



Tripper, Bear and **THE AIR**

Learning about ozone pollution in San Juan County, New Mexico.

This project was developed by the New Mexico Environment Department, Air Quality Bureau, and was funded by an environmental education grant by the United States Environmental Protection Agency.



NMED, Air Quality Bureau

For general information about ozone in San Juan County, contact the New Mexico Environment Department: www.nmenv.state.nm.us/aqb/ or call the Air Quality Hotline 1-800-224-7009

For general information about health and ozone:
www.epa.gov/airnow
www.epa.gov/airnow/health/smog1.html
www.epa.gov/oar/oaqps/gooduphigh
American Lung Association: www.lungusa.org/air

Design, animal photography and hamster handling by Creative Geckos, Farmington, New Mexico. 505-599-9000

Hey there! Take a look inside to learn about ozone air pollution in San Juan County. You and your friends can follow the adventures of Tripper the cat and Bear the hamster as they learn about ground-level ozone air pollution. Along the way, you can discover how ozone pollution affects you and your family, and learn how you can reduce ozone air pollution in your community. Have fun!

Tripper, a black and white manx kitty (that is, a cat with a short tail) and Bear, a silky-tan hamster, usually spent most of their days napping, telling stories, and sneaking a little TV when their people were out. Now, usually a hamster would be in danger from any cat, but Tripper and Bear had been friends ever since they each discovered they have no tails. All hamsters have tiny tails, but for cats it's more rare, "I'm special," Tripper would often purr smugly.

Today something caught Tripper's eye, "Bear, check this out in the paper."

"What do you see?" asked Bear, pausing from his whisker washing.

"Here's an article about our air and ozone pollution right here at home in San Juan County, New Mexico."

"Hmm...Tripper, let's find out more—I'll make some phone calls with the speakerphone and you go online with the computer," said Bear. He liked the phone and was happy to have an excuse to dance on the buttons.



"Hey Bear, ozone pollution is high here at home!"



You can go online to www.nmenv.state.nm.us/aqb/ and look for the kid's link about ozone.

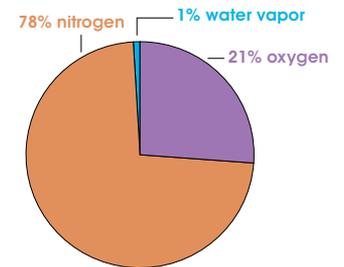


“What do we need air for?”

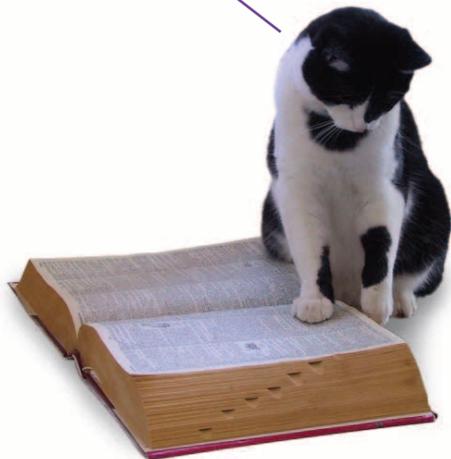
All about air

The Earth is surrounded by a huge ocean of air. This is a band of air that stretches from the ground up to about 500 miles. This band of air is called the atmosphere (AT•mus•fear).

Air is a mixture. It contains many things — mostly gases we can't see. Gases are neither solid nor liquid. Gases move around and do not have shape. Adults breathe in about 35 pounds of air a day. 21% of air is oxygen, the rest is nitrogen (78%), and 1% is small amounts of carbon dioxide, other gases and water vapor.



“OK, Bear, we breathe air and so do plants...and the cleaner the air the better!”



