Before Blandy visit Activity

Introduction to Macroinvertebrates and Sampling Methods

Investigative question: What can macroinvertebrates tell us about a watershed and water health?

Goal- Students learn about the connections between water chemistry and macroinvertebrate health and how to identify macroinvertebrates.

Objectives

Students:

- Define macroinvertebrate.
- Explain two ways scientists can measure diversity in a body of water.
- Give example of how macroinvertebrates are dependent on the health of a body of water.

Virginia SOL: Science 6.1, 6.7

Procedure/Instructional Practice

1. Navigate students to: Introduction to Stream Sampling (covers macro and water chemistry) http://www.cacaponinstitute.org/Benthics/intro%20movie%20v.html
2. After watching the slideshow, ask students to describe two ways to measure diversity of a freshwater stream or river.

Go to http://www.cacaponinstitute.org/Benthics/What%20is%20a%20Benthic%20Macroinvertebrate%20-%20V.html

3. Inquire:

- What is a benthic macroinvertebrate?

- What can macroinvertebrates tell us about watershed health?

- Describe two different roles (or niches) that macroinvertebrates have in a watershed.

- Describe or draw a benthic macroinvertebrate life cycle.

4. Go to http://www.cacaponinstitute.org/Benthics/BMI%20dich%20key_MS.html to practice using a Macroinvertebrate dicot key. This key is very similar to the one they will use while at Blandy. Practice identifying some of the macroinvertebrates. Students have the opportunity to draw macroinvertebrates and note distinguishing features.

Connecting to the Chesapeake Bay
Post-Blandy Activity

Goal:

Objective: Students compare their water chemistry data with the larger Chesapeake Bay watershed. Student will describe trends/patterns in nitrate and make connections between land use and nutrient (i.e. nitrate) loading.

Teacher Background information on Nitrates

- Wastewater treatment plants contribute the majority of nutrients that enter the bay by releasing treated water—often still containing large amounts of nutrients—into local streams and rivers, which eventually flow to the bay.
- Nutrients that run off the land- including farmland and urban and suburban areas- come from fertilizers, septic systems, boat discharges, and farm animal manure.
- Air pollution from vehicles, industries, gas-powered lawn tools, and other emitting sources contribute nearly one-third of the total nitrogen load to the Chesapeake's waterways.
- Scientists are most interested in the nutrients that are related to people living in the coastal zone because human related inputs are much greater than natural inputs. Because there are increasingly more people living in coastal areas, there are more nutrients entering our coastal waters from wastewater treatment facilities, runoff from land in urban areas during rains and from framing. All these factors can lead to increase nutrient pollution.

Elaborate/Extend

Procedure Part 1

Your students examined water chemistry at Blandy Experimental Farm and recorded their data. Water quality monitors, citizen scientists, and researchers use data such as these to learn about long-term effects on the overall health of the Chesapeake Bay watershed. With this activity, your students can connect the data they collected into the larger watershed.
Use the student sheet and the FieldScope activity to examine connections between nitrates and land use cover.

1. Open the Fieldscope map Nitrates in the watershed: http://chesapeake.fieldscope.org/v3/maps/333
2. Examine the legend (on the right hand side)
    a. What do the numbers in the green circles represent?
    b. What does the size of the circles represent?
3. Ask students to use the map to answer these questions-
    a. In what part of the Chesapeake Bay watershed do you observe high nitrate levels? What are some reasons you think this might occur?
    b. Record the range of nitrate levels in the Chesapeake Bay. (Find the highest observed level and the lowest observed level.)
    c. When nitrate levels are high, how do you think aquatic life is affected?

Procedure Part 2

1. Continue to examine the Nitrates on the FieldScope page.
2. Refer to your Blandy data sheet and put your nitrate reading(s) in the table below. Also record if this reading was above or below the accepted range and how many data points you took. (Refer to the class/group data.)
3. Click on the  on the lower left side of the map. Type in 'Blandy Farm, Boyce VA' The map should fly in to Blandy. Zoom out (click on the '-' symbol) until you see a green dot that is sort of close to Blandy. Click on the dot to display info, click on 'show in table' and record data below.
4. Next, click on  , type in 'South Fork of Shenandoah' and find the closest green dot and record the info.
5. Continue to use the search function to find other site names and record the data in the table.

