

# Whispurr and Muttley



## Air Detectives

An interactive adventure for those who dare to learn about ozone!



This project was developed by the New Mexico Environment Department, Air Quality Bureau.

Available for download at <https://www.env.nm.gov/air-quality/kids/>. For print copies, call the Air Quality Bureau, (505) 476-4300.

For more information on air quality monitoring in New Mexico, visit <http://nmaqinow.net/>.

For general questions regarding ozone and its impacts on health and the environment, visit <https://www.epa.gov/ozone-pollution>.

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## Take the Challenge!

Whispurr and Muttley are pretty smart. They know that clean air is important for health – **and** for a healthy environment. Dirty air can cause breathing problems and other health impacts. It can also harm trees, crops and other plants.

More than that, Whispurr and Muttley know that it is **everyone's job** to do their part for cleaner air. Air knows no borders, so what one person does affects many others.

What can you do? Take up the Kids' Air Quality Challenge. Let us know what you are doing to help protect New Mexico's air. Send us your stories, your pictures, and your events for a chance at the spotlight on the Kids' Page of the New Mexico Environment Department website.

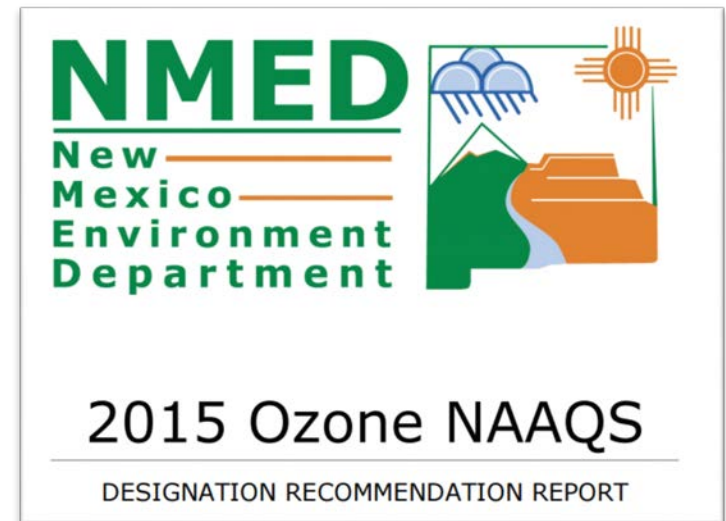
To sign up for the Kids' Air Quality Challenge, email [cindy.hollenberg@state.nm.us](mailto:cindy.hollenberg@state.nm.us) or go to <https://www.env.nm.gov/air-quality/kids/>.



Whispurr and Muttley are unusual friends. Whispurr, a very princess-like gray tabby, prides herself on how smart she is; she can read, after all. Muttley, her shaggy Terrier/Chihuahua companion, asks a lot of questions, confident that Whispurr will know the answers. Together they make quite a team!

Sometimes Whispurr and Muttley sleep the day away ... but not today. Muttley turned on the TV just as the news came on with a story about ozone pollution. He sighed, "I'm sure glad we live in New Mexico, where the air is clean!"

Whispurr looked up from her reading. "Don't be so sure," she purred. "It seems New Mexico has problems with ozone too. It says so right here in this report." She sat up straighter, looking as proud as ever.



Find this report at <https://www.env.nm.gov/air-quality/ozone/>



"Oh, no!" yipped Muttley. "Is it serious?"

"I don't know," Whispurr replied casually.

"Let's do some research!"

Whispurr and Muttley got busy finding out all they could about air and ozone. Before long, they had lots of information.



