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Understanding Groundwater: Michigan's Hidden Resource
Michigan State University Cooperative Extension Service
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*UNDERSTANDING
GROUNDWATER:
Michigan's Hidden Resource*



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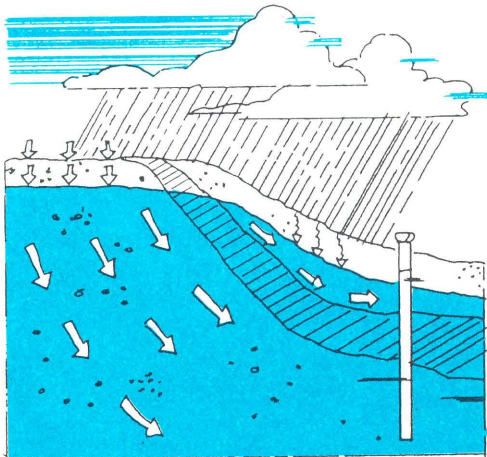
Groundwater contamination is a serious problem. It is not too late to learn how to deal with it. But first we must become acquainted with groundwater: how it is formed, how it is used, how it is contaminated, where it is most vulnerable, what the methods and costs of cleaning it are and what we can do to protect this valuable natural resource. We must be willing to change our habits to ensure that clean, safe groundwater will always be available.

Why is it important?

Groundwater is a critical resource for Michigan farmers, individuals, industries and communities who depend on it for all or part of their water supplies.

What is groundwater?

Most groundwater is fresh water. Many think of groundwater as part of a system of underground lakes and streams. This is true in only a few cases, however. Groundwater is usually found in cracks and spaces between rocks and between the soil particles that are under the earth's surface. These spaces act a bit like a giant underground sponge.



The water found just below the earth's surface in pore spaces filled partly with water and partly with air is called soil water. The water in deeper spaces completely filled or saturated with water is called groundwater. The top of the saturated area is the water table. Water for drinking and other use is drawn from a saturated zone called an aquifer. About 95% of the United States' total supply of fresh water is groundwater. The remaining fresh water is surface water, found in lakes and streams. The Great Lakes hold almost 95% of the nation's surface water.

Where is our groundwater located?

Groundwater supplies are not distributed evenly. Michigan is fortunate to have abundant groundwater quantities. Groundwater is found at different depths — from the fairly shallow wells of the Upper Peninsula to deeper ones in the Lower Peninsula. The composition of the soil — clay, sand, or rock — generally determines the amount of groundwater and the depth at which it is found.

What is the source of groundwater?

All water comes from rain and snow melt. But not all water becomes groundwater. Plants and trees use water found near the earth's surface. Some water runs overland into lakes and streams or evaporates into the air. Some water percolates slowly downward through rock crevices and soil to become groundwater.

How does groundwater move underground?

Groundwater moves from a few inches to a few feet each day. Flow is irregular — from less to more porous areas, from shallow to deeper areas and in some instances, from deep to shallow locations.

Movement depends in part on the number and size of pores in the soil or rock in which groundwater is located. Gravity pulls groundwater downward from its point of entrance or recharge; pressure may also push groundwater downward and, in some instances, upward to its point of exit or discharge into lakes, streams and wetlands.

How do Michigan residents use groundwater?

Forty-three percent of Michigan's residents depend on groundwater for drinking. Thirty-seven percent of Michigan's farmers use groundwater for irrigating crops and watering livestock. Michigan industries use groundwater for manufacturing, food processing, mining and metal finishing. Many Michigan homeowners use groundwater for watering lawns and gardens as well as for septic system discharge. Some golf courses and parks are irrigated by groundwater.

How does groundwater become contaminated?

Carelessness and lack of understanding of groundwater often cause groundwater contamination.

Leaking underground storage tanks. Gasoline, oil and other chemicals, such as solvents, leak from poorly maintained, corroded or abandoned tanks into surrounding groundwater.

Industrial activities. Leaks from industrial surface water impoundments and the careless handling of raw materials and wastes affect groundwater supplies in many areas. The improper handling of brine in oil fields and acid mine drainage in mining areas cause contamination. Spills that pollute can occur during the transportation and handling of chemicals and other hazardous materials.

Dumps and landfills. Water that passes through a landfill picks up soluble and suspended wastes. This water called leachate can carry micro-organisms, organic materials and inorganic materials that contaminate nearby groundwater.

