Watersheds, wetlands and water quality - Teacher

What are the human impacts on water quality? How do wetlands mitigate those impacts?

Part 1: Defining watersheds and Lake Erie Case Study

Teacher Instructions

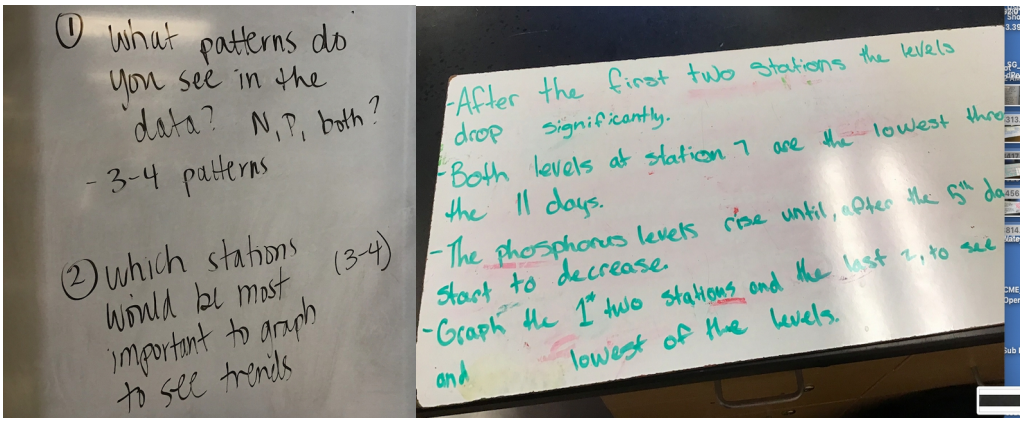
1. Have students go to google maps - Locate Lake Erie/Old Woman Creek. Look for human impact around Lake Erie. List the types of possible pollutants.

   Note: Using google maps to look at Lake Erie and the surrounding area is really interesting for students: we looked at river flow, discussed elevation, and discussed land use, point and nonpoint pollution sources.

2. Have students **model a watershed**. These resources give background about watersheds: https://cityofbarberton.com/255/Watersheds (Images of Ohio, US).
   What is a watershed?: https://www.youtube.com/watch?v=QOrVotzBNto&feature=emb_logo)
3. Go back to Google maps. Switch between satellite view and map view to show water flow into Old Woman Estuary.
4. Define the function of Old Woman Estuary (although it is named estuary, it actually represents a wetland).
5. Connect back to nitrogen and phosphorus cycles - how are humans and agriculture impacting these cycles?

   Read Nutri-Facts: Phosphorus from IPNI: http://www.ipni.net/publication/nutrifacts-na.nsf/0/1249DC4DC82C318585257CD300561B0C/$FILE/NutriFacts-NA-2.pdf

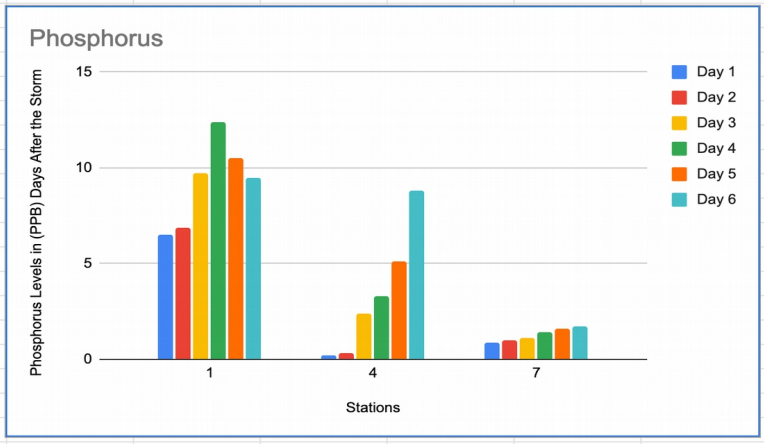
   Read Nutri-Facts: Nitrogen from IPNI: http://www.ipni.net/publication/nutrifacts-na.nsf/0/5F7C43DE5DD504BC85257CD30055A8C4/$FILE/NutriFacts-NA-1.pdf
6. Connect algae blooms to increased nutrient loads – **water quality and eutrophication** (The elearning course helps to explain nutrient loads and effects on water quality: https://elearning.grownextgen.org/water-quality/#/)
7. Have students google images and news headlines of harmful algae blooms - (local, national , international) and briefly discuss.
8. Introduce **Lake Erie Case Study** with the question - To what extent are wetlands effective in reducing nutrient runoff loads into major watershed areas, such as Lake Erie?
9. Background on wetlands (using **wetlands deck** and **wetlands study**) could be done later or before starting.
10. Show students Figure 1 and Figure 2 - explain stations and testing data.
11. Brainstorm with dry erase boards before graphing: (Did this with on-level, very helpful-they needed this and then were successful with graphs. AP level seemed fine without this step, and discussed what they needed to at tables.)