## Do you know air?

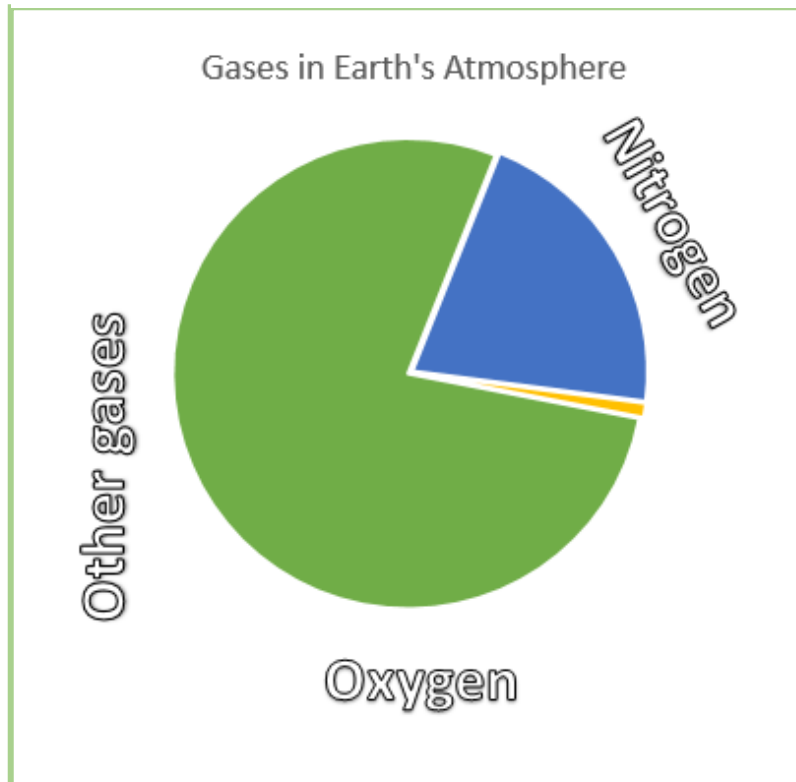
Fill in the blanks below, then go to [http://www.eo.ucar.edu/basics/wx\\_1\\_b\\_1.html](http://www.eo.ucar.edu/basics/wx_1_b_1.html) to check your answers.

1. \_\_\_\_\_  
is the most common gas in our atmosphere. It makes up about \_\_\_\_\_% of the lower layer.
2. Oxygen makes up only about \_\_\_\_\_% of the air we breathe.
3. The lowest layer of the atmosphere is called the troposphere. The next layer up is called the \_\_\_\_\_.
4. Ozone in the stratosphere is important for protecting us from \_\_\_\_\_.
5. Ozone in the troposphere damages \_\_\_\_\_ and causes breathing problems for animals.

"Air is really, really important," Whispurr purred. "The Earth is surrounded by it. It's like a 500-mile thick envelope that has what people, plants and animals need to survive. That air envelope is called the atmosphere."



**In the pie chart below, color the names of the gases to match the correct slice. Write in the correct percentages.**



"What's in the atmosphere?" asked Muttley, turning his head sideways quizzically.

"Well," Whispurr purred, "it's a mixture of gases, mostly. 78% is nitrogen, 21% is oxygen and a little bit is water vapor, carbon dioxide and other gases. People and animals need to breathe oxygen to live. Plants give off oxygen."

Muttley wagged his tail. "So people and animals need plants, right?"

"Right, Muttley. But plants need people and animals, too! When we breathe out, we exhale carbon dioxide. Plants need carbon dioxide and sunlight to grow."

Muttley lay down and thought for a moment. "So, if people, animals and plants all need air, it's pretty important for the air to be clean!" His enthusiasm came out through his tail again.

