# Follow the Food

Food webs and food chains
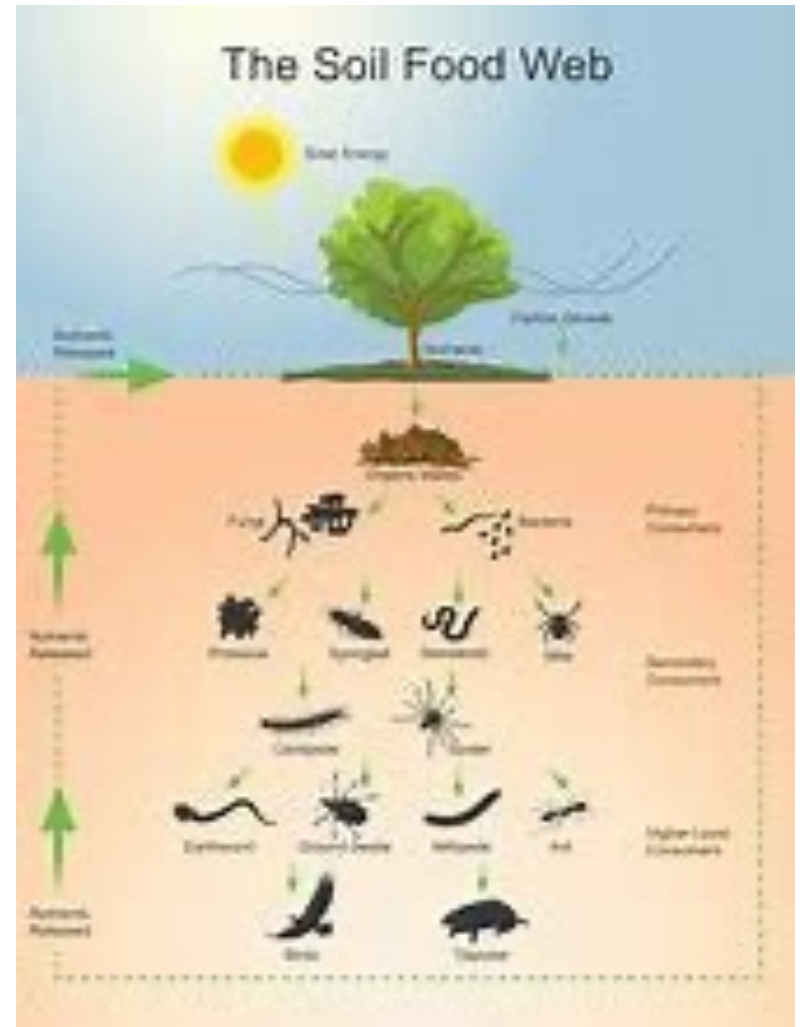

The Soil Food Web
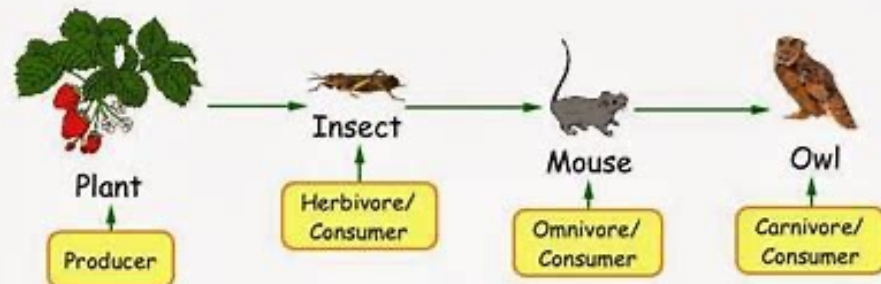
# What is a food chain?

Each food chain is a possible path that energy and nutrients may take as they move through the ecosystem. All the interconnected and overlapping food chains in an ecosystem make up a food web.

## The Food Chain Of An Owl

Plant — Producer

Insect — Herbivore/Consumer

Mouse — Omnivore/Consumer

Owl — Carnivore/Consumer

A food chain shows the path of energy from one living thing to another. Decomposers like bacteria, are necessary for all food chains.