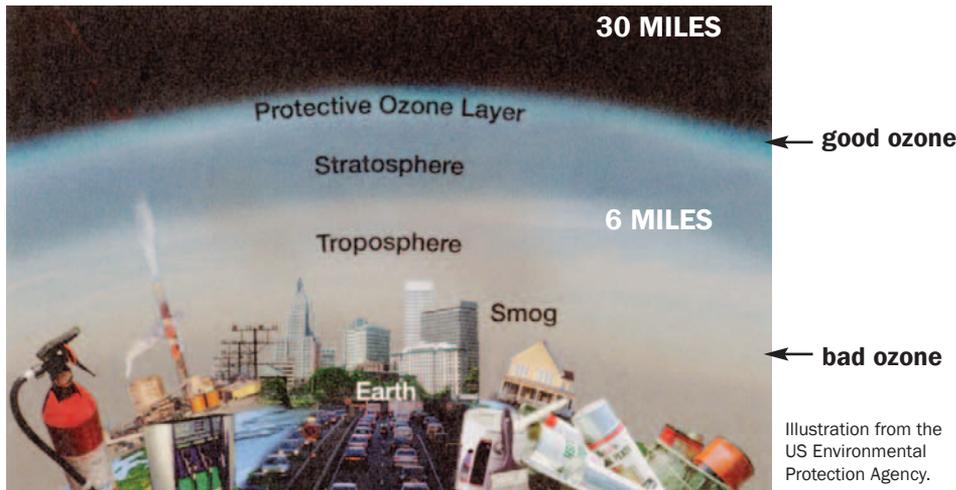
The most important gas in air for people and animals is oxygen. Oxygen has no color or smell. People and animals need to breathe oxygen to live. Plants help us breathe by giving off oxygen. As people and animals exhale, they give off carbon dioxide. Plants take in what we exhale (carbon dioxide) and we inhale what plants give off (oxygen).

Plants and people and animals need each other to survive!

Ozone—What is it?

Ozone is in two layers of the atmosphere. The layer closest to the Earth's surface is the troposphere (TRO•po•sfeer). Here, ground-level or “bad” ozone is an air pollutant that is harmful to breathe and damages crops, trees and other vegetation. It is a main ingredient of smog, which is the brown hazy layer that we sometimes see in the sky.

The troposphere extends to a level about 6 miles up, where it meets the second layer, the stratosphere (strat•U•sfeer). The stratosphere or “good” ozone layer extends upward from about 6 to 30 miles and protects life on Earth from the sun's harmful ultraviolet rays. Each year scientists detect a 3%-5% reduction in the Earth's good ozone layer.



“Ozone is good in the upper atmosphere, but it’s bad down here near us. It can hurt our health.”

Where does ozone pollution come from?

Much of our air pollution comes from burning. For example, when we burn gasoline to operate cars, chemicals called nitrogen oxides (NO_x) and volatile organic compounds (VOCs) are released into the air. Nitrogen oxides are also made by power plants that make our electricity, and furnaces to heat our homes. In addition to being made by cars, volatile organic compounds come from oil and gas production and household products such as gasoline, cleaners, paints, and garden chemicals.

Ozone pollution in our lower atmosphere, where we breathe, is made when air pollutants such as smoke, dust, dirt, nitrogen oxides and VOCs have sunlight and high heat. The ozone is created by chemical reactions when these pollutants combine. In the summer, we have a special problem with ozone pollution caused by higher temperatures and more sunlight.

Two pollutants combine to make ozone:

NO_x (nitrogen oxides) + VOCs (volatile organic compounds) + Sunlight = Ozone

Ozone pollution can be very harmful to our health when there is too much ozone in the air we breathe. When we breathe, ozone pollution enters our lungs and, over time, can damage our lungs.

Ozone pollution can be easily inhaled by people and other living things. Ozone pollution can make it difficult for people to breathe and can make a brown haze in the sky. Ozone pollution can also affect plant and animal life. Do not be fooled, ozone pollution affects everyone, not just people who are sick or have asthma.

“A lot of our air pollution is made from burning fuels, like driving a car, heating our homes, and making electricity.”





“We all contribute to pollution, Tripper, and there are a lot of pollutants that can harm us.”

Measuring Ozone in San Juan County

The New Mexico Environment Department uses air monitors to detect ozone pollution at many different locations around New Mexico. These monitors tell the New Mexico Environment Department about the level of ozone pollution around the state. In San Juan County, ozone is monitored at two sites, one west of Farmington and one north of Bloomfield. The New

Mexico Environment Department's monitors have shown high amounts of ozone pollution in San Juan County.



San Juan County

Ozone pollution is normally found in large cities such as Los Angeles, but more frequently small towns are starting to see high levels of ozone pollution. To help reduce ozone pollution, the citizens of the Four Corners area are working together to figure out how to deal with ozone pollution in the County. A research project has been started by the New Mexico Environment Department to find out where the ozone pollution is coming from.



You can find out more about the research project by going online to: www.nmenv.state.nm.us/aqb/

Anyone can help in the fight against ozone pollution.

Remember, “Every Little Bit Helps.” Tell your parents that by following these eight steps you will be doing your part to help reduce pollution in San Juan County. Many of these steps can save money too!

