Where's the air?. [Supplement, Vol. 18, No. 6] [December 1994]

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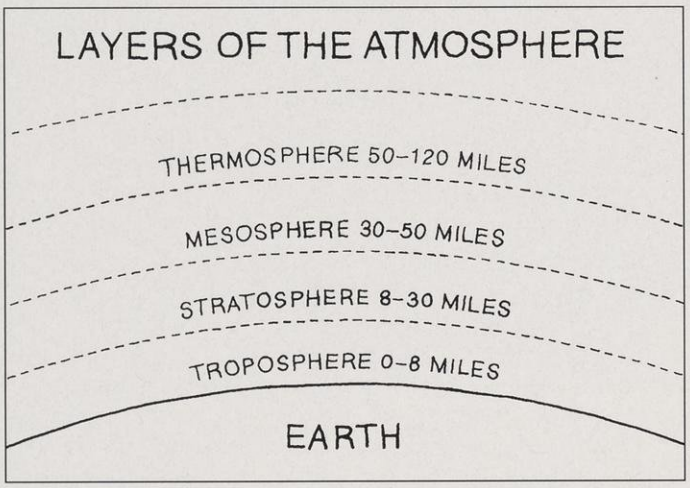
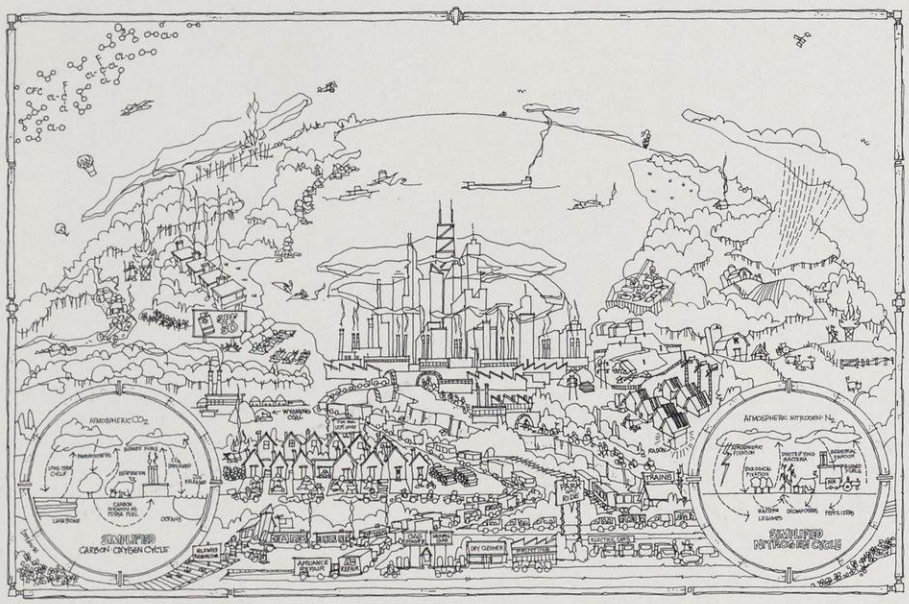
Where's the air?

Everywhere!

The world's supply of air seems endless! Our planet is surrounded by a vast sea of gases we call the atmosphere. Without air, there would be no life on earth. All plants and animals need air to survive. Humans can live for only a few minutes without it. During the course of a day we breathe over 22,000 times. Day in and day out, we rarely take the time to consider the importance of the air we breathe — and pollute.





What can you find?

Air pollution has many sources and many potential solutions. Artist Tom Lowes has illustrated many of them in "Where's the Air?" Take some time to closely investigate the poster. How many sources of air pollution can you identify? One example would be car exhaust. How many positive actions that can reduce air pollution or save energy can you find? An example would be carpooling. Challenge another member of your family or a friend to see how many they can find. Can you think of any additional natural or human sources of air pollution?

Send in your ideas!

What other actions to reduce air pollution would you suggest? Draw your ideas or list them and send them to *Wisconsin Natural Resources* magazine, Box 7921, Madison, WI 53707 and we may include them in the Readers Write column.

