

Energy in Living Things

Grades 3-8

45min - 1hr

Learning objectives:

Energy is transferred from organism to organism via the food web

Identify Producers, Consumers, and Decomposers.

Background:

A food web or food chain begins with the sun. Plants are producers, they use sunlight to grow. Animals that eat plants (herbivores) are primary consumers. Secondary consumers and other consumers (carnivores and omnivores) are animals that eat other consumers. Decomposers and detritivores, are those things that break down dead materials into nutrient building blocks. The sun's energy is trapped by plants in the form of sugar. As the sugar (calories) is transferred from organism to organism, some of that stored energy is given off as heat when calories are burned. The rest is used to help the organism grow. When an organism dies, bacteria, fungi and scavenging creatures digest what is left, and the cycle begins again.

Materials:

Food web cards and yarn ball

Examples of plant energy storage structures (bulbs, tubers, carrot, potato, large seeds, i.e. nuts)

Gather the group at the amphitheater and ask them to all to take a seat. Become still for a moment Ask them to concentrate on what they what they see, smell, feel, and hear. Take a moment to experience the energy of nature all around us.

Explain: Energy is the force that powers machines, that propels our cars and sends rockets to the moon. It is the force that causes volcano's to erupt, that gives Hurricanes and tornados the power to blow down houses and knock over trees. It's the force that allows earthquakes to shake the earth and it is the force that allows us to light our homes. Fossil fuels – gas, oil and coal - are very old reservoirs of energy that originated from plants that stored energy from the sun.

Energy is the force that also flows through all living things, allowing life to exist.

Today we are going to explore how energy flows through the natural world and fuels and supports all life.

The sun is the source of all life, and its energy is within every living thing. The sun's heat and light produces conditions that support life.

Explain the 4 groups that make up the food chain

- Producers capture the sun's energy in their green chlorophyll and change the energy from sunlight into food (sugars). Collect several hickory nuts or acorns. Or show the items you brought. (You can carry some examples of plant food storage organs, potato, carrot, etc.). **DO NOT BRING AIR POTATOES INTO THE PARK.** These are examples of stored energy. **Plants store food energy** These seeds, roots, bulbs etc. are little power plants. When the weather cools down in the winter, or too hot in the summer, many plants go dormant. The leaves fall off, and for some plants, the entire above ground part of the plant dies back. When a seed germinates or a plant starts to grow again from being dormant, it needs that stored energy to start growing stems and leaves that form sugars

from sunlight. **Light energy** from the sun is converted into sugar by a process called **photosynthesis**. Once the green parts of the plant start making sugars, the plant will grow new leaves, flowers, fruit, seeds, roots, etc. Point out an evergreen, Magnolia or Palm or Pine tree. Even evergreen trees will drop their leaves or needles. When they have the energy to make new leaves the old ones are replaced and the tree never has to go without green leaves, hence the name evergreen. Live Oak trees may have gotten their name from their habit of not dropping leaves until the new ones begin to grow. Often, a plant will pull nutrients out of the old leaves before they die to feed the new ones. This conserves valuable energy and minerals to keep the plant healthy. Palm trees do this. That is why you should not remove green palm fronds.

- The primary **consumers are creatures that eat plants**. They get their energy from eating the producers. Taking their energy and transforming it into sugars that help fuel them.
- The secondary consumers then eat the primary consumers to give them the energy they need to survive.
- Bacteria and molds are **decomposers** as are worms and some insects including termites. **Scavengers** eat dead plants and animals Crabs and shrimp eat rotting material, they are scavengers. These creatures then return to the soil the nutrients that the producers need along with the sun and rain to begin the cycle over again.

Take group on a walk down the jungle trail and on the way point out the different groups (listed above) of plants and animals and ask the group to identify what it is. Try to get at least a couple of every category if possible. You can use the interpretive signs for animals that you don't see. Stop along the way if there is something that captures the groups' imagination or there is something of interest you want to point out.

After returning to the start of the jungle trail, gather the group in a circle

Summarize the energy cycle of life

- Producers –
- Primary consumers
- Secondary consumers
- Decomposers and scavengers

A final thought: some animals and insects use a lot of energy to catch their food, while others stay very still and wait for prey to come within reach.

Let's do an exercise that will illustrate what we have been talking about.