1. Reduce use of Volatile Chemicals

Reduce using spray-can products and oil-based paints. Tightly seal containers of paints, cleaners, fuels, and other chemicals to prevent evaporation into the air.

2. Reduce, Eliminate or Reschedule Driving

Combine errands and reduce trips. Reduce travel during congested peak rush hour traffic. Carpool to school and for other group activities.

3. Conserve Electricity and Other Energy

Conserve energy—at home, at school, everywhere. The less energy used, the less pollution released by the power plants. Some ways you can conserve are:

- Set your air conditioner at a higher temperature or turn it off altogether, especially when no one is home
- Set your heater at a lower setting—a few degrees can save a lot of energy (wear a sweater!)
- Use a clothesline instead of a dryer
- Turn off lights when you leave a room
- Turn off electrical appliances, such as computers, televisions and stereos when you are not using them
- Use energy saving light bulbs instead of traditional lights

4. Reduce Mowing, Barbecuing and Engine Use

Two-cycle engines, often found in lawn mowers, chain saws, outboard motors, all-terrain vehicles and off-road motorcycles, are especially bad air polluters. Reduce charcoal lighter use and barbecuing.

5. Choose a Cleaner Commute

Use public transportation, bicycle or walk when possible.

6. Tell Your Parents to Drive Wisely

To save gas and reduce pollution, don't carry unneeded items in your vehicle, and reduce drag by carrying cargo inside rather than on your roof racks. Drive with your pickup tailgate open or removed when possible. If your vehicle has overdrive, shift into overdrive whenever your speed is high enough.

7. Don't Spill the Fuel

Avoid topping off your gas tank. Be careful to avoid spills and overfills at the gas station, since gasoline fumes are an ingredient for ozone. Apply the same precautions against sloppy refueling when filling lawnmowers, outboard motors, etc.

8. Have Your Parents Refuel Their Cars in the Evening

Refuel your car late in the day, when it's cooler.



“Every little bit helps!”



Bear sat back and relaxed after all their reading, “We learned a lot today, Tripper.”

“Yeah, we need to tell our people they can help reduce pollution,” said Tripper.

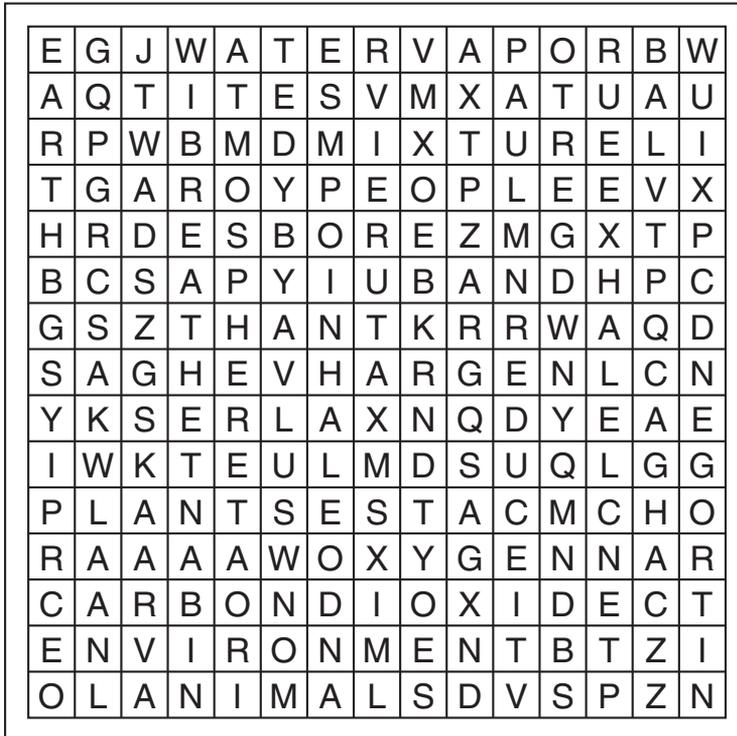
“Let’s go have some fun with these puzzles.”

True or False?

