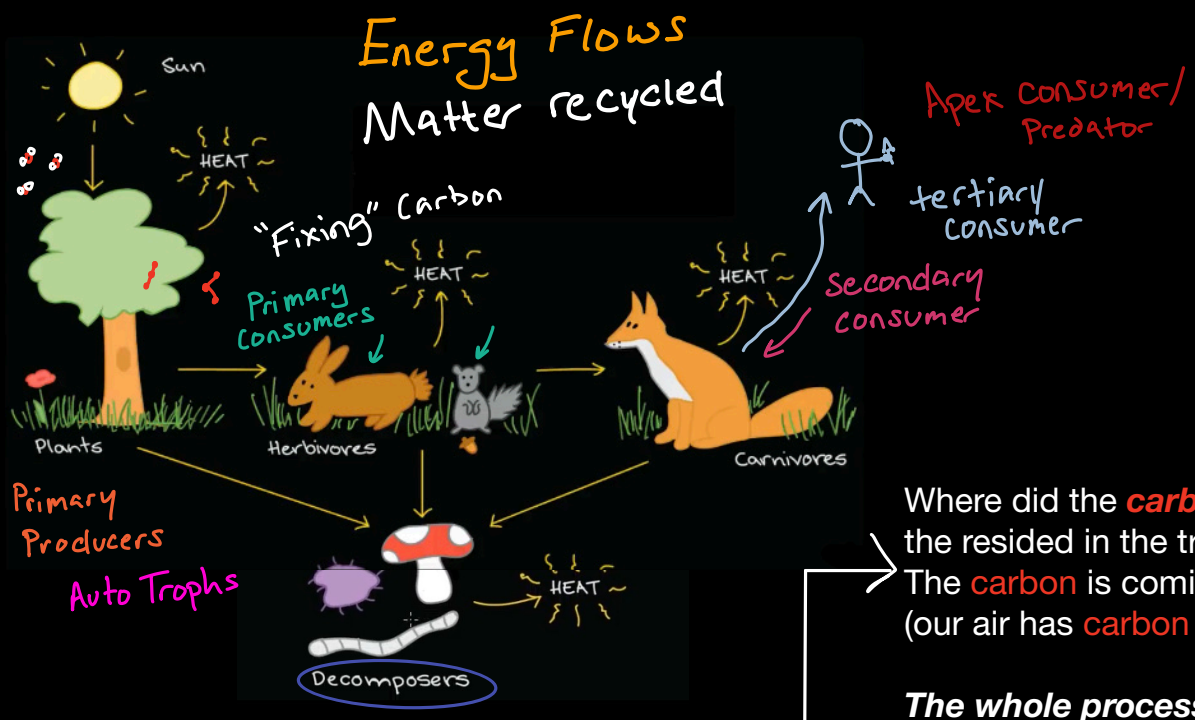


How energy flows and how matter is recycled:

Energy: energy (for most ecosystems) originally comes from the Sun. (There are some others like moonlight and geothermal, but most come from the sun)

How does the ecosystem make use of that energy? How does it get stored in the ecosystem especially as biomass?

It starts with ***Primary Producers*** which are usually plants (but can be bacteria that can photosynthesize: take the energy and create biomolecules that store energy) (In the Diagram: the ***Plants***) sometimes referred to as ***Auto Trophs*** they are getting their own food from the sun

How is that energy stored?
It's stored in the biological molecules. The bonds between the ***carbons***, to make the bonds required energy and breaking those bonds it would release energy.

Where did the ***carbons*** come from the resided in the tree?
The carbon is coming from the air (our air has carbon dioxide in it)

The whole process of photosynthesis is: fixing the carbon. From a gaseous form (when its part of carbon dioxide) into the structure of the plant, into biological molecules. To store the energy.

It's not an efficient process not all the energy from the sun is going to be able to be stored. (Some is reflected, the plant uses some for it to live: reproduce, cells divide) Eventually the energy is released as heat.

What earth the primary producers?
Primary Consumers eat primary producers. (In the Diagram: the *bunny* and the *squirrel* are primary consumers because they eat the *plants* which are primary producers)

Why do the primary consumers eat the primary producers?
Because they get energy from the bonds in the biological molecules from the carbon bonds.

Continuation….
The primary consumer is able to use the energy it gets from the primary producer to grow itself, to reproduce, to live, to run around, and it stores some of that energy in its own biomass.

