

Drinking Water and Your Health



Environmental
Public Health

Photos: Steve Wall, Magda Wojtyra

Water, Water Everywhere



Photos: Matt Hintsa, Joseph Novak, Joel Mann, Garret Croakley, Jose Maria Cuellar

Water is Essential to Life



- All living organisms depend on water to survive.
- Water comprises up to 60% of the human body.
- 70% of Earth is covered by water.

Photo: Elyce Felze

Discuss importance of water to life and the need for clean, safe water. Clean water is something we often take for granted. Have any of them ever been in a situation where they did not have access to clean water (i.e., camping? Foreign travel?)

Water is Essential to Life



- We have the same amount of water on Earth as when it was first formed. While water is recycled over and over by nature, we cannot get any more water.
- In the U.S., we use almost 70 gallons of water per person per day.

Can students think of ways that we can conserve water?

Sources of Water



- Drinkable freshwater water accounts for only about 1% of all water in the world. 97% is salt water, and the remaining 2% is frozen in glaciers and ice caps.

Watersheds



- We all live in a watershed, a geographic area that drains to a common waterway such as a stream, lake, wetland, estuary, aquifer or ocean. Maryland is part of the Chesapeake Bay watershed.

How do your individual actions affect the watershed? Have students provide examples of individual behaviors that can enhance water quality, as well as behaviors that are detrimental.

Chesapeake Bay Watershed



- The Chesapeake Bay watershed, highlighted in gray, includes 64,000 square miles and parts of 6 states: New York, Pennsylvania, Delaware, Maryland, Virginia and West Virginia as well as the entire District of Columbia. 1,000 streams and rivers flow into the Chesapeake Bay.

Image: Chesapeake Bay Foundation

Discuss the Chesapeake Bay watershed and ongoing efforts to clean up the Bay. Have they participated in any activities to benefit the Chesapeake Bay?

More information on the Chesapeake Bay watershed and specific activities to improve the bay can be found at the Chesapeake Bay Foundation website

<http://www.cbf.org/page.aspx?pid=1000>

Additional information and resources and references are available in the lesson plan.

Drinking Water Sources



- Drinking water comes from underground reservoirs and surface waters (rivers, lakes, etc).
- About 85% of Americans get their water from public water systems, the remaining 15% use private drinking water (wells).

Do the students know where their drinking water comes from? Do any of them use private wells? If time allows, students can research their local water source.

Threats to our Water: Contaminants



- Sometimes you can tell that water is contaminated just by looking at it or smelling it. More often, you cannot tell if water is safe unless it is tested. Drinking water is tested to make sure that it does not include harmful levels of contaminants that could impact your health.

Discuss the importance of ongoing testing of drinking water to assure it is safe to drink. The Safe Drinking Water Act was passed in 1974 and authorizes the U.S. Environmental Protection Agency (EPA) to set standards for clean and safe drinking water and oversees state and local efforts to comply with the law. See lessons plan for additional information.

Threats to our Water: Contaminants



- Water Contaminants
 - Man-made
 - Examples: contaminants from agriculture or industry, such as pesticides, chemicals and other toxic substances.
 - Naturally-occurring
 - Examples: bacteria, viruses, and microscopic parasites

Photo: Bert van Dijk

How can individuals, government, industry and communities work to reduce contaminants in water? Differentiate between man-made and naturally occurring contaminants. The discussion could lead into some specific class project ideas (see lesson plan for evaluation options and additional information). The Clean Water Act is national legislation that regulates the discharge of pollutants into U.S. waterways and establishes quality standards for surface water.

Point Source Pollution



- Point source pollution is something you can point to, such as a pipe that releases pollution from a factory or sewage treatment plant.

Photo: Bay Smart Program

Are the students familiar with any point source pollution sources? Perhaps come up with some specific examples in your local area.

Nonpoint Source Pollution



- Non-point source pollution comes from many different sources that are more difficult to regulate by the government. It comes in part from agricultural, industrial and urban runoff and is the leading cause of water quality problems.

Photo: NOAA

Do students have any examples of non-point source pollution? Why do they think non-point source pollution is more difficult to regulate? What are some specific actions by individuals, industry, government, and communities to reduce non-point source pollution?

