Vermont Envirothon 2020 Current Issue

Drinking Water: Issues and Solutions

Introduction

Vermonters are lucky when it comes to water. Thanks in large part to our healthy forests, the water cycle here maintains healthy soils and sustains wildlife, humans and our environment. Most of us can take for granted abundant, clean drinking water and groundwater as well as copious rainfall to recharge our supplies. We use this water for drinking, for growing crops and for recreation. Because our water cycle shapes the beauty and health of our environment, the beauty and health of our state and its economy are dependent on it also. Around the world, many, many areas are not so fortunate. Their water supplies are either polluted, insufficient or both. In some cases, this is a serious challenge; in other places it has become a crisis. In this year's Envirothon, you'll explore a water issue in an area outside of Vermont, identify threats to your community's drinking water supplies, consider solutions to these threats and compare the two situations.

A. Climate-related Drinking Water Issues. Some of the water issues around the globe are climate-related. In these areas, drought, flooding, saltwater intrusion and competition for the resource are all caused in part by a changing climate.

Drought, caused by changing weather patterns, has reached crisis stage in parts of Africa and Central America. The resulting food insecurity is one of the reasons for the mass migration of people from those areas to places like Europe and the US.

Flooding is also frequently climate-related and can lead to dire consequences. In South Asia, millions of people have lost their homes and livelihoods to flooding caused by monsoons. Those displaced people have to find somewhere else to live; many of them are forced from their homelands to look for a more secure life elsewhere. Flood waters containing fertilizers, heavy metals, waste water and other pollutants can contaminate drinking water supplies; sometimes temporarily, sometimes permanently. Sometimes the problems are caused by the existence of too many people or too many competing uses for the available water supply.

In some rapidly growing coastal areas, overuse of freshwater is causing **saltwater intrusion** into the freshwater aquifer. This could render it unusable for drinking and most other purposes. Climate-related sea level rise will make this situation worse. Either people will have to leave the area or enough water will have to be brought in to satisfy all their needs. Saltwater intrusion is affecting cities in Florida, California and throughout the Middle East.

Another water-related problem is caused by **competing uses of the resource**, leading to overuse. Although this is happening in areas worldwide, the classic cases are in the American Southwest. Competition for use of the Colorado River's waters has pitted

many states against each other and has pitted farmers against population centers. The need for drinking water and irrigation water are both out-growing the resource. Worsening the problem is drought caused by Climate Change. Situations like these in the US and around the globe are resulting in legal conflict, mass migration and armed conflict.

B. Vermont Water Issues Here in VT, water problems are of a different nature. In general, when a Vermont community has concerns about drinking water, it's about quality or safety rather than quantity. However, parts of the state do suffer from drought; 2018 was extremely dry in northern Vermont and many private wells and farms were severely impacted. Drinking water can be polluted in many ways including flooding from large storms, chemicals and leaky underground tanks.

Large storms and the floodwaters they cause can create drinking water problems. Wastewater treatment plants have been overwhelmed by large storms and the resulting outflow has polluted water supplies. River floodwaters carrying contaminants in runoff have polluted wells or water supplies. Breaks in water supply pipes can lead to temporary but severe inconvenience to residents. Other situations are less obvious yet can be far more toxic.

Chemicals also pose a threat to Vermont drinking water supplies. Some chemicals, called PFAS, (which stands for per- and polyfluoroalkyl substances) are used to make Teflon and a variety of other coatings. They are also used in some fire-fighting foam, including that used by the military. PFAS, which have been linked to certain types of cancer, can leach from the manufacturing or usage site, through the soil into the groundwater. In Bennington, PFAS have contaminated private wells and public water supplies, rendering them unsafe or of uncertain safety. A statewide issue is lead in old water pipes and fixtures. Lead can be in the pipes themselves or in the solder joining the pipes together and can leach from the pipes into the water we drink. Lead is toxic and can cause brain damage in children and kidney and other damage cumulatively in adults. In Williamstown in the 1980's, "perc", a chemical associated with dry cleaning, required a massive cleanup when it was found in the town well and several private wells. The drycleaner, Uni-First, was near the elementary and high schools. A similar situation occurred on Woodstock Ave. in Rutland although the perc was found in groundwater before it had polluted wells in the nearby residential area. Cyanobacteria, known for its beach-closing blue green algae blooms, can also be toxic in drinking water supplies.

