



HOW CLEAN IS THE AIR WE BREATHE?

Let's look at Air Quality!

Name

Date

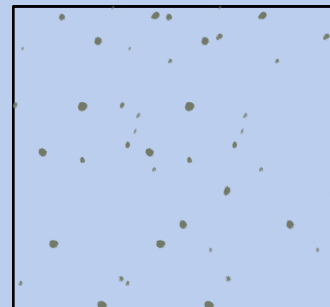
Look at the map of PM2.5 sensor stations at <https://cyclone.unbc.ca/aqmap/v3> and use it to answer the following questions:

1. Count the number of stations in New Brunswick (both ○ and ◇). Use the roller on your mouse to zoom in if there seem to be more stations in a small area, then zoom back out to continue counting. How many stations?

2. Look at the colour of the station markers. The colour indicates the level of PM2.5 measured at that station. Match the colour to the legend on the right of the map. What colour range (or ranges) do the stations fall into?

3. The units for measuring the volume of PM2.5 in air are $\mu\text{g}/\text{m}^3$ (say: “micrograms per metre cubed”). This is a very small amount! Recall when you learned about mass in math class, and how much one gram is. A gram is pretty small... But there are ONE MILLION micrograms in a gram! A measurement of $1 \mu\text{g}/\text{m}^3$ means one microgram of PM2.5 inside one cubic metre of air. To understand how much space a cubic metre of air is, imagine a metre stick being one side of a big cube. That's one cubic metre. So a measurement of $1 \mu\text{g}/\text{m}^3$ means one millionth of a gram inside one cubic metre of air.

A PM2.5 measurement of $1 \mu\text{g}/\text{m}^3$ is pretty clean air, but constantly breathing in air that has, say, $30 \mu\text{g}/\text{m}^3$ of PM2.5 in it adds up to a lot of particulate going in to your lungs and can cause or worsen health issues such as asthma. That's why the government sets a threshold level of PM2.5. If an area's PM2.5 is consistently higher than this safe threshold, we look at ways to make the air quality better. What are some things that can be done to make air quality better in an area?



4. a) Tally up the number of stations reporting each level of PM_{2.5} on the map, and fill in the table below. Hint: Start at the top of New Brunswick and carefully work your way down, left to right. Zoom in where you see several stations overlapping, tally their value, and then zoom back out to continue counting.

PMP.5 level (µg/m ³)	Number of stations with this number
1	
2	
3	
4	
5	
6	
7	
8	
9	
9+	

4. b) What is the most common PM_{2.5} level in the province right now?

5. Click on any station on the map. Click "Plot Time Series". After a moment, a graph will appear. Along the bottom of the graph (the "x-axis") are dates, moving forward in time as you go to the right. On the left side of the graph (the "y-axis"), are shown the values of PM_{2.5}.

5. a) What is the graph showing us?

5. b) Approximately what is the the highest value of PM_{2.5} plotted on your graph? On what date was the highest value recorded?

5. c) Approximately what is the lowest value of PM_{2.5} plotted on your graph? On what date was the lowest value recorded?

Use the following data to answer questions 6 and 7:

Time	PMP.5 level ($\mu\text{g}/\text{m}^3$)
6:00 am	
7:00 am	
8:00 am	
9:00 am	
10:00 am	
11:00 am	
12:00 am	
1:00 pm	
2:00 pm	
3:00 pm	
4:00 pm	
5:00 pm	
6:00 pm	
7:00 pm	
8:00 pm	

6. a) What is the highest observation (the “maximum”) in $\mu\text{g}/\text{m}^3$?

6. b) What is the lowest observation (the “minimum”) in $\mu\text{g}/\text{m}^3$?

6. c) What is the most common observation in $\mu\text{g}/\text{m}^3$?

The average (or “mean”) PM_{2.5} level is calculated as the sum of all the PM_{2.5} values, divided by the number of observations.

7. a) What is the sum of all the PM_{2.5} values? (Show your work.)

7. b) How many observations are reported in the table? (Show your work.)

7. c) What is the average PM_{2.5} level? (Show your work.)

Take a look around the map by zooming out to a larger area. Are there any dark blue areas? Are there any yellow or orange? What do you think it means if a station or an area is yellow or orange? Discuss with your classmates.

8. What do you think is happening in areas that are not light blue? Can you think of any reasons why the PM might be higher there?

Ruby lives in Fredericton, a small city in Canada. The average PM_{2.5} concentration in Fredericton today was 4 $\mu\text{g}/\text{m}^3$. Max lives in Toronto, the largest city in Canada. The average PM_{2.5} concentration in Toronto today was 16 $\mu\text{g}/\text{m}^3$.

9. a) How much higher was the PM_{2.5} in Toronto than in Fredericton today in $\mu\text{g}/\text{m}^3$?

9. b) Can you think of some reasons why the PM_{2.5} level may be higher in Toronto than in Fredericton?