# What is a food web?

A food web consists of all the food chains in a single ecosystem. Each living thing in an ecosystem is part of multiple food chains
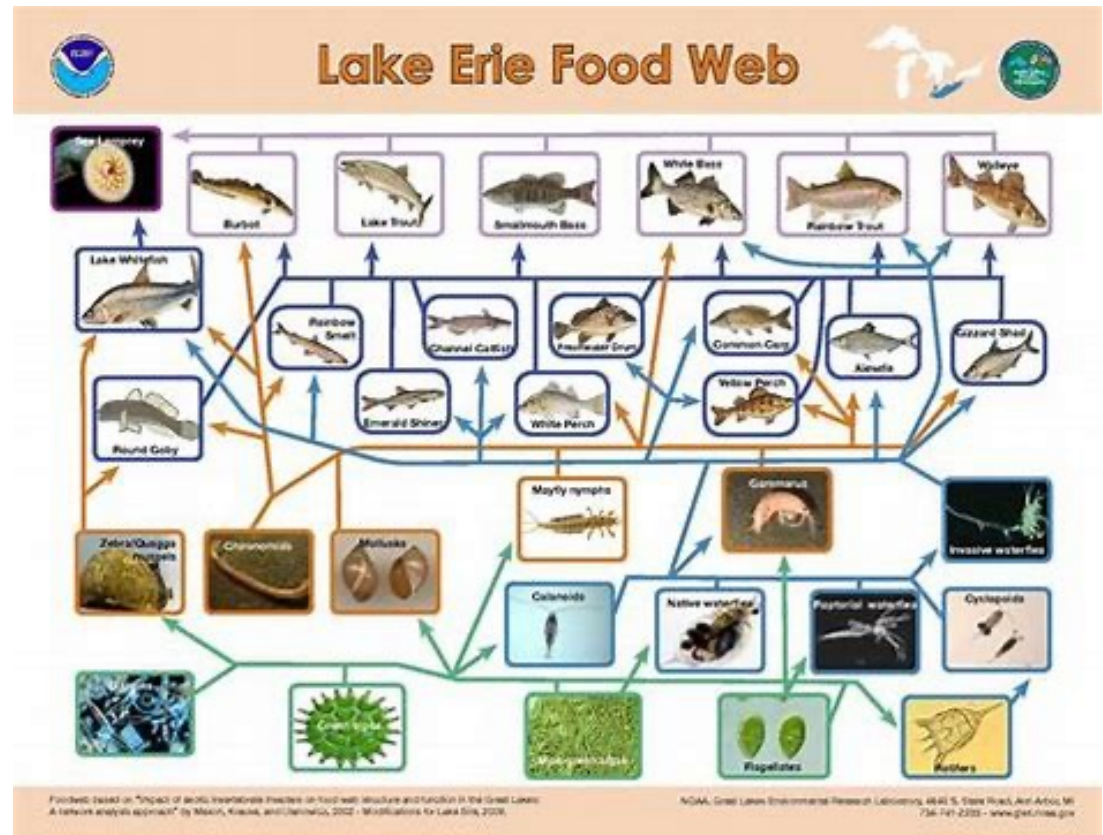
# Trophic levels

Organisms in food webs are grouped into categories called trophic levels. Roughly speaking, these levels are divided into producers (first trophic level), consumers, and decomposers (last trophic level).

