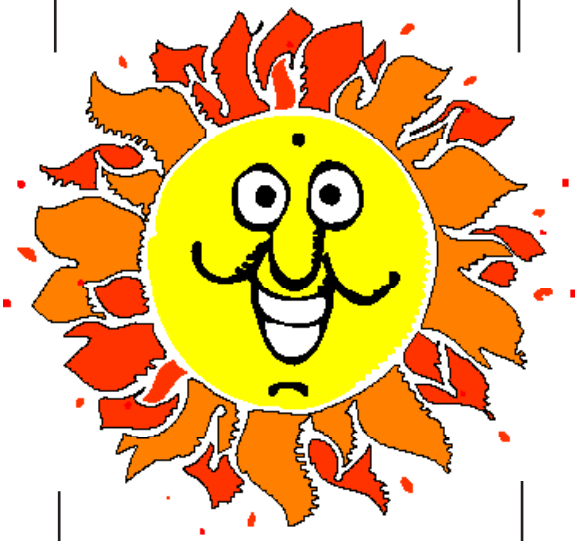
How does weather affect air pollution?

What we call "weather" is really the daily changes in temperature, wind, precipitation (rain, sleet, or snow), and the movement of large masses of air (called weather systems). Weather systems are often defined as being either a high or low pressure system. High pressure systems usually mean clear skies and temperature inversions.

During winter, high pressure systems lead to cold temperatures, stagnant air, and a build up of pollutants in the air. Low pressure systems bring winds and/or precipitation, which disperse air pollutants. Wind, rain and snow storms are sometimes called scrubbers because they help clear out the air pollution.

What is a temperature inversion?

A temperature inversion is when a layer of warm air sits on a layer of cold air and pollutants. During most other weather conditions, warm air is near the ground and the air can rise easily and carry away pollutants. In a temperature inversion the reverse is true. Cold air is trapped near the ground by a layer of warm air. Warm air acts like a lid, holding pollutants down where we breathe.



What kind of pollutants get trapped by an inversion?

During winter, smoke from fireplaces and wood stoves is a major source of pollution in Spokane. Smoke is made up of tiny particles called particulate matter (PM). During an inversion, smoke from chimneys can't rise and our neighborhoods can get smokey. That's why, if there's too much smoke in the air, a burn ban may be issued to reduce or stop the use of wood burning devices. Another major source of air pollution in Spokane is from automobiles. Automobiles produce invisible carbon monoxide (CO) gas. During winter, carbon monoxide can reach unhealthy levels during inversions. People are encouraged to use other ways to get around besides driving alone, such as carpooling, riding the bus, bicycling, and walking.

Spokane Regional Clean Air Agency

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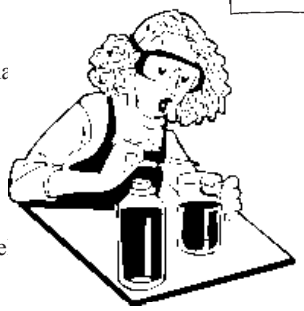
Create your own Inversion!

As you have learned, air can create layers based on temperature. That's what holds in pollution during an inversion. Here is a model using water for air, so you can see what an inversion might look like. (If you are doing this at home, make sure to ask before using food coloring!)

What you need:

1. Quart-sized mayonnaise jar or small aqua
2. Red, blue and green food coloring
3. Tap water
4. Salt (about 1/4 cup)
5. 4-cup measuring cup
6. Funnel
7. Plastic or rubber tubing that fits on funne



Follow these easy steps:

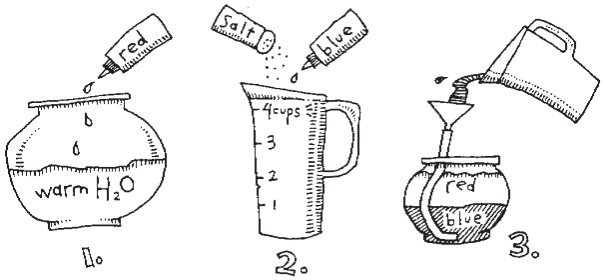
1. Fill the container (jar or aquarium) a little less than half full with lukewarm water. Put two drops of red food coloring in. The red water represents warm air, which is lighter than cold air.

2. Fill a 4-cup measuring cup with water and saturate it with salt (add salt until no more will dissolve—about 1/4 cup). Adding salt makes the water more dense and heavy. Add two drops of blue food coloring. The blue water represents cold air, which is heavier than warm air.

3. Fit the tubing snugly on to the end of the funnel. Make sure the tubing is on the bottom of the jar or aquarium. Pour the blue water slowly and carefully through the funnel. There should be two layers—blue on bottom and red on top. This is what happens during an inversion!! The air is stable and the heavy and light air don't mix, making it easier for pollution to concentrate in the heavier air.

Optional Step 4:

4. Drop a few drops of green food coloring into the jar or aquarium to represent air pollution. Notice how the "pollution" remains held in one layer. Now, grab a spoon and create a "wind storm" by stirring up the water in your jar or aquarium. What happens to air pollutants when a storm comes along?



Weather Puzzle

In the text on the reverse side, you will see 21 key words which are underlined. Each of these words is hidden below. Transfer the underlined words to the spaces below, then see if you can find them in the puzzle.

Can you find the Extra Words?: brain, bike,

B	E	A	H	C	F	O	I	E	N	I	T	Q
R	E	U	Y	U	O	U	E	K	O	M	S	C
A	T	T	S	W	E	A	T	H	E	R	T	A
I	A	O	R	G	S	K	E	M	A	I	N	R
N	L	M	E	U	L	K	M	R	P	N	A	B
E	U	O	B	J	I	B	P	E	W	V	T	O
T	C	B	B	B	G	D	E	Y	A	E	U	N
R	I	I	U	A	L	A	R	A	R	R	L	M
A	T	L	R	O	C	D	A	L	M	S	L	O
P	R	E	C	I	P	I	T	A	T	I	O	N
P	A	S	S	F	D	L	U	O	R	O	P	O
E	P	R	E	S	S	U	R	E	E	N	S	X
D	B	R	E	A	T	H	E	D	N	I	W	I
O	V	W	O	O	D	S	T	O	V	E	S	D
W	I	N	A	E	L	C	S	D	S	I	T	E