12. Have students study the data and look for trends.
13. Analyze data and display in graphs to share. (See below for examples.)
14. After sharing trends, students investigate additional ways that water quality may be protected by researching the **watershed topics**.

Some examples of data analysis:

	1	2	3	4	5	6
1	6.5	6.9	9.7	12.4	10.5	9.5
4	0.2	0.3	2.4	3.3	5.1	8.8
7	0.9	1	1.1	1.4	1.6	1.7



What I have found so far in my analyzes is that for phosphorus in all stations the levels of phosphrus found has increased over the days after the storm, and this may be from runoff of fertilizers that took a longer to travel into the water ways

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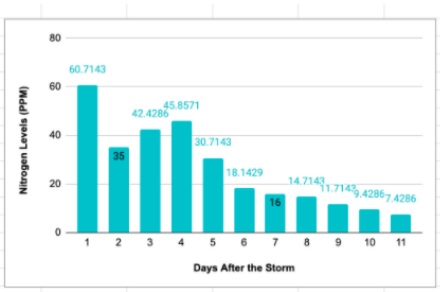
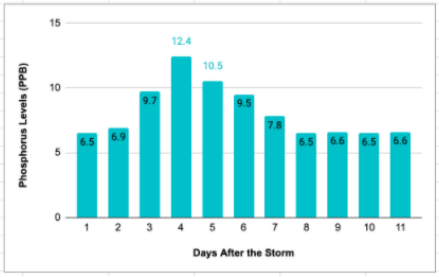
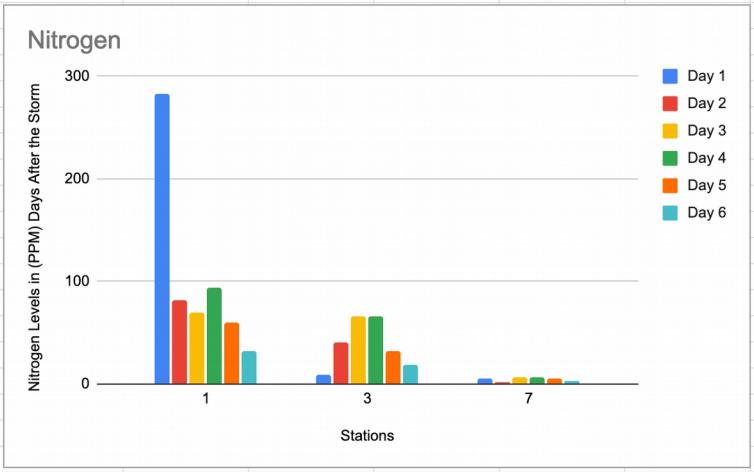




I averaged the values collected at all of the stations each day to see the overall trend in Nitrogen and Phosphorus levels. These charts do a good job of showing trends that might not be as obvious when there are separate lines for each station, especially for the Phosphorus levels. It's clearer to see that there is a sharp decrease in Nitrogen levels after the first day, but then a small rise until it decreases again starting the fifth day. In the Phosphorus graph, the averaged values show the Phosphorus in the creak reaching a peak on day four, and then gradually decreasing and then plateauing.

	1	2	3	4	5	6
1	283	82	70	94	60	32
3	9	41	66	66	32	19
7	5	2	6	6	5	3



What I have found so far, in regards to the nitrogen, is that station 1 on the first day after the storm experianced the highest levels of nitrogen that was recorded Another thing that I found in station 2 is that the highest amount of nitrogen was recorded around day 3 and 4. Station 7, the farthest away from old woman creek, was found to have very little amounts of nitrogen in the water.

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