Tertiary consumers

econdary consumers
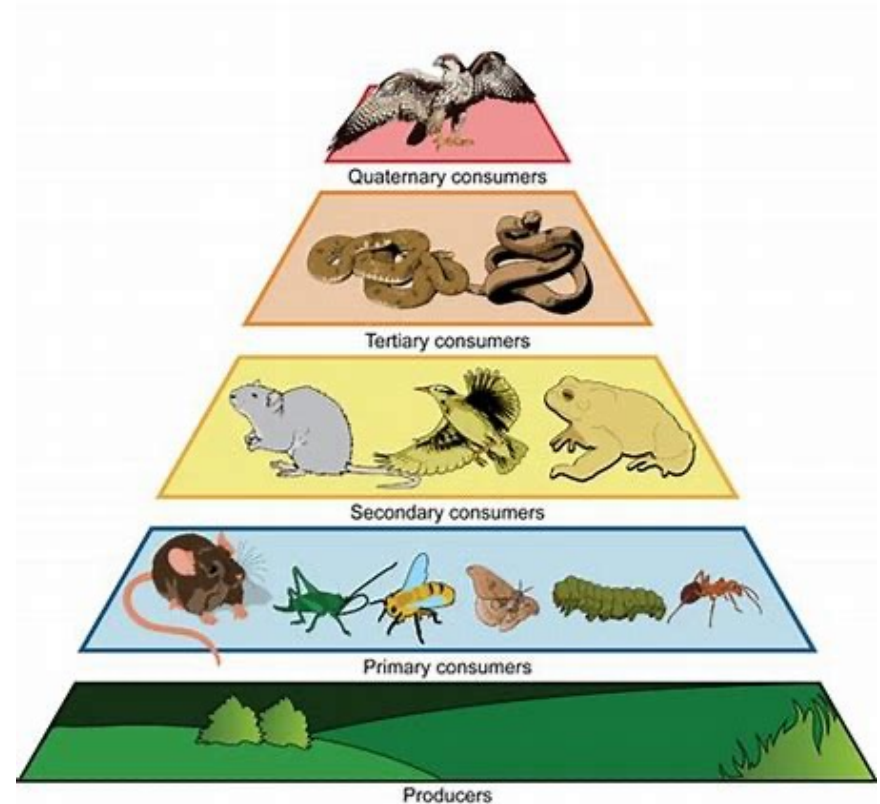
nary consumers

Producers

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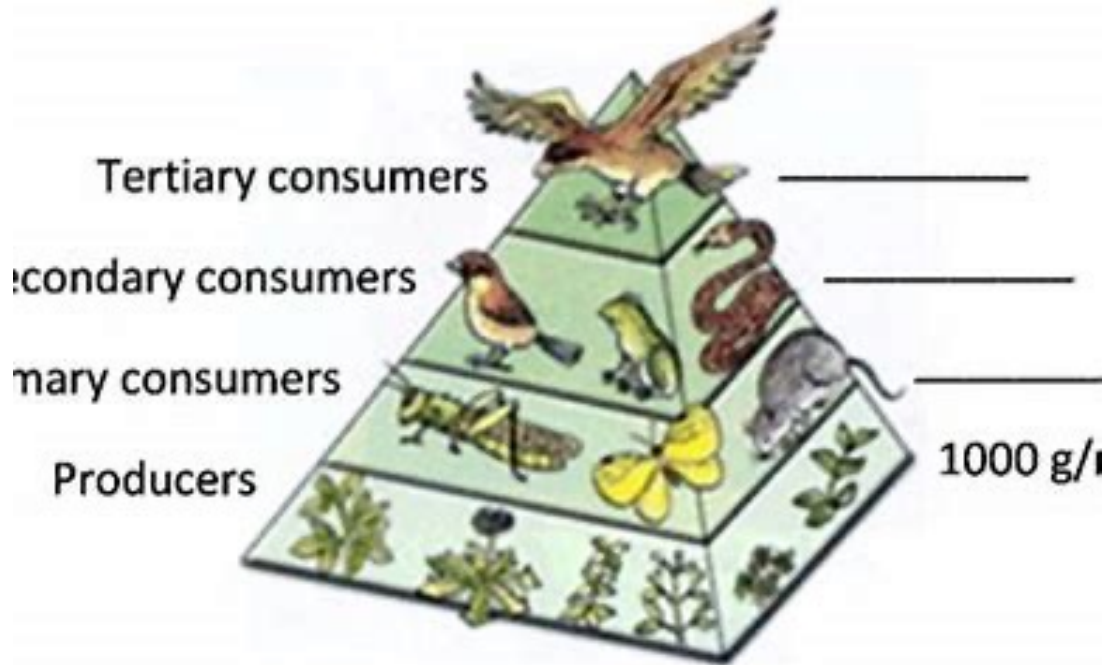
# Producers