Taking action

Everyone can and needs to play a role in preventing or reducing air pollution. One person taking action can make a big difference over the course of a lifetime. Here are some simple things you and your family can do:

- **Educate yourself and others.** Learn as much as possible about air pollution. Share the information with your family and friends. Set a great example for others!
- **Tightly seal containers of household chemicals and gasoline.** This will reduce evaporation of volatile organic compounds into the atmosphere. Handle containers carefully to avoid spilling.
- **Use wood stoves and fireplaces wisely and sparingly.** Build efficient fires that burn hot and clean using dry wood. A well-maintained stove or fireplace is safer and produces less pollution.
- **Be a wise consumer.** Look for efficient appliances that do not use ozone depleting chemicals.
- **Maintain or properly dispose of refrigerators and air conditioners.** Appliances will run more efficiently and last longer if they receive regular maintenance. When the time comes, contact your local government to find out the proper procedures for disposing of home appliances.
- **Start your barbecue with an electric probe or use a gas grill.** Charcoal lighter fluid vaporizes quickly and can cause air pollution.
- **Don't burn trash or yard waste.** Burning your garbage outdoors harms the health of your family, your neighbors and the environment. It can release arsenic, benzene, dioxin and other gases into the air. Open burning can be a big nuisance to your neighbors. Compost your yard wastes or take them to a municipal compost facility. In many areas, burning trash or yard waste is illegal.
- **Conserve energy at home.** If we use less energy, power plants will not need to burn as much coal or oil. Weatherstripping, fluorescent lights and thermostat controls help save energy.
- **Reduce the use of gasoline-powered engines.** Use an electric lawn mower or push mower instead. Sweep and hand trim instead of using gasoline-powered leaf blowers and other equipment.

Here's how to decrease pollution from automobiles:

- **Reduce your driving.** Plan your trips to avoid wasting fuel and time.
- **Ride share.** Carpool, even if it is just one day a week. Consider starting a rideshare program in your neighborhood, school or place of work.
- **Travel light.** Remove unnecessary weight from your trunk.
- **Use radial tires.** Keep them properly inflated.
- **Use clean fuels.** Fill up at gas stations that have vapor controls at the pump to reduce air pollution. Don't top-off the tank; you may block the vapor recovery system and cause a spill.
- **Maintain your air conditioner.** Have leaks repaired by a certified technician using required CFC recycling equipment. Use the AC only when absolutely necessary!
- **Get regular engine tune-ups and car maintenance checks.**
- **Turn off your engine when you stop your car for a minute or more.**
- **Try walking, biking or using public transportation!**

Many of these actions are simple and inexpensive — a matter of changing some old habits and creating new ones. These actions will make your community a better, cleaner and safer place to live.

For more information on air pollution, write to the Wisconsin Department of Natural Resources, Bureau of Information and Education, Box 7921, Madison, WI 53707.

Check yourself

Listed below are the sources of air pollution and the many air pollution reduction steps that are depicted in "Where's the Air?" Note that some are listed in both areas because of the efforts that are being made to reduce the amount of pollution from that source.

Compare your list with the one below. How many were you able to find?

Give yourself credit for interpreting other sources and solutions!

Air pollution sources or problems

Natural sources:	Human sources:		
pine trees	single passenger cars	oil carrier	woodpiles
forest fire	furnaces	oil storage	fireplace/woodstoves
cows	open burning	acid rainfall	lawn mowers
radon	leaf burning	factories	off-road vehicles
	salvage yard	landfill (dust)	jet skis
	coal pile (dust)	printer	airplanes
	power plants	dry cleaner	grills
		gas station	CFCs

Solutions to air pollution

- schools and education
- solar panels
- wind generator
- electric lawn mower
- electric car
- buses and mass transit
- school bus
- school project on biomonitoring
- salvage yards and recycling
- landfill/methane collection
- bicyclists
- walkers
- light rail trains
- park-and-ride
- carpoolers
- carpool lane of traffic
- printers/product substitution
- dry cleaners/product substitution
- natural gas car fill-up
- gas station/Stage 2 vapor recovery
- appliance repair
- air conditioning repair
- green areas in city
- sunscreen sign
- shaded sunbathers
- power plant/emission controls
- Wyoming coal/low sulfur content
- ozone layer/O_3
- space probe/study atmosphere
- sailboat

Rating scale:

Less than 10—You're still in the troposphere. Try glasses and keep looking.

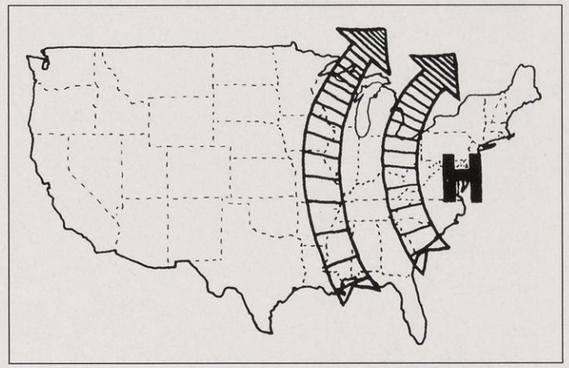
10 to 20—In the stratosphere. Getting better.

