Groundwater Awareness Week

March 13-17, 2006 is National Groundwater Awareness Week. Groundwater, found between soil particles and cracks in underground rock in formations known as aquifers, is a primary source of drinking water in Texas.

Groundwater 101

Water is always in motion. When rain falls to the ground, some of it flows along the surface to streams or lakes, some of it is used by plants, some evaporates and returns to the atmosphere, and some sinks into the ground. Where does the water go then? Imagine pouring a glass of water onto a pile of sand. The water moves into the spaces between the particles of sand. This is ground water.

Groundwater is used for drinking water by more than 50 percent of the people in the United States, including almost everyone who lives in rural areas. The U.S. Geological Survey estimates that in Texas, approximately 46 percent of the population used groundwater as their drinking water source in 1996. According to the 2002 Texas Water Plan developed by the Texas Water Development Board, groundwater supplied 58 percent of the 16.0 million acre-feet of water used in the State in 1999. About 78 percent of the 9.3 million acre-feet of water produced from aquifers in 1999 was used for irrigation. Approximately 36 percent of water used for municipal needs is from groundwater sources because most of the large cities rely on surface water sources to meet their large demands. Most of the western half of the State and a good part of the eastern half of the State rely primarily on groundwater resources.

Groundwater is stored in--and moves slowly through--layers of soil, sand and rock called aquifers. Aquifers typically consist of gravel, sand, sandstone, or fractured rock, like limestone. These materials are permeable because they have large connected spaces that allow water to flow through. The speed at which groundwater flows depends on the size of the spaces in the soil or rock and how well these spaces are connected.

Groundwater can be found almost everywhere. The area where water fills the aquifer is called the saturated zone (or saturation zone). The top of this zone is called the water table. The water table may be located only a foot below the ground's surface or it can sit hundreds of feet down. It can rise or fall depending on many factors. Heavy rains or melting snow may cause the water table to rise, or heavy pumping or drought may cause the water table to fall.

Water in aquifers may be brought to the surface naturally through a spring or can be discharged into lakes and streams. Groundwater can also be extracted through a well drilled into the aquifer. All of these cause groundwater to interact with the other waters of the hydrologic cycle.

Groundwater supplies are replenished, or recharged, by rain and snow melt. In some areas of the world, people face serious water shortages because groundwater is used faster than it is naturally replenished. In other areas groundwater is polluted by human activities.

The Hydrologic Cycle

The idea of separate water bodies on this earth (oceans, lakes, streams, underground and atmospheric) is a myth. In truth, all water is related in what is called the hydrologic cycle, in which constant interaction exists between all sources. Contaminating one water source can lead to the contamination of others.

The hydrologic cycle begins when the process of evaporation releases water vapor into the atmosphere. The vapor condenses as it forms into clouds. This water returns to the ground through precipitation – rain. Water runoff soaks into the soil, penetrating deep into the ground until it becomes groundwater, which is found in aquifers below the surface. We come into contact with groundwater when it is pumped for uses such as irrigation and drinking water or when it discharges into a lake or stream. From there, the cycle begins again.

Threats to Ground Water

There is no doubt that groundwater is an important and valuable resource, as it provides almost half of all drinking water supplies in Texas. Most of Texas' major and minor aquifers provide safe and sufficient water for all uses. Existing groundwater quality in Texas varies among the major and minor aquifers. In a small percentage of wells, contaminates such as nitrate, sulfate and total dissolved solids have exceeded federal standards. There is considerable debate as to whether contaminates such as nitrate and sulfate are naturally occurring or the result of man-made activities. However, no controversy exists over the documentation of 7,000 cases of groundwater contamination, as listed in the 2004 Joint Groundwater Monitoring and Contamination Report. Here are some of the threats that have been recognized by the Texas Groundwater Protection Committee:

Use – Simply put, we use a lot of groundwater. Although many think of it as an abundant resource, it is limited. There are many uses of groundwater including municipal and rural use for drinking water and sewage systems, agricultural use for irrigation and livestock, and many industrial uses. Overuse of groundwater can obviously result in quantity issues, but overuse can also cause problems with water quality because it can mine the resource, resulting in lower quality water being produced.