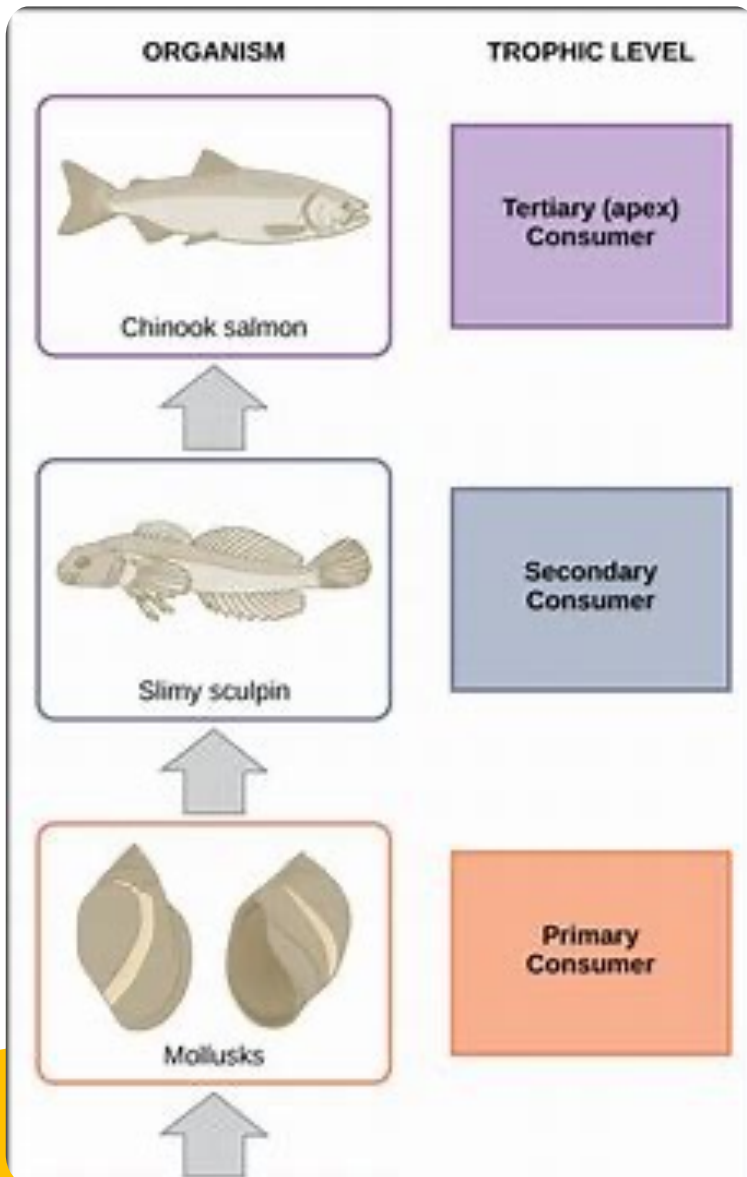Producers make up the first trophic level. Producers make their own food and do not depend on any other organism for nutrition. Most producers use photosynthesis to create food from sunlight, carbon dioxide, and water.
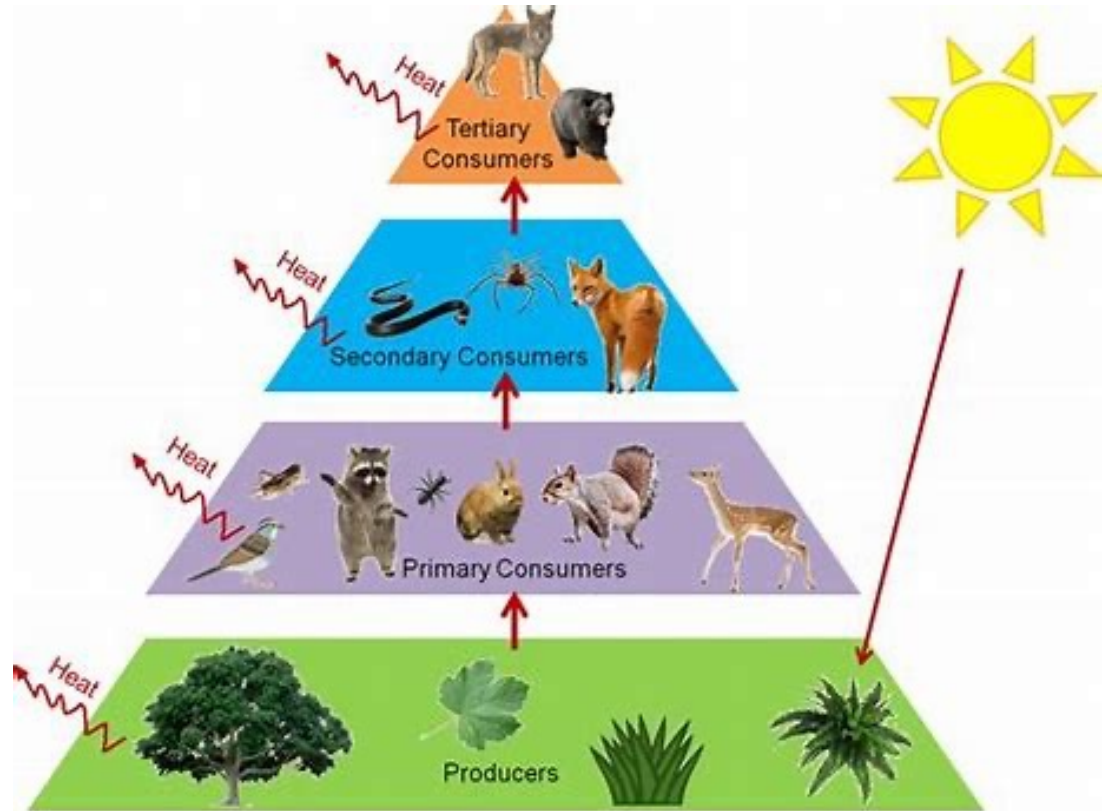
# Consumers

Consumers can be carnivores that eat other animals, herbivores that eat plant life, insectivores that eat insects, or omnivores that eat from several categories of food.

