WATER QUALITY:

Connect the Bay to the Classroom

Water Quality 101

What is water quality?

Water quality is a measure of physical, chemical, and/or biological components of the water that will give us an idea of how healthy it is. People with different interests or jobs might want to measure and take water quality samples to study long-term trends in water quality out of concern for an animal population (like blue crabs or eastern oysters) that lives there, to maintain a level of cleanliness for drinking water, or to determine if the water is safe for recreation.

❑ GOT IT!

Questions to Investigate

❑ What is water quality? (See above)

❑ What impacts water quality?

❑ How can water quality be measured?

❑ How can water quality data be used to save the Bay?

This investigation pairs with the videos 'Why Is Water Quality Important' and 'Water Quality Testing' at cbf.org/news-media/multimedia/video/cbf-education-videos/what-is-water-quality-and-how-do-you-test-it.html

Driving Question

How can the public explore and learn about water quality measurements sampled throughout the watershed?

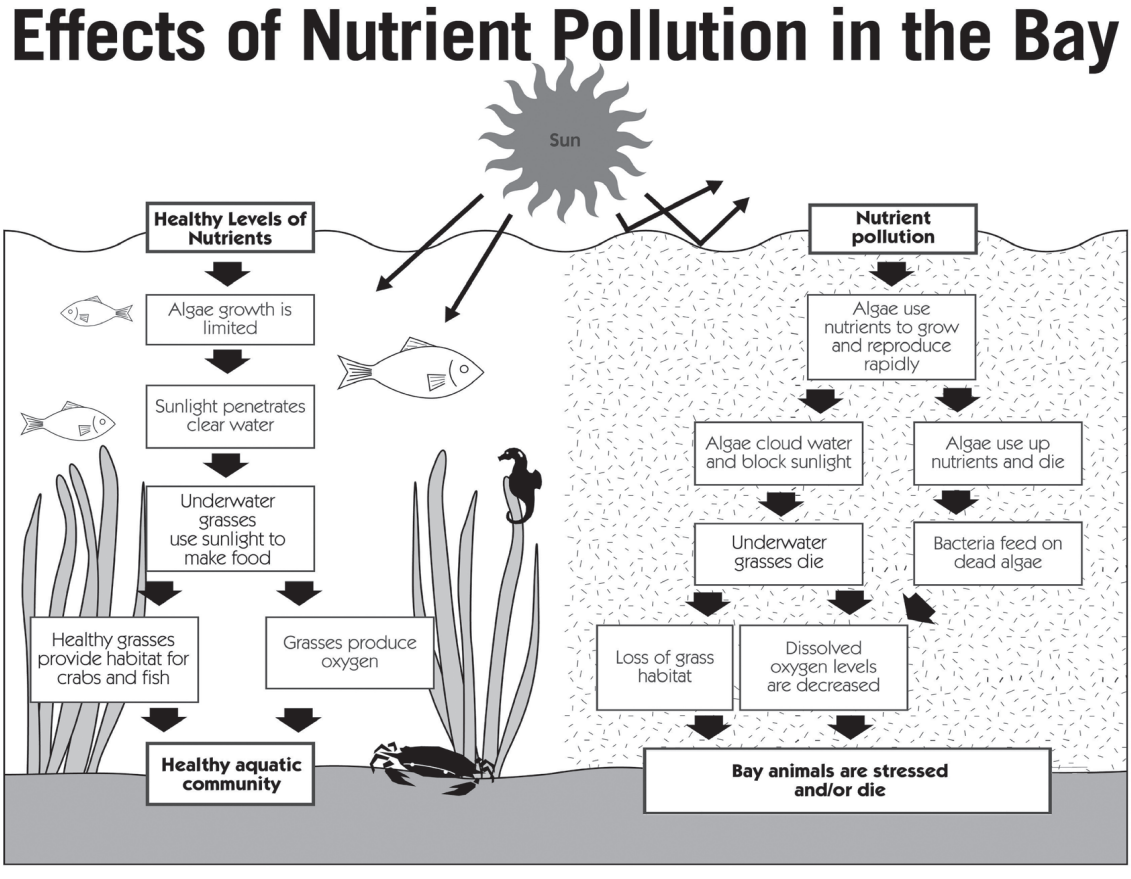
Can you think of other reasons someone might want to measure and track water quality?