How is our water protected?



- The United States has laws and regulations to help keep contaminants out of our water, namely the Clean Water Act and the Safe Drinking Water Act.
- The U.S. Environmental Protection Agency and state and local environmental agencies are responsible for testing the water from public systems and making sure the laws and regulations are followed.

Do they think these regulations are necessary? May want to refer back to the beginning discussion about the importance of clean water to life and the consequences of not having clean water.

How is our water protected?



- Some examples of regulated contaminants are:
 - Nitrates - Used as fertilizers in agriculture. Nitrates diminish the ability of the blood to transport oxygen.
 - Lead - This highly toxic metal can be found in old pipes, contaminating drinking water.

What can be done to reduce these types of contaminants? Specific actions by individuals, industry, community, and government can be discussed.

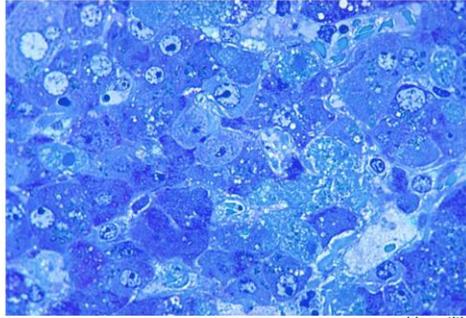
How does water impact our health?



- Drinking, cooking with or swimming in contaminated water can make people sick. Some illnesses that can be caused by contaminated water are:
 - Acute
 - Gastro-enteritis: an infection of the gastro-intestinal tract causing vomiting and diarrhea
 - Infected cuts or rashes

Discuss role of environmental health professionals and the need to test our drinking and recreational waters to make sure water is safe to drink, cook, swim. Have students had any experiences with not being able to drink or swim in water? Boil water alerts? Closed beaches?

How does water impact our health?



Hepatitis

- Other illnesses that can be caused by contaminated water are:
 - Chronic
 - Chronic Hepatitis: an infection of the liver
 - Lead poisoning: brain and kidney damage
 - Cancer

Photo: CDC

Chronic diseases develop or worsen over long periods of time (months or years). It is often hard to determine specific causes of chronic diseases and specific environmental contributors. Scientists continue to study the links between contaminated water and specific health outcomes. What types of information do they think might be helpful to advance our understanding of these links? See lesson plan for additional information.

How do we clean our water?



- Wastewater treatment plants clean water that has been used by individuals (sinks, toilets, showers) and industry (factories, agriculture). This is sometimes called “sanitary sewage.”
- Rainfall that goes in the sewer, sometimes called “storm sewage” is also cleaned at wastewater treatment plants.

Photo: Pam Broviak

See lesson plan for additional information, references and resources on wastewater treatment plants.

How do we clean our water?



- Here's how water treatment plants work:
 - First, dirt and particles are separated from the water.
 - Then, the water is passed through filters to remove even smaller particles.
 - Next, a small amount of chlorine or another disinfectant is added to kill microorganisms.
 - Finally, water is stored in a reservoir or tank and circulated back through the community, flowing through our taps, showers and hoses.

Photo: PeacePlusOne

If time allows, students can research the water treatment plant serving their local community. Additional information, references, and resources are available in the lesson plan.

Global Health and Water



- More people in the world die from unsafe water each year than from all forms of violence, including war.
- Each year, unsafe or inadequate water cause 2.2 million deaths worldwide, mostly of children under 5.
- Every day, 2 million tons of sewage and industrial and agricultural waste are discharged into the world's water sources.

Photos: Jon Gos, Trey Ratcliffe, Harini Caluma

Are there specific actions individuals, industry, government and communities in the U.S. can take to help improve water quality throughout the world? More information on global health and water can be found on the World Health Organization's water page at:

<http://www.who.int/topics/water/en/>

Additional information and references and resources are available in the lesson plan.

What can we do to protect our water?