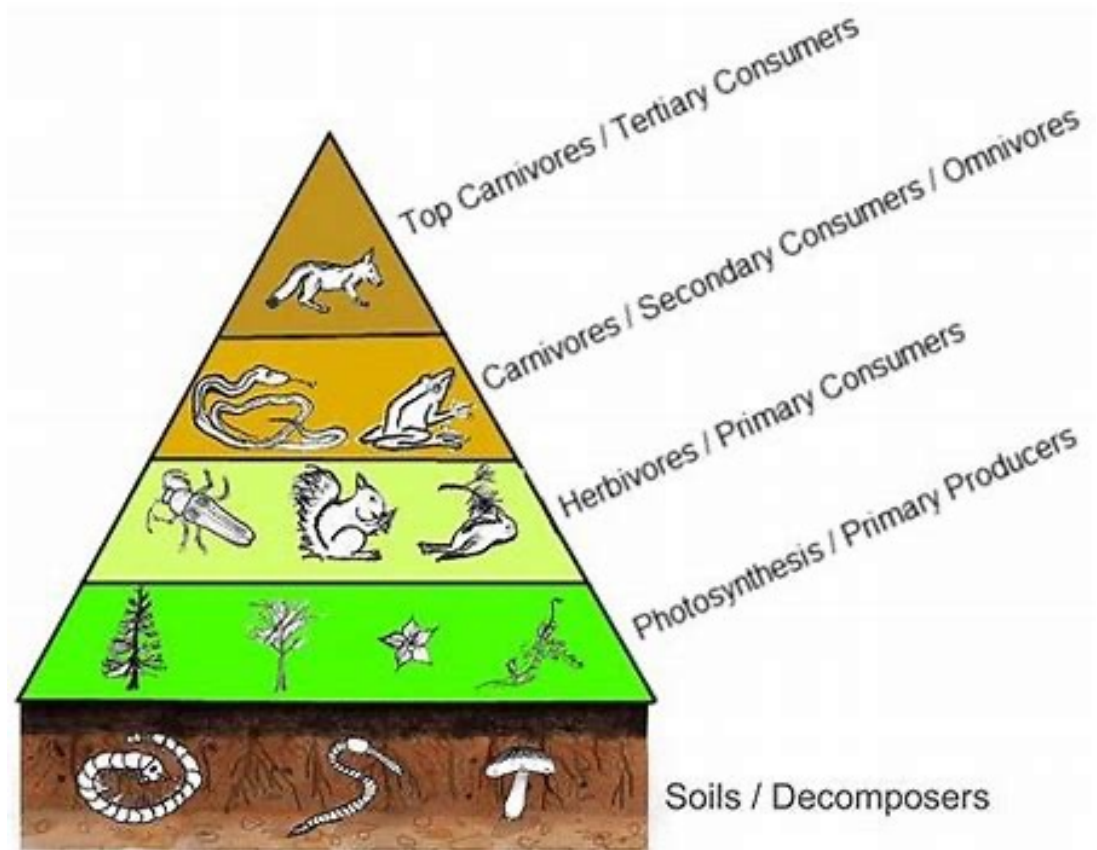| ORGANISM | TROPHIC LEVEL |
|----------|---------------|
| Chinook salmon | Tertiary (apex) Consumer |
| Slimy sculpin | Secondary Consumer |
| Mollusks | Primary Consumer |

Herbivores eat plants, algae, and other producers. They are primary consumers. They are at the second trophic level. In a grassland ecosystem, deer, mice, and even elephants are herbivores. They eat grasses, shrubs, and trees. In a desert ecosystem, a mouse that eats seeds and fruits is a primary consumer.

In an ocean ecosystem, many types of fish and turtles are herbivores that eat algae and seagrass. In kelp forests, seaweeds known as giant kelp provide shelter and food for an entire ecosystem. Sea urchins are primary consumers in kelp forests.
Secondary consumers eat herbivores. They are at the third trophic level. A secondary consumer may be a snake that eats a mouse or sea otters that eat sea urchins.

Tertiary consumers eat secondary consumers. They are at the fourth trophic level. An owl or eagle may eat a snake.

# Apex predators

Top predators, also called apex predators, eat other consumers. They may be at the fourth or fifth trophic level. They have no natural enemies except humans.



Top Carnivores / Tertiary Consumers

Carnivores / Secondary Consumers / Omnivores

Herbivores / Primary Consumers

Photosynthesis / Primary Producers

Soils / Decomposers

# Bioaccumulation

Some types of materials,
especially toxic chemicals, increase with
each trophic level in the food web.
These chemicals usually collect in
the fat of animals.