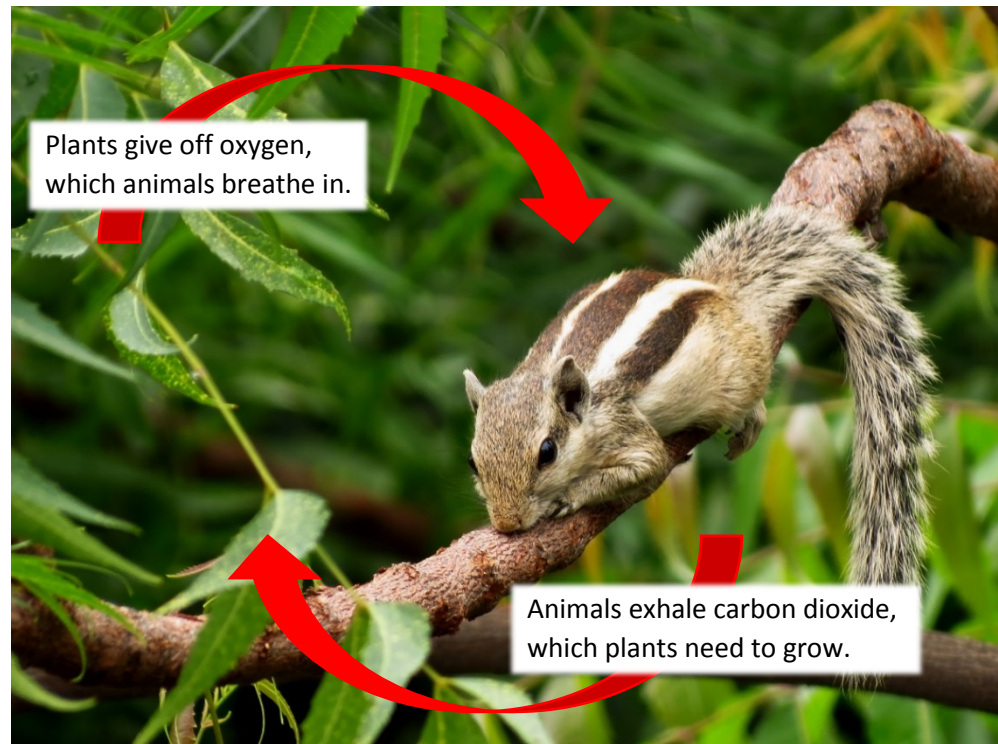


Image Source: <https://static.pexels.com/photos/122892/pexels-photo-122892.jpeg>

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*Go further ... research on the internet*

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What is the name of the major law to prevent air pollution? \_\_\_\_\_

"Yes," Whispurr explained in between paw licks and ear washing. "Air is important. Just think about people. An adult human breathes in 35 pounds of air every day. And if it's not clean ..."

Muttley finished Whispurr's thought: "It's not healthy! That's what I found out about ozone. It's bad for our lungs and it damages plants, too!"



Whispurr took her favorite spot – on top of the arm chair. "So ... why do people talk like a hole in the ozone layer is bad? I've read all about that. Do you know why we wouldn't want it all to go away?" She put on her best superior look, pretending she knew the answer.



"Oh no. The ozone hole is different." Muttley sat up straight. He loved showing Whispurr that he was just as smart as she was. "The good ozone is found in the stratosphere. That's way up high – 6 to 30 miles above us. The ozone up in the stratosphere protects life down here from the sun's harmful rays."

"You mean like ultraviolet rays?" asked Whispurr. She turned her head and gave another lick to her paw and another wet brush to her ear.

"Exactly! Ultraviolet rays – or UV for short – can damage trees and crops. Too much UV exposure can even cause skin cancer! Scientists started noticing good ozone disappearing more than 30 years ago. Now, because of environmental laws, it's coming back."

## Explore ...

Go to

<http://thescienceexplorer.com/nature/hole-ozone-layer-rapidly-shrinking>

and read the article. Then answer the following questions:

1. What major class of pollutant was linked to destroying the ozone layer over Antarctica?

\_\_\_\_\_ (or CFCs) The major element in these compounds (linked to ozone depletion) is \_\_\_\_\_.

2. During what month is the ozone hole typically the largest? \_\_\_\_\_

3. How much did the researchers find that the ozone hole had shrunk in 2015?

\_\_\_\_\_ square kilometers

4. By what year does this researcher expect the ozone hole to close permanently?

\_\_\_\_\_



"So ... ozone is good?" Whispurr looked upward, trying to hide her confusion.

"Only if it's in the stratosphere," Muttley yipped patiently. "When it's down here in the troposphere where we live and breathe, it's harmful. It damages plants and makes it hard for people and animals to breathe."

"Oh, that is bad," agreed Whispurr, forgetting momentarily to act like a princess.

