, the amount of biomass **decreases** as you move up trophic levels.



ECOLOGICAL PYRAMIDS

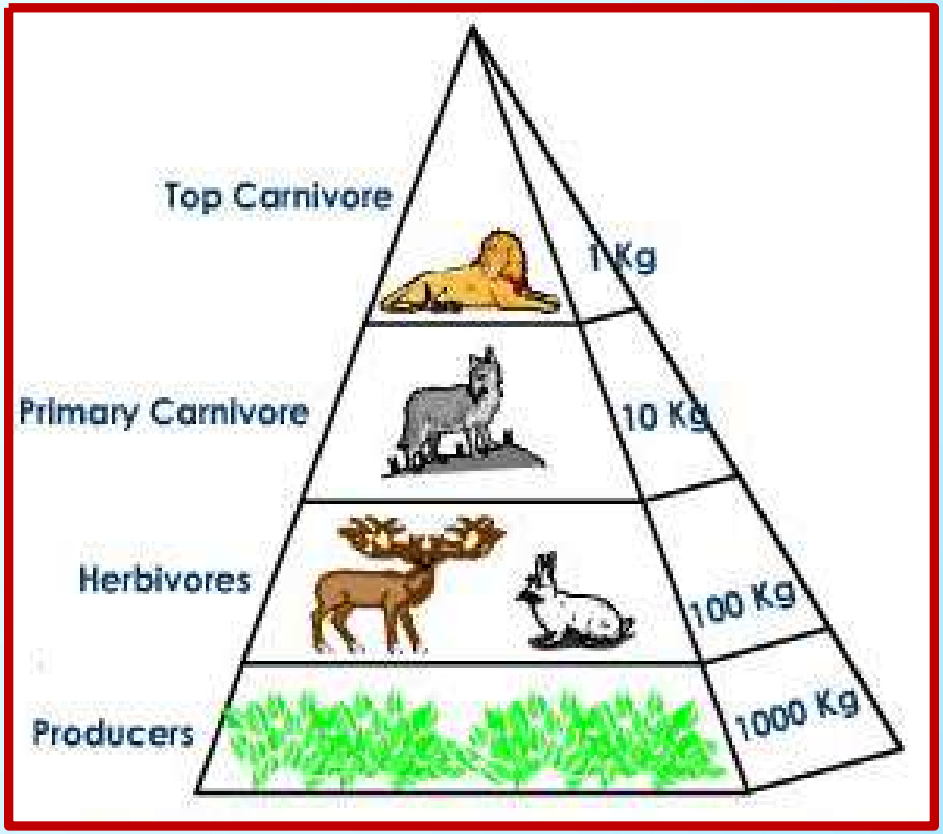
Ecological Pyramids: These are diagrams that represent each trophic level according to its **energy** , **biomass** or **population**.

2) Pyramid of Biomass:

This pyramid indicates the amount of **biomass** that is present in each trophic level, in a given area.

Biomass is the amount of **dry matter** (without water) within organisms.

On land, the amount of biomass **decreases** as you move up trophic levels.