When an herbivore eats a plant that is
covered in pesticides, those pesticides are
stored in the animal's fat. When
a carnivore eats several of
these herbivores, it takes in
the pesticide chemicals stored in its prey.
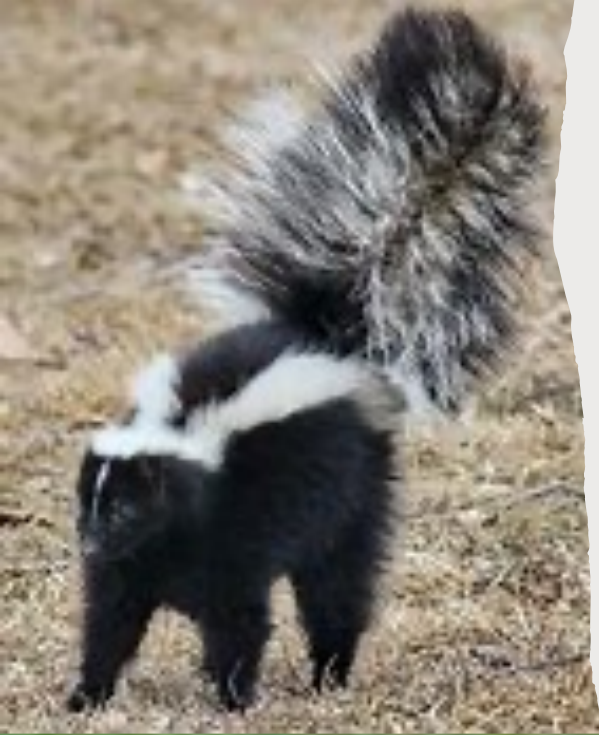This process is called bioaccumulation.



Bioaccumulation of dioxin
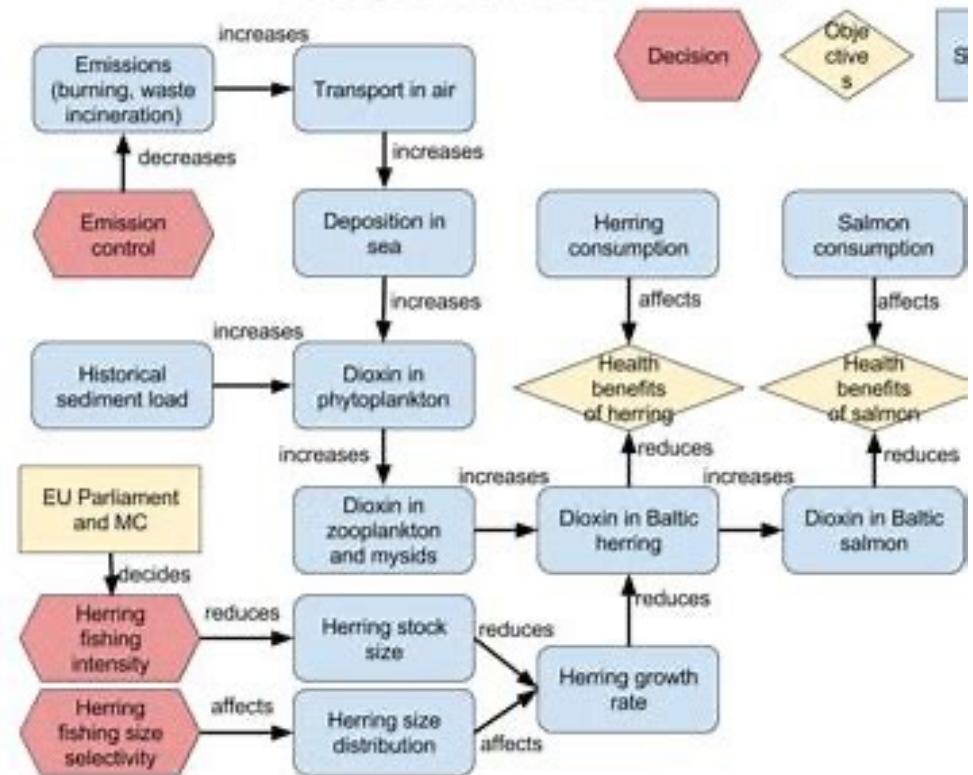
# What are predators and prey?

Predators eat other organisms. Prey are the organisms which the predator eats. Bear and fish, fox and rabbits are examples of predators and their prey.

Predator and prey evolve together. The predators need the prey to eat to survive so they evolve with the adaptations they need such as  speed, camouflage, a good sense of smell, sight, or hearing, the right kind of claws, teeth, mouth parts or digestive system, etc.


Predators are part of the prey's environment, and the prey dies if it is eaten, so it evolves what is necessary to avoid being eaten such as speed, a good sense of smell, sight, or hearing, a tough or spiny  covering, unpleasant smell or taste, etc.

