

## Plants Provide Vital Ecosystem Services

Plants perform a multitude of services that maintain ecosystem functioning. Most significantly, they serve as a pump in the water cycle, provide food directly or indirectly for all animals and non-photosynthetic microbes, convert carbon dioxide into oxygen and glucose and in so doing remove carbon dioxide from the atmosphere.

### *Pumps in the water cycle*

Where do plants get their water? Where does that water come from?

If the water from clouds lands on soil, it will soak into the soil or flow across the land. If water infiltrates, it will stay underground or it will get sucked up by a root. If the water gets this far, what happens to it after it gets sucked up by the root?

Imagine opening your mouth very wide and standing in front of a blowing fan or sticking your head out the window of a fast car. The water on your tongue would quickly dry, but it would not disappear. It has to go somewhere! It would be converted from liquid on your tongue into gas and floats into the atmosphere. Essentially the same thing happens to plants. Plants have teeny, tiny “mouths” called stomata on their leaves. They open these mouths to get carbon dioxide to do photosynthesis. But they pay a price for sitting there with their stomata wide open: they lose water as they gain carbon dioxide.

As water is pulled from the leaves into the atmosphere, more water is brought into the plant from the soil through the roots. This creates a water column that allows water to travel against gravity. As water availability decreases, the stomata lose water and close (they may also close as night approaches, which ends photosynthesis and the need for carbon dioxide).

### *Plants that live and grow today are the ultimate source of food for all animals.*

Food is really just stored energy that, once in our body, will be converted into a new form of energy that allows us to dance, smile, yell, cry, roll our eyes, grow hair, breathe, get dressed, brush our teeth, play tag, sing, write, poop and pee, feel pain, talk on the phone, ride our bike etc. And all the energy to accomplish all those human movements comes from the sun’s energy that is trapped by plants. All of our food comes from plants, eventually. That is why ecologists say that plants are the basis, or bottom, of the food chain. Even if you eat steak and nothing else, that steak came from a cow that eats what? Grass and grains (which are types of plants, of course).

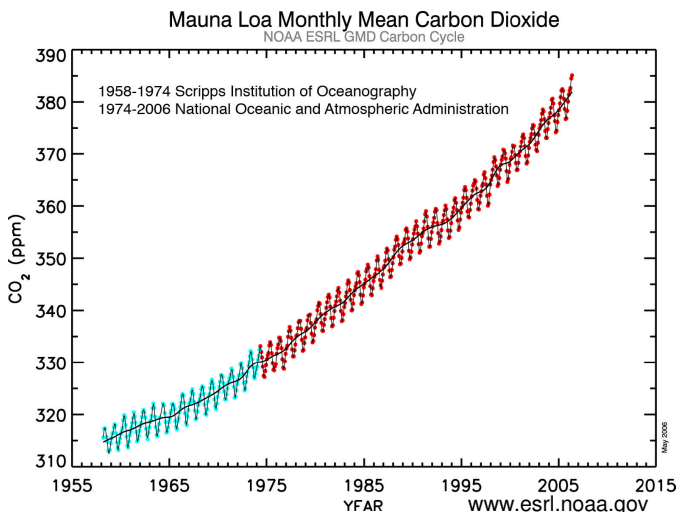
It all begins with nuclear fusion on the sun that sends humungous amounts of energy in the direction of Planet Earth. The problem is, for animals and some microbes, energy from the sun is pretty useless. It gives us warmth and light, but it doesn’t directly give us energy to live, move and grow. That is where plants and photosynthesis comes in. Plants use water, carbon dioxide, and energy from the sun to make glucose and oxygen. Then they burn the sugar (just like us) to grow. Therefore, when we eat, we are actually eating that trapped energy from the sun, in the form of sugar or starch, which was produced by the plant during photosynthesis. Then when we eat we have energy to move and grow. So the plant, and its ability to do photosynthesis, is the link between the sun’s energy and the survival of all animals (including humans!) and many microbes and decomposers.

### *The American meal on wheels*

The “meal on wheels” does not just refer to the multitude of meals we can order from, and eat in, our cars. It refers to the distance our food, or the ingredients our food travels, from farm to plate.

Research shows that whatever you ate for dinner traveled 2,000 miles before it got to your plate (Orange County Farms 2007). What does this mean? Basically, this means that the tomato sauce on your pizza and the wheat in your toast came from plants which were grown many, many miles away! Why do we have to get our plants from so far away, you ask? Certain plants grow best in certain climates. Tomatoes grow best in warm, sunny states, like California. Wheat prefers moderately dry and temperate climates like Kansas and North Dakota. And a favorite treat, chocolate, comes from the cocoa plant that lives in warm and wet climates of tropical countries like Ecuador and Brazil! Therefore, the diversity of the planet’s climate, soil and topography allow for many different types of plants, which yield a tremendously diverse diet for humans.

### *The lungs of the world*



Over the last 50 years, the amount of carbon dioxide in the air has been increasing. Why is it increasing? To begin, there are many sources of carbon dioxide including decomposition, fire and burning fossil fuels. While plants and algae take up this carbon dioxide, they will never take up enough carbon dioxide to neutralize our emissions. Thus, there is a net increase in carbon dioxide in the atmosphere, as shown in this graph. But why does the graph above show that the amount of carbon dioxide in the air goes up and down during each year? This is mainly due to the way that plants use carbon dioxide.

During the summer, when all the leaves are out in temperate zones, plants take up huge amounts of carbon dioxide and therefore leave less in the air. But in the winter, when temperate deciduous trees are leafless and not photosynthesizing, a lot more carbon dioxide is floating around.

So, what do we care if there is so much carbon dioxide in the air? Carbon dioxide is one of the most important greenhouse gases. The more carbon dioxide in the air, the warmer the Earth gets. Such changes can throw ecosystems into dramatic changes. So, in order to protect our environment from warming too quickly, we must protect plants while reducing the greenhouse gases we put in the atmosphere.

### *Sources*

Coder, K. *Water movement in trees*. University of Georgia School of Forest Resources Extension. Publication for 99-007. 4/1999.

Orange County Farms. 26 Nov 2007. *Enjoy exceptional taste and freshness*. Retrieved Jan 9, 2008 from <http://www.orangecountyfarms.org/education.asp>.