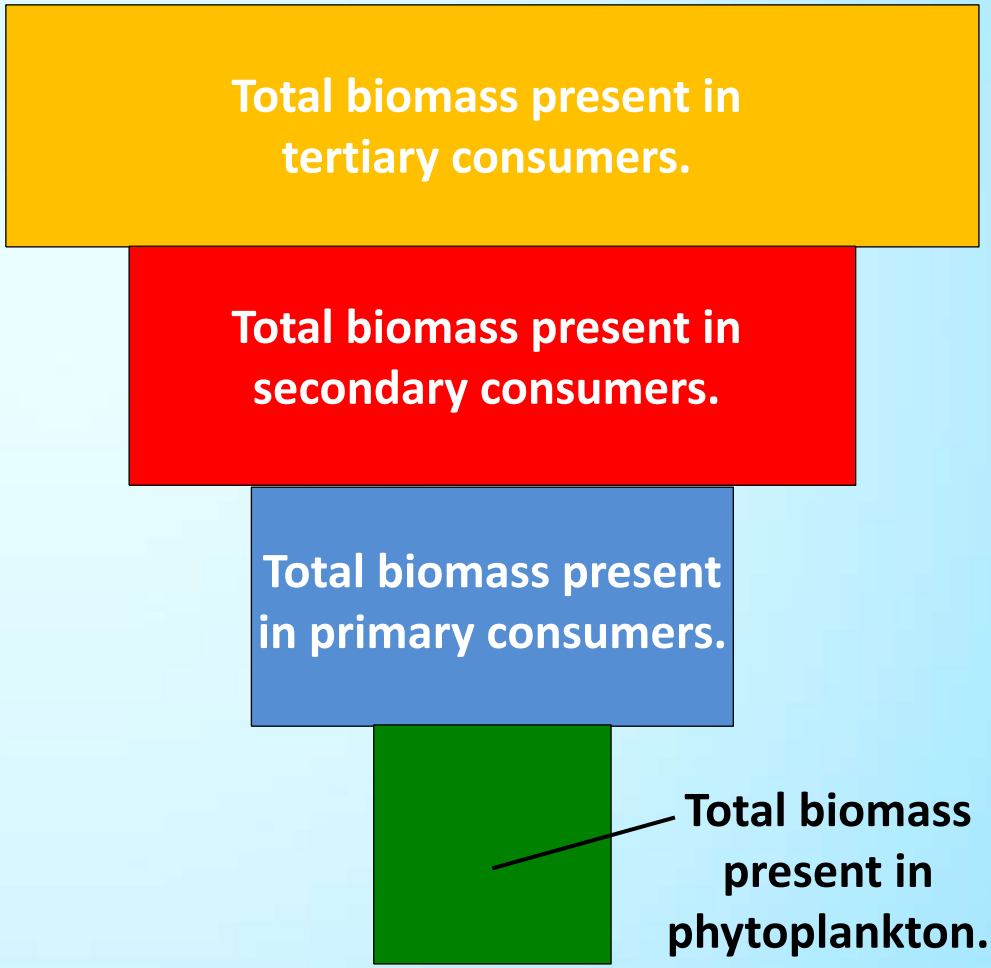
ECOLOGICAL PYRAMIDS

Ecological Pyramids: These are diagrams that represent each trophic level according to its **energy**, **biomass** or **population**.

2) Pyramid of Biomass:

In the water, the amount of biomass **increases** as you move up trophic levels, creating an **inverted** pyramid.

This is only possible because the reproductive rate of the organisms **increases** as you go down trophic levels.



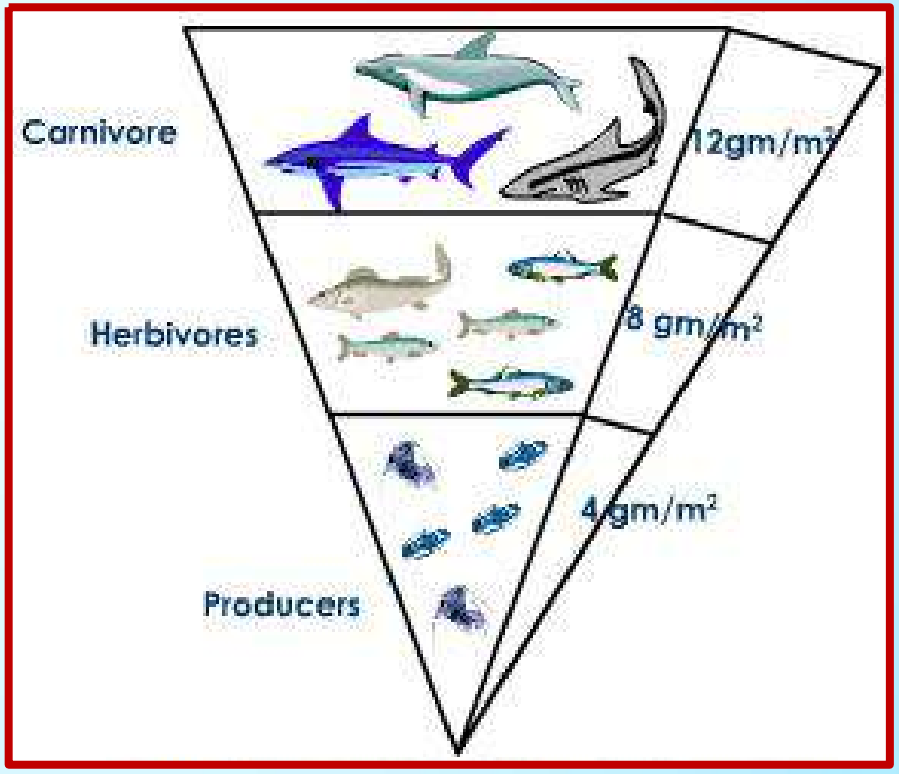
ECOLOGICAL PYRAMIDS

Ecological Pyramids: These are diagrams that represent each trophic level according to its **energy** , **biomass** or **population**.