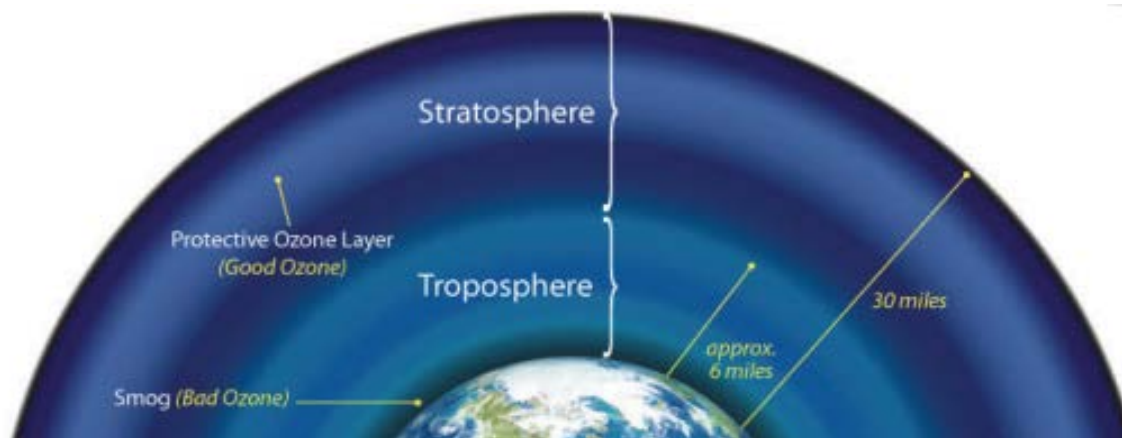


Image courtesy of the U.S. Environmental Protection Agency.

Image source: <https://www.epa.gov/sites/production/files/documents/ozonedepletion.pdf>.

Muttley was encouraged by her interest. "Have you ever seen a brown, hazy layer of air, especially near cities?"



Albuquerque, New Mexico

CLICK ON THE CITY NAME ABOVE OR GO TO THE CITY'S WEB PAGE (<https://www.cabq.gov/airquality/stay-healthy/living-in-albuquerque>). WHY DOES ALBUQUERQUE EXPERIENCE FREQUENT SMOG? (WRITE A PARAGRAPH BELOW.)

"Of course I have," she meowed. "It's called smog." She folded her paws beneath her. "What does that have to do with ozone?"

Muttley patiently explained. "Ozone is one of the main ingredients of smog, along with smoke, other tiny particles from combustion and some harmful gases."

Secretly, Whispurr was amazed at how smart Muttley was. She thought about ozone for a few minutes. Then, she wondered aloud where bad ozone comes from.

Muttley's excitement showed in his eyes, his ears, his tail; and he couldn't keep his paws from dancing. "A lot of our air pollution – not just ozone – comes from burning fuels. Burning gasoline or diesel, for example, releases chemicals called nitrogen oxides (or NO<sub>x</sub> for short) and volatile organic compounds (or VOCs) into the air.



Image Source:

[https://cdn.pixabay.com/photo/2017/01/27/07/37/power-plant-2012377\\_340.jpg](https://cdn.pixabay.com/photo/2017/01/27/07/37/power-plant-2012377_340.jpg)

"Power plants that burn fossil fuels (especially coal) emit large quantities of NO<sub>x</sub>; burning from wood stoves and some furnaces emits smaller amounts of NO<sub>x</sub>, although there are a lot of those in New Mexico.

"VOCs come from oil and gas production, some cleaners and paints, petroleum products such as gasoline and kerosene, and other stinky chemicals people use every day."

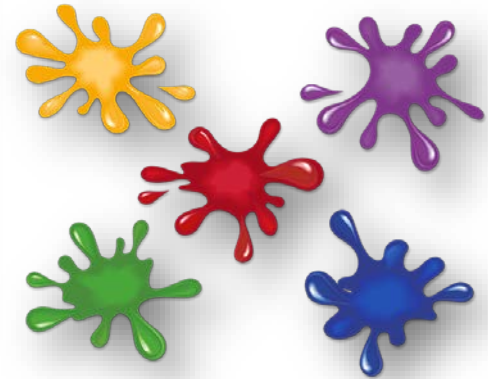


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Muttley sat, but his tail refused to stop. "Ozone pollution is made when sunlight causes a chemical reaction in the air, resulting in oxygen combining with NO<sub>x</sub> and VOCs. That's why, in most places, the worst ozone pollution happens in the summer."

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Oxygen (O<sub>2</sub>) + NO<sub>x</sub> + VOC + sunlight = ozone pollution

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Whispurr's eyes closed, trying to look bored. Muttley knew better. "So," he sighed, "what else did you find out?"



Whispurr pointed to the computer screen. "See this map? It shows everywhere the New Mexico Environment Department has monitors – special machines to measure pollution in the air. Some of them have detected high levels of ozone in the last few years."

"How high?" asked Muttley. "And where?"

Go to the NMED [monitoring web page](http://nmaqinow.net/) (<http://nmaqinow.net/>) to see current monitoring data.

"High enough that the U.S. Environmental Protection Agency can require the State to create a plan for reducing ozone levels," Whispurr replied. "The worst ozone pollution is in Doña Ana County near the Texas and Mexico borders. Of course, ozone can cross state and international borders!"