20 to 30—In the mesosphere. Almost there. Try one more time.

More than 30—You reached the thermosphere! Congratulations! Great work!

Radon

Radon is a naturally occurring radioactive gas. Radon can enter basements from the soil through cracks in the foundation. The United States Environmental Protection Agency estimates that one out of every 15 homes in the United States has high radon levels. Radon is estimated to be the second leading cause of lung cancer in the United States. For additional information on radon in Wisconsin and how to test for radon in your home, call the Wisconsin Division of Health, (608) 267-4795.



Regional air transport

This map shows one example of how air pollution can be transported across a region. A high-pressure center (H) is located in the East. This type of system usually brings hot, muggy weather to the Midwest. Under these conditions, pollutants produced in the Ohio River Valley can reach Wisconsin. Pollution from Wisconsin can be carried into Canada. To solve the air pollution problem, every country, state and local community must help.

Produced by the DNR Bureaus of Air Management and Information & Education

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Ozone: good and bad

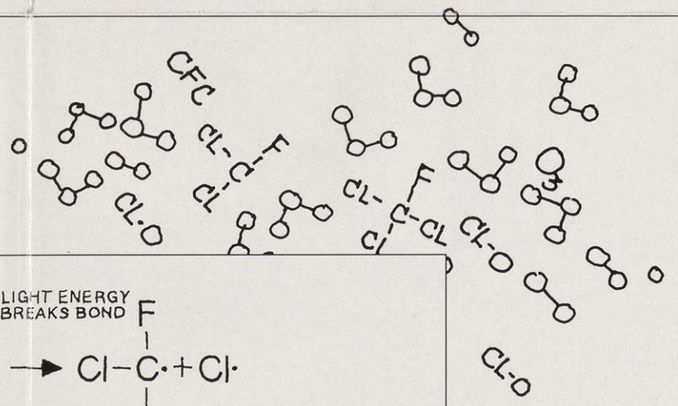
Ozone is ozone. But in different places it has different effects. Ozone is a molecule made up of three oxygen atoms (O_3) instead of two (O_2), which is the type of oxygen in the atmosphere that animals require to stay alive. Ozone is good when it is part of the stratosphere, where it protects the earth from the harmful ultraviolet rays of the sun. Ozone can be bad when it is part of the troposphere. Here ground-level ozone or smog is harmful to our health and the environment. Let's examine both types of ozone.

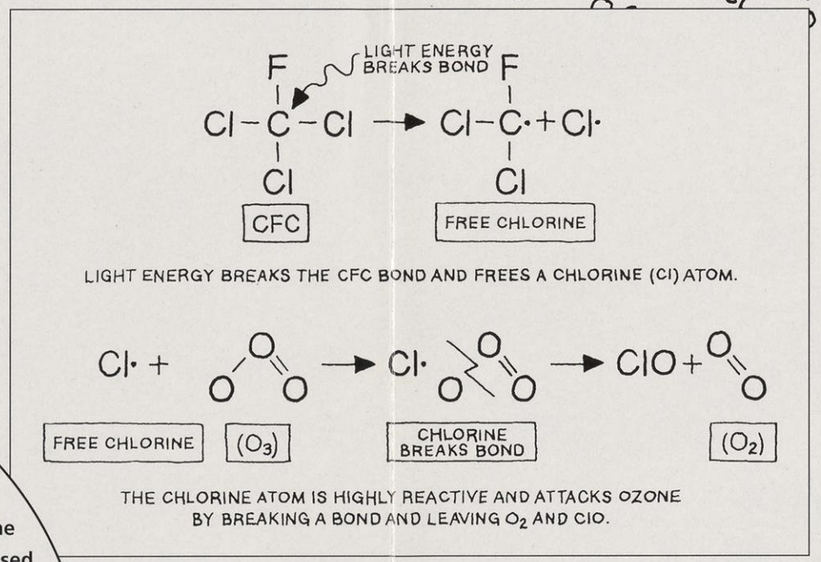
Stratospheric ozone (O_3), or good ozone, occurs naturally and is located from eight to 30 miles above the earth. This ozone layer absorbs some of the ultraviolet radiation coming from the sun. In the 1970s, scientists suggested that chlorofluorocarbons (CFCs) could destroy stratospheric ozone. CFCs were widely used then as aerosol propellants in hairspray and deodorant and for many industrial uses.

In response to this concern, the use of CFCs in aerosol cans made in the United States has been prohibited since 1978.