2) Pyramid of Biomass:

In the water, the amount of biomass **increases** as you move up trophic levels, creating an **inverted** pyramid.

This is only possible because the reproductive rate of the organisms **increases** as you go down trophic levels.



ECOLOGICAL PYRAMIDS

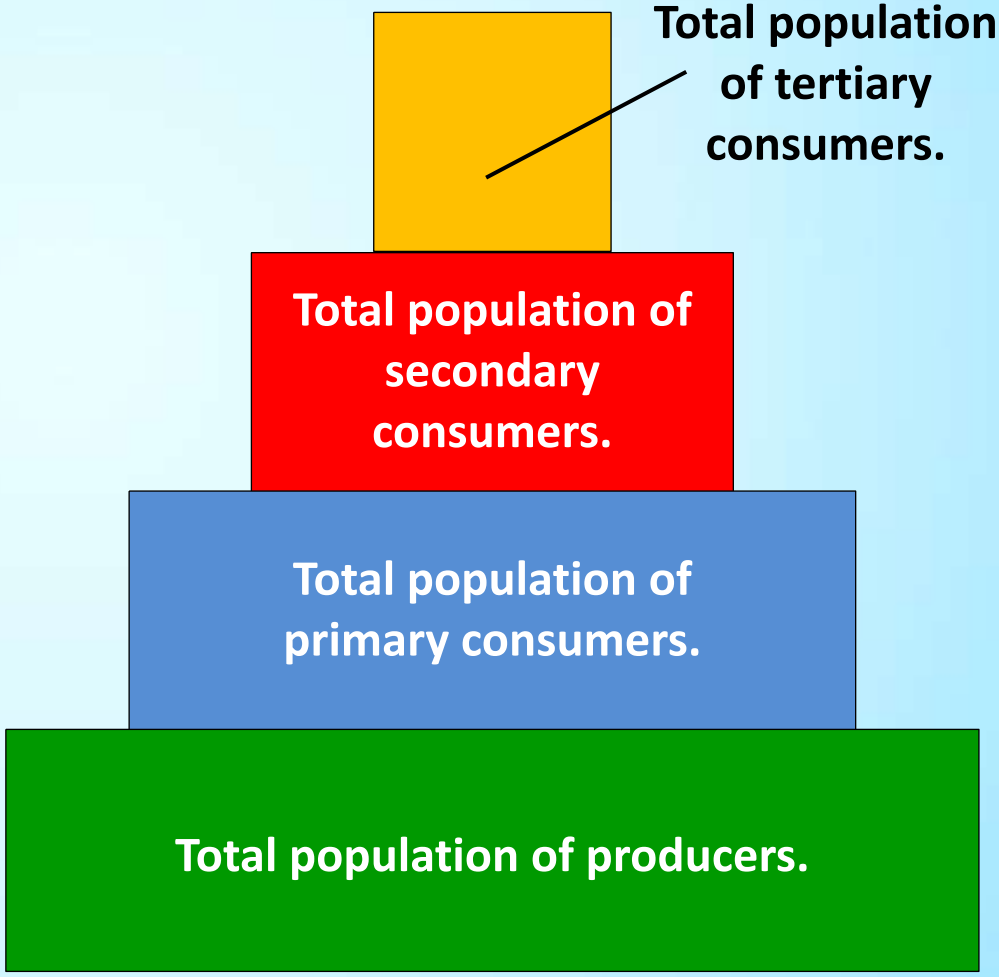
Ecological Pyramids: These are diagrams that represent each trophic level according to its **energy** , **biomass** or **population**.

3) Pyramid of Numbers:

This pyramid indicates the **population** of individuals at each trophic level.

The typical pyramid of numbers **decreases** as you move up trophic levels.

This occurs when many **small** and **numerous** producers feed a **smaller** number of consumers.



