



MASSACHUSETTS ENVIROTHON

2010 Mass Envirothon Current Issue

Groundwater Protection

Strategies for Community Research

The 2010 Current Issue problem will ask you to identify a critical groundwater issue in your community, and to propose next steps your community should take to address it.

The purpose of this document is to help your team get started on the research you will need to do to prepare for your Current Issue presentation at the Massachusetts Envirothon.

Groundwater protection is a big issue. Below are FIVE possible starting points for research on groundwater in your community. To do a good job in your research, your team will eventually need to get acquainted with ALL these areas. But you can start with any one of them.

The ideas and questions and web resources listed in this document are just a starting point for your research. They are drawn from the much more comprehensive *Questions and Resources for Team Preparation* (see “Primary Resources for 2010” at <http://www.maenvirothon.org/currentissue.htm>).

Questions about your community research? Feel free to contact Will Snyder, UMass Extension, 413/545-3876 or wsnyder@umext.umass.edu.

Entry Point #1 Groundwater Science

Your team will need to develop a good working knowledge of the basics of groundwater science. You can start with an intensive effort to build this foundation, or you can build it as you go along.

Remember learning about the “water cycle” back in elementary school? Well, it’s time to revisit those ideas and update your knowledge at a much more sophisticated level!

What’s the most important thing to remember about the water cycle for this year’s Envirothon?

- Groundwater and surface water are one single system. Groundwater may flow very slowly, but it is an important part of the water cycle. How do groundwater and surface water interact?

Groundwater serves important ecological functions.

- How is soil related to groundwater? Soil characteristics play an important role in groundwater recharge. Moisture in the soil above the water table is related to groundwater and is critical for ecosystem functions.
- Forests play an important role in protecting groundwater quality and quantity

- Both terrestrial and aquatic wildlife rely on groundwater. Wetlands, where the water table is at or close to the surface, are a particularly ecologically sensitive manifestation of groundwater.
- Can groundwater be pumped without affecting ecosystems at the surface?

Groundwater protection must consider both quality and quantity issues. Sometimes these can appear to be different issues, but quantity and quality are always related. Look for the relationships!

Stormwater and its interaction with groundwater is one good place to see the connections between quantity and quality.

Quality Issues. Different kinds of pollutants move differently in groundwater. Different kinds of soils also have an effect on the transport and fate of pollutants. Some water contaminants can be removed by filtering through soil, while others cannot. Contaminants are as varied and numerous as the land uses in the contributing watershed. Seldom does one kind of pollution occur in isolation. In general, contaminants fall into one of these categories: sediments, nutrients, pathogens, toxics.

- What activities produce which kinds of pollutants?
- What dangers do they pose to people or the ecosystem?
- How do they move underground?
- What happens to them over time?

Quantity Issues. Both development (such as pavement and buildings) and groundwater pumping affect groundwater quantity. What are the effects? What are the quality and quantity effects of increasing impervious surface areas in a community?

- Does pumping affect the level of the water table around the well, and the direction of groundwater flow? What happens when groundwater is pumped faster than it is recharged?
- Development increases the impervious surface area and interrupts the infiltration of water from the surface to the water table. How much does development affect quantity?

Entry Point #2 The Hydrogeology of Your Watershed

What does the water cycle look like - at the surface and underground - in YOUR neighborhood? It's not good enough just to have a general knowledge of how the water cycle works. To make good choices for protecting groundwater in your community, you need to know the specifics of water in your own watershed.

To investigate this, you will have to use maps, get outside and explore, and find people who know your watershed well.

- Where does your drinking water come from? Was it ever groundwater? Where and when?
- Describe how groundwater flows through your watershed - what direction, how fast?
 - Have groundwater resources changed over time? See these historical stream maps and judge for yourself: <http://docs.unh.edu/nhtopos/MassachusettsList.htm>.
- What are the major ecological roles for groundwater?
- How do people depend on groundwater in your community?
- How are development patterns changing groundwater quantity and quality?
- Is the water budget in balance? changing? what are the major factors affecting it?
- What are the existing or potential sources of pollution?

Your team will receive a large map relating to your town's groundwater resources when you register for this year's Envirothon. Here is another source of maps online:

http://www.mass.gov/dep/service/my_comm/mycomm.htm

Entry Point #3 Tools for Protecting Groundwater

There are many "tools" -- policies, planning, education, regulation, technologies, etc. -- that can be used to protect groundwater resources.

Does your community have a Municipal Master Plan (or Comprehensive Plan)? This is an excellent place to start. What does it say about water issues?

Some of the tools available for ground water protection at the local or state level include

- municipal master plans using smart growth strategies
- groundwater protection districts and wellhead protection
- requiring permits for water withdrawals
- stormwater management
- reduction and proper disposal of waste
- wastewater treatment
- public education and incentives for water conservation
- reducing demand through conservation and efficiency technologies
- leak detection and repair in water supply and wastewater systems

Entry Point #4 People Involved with Groundwater

People are absolutely your best source of information about local groundwater protection. Many of the people on this list will be good resources because they have responsibilities or special knowledge or skills, or a special interest in protecting groundwater. They are familiar with the watershed and are already thinking about potential solutions.

But you should also remember that they may have strong opinions. Their views of the watershed may be biased by their experiences or their work. Talk to lots of people! Don't rely on just one or two perspectives.

You can start with people you already know by some personal connection. Get them to recommend more people to talk with, and follow those leads. As you get more familiar with groundwater issues, it will get easier and easier to ask questions.

Here is a list of occupations that are involved with water in your community:

- The people who supply your drinking water
- Major water users
- Newspaper reporters with an environmental beat
- Environmental organization staff
- Your municipal Planning Board, Conservation Commission, and Board of Health
- Science and engineering consultants (geologists, hydrologists, soil scientists)
- People involved with writing your town's Master Plan

In addition, several government agencies are involved with planning and regulation of groundwater resources on a larger scale:

- Regional planning agencies (search for <regional planning agencies> at <http://www.mass.gov>)
- The Mass Department of Environmental Protection (e.g. <http://www.mass.gov/dep/water/>)
- U.S. Environmental Protection Agency (e.g. <http://www.epa.gov/region01/eco/drinkwater/>)

Entry Point #5 Investigate current local issues involving groundwater

This is how most people get started in their research on environmental issues: Begin with a genuine question or concern, and fill in what you need to know (people, science, local geography, planning tools) as you go.

Watch your local newspaper:

What issues are people concerned about?

What planning/protection efforts are currently underway?

What still needs to be done?

Here are some “hot topics” in groundwater protection in Massachusetts communities:

- Determining “sustainable yield” - How much water is available for human use on an ongoing basis? How do we balance water supply needs with water requirements for ecosystem habitats?
- Protecting water resources using zoning and groundwater protection bylaws
- Planning for development using “smart growth” (including “low impact development”) strategies
- Increased summertime demand and the need for water conservation and water efficiency standards
- Sewers and septic systems
- Stormwater management and groundwater recharge -- quantity and quality issues
- Identifying, monitoring, and remediating groundwater pollution
- Groundwater and energy -- geothermal heating/cooling systems, water use in power generation
- Green roofs, rainbarrels, rain gardens, and other urban stormwater solutions to slow down and clean up water in urban areas

In March, your team will receive the 2010 Mass Envirothon Current Issue Problem, which will ask you to identify a specific, critical groundwater protection issue in your community and to propose next steps that should be taken. The community research you have done here will enable you to make a strong proposal and to prepare an effective presentation.