

BACKGROUND ECOLOGY INFORMATION

Air Cleaning Department



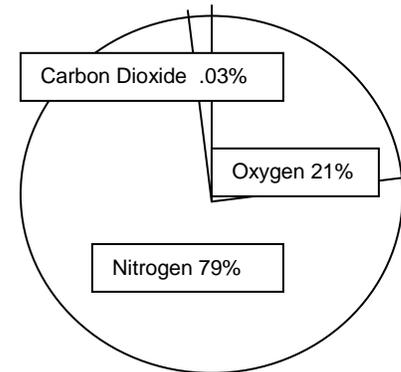
Major Concepts:

- Trees provide many things for humans and other organisms in all ecosystems.
- Some gifts from trees include clean air, oxygen, homes, wood for shelter, food, medicines, shade and beauty.
- Plants act as air filters, cleaning the air of harmful chemicals and particulates.
- Dust, smoke and other kinds of dirt can make the air dirty.
- Cars, factories and other manmade things make pollution that makes the air dirty.
- Many trees are being cut down. When they are cut down, they cannot clean the air.
- The Air Cleaning Department can rid the air of many pollutants but an increase in pollutants and deforestation make it difficult for this Department to accomplish its work.

Air Cleaning - A Vital Life Support Function

Safe, fresh air to breathe is something that we take for granted. Trees and other plants are primarily responsible for providing that clean air. We can think of plants as air filters for our Garden Earth home.

We know that plants use carbon dioxide and give off oxygen during photosynthesis, whereas animals must have oxygen to breathe and give off carbon dioxide when they exhale. However, beyond this very simple model of gas exchange, plants are also responsible for other types of air purification.



Major Gaseous Components of Earth's Atmosphere

What other ways can plants purify the air? There are many interesting examples. Some types of algae are able to take gaseous nitrogen and turn it into forms that can be used as fertilizer. Volcanic eruptions often release pollutants into the atmosphere. The eruption of the Mount Pinatubo volcano in the Philippines released many tons of sulfur gases into the air. As plants respire, they take in these gaseous natural pollutants such as sulfur dioxide, and release purified air. Plants, such as the philodendron, are also known to be able to remove carbon monoxide, a pollutant produced by automobiles, from air.

Plants have no way of screening out different chemicals from the air that they take in. When plants take in the carbon dioxide that they need for photosynthesis, they also get sulfur dioxide, ozone, and whatever else is there at the time. These pollutants damage some plants more than others. Some of these pollutant gases get trapped by the internal plant tissues, so the gas that comes out of plants, besides being rich in oxygen, often contains lower concentrations of the pollutants. Removing pollutant gases from the air, though, often comes with a cost. Some plants are very sensitive to air pollution. The intolerant plants photosynthesize less and therefore will grow or reproduce less when they take in pollutant gases. For some species, exposure to sulfur dioxide can cause stomata to close and photosynthesis to stop completely. In clean air, the tolerant plants don't grow as fast as the intolerant plants. The different growth rates of these two groups of plants in polluted and unpolluted environments suggests that there is a disadvantage to being able to tolerate polluted air.

Forests can also purify the air of particulate matter, such as dust. Forests act as traps for dust as the wind moves. The dust sticks to leaves and branches and then when rain falls, the dust gets washed down into the soil. Humans and other animals can't tolerate much dust, and they cough or sneeze to keep the dust from clogging their breathing passages. Ridding the air of dust is another valuable service that is provided by the forests.

Air Cleaning in Your Community

If you can't see air, how do you know that the Air Cleaning Department is at work? Well, there are certain times when you **can** see air--when it is carrying particulates (small particles of dust and other materials). If you know a place near a busy road where cars or trucks stir up dust and spew dirty diesel exhaust smoke into the air, you'll see that the dust collects on the surface of the leaves. Trees and other plants provide a lot of surface area to remove dust and other particles from the air.

But plants also remove gases from the air. Air passes into a plant through stomata, small holes that are opened or closed by the shrinking or swelling of specialized guard cells. When the guard cells swell with fluid, spaces or pores open to the interior of the leaf, letting air enter the leaf. Leaves remove carbon dioxide from the air as well as some of the pollutants such as sulfur dioxide. Look at a leaf. Can you see any stomata? Most stomata are on the underside of leaves but are so small you'll need a microscope to see them. Look around and notice all the leaves on the trees, shrubs, and every blade of grass. Take a deep breath. Imagine all of them taking in a great big breath like you are. Does the Air Cleaning Department seem more real to you now?

Threats	Stewardship Actions
Deforestation	Planting trees and other green plants
Exhaust from cars and factories	Walk when you can, use mass transit, buy from green companies, use less electricity
Acid rain	Recycling paper and other wood products

Quiz Yourself

1. Forests can rid the air of:
a. sulfur gases b. carbon monoxide c. dust d. a, b, and c
2. **True or False.** Volcanic eruptions are sources of air pollutants.
3. The most abundant gas in our atmosphere is:
a. oxygen b. carbon dioxide c. hydrogen d. nitrogen
4. **True or False.** Carbon monoxide is an air pollutant produced by automobiles.
5. **True or False.** Luckily, plants can remove a limitless quantity of pollutants from the air.