ECOLOGICAL PYRAMIDS

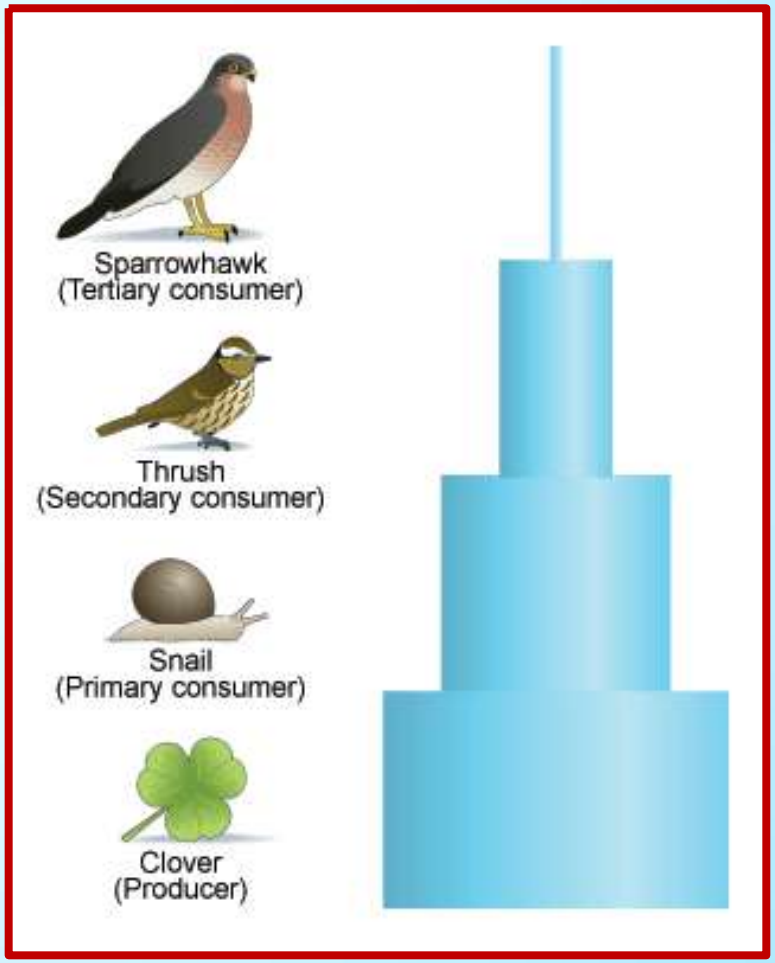
Ecological Pyramids: These are diagrams that represent each trophic level according to its **energy** , **biomass** or **population**.

3) Pyramid of Numbers:

This pyramid indicates the **population** of individuals at each trophic level.

The typical pyramid of numbers **decreases** as you move up trophic levels.

This occurs when many **small** and **numerous** producers feed a **smaller** number of consumers.