Storm Water – Rainfall in urban areas can threaten groundwater by carrying contaminants into the groundwater. There are three main types of storm water pollution: **litter**, such as cigarette butts, cans, paper or plastic bags, **chemical pollution**, such as detergents, oil or fertilizers, and **'natural' pollution**, such as leaves, garden clippings or animal droppings.

Onsite Wastewater Treatment Systems – Sewage systems dispose of waste from homes and businesses. Proper maintenance, construction and use can protect groundwater resources. However, improper use and poor maintenance can lead to contamination of water supplies from bacteria, viruses and other pollutants.

Underground Storage Tanks – The most commonly reported contaminants come from petroleum storage tank facilities in heavily populated areas of the state such as Houston, Dallas, Fort Worth, San Antonio and El Paso. Contaminants are often released from leaking petroleum storage tanks that include gasoline, diesel, and other petroleum products. Of the 6,746 case of documented groundwater contamination reported in 2004 in Texas, 72 percent are related to the storage of petroleum products underground.

Who Protects My Groundwater?

So far we've covered what groundwater is, how it interacts with other components of the hydrologic cycle, its importance as a resource, and some of the many threats to its quality and quantity. But who's in charge? Who protects our groundwater from contaminants? Who oversees remediation for contaminated groundwater? Who ensures that industry and private uses to do not threaten this resource as a common good? Who plans for future water needs? The answer: state and local government.

Currently there is no federal program to oversee groundwater protection. However, each state government has an agency or multiple agencies that are charged with protecting a piece of the groundwater "pie". State and local agencies protect groundwater in a variety of ways through several programs including:

- **Public water supply**
  By regulating the quality of the water we drink
- **Source Water Protection**
  By protecting water from streams, rivers, lakes, or underground aquifers which is used to supply private wells and public drinking water
- **Underground Injection Programs**
  By regulating the disposal of waste streams in a way that ensures the protection of groundwater
- **Underground Storage Tank Programs**
  By detecting and preventing releases from underground storage tanks
- **Ground Water Monitoring**
  By monitoring for changes in ground water quantity and quality
- **Resource Management**
  By regulating ground water, oil, gas, and mineral recovery to ensure the protection of ground water

For more information about the roles and responsibilities of the various state and local agencies that are members of the Texas Groundwater Protection Committee see the Texas Groundwater Protection Strategy at http://www.tceq.state.tx.us/assets/public/comm_exec/pubs/as/188.pdf .

What You Can Do!

Although programs exist to help protect our sources of drinking water, including groundwater, we the users are the most important actors in protecting these resources. Here are some things you can do to help protect your groundwater:

1 - Be aware – Do you know where the tap water in your house comes from? Is it ground water or surface water? Does it come from a spring, lake or other public water supply?

2 - Be mindful – Protect your groundwater from household pollutants. Do you use household chemicals and dispose of them down the drain. Cut down on household chemical use and learn to dispose of chemicals properly.

3 - Use Less – What are the main uses of water in your household? How can you cut back on use and waste? Is the shower running for five minutes before you climb in? That's 25 gallons. Didn't finish that glass of water? Don't pour it down the drain, water a plant. Do you use drought tolerant landscaping

specific to your region? If not, try some of the water conservation practices recommended by the Texas Water Development Board at http://www.twdb.state.tx.us .

Here are nine more ways you can help protect and conserve groundwater:

- Dispose of chemicals properly.
- Take used motor oil to a recycling center.
- Limit the amount of fertilizer and pesticides used on plants.
- Take shorter showers.
- Shut off water while brushing teeth.
- Run full loads of dishes and laundry.
- Check for leaky faucets and have them fixed.
- Water plants only when necessary.
- Get involved in your community's land and water use planning decisions.

For more information on ground water visit:

The Ground Water Protection Council at http://www.gwpc.org/

The Groundwater Foundation at www.groundwater.org

The National Ground Water Association at http://www.ngwa.org/awareness/aware.cfm

The U.S. Geological Survey at http://water.usgs.gov/NGWAW.html