What affects water quality?

Broadly put, POLLUTION affects water quality. But what is pollution? To know how our water is affected by pollution, we need to know what types of pollution exist and the sources of those pollutants. Three big categories of pollution that CBF is concerned with are NUTRIENTS, SEDIMENT, and TOXICS. Let's break them down.

NUTRIENTS

Sounds like a good thing, right? Well, too much of anything can become unhealthy, and that's exactly what's happened to the Chesapeake Bay over time. Nitrogen and phosphorus, two naturally occurring nutrients, have become too abundant in the waters flowing into the Bay and the Bay itself. Excess nutrients are responsible for anthropogenic (human-caused) eutrophication, which is an over-abundance of algae in the water. This eventually leads to areas in the Bay that cannot support aquatic life because they are depleted of dissolved oxygen.

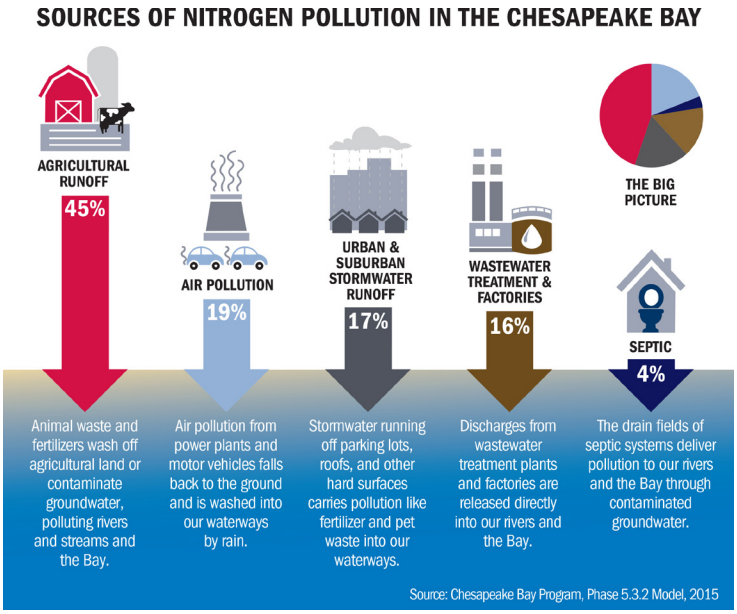


So where are the excess nutrients coming from?

Look at the image at right.

1. Which of the following sources of pollution are you most concerned about?

2. Which one do you think we could work towards reducing?



SEDIMENT

Sand, silt, clay, or sediment are fancy scientific words for dirt. These dirt particles erode from shorelines, tilled agricultural lands, worked construction sites, and exposed ground. In the water, suspended sediment blocks sunlight from reaching underwater grasses, which are essential for filtering the Bay and providing habitat for many of the Bay's critters. Once the sediment settles on the bottom, it can cover more critical habitats. For example, sediment in the James River covers the rocky bottom making it difficult for Atlantic sturgeon to have a suitable place to lay their eggs.

Look at the satellite image at right.

This image was taken from outer space. Notice the cloudy brown rivers towards the left side of the image. What you are seeing is excess sediment in the rivers.

3. What could be a source of this excess sediment?

4. How do you think sediment got into the river?

TOXICS

Those things that are in are waterways that we all know are bad for the health of the organisms. Toxics include oil, gasoline, or pesticides whose purpose is to kill things. Toxic pollution can even come from the cleaning products you use. One of the biggest problems with many toxic pollutants like mercury or PCBs (polychlorinated biphenyls) is that they do not break down easily and can stay in the ecosystem for many years.

CBF looks for the presence of elevated toxic levels by monitoring water quality. While this doesn't tell us the exact pollutants that are present, it can give us a long-term picture of the health the river or stream.

