

TaHome Nature Education: Plant Food

Grades 3-5



Reading: Plants, Leaves, and Photosynthesis

Plants provide many benefits for other organisms. Animals use plants as food, to hide from predators, lay eggs, raise young, and more. People use plants to make all kinds of products, build homes, and provide cool shade on hot days. Plants couldn't do any of this if they couldn't feed themselves. Plants get their energy to grow, make seeds, and spread largely from the sun. **Chlorophyll** is a green substance inside of leaves that absorbs sunlight and gives leaves and plants a green color.



Plants make oxygen and sugars by using energy from the sun, water collected by their roots, and a gas called carbon dioxide from the air (the same gas that people exhale when they breathe out). The sugars give plants the energy they need to grow, and make flowers, fruits, and seeds. The sugar that plants make is also what makes it possible for other kinds of life in most **food webs**. People and animals get their energy from eating plants or from eating other animals that have eaten plants. This process of using sun, carbon dioxide, and water to create sugars and oxygen is called **photosynthesis**.

In the winter, most **deciduous trees** lose their ability to photosynthesize when their leaves fall off. Like many animals, these trees go into a dormancy during the winter. In the fall, the chlorophyll in leaves breaks down, causing leaves to change color. Then the tree makes a special acid where each leaf connects to the tree. This acid tells the leaf to fall off and also tells the tree to slow down growth and stop making new leaves to save energy. In the spring, more sunlight hours and warmer temperatures let the tree know to start growing leaves and creating sugars and oxygen again.



Conifer needles may not look like leaves, but they are. **Conifer trees** keep their needles all year long, and can therefore photosynthesize and create energy even during the winter. They do lose their needles, depending on the species of tree, every three to five years. The needles are replaced over time, so that there is always a fairly full crown of leaves photosynthesizing year-round. However, in Tahoe, the winter means fewer hours of sunlight, weaker sunlight, less available liquid water, and colder temperatures. These conditions cause photosynthesis to slow down in the winter. Plus, conifer needles are small and can't capture as much sunlight as larger leaves.

Some plants photosynthesize through more than just their leaves. For example, many plants have green stems that contain chlorophyll. The Starvation Prickly Pear cactus can be found in the foothills just east of Lake Tahoe, and is made up of green stems and pads. The pads are actually modified leaves, but the entire surface of the cactus can photosynthesize. The bark on an aspen tree can photosynthesize too, which means these trees are able to photosynthesize during occasional periods of mild weather from fall through spring. This ability may help aspen survive in Tahoe's challenging climate.



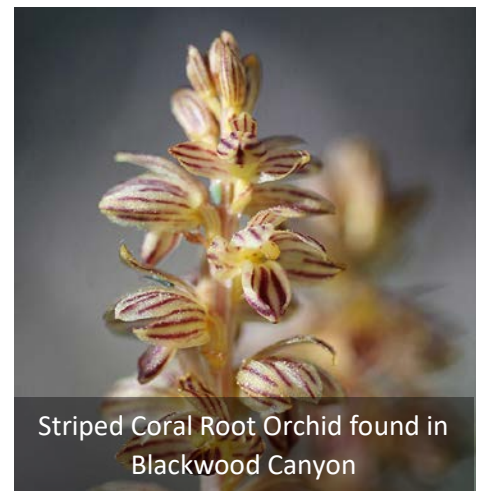
Not all plants photosynthesize to get their food. Some of Tahoe's most interesting plants steal their food instead of making their own. These include Snow Plants, Pinedrops, Sugarstick, and several species of small orchids like the Phantom Orchid and Spotted Coral Root. All of these plants lack chlorophyll and therefore are not green, but instead are various shades of red, white, and yellow. These plants steal nutrients and sugars from fungi, which grow in the forest's soil and help trees and other plants absorb water and nutrients in exchange for sugars from the plants. However, these plants don't need much energy compared to the trees or fungi, so their stealing doesn't hurt the other species. Many other common Tahoe plants, like our two species of Elephant's Head and the many species of Indian Paintbrush, steal a portion of their nutrients from other plant species, but they also photosynthesize. It turns out there are complicated things going on down in the soil!



Snow Plants lack chlorophyll and can't get their food from the sun.



Sugarstick steal their food from fungi.