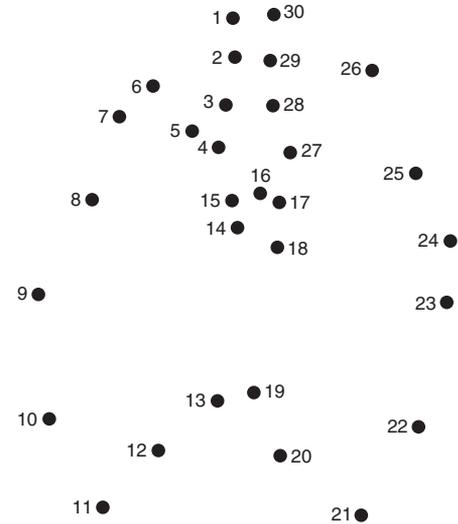
Place **T** next to those statement that are true and a **F** next to the statements that are false.

- Ozone pollution can enter our lungs and over time can harm our lungs.
- A 3% to 5% reduction in the earth’s protective ozone layer is detected each year.
- Some of the sources of VOCs in San Juan County are oil and gas production and household products.
- Ozone pollution only occurs in large cities like Los Angeles.
- Each day, an adult breathes about 35 pounds of air!
- Ozone pollution only harms people with illnesses like asthma.
- There is “good” ozone and “bad” ozone.
- Ozone pollution is more of a problem during the winter months.
- Some of the producers of nitrogen oxides in San Juan County are power plants and cars.
- Ozone pollution is directly released by several sources around San Juan County.

Find all the air words.

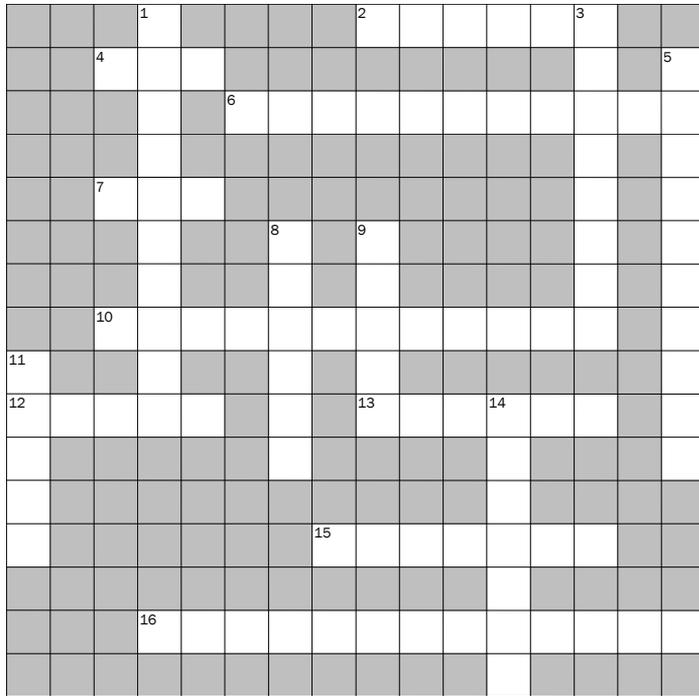


- | | | |
|---------------|-------------------|----------------|
| 1 air | 7 atmosphere | 13 exhale |
| 2 water vapor | 8 earth | 14 environment |
| 3 mixture | 9 animals | 15 breathe |
| 4 oxygen | 10 nitrogen | 16 inhale |
| 5 reduce | 11 plants | 17 band |
| 6 gas | 12 carbon dioxide | 18 people |



This organ in a person's chest can be affected by ozone. Children and the elderly should take special care when ozone levels are high.

I am the _____.



Across

- 2. People need to _____ the oxygen that is produced by plants to survive.
- 4. The troposphere is where “_____” ozone is found.
- 6. The New Mexico _____ Department is conducting a research project on ozone in San Juan County
- 7. _____ and gas production sends out volatile organic compounds into the air
- 10. Earth’s protective ozone layer is located here.
- 12. _____ pollution is created by a chemical reaction.
- 13. The season of the year that ozone pollution is highest.
- 15. Much of our air pollution comes from _____.
- 16. What people exhale from their bodies that plants need to survive

Word Bank

- BAD
- ATMOSPHERE
- ENVIRONMENT
- BURNING
- OZONE
- SUMMER
- OIL
- CARBONDIOXIDE
- FARMINGTON
- EVERYONE
- INHALE
- MONITOR
- CITIES
- GASES
- STRATOSPHERE
- POWER

Down

- 1. One of the ozone monitors is located west of this town.
- 3. Ozone pollution affects _____ !
- 5. The band of air that surrounds the Earth
- 8. Large and small _____ can have ozone pollution.
- 9. Air is a mixture of many things, but mostly _____.
- 11. _____ plants are producers of nitrogen oxides
- 14. A tool used to detect air pollution

“Bear, what season is ozone the highest?”