5. What examples of toxics do you think we would find if we tested the rivers and streams around your neighborhood?

6. What can we do to stop these toxics from entering our rivers and streams?

7. Now that you know a little more about the top three pollutants of the Chesapeake Bay, what are three ways we can work to reduce them?

One way to reduce NUTRIENTS:

One way to reduce SEDIMENT:

One way to reduce TOXICS:

Measuring Water Quality

CBF uses chemical tests and digital sensors to measure different chemical parameters of water quality, including concentrations of dissolved oxygen (DO), nitrate and phosphate, as well as temper ature, pH, and turbidity.

Why should we collect these data and what do people do with it?

CBF wants to track trends to measure changes in water quality across the watershed. We take water quality measurements throughout most of the year, around a large portion of the watershed. We are creating one of the most comprehensive databases of water quality data available for the Chesapeake Bay region. We frequently test in the same area, but also test various places throughout Virginia, Pennsylvania, and Maryland.

To find out more about CBF's Water Quality Data Collection, visit our website and interactive water quality map.

Some of our programs add water quality data to the Chesapeake Monitoring Cooperative (CMC), an even larger dataset generated entirely by citizen scientists. The equipment and procedures that we use to collect the data were vetted by our water quality team of experts, which keeps the data accurate and precise, allowing it to be used reliably by scientists as well as everyday people.

Long-term monitoring datasets are useful for scientists, as well as the general public. Abnormalities in water quality identified on field programs are communicated to our staff scientists for further investigation. Once our staff scientists are notified of suspicious water quality samples, they investigate and look for the sources of excess pollution. Once discovered, they alert the proper authorities, including local and state agencies or regulatory bodies that can help us take action. We also hold these agencies accountable by demanding action, working with citizens to advocate for clean water regulations. Through water quality samples, CBF gets involved with reducing pollution, holding polluters accountable, and notifying the public.

Application

Go to the Water Quality App (cbf.org/join-us/education-program/whats-up/water-quality-data-connects.html) and complete the following investigations. Locate the nearest data point to your home or school.

8. What are the results? Are these results better or worse than you expected?

9. After identifying your data point and looking at results, what is your hypothesis for why the results were what they are?

Let's test your hypothesis. Using a 5-mile radius around your data point, identify the various types of land cover like neighborhoods, stores, farms, or forests, surrounding your selected data point.

10. How could the type of land cover affect the water-quality results?

11. How might the water-quality results change if:

There was a three-month drought?

There was three months of heavy rain?

There was a change in the season? For example, a change from spring to summer or summer to fall?

There was a change in land development or land cover in your area?

DIVE DEEPER:

Explore the Virginia Department of Environmental Quality's Virginia Environmental Geographic Information Systems (VEGIS) application.

Let's investigate waterway impairments around this watershed state.

❑ Open DEQ's What's in my Backyard? GIS application.

❑ Choose an area or city to view. As you zoom in, notice that more any options in the table of contents will become available the more closer you zoom in.

❑ Turn on Rivers (2018).

❑ Click on the closest waterway that is shown in RED.

❑ Use the pop-up menu to identify the cause of the impairment (IMP_ Cause) status as well as the Source.

❑ Trace that waterbody to its confluence, or where it meets the next body of water.

What is the name of that waterbody?

What is the impairment status?

❑ Turn off Rivers and turn on Estuaries.

❑ Zoom out and make observations.

What do you notice?

12. If a stream began at your house, what impacts could your yard have on that stream?

13. How could you alter your home and area around your home to make it better for the Bay and/or the water quality of a local river or stream?

Write about it: A Water Droplet's Commute

Think of the trip you take from where you live to your school. What different types of land cover or things would you see on your way? Houses, neighborhoods, stores, sidewalks, playgrounds, farms, forests? Write what you can see here.

Now imagine, that you are a water droplet, collecting pollution as you make your way from your house to your school. What things might you pick up along the way and transport to your school? Write about your journey and what types of pollutants you pick up on the way from your house to your school.