Muttley wrinkled his forehead. "So how can New Mexico plan for cleaner air if pollution comes from somewhere else?"

Whispurr purred, "That's a good question, Muttley. And not an easy one to answer. First, the New Mexico Environment Department is concerned about ozone in other parts of the State too. Protecting our health and the environment is important: It's the Environment Department's mission!"

## NOx and VOC Sources

Go to <https://www.epa.gov/air-emissions-inventories/where-you-live>. If you can use Google Earth, take a look at the "Top NOx emitting Sectors" and "Top VOC emitting Sectors" under Facility Emission Summaries. Focus in on New Mexico, then especially on the southern part of the State where Texas meets our State. What NOx-emitters and VOC-emitters are in New Mexico?

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Even if you can't use Google Earth, click on "Ground-level Ozone Precursor: Nitrogen Oxides." Find the map near the bottom and click on New Mexico. What are the 3 biggest categories of NOx emitters?

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"Also, even small changes can make a difference. The New Mexico Environment Department's Air Quality Bureau is working to discover what changes can be made that will reduce ozone to healthier levels."

"Is there anything we can do?" asked Muttley.

Princess Whispurr returned to her royal pose. "Well, not **us** so much. But **people** can do a lot just by making a few small changes."



"Like what?" Muttley asked.

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*What does EPA say about reducing ozone pollution?*

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Go to <https://www3.epa.gov/region1/airquality/reducepollution.html>. Make a poster or flyer about what people can do to reduce ozone pollution.

"Like using less energy, driving less, filling gas tanks at night when there's no sunlight and using environmentally friendly paints, cleaners and other products."

Muttley sat up straight. "What else can people do to help?"

"There's a whole list of things on the [kids' page](https://www.env.nm.gov/air-quality/kids/) of the Air Quality Bureau website (<https://www.env.nm.gov/air-quality/kids/>). I hope kids learn that they can make a difference by sharing all of this information with their parents and other family members."

"Friends too!" yipped Muttley, excitedly.

"Yes, Muttley. Friends too." She leapt down from her perch and sat beside him. "Just like you and me. Together we can make a difference and help New Mexico breathe easier."





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### *What did you learn? Test yourself!*

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**Circle the letters of the statements that are true.**

- A. Ozone pollution can enter our lungs and, over time, can harm our lungs.
- B. Some sources of VOC include gasoline evaporation and some paints.
- C. Ozone pollution only occurs in big cities, like Los Angeles.
- D. Each day, adults breathe in approximately 35 pounds of air.
- E. Ozone pollution only hurts people with illnesses like asthma.
- F. “Good” ozone lives in the stratosphere; “bad” ozone lives in the troposphere.
- G. In New Mexico, winter is the time for the most ozone pollution problems.
- H. Big sources of nitrogen oxides in New Mexico are power plants and cars.
- I. There are many sources of ozone pollution in New Mexico.
- J. There is nothing people can do to reduce ozone pollution.



Image Source: [https://cdn.pixabay.com/photo/2016/12/04/02/22/idea-1880978\\_960\\_720.jpg](https://cdn.pixabay.com/photo/2016/12/04/02/22/idea-1880978_960_720.jpg)

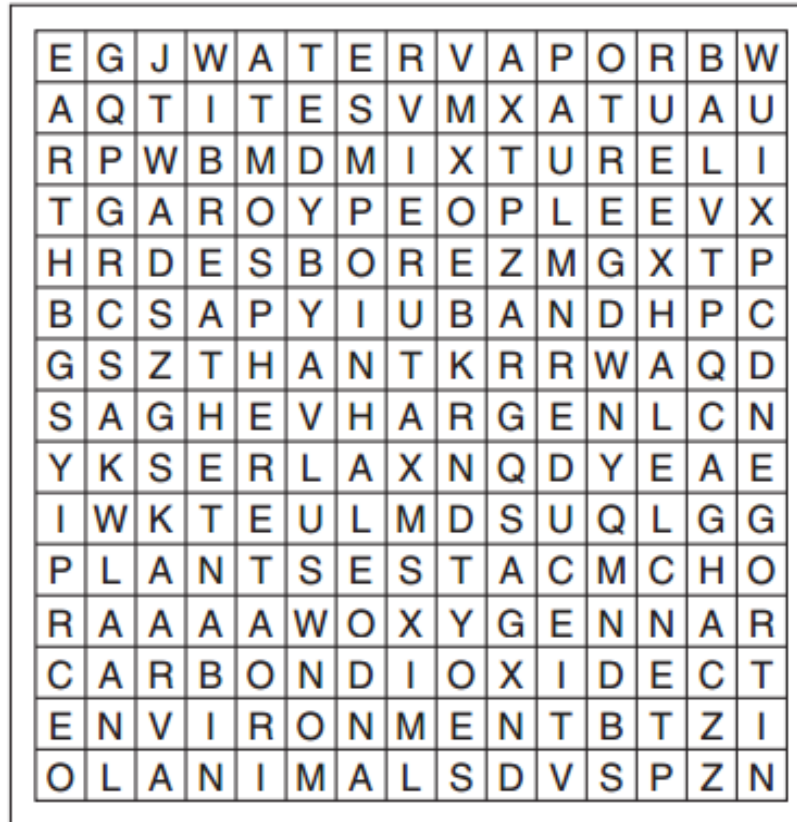
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### *How did you do?*