Site Name or location	Nitrate reading (ppm)	Is this above or below the 'accepted' range?	# of observations at this site
Blandy Lake Georgette	0.5	Below	4
South Fork of Shenandoah	0.15	Below	2
Annapolis, Maryland	1.00		31
Washington DC	3.31	Above	9
Chapel Branch, Delaware	8	Above	3

Sample data table

Site Name or location	Nitrate reading (ppm)	Is this above or below the 'accepted' range?	# of observations at this site

Students' data sheet

6. Examine the data table.

   Are there multiple data points at each site? Which sites have many points/reading and which have only one?

   Based on what you have learned about collecting data, are all of these reading accurate? Why or why not, Use Evidence to support your reasoning.

   Zoom out on the map to look at the whole Chesapeake Bay. Where do you notice the highest nitrate readings? Is there a pattern that you notice? Hint: Look at major rivers and waterways.

Part 3 (or an Extension for some classes)

1. Click on '4. Select Map Layers' above the map. Scroll to the "Land Cover' icon and click 'Add'.
2. Click 'Next' in the bottom right hand of screen. Then click on 'show legend'. Type 'South Fork Shenandoah' again. What are the dominant types of land around that area?
3. Type Washington DC in the search bar again. What are the dominant types of land around that area? Zoom out: Look at the nitrate green circles and look at the type of land cover. Do you notice any trends or patterns, as to where the nitrate numbers are high and the type of land cover?
4. Do you notice and patterns as to where nitrate numbers are low and the type of land cover? Why do you think this is?
5. Describe what evidence supports your reasons?

Connecting your data to the Chesapeake Bay- Student Data Sheet

With this activity, you will connect the data you collected to the larger Chesapeake Bay watershed. Using your data and FieldScope, examine connections between nitrates and land use cover.

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2. Examine the legend (on the right hand side)
   a. What do the numbers in the green circles represent?

   b. What does the size of the circles represent?

3. Answer these questions
   a. In what part of the Chesapeake Bay watershed do you observe high nitrate levels? What are some reasons you think this might occur?

   b. Record the range of nitrate levels in the Chesapeake Bay. (Find the highest observed level and the lowest observed level.)

   c. When nitrate levels are high, how do you think aquatic life is affected?

Procedure Part 2

1. Continue to examine Nitrates on the FieldScope page.
2. Refer to your Blandy data sheet and put your nitrate reading(s) in the table below. Also record if this reading was above or below the accepted range and how many data points you took. (Refer to the class/group data.)
3. Click on the  on the lower left side of the map. Type in 'Blandy Farm, Boyce VA'. The map should fly in to Blandy. Zoom out (click on the '-' symbol) until you see a green dot that is near Blandy. Click on the dot to display info, click on 'show in table' and record data in the table.
4. Next, click on  , type in 'South Fork of Shenandoah' and find the closest green dot and record the info.
5. Continue to use the search function to find other site names and record the data in the table.

Adapted from:
http://education.nationalgeographic.com/education/lesson/using-fieldscope-make-informed-decision/?ar_a=1
Chesapeake FieldScope project through National Science Foundation and National Geographic

NOAA B-WET Project
2014-2017

Site Name or location	Nitrate reading (ppm)	Is this above or below the 'accepted' range?	# of observations at this site
Blandy Lake Georgette			
South Fork of Shenandoah			
Annapolis, Maryland			
Washington DC			
Chapel Branch, Delaware			

Students' data sheet

6. Examine the data table.

   Are there multiple data points at each site? Which sites have many points/reading and which have only one?

   Based on what you have learned about collecting data, are all of these reading accurate? Why or why not, Use Evidence to support your reasoning.

   Zoom out on the map to look at the whole Chesapeake Bay. Where do you notice the highest nitrate readings? Is there a pattern that you notice? Hint: Look at major rivers and waterways.

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4. Do you notice and patterns as to where nitrate numbers are low and the type of landcover? Why do you think this is?

5. Describe what evidence supports your reasons?