

## Introduction

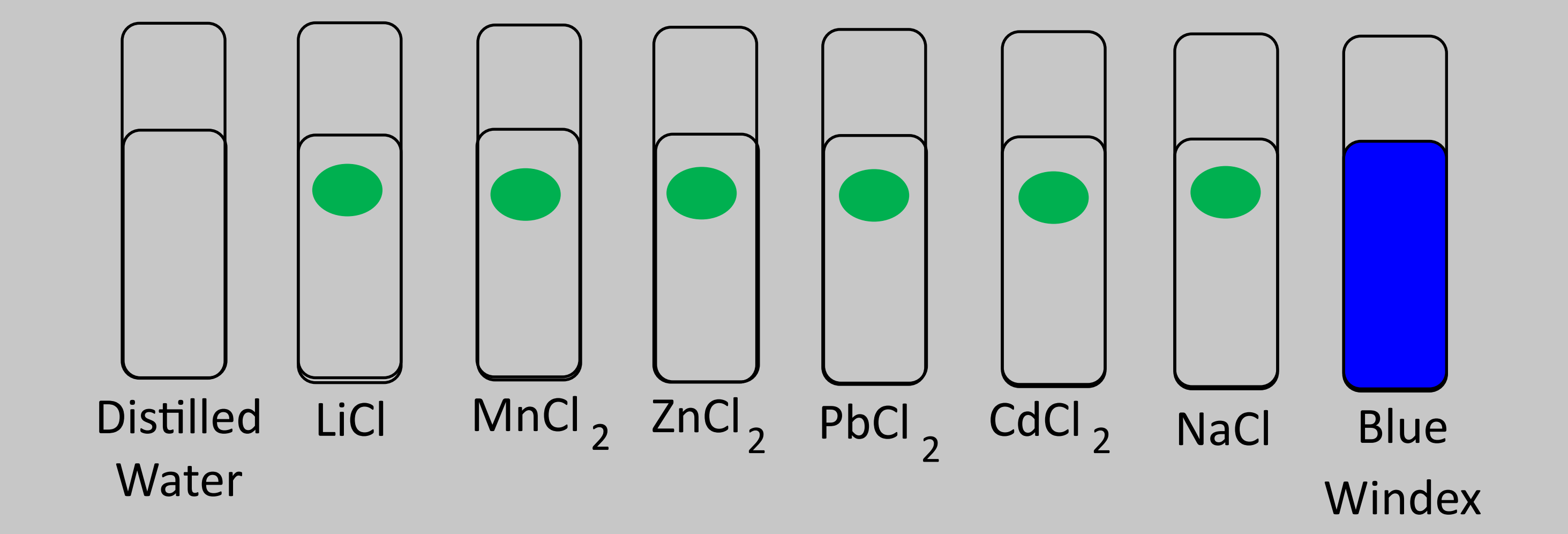
- ## Hypothesis

Using lichen and an air quality monitor, a gradient concentration map of heavy metals specific to wood burning, particulate matter and the AQI can be constructed by using a residential wood boiler as an epicenter in Hudson Falls, NY.

## References

# Using Lichen to test Air Quality and Metal Content around a Wood Boiler Epicenter in Hudson Falls, NY

## Methodology



## Assay Kit

- 0 is the color of distilled water, meaning no heavy metals in that sample
- 4 is the color of Blue Windex, the maximum intensity possible for the sample



**Lichen sample locations (Hogan, 2019)**

## Pocketlab Air Quality Sensor

- AQI
- PM  $>2.5$  micrograms per cubic meter
- Real-time data
- Took points every second


## Results

Solution	Intensity (0-4 scale)										
Sites	1	2	3	4	5	6	7	8	9	10	11
LiCl	0.5	0	0	0.5	0.5	0	0	0.5	0.5	0	0.5
MnCl <sub>2</sub>	2	0.5	0.5	2	2	1.5	3	0.5	1.5	0.5	1
ZnCl <sub>2</sub>	3	0.5	1	1	3	2	0	1	1.5	1	—
PbCl <sub>2</sub>	2	1	2	2	2	3	3	3.5	3.5	1	2
CdCl <sub>2</sub>	1.5	1	1	1.5	1	2	1	1	1	1	1
NaCl	1	0	0.5	0	0.5	0.5	0.5	0.5	1	0	0
Avg.	1.66	0.5	0.83	1.17	1.5	1.5	1.25	1.17	1.5	0.58	0.9

**Table 1** is a qualitative chart that *numerically shows the intensity levels of the different solutions resulting from the assay kit.*  
*The data for the  $ZnCl_2$  was inconclusive (Hogan, 2019)*

Sample	Date	Lat/Long	PM2.5	Mean PM2.5	AQI	Location
1	9/18/19	(43.31312, -73.55096)	3.4	3.215428	14.16666	on top of wood boiler
2	9/19/19	(43.31308, -73.551)	4.9234303	3.457936	18.00685	south of wood boiler in a tree
6	10/28/19	(43.31312, -73.55096)	26.280334	20.48855	78.34612	on top of wood boiler
7	10/28/19	(43.31306, -73.55091)	19.232044	46.09518	39.36286	south of wood boiler in a tree
10	11/13/19	(43.31312, -73.55096)	1.3054187	1.822441	5.439244	on top of wood boiler