- Some things we can all do to help protect our water:
 - Reduce or eliminate fertilizer use
 - Reduce waste generated and properly dispose of all types of waste (motor oil, batteries, electronics, etc.)
 - Use public transportation when possible

Photo: US Army Corps of Engineers, LA

What do the students do to help protect our water? Do they have ideas as to what their school, government, industry, and community might do to protect our water? Discussion can lead to specific project ideas (see lesson plan for evaluation options and additional information)

What can we do to protect our water?



- More things we can do to help protect our water:
 - Plant a rain garden with native vegetation to reduce storm water runoff
 - Try to buy food and other products from eco-conscious companies
 - Volunteer to protect your watershed
 - Tell your elected officials to support water protection and preservation

Photo: WaterWatch

Do students have other suggestions? Discussion here can also lead to class project ideas.

Water Data



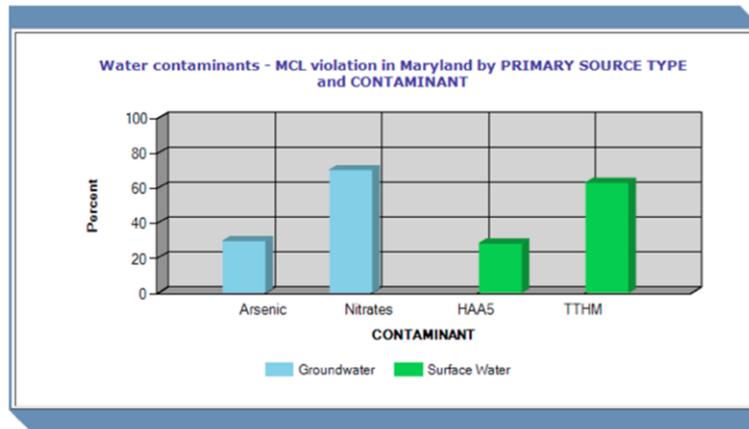
- Government agencies such as the Environmental Protection Agency (EPA) track water quality and quantity information. Contact your county department of health or environment to find out more about your water supply.

Photo: Joshua Davis

Why is water quality and quantity information important? What types of data do they think are important to have? If time permits, students can visit their local county government websites and the Maryland Environmental Public Health Tracking Program (M-EPHT) site (link below) to explore types of water data and information available:

<http://ideha.dhmh.maryland.gov/eh/tracking/Default.aspx>

Water Testing in Maryland



Public drinking water in Maryland is considered safe and high quality. It is tested for harmful contaminants such as arsenic and nitrates. Local health departments have more information for people who want to see reports on their drinking water quality.

Image: Maryland EPHT

Arsenic is a highly poisonous element that is odorless and tasteless. It can contaminate drinking water through the ground or as runoff into surface water surfaces as a result of natural deposits in the Earth or agricultural or industrial practices.

Nitrates are chemicals used as fertilizers, which can cause negative health effects if ingested via drinking water. Nitrates are a wide spread contaminant of ground and surface waters worldwide. They may enter water through agricultural runoff, septic tank leakages or other sources. Nitrates can reduce the body's ability to carry oxygen in the blood.

HAA5= Haloacetic Acids and TTHM - Total Trihalomethanes are disinfectant by products which form as a result of reactions between disinfection agents and organic matter during the water treatment process. Disinfectant by products can be harmful to human health.

Source of data: Maryland Environmental Public Health Tracking Program (M-EPHT): <http://ideha.dhmd.maryland.gov/eh/tracking/Default.aspx>

Other Types of Research Needed



- Methods for reducing water consumption in agriculture and industry
- More efficient water sanitation technology
- Studies to better understand the linkages between water contaminants and health
- Information on aging water infrastructure systems and the cost of keeping our water safe

Can students think of other types of research that might be helpful to protect our water? What types of information and data are needed for this type of research. If time allows, students could explore types of ongoing water research. See lesson plan for specific evaluation options and further information.

Water and You



- What are some things you currently do (or could do) to protect and conserve water?
- What are some things your school, community, or businesses can do to help protect and conserve water?
- What policies could be enacted on the state or national level that would help protect our water?

Students could brainstorm ideas to help protect and conserve water and then discuss which ones might be the most feasible and why. What are some barriers to protecting water? How might these barriers be overcome? If time allows, these discussions could lead into class project ideas (see lesson plan for evaluation options and additional references and resources).



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