Other threats to Vermonters' drinking water include but aren't limited to: leaky gas or fuel oil storage tanks, failing septic systems polluting nearby wells. Several companies bottle VT water to sell. Unlike in some other states, this has been small-scale so far although in 2008, a company did have a plan to withdraw and bottle 250,000 gallons of water per day from a spring in E. Montpelier, potentially diminishing nearby water supplies.

C. Regulatory efforts There are federal, state and in some cases, municipal laws and regulations that protect groundwater and drinking water. The US Clean Water Act and the US Safe Drinking Water Act are two. In VT, groundwater was protected in 2008 with further protection in 2011. Drinking water has been protected in other legislation over the years. Just this past spring, the Legislature passed two such laws: one requiring testing for PFAS and the other for lead in all schools and childcare centers. The Department of Environmental Conservation and the Department of Health responded with plans to test, remediate and/or prevent these drinking water-related issues. Public drinking water supplies and schools with wells must be tested for PFAS this year. Testing is also required around locations such as certain factories, car washes and landfills where the products with the chemicals are made, used or disposed of. Also this year, all schools and childcare centers must test all water (every tap) used for cooking and drinking. Each tap that fails must be replaced. Your school's maintenance department has already done or soon will do the lead testing in every faucet and water fountain in your school. Your school's well or your community's municipal water supply will be tested for PFAs.

II Your Challenge

A. Research

1. Outside Vermont
   - Choose at least one place not in VT that has a climate-related water supply problem (the water supply was polluted by flooding; drought has reduced water to an insufficient level for the size/needs of the population; the population and claims on water have grown too large for the available water supply; or there have been salt-water intrusions due to overuse of the existing water supply.)
   - What caused the situation?
   - What are some possible results if it isn't resolved?
2. Vermont

Research some of the drinking water problems that are affecting Vermont communities. What are the problems? What are some of the solutions? If you have friends or family living in one of the affected towns, talk with them about their experience.

3. Your community
   - Where does your school's water come from? Trace it from a tap to its source. Are there any threats to its quantity and quality? What protections are in place to ensure its safety for you?
   - Where does your own family's water come from? Each team member should research this. Is it the same as for the school's water or different? Are there any threats to its quantity and quality? What protects its safety?
   - Has your school been tested yet for lead? For PFAs? What were the results? Has your home's water supply ever been tested? Find out how you would do that.

B. Analysis

1. As a team, come to a consensus on which of the water-related issues in your community is the highest priority. Brainstorm and research ideas for preventing or solving it.

2. Compare and contrast some of the differences between your community's water supply concerns/solutions and the issues affecting the place you researched that wasn't in Vermont.

C. Presentation

1. Create a 15-minute presentation about the topic to be given in front of a panel of judges. You can use PowerPoint for your presentation. In general, slides should be used for maps, diagrams, pictures and other graphics – they should enhance your presentation and make it interesting rather than including many slides of text you read from. Points will be deducted for slides with too much text or if you are frequently reading from the slides. Following the presentation, the judges will have five minutes to ask you questions. Everyone on your team should help present your work and be able to answer questions. Bring your work on a thumb drive; we will have a computer, projector and screen already set up. A month or two before the Envirothon, your team will receive a copy of the rubric the judges will use to assess your work. This will help fine-tune your efforts – but don't wait for it before you get started.

2. Your presentation should include:

- Information about a place not in VT that has a climate-related water supply problem. What caused the situation? What are some of the possible results if it isn't resolved?
- Information about some of the water issues facing VT communities and their causes. Is your community affected by any?
- Information about where your school's drinking water comes from as well as where each team member's water comes from. A map would be useful here.
- Possible threats to those water supplies
- Your ideas for ways to solve or prevent one of the problems. Be as thorough, detailed and practical as you want to be. If you have examples of other places these ideas have been tried, that would be useful.
- Summarize your work by comparing and contrasting some of the differences between your town and an area without adequate drinking water.