This process is ***inefficient*** going from one layer of trophic to another layer of trophic you only have about 10% of transferred energy (stored in the next layer).

Why only 10%?
Because not all the plants get eaten, the process of eating, and digesting plants, some of the energy gets pooped out (because the consumer can't get all the energy out of the biological molecules)

The primary consumer has energy stored in the biological molecules of biomass. There are things that like to eat primary consumers (In the Diagram: the fox)

Secondary Consumer: eats primary consumers (In the Diagram: the fox)

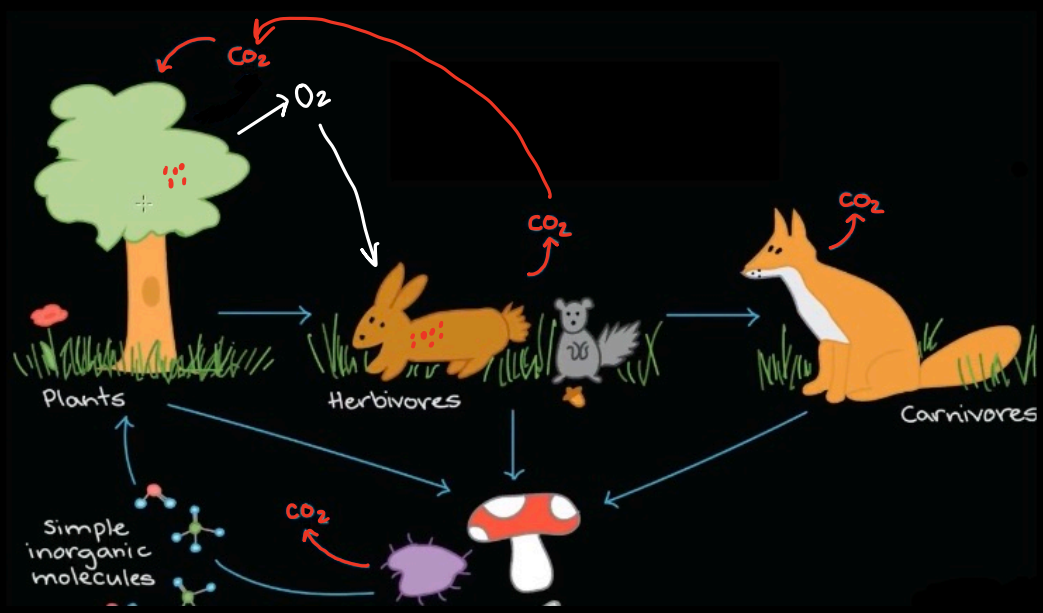
This cycle could continue up the food chain, say to a human hunter. Who wanted to eat the fox for its energy and matter. This would be know as a ***Tertiary Consumer*** and if there's no one who wants to eat him then he's known as an ***Apex Consumer / Predator*** (Top of the food chain).

At some point the primary producers, primary consumers, secondary consumers, tertiary consumer, or apex consumer will all eventually die. The energy doesn't disappear.

Energy is conserved and it flows from one place to another.

The energy from the dead consumers and producers are going to be used by ***decomposers:*** they can take all the left over energy from the dead carcass or poop and make use of it. (For them to live, and reproduce).Then they break it down, they release a lot of the nutrients and the matter that's used by the plants. (Matter is recycled).

It comes in as sun light which is transferred through different layers of trophic, though its an inefficient system and as the animals run around they release some of that energy as heat.



Matter is recycled, there isn't new matter entering or leaving the ecosystem or being magically created or magically destroyed.

When you look at a leaf on a plant that matter isn't coming out of nowhere, its just a different form. That matter was always there in the form of carbon dioxide.

The plant is using the energy from the sun to fix the carbon from a gas form into a solid form. It's able to use the energy to form bonds between the carbons in the biological molecules; that store energy. The plant can use the energy to grow. The things that eat the plants or eat the things that eat the plants can use that energy.

The carbon dioxide goes into the plants and releases **oxygen**. (Part of the photosynthesis process)

The oxygen is used by animals to metabolize the biological molecules (respiration).

The matter when eaten by the primary consumer in carbon form, is transferred into the primary consumer. When the primary consumer uses the energy breaking the bonds through respiration the carbon is released in the form of carbon dioxide.

Matter: All the atoms on our body, on Earth, are just constantly being recycled. It was generated inside of stars many billions of years ago. We just keep reusing it over and over again.

Matter gets recycled from one form to another.