Attack of the Dreaded Mutant Oxygen Molecule

It was a hot __1__ day in San Juan County, New Mexico. The birds were singing, children were playing and everything seemed right with the world. That was until the citizens noticed the San Juan mountains were gone. “Where did our mountains go?” everyone cried out. “They have been stolen,” a woman said, but by whom? Through much detective work the citizens of San Juan County figured out that their mountains had not been stolen, but that the sky was under attack by the dreaded mutant oxygen molecule known as OZONE. Well, this OZONE was a nasty lot. It liked to make people __2__ and cause black __3__ on the __4__ and bushes. OZONE also liked to make things disappear, like the San Juan Mountains. Once the citizens of San Juan County realized that their mountains and overall __5__ were under attack, they decided to take action. Well, as with any mutant creature, figuring out how to destroy the monster takes a good __6__. So, as OZONE continued its destructive ways, the citizens of San Juan began to come up with a plan to get rid of the dreaded Ozone. After many months of planning they decided to take action. They knew that OZONE had to have three things to survive: nitrogen oxides, __7__, and sunlight. Late that night as OZONE slept the citizens put their plan into action. By day break they were finally done. When OZONE awoke that morning, it stretched and looked around to see how it could bully the citizen of San Juan today, but very quickly it realized that something was different. It looked around to see instead of people driving __8__ they were walking and riding __9__, there were also __10__ where concrete used to be. In a panic OZONE began to rise in the __11__. Once it was high enough it realized that the local industry and citizens were not sending out the same amount of __12__ that they used to. Right then OZONE began to disappear, without the __13__ produced by cars and power plants, and the volatile organic compounds given off by oil and gas production and household products OZONE could not survive. OZONE took one last gasp of air and disappeared forever and the citizens of San Juan took in a deep breathe of their new __14__ air and gave a sigh of relief.

Fill in the story with the correct words.

volatile organic compounds
sky
trees
pollutants
summer
cough
clean
cars
spots
air quality
plan
bicycles
plants
nitrogen oxides

The answers

Answers to True or False

__T__ *Ozone pollution can enter our lungs and over time can harm our lungs.* Small particles of pollution can get trapped in your lungs and make conditions such as asthma worse, and even make healthy people sick.

__T__ *A 3% to 5% reduction in the earth's protective ozone layer is detected each year.* The ozone layer is gradually being destroyed by man-made chemicals.

__T__ *Some of the sources of VOCs in San Juan County are oil and gas production, house-hold products and vehicles.* The VOCs that are sent out by oil and gas production and cars, paints and household chemicals contribute to the formation of ozone pollution.

__F__ *Ozone pollution only occurs in large cities like Los Angeles.* More frequently ozone pollution is being detected in areas like San Juan County.

__T__ *Each day, an adult breathes about 35 pounds of air!* Oxygen is the fuel all the cells and organs of our body need to function. Oxygen is taken from the air we breathe into our lungs and then is sent to the bloodstream.

__F__ *Ozone pollution only harms people with illnesses like asthma.* Anyone can be affected by ozone pollution, even people who are considered healthy.

__T__ *There is "good" ozone and "bad" ozone.* There are two layers of the atmosphere where ozone occurs, the layer closest to the earth is where "bad" ozone is found.

__F__ *Ozone pollution is more of a problem during the winter months.* Ozone pollution is more a problem during the summer months when temperatures are higher because higher temperatures increase the chemical reactions.

__T__ *Some of the producers of nitrogen oxides in San Juan County are power plants and cars.* Power plants and cars can send out nitrogen oxides which contribute to the formation of ozone pollution.

__F__ *Ozone pollution is directly released by several sources around San Juan County.* Ozone is not made directly, but is created by a chemical reaction when certain pollutants combine and react with sunlight.



For general information about ozone in San Juan County, contact the New Mexico Environment Department, Air Quality Bureau:

www.nmenv.state.nm.us

Or call the Air Quality Hotline 1-800-224-7009



Tripper the cat lives in the country, just outside of Farmington, New Mexico. He is a two-year-old manx kitty and sports a very short tail. He likes napping and snacking, just like Bear the hamster. Bear lives in Farmington, New Mexico with the principal of Aztec's Park Elementary School. He is five months old, likes to eat seeds, sleep in his little wooden house, and roll around in his plastic ball. He too has a VERY short tail.