Transportation activities. Spills and leaks from trucks and trains cause groundwater contamination. Salts used for highway ice and dust control are known pollutants.

Agricultural activities. Animal waste from livestock operations may be a source of contamination. Some fertilizers, soil additives, insecticides and herbicides can move through the soil into the groundwater. Applied in excess, these chemicals may affect large areas of groundwater.

Homeowner activities. Household chemicals and used motor oil that are dumped down the drain or poured on the ground cause groundwater contamination. Improperly maintained or constructed septic tanks can pollute groundwater. Recent studies indicate that the homeowner uses more agricultural chemicals per acre than the farmer. Excessive use of lawn and garden chemicals can cause contamination.

Because groundwater moves slowly and because air, sunlight and micro-organisms that cleanse surface waters are not present in groundwater, contamination tends to remain concentrated for a long period of time near the point pollution occurred. Contaminated groundwater disperses in a three-dimensional plume. Thus groundwater may be heavily contaminated at one location and depth and yet be clean a short distance away.

What are the effects of this contamination?

Groundwater containing bacteria, chemicals, insecticides, herbicides, gasoline, oil or solvents can cause serious health problems such as bacterial diseases, nervous disorders, liver and kidney failure and cancer to those who drink it. A high density of septic tanks and the extensive use of fertilizers containing nitrogen have resulted in nitrate levels harmful to infants and to animals who drink the water.

How can you tell if groundwater is contaminated?

There is no easy way to tell if your groundwater supply is polluted. The best thing to do is to have your water tested. Discuss water testing with your County Health Department; request recommendations for reliable private laboratories.

Can contaminated water be cleaned up?

We hope so. Known techniques of groundwater cleanup are costly and can take years. By 1988 the Michigan Department of Natural Resources (DNR) had identified over 1700 areas of groundwater contamination. Approximately 240 sites are being added to this list each year.

How can you help?

Michigan residents can do many things to protect groundwater:

1. If you have a well, test it for contaminants regularly. The fact that a neighbor's well tests safe does not mean that your well is safe. Ask your County Health Department for information and guidance.

2. If you drill a new well, study local well codes and requirements before you start. Ask your County Health Department for information.

3. If there is an abandoned well on your property, have it plugged. An open, abandoned well is a possible conduit for groundwater contamination. It should never be used for waste disposal.

4. If you have a septic system, pump it out every one to three years. Do not flush grease, caustics and non-biodegradable materials into the system. Before installing a new septic system, read local code requirements. Have your new septic system installed by a licensed individual. Do not use septic tank cleaners. They are not needed and can be harmful.

5. Federal law requires that abandoned underground storage tanks be removed and that leaking tanks be replaced. If you have an underground tank on your property, have it checked for leaks. Consider switching to above ground storage.

6. If you farm, follow the best livestock manure management practices available. Test the soil to avoid over-application of fertilizer. Follow label recommendations for proper pesticide application. Do not apply chemicals if heavy rain is forecast. Learn about I.P.M. (Integrated Pest Management) from your Cooperative Extension Service.

7. Properly dispose of household hazardous wastes and their containers. Support collection days and facilities in your community.

8. NEVER DUMP, SPILL OR PERMIT CONTAMINANTS TO LEAK ON THE GROUND. Take **used oil** to the nearest collection center. For information call **1-800-634-9504**.

9. Be alert for leaking storage tanks or leaks and spills in your community. Report **pollution emergency** cases to the D.N.R. The hotline number to call is **1-800-292-4706**.

Michigan citizens' groups can work to prevent groundwater contamination:

1. Work with state and local governments to establish landfilling alternatives such as waste reduction, recycling and composting.

2. Insist that landfills and septic systems be located, designed and maintained according to modern standards of good waste management. Work with local governments to draft and enact definitive, up-to-date standards and ordinances for septic systems.

3. Support groundwater protection legislation at local, federal and state levels.

4. Locate local groundwater supplies. Identify possible causes of contamination. Work with local officials to insure effective monitoring and land use decisions.

5. Promote and participate in local groundwater education programs. Encourage your community to develop groundwater protection projects.

FOR GROUNDWATER PROTECTION
INFORMATION AND ASSISTANCE CALL
YOUR:

County Cooperative Extension Service
County Department of Health

or

Michigan Department of Natural Resources

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