Striped Coral Root Orchid found in Blackwood Canyon

Activities for Grades 3-5

Sunlight Experiment (Outside or Inside. 10 active minutes + 4 days waiting)

What would happen to leaves without sunlight? Try this experiment to find out.

You will need these materials:

- A tree, shrub, or indoor plant with healthy leaves
- Tape
- A cut-up paper grocery bag or construction paper

Follow these instructions:

1. On your plant, pick 3-4 healthy leaves. These leaves should be spread apart from one another. Take photos of these leaves to remember what they look like.
2. Cover the whole leaf with your paper bag or construction paper and tape the paper in place.
3. Keep the leaves covered for four days.
4. After four days take the paper off of the leaves and observe them.

Discuss these questions with a family member:

1. Do the leaves look the same or different from when you started the experiment? How?
2. Do the leaves look the same or different from leaves that you didn't cover up? How?
3. What do you think would eventually happen to the leaves if you left on their covers? What do you think will happen to the leaves with the cover now off?



Chlorophyll Coloring (Outside. 20-30 minutes)

Gather one leaf or needle from 5-6 different trees and shrubs. Only take a leaf if you see 20 others just like it within arm's length. Make sure to take only one. Leave the rest for the tree and animals who need it.

On a piece of paper, divide the paper into 5-6 sections, or however many different kinds of leaves you collected. In each section, trace one of your leaves and draw in the details you see on the leaf. Then, use that same leaf to color the paper. It helps to use thick paper, like watercolor paper, but notebook paper will work too. Rub the leaf between your paper and your finger until color appears. After you have rubbed each leaf, discuss these questions:

1. What colors came out on the paper from rubbing the leaves? Where do you think that color came from?
2. Do some leaves work better for coloring than others? Which ones? Why do you think they worked best?
3. Were there any leaves that didn't work? Why do you think they didn't?

If you like, try doing this again with other plant parts, like flowers or stems.

TINS wants to see your art! Have your parent post a photo of your art project to Facebook and tag [Tahoe Institute for Natural Science](https://www.facebook.com/TahoeInstituteForNaturalScience). You could also email the photo to us at kendal@tinsweb.org.



Breathing Leaves (Outside. 10 active minutes + 4+ hour waiting time)

See evidence of transpiration, the water inside plants, in this easy experiment. First you will need these materials:

- A clear plastic bag
- A rubber band or bag tie
- A tree or shrub with leaves

On a sunny day, find a leaf you can reach and follow these instructions:

1. Without taking the leaf off the tree, slip a small plastic bag over the entire leaf. Use a rubber band or bag tie to tightly close the bag on the branch the leaf is on.
2. Leave the bag and leaf alone in the sun for an hour.
3. After an hour, come back and look at the bag and leaf, but don't take the bag off yet Do you notice anything different? Write down your observations.
4. Leave the bag and leaf alone for another few hours, or overnight.
5. Come back and observe the bag and leaf again. What do you notice? Write down your observations and call a family member or friend in another town to tell them what you found.
6. Don't forget to remove the bag after your observations.



Words to Know

Chlorophyll: A green substance that plants use to convert sunlight to sugars through photosynthesis.

Photosynthesis: The process of plants using sunlight, water, and carbon dioxide to create oxygen and carbohydrates (sugars).

Food Webs: [A diagram](#) that shows how plants and animals are connected through many interconnecting food chains.

Deciduous Trees: Trees that shed leaves seasonally, usually in the fall.

Conifer Trees: Cone-bearing trees that keep their needles through the winter and are green year-round.



Palabras para conocer

Clorofila: Un pigmento de color verde que se halla presente en las hojas y tallos de muchos vegetales y que es responsable del proceso de fotosíntesis

Fotosíntesis: El proceso químico que tiene lugar en las plantas con clorofila y que permite, con la energía del sol, transformar un sustrato inorgánico en materia orgánica rica en energía.

Red alimentaria: [Un diagrama](#) que explica las relaciones de alimentación que existen entre las diferentes plantas y animales de un ecosistema

Árbol de hoja caduca: un tipo de árboles que pierden sus hojas en determinadas épocas del año.

Árbol de coníferas: Árboles con ramas que se presentan en forma cónica y frutos que también tienen una estructura de cono.

Further Learning

Try [flower pounding](#).

[Make](#) a photosynthesis model.

[Watch](#) this video on photosynthesis.