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The true answers are A, B, D, F, H and I. C is not correct, because ozone happens in rural areas too. E is not correct because high levels of ozone can harm even healthy people. It can also harm plants and animals. G is not correct because New Mexico experiences its worst ozone problems in the summer, although high ozone days can also happen in spring and summer (and in winter, but infrequently). J is not correct because there are lots of things people can do to help reduce ozone pollution.

# Find all the air words.



AIR  
WATER VAPOR  
MIXTURE  
OXYGEN  
REDUCE  
GAS

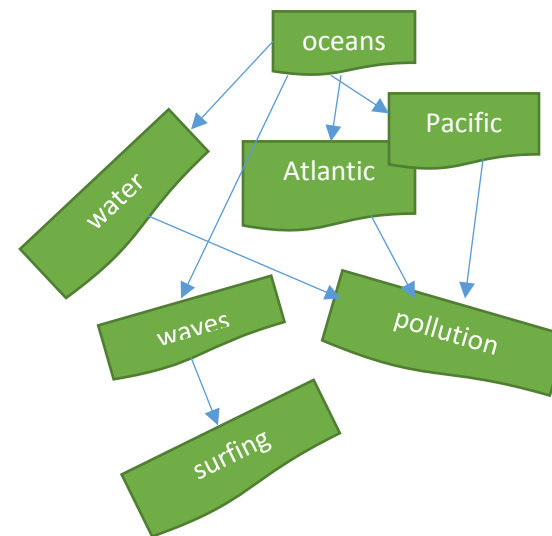
ATMOSPHERE  
EARTH  
ANIMALS  
NITROGEN  
PLANTS  
CARBON DIOXIDE

EXHALE  
ENVIRONMENT  
BREATHE  
INHALE  
PEOPLE

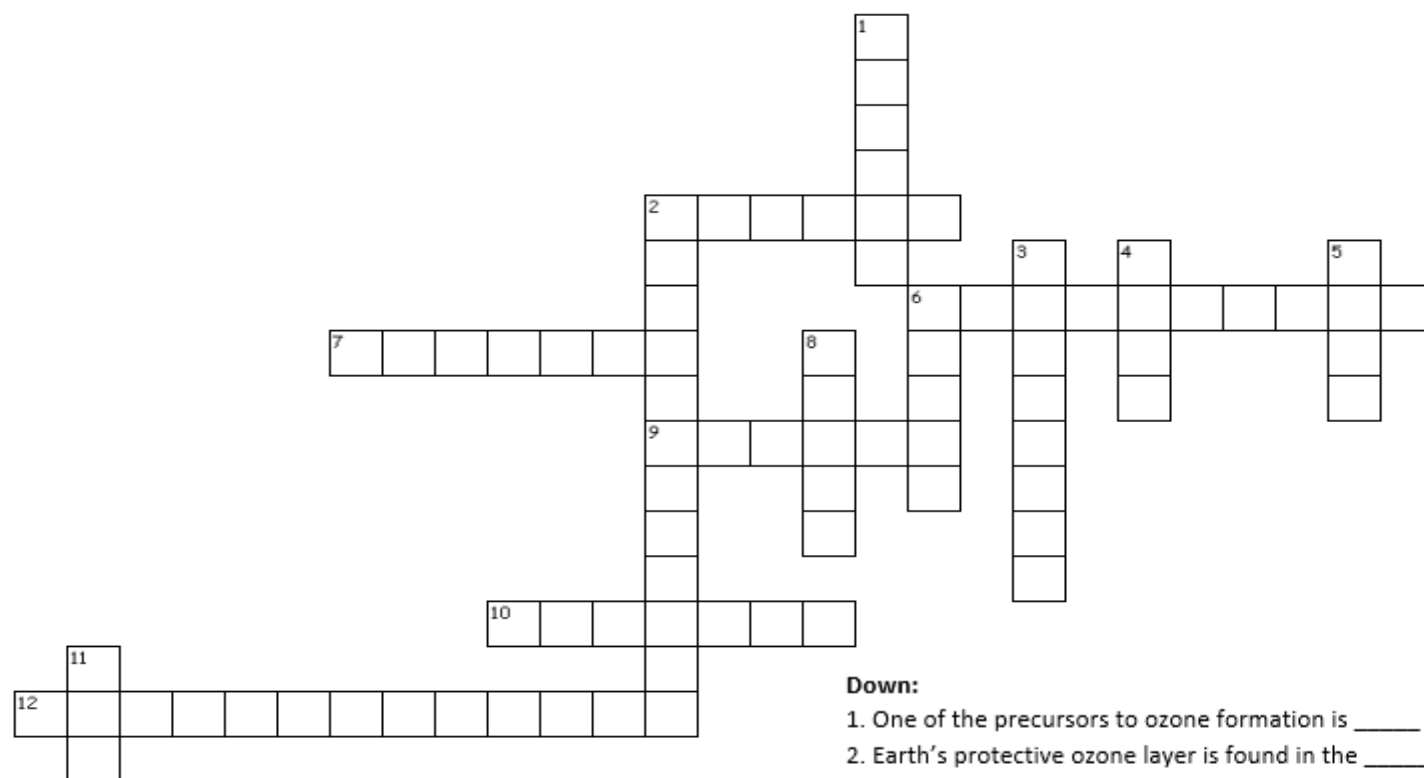
## Concept Mapping

Create a concept map using the words in this puzzle. A concept map connects topics in ways that make sense – like the one below on oceans.

1. Write each word on a separate piece of paper – use scrap paper from the recycling bin!
2. Arrange the words so that those related in some way are near each other.
3. Draw connections that show how terms are related to each other.



## Ozone Pollution in New Mexico



### Across:

2. The season of the year when New Mexico experiences the most ozone problems.
6. The Environmental \_\_\_\_\_ Agency can require the State to plan for healthier levels of ozone.
7. County in New Mexico with ozone problems.
9. What plants give off that humans and animals need.