Further investigation has shown that the ozone layer is being depleted faster than previously thought. At first, the loss of ozone was observed in the atmosphere above Antarctica. Today, significant losses are now being measured all over the world.

The reaction between CFCs and ozone are very complex. They can be summarized by the following process:





Light energy breaks the CFC bond and frees a chlorine (Cl) atom.

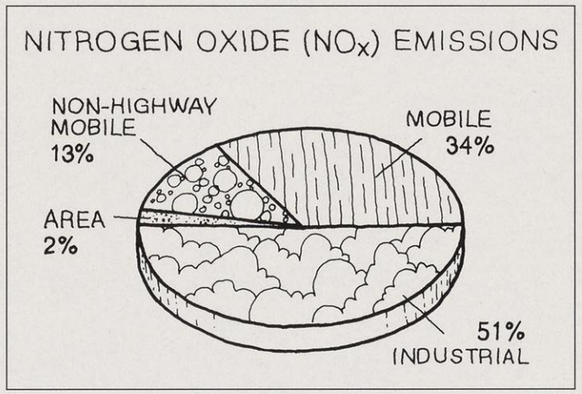
The chlorine atom is highly reactive and attacks ozone by breaking a bond and leaving ClO and O_2.

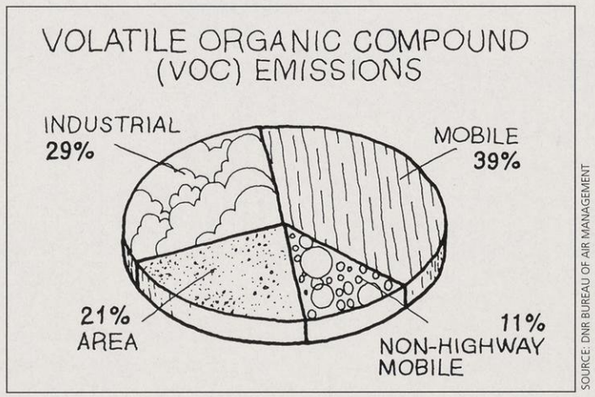
The chlorine atom quickly regenerates and can react with as many as 100,000 ozone molecules. This process thins or depletes the ozone layer, allowing more of the sun's ultraviolet rays to reach the surface of the earth — and us. For humans, this means increased occurrences of skin cancer and eye cataracts, and weakening of immune systems. We are just beginning to understand the effect on plants and animals. For instance, ultraviolet rays reduce marine phytoplankton, the tiny aquatic plants at the base of the ocean food chain.

Today, CFCs and other ozone-depleting chemicals are still widely used in air conditioners, refrigerators and freezers, industrial cleaning processes and some foam cushions and insulation. Many industries are searching for substitutes for CFCs. A worldwide effort has started to eliminate the production and use of ozone-depleting chemicals. Nearly all nations have agreed to halt CFC production before 1997.

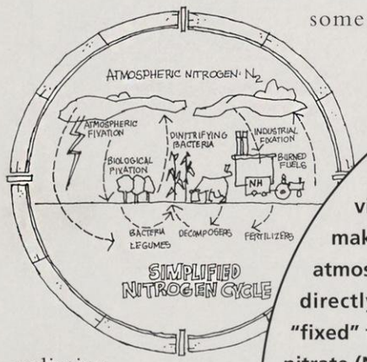
This effort will help prevent damage to the ozone layer in the future and give nature a chance to recover. The natural repair process will be a slow one. Meanwhile, harmful UV rays from the sun are a real threat. You and your family can reduce the danger by limiting your exposure to the sun. Use sun-blocking lotions, wear sunglasses, hats and protective clothing, and avoid sunlight during the most dangerous times of 10 a.m. to 2 p.m. Infants and the elderly are especially susceptible and require careful attention.

Tropospheric ozone (O_3), or bad ozone, is formed when sunlight reacts with nitrogen oxides (NO_x) and volatile organic compounds (VOCs) to form ozone. This mixture of gases is called "smog."





SOURCE: DNR BUREAU OF AIR MANAGEMENT



The nitrogen cycle

Plants and animals need nitrogen to survive. It is one of the most common elements and makes up over 78 percent of our atmosphere. Yet the atmospheric nitrogen (N) that surrounds us cannot be used directly by most life forms. Most plants and animals use "fixed" forms of nitrogen like ammonia (NH_4), nitrite (NO_2) and nitrate (NO_3).