Web of life exercise

Move to another location Have the group form a circle and hand each student a food web card. Without looking at the back of the card, ask each student to read their organism and tell whether it is a producer, consumer or decomposer.

Food Web Activity

All living things are interconnected and either depend upon or somehow affect the other things around them. In a food chain as one thing eats another, and energy is transferred, there is a ripple effect that involves other organisms as well. We are going to explore the transfer of **energy in a Food Web, not a chain**. Choose an adult to be the Sun. Instruct each child to read the back of their card and familiarize

themselves with their organism. Also give each adult a card if they want to participate. Have the students raise their hand if they have a **Producer**, then **Consumer**, then **Decomposer** or **Scavenger**. Address any confusion or questions about what they have, before starting the activity. **THE FOLLOWING INSTRUCTIONS CAN BE READ TO THE GROUP IF YOU WANT. The ball of yarn starts with the Sun. While holding the loose end of the yarn, the Sun will toss the ball to a producer. Each student should hold a section of yarn when they toss the ball. Next, toss the yarn ball to a consumer that ate the producer, continue to each student that would eat or get energy from the one before it. At any time, the organism can be determined to die or be eaten by something instead of doing the eating. A decomposer can be chosen when an animal dies. Then a producer can use the nutrients to grow and start moving up the food chain again.**

After everyone has been included, the group should look like a messy spider's web. Review how energy moved through the food web. All life forms need some kind of food for energy to survive. Explain that there are connections to everything either directly or indirectly. Now you can see why the elimination or extinction of a species could possibly cause serious harm to the food web. Choose one animal to be eliminated (he drops the yarn and leaves the web). Anyone that was directly attached to the missing animal then leaves the web. Very soon no one is left except the Sun who then is asked to roll up the ball of yarn. (Collect the cards).

If time allows, other things you can discuss to help get the point across:

Hibernation is when animal metabolism is slowed down to the extent that the heart beat is slowed and very little energy is used. Examples are bears and groundhogs. Animals hibernate to survive when their food sources are unavailable in the winter. Feel your heartbeat, imagine how much less energy you would use if it only beat twice a minute.

Soaring is what birds do when they glide through the air without flapping their wings. Examples are vultures, eagles and hawks that find warm air rising (thermals) and soar in a circular pattern. Look up to see if there are any birds soaring right now.

Flocks of birds ride on air currents when they migrate long distances. Many smaller birds would never be able to travel such long distances if the upper level winds didn't carry them along.

Fish positioning in moving water. Fish will find slowly moving areas in a fast moving stream so they don't have to swim so hard just to stay in the same place. It's like walking on a treadmill. The faster the setting, the more energy it takes to keep you in the same place.

Shrimp flow with the current. They let the current and tides carry them to new places in the river. Shrimp use the river like a moving sidewalk. They just go along for the ride using very little energy.

What do alligators, turtles, snakes and other reptiles do to warm their bodies so they can move efficiently and quickly? Bask in the sun. They use **heat energy** from the sun. They cannot make body heat because they are reptiles. Reptiles are cold blooded. Warm blooded mammals, like people, can also use the sun to get warm, but we are able to make our own body heat by burning calories (calories are a unit of energy) to make heat.

Point out vegetation along the shoreline that is good alligator habitat. Alligators build nests of vegetation, sticks and mud. The female will lay 35 – 50 eggs inside. Alligators have a special adaptation that creates male and female offspring. The nest pile produces heat energy as it decomposes and warms

the eggs. The sex of the hatchlings depends on how hot the eggs were while incubating. Whether they become male or female, is determined within the first three weeks of incubation. The total incubation period is about 65 days. Males develop from eggs that were above 93°, and females from eggs that were below 86°. Between those temps they develop into both sexes. Alligators have a slow metabolism; which means that they don't use a lot of energy while at rest. They are capable of short bursts of speed. Alligators are opportunistic feeders, they will eat whatever is easy to get, although they prefer food that can be swallowed in one bite. They cannot chew their food. If it is too big, they can rip off a piece by rolling rapidly under water. Rotten meat rips more easily than fresh, so sometimes they will store a freshly killed animal under water for later. They need to be warm to digest their food. They do not eat when they are too cold because the food would rot in their stomachs instead of digest.

Rotation locations:

Amphitheater
Jungle Trail
Grass behind Kiwita