10. You can help reduce ozone pollution by telling your \_\_\_\_\_ about ozone reduction ideas.
12. What humans breathe out that plants need to grow.

### Down:

1. One of the precursors to ozone formation is \_\_\_\_\_ of nitrogen.
2. Earth's protective ozone layer is found in the \_\_\_\_\_.
3. Special machines set up throughout the State that measure air pollutants.
4. People can drive \_\_\_\_\_ to help reduce ozone pollution.
5. These are emitted from the evaporation of gasoline and some paints and cleaners.
6. Using low VOC \_\_\_\_\_ can help reduce ozone pollution.
8. It's better to fill gas tanks at what time of day?
11. The troposphere is where \_\_\_\_\_ ozone is found.

### Answers

Across: 2. Summer; 6. Protection; 7. Dona Ana; 9. Oxygen;  
10. Parents; 12. Carbon dioxide

Down: 1. Oxides; 2. Stratosphere; 3. Monitor; 4. Less; 5.  
VOCs; 6. Paint; 8. Night; 11. Bad

## Introducing ...

**Whispurr**, a mostly gray, long-haired Tabby, also known as "Buddy." Buddy lives with his mom and dad in Rio Rancho, New Mexico, along with Muttley. Buddy loves to drink out of the bathtub and found his family in Florida more than 10 years ago!



**Muttley**, a very wiry Terrier/Chihuahua mix, who thinks he's a big dog! (He'll take on anyone in the neighborhood.) He also lives with his mom and dad in Rio Rancho, where he answers to "Sparky." He loves to go on walks and hug his Teddy.

For general information about ozone in Doña Ana County and elsewhere in the State, contact the New Mexico Environment Department, Air Quality Bureau.

<https://www.env.nm.gov/air-quality/>  
(505) 476-4300