**Table 2** numerically shows the Pocketlab Air quality sensor results (**Hogan, 2019**)

 = wood boiler was not running  
 = wood boiler was running

## Gradient Maps



**Figure 1:** *An intensity map showing the results of the assay kit* (Hogan, 2019)

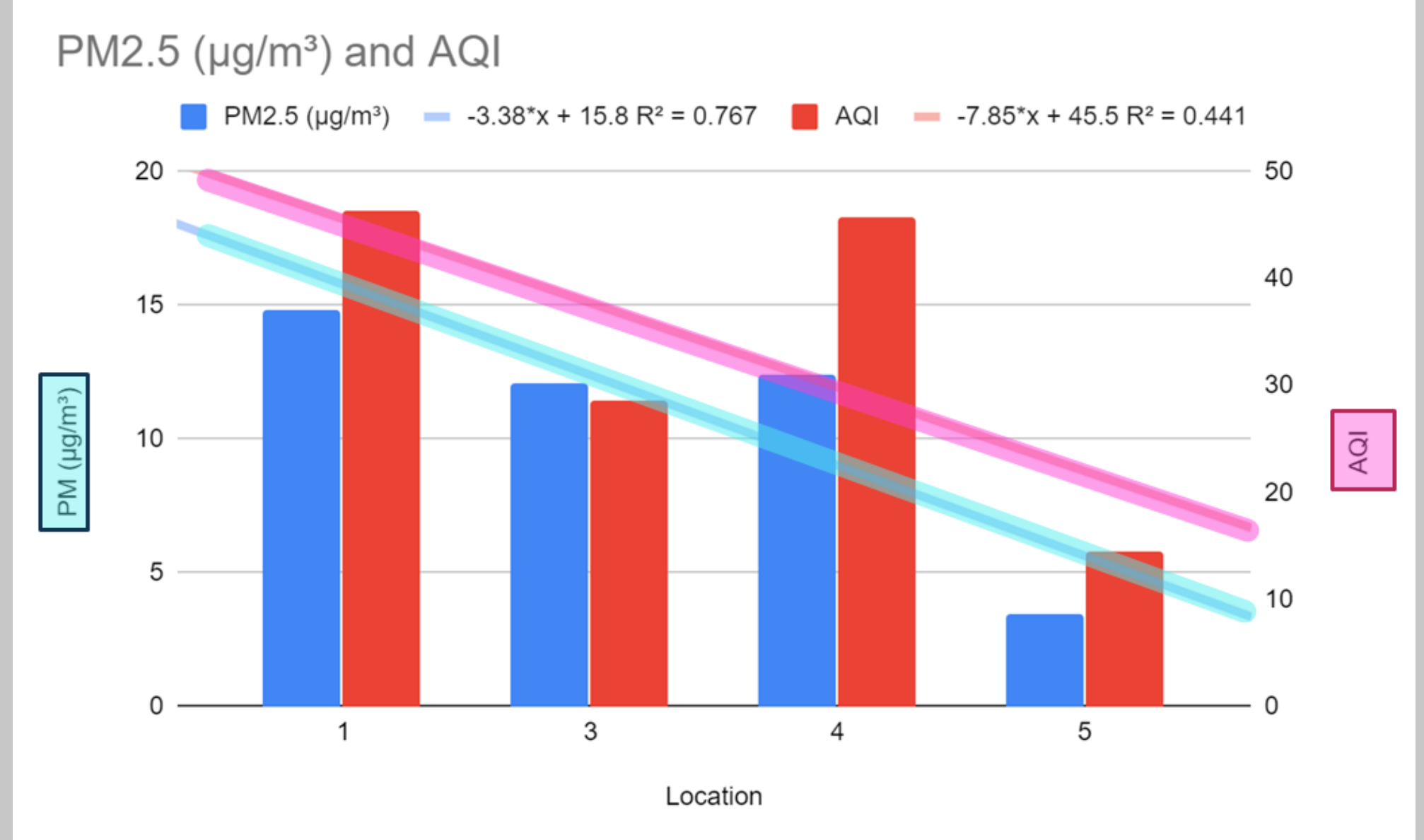


**Figure 2:** This intensity map showing the Pocketlab Air Quality Index (AQI) data (Hogan, 2019)



**Figure 3:** The intensity map shows the Pock-  
etlab particulate matter  
 $< 2.5 \text{ } (\mu\text{g}/\text{m}^3)$  (Hogan,  
2019)

## Discussion



Graph 5 shows the AQI and PM 2.5 ( $\mu\text{g}/\text{m}^3$ ) results as the location point distance increases from the epicenter (**Hogan, 2019**)

- Highest levels at epicenter**
- Levels decreased moving away from the epicenter**
- Lead Chloride, Zinc Chloride, Manganese Chloride were highest over all**
- Similarities between Figures 2 and 3 suggest they were affected by the same agent**
- Take more points**
- Add to gradient maps**
- Weather and season**