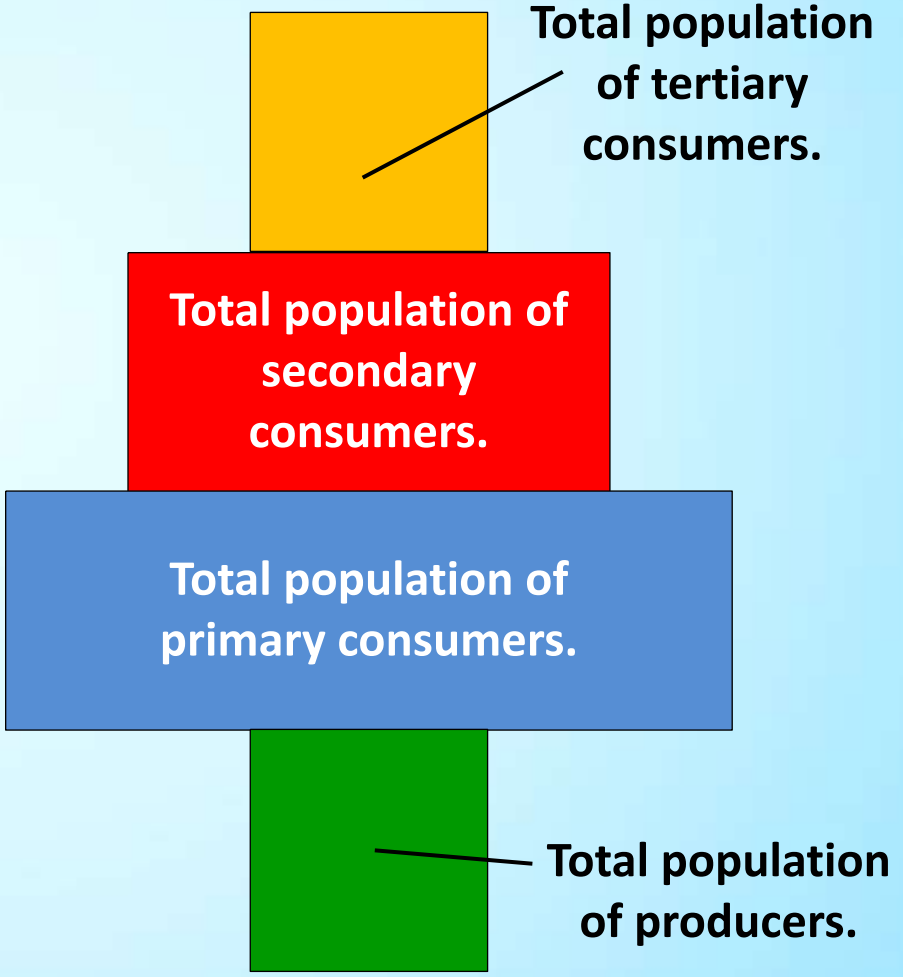
ECOLOGICAL PYRAMIDS

Ecological Pyramids: These are diagrams that represent each trophic level according to its **energy** , **biomass** or **population**.

3) Pyramid of Numbers:

However, when the producers are **large** , and are **fewer** in number than the primary consumers, the pyramid looks like this.

Give an example of the kind of producers that would result in this type of pyramid.



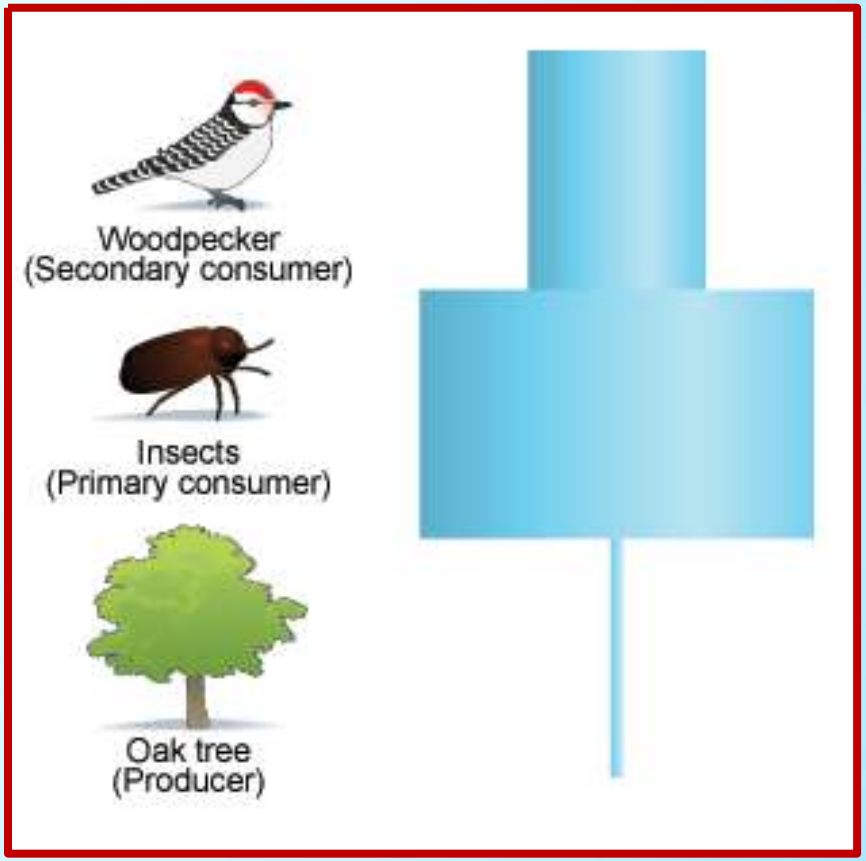
ECOLOGICAL PYRAMIDS

Ecological Pyramids: These are diagrams that represent each trophic level according to its **energy** , **biomass** or **population**.

3) Pyramid of Numbers:

However, when the producers are **large** , and are **fewer** in number than the primary consumers, the pyramid looks like this.

Give an example of the kind of producers that would result in this type of pyramid.



The End!

Created by Anh-Thi Tang – Tangstar Science

http://www.teacherspayteachers.com/Store/Tangstar-Science