An example of evolution is that the fastest coyotes with the sharpest senses survive and reproduce; likewise, the fastest deer with the sharpest senses will survive and reproduce. They both get faster and sharper senses, so the relationship remains the same

Another example of predator-prey evolution is  the Galapagos tortoise and the cactus it eats. On one of the islands, branches  grow higher and there, long-necked tortoises live. On a different island, branches are lower down and there, short-necked tortoises live.

# Functional traits in predator-prey relationships

Functional traits are any morphological (form), behavioral, or physiological trait of an organism associated with interactions that occur when organisms living in the same community directly or indirectly influence one another. Such traits include predator and prey size and personality, predator way of hunting, prey mobility, and prey anti-predator behavior.

# Predator prey relationships are also impacted by environment and human intervention.

Predators and prey also compete for basic needs—space, shelter, water and food.

Human intervention and climate change can affect predator and prey relationships.

An example of human intervention affecting predator prey relationship is people putting out food and water for deer. The deer can become habituated (used to) humans and feel safe traveling in neighborhood streets, at risk for being hit by a car. Or the feeding may increase the herd size beyond the carrying capacity of the space, resulting in fewer births, or weaker fawns, as well as inadequate supplies of basic needs.

# Animal Pupils

Pupil shape tends to relate to how animals find food and the time of day they are active. Vertically elongated pupils are likely to belong to ambush predators, active day and night, with eyes in front. Horizontally elongated pupils are likely to belong to prey with eyes on the sides. Vertically elongated pupils allow the predator to get sharp vision ahead, and to be able to estimate distance. Horizontally elongated pupils create a panoramic view, ahead, to the sides, and behind, to detect predators from different directions and on uneven terrain.

Short predator

Tall

Short prey
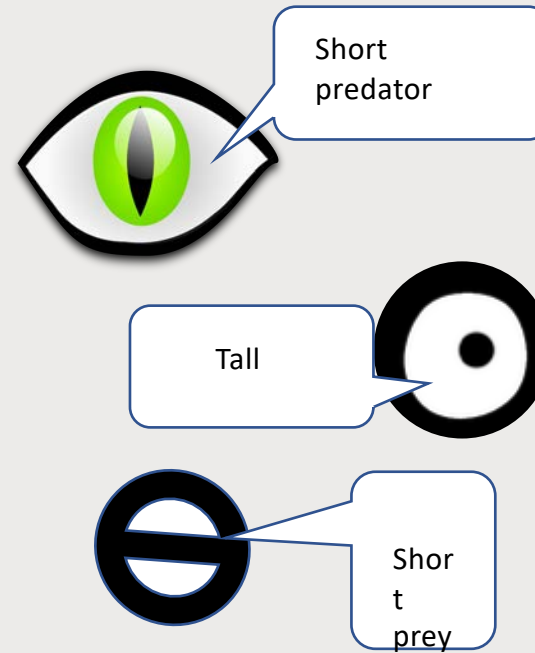
# Predator adaptations

Predators need to obtain food without exhausting available energy. They will hunt sick, old or very young prey which makes the prey population stronger. Predator adaptations include:

Big eyes in front with a narrow field and binocular vision

Long snout for sharp sense of smell

Ears that can swivel forward

Hunting strategies including stalking, sitting and waiting, and group hunting

Sharp claws and teeth for cutting, shearing and tearing, with strong jaws that move up and down

Superior strength and speed

Special features such as long tongues, webbed feet and oily fur

Larger brains with superior intelligence

# Prey adaptations

Prey animals need to be able to forage (gather food) without being eaten so they develop adaptations to escape predators:

Camouflage--color resembling the environment, counter shading of two blended colors to hide contours, or distraction coloration like spots and stripes

Peripheral wide field vision, sharp hearing and sense of smell

Warning, visual and alarm signals like white tailed deer lifting their tails

Special defensive and chemical weapons like porcupine quills and skunk musk

Speed

Behavioral adaptations like playing dead or bluffing, pretending to be dangerous, living in groups, or hiding in a burrow or tunnel

And population control by producing multiple offspring

Prey typically have grinding teeth which move side to side, and a small brain.