The process of converting atmospheric nitrogen to fixed nitrogen is complex. Microscopic bacteria and algae, lightning and even factories are part of the process. Many of the microbes live in colonies on the roots of certain plants called legumes like peas, beans and alfalfa. The process of converting nitrogen is a marvelous example of how important microbes are to life on earth. Today, fertilizer factories produce millions of tons of nitrogen fertilizer for crops and lawns by converting atmospheric nitrogen to ammonia.

Bad ozone is produced when airborne "ingredients" combine in the presence of sunlight. The ingredients that produce bad ozone are shown in the pie charts below.

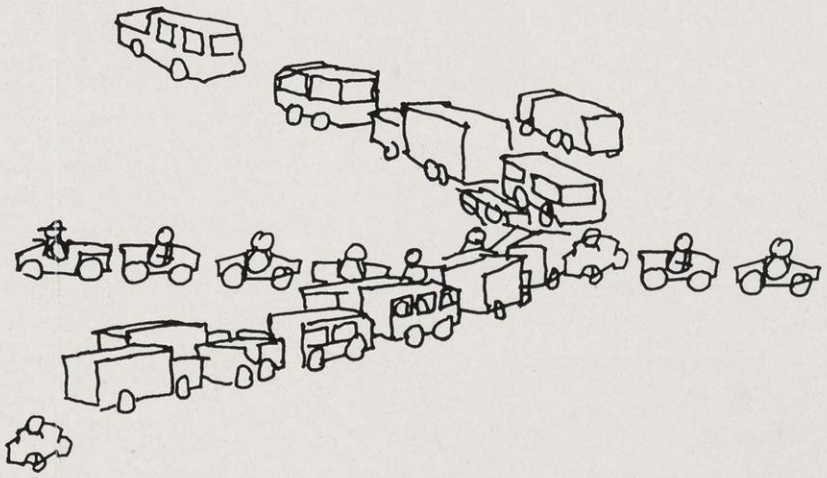
Mobile: Emissions from all motor vehicles operating on public roads.

Non-highway mobile: Emissions from engines which are not used on public roads, such as lawn mowers and motorboats.

Area: Emissions from non-engine sources such as paints, solvents, and vehicle refueling.

Industrial: Emissions from power plants and other manufacturing facilities.

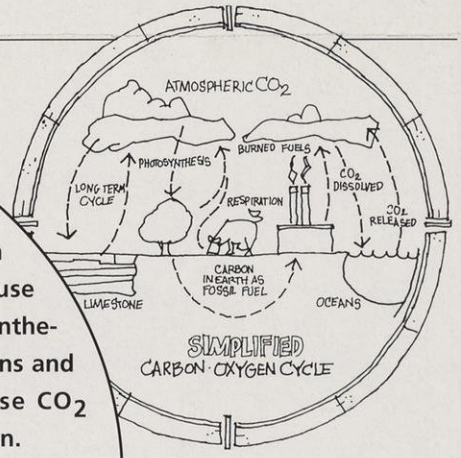
The hotter the day, the more the ingredients will cook. The final product is a high level of ozone that poses a serious health risk to humans. People with asthma and emphysema, the elderly, children, and adults who exercise outdoors on high ozone days may experience irritated eyes, coughing, and shortness of breath. Human immune systems may be weakened.



Carbon-oxygen cycle

The carbon-oxygen cycle is also known as the carbon dioxide cycle. Green plants use atmospheric CO_2 in the process called photosynthesis to produce sugars and release oxygen. Humans and animals use the food and oxygen and release CO_2 through the process of respiration or decomposition.

Humans are altering the carbon-oxygen cycle by burning fossil fuels. Each year billions of tons of CO_2 are being added into the atmosphere. Over the last 50 years the CO_2 content in the atmosphere has increased by more than 10 percent. If current trends continue, the atmospheric CO_2 will increase by an additional 20 percent by the year 2000. This increase may significantly affect our global climate.



Clean Air Act Amendments of 1990

Much has been done to clean up the air. Industry has greatly reduced pollution. The car is cleaner today than ever before. More and more people like you are becoming involved. However, almost 60% of Americans live in "nonattainment" areas. These are mostly urban regions that do not meet the clean air standards.

Air pollution is still a serious threat to our health. It is especially harmful to children, the elderly and people with respiratory ailments. Long-term exposure to some pollutants can damage healthy people's lungs.

Air pollution is also costly. Health care costs, lost work time, damage to crops and buildings are just a few examples.

The Clean Air Act Amendments of 1990 are a series of new rules and guidelines designed to further reduce levels of pollution. The rules will affect all citizens and industries. By working together, we can all make the air cleaner.

Where's the air?