# You can be predator or prey!



I'm a hunter with sharp claws, (curling fingers)

Seeing straight ahead, strong jaws. (pointing straight ahead with fingers at eye level)

I'm the hunted with my tools, (swiping hand down chest)

Warning colors and camouflage fools! (swiping hand down chest)

# You can sing the song to *Oh My Darling Clementine*!

I'm a predator (claw fingers)

Hunting nightly. (covering eyes)

I am strong and I have speed. (making muscle)

Stalking prey with stealthy movements

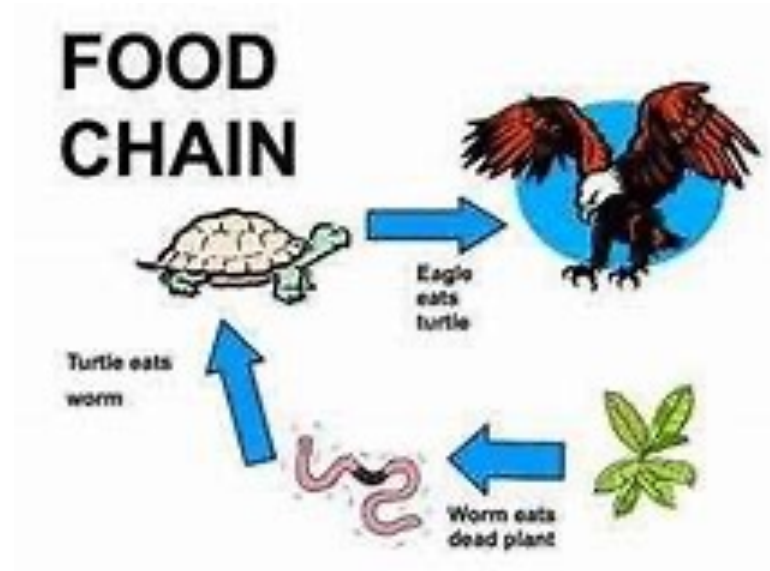To obtain the food I need. (hand to mouth)

I'm a prey and have strategies (pointing to head)

To the predator evade. (covering face with both hands)

I can use my dappled colors (fingertips)

Hiding deep beneath the shade. (hand shading head)

# What's on the Menu?

All animals need to eat to get energy and stay healthy. Some animals eat plants and their fruit. Some animals eat other animals. Both are necessary for a healthy ecosystem.

I'm a hunter with sharp claws,

See straight ahead, and strong jaws.

I'm the
hunted
stinky smell
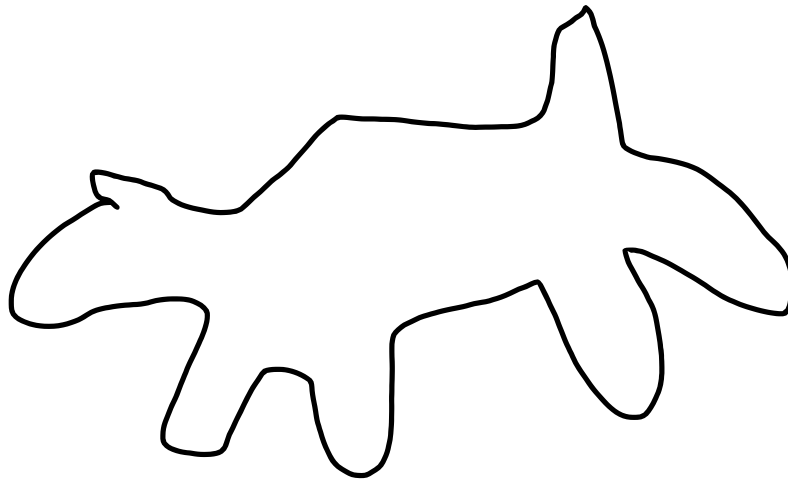
# Hard and scaly protecting shell!

What are some places around the park that prey could use to evade predators?

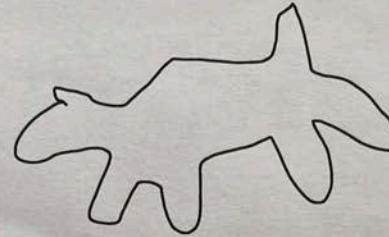You can be a stalking predator looking for places prey might hide!

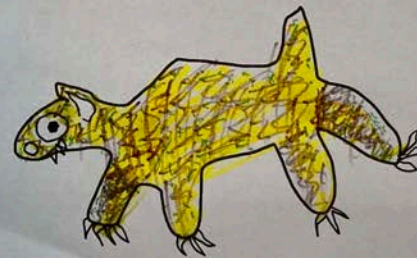You can design a prey animal? What adaptations will you give it to evade predators?

You can design a prey animal to protect itself!

Who eats who?

# What's on the menu?



We can make a snack using foods to represent predator adaptations!

What foods might look like claws? Pretzel twists? Can you think of any others?

How about teeth? Pumpkin or sunflower seeds? What else?

These books explain why animals eat other animals and how food chains work.

https://www.youtube.com/watch?v=lXznO1b34Y0

https://www.youtube.com/watch?v=KvPGetC8zo8